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Projects

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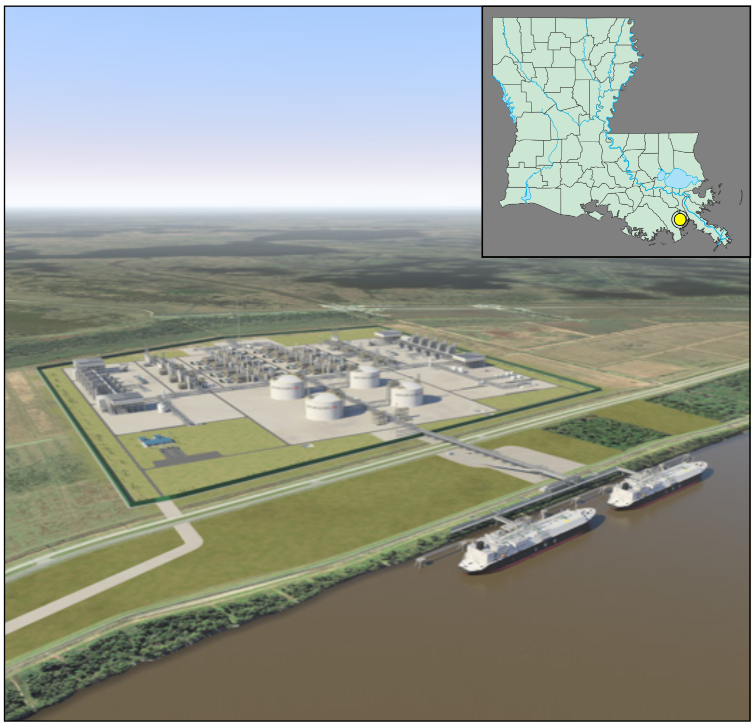
DRAFT ENVIRONMENTAL IMPACT STATEMENT
for the
Plaquemines LNG and Gator Express Pipeline Project



Venture Global Plaquemines LNG, LLC | **Docket Nos. CP17-66-000**
Venture Global Gator Express, LLC | **CP17-67-000**

Federal Energy Regulatory Commission
Office of Energy Projects
Washington, DC 20426

Cooperating Agencies:

U.S. Environmental Protection Agency

U.S. Army Corps of Engineers

U.S. Coast Guard

Pipeline and Hazardous Materials Safety Administration

U.S. Department of Energy

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON D.C 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas Branch 1
Venture Global Plaquemines LNG, LLC and Venture Global Gator Express, LLC
Plaquemines LNG and Gator Express Pipeline Project
Docket Nos. CP17-66-000 and CP17-67-000

TO THE INTERESTED PARTIES:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared a draft environmental impact statement (EIS) for the Plaquemines LNG and Gator Express Pipeline Project, proposed by Venture Global Plaquemines LNG, LLC and Venture Global Gator Express, LLC in the above-referenced dockets. Venture Global requests authorization to construct and operate a new LNG export terminal and associated facilities along the west bank of the Mississippi River in Plaquemines Parish, Louisiana (Terminal) and to construct and operate two new 42-inch-diameter natural gas pipeline laterals that would connect to the LNG Terminal. The new liquefaction facilities would have a design production capacity of 20 million metric tons of liquefied natural gas (LNG) per annum.

The draft EIS assesses the potential environmental effects of the construction and operation of the Plaquemines LNG and Gator Express Pipeline 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. These impacts would be reduced to less-than-significant levels with the implementation of Venture Global's proposed mitigation measures and the additional measures recommended in the draft EIS.

The U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Department of Energy, U.S. Environmental Protection Agency, and U.S. Department of Transportation participated as cooperating agencies in the preparation of the EIS. Cooperating agencies have jurisdiction by law or special expertise with respect to resources potentially affected by the proposal and participate in the NEPA analysis.

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

- **LNG Terminal**: Construction and operation of various liquefaction, LNG distribution, and appurtenant facilities within the boundaries of the site leased by Venture Global on the Mississippi River, including:
    - six pretreatment facilities (three in each phase);
    - a liquefaction plant with 18 integrated single-mixed refrigerant blocks and support facilities (otherwise referred to as liquefaction blocks or blocks) to be constructed in two phases (nine blocks in each phase);
    - four 200,000-cubic-meter aboveground LNG storage tanks;
    - three LNG loading docks within a common LNG berthing area; and
    - air-cooled electric power generation facilities.
- **Pipeline System**: Construction and operation of two parallel 42-inch-diameter natural gas pipelines that share one right-of-way corridor for the majority of their respective routes and appurtenant aboveground facilities, including the following:
    - 15.1-mile-long Southwest Lateral Tennessee Gas Pipeline, LLC (TGP) Pipeline;
    - 11.7-mile-long Southwest Lateral Texas Eastern Transmission, LP (TETCO) Pipeline;
    - TGP metering and regulation station; and
    - TETCO metering and regulation station.

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. CP17-66 or CP17-67). 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, it is important that the Commission receive your comments on or before 5:00pm 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 numbers (CP17-66-000 and CP17-67-000) 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 the 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 11, 2018 (4:00 p.m. – 7:00 p.m. CST)	Belle Chasse Library 8442 Hwy 23 Belle Chasse, Louisiana 70037 (504) 394-3570

The primary goal of these comment sessions 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 7:00 pm CST. 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 7:00 p.m. 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 6:30 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 which 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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TECHNICAL ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	micrograms per cubic meter
μPA	micropascal
μPA_{RMS}	micropascal root mean square
ACHP	Advisory Council on Historic Preservation
AOI	area of influence
APE	Area of Potential Effect
API	American Petroleum Institute
applicant	Venture Global Plaquemines LNG, LLC, and Venture Global Gator Express, LLC; *also* Venture Global
AQCR	Air Quality Control Regions
AQRV	Air Quality Related Value
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ATWS	additional temporary workspace
BA	biological assessment
BACT	Best Available Control Technology
BAHX	brazed aluminum heat exchanger
BCC	Birds of Conservation Concern
bcf/y	billion cubic feet per year
bcfd	billion cubic feet per day
BCR	Bird Conservation Region
b.e.g.	below existing grade
BGEPA	Bald and Golden Eagle Protection Act
BLEVE	boiling liquid expanding vapor explosion
BMP	best management practice
BOG	boil-off gas
BPVC	Boiler and Pressure Vessel Code
BTU	British thermal unit
Btu/ft^2-hr	British thermal units per square foot per hour
CAA	Clean Air Act of 1970
CAMx	Comprehensive Air Quality Model with Extension
CCGT	Combined cycle gas turbine
CEQ	Council on Environmental Quality

Certificate	Certificate of Public Convenience and Necessity
CFR	Code of Federal Regulations
CH_4	methane
CI ICE	Compression Ignition Internal Combustion Engines
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
COI	Certificate of Inspection
Commission	Federal Energy Regulatory Commission; *also* FERC
COTP	Captain of the Port
CPRA	Coastal Protection Restoration Authority
CPT	cone penetration test
CUP	Coastal Use Permit
CWA	Clean Water Act
CZMA	Coastal Zone Management Act of 1972
CZMP	Coastal Zone Management Program
DAT	deposition analysis threshold
dB	decibel
dBA	A-weighted decibel
DE	design earthquake
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DOTD	Louisiana Department of Transportation and Development
E1UB	estuarine subtidal unconsolidated bottom (wetland)
EA	environmental assessment
EDMS	Electron Data Management System
EEM	estuarine emergent (wetland)
EFH	essential fish habitat
EI	Environmental Inspector
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
EPAct 2005	Energy Policy Act of 2005
ERIC	Emissions Reporting and Inventory Center
ERP	Emergency Response Plan
ESA	Endangered Species Act of 1973

ESD	emergency shutdown
ESS	estuarine scrub/shrub (wetland)
FAA	Federal Aviation Administration
FE	Office of Fossil Energy
FEED	front-end engineering and design
FEMA	Federal Emergency Management Administration
FERC	Federal Energy Regulatory Commission; *also* Commission
FLM	Federal Land Manager
FLNGV	Floating Liquefaction and Storage Vessel
FR	Federal Register
FSA	Facility Security Assessment
FSP	Facility Security Plan
FTA	Free Trade Agreement
FWS	United States Fish and Wildlife Service
g	factor of gravity
Gator Express Pipeline	Venture Global Gator Express, LLC
GHG	greenhouse gas
GIS	geographic information system
GMD	geomagnetic disturbances
GWP	global warming potential
H_2S	hydrogen sulfide
HAP	hazardous air pollutant
HAZOP	hazard and operability review
HCA	high consequence area
HDD	horizontal directional drill
HP	Brake horsepower
HRSG	heat recovery steam generator
HUC	hydrologic unit code
HVAC	heating, ventilating, and air conditioning
I-#	Interstate
IBC	International Building Code
ICW	Intracoastal Waterway
IMO	International Maritime Organization
ISA	International Society for Automation
ITEP	Industrial Tax Exemption Program
JPA	Joint Permit Application

KO	knockout
KOP	key observation point
LAC	Louisiana Administrative Code
LDEQ	Louisiana Department of Environmental Quality
Ldn	Day-Night Average Sound Level
LDNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries
Leq	Equivalent Sound Level
LNG	liquefied natural gas
LNHP	Louisiana Natural Heritage Program
LOD	Letter of Determination
LOI	Letter of Intent
LOR	Letter of Recommendation
LPDES	Louisiana Pollutant Discharge Elimination System
LRS	Louisiana Revised Statutes
M&R	metering and regulation
m/s	meters per second
MAOP	maximum allowable operating pressure
MARAD	Maritime Administration
MBTA	Migratory Bird Treaty Act of 1918
MEOW	maximum envelope of water
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
MLV	mainline valve
MMBtu	million British thermal units
MMPA	Marine Mammal Protection Act
MOF	material offloading facility
MOU	Memorandum of Understanding
MP	milepost
mph	miles per hour
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSL	mean sea level
MTPA	million metric tons per annum
MTSA	Maritime Transportation Security Act of 2002
MW	megawatt
N_2O	nitrous oxide

NAAQS	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum of 1988
NEP	National Estuary Program
NEPA	National Environmental Policy Act of 1969
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFIA	National Flood Insurance Act of 1968
NFPA	National Fire Protection Association
NGA	Natural Gas Act
NHPA	National Historical Preservation Act
nm	nautical miles
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NO_x	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	noise sensitive area
NSPS	New Source Performance Standards
NSR	New Source Review
NVIC	Navigation and Vessel Inspection Circular
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
O_3	ozone
OBE	operating basis earthquake
OCM	Office of Coastal Management
OEP	Office of Energy Projects
P&ID	piping and instrument diagram
Parish Plan	Plaquemines Parish Comprehensive Master Plan
PEM	palustrine emergent (wetland)
PFD	process flow diagram
PFO	palustrine forested (wetland)
PGA	peak ground acceleration
PHMSA	Pipeline and Hazardous Materials Safety Administration

pipeline system	Venture Global Gator Express, LLC's lateral pipelines that will connect the Venture Global Plaquemines LNG, LLC, terminal to the existing U.S. natural gas transmission grid
Plaquemines LNG	Venture Global Plaquemines LNG, LLC
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns
PNR	potential noise receptor
ppb	parts per billion
ppm	parts per million
ppmv	parts per million volume
ppt	parts per thousand
Project	the combined Venture Global Plaquemines LNG, LLC, and Venture Global Gator Express, LLC, actions and facilities
Project-specific Plan	project-specific *Upland Erosion Control, Revegetation, and Maintenance Plan*
Project-specific Procedures	project-specific *Wetland and Waterbody Construction and Mitigation Procedures*
PSD	Prevention of Significant Deterioration
psig	pounds per square inch gauge
PSS	palustrine scrub-shrub (wetland)
Q/D	emission to distance
RHA	Rivers and Harbors Act
RICE	Reciprocating Internal Combustion Engines
RMP	Risk Management Program
RMS	root-mean square
ROI	radius of influence
RSRIS	Road Safety and Reliability Impact Study
RV	recreational vehicle
SAV	submerged aquatic vegetation
SCR	selective catalytic reduction
SCPT	seismic cone penetration tests
SEL_{cum}	cumulative sound exposure level
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
SMC	significant monitoring concentration
SO_2	sulfur dioxide
SOLAS	*Safety of Life at Sea*
SONRIS	Strategic Online Natural Resources Information System
SPCC	Spill Prevention, Control, and Countermeasures
SSE	safe shutdown earthquake
SSURGO	Soil Survey Geographic
SW	southwest
SWEL	still water elevation
SWPPP	Stormwater Pollution Prevention Plan
TAP	toxic air pollutant
terminal	Venture Global Plaquemines LNG, LLC's proposed liquefied natural gas terminal on the west bank of the Mississippi River in Plaquemines Parish, Louisiana
TETCO	Texas Eastern Transmission, LP
TGP	Tennessee Gas Pipeline, LLC
tpy	tons per year
TTS	temporary threshold shift
TWIC	Transportation Worker Identification Credential
U.S.C.	United States Code
US #	U.S. Highway
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
Venture Global	Venture Global Plaquemines LNG, LLC, and Venture Global Gator Express, LLC; *also* applicants
VOC	volatile organic compound
WEG	wind erodibility group
WSA	Waterway Suitability Assessment

EXECUTIVE SUMMARY

INTRODUCTION

On February 28, 2017, Venture Global Plaquemines LNG, LLC (Plaquemines LNG) filed an application with the Federal Energy Regulatory Commission (Commission, *also* FERC) for authorization pursuant to section 3(a) of the Natural Gas Act (NGA) and part 153 of the Commission's regulations. Also on February 28, 2017, Venture Global Gator Express, LLC (Gator Express Pipeline) filed an application with FERC for a Certificate of Public Convenience and Necessity (Certificate) pursuant to section 7(c) of the NGA and part 157 of the Commission's regulations.

In Docket Nos. CP17-66-000 and CP17-67-000, Plaquemines LNG and Gator Express Pipeline request authorization to site, construct, and operate natural gas liquefaction, storage, and export facilities at a proposed liquefied natural gas (LNG) terminal on the west bank of the Mississippi River, and authorization to construct and operate associated lateral pipelines in Plaquemines Parish, Louisiana. The combined Plaquemines LNG and Gator Express Pipeline actions and facilities are referred to herein as the Project, and the applicants are collectively referred to as Venture Global.

The purpose of the environmental impact statement (EIS) is to inform FERC decision-makers, the public, and the permitting agencies about the potential adverse and beneficial environmental impacts of the Project and its alternatives, and recommend mitigation measures that would reduce adverse impacts to the extent practicable. As part of the Commission's consideration of these applications, we[1] prepared this draft EIS to assess the potential environmental impacts resulting from the construction and operation of the Project in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA). Our analysis was based on information provided by Venture Global, and further developed from data requests, field investigations, scoping, literature research, and communications with federal, state, and local agencies, and individual members of the public.

FERC is the lead agency for the preparation of the draft EIS. The U.S. Army Corps of Engineers (USACE), U.S. Coast Guard (USCG), U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and U.S. Department of Transportation (DOT) are participating in the NEPA review as cooperating agencies and provided comment on this draft EIS.

PROPOSED ACTION

The Project consists of two main components: 1) the development of natural gas liquefaction and LNG export capabilities through construction of a new facility (LNG terminal) in Plaquemines Parish, Louisiana; and 2) the construction of facilities necessary to provide natural gas supplies to the LNG terminal, including two new pipelines, six main line valves, three pig launchers, two pig receivers, and two metering and regulation stations. The Project would produce 20 million metric tons per annum of LNG for export.

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

PUBLIC INVOLVEMENT

On July 2, 2015, FERC began its pre-filing review of the Project and established pre-filing Docket No. PF15-27-000 to place information related to the Project into the public record. The pre-filing process ended on February 28, 2017, when Venture Global filed its application with 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 FERC.

On October 5, 2015, FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Plaquemines Liquefied Natural Gas Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting* (NOI). This notice was sent to nearly 370 interested parties including federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; federally recognized tribes (tribes); affected property owners; other interested parties; and local libraries and newspapers. On September 14, 2016, FERC issued a *Supplemental Notice of Intent to Prepare an Environmental Impact Statement for the Planned Plaquemines Liquefied Natural Gas Project*. This Supplemental NOI was sent to eight new landowners in the vicinity of Project facilities based on the revised pipeline route. Publication of each NOI established a 30-day public comment period. We received a total of eight comment letters in response to the NOIs. Substantive environmental issues identified through this public review process are addressed in this draft EIS.

ENVIRONMENTAL IMPACTS AND MITIGATION

We evaluated the potential impacts of construction and operation of the Project on geology; soils and sediments; water resources; wetlands; vegetation; wildlife and aquatic resources; threatened, endangered, and other special status species; land use, recreation, and visual resources; socioeconomics; cultural resources; air quality and noise; reliability and safety; cumulative impacts, and alternatives. Where necessary, we recommend additional mitigation measures to minimize or avoid impacts. Sections 5.1 and 5.2 of the draft EIS contain our conclusions and a compilation of our recommended mitigation measures, respectively.

Construction of the LNG terminal facilities would disturb 648.1 acres of land, and 80.6 acres of water. Of this total, 625.8 acres of land would be impacted by operation and maintenance of the LNG terminal facilities, and 10.7 acres of water would be affected by operation and maintenance of the turning basin. The remaining 22.3 acres of land would be temporarily affected during construction. An additional 77.0 acres would be leased by Venture Global at the LNG terminal site, but would not be affected by construction.

The land requirements for the pipeline system and its aboveground facilities include 953.9 acres during construction and 137.3 acres during operation. An 80-foot-wide permanent easement would be required where the two pipelines are collocated, and a 50-foot-wide permanent easement would be required where the Southwest Lateral TGP would be located alone.

Based on our analysis, Project scoping, agency consultations, and public comments, the major Project construction and operational issues are impacts on waterbody and wetlands; vegetation; wildlife and aquatic resources; federally listed species; land use, recreation, and visual resources; socioeconomics; air quality and noise; reliability and safety; and cumulative impacts.

WATER AND WETLAND RESOURCES

Construction of the pipeline would primarily occur in open water and inundated wetlands. The pipeline would be installed by the barge lay method in areas of open water and by direct push in areas of inundated wetlands/marsh. Venture Global would conduct one horizontal direction drilling (HDD) operation along the pipeline for installation under wetlands and a canal. Use of the HDD method would avoid disturbance to wetlands near the terminal. In the event of an inadvertent release of drilling mud during an HDD crossing, Venture Global would implement its HDD Contingency Plan that includes measures to minimize drilling mud impacts. No active public or private drinking water supply wells are within 150 feet of the pipeline.

Construction of the terminal would result in the permanent loss of 368.1 acres of wetlands as a result of permanent fill placement. All permanent wetland loss would occur to palustrine emergent wetlands and are a result of construction at the terminal site. Additionally, Venture Global would require 2.8 acres of wetland conversion from palustrine forested wetlands to palustrine emergent wetlands and 12.0 acres of temporary wetland impacts within the terminal site. Venture Global designed the terminal facilities to minimize wetland impact and would follow its Project-specific Procedures to further reduce impacts on wetlands. To mitigate unavoidable impacts on wetlands, Venture Global would comply with its Compensatory Mitigation Plan (CMP) which would identify the acreage and type of mitigation as required by the USACE for the Section 404 compliance.

Construction of the pipeline facilities would affect a total of 70.8 acres of wetlands by construction of the pipeline, aboveground facilities (meter stations and mainline valves [MLV]), additional temporary workspace (ATWS) areas, contractor yards, and access roads. Approximately 0.4 acre of this impact would result in permanent wetland loss as a result of fill placement for MLVs, permanent road to MLVs, and portions of the pipe trestle over the levee near Lake Hermitage Road. Following construction, the remaining disturbed areas would be restored and the permanent right-of-way maintained, in accordance with Venture Global's Project-specific Procedures.

With implementation of the HDD method, HDD Contingency Plan, Venture Global's CMP, Project-specific *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and Project-Specific *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures), and our recommendations, we conclude that impacts on water and wetland resources due to construction and operation of the Project would be minimized to the extent practicable and would not be significant.

VEGETATION

Construction and operation of the LNG terminal facilities would permanently affect approximately 629.0 acres of vegetation, resulting in the loss or conversion to developed area of palustrine emergent wetlands, palustrine forested wetlands, forested scrub/shrub uplands, and herbaceous uplands.

Construction of the pipeline system would affect about 107.3 acres of vegetation, of which 2.1 acres would be permanently lost as it would be associated with aboveground facility sites and permanent access roads. The primary impacts on vegetation from construction would be the cutting and clearing of existing vegetation within the construction work areas. Impacts resulting from operation of the facilities would include conversion of some scrub-shrub vegetation to herbaceous vegetation due to maintenance of the pipeline right-of-way, and conversion of vegetation within new aboveground facilities to non-vegetated land. Impacts on vegetation within the pipeline right-of-way and ATWS would be temporary and short-term because these areas would revegetate within one to two growing seasons.

One vegetation community of special concern (Coastal Live Oak-Hackberry Forest natural community, also known as a Chenier) was identified by the Louisiana Department of Natural Resources as potentially present in the Project area. During field surveys, 4.0 acres of coastal live oak-hackberry forest were found within the footprint of the pipeline system. Of the 4.0 acres, 1.6 acres would be avoided by HDD, 0.7 acre would have a temporary impact and allowed to recover after construction, and 1.7 acres would be permanently converted from Coastal Live Oak-Hackberry Forest to herbaceous uplands. This vegetation community is in proximity to the non-federal levee, and the non-federal levee will be crossed with a pipe bridge. The location of the HDD entry site is limited by the proximity to the pipe bridge. Therefore, impact to this vegetation community cannot be avoided. This represents a relatively small percentage of the remnants of this natural community.

To minimize impacts of the Project on vegetative communities, Venture Global would construct and operate the LNG terminal and pipeline system in accordance with its Project-specific Plan and Procedures. With the implementation of the proposed mitigation measures we conclude that construction and operation of the Project would not have a significant impact on vegetation communities in the Project area.

WILDLIFE AND AQUATIC RESOURCES

Wildlife Resources

Although construction of the LNG terminal and pipeline system could cause displacement, stress, and direct mortality of some individuals, construction and operation of the LNG terminal would not have significant long-term impacts on wildlife species due to the degraded wildlife habitat value provided by the site and the proposed mitigation for wetland impacts. Operation of the LNG terminal would result in increased noise, lighting, and human activity that could disturb wildlife in the area. However, due to the existing heavy ship traffic and other industrial uses along the Mississippi River, most wildlife in the area are acclimated to the noise and artificial lighting associated with these activities. In addition, pipeline system operations require little lighting, activities, or other disturbances that would affect wildlife. We conclude that the LNG terminal and pipeline system's operational impacts on wildlife would be minimized and not significant. Venture Global would implement the Project-specific Plan and Procedures to restore habitat following construction.

The vegetative communities in the Project area provide potential habitat for migratory bird species, including songbirds, waterbirds, and raptors. Much of the approximately 600 acres of habitat associated with the LNG terminal site was previously disturbed by cattle grazing and past fill activities that reduce nesting habitat value. However, the undisturbed areas contain higher quality nesting habitat that would be more attractive to breeding bird species. Much of the habitat along the pipeline system consists of wetlands, which provide habitat for waterfowl and other migratory birds. At the LNG terminal site, and where practicable along the pipeline, Venture Global would conduct clearing outside the migratory bird nesting window of March 1 to September 15. Where clearing cannot occur outside of the nesting window, Venture Global has committed to conduct preconstruction surveys of the Project area and if active nests are detected, they would be avoided until young have fledged.

Colonial waterbird nesting colonies occur within the Project area, specifically within 600 to 1,800 feet of the pipeline. The Louisiana Department of Wildlife and Fisheries (LDWF) and United States Fish and Wildlife Service (FWS) provided guidelines for preconstruction site visits and, if warranted, distance and timing restrictions. We recommended that Venture Global conduct surveys and consult with the LDWF regarding nesting colony bird surveys and additional mitigation measures for rare wildlife species with potential habitat in the LNG terminal and pipeline system area, and file that information for review and approval prior to construction. With the implementation of the measures recommended by the FWS and LDWF and our recommendations, we conclude that impacts on wildlife, including migratory birds and colonial waterbirds, would be less than significant.

Aquatic Resources and Essential Fish Habitat

Construction of the LNG terminal marine facilities, berthing area and turning basin would not require dredging/excavation of the Mississippi River. However, marine facility construction would require driving concrete pilings in water with vibratory and impact pile drivers to install docks and berthing structures. Potential impacts from these activities include increased sedimentation, turbidity, and noise levels, which could adversely affect aquatic resources. During construction of the two meter stations in Barataria Bay, multiple 12-inch-diameter steel piles would be installed during construction, as well.

Impacts on aquatic resources due to increased turbidity and suspended sediment levels would vary by species; however, the aquatic resources within the Project area are likely accustomed to regular fluctuations in turbidity levels from industrial activity and regular maintenance dredging within the Mississippi River. Substrates within the Mississippi River are considered early successional due to frequent disturbance from maintenance dredging, propeller wash, and vessel traffic. The soft bed substrates that characterize the Project vicinity are prone to dynamic patterns of sediment scour and deposition, favoring organisms that are adapted to a dynamic bed environment, and, therefore, would recover quickly after construction. We conclude that sedimentation and turbidity impacts on aquatic resources from pile driving and other intrusive activities would be localized, temporary, and minor.

Underwater noise impacts from pile driving may result in injury or trauma to fish, sea turtles, and other aquatic species if measures are not implemented to avoid and minimize these potential impacts. Venture Global is considering noise attenuation measures to substantially reduce underwater sound pressure levels produced by pile driving, thereby reducing the extent of potential behavioral and injury level effects on aquatic species. Because Venture Global has not yet committed to any specific mitigation measures, we recommend it file a final plan detailing proposed mitigation measures, prior to the end of the draft EIS comment period, developed in consultation with the National Marine Fisheries Service (NMFS), the FWS, and the LDWF. We expect this final plan to reduce impacts to acceptable levels.

Venture Global would construct the majority of its pipeline using the barge lay and push lay methods as well as the one HDD, to cross wetlands and waterbodies. This would avoid or minimize impacts on fisheries, fish habitat, and other aquatic resources. The majority of fish species present within the waterbodies at the time of construction activities would likely be displaced to similar adjacent habitats; however, stress, injury, or death of individual fish may occur. Increased suspended sediment and turbidity levels may also cause degradation of benthic and spawning habitat and decreased dissolved oxygen levels within the crossing location. Venture Global would implement the measures outlined in its Project-specific Procedures to minimize impacts on waterbodies and aquatic resources during pipeline system construction. In addition, we recommend that Venture Global consult with the LDWF regarding that agency's proposed in water construction windows. Once construction is complete, beds and banks would be restored to their preconstruction conditions and contours to the maximum extent practicable. Operation of the pipeline system would not affect aquatic resources. With implementation of the mitigation measures described above, we anticipate that the pipeline system would have minimal, localized, and no significant impacts on aquatic resources.

LNG terminal construction would affect approximately 100 acres of essential fish habitat (EFH) within the Mississippi River. Approximately 775.4 acres of estuarine open water mapped as EFH and 423.9 acres of estuarine open water not mapped as EFH (in Lake Laurier, Barataria Bay, and Wilkinson Bay), along with approximately 64.5 acres of estuarine emergent wetlands that can function as EFH, would be temporarily modified by dredging, excavation, and related activities within the workspace required for pipe installation, meter station construction, and barge access channels. However, no submerged aquatic vegetation was identified during Venture Global's field surveys at proposed dredging/excavation locations. Therefore, no impacts on submerged aquatic vegetation are expected. Construction impacts, including increased turbidity, loss of benthic habitat, and habitat modification, are expected to be minor or of short duration, as populations of EFH species and their food sources would be expected to recover quickly following construction. These impacts would also be minimized through implementation of the Project-specific Procedures, the *Spill Prevention, Control, and Countermeasures* (SPCC) Plan, and the HDD Contingency Plan. Therefore, we conclude that construction of the Project would adversely affect EFH, but these adverse effects would be temporary. Permanent adverse effects on EFH would be offset by compensatory mitigation included in Venture Global's CMP.

THREATENED AND ENDANGERED SPECIES

The FWS Louisiana Ecological Services list of endangered, threatened, and candidate species by county identified 10 species as potentially present in Plaquemines Parish, including the West Indian manatee (*Trichechus manatus*), piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), Gulf sturgeon (*Acipenser oxyrinchus desotoi*), pallid sturgeon (*Scaphirhynchus albus*), and five species of sea turtles. NMFS identified 12 federally listed threatened and endangered species that may occur in the Project area, including three fish, five sea turtles, and four whales. Potential impacts on aquatic and terrestrial habitats and species have been described above, and those same impact types apply to threatened and endangered species. We determined that the Project *is not likely adversely affect* federally listed threatened and endangered species. As required by section 7 of the Endangered Species Act of 1973, we request that the FWS and NMFS accept the information provided in this EIS as the Biological Assessment for the

Project. We also recommend that Venture Global should not begin any Project construction until FERC staff completes Endangered Species Act consultation for the Project.

LAND USE, RECREATION, AND VISUAL RESOURCES

The Project would be within the Louisiana Coastal Zone. All activities or developments that may affect Louisiana's coastal zone require a federal consistency review under the National Coastal Zone Management Program, and must obtain a Coastal Use Permit from the Louisiana Department of Natural Resources. To ensure compliance with this federal requirement, we recommend that Venture Global file the consistency determination with the Secretary, prior to any LNG terminal and pipeline system construction.

The majority of the LNG terminal facilities would be within cultivated crop land, which encompasses active cropland, pasture, and hayfields. Forested land, wetlands, developed commercial/industrial land, open water, herbaceous land, and scrub-shrub are the other U.S. Geological Survey land use classifications that would be affected. The proposed LNG terminal is entirely on private lands, and no federal or state-managed public lands are within 0.25 mile of the site. There are currently no existing or planned residential or commercial developments within 0.25 mile of the LNG terminal. There are both existing and planned industrial developments within the vicinity of the LNG terminal.

The Plaquemines Parish developed a Comprehensive Master Plan in 2012 for the terminal site (as well as other lands within Plaquemines Parish). The Project would be consistent with the Parish Plan for development because most of it would be constructed on properties identified in the Parish Plan for "port/terminal" and "major industries."

Construction and operation of the LNG terminal and pipeline system would not directly affect designated recreational areas or special interest areas. There are three wildlife refuges, a private conservation area, one historic park and preserve, five restoration areas, and three public marinas located in proximity to the Project.

There are no wildlife refuges, preserves, or conservation areas located within 16 miles of any Project workspace. The three wildlife refuges located in Plaquemines Parish—Breton National Wildlife Refuge, Delta National Wildlife Refuge, and Pass A Loutre State Wildlife Refuge—are all located over 35 miles from any Project workspace and would not be affected by Project construction or operation activities. A private conservation area, Woodland Trail and Park, and a preserve, Jean Lafitte National Historic Park and Preserve, are both located over 16 miles from any Project workspace and would not be affected by Project construction or operation.

The Barataria-Terrebonne National Estuary is located between the Mississippi and Atchafalaya Rivers in south Louisiana. The estuary's watershed includes the LNG terminal site and pipeline system right-of-way. Construction of the pipelines would require dredging of channels within the Barataria-Terrebonne estuary to provide temporary access for pipeline lay barges and support vessels. Recreational boaters in the Barataria-Terrebonne estuary may be temporarily prevented from using channels during these dredging operations. Users may also observe a temporary increase in barge traffic during construction of the pipeline system. These impacts on boaters would be temporary and minor.

Four restoration areas, Lake Hermitage Marsh Creation (BA-42), Fringe Marsh Repair, West Pointe a lá Hache Siphon Diversion, and Bayou Grande Cheniere Marsh and Ridge Restoration are located between 3.0 miles and 7.7 miles from any Project component. No impacts are anticipated at these restoration areas from either direct contact or indirect tidal influences.

West Pointe a lá Hache Marina is located 0.4 mile northeast of the terminal site. The marina is located off of the Back Levee Canal that parallels the east bank of the Mississippi River. Lake Hermitage Marina is located 1.8 miles to the east of the SW lateral TGP. St. Jude Hump Public Boat Launch is located 1.8 miles southeast of the LNG terminal site. Woodland Plantation is located 0.8 mile east of the terminal site. None of these facilities are expected to be affected by the Project. We have determined the Project would have some adverse impacts on recreation, including boating and fishing along the Mississippi River and Barataria Bay.

The presence of the LNG terminal and associated increased lighting from exterior plant lighting, air navigation lighting, LNG storage tanks, electric power generation facilities, liquefaction heat exchangers, air coolers, and the flare stack would have an influence on visual resources. The location of the LNG terminal would be in the viewshed of local residents, drivers, and visitors travelling along State Highway 23 and other nearby roadways. It also would be visible to recreational and commercial users of the Mississippi River. However, most of the activities and structures within the LNG terminal site would be obscured by existing scrub-shrub and tree cover and a perimeter floodwall, and the surrounding developed areas along the Mississippi River are currently heavily lit by industrial facilities during the night-time hours.

Construction and operation of the pipeline system may affect visual resources through the removal or alteration of existing vegetation as well as earthwork and grading scars associated with heavy equipment tracks, trenching, and dredging. A pipe bridge over State Highway 23 and other new aboveground facilities also would be built that would be visible to outside viewers. As much of the pipeline system would be located in rural or industrial areas, the pipeline system would be anticipated to cause minor impacts with regard to visual resources. Existing vegetation would help to provide some visual buffers from the operation of the pipeline system. In areas where vegetation would be removed or altered, pre-Project conditions would be restored according to the Project-specific Plan and Procedures.

SOCIOECONOMICS

Construction of the Project would stimulate local economies by generating construction jobs and sales and payroll taxes and increasing demand for local goods, services, and equipment, including in the study area parishes of Plaquemines, Jefferson, and Orleans. The Project would increase economic activity along supply chains and increase consumer spending through workforce compensation, contributing to a moderate or more substantial local benefit over the 4.5 years of construction and a year or two after construction ends. Venture Global estimates 10 percent of the total estimated Project cost of $8.5 billion would be spent locally or regionally.

Economic impacts and employment benefits during operation would be permanent as Venture Global would hire 250 workers with average salaries of $75,000 to $90,000, excluding benefits, with combined annual payroll of $21 million. It would spend approximately $20 million annually on materials, land leases, and utilities (water, sewer, waste disposal). Initially, its operational tax contributions would be a minor benefit at the local and state levels, consisting of payroll, income, and sales taxes and ad valorem taxes on the pipeline system. Venture Global has applied for a Louisiana Industrial Tax Exemption Program waiver on ad valorem taxes on the LNG terminal for up to 10 years.

Neither construction nor operation would have significant adverse impacts on housing supply or provision of community services, though effects on temporary housing could be noticeable and minor in specific locations within the study area. Neither construction nor operation would have disproportionately high or adverse environmental and human health impacts on low-income and/or minority populations.

Given the width of the Mississippi River and the volume of vessel traffic it handles currently, the vessel traffic contributed by the Project during construction or operation would not create significantly vessel traffic congestion. During construction, vehicle traffic congestion on State Highway 23 during peak commute hours would be minimized through multiple mitigation measures, including limiting worker parking passes to induce carpooling, constructing turning lanes along State Highway 23 at its intersection with the terminal entrance, and stationing a police officer to control traffic during rush hours.

AIR QUALITY AND NOISE

Air quality would be affected by construction and operation of the Project. Air pollutant emissions would be generated by operation of equipment during construction of the Project facilities, a combination of construction emissions and interim operating emissions would occur for an approximately 4.5-year period, followed by long-term operational emissions. The highest level of emissions associated with the Project would result from the combination of construction and interim operation of the LNG terminal. Plaquemines Parish is designated as unclassifiable/attainment for all criteria pollutants (ozone [O_3]), particulate matter less than 2.5 microns in aerodynamic diameter, particulate matter less than 10 microns in aerodynamic diameter, carbon monoxide and nitrogen dioxide.

The Project would not lead to impacts above standards or other thresholds on any special national (Class I) or regional natural, scenic, recreational, or historic value areas for which the Prevention of Significant Deterioration regulations provide special protection. As a new facility, the Project must obtain an air quality permit from the Louisiana Department of Environmental Quality, who is the lead air permitting authority for the Project, prior to initiating construction.

Emissions from construction equipment would be temporary and depend on the duration and type of construction activity, together with the number and type of vehicles and equipment in use at any point in time. Venture Global would have short-term and localized construction emissions as equipment and activities move sequentially along the route, and would depend on the equipment being operated at any given time. Venture Global has identified the specific measures it would implement to control fugitive dust emissions during construction at the LNG terminal in a Fugitive Dust Control Plan.

Operation of the Project would result in long-term air pollutant emissions from stationary equipment at the LNG terminal site, including combustion turbines, duct burners, diesel engines for backup generators, and fugitive emissions from various components. In addition, the LNG terminal marine facility would be a source of emissions, as well as fugitive emissions from various onshore components. Stationary emissions sources associated with the pipeline system would include pig launcher/receivers, meter stations, block valves, and fugitive emissions from various components.

Mobile sources of operational emissions would include cars, trucks, and marine vessels associated with the LNG terminal facility. Marine vessels that would produce operational emissions would include LNG carriers at berths, LNG carriers underway, escort tug boats, and security vessels.

Venture Global estimated ambient pollutant concentrations in the vicinity of the Project. The analysis for all pollutants except O_3 used the EPA's AERMOD to predict maximum short-term and annual concentrations. The modeling analysis and "culpability analysis" showed that the Project would not significantly contribute to any of the modeled National Ambient Air Quality Standard (NAAQS) exceedances, and is shown to be in compliance with the NAAQS.

Venture Global performed additional assessments, based on the results of the NAAQS, of potential impacts from air emissions on Class I areas; soils, vegetation, and wildlife; and effects on development growth. The Project would not have a significant impact on pollutant concentrations or visibility impairment in any Class I areas or result in significant impacts on soils, vegetation, or wildlife as a result of air emissions.

Venture Global performed another air quality modeling analysis to quantify the potential impact of the Project on O_3 concentrations in the surrounding area, relative to the 8-hour O_3 NAAQS. The analysis determined that the addition of the modeled Project impact on background concentrations would not exceed the 70 parts per billion 2015 O_3 NAAQS. Therefore, the Project would not cause or contribute to a violation of the O_3 NAAQS.

During the construction period, residents in the vicinity of the Project would experience local impacts on air quality. Concurrent emissions from staged construction, commissioning and start-up, and operation of the LNG Terminal would temporarily impact local air quality, and could result in exceedances of the NAAQS in the immediate vicinity of the LNG Terminal during these construction years. These exceedances would not be persistent at any one time during these years due to the dynamic and fluctuating nature of construction activities within a day, week, or month. During operation, extensive modeling has indicted that the Project would not have significant impacts on the local and regional air quality and Class I areas.

Pile driving, both land-based and marine-side, and internal combustion engines associated with LNG terminal construction would generate noise. Pile driving could produce peak sound levels perceptible above the background sound levels at the nearest noise-sensitive areas (NSAs). Construction operating hours would be from 7:00 a.m. to 7:00 p.m., Monday through Saturday. Land-based and marine-side pile driving, which is the loudest construction activity, is expected to also occur six days per week starting at 7:00 a.m., as well, but would end at 5:00 p.m. Pile driving activities could occur for 16 months. Venture Global has committed to implementing mitigation measures to reduce land-based and marine-side pile-driving noise impact on NSAs. Venture Global would construct 5-meter-high noise protection walls around piling rigs for mitigation. As modeled, these noise barriers would reduce the increase of ambient noise levels to 0.4 decibels on the A-weighted scale (dBA) and 2.2 dBA at the two nearest NSAs.

With implementation of the mitigation measures identified in the noise analysis, the resulting noise at the NSAs would meet our criteria of a day-night average sound level (L_{dn}) of 55 dBA. In order to ensure implementation of these measures, we recommend that Venture Global file a noise survey with the Secretary after placing each phase of liquefaction blocks into service and after placing the entire LNG terminal into service to confirm that the criteria would be met.

With the exception of the HDD activities, normal pipeline construction would be limited to daytime hours, minimizing any impacts on nearby residences. Construction noise would be temporary and would vary as construction progresses along the corridor. Noise levels from HDD operations could exceed FERC's criteria of 55 dBA L_{dn} at some of the NSAs near the HDD entry point. To minimize impacts on NSAs from HDD operations, Venture Global proposes to implement a sound curtain enclosure or acoustic barrier as necessary. Sound curtain enclosures would be used around the drilling rig and other stationary equipment during the HDD process. Sound curtain enclosures have been shown to provide 10 to 14 dBA of mitigation. Sound enclosures or acoustic barriers could also be used during dredging activities if nearby structures are occupied during barge access channel dredging required for pipeline construction.

Impacts associated with pipeline HDD and dredging activities would be temporary and minor at NSAs and potential noise receptors. Further implementation of sound curtains or acoustic barriers, as necessary, would further minimize this temporary impact.

Based on the analyses conducted and our recommendations, we conclude that operation of the LNG terminal and pipeline system would not result in significant noise impacts on NSAs.

RELIABILITY AND SAFETY

As part of the NEPA review and NGA determinations, Commission staff assesses the potential impact on 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 FERC staff in evaluating whether Venture Global's proposed design would meet the DOT's 49 Code of Federal Regulations (CFR) 193 Subpart B siting requirements. DOT will provide a Letter of Determination on the Project's compliance with 49 CFR 193 Subpart B. This determination will be provided to the Commission for its consideration on whether to authorize or deny the Project. If the Project 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 reviewed the proposed LNG terminal and the associated LNG carrier traffic. The USCG reviewed a Water Suitability Assessment (WSA) submitted by Venture Global that focused on the navigation safety and maritime security aspects of LNG carrier transits along the affected waterway. On January 23, 2017, the USCG issued a Letter of Recommendation to FERC indicating the Lower Mississippi River would be considered suitable for accommodating the type and frequency of LNG marine traffic associated with this 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 facility 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 Venture Global design, including potential external impacts based on the site location. Based on this review, we recommend the Commission Order include a number of mitigation measures 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 life of the facility to enhance the reliability and safety of the facility. With the incorporation of these mitigation measures, we conclude that the Venture Global Project 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 offsite public.

CUMULATIVE IMPACTS

During the cumulative impact analysis, we identified 16 permitted or proposed actions, including the Project that warranted careful consideration based on geographic and temporal criteria we established for each environmental resource. Six major industrial developments, including the Project, planned on the banks of the Mississippi River in Plaquemines Parish presented the highest potential for creating cumulative adverse effects. These industrial developments, all within 21 miles of each other, include two methanol manufacturing facilities; two LNG manufacturing facilities and export terminals, including the Project; an oil blending, storage, and distribution facility; and a container shipping terminal.

Based on our evaluations of resources affected by the Project and the proposed activities associated with the other actions, geology; soils; surface waters and aquatic wildlife and habitat; wetlands; vegetation and wildlife; land use; visual resources; socioeconomics; vessel traffic; roadway traffic, cultural resources; and the noise environment would not sustain significant adverse cumulative impacts. Given available information, only air quality could undergo adverse effects by the combined effects of the Project and other foreseeable actions. Because we cannot determine the Project's incremental physical impacts on the environment caused by climate change, we cannot determine whether the Project's contribution to cumulative impacts on climate change would be significant.

Air Quality: The Clean Air Act and implementing regulations establish limits on pollutant emissions from major industrial developments, among others. Venture Global has prepared a modeling study of the LNG terminal's future effects on air quality that includes emissions from the permitted, as-yet-unconstructed Braithwaite Methanol Manufacturing Plant and NOLA Oil Terminal and demonstrated that their combined emissions would not exceed the NAAQS. During Commission review of the Pointe LNG project, similar modeling studies that account for existing emissions would be required. However, Gulf Coast Methanol Park was issued an air permit in January 2018, and neither Venture Global nor IGP Methanol LLC, included the other's development in its modeling study. Therefore, we conservatively assume their cumulative emissions could exceed the NAAQS and significantly affect air quality. Emissions from vessels, vehicles, and other mobile sources associated with operation of the foreseeable industrial facilities along the Mississippi River could contribute to an adverse effect on air quality. Vessel emissions are not addressed in Louisiana Department of Environmental Quality regulations and air permit application requirements, but the International Maritime Organization, of which the U.S. is a member, promulgates emissions standards limiting SO_X and NO_X. Also, the EPA adopted emission standards on engines installed on U.S. vessels. Thus, the resulting cumulative effect of vessel emissions on air quality in the geographic scope of the Project is not likely to be significant.

ALTERNATIVES CONSIDERED

We evaluated several alternatives to the Project, including the No Action Alternative, system alternatives for the proposed LNG terminal, alternative LNG terminal sites, alternative LNG terminal configurations, alternative pipeline system routes, and alternative aboveground facility sites. While the No Action Alternative would eliminate the short- and long-term environmental impacts identified in the draft EIS, the stated objectives of the proposed action would not be met.

System alternatives evaluated for the LNG terminal included 10 existing LNG import/export terminals with approved, proposed, or planned expansions to provide liquefaction capabilities and 11 approved, proposed, or planned stand-alone LNG Projects. We cannot speculate or conclude that excess capacity would be available to accommodate the Project's purpose and need. Therefore, construction of this Project as part of another site would likely require an expansion or new facility similar to the proposed facilities, resulting in environmental impacts similar to the Project. Therefore, these systems alternatives would not offer a significant environmental advantage over the Project.

Using a set of selection criteria, six potential sites were evaluated by Venture Global to determine the preferred location for the LNG terminal. Of the alternative terminal locations, we conclude that the proposed site (Mississippi River Mile 55-West Bank) represents an acceptable site for the LNG terminal. The proposed site is currently zoned for heavy industrial use, is sufficiently sized to allow optimal facility layout design, and has available the necessary water frontage. The proposed site is also well separated from area residences and population centers. The proposed site is the only alternative that satisfies all of the selection criteria. From a visual impact perspective, the LNG terminal would be consistent with existing and foreseeable industrial development along this portion of the Mississippi River.

We evaluated the proposed LNG terminal configuration and Project specifications relative to impacts on wetlands and other sensitive resources. We did not find any alternative configurations that would meet the required regulations, codes, and guidelines and at the same time further avoid or reduce environmental impacts associated with the Project.

One alternative pipeline system design and two major route alternatives were evaluated during the early stages of the Project application process. Initially, at the start of the pre-filing process, the planned Venture Global pipeline system consisted of three pipelines on three routes that would supply feed gas to the Venture Global terminal facility: the 21.2-mile-long NW lateral, 12.1-mile-long SE lateral, and 11.1-mile-long SW lateral pipelines. During the pre-filing process, Venture Global continued to evaluate and further its Project design. When Venture Global filed its application for the proposed pipeline system with FERC, it had removed the NW lateral and SE lateral from the Project. It also modified and renamed the SW lateral pipeline route so that it now includes two collocated pipelines identified as SW lateral TETCO and SW lateral TGP. The applicants propose to construct and operate these two pipelines in one route—the SW laterals pipeline route.

The two route alternatives are both over 11 miles long and generally trend in the same direction as the preferred route. These two alternatives did not offer any environmental advantages over the preferred route.

Proposed aboveground facilities for the pipeline system would include six MLVs, three pig launchers, two pig receivers, and two metering and regulation stations. All of these facilities would occur within or adjacent to the SW laterals pipeline route right-of-way. These facilities are small, would only affect environmentally sensitive areas to a minimal extent, are not located near residences, and their locations are tied to the locations of the required interconnect pipeline facilities. We did not identify any environmental concerns that require the need to identify and evaluate alternative sites for these minor aboveground facilities, nor were any alternatives suggested during the public scoping period. Therefore, we concluded that the proposed aboveground facility sites are the preferred alternative.

CONCLUSIONS

We determined that construction and operation of the Project would result in adverse environmental impacts, but all of these impacts would be reduced to less-than-significant levels. From a cumulative impact perspective, we determined that the Project combined with other projects in the geographic scope could potentially result in significant cumulative impacts on air quality. This determination is based on a review of the information provided by Venture Global and further developed from data requests; field investigations; scoping; literature research; alternatives analysis; and contacts with federal, state, and local agencies as well as Indian tribes and individual members of the public.

Although many factors were considered in this determination, the principal reasons are:

- The HDD method would be used to avoid direct affects to a canal and large wetland area and most of the pipeline would be installed in open water, which would minimize impacts on sensitive wetland resources.

- Venture Global would mitigate wetland impacts associated with the construction and operation of the proposed LNG terminal and the pipeline system with the implementation of its CMP and in accordance with USACE permit regulations.

- FERC staff would complete the process of complying with section 7 of the Endangered Species Act prior to construction.

- FERC staff would complete consultation under Section 106 of the National Historic Preservation Act and its implementing regulations at 36 CFR 800 prior to construction.

- Venture Global would comply with all applicable air and noise requirements during construction and operation of the Project.

- Venture Global would minimize impacts on environmental resources during construction and operation of the Project by implementing, as applicable, their Project-specific Plan and Procedures; HDD Contingency Plan; and SPCC Plan.

- The siting requirements of DOT for the LNG terminal, the LOR issued by the USCG for the LNG marine traffic in the Mississippi River, FERC staff's preliminary engineering review and recommendations for the LNG terminal, and the regulatory requirements for the pipeline system and LNG terminal would avoid a significant increase in public safety risks.

- An environmental inspection program would be implemented to ensure compliance with the mitigation measures that become conditions of FERC authorization.

We developed recommendations that Venture Global should implement to further reduce the environmental impacts that would otherwise result from construction and operation of the Project. We determined that these measures are necessary to reduce adverse impacts associated with the Project and, in part, are basing our conclusions on implementation of these measures. Therefore, we recommend that these mitigation measures be attached as conditions to any authorization issued by the Commission. In addition, we recommend that Venture Global file certain updated information with the Secretary prior to the end of the draft EIS comment period. This information is necessary to ensure the final EIS provides the most up-to-date information on Venture Global's ongoing efforts to minimize the impacts of the Project. These recommended mitigation measures are presented in section 5.2 of the draft EIS.

1.0 INTRODUCTION

On February 28, 2017, Venture Global Plaquemines LNG, LLC (Plaquemines LNG) filed an application with the Federal Energy Regulatory Commission (Commission, *also* FERC) for authorization pursuant to section 3(a) of the Natural Gas Act (NGA) and part 153 of the Commission's regulations. In Docket No. CP17-66-000, Plaquemines LNG requests authorization to site, construct, and operate natural gas liquefaction, storage, and export facilities at a liquefied natural gas (LNG) terminal on the west bank of the Mississippi River in Plaquemines Parish, Louisiana (the LNG terminal).

Also on February 28, 2017, Venture Global Gator Express, LLC (Gator Express Pipeline) filed an application with FERC for a Certificate of Public Convenience and Necessity (Certificate) pursuant to section 7(c) of the NGA and part 157 of the Commission's regulations. In Docket No. CP17-67-000, Gator Express Pipeline requests authorization to construct and operate associated lateral pipelines that would connect the LNG terminal to the existing U.S. natural gas transmission grid (pipeline system). The pipeline laterals would be located within Plaquemines Parish, Louisiana.

The combined Plaquemines LNG and Gator Express Pipeline actions and facilities are referred to herein as the Project, and the applicants are collectively referred to as Venture Global. As part of the Commission's consideration of these applications, we[1] prepared this draft environmental impact statement (EIS) to assess the potential environmental impacts resulting from the construction and operation of the Project in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA).

The LNG terminal would be located on an approximately 632-acre parcel of land on the west bank of the Mississippi River, about 20 miles south of Belle Chasse, Louisiana. This would be a new facility and would include 18 integrated single mixed-refrigerant blocks and support facilities (otherwise referred to as liquefaction blocks or blocks) with a design production capacity of 20.0 million metric tons per annum (MTPA) of LNG. Natural gas would be delivered to the terminal via the pipeline system, which would connect the terminal with two existing interstate pipeline systems. Specifically, construction of the pipeline would consist of the southwest (SW) lateral Texas Eastern Transmission, LP (TETCO) pipeline (11.7 miles) and the SW lateral Tennessee Gas Pipeline, LLC (TGP) pipeline (15.1 miles).

Subject to the receipt of FERC authorization and all other applicable permits, authorizations, and approvals, Venture Global anticipates it would commence a two-phased construction approach for the liquefaction facility after receiving the FERC authorization. Phase I is anticipated to last approximately 24 months, with service of the first liquefaction train initiated in 2021. Construction of Phase II would commence approximately 18 months after the construction of Phase I. The SW lateral TGP pipeline would be installed during the Phase I construction process, beginning 2020, while the SW lateral TETCO pipeline would be constructed

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

concurrently with Phase II facilities. The Project is anticipated to be fully complete and operational by 2023.

Section 3 of the NGA, as amended, requires that authorization be obtained from the U.S. Department of Energy (DOE) prior to importing or exporting natural gas, including LNG, from or to a foreign country. For applicants that have, or intend to have, a signed gas purchase or sales agreement/contract for a period of time longer than 2 years, long-term authorization is required. Under section 3 of the NGA, FERC considers, as part of its decision to authorize natural gas facilities, all factors bearing on the public interest. Specifically, regarding whether to authorize natural gas facilities for importation or exportation, FERC shall authorize the proposal unless it finds that the facilities will not be consistent with the public interest.

Under section 7 of the NGA, the Commission determines whether interstate natural gas transportation facilities are in the public convenience and necessity and, if so, grants a Certificate to construct and operate these facilities. The Commission bases its decisions on technical competence, financing, rates, market demand, gas supply, environmental impact, long-term feasibility, and other issues concerning a project.

1.1 PROJECT PURPOSE AND NEED

Venture Global states that the purpose of the Project would be to transport and liquefy domestic natural gas in order to provide a cost-effective outlet for the domestic natural gas to the global market. This would be accomplished by constructing liquefaction blocks and a new pipeline for feed gas at a new facility along the Mississippi River and loading LNG into vessels berthed at the Venture Global marine facility to transport LNG to global markets. Any exports would be consistent with authorizations from the DOE.

1.2 PURPOSE AND SCOPE OF THIS ENVIRONMENTAL IMPACT STATEMENT

The principal purposes in preparing an EIS include the following:

- identify and assess potential impacts on the human environment that would result from implementation of a proposed action;
- identify and assess reasonable alternatives to a 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 FERC's jurisdiction (i.e., the new terminal and liquefaction facility and the new pipelines). The topics addressed in this EIS include geology; soils; water use and quality; wetlands; vegetation; wildlife; fisheries and essential fish habitat (EFH); threatened, endangered, and special status species; land use, recreation, and visual resources; socioeconomics; cultural resources; air quality; noise; reliability and safety; cumulative impacts; and alternatives. This EIS also presents our conclusions and recommended mitigation measures.

The Energy Policy Act of 2005 (EPAct 2005) provides that 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. FERC, as the lead federal agency, is responsible for preparation of this EIS. This effort was undertaken with the participation and assistance of the U.S. Army Corps of Engineers (USACE), U.S. Coast Guard (USCG), DOE, U.S. Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA), and the U.S. Environmental Protection Agency (EPA) as cooperating agencies under NEPA. Cooperating agencies have jurisdiction by law or special expertise with respect to environmental impacts involved with a project. The roles of FERC, the USACE, USCG, DOE, DOT/PHMSA, and EPA in the project review process are described below. This EIS provides a basis for coordinated federal decision making in a single document, thereby avoiding duplication among federal agencies in the NEPA environmental review processes. In addition to the lead and cooperating agencies, other federal, state, or local agencies may use this EIS in approving or issuing permits for all or part of the Project. Federal, state, and local permits, approvals, and consultations for the Project are discussed in section 1.5.

1.2.1 Federal Energy Regulatory Commission

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

As the lead federal agency for the Project, FERC is required to comply with the following: section 7 of the Endangered Species Act of 1973 (ESA), as amended; the Magnuson-Stevens Fishery Conservation and Management Act, commonly referred to as the Magnuson-Stevens Act (MSA); section 106 of the National Historic Preservation Act (NHPA); and section 307 of the Coastal Zone Management Act of 1972 (CZMA). Each of these statutes has been taken into account in the preparation of this EIS. FERC will use this document to consider the environmental impacts that could result if it issues an authorization to Plaquemines LNG under section 3(a) of the NGA and a Certificate to Gator Express Pipeline under section 7(c) of the NGA.

FERC consulted with cooperating agencies throughout the pre-filing and application phases of the Project. The cooperating agencies provided input on the Project during several conference calls. In addition, an interagency scoping meeting was held on December 9, 2015, in order to solicit comments and concerns regarding the Project. Agency representatives also participated in the public scoping meeting held on October 21, 2015. The cooperating agencies have had the opportunity to comment on the administrative draft EIS. Comments and concerns have been incorporated into this draft EIS.

1.2.2 U.S. Army Corps of Engineers

The USACE has jurisdictional authority pursuant to the following: section 404 of the Clean Water Act (CWA) (33 United States Code [U.S.C.] 1344), which governs the discharge of dredged material into waters of the United States; section 10 of the Rivers and Harbors Act (RHA) (33 U.S.C. 403), which regulates any work or structures that potentially affect the navigable capacity of a waterbody; and section 14 of the RHA (33 U.S.C. 408), which grants permission for the alteration, occupation, or use of a USACE civil works project if the activity will not be injurious to the public interest or affect the USACE project's ability to meet its authorized purpose. Because the USACE 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 Project is within the New Orleans District of the USACE's Mississippi Valley Division. Staff from the New Orleans District participated in the NEPA review and will evaluate USACE authorizations, as applicable.

The primary decisions to be addressed by the USACE include the following:

- issuance of a section 404 permit for the placement or redistribution of dredged and/or fill material within jurisdictional waters, to include wetlands, associated with construction of the terminal and pipeline;
- issuance of a section 10 permit for construction activities within navigable waters of the United States; and
- section 14 (or section 408) permission for the alteration, occupation, or use of the USACE-managed civil works projects, including USACE-maintained navigation channels and federal levees associated with the construction and operation of the terminal and associated facilities.

As an element of its review, the USACE must consider whether a project strives to avoid, minimize, and compensate for impacts on existing aquatic resources, including wetlands, in order to achieve a goal of no overall net loss of values and functions. Additionally, the USACE reviews applicable portions of a project that may impact USACE-managed civil works projects to determine whether or not the project would be injurious to the public interest or would impair the usefulness of the federal civil works projects (e.g., a levee). The USACE must also evaluate whether or not a project has a "water dependency." The USACE would issue a Record of Decision to formally document its decisions on a proposed action, including section 404(b)(1) analyses and required environmental mitigation commitments.

1.2.3 U.S. Coast Guard

The USCG is the federal agency responsible for determining the suitability of waterways for LNG marine traffic. The USCG exercises regulatory authority over LNG facilities that affect the safety and security of port areas and navigable waterways under Executive Order 10173, the MSA (50 U.S.C. 191), the Ports and Waterways Safety Act of 1972, as amended, and the Maritime Transportation Security Act of 2002 (MTSA) (46 U.S.C. 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 LNG tanks. As appropriate, the USCG (acting under the authority in 33 U.S.C. 1221 et seq.) also would inform FERC of design- and construction-related issues identified as part of safety and security assessments. If the Project is approved, constructed, and operated, the USCG would continue to exercise regulatory oversight of the safety and security of the LNG terminal facilities in compliance with 33 CFR 127.

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 Waterway Suitability Assessment. The process of preparing the LOR begins when an applicant submits a Letter of Intent to the local Captain of the Port. In a letter dated January 23, 2017, the USCG issued a LOR for the Project. In the LOR, the USCG stated that, after reviewing the Waterway Suitability Assessment (WSA), they recommend that the Lower Mississippi River be considered suitable for accommodating the type and frequency of LNG marine traffic in accordance with the guidance in the Coast Guard Navigation and Vessel Inspection Circular 01-2011.

1.2.4 U.S. Department of Energy

The DOE 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 proposed import or export would not be consistent with the public interest. On March 1, 2016, Plaquemines LNG submitted, in Fossil Energy Docket No. 16-28-LNG, an application to the DOE/Office of Fossil Energy (FE) to export up to a total of 24.0 MTPA of natural gas in the form of LNG to Free Trade Agreement (FTA) and non-FTA nations over 25 years. Venture Global seeks to export LNG from the terminal to any country: (1) with which the United States has, or in the future may have, a free trade agreement requiring national treatment for trade in natural gas; (2) with which the United States does not have a FTA requiring national treatment for trade in natural gas; (3) that has, or in the future develops, the capacity to import LNG via ocean-going carriers; and (4) with which trade is not prohibited by United States law or policy.

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 DOE requesting authorization of the import or export of natural gas, including LNG, from or to a nation with which there is in effect an FTA requiring national treatment for trade in natural gas, be deemed consistent with the public interest and granted without modification or delay. On July 21, 2016, DOE/FE approved Venture Global Plaquemines LNG, LLC's application to export LNG to FTA nations in DOE/FE Order No. 3866.

In the case of applications to export LNG to non-FTA countries, section 3(a) of the NGA requires DOE/FE to conduct a public interest review and grant the applications unless DOE/FE finds that the proposed exports will not be consistent with the public interest. Additionally, NEPA requires DOE/FE to consider the environmental impacts of its decisions regarding applications to export natural gas to non-FTA nations. DOE/FE has not yet granted Venture Global export authority to countries without an FTA. In accordance with 40 CFR 1506.3, after an independent review of the EIS, DOE/FE may adopt the document prior to issuing a Record of Decision on the Venture Global application for authority to export LNG to countries without an FTA.

1.2.5 U.S. Department of Transportation

The DOT has prescribed the minimum federal safety standards for LNG facilities in compliance with 49 U.S.C. 60101. Those standards are codified in 49 CFR 193 and apply to the siting, design, construction, operation, maintenance, and security of LNG facilities. The National Fire Protection Association (NFPA) Standard 59A (NFPA 59A), *Standard for the Production, Storage, and Handling of Liquefied Natural Gas,* is incorporated into those requirements by reference, with regulatory preemption in the event of conflict. In accordance with the 1985 Memorandum of Understanding (MOU) on LNG facilities and the 2004 Interagency Agreement on the safety and security review of waterfront import/export LNG facilities, the DOT participates as a cooperating agency. The DOT participates as a cooperating agency but remains responsible for enforcing their regulations covering LNG facility siting, design, construction, and operation. On August 31, 2018, FERC and DOT signed an MOU to streamline LNG project reviews and eliminate duplicative efforts. DOT will issue a Letter of Determination (LOD) to FERC on the 49 CFR Part 193 Subpart B regulatory requirements, which would be filed with the Commission as part of the consolidated record for the Project and would be one of the considerations for the Commission to deliberate in its decision to authorize, with or without modification or conditions, or deny an application. The LOD will provide DOT's analysis and conclusions regarding 49 CFR Part 193 Subpart B regulatory requirements.

The DOT also houses the Federal Aviation Administration (FAA), which is a federal agency responsible for regulating all aspects of civil aviation including management of airports, air traffic control, and protection of the public, property, and the national security and foreign policy interests of the U.S. during commercial space launch and reentry activities. In its mission to safely manage U.S. airspace and air traffic, the FAA requires that certain elevated structures with the potential to affect navigable airspace are placed on public notice (14 CFR 77). Due to the height of facilities associated with the Project, on January 16, 2017 Venture Global submitted a Notice of Proposed Construction or Alteration of Objects that may affect the Navigable Airspace and ensure that marking and lighting of all elevated structures is in compliance with FAA standards. On January 25, 2017, Venture Global received a DOT FAA Determination of No Hazard to Air Navigation in accordance with 14 CFR Part 77.

1.2.6 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 Louisiana, jurisdictional authority under section 401 of the CWA has been delegated to the Louisiana Department of Environmental Quality (LDEQ). The EPA also oversees the issuance of a National Pollutant Discharge Elimination System (NPDES) permit by the LDEQ for point-source discharge of used water into waterbodies (section 402 of the CWA). The EPA shares responsibility for administering and enforcing section 404 of the CWA with the USACE and has authority to veto USACE permit decisions.

The EPA has jurisdictional authority under the Clean Air Act of 1970 (CAA) (42 U.S.C. 85) to control air pollution by developing and enforcing rules and regulations for all entities that emit pollutants into the air. Under this authority, the EPA has developed regulations for major sources of air pollution and certain source categories and has established general conformity applicability thresholds. The EPA has delegated the following jurisdictional authority under the CAA to the LDEQ, unless the source would be located within Native American lands:

- Title 1, Part A, Section 111 – New Source Performance Standards (NSPS);

- Title 1, Part A, Section 112 – National Emission Standards for Hazardous Air Pollutants (NESHAP);
- Title I, Part C – Prevention of Significant Deterioration (PSD); and
- Title V – Operating Permits.

Under section 309 of the CAA, the EPA is (1) required to review and publicly comment on the environmental impacts of major federal actions, including actions that are the subject of draft and final EISs, and (2) responsible for implementing certain procedural provisions of NEPA (e.g., publishing the Notices of Availability 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

On June 18, 2015, Venture Global filed a request with FERC to use our pre-filing review process. This request was approved on July 2, 2015, and pre-filing Docket No. PF15-27-000 was established in order to place information filed by Venture Global and related documents issued by FERC into the public record. 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 FERC.

Venture Global held an open house in Port Sulphur, Louisiana (Plaquemines Parish) and Lafitte, Louisiana (Jefferson Parish)[2] on September 15 and 16, 2015, to provide information to the public about the Project. FERC staff participated in the meeting by describing the FERC process and providing those attending with information on how to file comments with FERC.

On October 5, 2015, FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Plaquemines Liquefied Natural Gas Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting* (NOI). This notice was sent to about 370 interested parties, including federal, state, and local officials, agency representatives, conservation organizations, Native American tribes, local libraries and newspapers, and property owners in the vicinity of planned Project facilities. Publication of the NOI for the Project established a 30-day public comment period for the submission of comments, concerns, and issues related to the environmental aspects of the Project.

On October 21, 2015, FERC conducted a public scoping meeting in Belle Chasse, Louisiana (Plaquemines Parish) to provide an opportunity for the public to learn more about the Project and participate in our analysis by providing oral comments on environmental issues to be included in the EIS. Five individuals elected to present oral comments at the scoping meeting in support of the Project. A transcript of these comments is part of the public record for the Project

[2] Jefferson Parish was included in the initial open house because the original project scope included two additional feed gas pipelines to be constructed in Jefferson Parish. Venture Global has since removed these pipelines within Jefferson Parish from the project scope.

and is available for viewing on the FERC internet website (http://www.ferc.gov). We received comments from three federal agencies, one federally recognized tribe (tribe), and two state agencies in response to the NOI for the Project (EPA, National Marine Fisheries Service [NMFS], the National Park Service [NPS], the Choctaw Nation of Oklahoma, Louisiana Department of Wildlife and Fisheries (LDWF), and Louisiana Department of Transportation and Development [DOTD]). The Commission also received written comments from elected officials, public officials, and one citizen.

On December 9, 2015, a joint interagency meeting for the Project was conducted with representatives of the EPA, NMFS, Louisiana Department of Natural Resources (LDNR), and LDWF to discuss coordination of agency review, permit requirements and status, impacts on natural resources, and each agency's interest in participating in our environmental review as a cooperating agency. Following the interagency meeting, FERC staff visited the terminal site and pipeline routes. In addition, interagency conference calls were conducted bi-weekly with the agencies and Venture Global representatives throughout the pre-filing period.

On September 14, 2016, FERC issued a *Supplemental Notice of Intent to Prepare an Environmental Impact Statement for the Planned Plaquemines Liquefied Natural Gas Project*. This NOI was sent to eight new landowners in the vicinity of Project facilities based on the revised pipeline route (see previously referenced footnote 2). Publication of the NOI for the Project established a 30-day public comment period for the submission of comments, concerns, and issues related to the environmental aspects of the Project.

Issues identified after the initial open house and during and after public scoping are summarized in table 1.3-1, along with a listing of the EIS sections that address the comments.

Table 1.3-1
Key Environmental Concerns Identified during the Scoping Process for the Project

Issue/Specific Comment	EIS Section Addressing Comment
General	
Right-of-way requirements and configurations	**2.2.2**
Project design	**2.1**
Improve Project map/include political boundaries	**2.1.1**
Quantity and location of fill material and excavation of native material	**4.4**
Relevant permits (air, water, transportation, etc.)	**1.5.11**
Project timeline	**2.1.1**
Alternatives	
Explore alternative pipeline routes	**3.5**
Provide a clear discussion of the reasons for the elimination of alternatives that are not evaluated in detail	**3.3.1**
Describe how each alternative was developed, how it addresses each Project objective, and how it will be implemented	**3.0 through 3.6**
Describe the rationale used to determine whether impacts of an alternative are significant or not	**3.0 through 3.6**
Describe the methodology and criteria used for determining Project siting	**3.3 and 3.5**
Evaluate Project alternatives to demonstrate the Project's compliance with section 404(b)(1) guidelines	**3.3, 3.5, and 4.4**
Discuss alternatives to avoid or minimize dredged or fill material discharged into waters of the United States	**4.4**
Soils	
Aquatic erosion/sediment control	**4.2.3**
Water Quality and Aquatic Resources	
Altered hydrology	**4.3.2.1**
Dredged material may contain contaminants and should be tested prior to placement	**4.3.2.2**
Test sediments to be placed in waters of the United States for beneficial use for contamination according to the USACE/EPA Inland Testing Manual to determine their suitability for open water disposal	**4.3.2.2**
Test sediments for contamination using the USACE Upland Testing Manual in cases where potentially contaminated dredged material is proposed for disposal in a Confined Disposal Facility and there is potential for effluent to enter waters of the United States	**4.3.2.2**
Water quality impacts associated with the pig station at Bridgeline Holdings Interconnect	**N/A**
Impacts on productivity of Barataria Bay estuary	**4.6.2.1 through 4.6.4.2**
Impacts on coastal restoration projects	**4.8.4**
Impacts on water supply and the adaptability of the Project to these changes	**4.3.1.4**
Effects of Project discharges on surface water quality	**4.3.2.2**
Discharges within affected waters	**4.3.2.2**
Water reliability for the Project	**4.3.1.4 and 4.3.2.2**

Table 1.3-1 Key Environmental Concerns Identified during the Scoping Process for the Project	
Issue/Specific Comment	**EIS Section Addressing Comment**
Mitigation measures necessary or beneficial in reducing impacts on water quality and aquatic resources	**4.3.1.4 and 4.3.2.2**
CWA section 303(d) Impaired Waters, restoration and ongoing protection efforts, and mitigation measures	**4.3.2.1**
Impacts on groundwater quality and quantity associated with construction and operation activities	**4.3.1.4**
Mitigation measures to reduce impacts on groundwater resources	**4.3.1.4**
Work closely with state and local agencies that regulate the protection of groundwater resources	**4.3.1.4**
Identify areas of the Project located in the 50- or 100-year floodplain	**4.3.2.1**
A stormwater discharge permit is required for 1 or more acres of land disturbance	**4.3.2.2**
Wetlands	
Wetland crossing methods	**Appendix C and 4.4**
Right-of-way width in wetlands	**2.4.5.2**
Pipeline construction in the coastal zone will damage wetlands	**4.4.3 and 4.8.7**
Majority of wetlands within pipeline rights-of-way are categorized as EFH	**4.6.4.1**
Wetland delineation needed	**4.4.2**
Include a wetland mitigation plan to be reviewed by EPA, USACE, and other agencies, along with alternatives to show that potential impacts on wetlands have been addressed	**4.4.2**
Vegetation	
Critically imperiled Coastal Live Oak-Hackberry Forest ecological community	**4.5.1**
Introduction of invasive and exotic plant species	**4.5.3**
Fish and Wildlife Resources	
Habitat fragmentation	**4.5.4 and 4.6.2.2**
Mitigation plan to offset fish and wildlife resource impacts	**4.6.1.2 and 4.6.2.2**
Noise pollution	**4.6.1.2 and 4.6.2.2**
Light pollution	**4.6.1.2 and 4.6.2.2**
Listed threatened and endangered species with the potential to occur in Project area	**4.6.2**
Impacts on wildlife	**4.6.2**
Consistent surveying, monitoring, reporting protocols	**Appendix C**
Presence of aquatic species managed under the MSA by the Gulf of Mexico Fishery Management Council (GMFMC) and the NMFS within wetlands	**4.6.4**
Compliance with 50 CFR 600.920(e) regarding EFH	**4.6.4**
Measures to minimize EFH impacts	**4.6.4**
Compensation lands and mitigation	**4.4.2**

Table 1.3-1
Key Environmental Concerns Identified during the Scoping Process for the Project

Issue/Specific Comment	EIS Section Addressing Comment
Land Use	
Impacts on aesthetics and recreational opportunities	**4.8.6**
Light pollution	**4.8.6**
Noise pollution	**4.11.2**
Impacts on the Jean Lafitte National Historical Park and Preserve	**4.8.4**
Impacts on the Barataria Preserve	**4.8.4**
Socioeconomics/Environmental Justice	
Impacted communities within the geographic scope of the Project (i.e., minority and low-income populations)—evaluation and outreach	**4.9.1**
Coordination with tribal governments	**4.10**
Cultural Resources	
Impacts on culturally and historically significant properties	**4.10**
Section 106 of NHPA compliance	**4.10.5**
Air Quality	
Evaluation of baseline conditions	**4.11.1.2**
Air pollution and emission sources	**4.11.1.4**
Greenhouse gas emissions from Project operation	**4.11.1.4**
Statement of Purpose and Need	
Clearly identify the underlying purpose and need to which the FERC is responding in proposing the alternatives	**3.0**
Discuss the Project in the context of the natural gas supply and the need for additional export capabilities	**1.1**
Transportation	
If the Project requires access to or use of state highway rights-of-way, then a driveway permit or joint use agreement is required	**2.1.1.8**
Climate Change	
Future climate scenarios; potential changes to the affected environment due to climate change	**4.11.1**
Climate adaptation measures in response to future climate scenario impacts on the Project	**4.11.1**
Greenhouse gas emissions associated with production, transport, and combustion of natural gas proposed to be exported by the Project	**4.11.1.4**
Hazardous Materials	
Hazardous waste from construction and operation	**2.4**
Methane leakage prevention	**2.1.1.8**

1.3.2 Public Review of the Draft EIS

This draft EIS was filed with the EPA and a Notice of Availability for the draft EIS was mailed to federal, state, and local government agencies; elected officials; Native American tribes; affected landowners; local libraries and newspapers; intervenors in the FERC's proceeding; and other interested parties (i.e., miscellaneous individuals who provided scoping comments or asked to be on the mailing list). The distribution list for the Notice of Availability is provided in appendix A. A formal notice indicating that the draft EIS is available for review and comment has been published in the Federal Register. Also, this draft EIS was posted to FERC's eLibrary for public review. The public has 45 days after the date of publication of the EPA's formal notice to comment on the draft EIS both in the form of written comments and at the public comment sessions held in Plaquemines Parish. All comments received on the draft EIS related to environmental issues will be addressed in the final EIS.

1.4 NON-JURISDICTIONAL FACILITIES

Under section 7 of the NGA, FERC is required to consider, as part of a decision to authorize a project, all facilities that are directly related to the project if there is sufficient federal control and responsibility to warrant environmental analysis as part of the NEPA environmental review for the project. Some 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 jurisdictional facilities, or they may be merely minor components that would be constructed and operated as a result of authorization of the jurisdictional facilities.

Non-jurisdictional facilities associated with the Project would include new utility service connections to the local electric and water distribution systems within the temporary adjacent workspace. These utility connections would be provided by the local electric and water utility companies and would be authorized and regulated by state and/or local agencies. The utility companies would conduct the necessary environmental reviews and obtain all necessary permits for non-jurisdictional facilities.

The new electric utility connection that would be utilized during terminal construction would be provided by Entergy Louisiana, LLC. The anticipated design calls for a tie-in with Entergy's existing power line that runs along and inside the Project property line on the south side of State Highway 23 (SH 23) at the terminal site. The land disruption at this tie-in location would be minimal and localized, involving the installation of an electrical junction box, meters, and associated equipment. The electric service agreement would determine the scope of each party's responsibilities for the connection facilities. All other land disruptions associated with provision of electric services would be confined to the terminal site and, therefore, within the FERC-permitted workspace.

The Project may also establish a temporary connection to the existing 20-inch-diameter water line located in the same utility corridor as the existing power line (on the south side of SH 23). The design would call for an approximately 1,500-foot-long water line from a tie-in with the existing line (owned by Plaquemines Parish Water Works) to facilities at the terminal site. Although it is anticipated that service would be disconnected after construction, if a permanent connection becomes necessary, any additional environmental impacts would be minimal and confined to the existing utility corridor that runs along and inside the Project property line on the south side of SH 23. Venture Global is also exploring options to provide supporting water utilities via on-site groundwater wells and withdrawal from the Mississippi River. None of these three options would require new workspace, as all options would be available within the terminal site or adjacent to the terminal site (SH 23).

1.5 PERMITS, APPROVALS, AND REGULATORY REVIEWS

Federal agencies are required to comply with various federal environmental regulations and laws. FERC is required to comply with various federal environmental laws and regulations for projects that may or may not impact the environment. These regulations include, but are not limited to, the CZMA, ESA, MSA, Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle (BGEPA), Marine Mammal Protection Act (MMPA), RHA, CWA, CAA, MTSA, and NHPA, the Federal Aviation Act of 1958, and the National Flood Insurance Act of 1968 (NFIA). Each of these statutes, and others, has been taken into account in the preparation of this document. The major permits, approvals, and consultations for the Project are identified in table 1.5-1. Each federal environmental regulation and law directly relevant to this Project is discussed in the following paragraphs.

1.5.1 Endangered Species Act

Under section 7 of the ESA, a 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 U.S.C. 1536(a)(2)(1988)). FERC is required to consult with other federal agencies to determine whether any federally listed endangered, threatened, or proposed species, including their respective designated critical habitats, occur in the vicinity of a project. If FERC determines that these species or habitats have the potential to be impacted by a project, FERC is required to prepare a biological assessment (BA) to identify the extent of adverse impact and recommend measures to avoid or mitigate probable impacts. If FERC determines that no federally listed proposed, endangered, or threatened species or their designated critical habitat would be impacted by the Project, no further action is necessary under the ESA. Section 4.7 provides information on the status of FERC's compliance with section 7 of the ESA.

1.5.2 Magnuson-Stevens Fishery Conservation Management Act

The MSA, as amended by the Sustainable Fisheries Act of 1966 (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 section 305(b)(2)). No criteria have been established for conducting EFH consultations. However, NMFS recommends combining EFH consultations with interagency coordination procedures required by other statutes, 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 the consultation process, FERC has prepared an EFH assessment. This assessment and the status of EFH consultation are provided in section 4.6.

1.5.3 Migratory Bird Treaty Act

Migratory birds are species that nest in the United States and Canada during the summer and then migrate south to the tropical regions of Mexico, Central and South America, and the Caribbean for the non-breeding season. Migratory birds are protected under the MBTA (16 U.S.C. 703–711). Birds protected under the MBTA include all common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves and pigeons, swifts, martins, swallows, and others, including their body parts (feathers, plumes, etc.), nests, and eggs. The act makes it unlawful to pursue, hunt, take, capture, or kill, attempt to take, capture, or kill, possess, offer to or sell, barter, purchase, deliver, or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg, or product, manufactured or not, without a permit.

Executive Order 13186 (66 Federal Register 3853) directs federal agencies to identify where unintentional take is likely to have a measureable negative effect on migratory bird populations and to avoid or minimize adverse impacts on migratory birds through enhanced collaboration with the United States Fish and Wildlife Service (FWS). Executive Order 13186 states that emphasis should be placed on species of concern, priority habitats, and key risk factors, and that particular focus should be given to addressing population-level impacts. On March 30, 2011, the FWS and the Commission entered into a *Memorandum of Understanding Between the Federal Energy Regulatory Commission and the U.S. Department of the Interior United States Fish and Wildlife Service Regarding Implementation of Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds,"* 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 MOU does not waive legal requirements under the MBTA or any other statutes and does not authorize the take of migratory birds. See section 4.6.2.1 of this draft EIS for the status of our compliance with the MBTA.

1.5.4 Bald and Golden Eagle Protection Act

The BGEPA prohibits taking without a permit, or taking with wanton disregard for the consequences of an activity, any bald or golden eagle or their body parts, nests, chicks, or eggs, which includes collection, molestation, disturbance, or killing. The BGEPA protections include provisions not included in the MBTA, such as the protection of unoccupied nests and prohibition on disturbing eagles. The BGEPA includes limited exceptions to its prohibitions through a permitting process, including exceptions to take golden eagle nests that interfere with resource development or recovery operations. This EIS discusses compliance with the BGEPA under the jurisdiction of the USFWS in section 4.6.2.1.

1.5.5 Marine Mammal Protection Act

All marine mammals are protected under the provisions of the MMPA (16 U.S.C 31). While many marine mammal species are listed as threatened or endangered through ESA protections, the MMPA provides additional protections for all marine mammals. 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. "Take" is defined as "to hunt, harass, capture, or kill, or attempt to harass, hunt, capture or kill any marine mammal." Harassment is strictly defined as "any pursuit, torment, or annoyance that has the potential to injure marine mammal stock in the wild, or has the potential to disturb a marine mammal or marine mammal stock in the wild by disrupting behavioral patterns, including migration, breathing, nursing, breeding, feeding or sheltering." Actions that have the "potential to injure" are Level A harassment, and those actions that have the "potential to disturb" are Level B harassment. NMFS administers the MMPA in protecting whales, dolphins, porpoises, seals, and sea lions; the FWS protects walruses, manatees, dugongs, otters, and polar bears; and the Animal and Plant Health Inspection Service, a part of the U.S. Department of Agriculture (USDA), is responsible for regulations managing marine mammals in captivity (NMFS, n.d.[d]).

1.5.6 Rivers and Harbors Act

The RHA pertains to activities impacting navigable waters, including harbor and river improvements. Section 10 of the RHA prohibits the unauthorized obstruction or alteration of any navigable water. Construction of any structure or the accomplishment of any other work affecting course, location, condition, or physical capacity of waters of the United States must be authorized by the USACE. Section 14 of the RHA, also referred to as section 408, grants permission for the alteration, occupation, or use of a USACE civil works project if the activity will not be injurious to the public interest or affect the USACE project's ability to meet its authorized purpose. Section 4.3 provides the status of our compliance with the RHA.

1.5.7 Clean Water Act

The CWA, as amended, regulates the discharges of pollutants into waters of the U.S. and regulates quality standards for surface waters. Both the EPA and the USACE, along with a joint application with LDNR, Office of Coastal Management (OCM), have regulatory authority under section 404 of the CWA. The EPA has implemented pollution control programs, including setting wastewater standards for industry and creating water quality standards for all contaminants in surface waters. Under the CWA, it is unlawful to discharge any pollutant from a point source into waters of the U.S. without a permit. In accordance with section 402 of the CWA, the EPA operates the NPDES permit program, which regulates discharges by industrial, municipal, and other facilities that directly enter surface waters. Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the U.S. and is under the jurisdiction of the USACE. The status of NPDES and section 404 permitting requirements are further addressed in section 4.4 of this EIS.

Section 401 of the CWA requires that an application for a federal permit to conduct an activity that may result in a discharge to waters of the U.S. must provide the federal regulatory agency with a section 401 certification. Section 401 of the CWA certifications are made by the state in which the discharge originates and declares that the discharge would comply with applicable provisions of the act, including state water quality standards. The LDEQ is the regulatory authority responsible for section 401 water quality certification in Louisiana.

1.5.8 Clean Air Act

The CAA is the basic federal statute governing air pollution and was enacted by the U.S. Congress to protect the health and welfare of the public from the adverse effects of air pollution. Federal and state air quality regulations established as a result of the CAA include, but are not limited to, title V operating permit requirements and PSD review. The EPA is the federal agency responsible for regulating stationary sources of air pollutant emissions; however, in Louisiana, the federal permitting process has been delegated to the LDEQ. A title V and PSD permit application, along with Class I and Class II (including Louisiana Toxic Air Pollutants) air dispersion modeling protocols and an ozone modeling protocol, for the project were initially submitted to the LDEQ on September 15, 2015. The application included the LNG terminal and pipeline system. An addendum to the application and updated modeling protocols were submitted to the LDEQ on June 23, 2017. Class I, Class II, and Louisiana Toxic Air Pollutant dispersion modeling reports were submitted to the LDEQ on September 15, 2017. Section 4.11 evaluates air quality impacts that could occur as a result of construction and operation of the Project.

1.5.9 Federal Aviation Act

The FAA, under the Federal Aviation Act, oversees the safety, development, and regulations of civil aviation. The regulations associated with "the construction, alteration, establishment, or expansion, or the construction, alteration, establishment, or expansion of a structure when notice would promote safety in air commerce and the efficient use and preservation of the navigable airspace and of airport traffic capacity at public-use airports" are outlined in 14 U.S.C. 44718, Structures Interfering with Air Commerce. In accordance with 49 CFR 77, Safe, Efficient Use, and Preservation of the Navigable Airspace, the construction or alteration of structures requires that adequate notice be provided to the FAA. Following notification to the FAA, a public NOI would be issued for an aeronautical study of the obstruction to air navigational facilities and the effect the obstruction would have on the safe and efficient use of navigable airspace. Upon completion of the study, the FAA would issue a determination stating whether the construction or alteration would be a hazard to air navigation. Section 4.12 provides additional information regarding safety associated with the flare stacks.

1.5.10 Maritime Transportation Security Act

The purpose of the MTSA is to protect the nation's ports and waterways from a terrorist attack. The MTSA requires vessels and port facilities to conduct vulnerability assessments, develop security plans, and establish Area Maritime Security Committees at all of the nation's ports. These committees coordinate activities of all port stakeholders, including the maritime industry, the boating public, and other federal, state, and local agencies. As a cooperating agency with FERC, the USCG prepared a LOR to analyze the potential risks to navigation safety and maritime security associated with the Project (see section 1.2.3). The USCG also has responsibilities relating to LNG waterfront facilities under 33 CFR 127.

1.5.11 National Historic Preservation Act

Section 106 of the NHPA requires that FERC take into account the impacts of its undertakings on properties listed, or eligible for listing, in the National Register of Historic Places (NRHP), including pre-contact 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. In Louisiana, the Louisiana State Historic Preservation Officer (SHPO), within the Department of Culture, Recreation, and Tourism, reviews projects regarding section 106 of the NHPA. Venture Global, as non-federal parties, assisted FERC in meeting its obligations under section 106 by preparing information, analyses, and recommendations under the ACHP regulations in 36 CFR 800. Section 4.10 of this EIS provides information on the status of our compliance with section 106 of the NHPA.

1.5.12 National Flood Insurance Act

The National Flood Insurance Program is managed by the Federal Emergency Management Administration (FEMA). The purpose of the National Flood Insurance Program under the NFIA is to make flood insurance available, improve floodplain management, and develop maps of flood hazard zones. Pursuant to the NFIA, state and local governments must implement floodplain management regulations consistent with measures in 44 CFR 60, Criteria for Land Management and Use. To reduce the risk of flooding, participating local governments in flood-prone areas, as designated by FEMA, agree to adopt and enforce ordinances that meet or exceed FEMA requirements. Section 4.3 provides additional information regarding flood risks and our compliance with the NFIA.

1.5.13 Coastal Zone Management Act

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 Louisiana, the LDNR administers the Coastal Zone Management Program (CZMP). Venture Global consulted with and submitted an application to the LDNR for a Coastal Use Permit (CUP) on June 8, 2017, with a revised application submitted in March 2018. The CZMP is discussed further in section 4.8.

1.5.13.1 U.S. Department of Defense

EPAct 2005 and section 3 of the NGA require us to consult with the U.S. Department of Defense (DoD) to determine whether there would be any impacts associated with the Project on military training or activities on any military installations. FERC initiated informal consultation with a letter to the DoD in January 2016. After conducting an informal review, the DoD responded on February 23, 2016, requesting that Venture Global coordinate with the U.S. Department of the Navy, due to the proximity of the Project to Naval Air Station Joint Reserve Base New Orleans. In January 2017, Naval Air Station Joint Reserve Base New Orleans identified in an email to the FERC that the installation did not have any issues with the Project moving forward and would only contribute a minor impact to operations.

Table 1.5-1
Major Permits, Approvals, and Consultations for the Project

Agency	Permit/Approval/ Consultation	Status	
		Terminal	Pipelines
Federal			
Federal Energy Regulatory Commission (FERC)	Authorization to Construct and Operate Facilities under sections 3(a) and 7(c) of the Natural Gas Act (NGA)	Application filed February 28, 2017	Application filed February 28, 2017
U.S. Department of Energy, Office of Fossil Energy (DOE/FE)	Authorization to export LNG by LNG carrier to Free Trade Agreement (FTA) and non-FTA nations	FTA approval received on July 21, 2016 (DOE/FE Order No. 3866) Non-FTA application pending	NA
U.S. Department of Homeland Security, U.S. Coast Guard (USCG)	Waterfront Facilities Handling Liquefied Natural Gas and Liquefied Hazardous Gas (33 Code of Federal Regulations [CFR] 127), which includes Letter of Intent (LOI) submission (33 CFR 127.007), Waterway Suitability Assessment consultation, and Letter of Recommendation from the USCG (18 CFR 157.21)	Letter of Recommendation received on January 23, 2017	NA
U.S. Environmental Protection Agency (EPA), Region VI, Dallas, Texas	Consultation role to Louisiana Department of Environmental Quality (LDEQ) on air emissions permitting	Planned Review of LDEQ air permit application in November 2018	NA
	Floodplain management and protection of wetlands (44 CFR 9) Review of wetlands impacts for U.S. Army Corps of Engineers (USACE) Clean Water Act (CWA) section 404 permit	Commented on USACE Public Notice on April 12, 2018	Commented on USACE Public Notice on April 12, 2018
USACE, New Orleans District	CWA section 404 permit for impacts on waters of the United States, including wetlands (33 United States Code [U.S.C.] 1344) Rivers and Harbors Act (RHA) section 10 permit for construction and operation of structures in and across federally navigable waterways (33 U.S.C. 403)	Application for sections 404/10 submitted September 15, 2017	Application for sections 404/10 submitted September 15, 2017
	Section 408 authorization for work in federal project waters and federally navigable waters (33 U.S.C. 408)	Authorization request for section 408 approval submitted December 2017	Authorization request for section 408 approval submitted December 2017
U.S. Department of Commerce, National Oceanic and Atmospheric	Marine Mammal Protection Act Consultation (16 U.S.C. 1382)	All Pending	All Pending

Table 1.5-1 Major Permits, Approvals, and Consultations for the Project			
		Status	
Agency	**Permit/Approval/ Consultation**	**Terminal**	**Pipelines**
Administration, National Marine Fisheries Service (NMFS)	Endangered Species Act (ESA) section 7 consultation (16 U.S.C. 1856 et seq.) Magnuson-Stevens Fishery Conservation and Management Act (MSA) Consultation, Essential Fish Habitat (EFH) Consultation (50 CFR 600) Fish and Wildlife Coordination Act Consultation (16 U.S.C. 5a, subchapter I)		
U.S. Fish and Wildlife Service (FWS), Southeast Region 4	ESA section 7 consultation (16 U.S.C. 35) Migratory Bird Treaty Act Consultation (16 U.S.C. 7, subchapter II) Fish and Wildlife Coordination Act Consultation (16 U.S.C. Chapter 5a, subchapter I) BGEPA consultation	All Pending	All Pending
Federal Aviation Administration (FAA)	FAA's regulations at 14 CFR 77	Received FAA clearance determinations January 25, 2017	NA
U.S. Department of Transportation – Pipeline and Hazardous Materials Safety Administration (PHMSA)	Letter of No Objection 49 CFR 193 Subpart B	Letter of Determination - Pending	NA
State – Louisiana			
LDEQ, Water Permits Division	Hydrostatic Test Water Discharge General Permit (LRS 30:2001 et seq.)	Pending	Pending
	Section 401 Water Quality Certification (33 U.S.C. 26)	Received 401 Certification October 1, 2018	Received 401 Certification October 1, 2018
	Louisiana Pollutant Discharge Elimination System (LPDES) Construction Stormwater Discharge General Permit LAR100000	Pending	Pending
	LPDES Industrial Wastewater Discharge Permit, section 402 (33 U.S.C. 1342)	Pending	Pending

Table 1.5-1
Major Permits, Approvals, and Consultations for the Project

Agency	Permit/Approval/ Consultation	Status	
		Terminal	Pipelines
LDEQ, Office of Environmental Quality	Title V and Prevention of Deterioration of Significant (PSD) Air Permits (40 CFR 70)	Amended application submitted in July 23, 2017	NA
Louisiana Department of Natural Resources (LDNR), Office of Coastal Management (OCM)	Coastal Use Permit (CUP), a Joint Permit Application with USACE (R.S. 49:214.25)	CUP application submitted June 8, 2017	CUP application submitted June 8, 2017
LDNR, Office of Conservation	Title 38, Section 3098 (R.S. 38:3098—Chapter 13-B: Subsurface Water—Well Drillers)	Application to be submitted January 2019	NA
Louisiana Department of Wildlife and Fisheries (LDWF)	Threatened and Endangered Species Consultation (16 U.S.C. 460 et seq.)	Pending	Pending
Louisiana Department of Culture, Recreation and Tourism, Division of Archaeology	National Historic Preservation Act (NHPA) Section 106 Consultation (36 CFR 800) and Review	Concurrence from SHPO: Terminal Site, January 7, 2016; Terminal Site Avoidance Plan, August 22, 2016; Terminal Site Addendum, February 17, 2017; Unanticipated Discovery Plan, February 17, 2017	Concurrence from SHPO: Pipeline System, February 8, 2016; Addendum Report, October 12, 2016 152 acres - Pending
Louisiana Department of Transportation and Development (DOTD)	Driveway access, trestle crossing, temporary conveyor crossing	Application to be submitted in September 2018	NA
Louisiana Office of State Lands	Permit and lease for State Water Bottoms (LRS 41:1701-1714)	Application to be submitted in January 2019	Application to be submitted in January 2019
Local – Parish			
West Bank Levee	Crossing authorization	See information for section 408 authorization	See information for section 408 authorization
Plaquemines Parish Council	Building permit (if required)	Pending	Pending

2.0 PROPOSED ACTION

2.1 PROPOSED FACILITIES

The Venture Global Project consists of an LNG export terminal facility and a pipeline system in Plaquemines Parish, Louisiana that would supply the necessary gas for export. A description of these facilities is provided below.

- **LNG Terminal**: Construction and operation of various liquefaction, LNG distribution, and appurtenant facilities within the boundaries of the site leased by Venture Global on the Mississippi River, including:
  - six pretreatment facilities (three in each phase);
  - a liquefaction plant with 18 integrated single-mixed refrigerant blocks and support facilities (otherwise referred to as liquefaction blocks or blocks) to be constructed in two phases (nine blocks in each phase);
  - four 200,000-cubic-meter aboveground full-containment LNG storage tanks;
  - three LNG loading docks within a common LNG berthing area; and
  - air-cooled electric power generation facilities.
- **Pipeline System**: Construction and operation of two parallel 42-inch-diameter natural gas pipelines that share one right-of-way corridor for the majority of their respective routes and appurtenant aboveground facilities, including the following:
  - 15.1-mile-long Southwest Lateral Pipeline (SW lateral TGP);
  - 11.7-mile-long Southwest Lateral Pipeline (SW lateral TETCO);
  - TGP metering and regulation station; and
  - TETCO metering and regulation station.

Figure 2.1-1 shows the general location of the terminal site and pipeline routes.

Terminal Site Boundary
Eastern Workspace
SW Lateral – TETCO
SW Lateral – TGP
Interconnect and Meter Station

N

Figure 2.1-1
Proposed Project Facilities - Regional Location (Aerial Map)
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

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2.1.1 LNG Terminal

Venture Global proposes the development of an LNG terminal with a nameplate liquefaction capacity of 20.0 MTPA. The LNG liquefaction, storage, and export facilities would be constructed on an approximately 632-acre site on the west bank of the Mississippi River, near river mile marker 55 in Plaquemines Parish, Louisiana (see figure 2.1-2). The terminal site is bordered by the Mississippi River to the north and private property, historically used for agricultural purposes, to the south, east, and west. The terminal site has approximately 7,000 feet of frontage on the Mississippi River. The site is approximately 15 miles northwest of Port Sulfur, Louisiana and is bisected by SH 23. This state highway is a north-south regional highway that serves Plaquemines Parish. In addition, the terminal site extends across a federally maintained Mississippi River levee. The levee is part of the Mississippi River Flood Control Program and is under the regulatory and operational control of the USACE, New Orleans District.

The terminal site is located on "fastlands." The State of Louisiana defines fastlands as lands surrounded by publicly owned, maintained, or otherwise validly existing levees or natural formations that normally prevent activities, not to include the pumping of water for drainage purposes, within the surrounded area from having a direct and significant impact on coastal waters.

For descriptive purposes, the facilities at and adjacent to the terminal site are divided into two groups: the "terminal facilities" are those facilities located south of the landward toe of the Mississippi River levee and include the pretreatment, liquefaction, storage, and power generation facilities; and the "marine facilities" are those facilities on, over, or north of the Mississippi River levee and include the three LNG loading docks. The marine facilities are divided into land-based and water-based facilities. The marine facilities also include three temporary marine facilities and associated civil infrastructure (crane pad and levee sections of two access roads) for deliveries of materials and equipment during construction. The temporary facilities include a material offloading facility (MOF), bulk carrier mooring facility, and barge mooring facility.

At the location of the LNG loading docks on the Mississippi River (river mile marker 55), the federal navigation channel is approximately 1,900 feet wide (USACE, 2016a) and maintained to a depth of 45 feet Mean Low Gulf (USACE, 2016b). The existing channel depth would allow construction and operation of the LNG loading docks without the need for any dredging beyond that already performed by the USACE to maintain the navigation channel.

The LNG terminal site would be constructed in two phases (table 2.1-1). Venture Global anticipates initiating construction of Phase II approximately 18 months after initiating Phase I. However, Phase II is predicated on Venture Global's market outlook and the expected timeframe for securing offtake contracts for Phase II. Initiation of Phase II could be delayed based on market conditions and the status of offtake contracts.

Figure 2.1-2
Proposed Facilities at Terminal Site (Aerial Map)
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

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Venture Global plans to initiate construction of Phase I upon receipt of the Project's regulatory approvals required to begin construction. Venture Global anticipates that the full construction of each the two phases would take approximately 35 months. In both phases, the construction, commissioning, and operational startup of the liquefaction facilities would be achieved in steps, with each of the nine blocks per phase brought on line as it is commissioned. The Project's construction plan and its sequencing would be designed to ensure that LNG can be produced, stored, and loaded onto ships for export upon the commissioning of the first liquefaction block. The phased startup would be implemented pursuant to a simultaneous operations plan to be developed with the Project's engineering, procurement, and construction contractors. For Phase I, Venture Global anticipates commencing production of LNG as the first liquefaction block is completed, approximately 24 months after receiving FERC's authorization to commence construction. LNG production would then steadily increase as more liquefaction blocks are commissioned.

Table 2.1-1
Summary of Major Facility Components Constructed by Phase

Phase I	Phase II
9 Liquefaction Blocks	9 Liquefaction Blocks
3 Pre-treatment Facilities	3 Pre-treatment Facilities
2 LNG Storage Tanks (full containment type)	2 LNG Storage Tanks (full containment type)
2 LNG Loading Docks	1 LNG Loading Dock
Natural Gas-fired Power Plant (710 megawatt)	Natural Gas-fired Power Plant (710 megawatt)
SW Lateral TGP (15.1 miles)	SW Lateral TETCO (11.0 miles)
SW Lateral TETCO (0.7-mile segment)	
TGP and TETCO Meter Stations	

2.1.1.1 Pretreatment

Upon arrival at the terminal site, the natural gas would enter the gas gate station, which would include isolation and emergency shutdown valves, filters/separators, metering systems, connection to the fuel gas system, and a gas analyzer. At this stage, the gas would be split into two streams, one for process feed to the liquefaction plant and the other for fuel gas supply[1] to the electric power generation facilities. The feed gas pressure would be boosted as necessary by electric motor-driven compressors at the terminal site to achieve approximately 750 pounds per square inch gauge (psig) before pretreatment and before the gas enters the liquefaction system. Air-cooled heat exchangers would cool the gas to near ambient temperature to remove the heat caused by compression.

The pipeline-quality gas delivered to the terminal site would be composed primarily of methane but would also contain ethane, propane, butane, and other heavy end hydrocarbons (between 2 and 3 percent) in addition to small quantities of nitrogen, oxygen, carbon dioxide

[1] Natural gas feed for power generation would be supplemented with boil-off gas and other fuel gas streams generated in the liquefaction plant.

(CO_2), and water. To ensure that the liquefaction plant can function properly, the process feed gas would be treated to remove CO_2, hydrogen sulfide (H_2S), and water. The trace amounts of CO_2 present in natural gas would freeze in the cryogenic liquefaction process and block the cryogenic exchangers if not removed beforehand. H_2S is also removed to lower sulfur dioxide emissions.

Each construction phase consists of a Hydrogen Sulfide Removal Unit, an Acid Gas Removal Unit, and a Dehydration Unit. Each Hydrogen Sulfide Removal Unit includes six (6) Hydrogen Absorber Vessels while each Acid Gas Removal Unit includes three (3) parallel treatment blocks. There would be three (3) Dehydration blocks, where one (1) Dehydration block is dedicated to an Acid Gas Removal treatment block.

H_2S Removal Unit

Feed gas from the gas gate station, containing up to 5 parts per million volume (ppmv) H_2S, would be fed to the non-regenerative H_2S removal beds to remove H_2S and, thereby, lower sulfur dioxide emissions. The solid adsorbent is contained in multiple vessels in each of the six H_2S removal units. As the adsorbent is used up, individual vessels are isolated, and the adsorbent is emptied and recharged while the rest of the units remain on line. The treated gas is sent to the acid gas removal unit for further treatment. Spent adsorbent would be placed in containers and transported via truck to a processing facility.

Acid Gas Removal

The acid gas removal unit is designed to treat feed gas containing up to 2 percent mole CO_2 and any remaining traces of H_2S that remain after the H_2S removal unit process. After treatment in the acid gas removal unit, the feed gas would contain no more than 50 ppmv CO_2 and no more than 1 ppmv H_2S. Activated methyldiethanolamine technology would be used primarily due to its ability to remove CO_2 to very low levels and, with respect to comparative technologies, fewer corrosion issues and lower foaming tendencies. There would be three 50-percent capacity acid gas removal units for each phase. Antifoam injection would be provided, as well as amine and water storage and makeup facilities. The low-pressure, CO_2-rich acid gas stream with some H_2S and residual hydrocarbons content would be sent to the thermal oxidizer for destruction. The amines collected in the solvent drain tank would be filtered and transferred to the solvent storage tank, then sent off-site for reprocessing.

Dehydration Unit

The dehydration unit would be located downstream of the acid gas removal unit and is designed to remove water from the water-saturated feed gas leaving the amine tower. The gas dehydration system would consist of three 50-percent-capacity molecular sieve units for each phase, each with four vessels (three operating, one regenerating). The process flow would be routed through a valve system to one of the operating vessels, while the other operating vessels' sieve material would be regenerated with a small flow of dry, hot gas.

At any given time, three molecular sieve beds would be in water adsorption mode, while the other would be in regeneration mode. The regeneration gas is heated by a hot oil system. The dried treated gas is filtered downstream of the molecular sieve vessel and then sent to the heavy hydrocarbon removal unit. The water content of the gas is reduced to about 0.5 ppmv. Finally, the natural gas is further purified within the liquefaction trains to remove heavy hydrocarbons.

2.1.1.2 Liquefaction

The liquefaction plant would consist of 18 integrated single-mixed refrigerant blocks and support facilities (otherwise referred to as liquefaction blocks or blocks), which would be situated in the central sector of the terminal site (see figure 2.1-2). Nine of the blocks would be constructed in Phase I and nine would be constructed in Phase II. One block would contain two liquefaction trains, each consisting of a cold box, an electric-driven mixed-refrigerant compressor and a process module. Heavy hydrocarbon removal is integral to the cold box. Each train would also contain conventional air coolers (fin fans) to provide cooling during the liquefaction process.

Each block would have a nameplate capacity of 1.1 MTPA of LNG (for a Project nameplate capacity of 20.0 MTPA in aggregate) for export, which equates to a total liquefaction nameplate capacity of approximately 1,033 standard billion cubic feet per year (bcf/y) of natural gas. The Project's peak liquefaction capability may, depending on a variety of factors, be as much as 24.0 MTPA. Under optimal conditions, this equates to a total peak liquefaction capacity of approximately 1,240 bcf/y of natural gas.

The first step of the liquefaction process is to further purify the natural gas arriving from the pretreatment systems to remove heavy hydrocarbons that would freeze during the liquefaction process if not removed beforehand. The pretreated feed gas enters the cold box where it is chilled to a point at which most of the heavy components condense and are then separated in a distillation process. The small quantities of products removed would be recovered and used by the LNG terminal's hot oil heaters for fuel.

After the heavy hydrocarbons have been removed, the pretreated gas continues through the cold box, is de-superheated, condensed to liquid, and then sub-cooled to near -260 degrees Fahrenheit (°F) in aluminum plate-fin heat exchangers, which are enclosed and insulated with perlite powder in steel cold boxes. Refrigeration for this process is produced by a specifically designed single-loop, mixed-refrigerant system. The refrigerant, a mixture of hydrocarbon gases and nitrogen, is pressurized by a multi-stage electric motor-driven compressor and then partially condensed in air-cooled heat exchangers. The resultant cooled and pressurized vapors and liquids are separated into various streams and continue to be condensed and sub-cooled in the cold-box plate-fin heat exchangers. The cooling source for these mixed-refrigerant streams and the natural gas liquefaction stream is created by flashing cold mixed-refrigerant to lower pressures, then passing those colder mixed refrigerant streams in counter current to the streams to be cooled in the plate-fin heat exchangers. The lower-pressure, mixed-refrigerant is warmed to near ambient temperature and returned to the suction of the compressors to complete the cycle.

Each liquefaction train would contain a refrigerant make-up system with gas analyzers and controls that maintains the refrigerant components in proper proportion. The refrigerant make-up system is also designed to recover refrigerant during equipment shutdown. Distribution piping would connect vessels in the common refrigerant storage area to each liquefaction train. Except for certain safety systems, one distributed control system in the control building would be used for supervisory process and power control. Each liquefaction train would have its own process controller.

When the LNG exits the cold-box, it is depressurized to 100 psig and delivered sub-cooled to the LNG storage tanks, where it is flashed into the container.

2.1.1.3 LNG Tanks

The LNG storage tanks would be located between the liquefaction blocks and the LNG berthing area (see figure 2.1-2). Each tank would be approximately 300 feet in diameter and 180 feet in height from grade to the top of the dome roof, with a net usable capacity of 200,000 cubic meters. The four LNG tanks constructed during Phase I and Phase II (two during each Phase) would be full containment type.

Each full containment tank would consist of:

- a pile supported at grade tank foundation system with electric heater, designed to support the tank;
- an outer reinforced concrete tank with a carbon steel vapor barrier;
- a 9 percent nickel steel inner tank;
- a concrete ring beam, which supports the shell of the inner tank;
- an aluminum suspended insulation deck supported by hangers from the roof;
- an insulation system with insulation on top of the suspended deck, between the outer concrete tank and the 9 percent nickel steel inner tank, and between the outer tank bottom and the inner tank bottom;
- a tank settlement monitoring system;
- a heating system in the concrete foundation to prevent frost heave of the soil below the tank;
- submerged pumps, pump wells, internal piping, etc.;
- valves for pressure and vacuum protection;
- appurtenant equipment including roof platform, spill protection, stairs, walkways, caged ladders, monorail, handrails, pressure relief and vacuum relief valves, pipe-racks, equipment for various monitoring, fire detection and control system, etc.;
- electrical features including tank lighting, tank grounding and lightning protection; and
- control and instrumentation systems.

The Phase I tanks would be on the north side of the storage area, and the Phase II tanks would be on the south side of the storage area. The storage tanks, like other LNG facilities at the LNG terminal site, must be built to the requirements of NFPA Standard 59A (2001), as incorporated by DOT/PHMSA regulations at 49 CFR 193. Venture Global will design and construct the LNG storage tanks to other applicable regulations, codes, and standards.

Prior to being placed into service, the LNG storage tanks would be hydrostatically tested in accordance with the requirements of American Petroleum Institute (API) Standard 620, Q8.3. The source of hydrostatic test water would be the Mississippi River and, following any necessary treatment, the used test water would be discharged back to the river or into canals adjacent to the terminal site.

Liquefied natural gas from the liquefaction plant would be stored in the LNG tanks prior to being transferred to ocean-going LNG carriers.

2.1.1.4 LNG Loading and Ship Berthing Area

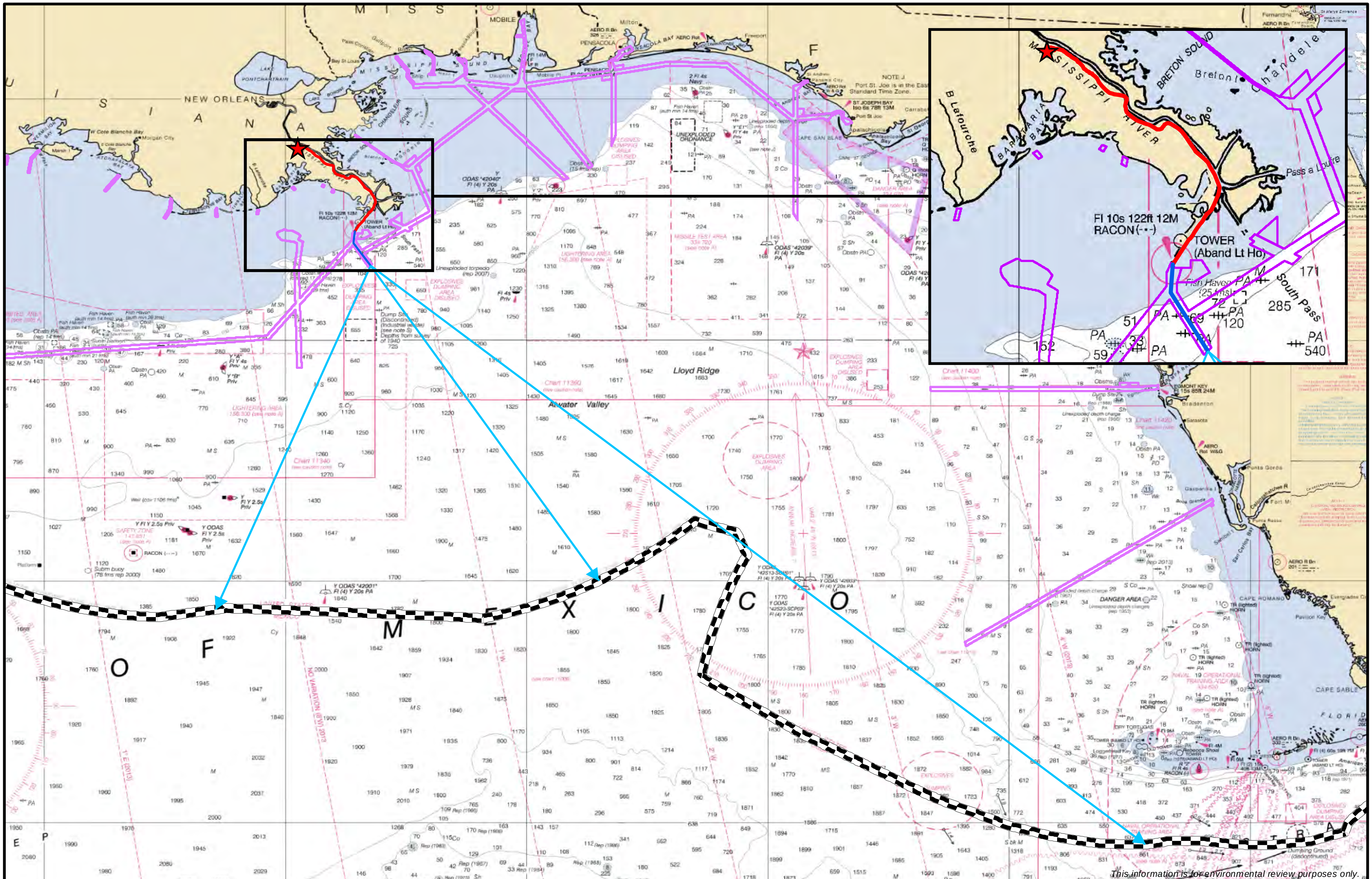
The LNG carriers would access the LNG terminal from the Gulf of Mexico via the Mississippi River. Figure 2.1-3 identifies the U.S. Exclusive Economic Zone; shipping fairways, lanes, and zones; and potential LNG carrier sea routes.

Each LNG loading dock would feature a concrete platform, which would be constructed on steel piles. Each platform would support three marine loading arms and one marine vapor return arm. LNG would be pumped from the LNG tanks through loading arms to ocean-going LNG carriers. The design pumping rate from the LNG storage tanks would be 12,000 cubic meters per hour. The vapor return arm is provided to route displaced/flash gas back to an LNG storage tank. Each loading and vapor return arm would have a powered emergency release coupling. Figure 2.1-4 shows a more detailed view of the marine structures.

2.1.1.5 Flare Stack

A flare stack is a gas combustion device primarily used for burning off flammable gas released by pressure relief valves. The purpose of a pressure relief and flare system is to safely and reliably protect plant systems from overpressure during start-up, shutdown, plant upsets, and emergency conditions. Upset events that require flaring or depressurizing are not planned, and the control system is designed to safely control the gas release and mitigate the air quality impacts of a release. Planned flaring is usually associated with system start-up, planned maintenance and shutdown scenarios, and LNG carrier gas-up/cool-down operations.

Three separate flare structures would be installed at the LNG terminal: a warm/cold flare structure containing two separate flare headers to handle cold relief fluids and wet/warm relief fluids; a low-pressure vent flare structure for low-velocity marine loading; and a marine vapor control structure for LNG carrier gas-up/cool-down operations.



Terminal Site
Navigable Channel (Pilot)
Safety Fairway (Ship Master)
Ship Master selects Open Water Sea Routes (routes shown are illustrative only)
Economic Exclusion Zone Boundary
Shipping Fairways, Lanes and Zones

0 25 50 Miles

Figure 2.1-3

LNG Carrier Sea Routes

Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

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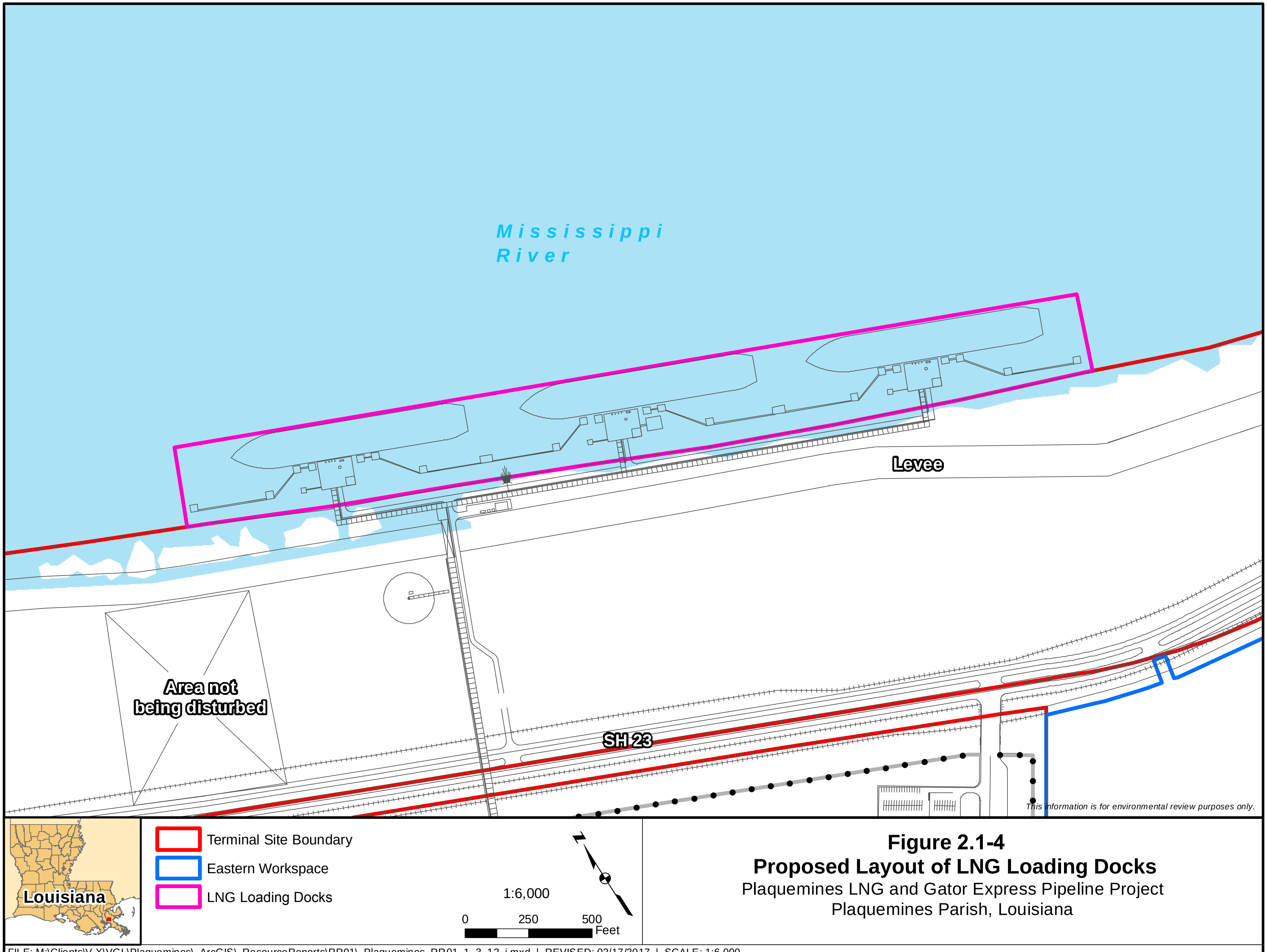

Figure 2.1-4
Proposed Layout of LNG Loading Docks
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

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After initial facility start-up, during which flaring of gas from process cool-down would occur, the LNG terminal is designed to limit flaring events only to LNG carrier gas-up/cool-down, which may occur up to forty times a year. Venture Global does not anticipate any other flaring/venting during normal operating conditions.

2.1.1.6 Power Generation Facilities

During operations, electrical power would be generated on the LNG terminal site by two combined-cycle gas turbine power generation facilities sized to reliably meet the LNG terminal's peak power demand of electricity in total for Phases I and II. A substation and transformer yard would be located near the power generation facilities.

The main power load would be generated by 36 compressor electric motor drivers in the liquefaction plant consisting of one driver for each of the two liquefaction trains in each of the 18 liquefaction blocks. Other plant loads would include LNG pumps, boil-off gas and boost compressors, and the multiple fan motors that would be used for air cooling during the liquefaction process. The power generation facilities would supply their own auxiliary electric loads, including fans in the air-cooled steam condensers, and would have multiple diesel generators for black start capability.

2.1.1.7 Construction Facilities

Temporary Marine Facilities

Venture Global intends to construct three temporary marine delivery facilities for use during Project construction. These temporary marine delivery facilities include the MOF, bulk carrier mooring facility, and barge mooring facility.

The MOF would be located in the Mississippi River, adjacent to the shoreline and east of the LNG loading docks. The MOF would consist of a concrete platform (200 feet x 300 feet) supported by large-diameter steel pilings. The platform elevation would be +15.0 feet North American Vertical Datum of 1988 (NAVD88). The primary use for the facility would be offloading of the LNG modules, power plant components and equipment, and other heavy lift/heavy haul (greater than 50 tons) material and equipment. The MOF would be used during both Phase I and Phase II. Once construction of Phase II is complete, the MOF would be removed, and the impact area would be restored to preconstruction conditions to the extent practicable.

The bulk carrier mooring facility would consist of five mooring piles at the proposed location of the LNG loading dock farthest upstream on the Mississippi River. The primary use of the bulk carrier mooring facility would be docking and unloading of bulk carriers, which would use an onboard conveyor system to offload rock, structural fill, and cement to a receiving hopper located on the channel side of the Mississippi River levee. The material would then be transported across the levee and SH 23 to the LNG terminal construction area by an overhead conveyor system. Mooring of deep-draft bulk carriers would require the use of two moored barges (approximately 250 feet long by 50 feet wide) to serve as spacers between the mooring dolphins and the bulk carriers. The bulk carrier mooring facility would be used during Phase I and then removed before construction of the third LNG loading dock at the same location during Phase II.

The barge mooring facility would consist of six mooring dolphins located on the Mississippi River, approximately 700 feet downstream from the MOF. The primary purpose of the barge mooring facility would be to secure cargo barges (anticipated to be 250 feet long and 52 feet wide) for offloading of piles and other materials by a shore-based crane during construction of the LNG terminal facilities. The materials would be transported by truck from the offloading area to receiving areas on the LNG terminal site. Once construction of Phase II is complete, the barge mooring facility would be removed, and the impact area would be restored to pre-construction conditions to the extent practicable.

Temporary Electric Power

The local electric power provider, Entergy Louisiana, LLC, would provide a utility service connection that would be used to provide electrical power during construction of the LNG terminal. This would be a temporary electric utility connection that would be removed following start-up of the LNG terminal's power plant. The design calls for an approximately 1,500-foot-long interconnect from the existing power line located along SH 23 heading southwest to a temporary construction electrical distribution center within the LNG terminal site.

2.1.1.8 Support Facilities

Water Supply

Venture Global is evaluating three potential water supply sources for construction and operation, including the following:

- connection to the public water supply;
- treated groundwater from on-site wells; and
- treated surface water from the Mississippi River or other local waterbodies.

Pending discussions with the parish, Venture Global may connect to the Plaquemines Parish Water District's existing water line that is adjacent to SH 23 and install an aboveground pipeline for approximately 1,500 feet to a distribution point at the LNG terminal site. This connection could potentially provide potable water during construction and would possibly be maintained for operational supply. Plaquemines is also evaluating the feasibility of constructing two or more groundwater supply wells that would supply water to the facility through a groundwater treatment system. The water supply system for the LNG terminal, regardless of source, is expected to include some volume of storage capacity in aboveground storage tanks.

During LNG terminal operations, the primary uses of potable water would include water supply for administration buildings, control rooms, and maintenance buildings for potable and sanitary uses and makeup water for the power plant steam system. Potential uses of potable water could include utility hose stations; indoor firewater sprinkler systems; initial fill and makeup for the closed-loop tempered water system, acid gas removal unit, and turbine water wash; and firewater system pressurization.

For firewater system pressurization, Venture Global proposes to use potable water to fill a fresh water storage tank. The firewater jockey pumps would draw from this tank to pressurize the main firewater ring header. Each jockey pump has a rated capacity of 132 gallons per minute. If the firewater jockey pumps cannot maintain firewater header pressure, then the jetty firewater pumps would draw water directly from the Mississippi River. Each jetty firewater pump has a rated capacity of 4,000 gallons per minute.

The sanitary waste system used for LNG terminal operations would include holding tanks on-site, which would be pumped out as necessary to be disposed at licensed facilities.

Safety and Security Communication

The LNG terminal would be designed to minimize the occurrence of events that could result in unsafe conditions and to mitigate potential impacts on the public and facility personnel. Proposed safety systems include the following:

- emergency shutdown (ESD) system – an automated system to prevent escalation of hazards from accidents or equipment failure;
- spill and leak containment and alarm systems for LNG and other hazardous liquids;
- flammable vapor detection systems;
- fire protection systems with:
    - heat detection;
    - ultra-violet radiation detection;
    - smoke detection;
- firewater delivery systems with seawater loop and hydrants; and
- electronic monitoring and emergency messaging systems.

Fire and gas detection systems would provide the means to monitor for and alert operators of hazardous conditions throughout the LNG terminal site resulting from fire, gas leaks, and low temperature LNG spills. The detection of these hazardous conditions would result in local audio and visual (e.g., strobe lights) signals with various alarms and colors, depending on the detected hazard. When appropriate, automatic emergency shutdown of specific equipment and systems would occur and may activate a wider ESD system response. Firewater and fire suppression/extinguishing systems would be provided to protect personnel, the public, and facility equipment in the event of a fire. Lightning arrestors would also be included in facility designs.

The terminal would be surrounded by perimeter fencing, with gated and monitored access, and would have 24-hour surveillance performed using a combination of electronic monitoring and facility personnel, in accordance with all applicable maritime and critical energy infrastructure safety and security laws. Security features include an intrusion detection system with closed-circuit TV cameras, intrusion monitors, and low-intrusion plant perimeter lighting.

Access Roads

During operation, vehicular access to the LNG terminal site would be via existing local public roadways. Venture Global indicates that access would require improvements such as auxiliary turn lanes along southbound SH 23, new site entrances and exits on SH 23, and required signage and lighting. All improvements would be designed in accordance with the American Association of State Highway and Transportation Officials, "*A Policy on Geometric Design of the Highways and Streets"* per DOTD recommendations.

Buildings

The LNG terminal site would also include the following systems and buildings necessary for the safe and efficient operation of the LNG terminal:

- ship loading control rooms;
- main process and power plant control room;
- administrative offices;
- workshop;
- warehouse; and
- various ancillary equipment buildings and shelters.

Stormwater Drainage and Containment

LNG terminal site preparation activities would be designed to ensure efficient and environmentally protective stormwater drainage. The LNG terminal site would be designed to direct discharges towards perimeter outfalls through a system of ditches and, if necessary, holding basins and filtration devices during construction, allowing sufficient retention time to preclude high sediment loads from reaching receiving waters. Stormwater controls, including placement of gravel or other suitable material to provide a stable, well-drained surface, would be installed. Throughout construction, Venture Global would follow the erosion and sedimentation control procedures described in its Project-specific *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) based, respectively, on FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan* (FERC, 2013a) and *Wetland and Waterbody Construction and Mitigation Procedures* (FERC, 2013b), and would also follow its construction Stormwater Pollution Prevention Plan (SWPPP).

2.1.1.9 LNG Carriers

The marine facilities would be designed to accommodate LNG carriers with capacities between 120,000 m^3 and 185,000 m^3. An LNG carrier's transit to the LNG terminal would begin outside the Mississippi River, where it would enter a pilot boarding station. The LNG carrier then would travel into the Mississippi River to mile marker 55 arriving at the LNG Terminal. Figure 2.1-3 identifies the U.S. Exclusive Economic Zone; shipping fairways, lanes, and zones; and potential LNG carrier sea routes.

2.1.2 Pipeline System

The pipeline system includes two natural gas pipelines in Plaquemines Parish, Louisiana, the SW lateral TGP and the SW lateral TETCO. These pipelines would connect the LNG terminal to the existing transmission pipeline network and provide feed gas to the liquefaction and power generation facilities. Each pipeline would have a nominal gas supply capability of 1.97 standard bcf/day, which includes a 20 percent contingency over the terminal design case, delivered from TGP's or TETCO's existing pipeline system, assuming a battery limit design pressure of approximately 500 to 900 psig at the gas gate station on the LNG terminal. The major components of the pipeline system are described below.

The SW lateral TGP would consist of approximately 15.1 miles of 42-inch-diameter steel pipeline extending to the LNG terminal from a proposed interconnection with TGP's interstate transmission pipeline system. For the TGP line, approximately 14.4 miles would be concrete coated and 0.7 mile would not be concrete coated.

The SW lateral TETCO would consist of approximately 11.7 miles of 42-inch-diameter steel pipeline extending to the LNG terminal from the proposed interconnection with TETCO's interstate transmission system. For the TETCO line, approximately 11.1 miles would be concrete coated and 0.6 mile would not be concrete coated.

One platform-mounted meter station with a pig launcher and pressure regulating valve would be located in the vicinity of each of the two pipeline interconnections described above for a total of two meter stations for the pipeline system. A gas gate station with pig receivers and pressure regulating valves would be located at the LNG terminal and would interconnect with the two pipelines. It would also include filter/separators, custody transfer meters, emergency shutdown valves, and gas analyzers.

Three mainline valves (MLVs) would be located on the SW lateral TGP, and three MLVs would be located on the SW lateral TETCO. On the SW lateral TGP and the SW lateral TETCO, one MLV would be located at the southwest end of each pipeline's pipe bridge crossing of the non-federal levee southwest of the LNG terminal (figure 2.1-2). A permanent access road that would be approximately 50 feet in length would be constructed to allow access to the MLV near the pipe bridge over the non-federal levee from Lake Hermitage Road.

One interconnect valve on the SW lateral TETCO with a pig launcher and pressure regulating valve would be located on the platform-mounted TETCO meter station, which includes an approximately 300-foot-long, 42-inch-diameter pipe section. The valve and pipe section would connect to the SW lateral TGP, allowing the SW lateral TGP to transport gas from either the existing TGP system or the existing TETCO system at any given time.

One pipe bridge to provide an aerial crossing for the two pipelines would be installed over the non-federal levee southwest of the LNG terminal and northeast of Lake Hermitage Road. All other sections of the pipeline would be installed underground.

During construction, Venture Global would require water access to the construction site for barges and other vessels involved in dredging, pipe laying, equipment and material deliveries, and spoil storage. Regional access to the area would be through the Intracoastal Waterway (ICW), which runs into Barataria Bay about 6 miles northwest of the SW lateral TETCO meter station. From Barataria Bay, northwest access to the pipeline route would be through Wilkinson Canal and Lake Laurier. All barge access to the work area would follow existing waterways, and a majority of the system is sufficiently deep (at least 8 feet) to allow free passage. However, some dredging would be required in four areas, totaling 8.9 miles, to increase the minimum water depth to the required level. Venture Global would undertake this dredging as part of the Project and in accordance with the necessary federal, state, and local permits and approvals.

2.2 LAND REQUIREMENTS

2.2.1 LNG Terminal

The terminal site would occupy an approximately 632-acre property and adjacent parcels for workspaces. The property has been secured by Venture Global pursuant to a lease option agreement that grants Venture Global the exclusive right to lease the LNG terminal site for up to 70 years. The lease agreement was approved by Plaquemines Parish Council on August 13, 2015, and executed by Venture Global and the Port of Plaquemines on August 19, 2015. The LNG terminal site would be utilized for permanent operational facilities. In addition, the majority of infrastructure for the three LNG loading docks and three temporary marine delivery facilities would be constructed and sited in the Mississippi River along the northern edge of the 632-acre property and would constitute an additional 14.6 acres of operational footprint. See figure B-1 in appendix B for workspaces within the terminal site.

For Phase I of the Project, adequate workspace would exist at the LNG terminal site to construct the facilities; however, temporary workspace beyond the LNG terminal site would be needed to support construction during Phase II of the Project. The proposed temporary workspace consists of approximately 80 acres of land along SH 23, east of and adjacent to the LNG terminal site. Venture Global currently has an option to lease this property from the Port of Plaquemines. It shares the same land use characteristics as the LNG terminal site, namely agricultural pasture designated as "fastlands" by the State of Louisiana. Although this temporary workspace is necessary only during construction, it would be permanently impacted by the ground preparation and aggregate overlay needed to allow its use as an equipment storage and laydown area.

Table 2.2-1 provides a summary of the land requirements at the LNG terminal and water-based marine facilities.

Table 2.2-1 Summary of Land Requirements at the Terminal Site[a]						
Terminal Component	**Land Impacted by Construction (acres)**	**Land Impacted by Operation (acres)**	**Water Impacted by Construction (acres)**	**Water Impacted by Operation (acres)**	**Total Area Impacted by Construction (acres)**	**Total Area Impacted by Operation (acres)**
Terminal Facilities	534.5	534.5	0.0	0.0	534.5	534.5
Land-Based Marine Facility	7.4	7.4	0.0	0.0	7.4	7.4
Terminal Workspace[b]	13.1	0.0	0.0	0.0	13.1	0.0
Water-Based Marine Facility	3.9	3.9	10.7	10.7	14.6	14.6
Utility Workspace[c]	6.4	0.0	0.0	0.0	6.4	0.0
Eastern Workspace	80.0	80.0	0.0	0.0	80.0	80.0
Marine Workspace	2.8	0.0	69.9	0.0	72.7	0.0
	648.1	**625.8**	**80.6**	**10.7**	**728.7**	**636.5**

a Does not include undisturbed land (77.0 acres) at the LNG terminal site.
b Terminal workspace includes areas along the federal levee where workspace for the crossing of the levee would be required.
c Temporary terminal workspace includes areas located along SH 23 currently used for utilities.

2.2.2 Pipeline System

Venture Global would construct its pipeline system using either a barge lay, push lay, or conventional lay method. In the areas that require installation by barge lay, Venture Global would require a 300-foot-wide construction right-of-way (temporary right-of-way plus permanent easement). Where installation would be accomplished with push lay or conventional lay, the construction right-of-way would be 130 feet wide. An 80-foot-wide permanent easement would be required where the two pipelines are collocated, and a 50-foot-wide permanent easement would be required where the SW lateral TGP is located alone. The land requirements for the pipeline system and its aboveground facilities are shown in table 2.2-2.

The use of temporary workspaces is required to safely cross atypical features, such as wetlands, waterbodies, existing utilities and road crossings. Temporary workspaces are used on either side of these crossings, typically not in wetlands or waterbodies, and are used to stage equipment and supplies and segregate topsoil or muck because workspaces are often a reduced width within an actual road, utility, or sensitive environmental resource crossing.

Table 2.2-2 Summary of Land Requirements for the Pipeline System and its Aboveground Facilities		
Facility	**Area Impacted by Construction (acres)**	**Area Impacted by Operation (acres)**
SW Lateral TGP (Phase I)[c,d]		
Pipeline Facilities	447.7[a]	128.0[b]
Aboveground Facilities (meter stations and MLVs)	71.8	9.3
Additional Temporary Workspace[c]	46.4	0.0
Access Roads	0.7	<0.1
Barge Access Channels[d]	322.6	0.0
SW Lateral TGP Total	**889.2[d]**	**137.3[d]**
SW Lateral TETCO (Phase II)[e,f]		
Pipeline Facilities	64.7[a]	0.0[c]
Aboveground Facilities (meter stations and MLVs)	0.0	0.0
Additional Temporary Workspace	0.0	0.0
Access Roads	0.0	0.0
Barge Access Channels[e]	0.0	0.0
SW Lateral TETCO Total	**64.7**	**0.0**
Overall Pipeline System Total	**953.9**	**137.3**

a No construction workspace is required at horizontal directional drill (HDD) segments except for HDD entry and exit points and HDD pull-back areas (both addressed as additional temporary workspace [ATWS]). No construction workspace is required for pipeline facilities at pipeline trestle crossings except for trestle construction and trestle supports (both addressed as ATWS and aboveground facilities, respectively).
b Calculated on the basis of a 50-foot-wide (SW lateral TGP) and 80-foot-wide (SW lateral TGP collocated with SW lateral TETCO) permanent easement.
c Excludes 62.5 acres of temporary workspace associated with meter stations which is included within stated aboveground facilities impacts.
d Acreage totals include temporary dredging and dredge spoil placement impacts for channels providing worksite access for construction barges and support vessels.
e To the extent that the temporary rights-of-way and workspace for the SW lateral TETCO and SW lateral TGP are shared, the overlapping acreage is included in the SW lateral TGP and SW lateral TETCO (Phase I) total and excluded from the SW lateral TETCO (Phase II) total.
f. To the extent that the permanent easements for the SW lateral TETCO and SW lateral TGP are shared, the overlapping acreage is included in the SW lateral TGP and SW lateral TETCO (Phase I) total and excluded from the SW lateral TETCO (Phase II) total.

Venture Global is not planning to use pipe yards. Instead, Venture Global would receive pipe joints from the pipe-coating yard and place them directly on rake haul barges, which would transport the pipes to a designated barge dock in the Project area, where they would be offloaded and then transported to the work site by truck.

Venture Global would require one temporary and one permanent access road for the pipeline system. Additionally, Venture Global would require barge access to the pipeline system. Venture Global would utilize existing channels for barge access; however, three areas would require deepening to accommodate construction vessels. See table 2.2-2 for land requirements for these Project components.

2.3 CONSTRUCTION SCHEDULE

Construction of the Phase I facilities is anticipated to last for approximately 35 months, with a full facility in-service target date of 2022. Construction of the Phase II facilities is anticipated to commence approximately one and a half years after construction of the Phase I facilities is initiated and is scheduled to last for 35 months, in which case the Project would be fully complete and operational by 2024. The SW lateral TGP and a portion of the SW lateral TETCO would be constructed concurrently with the LNG terminal's Phase I facilities; the remainder of the SW lateral TETCO would be constructed concurrently with the LNG terminal's Phase II facilities.

There would be an approximately 3-month overlap when Phase I construction would be at peak workforce (2,200 workers) and when the Phase II construction would be commencing. To support the start-up period of Phase I construction, it is expected that about 100 workers would be present on site. Thus, the overall peak workforce during this 3-month overlap would be approximately 2,300 workers. Similarly, there would be an approximately 3-month overlap when Phase II construction would be at a peak (2,200 workers) and Phase I construction would be decreasing as the facilities near completion. During this period, it is estimated that 100 to 1,000 workers would be required for Phase I. The maximum overall peak workforce would therefore be approximately 3,200 workers for approximately 3 months.

The average workforce for each phase of construction is estimated to be 1,400 workers, which would overlap for a period of approximately 12 months, during which the average combined on-site workforce would be approximately 2,800 workers.

Construction of the pipeline system would require fewer workers than the LNG terminal and for a shorter duration. As discussed in section 1.5.2.3, the SW lateral TGP and a 0.7-mile-long segment of the SW lateral TETCO would be constructed during Phase I; the remaining 11.0 miles of the SW lateral TETCO would be constructed during Phase II. For both Phases I and II, estimates for pipeline construction include approximately 150 workers at the beginning of construction to stake and prepare the work areas. Following the initial period, construction activity would gradually increase to a peak of about 500 workers for a one-month period and then gradually decrease as installation of the pipelines near completion. See Section 4.9, Socioeconomics, for further details regarding construction workforces.

2.4 ENVIRONMENTAL COMPLIANCE

FERC may impose conditions on any Certificate or authorization it grants for the Project. These conditions generally include additional requirements and mitigation measures recommended in this EIS to minimize the environmental impact that would result from construction and operation of the facilities (see sections 4 and 5). We will recommend that these additional requirements and mitigation measures (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 Venture Global be required to implement the mitigation measures proposed as part of the Project unless specifically modified by other Certificate or authorization conditions.

2.4.1 Environmental Inspection

Venture Global would be represented during construction by an environmental compliance manager, hired by and reporting to Venture Global, who would have overall authority for quality assurance and compliance with mitigation measures, other applicable regulatory requirements, and company specifications. The environmental compliance manager would be assisted by lead Environmental Inspectors (EIs), who would report directly to the manager. Venture Global would employ two to four EIs per construction spread based on the environmental and/or cultural resources present on each spread. The EIs would be on-site during active construction and would have peer status with all other activity inspectors.

The EI, as well as all Project contractors and company personnel, would have authority to stop construction activities that violate the measures set forth in the documents and permit authorizations for the Project. The environmental inspection program weekly reports would be sent to FERC for review and placed into the public record.

The EIs' duties are described in detail in Venture Global's Plan (see appendix B). At a minimum, the EI would be responsible for the following:

- identifying, documenting, and overseeing corrective actions as necessary to bring an activity back into compliance;
- verifying that the limits of authorized construction work areas and locations of access roads are properly marked before clearing and maintained throughout construction;
- 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;
- identifying erosion/sediment control and stabilization needs in all areas;
- locating dewatering structures and slope breakers to ensure they would not direct water into sensitive areas such as known cultural resource sites, wetlands, waterbodies, and sensitive species habitats;
- verifying that trench dewatering activities do not result in the deposition of sand, silt, and/or sediment near the point of discharge in a wetland or waterbody. If such deposition is occurring, the EI would stop the dewatering activity and take corrective action to prevent a reoccurrence;
- advising the environmental compliance manager and/or Chief Construction Inspector when conditions (such as wet weather) make it advisable to restrict construction activities to avoid excessive rutting, topsoil/subsoil mixing, or excessive compaction;
- approving imported soils and verifying that the soil is certified free of noxious weeds and soil pests, unless otherwise specified by the landowner;

- ensuring that erosion controls are properly installed, as necessary, to prevent sediment flow into wetlands, waterbodies, sensitive areas, and onto roads;
- inspecting and ensuring the maintenance of temporary erosion control measures at least daily in areas of active construction or equipment operation, on a weekly basis in areas with no construction or equipment operation, and within 24 hours of each 0.5 inch or greater of rainfall;
- ensuring restoration of contours and topsoil;
- ensuring the repair of all ineffective temporary erosion control measures as soon as possible but not longer than 24 hours after identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts;
- keeping records of compliance with conditions of all environmental permits and approvals during active construction and restoration; and
- identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase.

Additional inspection requirements would be included pending Venture Global's compliance with other permits, certifications, and approvals as shown in table 1.5-1 in section 1.5.

2.4.2 Compliance Monitoring

Venture Global would review Project-specific environmental conditions with prospective contractors during pre-bid meetings and would incorporate such conditions into construction bid documents. Contractors would be obligated to comply with all environmental conditions in the Project's permits. Venture Global would require that all contractors develop and train their construction workers in spill prevention and cleanup, waste management, and incident managing and reporting to support environmental compliance during construction.

For purposes of quality assurance and to support regulatory compliance, Venture Global would be represented by one chief inspector for the LNG terminal site and one chief inspector for the pipeline system. One or more craft inspectors and one or more EIs would assist each chief inspector. In addition, craft inspectors would be used for inspection services at manufacturing and fabrication facilities handling process modules, equipment, and piping prior to delivery to the LNG terminal site. All inspectors would have access to the compliance specifications and other relevant material contained in the construction contracts.

FERC would also conduct field inspections during construction. Other federal and state agencies may also conduct oversight or inspection to the extent determined necessary by the individual agency. After construction, FERC would continue to conduct oversight inspection and monitoring during operation of the Project to ensure successful restoration. Additionally, FERC staff would conduct annual operations inspections of the LNG facility throughout its entire life.

2.4.3 Environmental Training

Venture Global would implement a training program designed to meet regulatory requirements and to ensure all individuals receive training tailored to their particular role before beginning on-site work. The program would also ensure that adequate training records are maintained and refresher training is provided as needed.

2.5 CONSTRUCTION PROCEDURES

This section describes the general procedures proposed by Venture Global for construction activities at the LNG terminal and pipeline system. Refer to section 4 for more detailed discussions of proposed construction and restoration procedures, as well as additional measures that we are recommending to avoid or reduce environmental impacts.

The Project must be constructed in accordance with DOT/PHMSA Federal Safety Standards for LNG Facilities (49 CFR 193) and the incorporated NFPA 59A (2001), "Standard for the Production, Storage and Handling of LNG" and would be incompliance with National Electrical Code (NFPA 70) and applicable sections of the USCG's regulations for Waterfront Facilities Handling LNG (33 CFR 127 and Executive Order 10173). Specifically for the pipeline system, safety requirements are embodied in, but are not limited to, the DOT/PHMSA regulations in 49 CFR Part 192 and the LDNR Office of Conservation pipeline safety regulations found in Louisiana Administrative Code (LAC) 43:XIII.

Venture Global developed a Project-specific Plan and Procedures based, respectively, on FERC's Plan (FERC, 2013a) and Procedures (FERC, 2013b), which are available on the FERC website at http://www.ferc.gov/industries/gas/enviro/guidelines.asp. Implementation of the Project-specific Plan and Procedures during construction and post-construction monitoring would help ensure that ground disturbance and restoration activities are implemented in an environmentally appropriate manner. See appendix C for the Project-specific Plan and Procedures and Venture Global's proposed modifications to the FERC Plan and FERC Procedures.

During construction, some potential exists for spills of hazardous materials, such as hydraulic fluid and diesel fuel for equipment and vehicles. In addition, stormwater runoff from the construction workspace could carry unconfined debris and materials. To address these and related concerns for the LNG terminal site, Venture Global has developed and would adhere to a construction-specific Spill Prevention, Controls, and Countermeasures (SPCC) Plan and a SWPPP; likewise, the pipeline system has developed a comparable construction-specific SPCC Plan and SWPPP.

The LNG terminal and pipeline system would be required to implement all conditions in the Certificate or authorization issued by the Commission for the Project. Venture Global would implement the Project-specific Plan and Procedures developed to avoid or minimize environmental impacts during construction, which are discussed throughout this EIS.

2.5.1 LNG Terminal

Construction activities at the Project site would involve clearing and grading, placement of fill, installation of foundations for the planned Project facilities, other equipment settings, ancillary equipment, piping, and structures. Construction operating hours would be from 7:00 a.m. to 7:00 p.m., Monday through Saturday. Land-based and marine-side pile driving construction activity, is expected to also occur 6 days per week starting at 7:00 a.m., as well, but would end at 5:00 p.m. It is anticipated that the Project would require nighttime construction at the terminal site during the initial 6 to 12 months.

2.5.1.1 Site Preparation

The LNG terminal site would require significant area-wide improvements, including clearing, grubbing, grading, soil stabilization, and filling to increase ground elevation, some of which must be performed prior to foundation development and plant construction. Existing ground elevations at the LNG terminal site range from -2 and -4 feet (NAVD88) and would be leveled to an elevation of -2 feet (NAVD88) by grading and import of fill materials. It is anticipated that the existing soil at the LNG terminal site may require improvement and stabilization to provide a load-bearing surface during construction. Venture Global would employ commonly used stabilizers such as crushed stone, sand, portland cement, and/or hydrated lime while aggregate materials (e.g., gravel, oyster shell, and/or crushed stone) and geotextile layers would be used to level and finish temporary workspace and operational areas, as necessary. Initially, aggregate materials would be delivered to the LNG terminal site by truck to construct access roads and the crane pad for the barge mooring facility. Following installation of three temporary marine delivery facilities, aggregate materials would arrive by barge, bulk carrier, and truck.

Venture Global would install a floodwall around the portion of the LNG terminal site south of SH 23 to protect it from storm surge during construction and operations. At the outset of construction, Venture Global would install a temporary facility area interior to the floodwall at the LNG terminal site, which would include mobile offices, sanitary facilities, and a parking area. This would support preliminary construction activities, which include access road construction, preliminary site preparation, initial construction of the floodwall, a pile test program, and development of the three temporary marine transfer facilities. Once these temporary facilities are established, the overall workspace would be expanded to include additional laydown areas for construction.

2.5.1.2 Terminal Site

Following site grading, soil stabilization, and road installation, LNG tank foundation construction and floodwall installation would commence with the installation of piles. After the pile locations have been determined, precast or steel piles would be installed by vibratory or hammer methods; cast-in-place piles would be installed in pre-drilled holes. After the piles have been installed to design depths, caps would be constructed. Precast or steel piles would be delivered to the site by barge and/or truck. Concrete for cast-in-place concrete piles would be supplied by one or more on-site concrete batch plants.

The liquefaction trains would be connected with the gas gate station and LNG storage tanks by aboveground piping interconnects on steel-framed support racks. Pipe spool fabrication would be undertaken mainly off-site. Spools fabricated off-site would be delivered by truck and barge. Where possible, pipe racks would be modularized to minimize site work. Pipe sections would be painted, coated, and insulated, as necessary, after welds have been tested according to applicable codes.

Process modules such as pretreatment systems, liquefaction cold-boxes, and refrigerant compressors would be delivered by barge or truck. All equipment units necessary for the Project would be constructed at existing commercial facilities, while larger modular units would be barged to the LNG terminal MOF to be placed on their respective foundations.

Once foundations have been completed, work on the liquefaction blocks, piping interconnects, and associated utility systems can occur within the same general timeframe, but would be coordinated such that various inter-dependent systems (e.g., electrical and instrumentation) can be installed and tested according to an appropriately sequenced schedule. After the equipment and piping have been set in place, cable systems would be installed. Ultimately, road finish, final site grading, seeding, and cleanup would be completed. Temporary construction facilities would be disassembled and removed on a progressive basis when they are no longer needed. Pipe sections would be either hydrostatically or pneumatically tested, depending on the type and intended function of the pipe.

2.5.1.3 Marine Facilities

Venture Global does not anticipate that dredging would be required for installation of the three LNG loading docks or for LNG carriers to operate in the berthing area. Three LNG loading docks would be constructed in a collective berthing area and be supported by steel piles. The loading docks would be constructed of concrete decking with a hydraulic gangway, lighting, control buildings, and cathodic protection. The LNG liquid loading arms, which would be located on the concrete decks, would be fully balanced in the empty condition by a counterweight system and maneuvered by hydraulic cylinder drives.

The construction plan for the LNG loading docks and associated structures (cryogenic piping, utility lines, and piping/utility line trestle) to cross the federal levee and SH 23 would be developed in consultation with the USACE, DOT/PHMSA and DOTD.

2.5.1.4 Piping and Equipment Installation and Testing

All pipe would be fabricated according to American Society of Mechanical Engineers (ASME) standards by ASME section IX qualified welders. Once process equipment is set in place on the foundations, roughly aligned, and secured to the foundations, pipe installation would begin. Venture Global would coat all piping and equipment with a material that resists corrosion. When all process equipment is installed and electrical, mechanical, and other instrumentation work completed, the key pre-commissioning activities would commence.

After all pre-commissioning activities are complete, Venture Global would clean and hydrostatically or pneumatically test piping in compliance with the applicable codes that govern pipe design, and purge the piping. In general, Venture Global would pneumatically test cryogenic piping using dry air or nitrogen and hydrostatically test non-cryogenic piping using clean water. All testing would be performed in accordance with ASME B31.3.

2.5.2 Pipeline System

The applicant would construct the pipeline system and associated facilities as described in this section and in accordance with 49 CFR 192 and LDNR safety regulations (LAC 43:XIII). The pipelines and associated appurtenances would be coated below grade with fusion-bonded epoxy, field-applied sleeves, or an equivalent protective coating and painted above grade; in some areas, the pipeline may be coated with a layer of abrasive resistant coating over the fusion-bonded epoxy. Additional cathodic protection systems must be installed in accordance with applicable DOT and LDNR safety regulations. The pipeline sections in water-saturated or inundated areas would be coated with a 6-inch-thick layer of concrete over the fusion-bonded epoxy, providing negative buoyancy to counteract the tendency of the pipeline to float. Except for field-applied sleeves, all pipe coatings would be applied at commercial facilities prior to loading onto barges or trucks for delivery to the Project work areas. Venture Global would not conduct concrete coating in the field.

2.5.2.1 Surveying and Easement Acquisition

Prior to initiating construction-related activities, Venture Global would survey the route and secure right-of-way easements from the appropriate landowners. The limits of construction would be clearly marked in the field with various color-coded flagging to represent temporary easement, centerlines, workspaces, environmentally sensitive features, etc. Venture Global would notify landowners in advance of construction activities that could affect their property or business. All landowners have granted Venture Global permission to conduct environmental and engineering surveys.

2.5.2.2 General Construction Procedures

Venture Global would construct the SW lateral TGP during Phase I of the Project. Additionally, to minimize construction disturbance in the area between SW lateral TGP milepost (MP) 14.3 and MP 15.1, the corresponding collocated segment of SW lateral TETCO (MP 11.0 to MP 11.7), would be installed concurrently in Phase I. The remainder of SW lateral TETCO would be constructed in Phase II. SW lateral TETCO would be installed adjacent to SW lateral TGP with 50 feet of separation between the two pipelines. An 80-foot-wide permanent easement would be retained where the two pipelines are collocated.

Five installation methods would be used during construction of the two lateral pipelines: conventional lay, barge lay, push lay, horizontal directional drill (HDD) lay, and bore lay. In addition, Venture Global would construct a pipe bridge to cross the non-federal levee located north of Lake Hermitage Road.

2.5.2.3 Conventional Lay Construction

Pipeline construction using conventional techniques typically involves the following sequential activities: clearing; trenching; stringing, welding, and installation; backfilling and grade restoration; hydrostatic testing and tie-ins; and cleanup and restoration. Venture Global proposes to use conventional lay techniques in upland, non-saturated soil locations. The construction work area would be cleared to remove trees, rocks, brush, and roots, and then leveled to allow operation of construction equipment. Trenching involves excavating a pipeline ditch and would be accomplished with backhoes and/or similar excavation machinery. The trench would be excavated to a sufficient depth to allow a minimum of 3 feet of cover over the pipeline. The bottom width of the trench would be cut to accommodate the pipe to be installed. Stringing trucks would lay, or string, the individual pipe sections on temporary supports (skids) along the working side of the trench in preparation for subsequent welding, joint coating, lowering-in, backfilling, and associated inspection activities. After the pipe is lowered into the trench, the trench would be backfilled with previously excavated material. After the completion of backfilling all disturbed areas would be graded, erosion controls installed, and restoration completed.

2.5.2.4 Barge Lay Construction

The barge lay method would be required for pipeline sections located in deeper water or channels as it eliminates the need for land-based equipment and fill. In open waters, the pipeline would be installed using shallow-draft spud barges. The use of spud barges[2] in open waters would require the excavation of a flotation channel within a 300-foot-wide construction right-of-way. Using barges with anchor spuds eliminates the need for an anchor spread and anchor-handling boats, minimizing the area affected by construction operations.

The right-of-way centerline and boundaries would be staked with poles or floating buoys ahead of excavation. The pipeline trench would be excavated using a barge-mounted clam-bucket (or equal) dredge. Within the construction right-of-way, it is anticipated that the dredge barge would first excavate the flotation channel (where necessary) and then excavate the pipe trench along the bottom of the flotation channel. The dredge barge would cast the flotation channel and pipe trench spoil to either side of the right-of-way centerline, keeping the spoil below the water surface, where feasible, to minimize wave generated turbidity. The spoil would be placed parallel to the trench in 500 foot in length piles, with 50-foot-wide openings to allow the passage of local watercraft.

The pipeline would be fabricated aboard a string of shallow-draft spud barges, connected together in a line to form the lay barge. The pipe would first be offloaded from tugboat-towed supply barges and then each pipe joint would then be aligned end-to-end with the previous joint. The pipe joints would be assembled into one continuous pipeline by passing through multiple welding, inspection, repair, and coating stations. To ensure that the assembled pipe meets or exceeds the design strength requirements, the welds would be visually inspected and examined using radiography (X-ray), ultrasound, or other approved methods, in accordance with ASME standards. Once each weld has passed inspection and received its final coating, the pipe would be lowered off the back end of the lay barge into the pipe trench by lifting the anchor spuds of the lay barge and moving the lay barge forward the length of one pipe joint. The next pipe joint would be rolled into position for welding and the process would be repeated.

From MP 8.1 to 8.5 (SW lateral TGP) and MP 5.6 to 6.0 (SW lateral TETCO), which represents a relatively short crossing of marshland between two large bodies of open water (Upper Wilkinson Bay and Raquette Bay), Venture Global proposes to use the barge lay method. To minimize disturbance in this area of open water, Venture Global would stockpile the estimated 89,500 cubic yards of spoil generated by trench excavation on several barges within the southern

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[2] A **spud barge** is a form of **barge** that can be moored through the use of through-deck pilings, known as **spuds**. **Spuds** may be fabricated or made of commercially available pipe sections or logs.

body of open water (Upper Wilkinson Bay). Instead of side-casting on the construction right-of-way, Venture Global intends to load the material barges and temporarily moor the barges in the barge staging area. The barge staging area was selected as it is the closest location in which the open water was deep enough to accommodate the barges without requiring more excavation. Venture Global would utilize the barge staging area for 30 days during each phase of construction.

2.5.2.5 Push Lay

For the push method, a 130-foot-wide construction right-of-way with a 30-foot-wide trench width would be required. Push lay techniques are typically used in saturated areas where soil stability is efficient to support a trench and construction equipment. Trench spoil bank heights are anticipated to be relatively low because the excavated material lacks adequate unconfined compressive strength. To accommodate the trench spoil placement storage, the need for two spoil banks parallel to the push ditch is anticipated. A 50-foot-wide area would be required on both sides of the push ditch for spoil banks, equipment travel, and reasonable buffer gaps. Thus, the push construction technique would require a 130-foot-wide construction right-of-way due to the combination of the 30-foot-wide push ditch and the two 50-foot-wide areas for spoil banks, equipment travel, and reasonable buffer gaps between the edges of the right-of-way, spoil banks, and ditch.

Push sites in open-water areas would consist of several shallow-draft spud barges connected together to provide a working platform. At the push site, various pipeline operations would take place, including pipe make-up, welding, non-destructive testing, joint coating and coating repairs, and installation of floatation apparatus. Where there is standing water, only enough clearing and trenching would be done to accommodate installation of the pipe. Each excavator used would have a lateral reach sufficient to place spoil within the 130-foot-wide construction right-of-way. Pipe stringing and lowering in the push lay method would be similar to that described in the conventional lay method.

2.5.2.6 HDD Lay

The HDD method is a trenchless method for installing underground pipe and is used to avoid direct impacts on sensitive resources (e.g., waterbodies, wetlands) or infrastructure (e.g., major roads, railroads). This method entails drilling relatively deep beneath the surface features on a curved path. This method requires specialized equipment and personnel and has four general steps:

1. placement of guide wires over the anticipated path of the drill;
2. drilling a pilot hole on an arc-shaped path that typically extends between 30 and 50 feet beneath the waterbody or other sensitive feature;
3. enlarging the pilot hole with a series of reamers to accommodate the pipeline; and
4. pulling a pre-fabricated section of pipe through the hole.

The HDD method involves an entry and exit pad on each side of the crossing. The initial step of placing HDD guide wires over the path of the drill may require minor hand clearing. A pilot hole is drilled under the feature. The head of the pilot drill string contains a pivoting head that can be controlled by an operator as the drill progresses. Typically, the pilot hole would be directed downward at an angle until the proper depth is achieved, then turned and directed horizontally for the required distance, and finally angled upward back to the surface. Throughout the process of drilling and enlarging the hole, mud slurry, consisting of bentonite and water, would be pressurized and pumped through the drill stem to lubricate the drill bit, maintain the hole, and remove drill cuttings. Bentonite is the commercial name for a nontoxic mixture of naturally-occurring clays and rock particles. This slurry, referred to as drilling mud or drilling fluid, has the potential to be inadvertently released to the surface if fractures or fissures are encountered in the substrate during drilling.

The potential for an inadvertent release is generally greatest during drilling of the pilot hole when the pressurized drilling mud is seeking the path of least resistance and near the drill entry or exit pits where the drills are at their shallowest depths. The path of least resistance is typically back along the path of the drilled pilot hole. However, if the drill path becomes temporarily blocked or encounters areas such as large fractures or fissures that lead to the ground, then an inadvertent release could occur. Venture Global developed a site-specific HDD plan for each drill site and an HDD Contingency Plan to monitor for, contain, and clean up any inadvertent releases of drilling fluid during HDD operations. The HDD Contingency Plan is included in appendix D and would be utilized to:

- provide procedures that will minimize the potential for release of drilling mud into sensitive resource areas, such as wetlands and waterbodies, or onto adjacent upland surfaces;
- provide for timely detection of inadvertent returns;
- ensure the implementation of an organized, timely, and "minimum impact" response in the event an inadvertent return of drilling fluid occurs;
- ensure that all appropriate notifications are made in a timely manner;
- provide for an alternative plan in case of drill failure; and
- establish the criteria by which Venture Global will determine when a proposed HDD crossing is unsuccessful and must be abandoned.

Venture Global would install one 0.4-mile-long segment of pipe using the HDD method for each of the two pipelines. Both drill segments would be at the same route location, extending into the LNG terminal from just north of the pipe bridge crossing of the non-federal levee north of Lake Hermitage Road (MP 14.6 to MP 15.0 for the SW lateral TGP, and MP 11.2 to 11.6 for the SW lateral TETCO). Both HDDs would be undertaken during Phase I construction. Additional information on the related geotechnical investigations is presented in section 4.1.1.

2.5.2.7 Bore Lay

The bore method is a process that allows for trenchless installation by drilling a horizontal tunnel beneath a surface feature, such as road or utility, and installing a prefabricated segment of pipeline through the hole. Similar to the HDD method, throughout the boring process, a fluid mixture consisting of water and bentonite clay (a naturally occurring mineral) is pumped into the drill hole to lubricate the bit, transport cuttings to the surface, and maintain the integrity of the hole during installation of the prefabricated segment.

If a bore installation is successful, there is little to no impact on the surface feature being crossed. However, if a natural fracture or weak area in the ground is encountered during drilling, an inadvertent return of drilling fluid to the environment could occur. Venture Global's HDD Contingency Plan (appendix D) would also be applicable to bore construction methods and would outline the procedures that would be followed to minimize the potential for an inadvertent release of drilling mud and to undertake effective cleanup should a release occur.

2.5.2.8 Aboveground Facility Construction Procedures

Two meter stations are required for the pipeline system. Each meter station would be located in an open-water area; therefore, traditional site preparation, including clearing, grading, and compacting, would not occur. Construction would include the placement of a platform on installation piles. The meter stations would be constructed atop these platforms.

All components in high-pressure natural gas service would be pressure tested prior to arrival or on site, and all controls and safety equipment and systems, emergency shutdown, relief valves, and gas measurement and control equipment would be commissioned prior to being placed in service.

2.5.3 Access Roads

During construction, vehicular access to the LNG terminal site would be via existing local public roadways. Venture Global does not anticipate that such access would require any improvements to these roadways, with the exception of new auxiliary turn lanes along southbound SH 23, new site entrances/exits on SH 23, and signage and lighting as required by DOTD.

Venture Global would construct one permanent access road to the two MLVs just west of Lake Hermitage Road and one temporary access road to the pipe bridge area just east of Lake Hermitage Road. Both access roads would be used during construction, and the permanent access road would also be used during operation.

2.5.4 Pipe Storage and Contractor Yard

Venture Global is not planning to use pipe yards. Instead, Venture Global would receive pipe joints from the pipe-coating yard and place them directly onto rake haul barges, which would transport the pipe directly to the work site, or onto box-haul barges, which would transport the pipe to a designated barge dock in the Project area where they would be offloaded and then transported to the work site by truck. The LNG terminal site would not require any additional pipe storage yards beyond the site's own limits of construction.

2.5.5 Special Construction Procedures

2.5.5.1 Levee Crossing Construction Procedures

On the pipeline system, Venture Global plans to use a pipe bridge to cross the non-federal levee and adjacent canal south of the LNG terminal site. For the pipe bridge crossing, the construction process includes piling, pile cap installation, crane erection, setting vertical and horizontal bridge assemblies, and piping installation. Installation of the piles would be completed at the base of each bridge vertical assembly. Precast, steel, cast in-place, or concrete-driven piles would be installed by either a ground-supported rig, a marsh buggy-supported rig, or a barge-supported rig. The piles would be driven or constructed to meet the design capacity and would be tested to verify vertical and horizontal capacity of the piles in each group of piles. The concrete foundation would be poured as a pile cap around the top of the trimmed piles to create a fixed connection between the cap and the piles.

The bridge components would be trucked to the site in 20-foot to 130-foot-long preassembled section lengths. The bridge vertical components would be set on the pile caps and would support the horizontal components on top of the vertical components. All field connections are planned to be bolted connections to reduce the amount of field labor, amount of equipment that is required on site, and impact on the temporary workspace. The pipeline would be supported on the bridge by temporary rollers during installation. The final pipe supports would be installed as adjustable supports with clamping straps to allow axial thermal growth while resisting movement due to wind and seismic loading. The piping would be transitioned from the top of the bridge through piggable induction bends and connected to below-grade piping near the ends of the bridge work area.

2.5.5.2 Wetland and Waterbody Construction Procedures

Crossings of waterbodies and wetlands would be undertaken in accordance with the Project-specific Procedures. Because the Project involves use of the push method or barge lay method for installation of large-diameter pipelines, Venture Global proposes to use construction right-of-way widths greater than 75 feet, as described below.

In general, FERC requires wetland crossings to be accomplished using a maximum right-of-way width of 75 feet. Venture Global states in its application that this is not possible on this Project. The route for the SW laterals is located in a region where consolidated soils comprise less than 3 percent of the routes. Therefore, Venture Global's implementation of the push method is designed to minimize impacts on the vegetated wetland areas but does require workspaces greater than 75 feet wide.

Given the poor cohesion and expected high water content/saturation of the wetland soils along the route, Venture Global anticipates that the top-of-trench width would be a minimum of 30 feet and up to 50 feet to accommodate sloughing and resultant shallow side slopes. Further, because the material excavated from the trench would lack cohesion, the spoil banks are anticipated to be relatively low in height (approximately 3 feet) and wide (approximately 45 feet).

2.5.5.3 HDD Construction

The HDD method is a trenchless crossing method used to avoid direct impacts on sensitive resources (e.g., waterbodies, wetlands) or infrastructure (e.g., major roads, railroads) by conducting a deep bore beneath them. This method, described above in section 2.5.2.6, requires specialized equipment and personnel.

Venture Global would install one 0.4-mile-long segment of pipe using the HDD method for each of the two pipelines. Both drill segments would be at the same route location, extending into the LNG terminal from just north of the pipe bridge crossing of the non-federal levee north of Lake Hermitage Road (MP 14.6 to MP 15.0 for the SW lateral TGP, and MP 11.2 to 11.6 for the SW lateral TETCO). Both HDDs would be undertaken during Phase I construction. Additional information on waterbody crossings, including the use of the HDD method, is presented in section 4.3.2.2.

2.5.5.4 Proposed Modifications to the Federal Energy Regulatory Commission's Plan

Venture Global's Project-specific Plan includes proposed modifications to FERC's Plan (appendix C). FERC allows project sponsors to request modifications to its Plan. The FERC Plan directs applicants to specify in their application any individual measures that they consider unnecessary, technically infeasible, or unsuitable due to local conditions, and to describe the alternative measures they propose to use. They must also explain how their proposed alternative measures would achieve a comparable level of mitigation as the FERC measures.

The Project-specific Plan includes numerous minor wording changes to specify the Project sponsor and provide clarifications that do not require our specific approval. Those proposed modifications that are substantive and for which we have determined that Venture Global provided adequate justification are listed in appendix C, table 1. The table includes the original text from FERC's Plan, the modified text in the Project-specific Plan, and our determination regarding the proposed modification.

2.5.5.5 Proposed Modifications to the Federal Energy Regulatory Commission's Procedures

Venture Global's Project-specific Procedures regarding wetland and waterbody crossings include certain proposed modifications to FERC's Procedures (appendix C). Just as with our Plan, FERC's Procedures directs applicants to specify in their application any individual measures that they consider unnecessary, technically infeasible, or unsuitable due to local conditions, and to describe the alternative measures they propose to use. They must also explain how their proposed alternative measures would achieve a level of mitigation comparable to the FERC measures.

The Project-specific Procedures include numerous minor wording changes to specify the Project sponsor and provide clarifications that do not require our specific approval. Those proposed modifications that are substantive and for which we have determined Venture Global provided adequate justification are listed in appendix C, table 2. The table includes the original text from FERC's Procedures, the modified text in the Project-specific Procedures, and our determination regarding the proposed modification. One modification that was proposed by Venture Global regarding the time-of-year for crossing waterbodies is already allowed by the

FERC Procedures and is not included in the following table; however, this is discussed further in section 4.3.2.3.

2.6 OPERATION, MAINTENANCE, AND SAFETY PROCEDURES

All facilities would be operated and maintained in accordance with government safety standards and regulations that are intended to ensure adequate protection of the public and to prevent facility accidents and failures.

2.6.1 LNG Terminal

Operating procedures would be prepared for the Project after final design is completed. These procedures would address safe startup, shutdown, cool down, purging, etc., as well as routine operation and monitoring. Comprehensive training would be provided to ensure that all facility personnel are familiar with and adhere to properly documented and recognized safety procedures. The potential hazards of cryogenic LNG operation and proper equipment operation would be two areas of focus. Operators would meet the applicable training requirements of the USCG, DOTD, and other regulatory entities. Maintenance and safety procedures would be developed to cover the proper disposal for all hazardous fluids generated by LNG terminal operations. The procedures would include training of staff in the storage and handling of hazardous material. Additionally, the terminal SPCC Plan discusses spill response procedures, materials, and training; mitigation measures/response; and hazardous liquids quantities, storage, and disposal.

Maintenance of the LNG terminal and pipeline system must be conducted in accordance with the provisions of 49 CFR 193, subpart G, and would be in compliance with all applicable laws and regulations, and through procedures and programs developed by Venture Global. Full-time staff would conduct routine maintenance and minor repairs, whereas major overhauls and non-routine maintenance would be handled by specialty contractors. Both scheduled and unscheduled maintenance would be entered into a computerized maintenance management system and disseminated to the appropriate personnel for follow-up. All operators and maintenance personnel would be trained in the use of the computerized maintenance management system. Scheduled preventive and predictive routine maintenance would include equipment rotation and inspection of safety equipment, environmental equipment, and instrumentation. All maintenance activities would be implemented by trained maintenance technicians reporting to a Maintenance Supervisor.

Prior to operations, Venture Global would develop a complete solid and hazardous waste management plan that would describe procedures to ensure compliance with applicable state regulations and federal requirements per 40 CFR 260, Hazardous Waste Management. Solid waste typically generated during operations includes predominantly nonhazardous office waste and routine maintenance wastes such as paper, cardboard, scrap metal, wood, plastic, and small equipment parts. Examples of hazardous waste materials typically generated during operations include used oils, transmission and hydraulic fluids, antifreeze, absorbents, amines, greases, paints, and cleaning agents.

Under Venture Global's solid and hazardous waste management plan, recyclable materials would be separated and recycled. Non-recyclable wastes would be stored in covered trash bins according to state and local requirements. Hazardous wastes would be stored in labeled 55-gallon drums or other containers appropriate for the particular waste, equipped with secondary containment if required. Hazardous and non-hazardous waste must be transported in accordance with applicable DOT regulations for recycling, treatment, or disposal and in compliance with federal, state, and local regulations.

2.6.2 Pipeline System

Operation activities for the pipelines would be limited to right-of-way maintenance and pipeline inspection and repair, as needed. Company personnel would perform periodic aerial and ground inspections for exposed pipe, unauthorized encroachment on the right-of-way, activities in the vicinity of the right-of-way, and other conditions that could present a safety hazard or require preventative maintenance or repairs. The pipeline cathodic protection system would also be monitored and inspected periodically to ensure proper and adequate corrosion protection. Appropriate corrective actions for conditions observed during inspection would be taken as necessary.

The pipeline facilities would be clearly marked at line-of-sight intervals and at crossings of foreign pipelines, marine channels, roads, and other key points. The markers would indicate the presence of the pipelines and provide a telephone number and address where a company representative can be reached in the event of an emergency or prior to any excavation in the pipeline vicinity by a third party.

3.0 ALTERNATIVES

To adhere to CEQ regulations for complying with NEPA (40 CFR 1502.14), an EIS must evaluate reasonable alternatives. This EIS does so by comparing the environmental impacts of the proposed action against a range of alternatives. Each of the cooperating agencies with obligations under NEPA can use this alternatives analysis as part of their decision-making process. Individual agencies would ensure consistency with their own administrative procedures prior to accepting the recommendations in this EIS.

In accordance with NEPA and Commission policy, we evaluated alternatives to the Project to determine whether any would be reasonable and have significant environmental advantages compared to the proposed action. The alternatives analyzed consisted of the No Action Alternative, system alternatives for the LNG terminal and the pipeline system, alternative LNG terminal site locations, alternative LNG terminal configurations, an alternative pipeline route, and alternative locations for aboveground facilities. In some cases, the analysis concluded that consideration of alternatives was not feasible or required, and this is indicated, where applicable.

As part of the No Action Alternative, this EIS considers the effects and actions that could conceivably result if the proposed Venture Global Project were not constructed. The analysis of system alternatives evaluates the ability of other existing, planned, or proposed (new or expanded) LNG export terminals and pipeline systems to meet the Venture Global Project's purpose and objectives. The evaluation of alternative sites for the LNG terminal focuses on several locations. The primary consideration of pipeline route alternatives is related to the proposed SE and SW laterals.

We applied the following evaluation criteria when considering and weighing potentially reasonable and environmentally preferred alternatives to the Venture Global Project:

- The alternative must be technically and economically feasible and practical.
- The alternative must offer significant environmental advantages over the proposed Project or segment of the Project.
- The alternative must meet Venture Global's stated purpose of its proposed Project, specifically:
    - to provide a cost-effective outlet for domestic natural gas to the global market by constructing liquefaction blocks and a new pipeline to transport LNG to global markets; and
    - provide a peak liquefaction capability of 24.0 MTPA for export, consistent with Venture Global's DOE/FE authorization.

Venture Global participated in our pre-filing process during the preliminary design stage of the Project (see section 1.3). This process emphasized identification of stakeholder issues as well as identification and evaluation of alternatives that could reduce environmental impacts. We analyzed each alternative based on public comments and guidance received from federal, state, and local regulatory agencies. Additional sources of information included Venture Global's field surveys, aerial photography, USGS topographic maps, the FWS's National Wetland Inventory (NWI) maps, pipeline system maps, agency consultations, and publicly accessible databases. To ensure equitable results, consistent data sources were used when comparing a feature across alternatives (e.g., NWI data were used for wetlands comparisons, rather than a combination of NWI and field survey data). The following sections include a discussion of the scope, methodology, and results of our alternatives analysis.

The USACE assisted us in preparing this draft EIS and may use the document in its permit decision-making process. When making a decision on whether to issue its permit, the USACE must consider whether a proposed project represents the least environmentally damaging, practicable alternative pursuant to CWA section 404(b)(1) guidelines. The term "practicable" means that the alternative is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall purpose of the project. The USACE may not permit the discharge of dredged or fill materials into waters of the U.S. if there is a practicable alternative to the discharge that would result in less adverse impact on the aquatic ecosystem, unless the alternative would result in other significant adverse environmental consequences.

It is important to note that not all alternatives warrant the same degree of evaluation. Through environmental comparison and exercise of our professional judgement, each alternative was evaluated until it became clear that the alternative would: (1) be unable to meet the stated purpose of the proposed Project; (2) be technically and/or economically infeasible or impracticable; or (3) not offer a significant environmental advantage. The alternatives that appeared to be reasonable with the potential for significantly less environmental impact are reviewed in greater detail below. A detailed discussion of the environmental consequences of the Project (both adverse and beneficial) is included in section 4.0.

3.1 NO ACTION ALTERNATIVE

If FERC denies the Venture Global application (the No Action Alternative), the resource impacts (including short- and long-term and permanent impacts) identified in this EIS would not occur. However, the No Action Alternative would prevent Venture Global from achieving its stated purpose of transporting LNG to global markets. The No Action Alternative would also preclude the economic benefits of employment and tax revenues, as discussed in sections 4.9.1 and 4.9.2. Selecting the No Action Alternative could require potential end users to make different arrangements to obtain LNG from other sources. This could result in the use or expansion of other existing or proposed LNG facilities and associated interstate natural gas pipeline systems, or in the construction of new infrastructure in the Project area or elsewhere in the United States, resulting in both adverse and beneficial environmental impacts. LNG terminal developments and pipeline system expansions of similar scope and magnitude to the proposed Project would likely result in environmental impacts of comparable significance, especially those projects in a similar regional setting. In section 3.2, we examine reasonable LNG system alternatives.

Commenters have suggested that LNG export projects could be replaced by renewable energy resources alternatives such as wind power, solar power, tidal power, and hydropower. All of these alternatives represent alternative means of producing electrical power. Because the

Project's primary purpose is to prepare natural gas for export to foreign markets, development or use of renewable energy technology would not be a reasonable alternative to the proposed action.

3.2 SYSTEM ALTERNATIVES

System alternatives would make use of other existing, modified, or proposed LNG facilities and/or pipeline systems to meet the stated objectives of the Project. A system alternative would make it unnecessary to construct all or part of the Project; however, some modifications or additions to another existing system may be necessary. Such modifications or additions would result in environmental impacts that could be less than, similar to, or greater than those associated with construction of the Project. The purpose of identifying and evaluating system alternatives is to determine whether potential environmental impacts associated with construction and operation of proposed facilities could be avoided or reduced while still meeting the purpose and basic objectives of the Project. The analysis of the system alternatives for the LNG terminal is presented in section 3.2.1, and the pipeline system alternatives are evaluated in section 3.2.2.

3.2.1 LNG Project System Alternatives

For a system alternative to be viable and recommended, it must meet the purpose and need of the project, be technically and economically feasible, and offer a significant environmental advantage over the project as proposed. In the case of this Project, it must also be compatible with Venture Global's proposed export capacity, consistent with authorizations from the DOE/FE. Venture Global is proposing to export LNG to FTA and non-FTA countries. The volume of gas (commodity) for FTA countries has already been approved by the DOE and, therefore, is determined to be in the public interest by the DOE. The DOE determination for non-FTA countries is pending. There are other approved, proposed, or planned LNG export facilities along the Gulf Coast that have also either obtained or applied for DOE approval for the export of LNG associated with the production capacity in the respective project plans/proposals. Each of the approved, proposed, or planned projects considered as a potential system alternative (either to expand an existing facility or new construction at a proposed terminal site to accommodate the Venture Global's Project objective) is listed in table 3.2-1. In order for Venture Global's customers to obtain LNG from any of these other facilities, these facilities would need to construct additional liquefaction facilities to meet the export capacity proposed by Venture Global and as approved by the DOE authorizations. We recognize that liquefaction capacity may not be fully subscribed at all of these other facilities based on contracts executed as of the writing of this draft EIS. However, because the DOE's export approval is a determination that the export is in the public interest, we will not speculate that any portion of other LNG terminals' liquefaction capacity is in "excess" or available as an alternative for use by Venture Global to meet its Project objectives.

Table 3.2-1 Approved, Proposed, or Planned Liquefaction Projects Along the Gulf Coast – Summary Profile as System Alternatives						
Project/FERC Docket No./Location	**Facility Status**	**Existing or Proposed MTPA**	**FERC Status**	**In-Service Target Date**	**Could Expansion be Permitted/ Completed to Meet Project Schedule (In-service 2024)?**	**Adequate Space for Expansion?**
Sabine Pass LNG CP11-72-000 and CP14-12-000 *Sabine, LA*	Existing; Import/ Export	20.0	Authorized April 16, 2012, and February 20, 2014. Trains 1-4 substantially complete; Trains 5 and 6 under construction.	2016–2019	No	Possibly south of site or north of Highway 82, which forms northern border of site.
Sabine Pass LNG Expansion (Trains 5 and 6) CP13-552-000 and CP13-553-000 *Sabine, LA*	Existing; Export	9.0	Authorized April 6, 2015. Under construction.	2019	No	See above.
Cameron LNG CP13-25-000, CP13-27-000, and CP13-516-000 *Hackberry, LA*	Existing; Import/ Export	14.95	Authorized June 19, 2014. Under construction.	2018-2019	No	Possibly west and south of site. However, per final EIS, higher quality wetlands, existing oil and gas production activities, and greater open water areas in these areas represent disadvantages.
Cameron LNG Expansion (Trains 4 and 5) CP15-560-000 *Hackberry, LA*	Existing; Export	9.97	Authorized May 5, 2016. Construction has not yet begun.	2019	No	No. See above.
Freeport LNG CP12-509-000, CP12-29-000, and CP15-518-000 *Freeport, TX*	Existing; Import/ Export	13.2	Authorized July 30, 2014, and July 7, 2016. Under construction.	2018–2019	No	Possibly south of site and Highway 723. However, the area is occupied by residences.

Table 3.2-1
Approved, Proposed, or Planned Liquefaction Projects Along the Gulf Coast – Summary Profile as System Alternatives

Project/FERC Docket No./Location	Facility Status	Existing or Proposed MTPA	FERC Status	In-Service Target Date	Could Expansion be Permitted/ Completed to Meet Project Schedule (In-service 2024)?	Adequate Space for Expansion?
Corpus Christi LNG CP12-507-000 and CP12-508-000 *Corpus Christi, TX*	New; Import/ Export	15.0	Authorized December 30, 2014. Under construction.	2017–2020	No	Possibly west of site. East side of site is bound by existing industrial development.
Lake Charles LNG CP14-119-000, CP14-120-000, and CP14-122-000 *Lake Charles, LA*	Existing; Export	16.45	Authorized December 17, 2015. As of January 2017, construction had ceased.	2019-2020	No	Possibly west of site. However, per final EIS, physical and safety restrictions due to presence of existing plant infrastructure, the lack of direct road access, and LNG pipeline routing constraints in these areas represent significant disadvantages.
Magnolia LNG CP14-347-000 *Lake Charles, LA*	New; Export	8.0	Authorized April 15, 2016. Construction has not yet begun.	2018–2019	No	No. Limited uplands and the site is surrounded by Industrial Canal to north, existing industrial development to east and north, and saturated wetlands to south that would require fill.
Golden Pass LNG CP14-517-000 *Sabine Pass, TX*	Existing; Export	15.6	Authorized December 21, 2016. As of August 2018, construction has not yet begun.	2019–2020	No	Yes, south and southeast of site.
Gulf Energy LNG CP15-521-000 *Pascagoula, MS*	Existing; Export	10.0	Application filed June 19, 2015. Notice of Schedule issued August 2018.	2020	No	No. Site is surrounded by existing industrial development.
Calcasieu Pass Project CP15-550-000 *Cameron Parish, LA*	New; Export	10.0	Application filed September 4, 2015. Final EIS issued in October 2018.	2019	No	Yes, east of facility.

Table 3.2-1 Approved, Proposed, or Planned Liquefaction Projects Along the Gulf Coast – Summary Profile as System Alternatives						
Project/FERC Docket No./Location	**Facility Status**	**Existing or Proposed MTPA**	**FERC Status**	**In-Service Target Date**	**Could Expansion be Permitted/ Completed to Meet Project Schedule (In-service 2024)?**	**Adequate Space for Expansion?**
Texas LNG Brownsville CP16-116-000 *Brownsville, TX*	New; Export	4.0	Application filed March 31, 2016. Draft EIS issued October 2018.	2020	No	No. Site is surrounded by waterbodies and saturated wetlands that would require fill, and Laguna Atacosa National Wildlife Refuge.
Rio Grande LNG CP16-454-000 *Brownsville, TX*	New; Export	27.0	Application filed May 5, 2016. Draft EIS issued in October 2018.	2020	No	No. Limited upland area northeast of site, otherwise surrounded by waterbodies and saturated wetlands that would require fill.
Annova LNG Brownsville CP16-480-000 *Brownsville, TX*	New; Export	7.0	Application filed July 13, 2016. Notice of Schedule issued August 2018.	2021	No	Possibly east and west of site where existing dredge disposal areas exist.
Freeport LNG Expansion (Train 4) CP17-470-000 *Freeport, TX*	Existing; Export	5.1	Application filed June 29, 2017. Notice of Schedule issued August 2018.	2020	No	No. Site is surrounded by existing industrial development.
Driftwood LNG CP17-117-000 and CP17-118-000 *Calcasieu Parish, LA*	New; Export	26.0	Application filed April 11, 2017. Draft EIS issued in September 2018.	2025	Possible	No. Limited upland area north and south of site, otherwise surrounded by waterbodies and saturated wetlands that would require fill.
Corpus Christi LNG (Stage 3) CP18-512-000 and CP18-513-000 *Corpus Christi, TX*	Existing; Export	10.0	Application filed June 28, 2018. Notice of Schedule issued August 2018.	2021	No	No. Site is surrounded by existing industrial development.
Commonwealth LNG PF17-8-000 *Cameron Parish, LA*	New; Export	9.0	Pre-filing initiated August 15, 2017. Notice of Intent issued February 2018.	2022	Possible; however, project is +1 year behind Plaquemines LNG in the FERC process	Possibly west of site. Existing development and highways immediately north of site.

Table 3.2-1
Approved, Proposed, or Planned Liquefaction Projects Along the Gulf Coast – Summary Profile as System Alternatives

Project/FERC Docket No./Location	Facility Status	Existing or Proposed MTPA	FERC Status	In-Service Target Date	Could Expansion be Permitted/ Completed to Meet Project Schedule (In-service 2024)?	Adequate Space for Expansion?
Port Fourchon LNG PF17-9-000 *LaFourche Parish, LA*	New; Export	5.0	Pre-filing initiated August 21, 2017. Notice of Intent issued October 2017.	2021-2023	Possible; however, project is +1 year behind Plaquemines LNG in the FERC process	Yes, east and west of site.
Pointe LNG PF18-8-000 *Plaquemines Parish, LA*	New, Export	6.0	Pre-filing initiated September 14, 2018. This is the former Louisiana LNG site (PF14-17-000).	2025	No	Yes, northwest and southeast of site. Mississippi River to the southwest. Highway 39 and extensive marsh to the northeast.
Galveston Bay LNG PF18-7-000 *Galveston County, TX*	New, Export	16.5	Pre-filing initiated October 2018.	2025	No	Yes

An expansion of existing facilities to meet the export capacity proposed by Venture Global would need to be of a similar scope of pre-treatment and liquefaction facilities and possibly additional storage and marine transfer facilities, while any new facility would need a similar scope of pre-treatment, liquefaction, storage, and marine transfer facilities to accommodate the objectives of the proposed Project. Any expansion of an existing facility would result in environmental impacts that would likely be equal to or greater than the environmental impacts of the proposed action (depending on the environmental resource affected) and may not provide a significant environmental advantage over the proposed Project. Our analysis of system alternatives listed in table 3.2-1 assumes and/or considers whether the Project has an equal chance of being constructed, has the onsite space required for an expansion to accommodate facilities similar to those proposed for the Project, could be served by a pipeline system(s) for the export of 24.0 MTPA of LNG, and has a compatible in-service timeframe to meet the Project's objective. Meeting these criteria would qualify the system as a potential alternative. However, future Commission review and market forces will ultimately decide which and how many of these facilities are built.

As identified in table 3.2-1, we reviewed the liquefaction terminals that have been authorized, proposed, or planned as an alternative to the Project. Our review of Venture Global's proposed LNG terminal site in section 4.0 did not identify potential significant[1] environmental impacts, when mitigation is included, during the construction and operation of the LNG terminal or pipeline system. Additionally, we did not receive any specific comments relating to the use of a specific liquefaction terminal as a system alternative to the proposed LNG terminal. We note again that the Commission does not design projects. If the Commission ultimately determines that another project would be more appropriate, it could deny a proposal, but it could not force another entity to build a project that it has not proposed. Also, if the market support is not demonstrated for a project, and export volumes proposed by one liquefaction terminal are met by another liquefaction terminal, a project may not get built. However, we cannot speculate as to the future state of export markets or any project that may ultimately meet the same market demands as Venture Global.

As mentioned, Venture Global's export of LNG to FTA countries has already been found in the public interest by the DOE. For our analysis, we are assuming that all projects have contracted volumes and, as a result, these are not available as a direct "replacement" for the export volumes proposed by Venture Global. Any of the potential system alternative terminals would require additional volumes above and beyond what they have proposed or have been authorized in order to replace the liquefaction facilities of Venture Global.

If another entity proposes replacement facilities for Venture Global's facilities, they would need to submit an application identifying exactly what the replacement facilities would entail, including their environmental impact, and conduct the corresponding safety and engineering analysis. While this information is not available to Venture Global, it is likely that similar facilities at other locations would have very similar impacts to Venture Global's proposal, as they are also in coastal areas. Each of these sites would include the permanent fill of wetlands and involve

[1] Potential significant impacts that are discussed in section 4.0 are those where no proposed mitigation has been presented by Venture Global to reduce the potential impact. In section 4.0 we have recommended Venture Global provide mitigation plans to reduce these potential significant impacts.

impacts on waterways and fisheries. But, a simple one-to-one "placement" of the Venture Global facilities at another location may not be an accurate representation of what would be required, especially if the additional LNG vessel traffic would require additional berths. Such an analysis would be based on speculation and hypotheticals and would not provide the information necessary to inform the decision makers of the associated environmental impact.

It should also be noted that unlike a pipeline under section 7 of the NGA, an authorization granted under section 3 of the NGA does not grant the applicant eminent domain. As a result, we cannot ensure that a recommended alternative site would be available unless the landowner would make it available for purchase or lease.

Because none of the potential system alternatives would be able to design, engineer, permit, and construct a project within the timeframe proposed by Venture Global, and similar facilities at other coastal locations would have very similar impacts to Venture Global's proposal, we find that none of the system alternatives are a viable replacement that meets Venture Global's objectives. In conclusion, no system alternative meets the criteria of being technically and economically feasible, provides a significant environmental advantage, and meets the timeframes proposed by Venture Global to permit and construct a project; therefore, we do not recommend any system alternative to replace the proposed LNG terminal.

3.2.2 Pipeline System Alternatives

To serve as a viable pipeline system alternative to the proposed Venture Global pipeline system, the system would need to: (1) transport all or a part of the volume of natural gas required for liquefaction at the LNG terminal; and (2) cause significantly less impact on the environment than the proposed Venture Global pipeline system. Gas provided by a system alternative must connect to the Venture Global pipeline or directly to the LNG terminal.

We conducted a review of existing natural gas pipeline systems in the Project area. Following identification and evaluation of geographically proximate natural gas pipeline systems, the delivery capacity of each system was considered. The proposed pipeline is designed to connect the LNG terminal to TGP and TETCO, the two existing natural gas pipeline systems nearest to the terminal site. Because there is no existing or proposed pipeline that connects these systems to the LNG terminal, there is no reasonable system alternative to the Venture Global pipeline. Route alternatives for the Venture Global pipeline are discussed in section 3.5.

3.3 ALTERNATIVE TERMINAL FACILITY SITES

3.3.1 LNG Terminal Site Alternatives

Based in part on the information provided by Venture Global, we evaluated site alternatives identified by Venture Global in the general area of the proposed LNG terminal site.

Venture Global chose Louisiana as their preferred location based on the following three attributes:

- ready access to the Gulf of Mexico and maritime transportation routes to both the eastern and westerner hemispheres;

- availability of potential sites on major navigable waterways (Calcasieu River and Mississippi River) that can accommodate LNG carriers and have a history of industrial and commercial use; and

- state and local government support for industrial commerce and development.

Venture Global defined selection criteria to analyze site alternatives in southeast and southwest Louisiana. Venture Global identified sites based on whether they:

- provide direct access to a deep-draft shipping channel (40 feet or more below sea level) with sufficient water frontage for multiple LNG carriers;

- have compatible surrounding land use and are of sufficient size to construct and operate the proposed LNG facility;

- are available for purchase or long-term lease arrangements;

- have a sufficient buffer between the site and residential neighborhoods;

- have suitable road access and proximity to one or more highways;

- are proximate to natural gas pipeline infrastructure;

- are proximate to utilities (water and electrical); and

- avoid/minimize wetland/waterbody impacts and have viable mitigation options.

Using the eight selection criteria described above, the six potential sites were evaluated by Venture Global to determine the preferred location for the proposed LNG terminal. The general locations of the six site alternatives are shown on figure B-2 in appendix B. A comparison of each alternative site is presented in table 3.3-1 and discussed below.

3.3.1.1 Mississippi River Mile 55–West Bank (Proposed Site)

This parcel was the only site that meets all of the screening criteria established by Venture Global; therefore, Venture Global selected this site as the proposed LNG terminal site. The parcel has sufficient shoreline frontage (approximately 7,000 feet) on the Mississippi River to accommodate three LNG loading docks in a location that would allow safe and efficient navigation for both LNG carriers and existing marine traffic. The parcel is also of a suitable size, geometric shape, and topographic profile to optimize the layout design for plant infrastructure and buffer zones with respect to engineering feasibility, constructability, and safety. This site is available for lease and is located near existing utilities that would be required for operation. Louisiana Highway 23 bisects the proposed site, providing easy access.

Table 3.3-1 Alternative Sites Selection Criteria Summary						
Selection Criteria	**Mississippi River Mile 55 West Bank (proposed)**	**Mississippi River Mile 56**	**Mississippi River Mile 55 East Bank**	**Cutrone Property**	**South Carlyss Site I**	**South Carlyss Site II**
Deepwater access/waterfront footage	Yes	No	No	No	No	No
Sufficient land area and compatibility with surrounding land use	Yes	No	No	Yes	No	No
Land available for lease or purchase	Yes	No	No	No	Yes	Yes
Sufficiency of buffer[a]	Yes	No	No	Yes	No	No
Road and highway access	Yes	Yes	Yes	Yes	Yes	Yes
Proximity to natural gas pipelines	Yes	Yes	Yes	Yes	Yes	Yes
Proximity to utilities	Yes	Yes	Yes	Yes	Yes	Yes
Wetland/waterbody avoidance/minimization and viable mitigation alternatives	Yes	Yes	Yes	Yes	No	No

Notes:
[a] The distance necessary in order to not create an LNG thermal dispersion hazard to surrounding residential areas, businesses or public areas.

Natural gas pipelines to supply feed gas are in proximity to this site. In addition to meeting the Venture Global selection criteria, the site is located within fastlands, so it is protected by levees and pump systems to minimize flood risks. NWI wetland data indicated that riparian wetlands are located in the batture area within the Mississippi River levee, only small pockets of wetlands exist within the site landward of the Mississippi River levee, and there is appropriate mitigation available in the form of mitigation bank credits and potential restoration parcels in the vicinity of the site. For these reasons, Venture Global selected the Mississippi River Mile 55–West Bank as its preferred site and proposed LNG terminal location.

3.3.1.2 Mississippi River Mile 56

The Mississippi River Mile 56 site is an approximately 297-acre land parcel on the east bank of the Mississippi River at river mile 56. Currently, the property is used for agriculture. A coal-handling facility (United Bulk Terminal) is located directly to the east, and a barge terminal (Associated Terminal) lies to the west. Louisiana State Highway 39 fringes the parcel's northern boundary, and the Mississippi River marks the southern boundary. A small residential community is located adjacent and directly to the north. A highway, natural gas pipelines, and utilities are located in proximity to the site. NWI wetland data indicated that riparian wetlands are located in the batture area within the Mississippi River levee and only small pockets of wetlands exist within the site landward of the Mississippi River levee. Appropriate mitigation is available in the form of mitigation bank credits and potential restoration parcels in the vicinity of the site.

The approximately 5,100 feet of water frontage along the Mississippi River Mile 56 site is insufficient to support the three LNG loading docks for the proposed facility. Land use in the vicinity of the site, including the industrial facilities and residential community, is not compatible with an LNG terminal. The parcel is corporately owned, which could lead to lengthy and uncertain property negotiations; therefore, the availability of the property is uncertain. Sufficient buffers from incompatible land uses would not be available due to the residential community. For these reasons, the Mississippi River Mile 56 site was not considered preferable to the proposed site.

3.3.1.3 Mississippi River Mile 55–East Bank

The Mississippi River Mile 55–East Bank site is an approximately 475-acre parcel on the east bank of the Mississippi River at river mile 55. A coal-handling facility (United Bulk Terminal) is located directly to the west. A highway, natural gas pipelines, and utilities are located near the site. NWI wetland data indicated that riparian wetlands are in the batture area within the Mississippi River levee and only small pockets of wetlands exist within the site landward of the Mississippi River levee. Appropriate mitigation is available in the form of mitigation bank credits and potential restoration parcels in the vicinity of the site.

Like the Mississippi River Mile 56 site, the Mississippi River Mile 55–East Bank site water frontage of approximately 5,600 feet is insufficient for the three LNG loading docks planned for the LNG terminal, and its corporate ownership presents difficulties in securing the property. There is also one residence located on the parcel and several residences adjacent to the parcel to the east. Therefore, the land use in the vicinity of the site, including the industrial facility and the residences, is not compatible with an LNG terminal and the buffer is insufficient. For these reasons, the Mississippi River Mile 55–East Bank site is not considered preferable to the proposed site.

3.3.1.4 Cutrone Property

The Cutrone Property site is located on the east bank of the Mississippi River at river mile 46. The parcel covers approximately 160 acres of agricultural land and has been cleared of trees. A highway, natural gas pipelines, and utilities are located in proximity to the site. NWI wetland data indicated that riparian wetlands are in the batture area within the Mississippi River levee and only small pockets of wetlands exist within the site landward of the Mississippi River levee. Appropriate mitigation is available in the form of mitigation bank credits and potential restoration parcels in the vicinity of the site.

The Cutrone Property site has approximately 3,300 feet of water frontage on a straight stretch of the Mississippi River, where deep water and sufficient natural scour would preclude the need for dredging. However, this 3,300 feet is insufficient for the marine terminal's requirements. Additionally, Venture Global was unable to secure a long-term lease for the site. For these reasons, the Cutrone Property site is not considered preferable to the proposed site.

3.3.1.5 South Carlyss Site I

South Carlyss Site I is an approximately 174-acre parcel of privately owned land bordered to the south and west by Global Drive in Calcasieu Parish. Since the property is privately owned, the property may be available for purchase or long-term lease. The area is zoned for heavy industrial use. An access road and utilities are located near the site. There are natural gas pipelines in the region; however, the length of a pipeline necessary to provide feed gas would be much longer than what is required at the proposed site.

South Carlyss Site I has approximately 2,900 feet of water frontage access on the east side of the site, which is insufficient for three LNG loading docks. There is approximately 1,900 feet of water frontage on the west side of the site along the Intracoastal Waterway, which is also insufficient for three LNG loading docks. Additionally, the Intracoastal Waterway is relatively narrow and is an area of high ship traffic, which would present safety concerns for LNG ship maneuverability. While the land is zoned for heavy industrial use, the size of the site is insufficient and the configuration of the property is impractical for constructing an LNG terminal. Residential areas located approximately 0.5 mile to the southwest of the site could present buffer issues. NWI wetland data indicate that the western portion of the site is wetland and could be offset by wetland banking credits. As the size of the property is insufficient the South Carlyss Site I is not considered preferable to the proposed site.

3.3.1.6 South Carlyss Site II

South Carlyss Site II is an approximately 550-acre parcel of privately owned land bordered to the north by Burton Shipyard Road in Calcasieu Parish. The area is zoned for heavy industrial use and has an accessible waterfront. An access road and utilities are located in proximity to the site. There are natural gas pipelines in the region; however, the length of a pipeline necessary to provide feed gas would be much longer than what is required at the proposed site. The site is available for purchase or long-term lease.

The site has approximately 3,300 feet of water frontage, which is insufficient for three LNG loading docks. Residences are located 0.2 mile to the southwest, 0.5 mile to the west, and immediately adjacent to the north of the site; therefore, the buffer is insufficient. NWI wetland data indicate that a majority of the site is wetland and avoidance and minimization of wetland impacts would not be feasible but could be offset by wetland banking credits. As the proximity to residences and the required length of feed gas pipeline are limiting factors, we do not consider South Carlyss Site II site preferable to the proposed site.

Conclusion

Of the alternative terminal locations, we conclude that the proposed site (Mississippi River Mile 55-West Bank) represents an acceptable site for the LNG terminal. The proposed site is currently identified as port complex and industrial in the parish's master plan and is sufficiently sized to allow optimal facility layout design, and has the necessary water frontage available. The proposed site is also well separated from area residences and population centers. The proposed site is the only alternative that satisfies all of the tier two selection criteria. From a visual impact perspective, the LNG terminal would be consistent with existing industrial development along this portion of the Mississippi River.

3.4 ALTERNATIVE TERMINAL CONFIGURATIONS

In considering the arrangement of plant infrastructure, Venture Global determined that a critical element involves placing the liquefaction facilities and LNG storage tanks at the proposed locations within the LNG terminal site to ensure compliance with federal siting and safety requirements. Aligning the major infrastructure components in sequence according to process flow (pretreatment, liquefaction, storage, and export) minimizes the amount of cryogenic piping required and optimizes the site layout for process efficiency. With these considerations in mind, layout arrangements need to allow simultaneous operations involving the construction of Phase II infrastructure contemporaneously with the operation of Phase I infrastructure.

The proposed site layout provides the adequate minimum practical distance between the LNG loading docks and the LNG storage tanks; the administrative offices, maintenance facilities, and the central control room are well separated from the main plant. The proposed location of each of the components of the Terminal is in accordance with the applicable federal safety requirements. We did not identify any alternative configurations that would meet the regulations, codes, and guidelines while avoiding or reducing impacts when compared to those of the proposed terminal configuration. Therefore, we conclude that the proposed general configuration of the Terminal site is the preferred alternative.

3.5 ALTERNATIVE PIPELINE ROUTES

The proposed action for the Venture Global pipeline includes two parallel 42-inch-diameter natural gas pipelines sharing one right-of-way corridor for the majority of their routes. We evaluated pipeline route alternatives that could minimize or avoid impacts on environmentally sensitive resources (e.g., population centers, special use areas, waterbodies, wetlands, existing or planned residences, specific landowner concerns).

Typically, pipeline route alternatives are one of three types: major, minor, or variation. Major route alternatives include those that deviate from the proposed route for a significant distance and that provide a substantially different pathway from the source area to the delivery area. Minor route alternatives are typically shorter in length than major route alternatives and are often identified to avoid large environmental resources, engineering constraints, and/or developed areas. Minor route alternatives typically remain within the same general area as the proposed route. Route deviations are typically site-specific and may allow for avoidance of certain localized features such as a residence, wetland, or cultural resource site.

For the purposes of this Project, we reviewed only the proposed route and two major route alternatives. Due to the majority of the pipeline system being located in open water/wetlands (relatively homogenous environments), minor route alternatives and variations that generally are utilized to avoid sensitive resources or address constructability issues were not evaluated. The major route alternatives were sited in open water, where feasible, to avoid wetland impacts and only cross wetlands when necessary. The proposed route and the minor route alternatives are shown in figure B-3 in appendix B.

3.5.1 Background

Initially, at the start of the pre-filing process, the planned Venture Global pipeline system consisted of three pipelines on three routes that would supply feed gas to the Venture Global terminal facility: the 21.2-mile-long NW lateral, 12.1-mile-long SE lateral, and 11.1-mile-long SW lateral pipelines. During the pre-filing process, Venture Global continued to evaluate and develop its Project design. When Venture Global filed with FERC its application for the proposed pipeline system, it had removed the NW lateral and SE lateral from the Project. It also modified and renamed the SW lateral pipeline route so that it now includes two collocated pipelines identified as SW lateral TETCO and SW lateral TGP. The applicants propose to construct and operate these two pipelines in one route—the SW laterals pipeline route.

3.5.1.1 Northwest Lateral Pipeline Route

The 22.8-mile-long NW lateral pipeline route was to provide an interconnect point with the existing Bridgeline Holdings, L.P. pipeline near the intersection of Bayou Road and Intracoastal Road, approximately 5 miles southwest of Belle Chasse in Plaquemines Parish. The route crossed the Intracoastal Waterway and proceeded south-southeast toward the proposed LNG terminal site. This pipeline was collocated with an existing pipeline right-of-way from MP 13.0 to MP 20.6. The route was designed to avoid crossing the Jean Lafitte National Park and Preserve, as well as an EPA-designated section 404(c) wetland area.

After further evaluation, Venture Global decided to remove the NW lateral pipeline from the proposed action. The NW lateral pipeline route would have required a technically difficult crossing of a levee and adjacent waterbody. This route is approximately 6 miles longer than the proposed SW lateral TGP and 11 miles longer than the SW lateral TETCO. Because the NW lateral pipeline would have to be coupled with another pipeline to deliver the volume of necessary gas, this longer route would have more potential environmental impacts than the current proposed routes. The NW lateral would have crossed 34 National Hydrography Dataset waterbodies, of which 14 of the crossings would be greater than 100 feet. Additionally, the NW lateral pipeline route would have crossed approximately 17.8 miles of wetlands. As a result, once Venture Global determined that sufficient feed gas supply could be obtained using just the TGP and TETCO tie-ins, they removed the NW lateral pipeline from the proposed Project.

3.5.1.2 Southeast Lateral Pipeline Route

Venture Global also considered the 12.0-mile-long SE lateral pipeline that begin at a tie-in with TGP near Port Sulphur in Plaquemines Parish. The route proceeded northwest and then interconnected with a High Point Gas Transmission pipeline before proceeding to the proposed LNG terminal site. The route was collocated with an existing 20-inch-diameter Shell pipeline for 2.4 miles. Based on NWI mapping, the route would cross 3.1 miles of estuarine and freshwater emergent wetland and 3.0 miles of open water. Approximately 1,000 feet of oyster lease areas would also be crossed.

After further analysis, as with the NW lateral pipeline, Venture Global decided to remove the SE lateral pipeline from the proposed action once they determined that sufficient feed gas supply could be obtained by using only two existing systems (TGP and TETCO). Also, the tie-ins to the TGP and TETCO lines could be located in proximity, which would allow for the two pipelines to be collocated for a majority of their routes.

Because constructing the SE lateral and at least one of the other alternative pipelines would result in more overall impacts when compared to the proposed pipeline systems' collocated alignment, Venture Global removed the SE lateral pipeline from the proposed Project.

3.5.1.3 Southwest Laterals Pipeline Route

The SW laterals pipeline route is the proposed route for the two proposed lateral pipelines. Initially, at the beginning of the pre-filing process, the SW lateral was a single pipeline connecting TETCO to the LNG terminal site. After further design, Venture Global decided to also connect to the existing TGP system with a 15-mile lateral pipeline. Due to the proximity of the TGP and TETCO interconnects, the applicants propose to collocate these two laterals for the majority of the route. In its FERC application, Venture Global presented the collocated the SW lateral TGP and SW lateral TETCO pipelines as one proposed route—the SW laterals pipeline route.

3.5.2 Southwest Laterals Route (Proposed)

As discussed above, the SW laterals route consists of the 11.7-mile SW lateral TETCO pipeline and the 15.0-mile SW lateral TGP pipeline. Two major alternatives for the SW lateral TETCO pipeline route were analyzed. As illustrated on figure B-3 in appendix B, the route for the SW lateral TGP pipeline is collocated for the entire length of the SW lateral TETCO pipeline and (for the additional 3.3 miles) traverses homogenous, open water habitat between the TETCO and TGP interconnects. As a result, we did not identify the need to evaluate any route alternatives for the SW lateral TGP pipeline route and consider it the preferred route for that segment of the pipeline system. The alternatives are discussed in the following sections. A comparison of the three SW lateral TETCO pipeline route alternatives is presented in table 3.5-1.

Table 3.5-1
Summary of Selection Criteria for the Southwest Lateral TETCO Pipeline Routes

	Proposed	Alternative 1	Alternative 2
Length (miles)	11.7	11.0	11.1
Wetlands (miles)	3.5	6.6	3.6
Upland (miles)	0.6	0.4	0.2
Open Water (miles)	7.6	4.0	7.3
Oyster Leases Crossed (miles)	4.4	1.1	4.4
Collocation (miles)	0.0	0.0	0.0

3.5.2.1 Southwest Lateral TETCO Pipeline – Preferred Route

This preferred alternative is the proposed route for the SW lateral TETCO pipeline. It is 11.7 miles long and located in the coastal marshes of the Mississippi River delta. The route begins at an interconnect point with a TETCO pipeline near Bayou St. Denis in Plaquemines Parish. It proceeds northeast across the wetlands and open water to the proposed LNG terminal site. No utility corridors or other linear rights-of-way running in the same general direction are available for collocation.

Based on NWI information shown in table 3.5-1, the proposed SW lateral TETCO pipeline route crosses approximately 3.5 miles of estuarine emergent and freshwater forested/shrub wetland and 7.6 miles of open water. Approximately 4.4 miles of the 11.7-mile-long route cross oyster leases. Although it is slightly longer than Alternatives 1 and 2, it was selected as the proposed route based on its preferential location in open water, where practicable, to minimize disturbance of marsh vegetation.

3.5.2.2 Southwest Lateral TETCO Pipeline – Alternative 1

Alternative 1 is 11.0 miles long and is the shortest of the three variations for the SW lateral TETCO pipeline route. Alternative 1 crosses 6.6 miles of estuarine emergent and freshwater forested/shrub wetlands and 4.0 miles of open water. Approximately 1.1 miles of the 11.0-mile-long route cross oyster leases. This alternative was not selected because the wetland crossing length is nearly double that of the other alternatives and the tie-in location presented construction challenges due to the local terrain. This alternative did not offer any advantages over the preferred route.

3.5.2.3 Southwest Lateral TETCO Pipeline – Alternative 2

Alternative 2 is 11.1 miles long. This alternative crosses 3.6 miles of estuarine emergent and freshwater forested/shrub wetland and 7.3 miles of open water. Similar to the preferred route, approximately 4.4 miles of Alternative 2 cross oyster leases. Unlike Alternative 1, there is an acceptable location for a tie-in point. This alternative is nearly identical to the proposed route, deviating from the preferred route only at the extreme southern end of the route. The southern 2.5 miles of this alternative route would cross two marsh islands, resulting in an additional 0.1 mile of marsh impacts and habitat/marsh fragmentation. To avoid these marsh islands, the preferred route is approximately 0.6 mile longer, with more open water impacts. However, the preferred route was chosen over Alternative 2 since it would result in fewer wetland impacts and less habitat fragmentation.

3.6 ALTERNATIVE ABOVEGROUND FACILITIES SITES

Proposed aboveground facilities for the pipeline system would include six MLVs, three pig launchers, two pig receivers, and two metering and regulation (M&R) stations. All of these facilities would occur within or adjacent to the SW lateral pipeline route right-of-way. These facilities are small, would only impact environmentally sensitive areas to a minimal extent, are not located near residences, and their locations are tied to the locations of the required interconnect pipeline facilities. We did not identify any environmental concerns that require the need to identify and evaluate alternative sites for these minor aboveground facilities, nor were any alternatives suggested during the public scoping period. Therefore, we conclude that the proposed aboveground facility sites are the preferred alternative.

4.0 ENVIRONMENTAL IMPACT ANALYSIS

The environmental consequences of constructing and operating the LNG terminal and pipeline system would vary in duration and significance. Four levels of impact duration were considered: temporary, short term, long term, and permanent. Temporary impacts generally occur during construction with the resource returning to pre-construction condition almost immediately afterward. Short-term impacts could continue for up to 3 years following construction. Impacts were considered long term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of any activity that modified a resource to the extent that it would not return to pre-construction conditions during the life of the Project, such as the construction of an aboveground facility. We considered an impact to be significant if it would result in a substantial adverse change in the physical environment.

In this section, we discuss the affected environment, general construction and operational impact, and proposed mitigation for each resource. Venture Global, as part of its application, agreed to implement certain measures to reduce impacts. We evaluated the proposed mitigation measures to determine whether additional measures are necessary to reduce impacts. These additional measures appear as bulleted, boldfaced paragraphs in the text. We will recommend that these measures be included as specific conditions to any authorization that the Commission may issue. Conclusions in this draft EIS are based on our analysis of the environmental impacts and the following assumptions:

- Venture Global would comply with all laws and regulations;
- the proposed facilities would be constructed as described in section 2.0 of this document; and
- Venture Global would implement the mitigation measures as stated in its application and supplemental filings to FERC.

4.1 GEOLOGY

4.1.1 Geologic Setting

The Project would be located in the Mississippi Alluvial Plain section of the Coastal Plain physiographic province. The Coastal Plain lies along the U.S. Gulf Coast, stretching 100 to 200 miles inland and 100 to 200 miles offshore to the edge of the Continental Shelf. It comprises an elevated sea bottom with low topographic relief and extensive marsh lands, dipping gently seaward from its highest elevations of about 500 feet. The Mississippi River Delta portion of Mississippi Alluvial Plain consists of Quaternary-period unconsolidated sands and clays, with scattered salt diapirs overlain by anhydrite and sulfur deposits (Hunt, 1967). Surficial deposits underlying the LNG terminal and the first 2 miles of the pipeline system are comprised of Holocene-epoch deposits of the natural levee complex of the Plaquemines delta lobe, Mississippi River, which are predominantly of silt, silty clay, and clay. Surficial deposits underlying the remainder of the pipeline system are Holocene-epoch deposits composed of cyclically interbedded interdistributary peat and clay, natural levee silt and clay, distributary sand, and delta-front and prodelta mud and clay (LGS, 2011). The Holocene-epoch deposits are underlain by Pleistoceneepoch Mississippi River alluvial deposits of mudstones with interbedded sand beds between 500 feet and 2,000 feet below mean sea level (MSL) in the Project area (Ayrer, 2013).

Venture Global performed geotechnical studies to evaluate subsurface soil and groundwater conditions within the proposed terminal site and marine facilities:

- 86 geotechnical borings, ranging in depth from 60 to 200 feet;
- 10 cone penetration tests, ranging in depth from 142 to 148 feet; and
- two seismic cone penetration tests, each to a depth of 143 feet.

The investigations at the proposed terminal indicated that the materials within approximately 300 feet of the surface consist of three distinct strata:

- stratum 1: Cohesive soils consisting of clay, silt, and silty clay generally extend from the surface to a depth of about 150 feet below existing grade.
- stratum 2: Natural granular soils consisting of silty sand and clayey sand occur below Stratum 1 to a depth of about 175 feet below existing grade.
- stratum 3: Cohesive soils consisting of clays and sandy clays occur below Stratum 2 to a depth of about 300 feet below existing grade, the maximum depth explored in this area.

Groundwater was at or very near the surface in the geotechnical borings. The potential for corrosion of buried steel ranged from high to very high, based on resistivity and chloride ion concentrations. The potential for degradation of concrete, based on sulfate ion concentrations, was generally mild to moderate across the site (Fugro, 2016a).

A 2016 topographic survey undertaken by Venture Global indicated elevations at the LNG terminal site range from -2 feet to -5 feet NAVD88 south of SH 23, and from -2 feet to 2 feet NAVD88 between SH 23 and the toe of the federal flood protection levee. The crest of the flood protection levee had a crest of 14 feet NAVD88 adjacent to the proposed terminal site. The non-federal flood protection levee has an elevation of 9.5 feet NAVD88 at the pipeline system crossing.

The geotechnical investigation for the horizontal directional drill (HDD) between the LNG terminal site and non-federal levee will be completed by Venture Global in 2019. The results of this geotechnical investigation would identify the likelihood of success, quantify the potential for hydraulic fracture, and include measures to minimize risk of HDD complications.

4.1.2 Mineral Resources

No non-fuel mineral resources occur within 0.25 mile of the Project. The nearest non-fuel mineral resources are two active surface river silt borrow pits, both operated by Woodland Borrow Pits, LLC, and which are located approximately 3.0 miles southeast and 5.5 miles northwest of the proposed terminal. No borrow pits were identified along the pipeline system. The Lake Hermitage Dome sulphur mine is located 3.2 miles south of the LNG terminal, but this mine is not currently in production (USGS, 2017). The outer edge of the Lake Hermitage salt dome is located about 0.9 mile east of the pipeline system (at MP 7.5 of the SW lateral TETCO and MP 10.8 of the SW lateral TGP). An unnamed geothermal prospect is located 3,800 feet south of the proposed SW lateral TETCO temporary meter station at MP 0.0 (USGS, 2017).

Oil and gas production is prevalent throughout Louisiana and the surrounding region. The proposed terminal would be proximate to various oil and gas fields, and the Lake Hermitage, Manilla Village Southeast, Saturday Island, and Bay Batiste oil and gas fields underlie the pipeline system (LDNR, 2017a) (figure B-4, appendix B). Active and producing wells drilled in these fields have depths ranging from 11,900 to 19,000 feet. Based on a review of the LDNR's Strategic Online Natural Resources Information System (SONRIS), there are two plugged and abandoned dry hole wells within the proposed terminal site and three plugged and abandoned former oil and gas wells within the pipeline system construction workspace (LDNR, 2017a). In addition to the aforementioned wells, there are 18 additional plugged and abandoned wells, one permitted well, and two producing wells (currently shut-in for future utility) within 0.25 mile of the Project workspace (LDNR, 2017a) (figure B-5, appendix B). To afford the owner(s) the opportunity to have a representative on-site during construction activities, **we recommend that:**

- **Gator Express Pipeline should provide 72 hours' notice to the owner(s) of producing oil and gas wells located within 0.25 mile from the pipeline workspace in order to allow the owner's representative to be on-site during construction activities.**

The pipeline system crosses state mineral lease SL 707 from MP 10.0 to 11.8 on the SW lateral TGP and lease SL 21423 in the workspaces and meter site immediately surrounding the SW lateral TETCO meter station platform. Venture Global has indicated they would negotiate permanent easement rights and any necessary access restrictions with the lease owners.

4.1.3 Geologic Hazards

Geologic hazards are physical conditions, naturally occurring or induced, that can result in damage to land and structures or injury to people. Such hazards typically include seismicity (e.g., earthquakes, surface faults, soil liquefaction, and tsunamis), subsidence, flooding and storm damage, shoreline erosion, and landslides. Conditions necessary for the development of other geologic hazards, including avalanches, volcanism, and karst terrain, are not present near the LNG terminal or pipeline facilities. In general, the potential for these geologic hazards to markedly affect construction or operation of the proposed terminal and pipeline facilities is low. Geologic hazards present at the terminal facility will be discussed in detail in section 4.12. As such, the following geologic hazards, sections 4.1.3.1 through 4.1.3.4, discuss only the pipeline facilities.

4.1.3.1 Seismicity

The majority of significant seismic events are interplate earthquakes associated with movement between two tectonic plates, either laterally along a transform fault where plates are sliding past each other (such as in California) and rift separation zones, or vertically as one plate is subducted below another (such as in Alaska) where tectonic plates are converging (such as the New Madrid fault across the Missouri/Tennessee border). Relative to these highly active tectonic regions, Louisiana and the surrounding areas are seismically quiet. Seismic events may also be associated with volcanic activity, which is not present in the southeastern area of the continent, and induced events, such as significant injection of fluids (potentially associated with recent Oklahoma earthquakes) and initial filling of major reservoirs (such as Toledo Bend). Historically, induced seismicity resulted in low-magnitude events.

The 2014 U.S. Geological Survey (USGS) Hazard Mapping Program probabilistic seismic hazard analyses for peak ground acceleration (PGA) expected at the Project, expressed as a factor of gravity (g), indicates a 10 percent probability of exceedance is 0.0184g within a 50-year period and a 2 percent probability of exceedance is 0.0434g within a 50-year period due to seismic events (USGS, 2014). While the probabilistic PGA values are for rock, and the clay, silt, and sand underlying the proposed terminal site would amplify short-period PGAs by a factor of 2, PGAs of less than 0.039g would result in only light perceived shaking and no potential damage, and PGAs of up to 0.092 would result in only moderate perceived shaking and very light potential damage (USGS, 2006). The pipelines would be designed for earthquake ground motions, and it is unlikely they would be affected by the design earthquake(s).

4.1.3.2 Shoreline Erosion and Landslides

The flat topography associated with the pipeline system routes, which remains consistent between the open water and terrestrial transitions, would not be subject to landslide hazards. During construction and operation of the pipeline system, Venture Global would implement measures outlined in its Project-specific Plan and Procedures to minimize shoreline erosion and offsite transport of soil.

4.1.3.3 Land Subsidence and Sea Level Rise

Common causes of ground subsidence include the presence of karst terrain, underground mining, and substantial groundwater or fluid withdrawal. Underground mining poses risks to engineered structures due to the potential for the overlying strata to collapse into the voids formed by the extraction of minerals. While Louisiana and parts of adjoining states are underlain by evaporite rocks at various depths up to 7,000 feet, there are no karst or pseudokarst features proximal to the pipeline facilities (Weary and Doctor, 2014). The closest mining activities occurred at the Lake Hermitage Dome sulphur mine, located east of the pipeline system (USGS, 2017). Therefore, subsidence associated with these activities are not anticipated. Subsidence could occur near the pipeline facilities due to oil and gas extraction. As discussed above, these facilities would be within active oil and gas fields. However, if subsidence does occur, the impacts on the pipeline system are expected to be minor.

4.1.3.4 Flooding/Storm Damage/Tsunamis

FEMA produces flood insurance rate maps for municipalities across the nation. The maps are divided into zones with assigned probabilities of experiencing a flood event during any 1-year period. 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 would be equaled or exceeded in any individual year during a flood event. The lowest mapped probability of flooding is 0.2 percent, which would have an average flooding recurrence interval of 500 years. Venture Global would raise the elevation of its metering stations to the 500-year flood level to avoid minor flooding.

Venture Global conducted a tsunami hazard evaluation to assess the potential for a tsunami or a seiche (standing wave) to impact the LNG terminal. Due to the low probability of strong seismic events in the Gulf of Mexico, the tsunami hazard associated with seismic activity is low. The primary tsunami hazard for the pipeline system area is associated with submarine landslides. However, occurrences are rare (over 1,000 years between significant events) and estimated wave height from modeled events (less than 13 feet for a 500-year return period) are less than predicted storm surges (Fugro, 2016b). The tsunami hazard is inherently considered because the pipeline system and its ancillary facilities are designed for storm surge and the maximum estimated run-up values from potential tsunamis are substantially less than those from storm surge.

4.1.4 Blasting

Blasting is not expected to be necessary during construction. The Project areas at the LNG terminal site and pipeline system are underlain by unconsolidated sediments to depths greater than the excavation depth needed to construct the proposed facilities. In the event that Venture Global becomes aware of the need for blasting, Venture Global would prepare a Project-specific blasting plan in accordance with state and local regulations for the review and written approval of the Director of the Office of Energy Projects prior to conducting any blasting activities.

4.1.5 Paleontology

The geologic materials in the Project area are generally young (Holocene to late-Pleistocene) and do not have a high potential to contain significant paleontological resources. The LNG terminal and pipeline system facilities would not impact any older underlying geologic formations or the fossils, if any, lay within them. The nearest fossiliferous strata, the Sicily Island Loess and the Peoria Loess, which contain land and freshwater gastropods, freshwater pelecypods, and vertebrate bones, outcrops over 100 miles northwest of the Project area (LGS, 2008). Therefore, construction and operation of the LNG terminal would not likely affect paleontological resources.

4.1.6 Design and Construction of the LNG Terminal and Pipeline System

Discussion on issues such as site grading, foundations, and facility structure and design, including wind design and seismic design, are addressed in section 4.12.

4.1.7 General Impacts and Mitigation

The LNG terminal and associated marine facilities would impact 728.7 acres for construction and 636.5 acres during operation. Existing ground elevations at the terminal site vary between -2 and -5 feet NAVD88. The terminal site would be leveled to an elevation of -2 feet NAVD88 by grading and with the import of fill materials to provide a level platform with sufficient space to safely execute the work. As a result, the LNG terminal would permanently alter the existing geologic conditions at the site. Final grade surfacing and landscape would consist of gravel, asphalt, concrete, topsoil, and grass surface areas. Venture Global would drive precast concrete piles to support key LNG terminal components and structures. The number and location of piles would be determined during final design stages. The impact on the existing geologic conditions would be permanent and minor, dependent on the final number and location of piles.

Although there are oil and gas fields under the LNG terminal, active and producing wells drilled in these fields have depths ranging from 11,900 to 19,000 feet. As stated in section 4.1.2, the area has abandoned wells, plugged wells, and producing wells within 0.25 miles of the pipeline system and LNG terminal workspaces. Despite the historic presence of oil and gas wells in the area, we do not anticipate that there would be impacts on mineral resources in the Project area.

Based on the above discussion, and in consideration of Venture Global's proposed mitigation and design criteria, and our recommendation, the pipeline system would not significantly affect or be affected by geological conditions in the area.

4.2 SOILS

4.2.1 Existing Soil Resources

The soils affected by the Project were identified and assessed using various data sources, including digital soils data (e.g., the Soil Survey Geographic [SSURGO] database), published soil surveys for Plaquemines Parish (USDA NRCS, 2000), and additional information about soils and associated land uses from the Official Soil Series Descriptions (Soil Survey Staff, 2016a). The SSURGO database is a digital version of the original county soil surveys developed by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) for use with geographic information systems (GIS). It provides the most detailed level of soils information for natural resource planning and management. The attribute data within the SSURGO database provides the proportionate extent of the component soils and their properties for each soil map unit.

4.2.1.1 Soil Types and Limitations

The soils at the terminal site include Cancienne silt loams, Cancienne silty clay loams, Carville, Cancienne, and Schriever soils, Harahan clays, and Westwego clays. These soils have slopes ranging from 0 to 1 percent and do not contain bedrock or other root restrictive layers within 80 inches of the surface. Cancienne silt loams and Cancienne silty clay loams consist of somewhat poorly drained mineral rich soils that formed in silty alluvium on alluvial plains or natural levees. Carville, Cancienne, and Schriever soils consist of somewhat poorly drained mineral rich soil. The Carville component occurs in loamy alluvium on delta plains or natural levees. The Cancienne component occurs in silty alluvium on delta plains or natural levees. The Schriever component occurs on clayey alluvium on backswamps or delta plains. Harahan clays and Westwego clays consist of poorly drained mineral rich soils that formed in nonfluid over fluid clayey alluvium on backswamps or delta plains. In addition to the five soil map units, the SSURGO database shows portions of the terminal site as “water.” Soil characteristics are not applicable for the water areas, but the acreages are included in impact totals. The terminal site has been extensively ditched and drained, thereby likely altering the natural soil characteristics.

Soils types mapped within the pipeline system footprint consist of Bellpass muck, Clovelly muck, Cancienne silty clay loam, Gentilly muck, Harahan clay, Lafitte muck, Schriever clay, and Westwego clay. Three of the five soil types (Cancienne silty clay loam, Harahan clay, and Westwego clay) found at the terminal site are also found within the construction workspace of the pipeline system. Bellpass muck is a very poorly drained organic soil found in decomposed organic material overlying fluid clayey backswamp deposits on delta plains and marshes. Clovelly muck is a very poorly drained organic and slightly saline soil found in herbaceous organic material over very fluid clayey alluvium on coastal plains and marshes. Gentilly muck is a very poorly drained mineral soil found in thin herbaceous organic material over semifluid clayey over consolidated clayey alluvium on marshes. Lafitte muck is an organic, very poorly drained, and slightly saline soil found in herbaceous organic material on delta plains and marshes. Schriever clay consists of poorly drained mineral soils protected from most flooding by earthen levees, found in clayey alluvium on backswamps and delta plains. In addition to the eight soil map units, the SSURGO database shows portions of the pipeline system as “water.” Soil characteristics are not applicable for these areas, but the acreages are included in impact totals.

The soils within the proposed terminal site and pipeline system were evaluated to identify prime farmland and major soil characteristics that could affect construction or increase the potential for adverse construction-related soil impacts. The soil characteristics evaluated include erosion potential, the potential for compaction, and revegetation concerns. Table 4.2-1 summarizes the amount of prime farmland and soil characteristics within each component of the Project.

4.2.1.2 Prime Farmland Soils

The USDA defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed fiber, and oilseed crops" (Soil Science Division Staff, 2017). The USDA advised that, since the Project would not receive federal funding, the Project is exempt from the rules and regulations of the Farmland Protection Policy Act – subtitle I of title XV, section 1539-1549. This designation includes cultivated land, pasture, woodland, or other lands that are either used for food or fiber crops, or are available for these uses. Urbanized land, built-up land, and open water cannot be designated as prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods, and is not subject to frequent, prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by draining or irrigating). Impacts on prime farmland are of general concern because of the potential for decreases in long-term agricultural productivity.

Two of the soils at the terminal site are designated as prime farmland: Cancienne silt loam, 0 to 1 percent slopes; and Cancienne silty clay loam, 0 to 1 percent slopes. These soils make up approximately 146.4 acres (20.1 percent) of the soils affected at the terminal site. The portion of the terminal site south of SH 23 was historically used for sugar cane production and has been extensively ditched and drained. Most of the terminal site is currently fallow agricultural land and used for cattle pasture.

Two of the eight soils along the pipeline system are designated as prime farmland: Cancienne silty clay loam, 0 to 1 percent slopes; and Schriever clay, 0 to 1 percent slopes. These soils make up approximately 6.5 acres (0.7 percent) of the soils that would be affected by pipeline system construction and are considered prime farmland under all conditions. None of the soils represent unique farmland or farmland of statewide importance.

4.2.1.3 Hydric Soils

Hydric soils are defined as "soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (Soil Survey Staff, 1994). 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. Generally, hydric soils are those soils that are classified as somewhat poorly drained, poorly drained, or very poorly drained.

Table 4.2-1 Characteristics of Soils Associated with the Terminal Site and Pipeline System			
Facility	**Prime Farmland[a]**	**Hydric[a]**	**Compaction Prone[b]**
Terminal Site[c]			
Terminal Site, Water & Land-based Marine Facilities, and Adjacent Workspace (does not include 77.0 acres of undisturbed area within the terminal site)[d]	146.4	457.6	625.8
Terminal Site Subtotal[e]	**146.4**	**457.6**	**625.8**
Pipeline System			
SW Lateral TETCO and SW Lateral TGP (Phase I)			
Pipeline Facilities	2.5	68.1	3.5
Additional Temporary Workspace	3.2	7.9	3.2
Aboveground Facilities (Meter Station, Mainline Valves, and Bridge)	0.3	0.3	0.3
Access Roads and Barge Access Channels	0.4	1.1	0.8
Subtotal	**6.4**	**77.4**	**7.8**
SW Lateral TETCO (Phase II)[f]			
Pipeline Facilities	0.1	16.0	0.1
Additional Temporary Workspace	0.0	1.6	0.0
Subtotal	**0.1**	**17.6**	**0.1**
Pipeline System Subtotal	**6.5**	**95.0**	**7.9**
PROJECT TOTAL	**152.9**	**552.6**	**633.7**

Sources: Soil Survey Staff, 2016a, 2016b; USDA NRCS, 2000
a As designated by the NRCS.
b Includes soils in somewhat poor to very poor drainage classes with surface textures of sandy clay loam and finer.
c Terminal workspace includes areas along the federal levee where workspace for the crossing of the levee would be required.
d Temporary terminal workspace includes areas located along SH 23 currently used for utilities.
e Does not include undisturbed land (77.0 acres) at the terminal site.
f Overlapping workspaces are included in the SW lateral TETCO totals.

Due to extended periods of saturation, hydric soils can be prone to compaction and rutting, particularly during the operation of heavy equipment. Compaction can also occur in poorly drained, fine-textured, non-hydric soils when the surface layers are wet. In addition, high groundwater levels associated with hydric soils can create a buoyancy hazard for buried pipelines.

Three of the five soil map units at the terminal site are classified as hydric soils: Carville, Cancienne, and Schriever soils; Harahan clay; and Westwego clay. These soils make up approximately 457.6 acres (62.8 percent) of the soils affected at the terminal site.

Seven of the eight soils at the pipeline system are classified as hydric soil. The only non-hydric soil is Cancienne silty clay loam, 0 to 1 percent slopes. This soil makes up approximately 98.0 acres (10.4 percent) of the soils that would be affected by construction of the pipeline system.

4.2.1.4 Compaction Potential

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

All five soils at the terminal site are prone to compaction. These soils make up approximately 625.8 acres (98.3 percent) of the soils affected at the terminal site. The remaining 1.7 percent is 10.7 acres associated with the marine facility within the Mississippi River.

Four of the eight soils along the pipeline system are prone to compaction: Cancienne silty clay loam, 0 to 1 percent slopes; Harahan clay; Schriever clay, 0 to 1 percent slopes; and Westwego clay. These soils make up approximately 7.9 acres (0.8 percent) of the soils that would be affected by construction of the pipeline system.

4.2.1.5 Erosion

Highly erodible soils at the terminal site and within the construction workspace for the pipeline system were identified based on SSURGO database parameters that are directly related to the susceptibility of a soil to erosion by water or wind. The USDA has developed separate groupings for water and wind erosion because management and construction mitigation techniques used to minimize erosion hazards are different in each case.

For water erosion, attribute data were used that describe the land capability and slope class of each map unit. All map units with a land capability subclass designation of 4e through 8e, and map units with an average slope class greater than or equal to 9 percent, were identified as susceptible to water erosion. Wind erodibility was assessed based on wind erodibility group (WEG) designations. A WEG is a grouping of soils that have similar surface layer properties that affect their resistance to soil blowing. These properties include texture, organic matter content, and aggregate stability. Soils in WEG 1 and WEG 2 include sandy-textured soils with poor aggregation, which are particularly susceptible to wind erosion.

No soils at the terminal site or pipeline system are susceptible to high-water or wind erosion.

4.2.1.6 Revegetation Potential

Successful restoration and revegetation are important for maintaining soil productivity and protecting the underlying soil from potential damage, such as erosion. Droughty soils, which characteristically have a coarse surface texture and are excessively drained or somewhat excessively drained, may prove difficult to revegetate. The drier soils have less water to aid in the germination and establishment of new vegetation. The coarser textured soils also have a lower water holding capacity following precipitation, which could result in moisture deficiencies in the root zone, thereby creating unfavorable conditions for many plants. In addition, steep slopes can make the establishment of vegetation difficult. SSURGO data indicates that no soils at the terminal site or the pipeline system have issues with revegetation.

4.2.1.7 Stony/Rocky Soils

Soils with significant quantities of stones in the surface layer were identified by querying the SSURGO database. Stones may occur within each component soil series that have either: (1) a cobbley, stony, bouldery, shaly, very gravelly, or extremely gravelly modifier to the textural class of the surface layer; or (2) a surface layer for which more than 5 percent of total weight is made up of stones larger than 3 inches.

No soils at the terminal site or the pipeline system overlay stony/rocky soils.

4.2.1.8 Shallow Bedrock

Soils potentially underlain by shallow bedrock were identified by querying the SSURGO database for component soil series that have a bedrock contact listed at 60 inches or less in depth. The Project is not underlain by any such soils exhibiting shallow bedrock.

4.2.2 Soil Contamination

During construction, some potential exists for spills of hazardous materials, such as hydraulic fluid and diesel fuel for vehicles and equipment. In addition, stormwater runoff from the construction workspace could carry unconfined debris or other materials. To address these concerns, Venture Global would adhere to the Project-specific SPCC Plan and SWPPP for construction activities, in accordance with applicable regulations and permit requirements.

4.2.3 General Impacts and Mitigation

4.2.3.1 LNG Terminal

The soil characteristics listed in table 4.2-1 would be of most concern in circumstances where temporary land disturbance occurs and restoration to pre-construction conditions is required. At the terminal site, initial site preparation would require significant soil modifications to soil properties and topography. These modifications would include soil stabilization through the addition of material such as cement or lime, deposition of fill to achieve a ground elevation increase across the majority of the terminal site, and/or the installation of a surface layer to aggregate material to provide a safe and level work surface.

Given the modifications described above, drainage issues associated with hydric soils and erosion issues associated with upland spoil areas would not occur. With respect to soil compaction, readily compactible soils are favored around facility foundations and piles.

During construction disturbance, when surface topography is altered and subsurface soil may be left exposed, heightened erosion and sedimentation concerns are associated with potential stormwater runoff. The Project would address these concerns by adherence to the Project-specific Plan and Procedures, Louisiana Pollutant Discharge Elimination System (LPDES) Stormwater Construction General Permit requirements, and an SWPPP for construction activities at the terminal site.

To reduce impacts of construction on soils, Venture Global would implement measures outlined in its Project-specific Plan and Procedures, which include measures to control erosion and sedimentation during construction and to ensure proper restoration of disturbed areas following construction. Relevant mitigation measures specified in the Project-specific Plan and Procedures include:

- sediment barriers would be installed before ground-disturbing activities are initiated to prevent sediment flow from construction areas into waterbodies, wetlands, and roads;
- temporary erosion control measures (e.g., temporary slope breakers and mulch) would be installed during construction;
- permanent erosion control measures would be maintained following construction;
- erosion control fabric would be placed at dike and drainage swale outlets and adjacent to roads and waterbodies, as necessary;
- dust suppression, via water application, would be used, as necessary, to control and minimize wind erosion;
- during periods of heavy rainfall or unusual soil saturation, rutting, and compaction would be avoided, to the extent practicable, by utilizing low-ground weight construction equipment and/or timber mats; and
- an EI would monitor field conditions daily to ensure that the erosion and sedimentation control measures are functional and adequate until the construction workspace is fully stabilized.

The majority of soil disturbed within the terminal site and associated facilities and workspaces would be permanently impacted from the construction of paved or gravel plant roads, or occupied by aboveground facilities and workspaces. The permanent footprint totals 625.8 acres of land and 10.7 acres within the Mississippi River. The remaining 92.2 acres within the terminal site and associated facilities and workspaces consist of temporary workspaces.

To prevent contamination of soils within nearby wetlands, waterbodies, and other sensitive resources during construction, Venture Global has stated that it would implement its Spill Prevention Plan during construction and its SPCC Plan during operation of the LNG terminal. These plans would outline potential sources of releases at the site, measures to prevent a release to the environment, and initial responses in the event of a spill.

Given the impact minimization and mitigation measures described above, impacts on soils due to construction and operation of the terminal site would be permanent, but minor.

4.2.3.2 Pipeline System

As shown in table 4.2-1, construction and operation of the pipeline system would affect 953.9 acres of soils, 816.7 of which are temporary workspace and 137.3 of which are permanent easement.

Pipeline construction activities that have the potential to affect soil structure and revegetation potential include clearing (brush hogging or mowing), topsoil removal, grading, trenching, backfilling, and restoration. Potential soil impacts include: loss to soil due to water or wind erosion, especially on steep slopes (greater than 9 percent) or fine sandy soils; reduction of soil quality by mixing topsoil with subsoil; soil compaction due to traffic by heavy construction equipment; and disruption of surface and subsurface drainage systems. Most construction disturbance within pipeline rights-of-way is considered temporary in nature, and the general approach is to restore pre-construction conditions, to the extent practicable. However, the presence of certain soil conditions (e.g., droughty soils) can compromise vegetation.

Three of the soil types mapped within the pipeline system construction workspace are also represented at the terminal site. Thus, the same soil characteristics (hydric soils, compaction, and water erosion) that were discussed in section 4.2.1 also bear consideration for construction of the pipeline system. However, given the temporary nature of disturbance and the intent to restore to pre-construction conditions, to the extent practicable, these soil characteristics have greater relevance for the selection of construction techniques and mitigation measures for the pipeline system than for the LNG terminal.

As described in section 2.5.5.4 and appendix C, Venture Global has developed a Project-specific Plan that includes some modifications to our Plan. Those proposed modifications that are substantive and for which we have determined Venture Global provided adequate justification are listed in appendix C, table 1. One of those proposed modifications is to Section IV.F.3.c of our Plan that requires the installation of sediment barriers along the edge of work areas where wetlands or waterbodies are adjacent to and downslope to prevent sediment flow into the wetland or waterbody. Venture Global states that although the soils in the Project area are of a type that tend to slough when stacked, the terrain has limited elevation changes and yields few downslopes. Venture Global contends that the workspace width (130 feet) is sufficient to limit sediment migration laterally off the construction right-of-way. As a result, Venture Global proposes to only sediment barriers, as practicable, at upland and wetland/waterbody interfaces within the construction right-of-way.

FERC accepts that this proposed alternative measure will achieve a comparable level of mitigation to the FERC Plan that requires the installation of these sediment barriers as necessary to prevent sediment flow into a wetland or waterbody. In the Project-specific Plan, Venture Global has committed that its EIs will ensure erosion control devices are installed to prevent sediment flow into sensitive environmental areas, such as wetlands.

Soil impacts would be minimized through the implementation of the measures outlined in the Project-specific Plan and Procedures. Further, Venture Global would implement its SPCC Plan to reduce potential impacts on soils from spills of hazardous materials used during construction and operation. We have reviewed the SPCC Plan and the Plan and Procedures and found them to be acceptable. Given the impact minimization measures described in these plans, impacts on soils due to construction and operation of the pipeline system would be permanent, but minor.

4.3 WATER RESOURCES

The Project would be located in the Mississippi Alluvial Plain Deltaic Coastal Marshes and Barrier Islands Ecoregion (Daigle, 2006). In general, this ecoregion is a flat deltaic and coastal plain with fresh water and saline marshes, rivers, lakes, bayous, tidal channels, canals, and barrier islands. The geology of this area generally consists of alluvial, deltaic, interdeltaic, coastal, and shallow marine sediments of sand, silt, and clay of comparatively high organic content, including peat deposits in places. The sand and clay layers are stratified, with the sand layers bearing water and the clay acting as confining layers.

4.3.1 Groundwater Resources

Groundwater within Plaquemines Parish primarily consists of salt water with various concentrations of dissolved salts (Ayrer, 2013; USGS, 2013a). Limited freshwater (water with a chloride concentration of 250 milligrams per liter or less) may be available in the shallow aquifer system that contains point bar deposits and natural levees adjacent to the Mississippi River and that are recharged by the Mississippi River (USGS, 2013a). The deep aquifer system is an extension of the New Orleans aquifer system, which extends from Iberville Parish east to the eastern portion of Orleans Parish and south the to the Gulf of Mexico (Ayrer, 2013; USGS, 1989).

Point bar deposits in the shallow aquifer system, which may contain limited amounts of fresh water, consist of sand deposits that are hydraulically connected to the Mississippi River and subject to infiltration of water from the river. There are no known wells screened in these deposits within Plaquemines Parish from the state well registration records; however, wells drilled to 50 to 100 feet deep in point bar deposits in neighboring Orleans Parish have yielded small to moderate quantities of water (USGS, 2013a). In Orleans Parish, water from the point bar deposits is of poor quality due to high iron concentration and very high hardness (USGS, 2013a), both of which can contribute to problems with water collection and distribution systems.

As stated above, the deep aquifers beneath Plaquemines Parish are an extension of the New Orleans aquifer system. The New Orleans aquifer system includes four major aquifers: Gramercy aquifer; Norco aquifer; Gonzales-New Orleans aquifer; and the “1,200-foot” aquifer. These aquifers were formed by deposition of alternating beds of sands and clays that both thicken and dip southward (Ayrer, 2013). The alternating beds of sand function as aquifers, and the beds of clay are confining units between aquifers. The confining layers between the surficial deposits and the underlying aquifers gradually thicken southward, and the underlying aquifers become more deeply buried (USGS, 1989).

According to USGS Water Resources Technical Report No. 46, the Gramercy and Norco aquifers pinch out to the west of the terminal site. In the Project vicinity, the Gramercy aquifer is located approximately 200 to 300 feet below the surface (USGS, 2013a).

Water within the Gramercy and Norco aquifers underlying Plaquemines Parish is moderately saline, and withdrawal from the Gramercy aquifer accounts for less than 1 percent of the total withdrawals in the parish (USGS, 2013a). Limited transmissivity data suggest that the Gramercy aquifer, Norco aquifer, Gonzales-New Orleans aquifer, and the “1,200-foot” aquifer will each have a transmissivity values greater than 10,000 square feet per day at the terminal site.

Aquifers with similar transmissivity values can typically yield greater than 300 gallons per minute from properly constructed supply wells.

4.3.1.1 Sole Source Aquifers

Sole source aquifers are designated by the EPA as aquifers that supply 50 percent or more of the drinking water for an area, and for which there are no other reasonably available alternative sources should the aquifer become contaminated (EPA, 2017a). There are no designated sole source aquifers in Plaquemines Parish. The closest sole source aquifers are the Southern Hills Regional aquifer and the Chicot aquifer. The Southern Hills Regional aquifer system is located in eastern Louisiana and south Mississippi, with the southern edge of the aquifer system located more than 50 miles from the Project. The Chicot aquifer is located in southwest Louisiana with the eastern edge more than 100 miles west of the Project area (EPA, 2017a).

4.3.1.2 Water Supply Wells

Louisiana's Wellhead Protection Program is a component of the LDEQ's Drinking Water Protection Program and is designed to protect the quality of public drinking water supplies obtained from community water wells. The LDEQ delineates a drinking water protection area around each well, ranging from a 1,000-foot radius to a 1-mile radius, depending on well screen depth, construction date, or aquifer sources. The Project does not traverse any drinking water protection areas for groundwater wells.

A review of the publicly available well location data available in SONRIS (LDNR, 2017b) indicated that there are no active public water supply wells within 1 mile of the Project. There is one private well documented within 1 mile of the Project. The well is located approximately 1 mile east of the terminal site on the east bank of the Mississippi River. According to the data available in SONRIS (LDNR, 2017b), the well was drilled to a depth of 30 feet and is listed as an active domestic well. Due to the distance from the terminal site, and the fact that the shallow well (approximately 30 feet) is on the opposite bank of the Mississippi River, no short-term or long-term impacts are anticipated on groundwater in the vicinity of the well.

No wells are documented within 1 mile of the pipeline system. There are three wells approximately 1.5 miles east of the pipeline system near the south end of Lake Hermitage Road. These wells, two domestic supply wells and one commercial public supply well, are reported to be between 410 feet and 450 feet deep (LDNR, 2017b). Two of these wells are reported to be in the Gramercy aquifer.

In addition to the publicly available well data, Venture Global identified an artesian well within the eastern workspace for the terminal. This well would be capped and abandoned during construction.

4.3.1.3 Contaminated Groundwater

The LDEQ runs an Aquifer Sampling and Assessment Program to monitor the quality of groundwater produced in Louisiana's major freshwater aquifers. The program samples about 200 wells across 14 aquifers every 3 years and presents the results in a triennial report. The aquifers in Plaquemines Parish are not included in the program, likely because the aquifers in Plaquemines Parish are primarily saline.

Under the Federal Safe Drinking Water Act, the EPA has established the Primary Maximum Contaminant Level (MCL) for pollutants that may pose a health risk in public drinking water. Secondary MCLs have also been set by the EPA, but are defined as non-enforceable guidelines for taste, odor, or appearance. As stated above, groundwater is not a significant source of drinking water in Plaquemines Parish, and the aquifers in Plaquemines Parish are not part of the LDEQ Aquifer Sampling and Assessment Program. Therefore, data regarding aquifer contamination is limited.

Prior land use activities at the terminal site is understood to be agricultural in nature. Venture Global conducted a Phase I Environmental Site Assessment at the terminal site that included a review of federal, state, and local databases. No potential sources of groundwater contamination were identified at or near the terminal site, and no known groundwater contamination was identified at or near the terminal site. Additionally, Venture Global conducted 86 geotechnical borings at the terminal site. Although samples for contaminant analysis were not collected, Venture Global did not observe any physical evidence (e.g., odor, sheen) of contamination while conducting the geotechnical study.

4.3.1.4 Groundwater Impacts and Mitigation

Excavation

The majority of the construction activities associated with the LNG terminal and pipeline system would involve shallow, temporary, and localized excavation, with the exception of concrete and/or steel piles at the LNG terminal. Shallow aquifers could sustain minor, indirect impacts from changes in overland water flow and recharge caused by clearing and grading of the work areas. In addition, near-surface soil compaction caused by heavy construction vehicles could reduce the soil's ability to absorb water. During construction of the Project, local water table elevation could be affected by excavation and backfill. In areas where groundwater is near the surface, excavation may intersect the water table in low-lying areas.

Although Venture Global anticipates that surface water from the Mississippi River primarily would be utilized for hydrostatic testing of the LNG storage tanks, a new well or wells may be drilled at the terminal site to supply water for testing piping and non-LNG tanks and for use during operation of the terminal. If groundwater wells are to be installed, Venture Global anticipates that the Gramercy aquifer, Norco aquifer, Gonzales-New Orleans aquifer, and/or the "1,200-foot" aquifer could yield sufficient quantities of water to satisfy the LNG terminal's needs without adverse impact. Supply wells would penetrate the targeted aquifer, and one or more wells would produce up to a total of 600 gallons per minute for treatment and use. Although these aquifers would not be adversely affected by the withdrawal of this quantity of water, this information would be useful to the relevant permitting agencies. Therefore, **we recommend that:**

- **<u>Prior to the close of the draft EIS comment period</u>, Plaquemines LNG should provide its final proposed hydrostatic test water sources for piping and non-LNG**

tanks at the LNG terminal and for use during operation of the LNG terminal, including details on the depth and location of any new water wells to be installed.

Venture Global would install over 2,000 steel or concrete piles to support the LNG terminal and marine facilities, which would be driven to a depth no greater than -240 feet NAVD88. The proposed piles would be driven to a depth above the confined aquifer underlying the Project area. In addition, the proposed pile driving would not penetrate any aquifers supporting area wells.

Venture Global has not yet provided the details for the number of piles needed to support the meter stations associated with the pipeline; however, due to the relatively small size of these facilities, these piles would be significantly shallower than the piles required for the LNG terminal. Therefore, we expect that the pile driving associated with the meter stations would not have a significant impact on groundwater.

Contamination

Shallow groundwater areas could be vulnerable to contamination caused by inadvertent surface spills of hazardous materials used during construction and operation of the LNG terminal and pipeline system. Accidental spills and leaks of hazardous materials associated with equipment trailers, the refueling or maintenance of vehicles, and the storage of fuel, oil, and other fluids pose the greatest risk to groundwater resources. If not cleaned up, contaminated soil could continue to leach and add pollutants to groundwater long after a spill has occurred.

Venture Global prepared a Project-specific SPCC Plan for both the terminal and the pipeline. We have reviewed the plan and found it acceptable. Implementation of the Project-specific Plan and Procedures and SPCC Plan would minimize the potential for groundwater impacts associated with an inadvertent spill of hazardous materials during construction and operation. These plans identify preventive measures to reduce the likelihood of a spill and also specify measures to contain and clean up a spill should one occur. In addition, these plans address the storage and transfer of hazardous materials and petroleum products.

Groundwater Withdrawals

The Project would require fresh water during the construction at the terminal site. Venture Global is planning to use surface water from the Mississippi River for hydrostatic testing of the LNG tanks (26,200,000 gallons). For the additional 17,250,000 gallons anticipated to be required for construction of the LNG terminal, Venture Global may utilize water pumped from the Mississippi River, sourced from Plaquemines Parish Water District (surface water), or obtained from new groundwater supply wells installed at the terminal site. If groundwater is utilized, the water would require treatment, as the majority of the groundwater in the region is saline. Table 4.3-1 presents the anticipated water usage during LNG terminal construction.

Table 4.3-1 Estimated Water Usage During LNG Terminal Construction		
Water Source	**Use**	**Quantity (gallons)**
Plaquemines Parish Water District, surface water, and/or groundwater	Personal and sanitary consumption	6,000,000
	Concrete production, dust suppression, miscellaneous construction uses	11,200,000
	Hydrostatic testing of piping and non-LNG storage tanks	50,000
Surface water	Hydrostatic testing of LNG tanks	26,200,000

As stated above, limited transmissivity data suggest that the Gramercy aquifer, Norco aquifer, Gonzales-New Orleans aquifer, and the "1,200-foot" aquifer will each have a transmissivity values greater than 10,000 square feet per day at the terminal site. Aquifers with similar transmissivity values can typically yield greater than 300 gallons per minute for properly constructed supply well. If new supply wells were to be installed at the terminal site, one or more wells would be installed in the targeted aquifer to produce 600 gallons per minute for treatment and use. Since groundwater is not a significant source of industrial or potable water in Plaquemines Parish, the groundwater withdrawals associated with terminal construction would not have a significant effect on groundwater in the region.

Water necessary for construction of the pipeline system would primarily consist of water for drilling mud (HDD make-up water) and water needed for hydrostatic testing of the pipeline system. Venture Global plans to utilize surface water as the source for hydrostatic testing pipeline construction needs (see section 4.3.2.2).

No wells in the immediate Project area are used for public or private use. No known contaminated sites exist near the Project. Excavations and pile driving are not expected to penetrate to the depth of the deeper aquifers in the Project area. The majority of the water required would be obtained from surface waters. Venture Global would implement its SPCC Plan during construction, which contains measures to minimize the potential for spills to occur and clean-up procedures in the event of a release of fuels or hazardous materials. Therefore, we conclude that the Project would not have a significant impact on groundwater resources in the Project area.

4.3.2 Surface Water

Water quality standards are developed by states to enhance or maintain water quality, protect the public health and welfare, and provide for the designated uses of the waters of the state. In Louisiana, the surface water quality standards are codified in LAC 33:IX.11.

The LDEQ reports on water quality in the state by basin subsegment, which is a discrete hydrologic unit or watershed (LDEQ, 2014). Subsegments describe the primary waterbody within the watershed; however, the water quality standards and criteria apply to all tributaries and connected waterbodies within the boundaries of a subsegment. There are seven designated uses established for surface waters in Louisiana, including:

1. **Primary Contact Recreation**: Any recreational or other water contact use involving prolonged or regular full-body contact with the water and in which the probability of ingesting appreciable amounts of water is considerable;

2. **Secondary Contact Recreation**: Any recreational or other water contact activity in which prolonged or regular full-body contact with the water is either incidental or accidental and the probability of ingesting appreciable amounts of water is minimal;

3. **Fish and Wildlife Propagation**: The use of water for aquatic habitat, food, resting, reproduction, cover, and/or travel corridors for any indigenous wildlife and aquatic life species associated with the aquatic environment;

4. **Drinking Water Supply**: The use of water for human consumption and general household use;

5. **Oyster Propagation**: The use of water to maintain the biological systems that support economically important species of oysters, clams, mussels, or other mollusks so that their productivity is preserved and the health of human consumers of these species is protected;

6. **Agricultural**: The use of water for crop spraying, irrigation, livestock watering, poultry operations, and other farm purposes not related to human consumption; and

7. **Outstanding Natural Resource Waters**: Waterbodies designated for preservation, protection, reclamation, or enhancement of wilderness, aesthetic qualities, and ecological regimes.

Table 4.3-2 presents the basins where the LNG terminal and pipeline system are located, as well as the LDEQ-designated uses for each basin.

4.3.2.1 Existing Surface Water Resources

The USGS uses a national standard hierarchical system to categorize surface water resources of the United States into hydrologic unit codes (HUCs). Based on this tiered system, the United States is divided and sub-divided into successively smaller hydrologic units that are classified into four levels: regions, sub-regions, accounting units, and cataloging units. The hydrologic units are arranged or nested within each other, from the largest geographic area (regions) to the smallest geographic are (cataloging units). The Project would be located in HUC Region 08 – Lower Mississippi and HUC Sub-region 0809 – The Mississippi River below the Bonnet Carre Floodway. With the only exception being the LNG terminal berths, the Project would be within HUC Accounting Unit 080903 – Central Louisiana Coastal and would be divided between HUC Cataloging Units 08090301 – East Central Louisiana Coastal and 08090302 – West Central Louisiana Coastal. The LNG terminal berths would be located within HUC Accounting Unit 080901 – Mississippi Delta Louisiana and HUC Cataloging Unit 08090100 – New Orleans. These watersheds encompass the Mississippi River, agricultural lands, interconnected wetlands, drainage ditches, man-made channels, fresh and brackish marshes, and open water.

The Mississippi River serves as the primary source of drinking water for the parish (USGS, 2013a), and there are five public drinking water intakes on the River. Two of the intakes are upstream of the LNG terminal: Dalcour intake (25 miles upstream) and Belle Chasse (20 miles upstream). The other three intakes are downstream from the terminal site: Pointe a lá Hache and Port Sulpher (both 4 miles downstream) and Boothville intake (35 miles downstream). The Pointe a lá Hache intake is on the east bank of the Mississippi River, and the Port Sulphur and Boothville intakes are on the west bank of the Mississippi River. Water from the Mississippi River is high in mineral content (hardness) but, generally, does not exceed the EPA Secondary Maximum Contaminant Levels for drinking water (USGS, 2013a). The portion of the terminal site located within the Mississippi River batture is within the Source Water Protection Area for the Pointe a lá Hache water system and the Port Sulphur Water District.

In periods of low flow, the Mississippi River, both at and upstream of the terminal site, is subject to saline water intrusion, where dense, salty water (exceeding the secondary drinking water standard of 500 milligrams per liter (mg/L) total dissolved solids and 250 mg/L chlorides) moves upriver toward New Orleans. Because salt water has a greater density than fresh water, it moves upstream in the form of a wedge in the lower portion of the water column. A highly stratified wedge is common within deep rivers with high freshwater flows, such as the Mississippi River. The leading edge, or "toe," of the saltwater wedge is well defined. When freshwater flows increase or decrease, the saltwater wedge retreats downstream or advances upstream, respectively.

LNG Terminal

The terminal site is located adjacent to the Mississippi River, with the terminal berthing areas located in the Mississippi River. The terminal would have 7,000 feet of river frontage armored with rip-rap and a concrete revetment mattress to minimize erosion. At the terminal site, the Mississippi River is approximately 2,500 feet wide, and the federal navigation channel width ranges from 1,700 feet (River Mile Marker 54) to 1,900 feet (River Mile Marker 55). The federal channel depth is authorized to -55 feet Mean Low Gulf and maintained to a depth of -45 feet Mean Low Gulf. The LDEQ has established four designated uses for the Mississippi River at the terminal site: primary contact recreation; secondary contact recreation; fish and wildlife propagation; and drinking water supply (table 4.3-2). Based on the numerical criteria established for these designated uses, water quality in the Mississippi River at the terminal site fully supports all four designated uses (LDEQ, 2018a). In addition to the Mississippi River, the terminal site is transected by a series of man-made interconnected drainage ditches (table 4.3-3 and, figure B-6 in appendix B). These drainages ditches are part of a larger system of levees and drainage canals that were constructed to create over 5,000 acres of fastlands that prevent flooding and facilitate agricultural use of the area. The drainage ditches connect to a series of canals that convey runoff from the terminal site generally eastward to a pumping station adjacent to Lake Judge Perez, approximately 2 miles east of the terminal site.

Table 4.3-2 Designated Uses for Waterbodies Within the Project Area				
Subsegment Name (Subsegment No.)/ Description	**Project Component within Basin Subsegment**	**Milepost**	**Designated Use[a]**	**Water Quality Impairment**
Barataria Basin				
Barataria Bay (021101)/Caminada Bay, Hackberry Bay, Bay Batiste, and Bay Long	Pipeline System	0.0-1.8	A, B, C, E	None
	Barge Access Channels	NA		
Wilkinson Canal and Wilkinson Bayou (020904)/Wilkinson Canal and Wilkinson Bayou	Pipeline System	1.8 to 10.8	A, B, C, E[b]	Fecal Coliform
	Barge Access Channels	NA		
Bay Sansbois, Lake Judge Perez, and Bay De La Cheniere (020907)/Bay Sansbois, Lake Judge Perez, Lake Five, Oaks Bayou, Lake Laurier, and Bay De La Cheniere	Terminal Site	NA	A, B, C, E	None
	Barge Access Channels	NA		
	Pipeline System	10.8 to 15.1		
Mississippi Basin				
Mississippi River (070301)/Monte Sano Bayou to Head of Passes	Terminal Site	NA	A, B, C, D	None

a Louisiana State Water Quality Classifications (LDEQ, 2018a) designated uses include:
A = Primary Contact Recreation
B = Secondary Contact Recreation
C = Fish and Wildlife Propagation
D = Drinking Water Supply
E = Oyster Propagation
b Designated use is not fully supported due to fecal coliform impairment.

Table 4.3-3 LNG Terminal Site Waterbodies						
Waterbody	**Flow Regime**	**Description**	**Acres within Terminal Site**	**Acres of Permanent Fill**	**Acres of Permanent Modification Other than Fill**	**Acres of Temporary Impacts**
LNG Terminal						
WB001	Perennial	Man-made Canal	1.9	0.0	0.0	0.0
WB002	Intermittent	Man-made Ditch	0.3	0.3	NA	NA
WB003	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB004	Intermittent	Man-made Ditch	0.2	0.2	NA	NA
WB005	Perennial	Man-made Canal	3.1	3.1	NA	NA
WB006	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB007	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB008	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB009	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB010	Intermittent	Man-made Ditch	0.2	0.2	NA	NA
WB011	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB012	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB013	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB014	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB015	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB016	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB017	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB018	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB019	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB020	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB021	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB022	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB023	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB024	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB025	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB026	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB027	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB028	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB029	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB030	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB031	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB032	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA

Table 4.3-3 LNG Terminal Site Waterbodies						
Waterbody	Flow Regime	Description	Acres within Terminal Site	Acres of Permanent Fill	Acres of Permanent Modification Other than Fill	Acres of Temporary Impacts
WB033	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB034	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB035	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB036	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB037	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB038	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB039	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB040	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB041	Ephemeral	Man-made Ditch	0.9	0.9	NA	NA
WB042	Perennial	Mississippi River	87.3	0.0	14.6	72.7
WB043	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB044	Ephemeral	Man-made Ditch	0.3	0.3	NA	NA
WB045	Perennial	Man-made Ditch	2.6	0.0	0.2	1.1
Eastern Workspace						
WB101	Perennial	Man-made Canal	>0.1	0.0	0.0	0.0
WB102	Perennial	Man-made Canal	0.6	0.0	0.0	0.0
WB103	Perennial	Man-made Canal	2.6	0.0	1.2	0.0
WB104	Perennial	Man-made Canal	<0.1	<0.1	NA	NA
WB105	Ephemeral	Man-made Ditch	0.2	0.2	NA	NA
WB106	Ephemeral	Man-made Ditch	0.4	0.3	0.0	0.0
Sources: SWCA, 2015; Venture Global, 2017						

Pipeline System

The pipeline system and barge access channels traverse wetlands, canals, and estuarine open waters within the Barataria Basin (figure B-6 in appendix B). The Barataria Basin lies in the eastern coastal region of Louisiana and is bounded to the north and east by the Mississippi River, to the west by Bayou Lafourche, and to the south by the Gulf of Mexico. The basin is approximately 120 miles long and ranges from 24 to 35 miles wide. Major features include natural and artificial levees, a central marsh landmass, and a chain of barrier islands. Elevations range from -2 feet to 4 feet above sea level. The USACE maintains several navigation channels in the basin, which include: the Barataria Bay Waterway; the Gulf Intracoastal Waterway; and the Empire-Gulf Waterway. Freshwater and sediment inputs into the Barataria Basin have been diminished by the construction of levees along the Mississippi River and the closure of Bayou Lafourche at Donaldsonville, Louisiana. The main source of freshwater for the basin is rainfall.

As presented in table 4.3-4, the pipeline system traverses the following LDEQ watershed subsegments within the Barataria Basin: Barataria Bay; Wilkinson Canal and Wilkinson Bayou; and Bay Sanbois, Lake Judge Perez, and Bay de la Cheniere (LDEQ, 2018a). The designated uses established for all three of these subsegments are primary contact recreation, secondary contact recreation, fish and wildlife propagation, and oyster propagation. Two of the three subsegments fully support all four functions. Wilkinson Canal and Wilkinson Bayou do not fully support oyster propagation due the presence of fecal coliform, but support the other three designated uses.

The pipeline system crosses approximately 12.1 miles of open water habitat. Table 4.3-4 presents the waterbodies traversed by the pipeline, aboveground facilities, and barge access channels (figure B-6 in appendix B). The table includes mileposts, description, type, and crossing method.

Table 4.3-4 Waterbodies Affected by the Pipeline System					
Waterbody[a]	Crossing Length (feet)	TGP Milepost	Description	Type	Crossing Method/ Facility/Access Channel
WBB000	14,784	0.0 to 2.8	Bay Batiste	Open Water	Barge Lay
WBB000	7,920	2.8 to 4.3	Wilkinson Bayou	Open Water	Barge Lay
WBB000	23,232	4.3 to 8.7	Wilkinson Bay/North Wilkinson Bay	Open Water	Barge Lay
WBB000	8,448	9.2 to 10.8	Raquette Bay	Open Water	Barge Lay
WBB000	2,640	10.8 to 11.3	Wilkinson Bayou	Open Water	Barge Lay
WBB000	232	11.4 to 11.5	Hermitage Bayou	Open Water	Push/Pull
WBB000	430	11.7 to 12.1	Bayou Tambor	Open Water	Push/Pull
WBB000	220	12.2 to 12.3	Bayou Tambor	Open Water	Push/Pull
WBB000	1,120	12.4 to 12.6	Bayou Tambor	Open Water	Push/Pull
WBB000	7,920	12.7 to 14.2	Mix of unnamed channels, wetlands[b], and open water	Open Water/Wetland[b]	Push/Pull
WBB016	20	14.5 to 14.5	Unnamed Channel	Perennial Stream	Pipe Bridge
WBA056	26	14.8 to 14.8	Unnamed Channel	Perennial Stream	HDD
Aboveground Facilities					
WBB000	NA	0.0	Bay Batiste	Open Water	TGP Meter Station
WBB000	NA	3.3	Wilkinson Bayou	Open Water	TETCO Meter Station
Barge Access Channels					
WBB000	25,280	NA	Bayou St. Denis and Barataria Bay	Open Water	Barge Access Channel 1
WBB000	56,705	NA	Barataria Bay, Wilkinson Canal, Oaks Bayou, Lake Laurier, Wilkinson Bayou	Open Water	Barge Access Channel 2
WBB000	17,215	NA	Barataria Bay, Bay Batiste	Open Water	Barge Access Channel 3

a Field surveys conducted by Venture Global label all waters between TGP MP 00 and MP 14.8 as WBB000. This area is a mosaic of open water and wetlands. For the purposes of this table, we have sub-dived waterbody WBB000 to describe the named waterbodies traversed by the Project. The wetland portions of this area are discussed in section 4.4.1.
b The wetlands are discussed in section 4.4.1.

Venture Global has indicated that the channel depth for five portions of the barge access channels, totaling 9.1 miles, is not sufficient to allow for delivery of pipe and equipment to the pipeline construction right-of-way. These areas would require dredging to facilitate access from the Intracoastal Waterway via Barataria Bay and Wilkinson Canal. Venture Global proposes dredging, with a mix of excavation and wheel washing (propeller wash agitation), to achieve the necessary channel depth. Table 4.3-5 presents the proposed dredging areas, types of dredging, and dredging impacts.

Table 4.3-5
Pipeline System Barge Access Channel Dredging Impacts

Segment	Waterbody Name	Wheel Washing (linear feet)	Excavation (linear feet)	Total Length (linear feet)	Area of Disturbance (acres)
Barge Channel 1	Barataria Bay	1,200	11,913	13,113	86.3
Barge Channel 2					
Segment A	Barataria Bay	200	7,070	6,870	122.4
Segment B	Wilkinson Canal	1,095	550	1,095[a]	7.5
Segment C	Lake Laurier	875	9,724	10,399[a]	66.8
Barge Channel 3	Barataria Bay	6,688	9,870	16,538	113.9
	Total	**10,058**	**38,727**	**48,015**	**322.6**

a Total length is not a sum of the wheel washing linear feet and the linear feet of excavation due to overlapping areas where wheel washing and excavation are both proposed.

4.3.2.2 Surface Water Impacts and Mitigation

Impacts on surface waters resulting from construction and operation of the LNG terminal and pipeline system and the measures proposed to avoid or minimize impacts on surface waters are described below.

LNG Terminal

Table 4.3-3 describes the surface waters that would be affected as a result of construction and operation of the LNG terminal. Potential impacts on surface waters during construction and operation of the LNG terminal are associated with construction of the LNG ship berthing facilities, vessel traffic, site modification and stormwater runoff, hydrostatic testing, and spills or leaks of hazardous materials. Venture Global does not propose any dredging of the berthing facilities, as the maintained depth and width of the Mississippi River is sufficient for LNG vessel operation.

<u>Construction of the LNG Loading Docks and Ship Berthing Facilities</u>

Construction of the LNG loading docks and ship berthing facilities would be conducted in two phases. Phase I would consist of construction of three temporary marine delivery facilities and two of the three LNG loading docks. Phase II would consist of constructing the last LNG loading dock, removal of the temporary marine delivery facilities, and restoration of the area affected by the temporary marine delivery facilities.

The three temporary marine delivery facilities would consist of a bulk carrier mooring facility, barge mooring facility, and an MOF. The bulk carrier mooring facility would consist of five steel mooring piles. The barge mooring facility would consist of six steel mooring piles. The MOF would consist of a concrete platform supported by large-diameter steel piles. Each of the three LNG loading docks would feature a concrete platform that would be constructed on steel piles, four breasting dolphins, and six mooring dolphins. The proposed marine facilities would occupy a portion of the approximately 7,000 feet of river frontage. The LNG loading docks and temporary marine delivery facilities (bulk carrier mooring facility, barge mooring facility, and MOF) would occupy an approximately 14.6-acre footprint in the river channel and in wetlands along the river bank. The loading docks would be connected to shore by pipe and access trestles. A separate jetty substation, located on steel piles, would provide electricity to the loading docks. Land-based access for each dock would be via a staircase, supported by a concrete and compacted fill base.

Construction of the LNG loading and ship berthing facilities would require over-water and land-based equipment installation (e.g., LNG loading platform, pipe and roadway trestle, marine gangway). A combination of conventional in-water marine construction equipment (e.g., barges, cranes, pile driving equipment) and shore-based construction equipment (e.g., backhoes, bulldozers) would be used to install the LNG loading docks, pilings, and over-water structures. Construction of the marine facilities would require approximately 72.7 acres of temporary workspace within the river channel for anchoring of construction vessels, specifically barge mounted cranes for installation of the piles.

Construction of the LNG loading and ship berthing facilities would result in localized, temporary increases in turbidity and suspended sediment levels in the Mississippi River due to excavation and pile driving. However, these impacts are expected to be temporary (i.e., confined primarily to the period of in-water activity and shortly thereafter) and limited to the area within and immediately adjacent to the LNG loading and ship berthing facilities. No long-term or permanent water quality impacts are anticipated because there is no dredging required at the terminal.

Venture Global is required to obtain several permits that would address placement of the LNG terminal marine structures within the Mississippi River, including permits under section 404 of the CWA and sections 10 and 14 of the RHA of 1899 from the USACE. In June 2017, two Joint Permit Applications (JPAs) were submitted to the USACE and the LDNR; one for the LNG terminal and one for the pipeline system. These applications were submitted under sections 404 and 401 of the CWA, sections 10 and 14 of the RHA, and the Coastal Use Permit regulations. Revised applications were submitted in July 2016. In September 2017, a JPA was submitted to the USACE that combined the applications for the terminal and the pipeline. Venture Global received the section 401 Water Quality Certification from the LDNR for the LNG terminal and pipeline system on October 1, 2018. Venture Global anticipates receipt of the USACE permits in July 2019.

Vessel Traffic

Shoreline Erosion and Resuspension

The portion of the Mississippi River where the marine facilities are proposed has been modified by placement of rip-rap and a concrete revetment mattress along the river bank. These modifications are designed to minimize shoreline erosion along this major shipping lane. To minimize impacts on the existing revetment, Venture Global would repair any damage to rip-rap and concrete revetment mattress resulting from marine facility installation in accordance with necessary permit requirements; however, Venture Global is not proposing additional placement of rip-rap or revetment structures within the terminal marine facilities as the shoreline is already armored. Due to the previous armoring and Venture Global's commitment to repair or replace rip-rap and concrete revetment mattress, the new facilities would not result in additional erosion of the river bank.

To minimize erosion and sedimentation impacts on surface waters during construction, Venture Global would conduct land-disturbing activities in compliance with the LPDES program (Construction General Permit for storm water discharges and a Project-specific SWPPP), as required under the CWA and Louisiana law. Venture Global would install erosion control devices after initial clearing, but before soil disturbance, and maintain all erosion control devices in accordance with applicable permit conditions until restoration or surface stabilization is complete. Temporary erosion and sediment control devices and measures may include sediment barriers, storm water diversions, trench breakers, mulch applications, and revegetation.

The Mississippi River is maintained by the USACE to provide deep water access for maritime commerce. Ships calling on the LNG terminal during operations would be similar in nature to other existing ship traffic along this portion of the Mississippi River. LNG carriers transiting the Gulf of Mexico would use established shipping channels. As such, use of the waterways by LNG carriers, barges, and support vessels during construction and operation of the LNG terminal would be consistent with the planned purpose and use of active shipping channels, and associated impacts on water quality within the shipping channel would be minor.

Ballast Water Discharge

LNG carriers serving the LNG terminal would likely arrive with empty cargo tanks to be loaded with LNG destined for export. Vessels with empty cargo tanks ride higher in the water and can experience challenges associated with navigation due to the extra sail area (i.e., ship surface area above the water line). Challenges include the vessel being more susceptible to wind influences and less efficient as a result of reduced performance of the propeller, rudder, and propulsion system. To reduce or eliminate the challenges of navigating the ship without cargo aboard, water is often taken in from the surrounding waters and placed in ballast tanks to provide additional draft and improve navigation. To maintain a constant draft, ballast water is typically discharged below the water surface as the LNG cargo is loaded. The amount of ballast water discharged during LNG cargo loading would vary depending on the size of the LNG carrier. Venture Global estimates the ballast water discharge would not exceed 60,000 cubic meters (approximately 16 million gallons) per vessel.

As required by the USCG's regulations (33 CFR 151.2026), vessels equipped with ballast tanks must implement one of five specified options to control nonindigenous species in waters of the United States, including the introduction of invasive aquatic organisms into local waters. The International Maritime Organization (IMO) adopted this regulation and requires each vessel to install and operate a ballast water management system. These requirements would apply to all LNG carriers serving the Project.

Carriers calling at the LNG terminal would be required to comply with the USCG ballast water management regulations and procedures that establish a standard for the allowable concentration of living organisms in ships' ballast water discharged in waters of the United States. The USCG has also established engineering equipment requirements and an approval process for ballast water treatment systems installed on ships. All ships calling at U.S. ports and intending to discharge ballast water must either carry out open sea exchange of ballast water or ballast water treatment, in addition to fouling and sediment management. Venture Global would include these requirements in agreements for carriers calling at the LNG terminal. Therefore, any ballast water introduced into the Mississippi River would be primarily composed of open ocean water collected during ballast water exchange.

Ballast water discharges at the LNG terminal could impact water quality by changing the salinity, temperature, pH, and dissolved oxygen level of water within the vicinity of the LNG terminal loading docks in the Mississippi River. The physiochemical composition of ballast water in comparison to the water present within the Mississippi River would vary depending on the flow of the Mississippi River at the time of discharge.

The primary potential impact on water quality due to ballast water discharge would be a temporary increase in salinity level. As described above, the Mississippi River is usually freshwater at the terminal site; however, during periods of low flow, saltwater can push up the Mississippi River to the terminal site and beyond. Ballast water, which would generally consist of open ocean water, would have a salinity of approximately 35 parts per thousand (ppt) (NOAA, 2018). In general, ballast water would have a higher salinity than the surrounding water at the LNG loading docks. Natural flow would rapidly dilute the ballast water discharge and increased salinity would represent a temporary and minor impact on water quality within the Mississippi River.

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. The pH of the ballast water (reflective of sea water in open ocean conditions) is maintained in a fairly narrow range (8.1 to 8.5). The pH within the Mississippi River ranges from 7.2 to 7.9, with a median of 7.7 at Belle Chasse (USGS, 2013a), which is lower than seawater. Although the pH of the ambient water at the terminal site is anticipated to be lower than the ballast water, the difference in pH is minor and would be expected to quickly normalize.

Another water quality parameter that may be influenced by ballast water discharges is dissolved oxygen level. Dissolved oxygen levels in water are dependent upon many factors including temperature, rainfall, tidal magnitude, depth, currents, and phytoplankton activity. Ballast water would contain low dissolved oxygen levels and could decrease existing dissolved oxygen levels in the immediate vicinity of the discharge point. Although the dissolved oxygen of the ambient water at the terminal site is anticipated to be higher than the ballast water, it is expected that the dissolved oxygen of the ballast water would quickly normalize.

The amount of ballast water discharged into the Mississippi River during each LNG carrier visit to the LNG terminal would make up a small percentage of the water within the Mississippi River, as the Mississippi River discharges, on average, nearly 400 billion gallons per day into the Gulf of Mexico (NPS, 2018). Venture Global estimates that ballast water discharges would not exceed 16 million gallons per vessel, and Venture Global anticipates approximately 310 vessels annually. At full capacity, the terminal could accommodate six carriers per week. Therefore, ballast water discharge events could occur up to six times per week. Due to the high volume of water that flows along the Mississippi River, we conclude that impacts on salinity, pH, temperature, and dissolved oxygen would be temporary and minor.

Site Modification and Stormwater Runoff

During site preparation at the LNG terminal, several drainages ditches would be filled. The terminal site has a grid of drainage ditches that are part of the fastlands system formerly created to facilitate agriculture and development in the Project area. This system of drainage ditches moves water from the fastlands to a pumping station near Lake Judge Perez, where the water is pumped into Lake Judge Perez. Table 4.3-4 presents all the waterbodies within the terminal site and the adjacent eastern workspace, as well as the proposed impacts on these waterbodies. Table 4.3-6 presents a summary of the temporary and permanent impacts on waterbodies at the terminal site, including the landward terminal facilities, marine facilities, and the eastern workspace.

Table 4.3-6
Summary of Waterbody Impacts in Acres at the Terminal Site

	Perennial		Intermittent		Ephemeral		Total	
Facility	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Permanent**
Terminal Facilities	1.1	0.4	<0.1	0.8	0.1	13.1	**1.2**	**14.2**
Marine Facilities	72.7	14.6	0.0	0.0	0.0	0.0	**72.7**	**14.6**
Eastern Workspace	0.0	1.2	0.0	0.0	0.0	0.5	**0.0**	**1.7**
Total	**73.8**	**16.2**	**<0.1**	**0.8**	**0.1**	**13.6**	**73.9**	**30.5**

Since the landward terminal facilities south of SH 23 would be surrounded by a floodwall that is 28 feet above proposed grade, stormwater inside the terminal facilities would be collected through a series of ditches into a series of sumps. Sump pumps would pump the stormwater to the stormwater header, from which it would then be pumped to the Mississippi River. Sumps that service LNG spill impoundment basins and other facilities where hazardous materials may be present would be equipped with automatic shutoffs that activate when LNG or other solvents are present. This would prevent contaminated stormwater from being pumped from the facility. Stormwater from the LNG terminal marine facilities would be collected and processed through oil/water separators prior to discharging to the Mississippi River.

As described in section 4.2.2, Venture Global indicated that are no contaminated soils within the LNG terminal site. Therefore, construction activities are not expected to introduce contaminated sediments to adjacent surface waters or the Mississippi River. To minimize impacts on water quality due to increased stormwater runoff during construction, land disturbing activities would be conducted in compliance with: the LPDES General Permit for stormwater discharges from construction activities of 5 acres or more; Venture Global's Project-specific Construction SWPPP; and Venture Global's Plan and Procedures.

With implementation of the stormwater treatment system described above and adherence to Venture Global's SWPPP and LDEQ and EPA requirements, stormwater discharges resulting from construction and operation of the LNG terminal would result in temporary and minor impacts on surface waters.

Hydrostatic Testing

Before being placed into service, plant piping and storage tanks (other than LNG storage tanks) would be hydrostatically tested using municipal sources, surface waters, and/or groundwater. Table 4.3-1 identifies the volume of water required and the proposed water source. Venture Global would utilize 50,000 gallons of water, recycled over five uses, to test plant piping and tanks other than the LNG storage tanks. Venture Global would utilize 26,200,000 gallons of water for hydrostatic testing of a single LNG storage tank. The water for LNG storage tank hydrostatic testing would be transferred between tanks to conserve water.

Venture Global proposes to utilize an adjacent drainage canal on the southern edge of the terminal site as a source for the 26,200,000 gallons of water required for hydrostatic testing for the LNG storage tanks. Water would be withdrawn from the canal at a rate of 1,500 gallons per minute to minimize impingement of aquatic organisms and debris. The intake structure would be fitted with 0.25-inch to 0.5-inch screens to minimize entrainment of aquatic organisms and debris.

Small quantities of water used for hydrostatic testing may be discharged directly to the ground in well-vegetated upland areas in accordance with Venture Global's Procedures. Large discharges of hydrostatic test water would be treated, as necessary, and discharged to the Mississippi River, into adjacent drainage canals, or on-site in accordance with permit conditions. Pumps and energy dissipation devices would be used to control the discharge rate and limit scouring and erosion.

Where water from the nearby drainage canal is used to hydrostatically test the LNG storage tanks, chemical additives may be required during the testing process to neutralize bacteria and other components that can be corrosive. Before returning hydrostatic water to its surface water source, Venture Global would pass the water through 25 to 50 micron filters and an active carbon medium to remove suspended solids and neutralize or biodegrade the chemical additives. Following completion of the hydrostatic testing and prior to discharge, the test water would be analyzed for total suspended solids, oil and grease, and pH in accordance with LPDES general permit LAG670000.

Venture Global would comply with all testing requirements and environmental conditions of the LPDES General Permit for Discharges of Hydrostatic Test Water. Therefore, we conclude that impacts on surface waters as a result of hydrostatic testing would be negligible.

Spills

During construction and operation, hazardous materials resulting from spills or leaks flushed into the Mississippi River with stormwater could have an adverse impact on water quality. To prevent spills and leaks, Venture Global would implement its final Project-specific SPCC Plan during operation of the LNG terminal, which outlines potential sources of releases at the site, measures to prevent a release, and initial responses in the event of a spill. Given the impact minimization and mitigation measures described above, impacts on surface waters due to spills or leaks during construction and operation of the LNG terminal would be temporary and minor.

Pipeline System

Pipeline

The majority of the pipeline system (approximately 12.1 miles) would be constructed in open water, including bays, canals, bayous, and unnamed channels. Table 4.3-4 provides a list of affected waterbodies. In expansive open water areas, Venture Global would utilize a barge lay method (as described in section 2.5.2.4). Where open water channels are intermingled with wetlands, Venture Global would utilize a push/pull construction method (as described in section 2.5.2.5). Venture Global proposes to utilize conventional lay techniques for approximately 475 feet of the pipeline system route from SW lateral TGP MP 14.3 to SW lateral TGP MP 14.4, south of Lake Hermitage Road. North of Lake Hermitage road, the pipeline system would cross a levee and a perennial canal (WBB016) with a pipe trestle. From the pipe trestle to the LNG terminal, Venture Global would utilize HDD to cross a perennial canal (WBA056) and enter the terminal site.

The construction right-of-way for the barge lay construction technique would be 300 feet wide for each pipeline, with 250 feet of overlap, for a total construction right-of-way of 350 feet. The construction right-of-way for the push/pull construction technique would be 130 feet wide. In total, approximately 505.4 acres of waterbodies would be temporarily affected by construction of the pipeline system. All impacts would be temporary in nature, and the right-of-way would be restored post-construction.

The two primary methods for open water construction, barge lay and push/pull, require excavating a trench to accommodate the pipeline. Additionally, some minimal vegetation clearing and grading may be necessary along some portions of the push/pull installation. Vegetation clearing and grading would occur along the 475 feet of conventional lay. Runoff from the construction right-of-way in the conventional lay areas could affect nearby surface waters. Vegetation clearing and grading, trenching, and backfilling could increase sedimentation rates and turbidity levels. These activities could also reduce dissolved oxygen in the water column and release chemical or nutrient pollutants from sediments. In additional, refueling of vehicles over or near open water and the storage of fuel, oil, and other hazardous materials near surface waters could result in accidental spills that could contaminate surface waters.

Dredging through excavation and wheel washing would be necessary along some of the barge access channel that would be utilized to transport pipe and equipment to the right-of-way. Table 4.3-5 presents the location and quantities of dredge that would be required. These dredging activities could increase sedimentation rates and turbidity levels. These activities could also reduce dissolve oxygen in the water column and release chemical or nutrient pollutants from sediments.

Venture Global would minimize potential impacts on surface waters by implementing the Project-specific Procedures and the general and special conditions included in the USACE permit. In order to minimize potential impacts associated with an accidental spill of fuel, oil, or other hazardous materials, Venture Global would implement its Project-specific SPCC Plan, which identifies potential sources of hazardous materials present during construction activities and the measures that would be implemented to prevent, contain, and clean up accidental releases. With the implementation of this plan and the Project-specific Procedures, impacts on water quality in the event of a spill or leak are expected to be minor.

Impacts on surface waters are not expected during operation of the pipeline system because no further in-stream activities are expected. Because the pipelines would be installed at a sufficient depth below the beds of waterbodies, exposure of the pipe is not anticipated. In the event that a pipeline anomaly (e.g., corrosion, dent, rupture) is detected during routine inspections that could require pipeline excavation or replacement within a waterbody, impacts would be similar to those described above for construction.

Impacts on surface water resources due to construction and operation of the pipeline system would be temporary and localized. Venture Global would implement the Project-specific Plan and Procedures and SPCC Plan and follow all permit requirements to minimize impacts on water resources during construction and operation of the pipeline system. Therefore, we conclude that impacts on surface waters from construction and operation of the pipeline system would be minor.

<u>Aboveground Facilities</u>

Construction of the aboveground facilities (meter stations and stand-alone mainline valves) would affect waterbodies. The pipeline system would interconnect with existing TGP and TETCO pipelines at two separate open water locations in Bay Batiste and Barataria Bay, respectively, where the water depth averages 6 feet to 8 feet. A meter station would be constructed at each of the two locations. Venture Global would elevate the meter stations on pilings at a sufficient height above the water line to protect against storm surge. While the SW lateral TGP platform would encompass 1.1 acres and the SW lateral TETCO platform would encompass 1.3 acres, they would be fully supported on piles and no fill would be required for construction of either meter station. Thus, for each meter station, the actual acreage of surface water impact would be considerably less than the platform acreage.

Impacts on water quality associated with construction of the meter stations and mainline valves would be similar to those described above and would be minimized through the implementation of the Project-specific Procedures, the general and special conditions included in the USACE's permit, and Venture Global's Project-specific SPCC Plan (see "Pipelines," above). Therefore, we conclude that the impacts on surface waters from aboveground facility construction and operation would be minor.

Hydrostatic Testing

The lateral pipelines would be hydrostatically tested for structural integrity prior to being placed in service. Testing would be completed by capping installed pipe segments with test manifolds, filling these segments with available water, and pressurizing this water to levels beyond the maximum operating pressure of the pipeline. The water would be maintained at these pressure levels for a minimum of 8 hours. Hydrostatic testing must be conducted in a manner that meets or exceeds the DOT's "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards" (49 CFR 192). Venture Global estimates that 5,626,316 gallons of water would be required for hydrostatic testing of the SW lateral TGP pipeline, and 3,997,658 gallons of water would be required for hydrostatic testing of the SW lateral TETCO pipeline.

The SW lateral TGP and SW lateral TETCO HDD segments would be hydrostatically tested prior to installation. Water from the existing drainage canal (WBA056) along the south side of the LNG terminal (SW lateral TGP MP 14.8) would be used as the test water source. The withdrawal location would be in the construction right-of-way. Like the water uptake for HDD mud preparation, the pumping rate would vary from 250 to 500 gallons per minute and the water would be passed through a 0.25-inch to 0.5-inch mesh screen to block the uptake of various debris and aquatic biota. After testing, the water would be discharged back into the canal through an energy dissipating structure.

Apart from the HDD segments mentioned above (which would both be constructed in Phase I), hydrostatic testing of the SW lateral TGP and the SW lateral TETCO would occur during Phase I and Phase II, respectively. For each pipeline, water would be withdrawn near the TGP (Phase I) and TETCO (Phase II) platforms. The pumping rate would be up to 1,200 gallons per minute, and the suction end of the transfer hose would be equipped with screens ranging from 0.25 inch to 1 inch to prevent the uptake of various debris and aquatic biota. If necessary, a corrosion inhibitor would be added to protect the pipe. Prior to discharge, the water would flow through 25 to 50 micron filters to remove any entrained solids and an active carbon medium to remove chemical contaminants. The discharge location for Phase I would be the drainage canal along the south side of the terminal site at SW lateral TGP MP 14.8. The discharge location for Phase II would be the mainline valve site at SW lateral TGP MP 14.4 on the south side of Lake Hermitage Road.

Environmental impacts from the discharge of hydrostatic test water would be minimized by adoption of the measures prescribed in the Project-specific Plan and Procedures. Venture Global would locate hydrostatic test manifolds outside of wetlands and riparian areas, to the extent practicable, and would comply with all appropriate requirements of LPDES general permit LAG670000 for hydrostatic test wastewater discharges. By implementing the measures described above, we conclude that impacts on water resources as a result of hydrostatic testing would be minor.

4.3.2.3 Modifications to FERC Procedures

Venture Global developed Project-specific Procedures by modifying our Procedures as necessary for this Project. We have reviewed these modifications as they relate to waterbodies (sections I to V) and have found the majority of them to be justified, particularly given the hydrology of the region. As we present in section 2.5.5.5, those proposed modifications that are substantive and for which we have determined Venture Global provided adequate justification are listed in appendix C, table 2. Some of the requested modifications are discussed below.

Time Window for Construction

Section V.B.1 of our Procedures require that instream work within cool-water and warm-water fisheries must occur from June 1 to November 30, unless expressly permitted or further restricted by the appropriate federal or state agency in writing on a site-specific basis. Venture Global has stated that specific seasonal construction would not be practical. As the Procedures allow this modification with permission, in writing, from the appropriate federal or state agency, **we recommend that:**

- **<u>Prior to construction of the pipelines</u>, Gator Express Pipeline should file with the Secretary written documentation of consultation with the LDWF expressly permitting the requested construction time windows for waterbody crossings or confirmation that it will adhere to the warmwater fishery crossing time windows in the FERC Procedures.**

Equipment Staging, Fueling, and Storage of Hazardous Materials

Section IV.A.1.d of our Procedures requires all equipment to be 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 EI 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. In construction locations where there is no reasonable alternative other than to locate upland refueling sites less than 100 feet from wetlands or waterbodies, the Project would maintain at least a 10-foot setback. All refueling and equipment storage procedures, irrespective of proximity to wetlands or waterbodies, would be undertaken in accordance with Venture Global's SPCC Plan to reduce the potential for spills during construction and to mitigate the environmental impacts if a spill were to occur.

Section IV.A.1.e of our Procedures requires that hazardous materials, including chemicals, fuels, and lubricating oils, be stored at least 100 feet from 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. Equipment used in wetlands and open water would often operate at long distances (up to several miles) from the nearest upland refueling station. To move the equipment out of the wetland or open water for refueling, possibly on multiple occasions, is logistically impractical and potentially more environmentally damaging than refueling in situ. To minimize the environmental damage caused by excessive relocation of equipment, towed fuel barges would accompany amphibious equipment as construction progresses. Equipment operators would be fully trained in refueling procedures and Venture Global's SPCC Plan.

Extra Work Space

Section V.B.2.A of our Procedures requires that additional temporary workspace (ATWS) be at least 50 feet from the water's edge except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. For this Project area, several ATWSs are located within waterbodies. The in-water siting of these ATWSs is due to either standing water or the lack of cohesiveness in the saturated soil within the pipeline construction right-of-way and the consequent need for adjacent areas in which the additional volumes of loosely aggregated spoil generated at foreign pipeline crossings could be temporarily stored. These ATWSs would be used only for placement of spoil, and any equipment used for this purpose would work from barges or other similar platforms and would be within a secondary containment structure to reduce the risk of spills of fuels or other pollutants from entering the waterbody. The same secondary containment provisions would apply for equipment operating within the ATWS located at the meter station platforms and the barge staging area. Locations where Venture Global has proposed to place ATWSs areas in or within 50 feet of waterbodies are presented in table 4.3-7.

We have reviewed these proposed ATWS locations and conclude this modification has been adequately justified. Because the majority of the Project area consists of open water and coastal marsh, siting these ATWS areas in upland areas is not feasible for this Project.

Table 4.3-7 Proposed Locations of Additional Temporary Workspaces within Waterbodies							
TGP Approximate Milepost (direction from centerline)[a]	ATWS Dimensions (feet)	ATWS Acreage	Project Construction Activity	Waterbody Name	Waterbody Type and ID Number	Waterbody Impact Acreage	Justification
0.0	1,200 x 1,000	25.4	TGP Meter Station Platform	Barataria Bay	Subtidal WBB000	25.4	ATWS needed for placement of platform construction barge anchors and maneuvering of equipment and material barges during construction of meter station platform in open water.
3.4	1,400 x 1,400	37.1	TETCO Meter Station Platform	Barataria Bay	Subtidal WBB000	37.1	ATWS needed for placement of platform construction barge anchors and maneuvering of equipment and material barges during construction of meter station platform in open water.
7.0 (West)	2,335 x 50 and 840 x 250	7.4	Foreign Pipeline Crossing (Barge Lay)	Wilkinson Bay	Subtidal WBB000	7.4	ATWS needed for placement of additional spoil from new pipeline facilities crossing an existing foreign 8-inch-diameter pipeline.
7.0 (East)	2,290 x 50 and 675 x 250	7.3	Foreign Pipeline Crossing (Barge Lay)	Wilkinson Bay	Subtidal WBB000	7.3	ATWS needed for placement of additional spoil from new pipeline facilities crossing an existing foreign 8-inch-diameter pipeline.
9.0 (West)	250 x 137 – irregular shape	0.8	Foreign Pipeline Crossing (Barge Lay)	Upper Wilkinson Bay	Subtidal WBB000	0.3	ATWS needed for placement of additional spoil from new pipeline facilities crossing an existing foreign 6-inch-diameter pipeline.
9.0 (East)	250 x 338 – irregular shape	1.9	Foreign Pipeline Crossing (Barge Lay)	Upper Wilkinson Bay	Subtidal WBB000	0.1	ATWS needed for placement of additional spoil from new pipeline facilities crossing an existing foreign 6-inch-diameter pipeline.
11.0 (West)	500 x 1,788 – irregular shape	20.5	Barge Staging Area	Wilkinson Bay	Subtidal WBB000	20.5	ATWS needed for temporary placement of pipe and material barges during construction of pipeline segments in open water of Barataria Bay and Wilkinson Bay.
14.2 (West)	1,220 x 50 and 210 x 250	2.9	Foreign Pipeline Crossing (Push) and Pipe Bend Installation	Wilkinson Bay Tidal Area	Subtidal WBB000	1.1	ATWS needed for placement of additional spoil from new pipeline facilities crossing an existing foreign 20-inch-diameter pipeline.
14.2 (East)	1,080 x 50 and 160 x 250	2.4	Foreign Pipeline Crossing (Push) and Pipe Bend Installation	Wilkinson Bay Tidal Area	Subtidal WBB000	0.2	ATWS needed for placement of additional spoil from new pipeline facilities crossing an existing foreign 20-inch-diameter pipeline.
a All listed ATWS are located within waterbodies.							

4.4 WETLANDS

The USACE defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (Environmental Laboratory, 1987).

At the federal level, wetlands are regulated under section 404 of the CWA, which establishes standards to evaluate and reduce total and net impacts on wetlands under the jurisdiction of the USACE. In general, wetland impacts need to be avoided, if possible. If avoidance is not possible, impacts are to be minimized, rectified, reduced, and mitigated in accordance with federal and state regulations, including our Procedures and the USACE's section 404(b)1 guidelines, which restrict discharges of dredged or fill material where a less environmentally damaging and practicable alternative exists. USACE jurisdictional wetlands potentially affected by the Project are subject to review by the USACE to ensure that wetland impacts are fully identified and that appropriate wetland restoration and mitigation measures are identified. The Project is located in the USACE New Orleans District.

Wetland impacts authorized under section 404 of the CWA also require state water quality certification under section of the CWA and a state-issued CUP from the LDNR Office of Coastal Management (OCM) for impacts on coastal wetlands. Venture Global received the section 401 Water Quality Certification from the LDEQ on October 1, 2018, for the LNG terminal and the pipeline system. The State of Louisiana defines coastal wetlands as wetlands less than 5 feet AMSL (roughly equivalent to 5 feet NAVD88) that occur within the designated coastal zone (Louisiana Revised Statute 49:214.2). Coastal wetlands are under the jurisdiction of the LDNR Office of Coastal Management and the USACE. According to the revised June 7, 2012 Coastal Zone Inland Boundary, all Project components are located within the designated coastal zone.

Once the OCM completes its preliminary review, and the JPA CUP is deemed complete, it is forwarded to the USACE for concurrent review. In order to streamline the permit process, the program is executed jointly through an Interagency Joint Public Notice agreement with the USACE. As part of the Interagency Joint Public Notice system, the OCM submits basic project information to NMFS, FWS, EPA, LDWF, the Louisiana DOTD, SHPO, LDEQ Office of Environmental Services, and the Louisiana State Land Office. Coordination with local parishes is also required as part of the Louisiana Coastal Resources Program. Typically, these agencies submit comments or letters of no objection on projects or issue specific requirements or conditions that an applicant must comply with before the OCM will issue an authorization or permit.

In June 2017, two JPAs were submitted to the OCM: one by Plaquemines LNG for the LNG terminal (Permit Application No. P20170545), and one by Gator Express Pipeline for the pipeline system (Permit Application No. P20170543). Venture Global combined the two applications and submitted a single JPA application to the USACE in September 2017. The permit application is currently under review.

4.4.1 Existing Wetland Resources

Venture Global conducted wetland delineations at the terminal site in November 2015 and November 2016 (eastern workspace), and conducted delineations of the pipeline system in December of 2015 (figure B-6 in appendix B). Field teams employed two approaches when delineating wetlands within the Project boundary. For areas within the fastlands, the delineation involved a pedestrian survey that followed the standard wetland delineation methodology presented in the 1987 USACE Wetland Delineation Manual (Environmental Laboratory, 1987) and further defined in the Regional Supplement to the USACE Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (USACE, 2010). Outside of fastland areas, expansive coastal marshes are interspersed with canals and open water. In these areas, a desktop review of NWI maps and aerial imagery provided a baseline wetland map that the field teams used to field-verify wetland types as well as the boundaries between wetlands and open water while aboard an airboat.

Venture Global classified the wetlands and waterbodies within the Project area according to the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al., 1979). Representative species for each wetland type are presented in sections 4.5.1.1 (terminal) and 4.5.1.2 (pipeline). Five wetland types and one open water type were identified within the Project area, as described below.

- **Estuarine emergent (EEM)** wetlands, which include all tidal wetlands dominated by erect, rooted, herbaceous hydrophytes (excluding mosses and lichens) and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salt is equal to or greater than 0.5 percent and that are present for most of the growing season in most years. Perennial plants usually dominate these wetlands.
- **Palustrine emergent (PEM)** wetlands, which include all tidal and non-tidal wetlands dominated by persistent, emergent, vascular plants, emergent moss or lichens, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salt is below 0.5 percent. Plants generally remain standing until the next growing season.
- **Estuarine scrub/shrub (ESS)** wetlands, which include all tidal wetlands dominated by woody vegetation less than 5 meters (16 feet) in height, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salt is equal to or greater than 0.5 percent. Total vegetation coverage in ESS wetlands is greater than 20 percent.
- **Palustrine scrub/shrub (PSS)** wetlands, which include all non-tidal wetlands dominated by woody plants less than 6 meters (20 feet) tall in which salinity due to ocean-derived salt is below 0.5 percent.
- **Palustrine forested (PFO)** wetlands, which include all non-tidal wetlands dominated by woody vegetation greater than 6 meters (20 feet) tall, in which salinity due to ocean-derived salt is below 0.5 percent.

- **Estuarine subtidal unconsolidated bottom (E1UB)**, which includes deepwater tidal habitats with continuously submerged substrate. Venture Global defined these areas as waterbodies (open water).

Three wetland areas were identified at the terminal site consisting of two PEM wetlands located on the southwestern two-thirds of the site and one wetland area exhibiting a mixture of PEM and PFO wetlands located on the eastern portion of the site parallel to the Mississippi River. There are a total of 381.4 acres of wetlands within the terminal site consisting of 356.6 acres of PEM wetlands and 24.8 acres of PFO wetlands. In addition to the wetlands at the terminal site, four PEM wetlands (34.5 acres) were mapped within the eastern workspace adjacent to the terminal site.

For the pipeline system, field surveys were generally conducted within a 400-foot study corridor to identify and map wetlands along the pipeline system routes. The width of the corridor was established to accommodate ATWS and any subsequent route refinements for construction rights-of-way. A reduced corridor width was used for portions of the pipeline system routes collocated with foreign utilities. In these areas, the survey corridor was offset from the collocated utility on the side along which the new pipeline would be installed. Within the construction footprint of the pipeline system, 949.9 acres of wetlands and waterbodies were mapped consisting of 64.5 acres of EEM, 3.9 acres of ESS, 0.1 acre of PEM, 2.3 acres of PSS, and 880.1 acres of open water.

4.4.2 Wetlands Impacts and Mitigation

4.4.2.1 LNG Terminal

Construction of the LNG terminal would result in the permanent filling of 368.1 acres of wetlands, including impacts on wetlands within the eastern workspace. All 368.1 acres of permanent impacts as a result of permanent fill would be to PEM wetlands. In addition, 2.8 acres of PFO wetlands would be permanently converted to PEM/PSS wetlands (see table 4.4-1).

In addition to permanent impacts at the terminal site, 12.0 acres of temporary impacts would be required to construct the terminal facilities. These temporary impacts include 4.5 acres of impacts on PEM wetlands and 7.5 acres of impacts on PFO wetlands. Once construction is complete, these areas of temporary impacts would be restored. Venture Global avoided impacts on 33.0 acres of on-site wetlands, including 18.5 acres of PEM wetlands and 14.5 acres of PFO wetlands, as part of its site selection process.

Construction at the terminal site has the potential to have secondary and indirect impacts on adjacent wetlands. Implementation of protective measures in the Project-specific Plan and Procedures, the SPCC Plan, and the SWPPP, including erosion and sediment controls, would minimize the effects to adjacent wetlands.

Table 4.4-1 LNG Terminal Wetland Impacts				
Wetland ID	**Cowardin Classification[a]**	**Permanent Loss**	**Permanent Conversion**	**Temporary Impacts**
Terminal				
WET001	PEM	259.3	0.0	3.2
WET002	PEM	80.8	0.0	0.0
WET003	PFO	0.0	2.8	7.5
WET003	PEM	0.0	0.0	1.3
	Subtotal	**340.1**	**2.8**	**12.0**
Eastern Workspace				
wl101	PEM	18.6	0.0	0.0
wl102	PEM	4.0	0.0	0.0
wl103	PEM	2.4	0.0	0.0
wl104	PEM	3.0	0.0	0.0
	Subtotal	28.0	0.0	0.0
	TOTAL	**368.1**	**2.8**	**12.0**
a PEM = Palustrine Emergent Wetland, PFO = Palustrine Forested Wetland				

Construction of the LNG terminal would impact a substantial amount of wetlands. A permanent loss of 368 acres of wetlands would occur due to the LNG terminal facilities. As discussed below, Venture Global would be required to mitigate the impacts on wetlands through the USACE's permitting process. In its September 2017 section 404/10 permit application, Venture Global proposes to utilize the purchase of credits from mitigation banks as its mitigation method, which would be finalized as part of the USACE permit. If sufficient mitigation bank credits are not available to satisfy the mitigation requirements, Venture Global proposes to utilize a combination of mitigation bank credits and in-lieu program fees to satisfy wetland mitigation requirements. The permanent impacts would be primarily on wetlands within former pasture areas. These wetlands have been ditched and drained to facilitate agriculture use. This alteration has reduced the wetland function. These ditched wetlands are relatively common within fastland areas in the region. We conclude that wetland impacts would not be significant, and the impacts on wetlands would be further reduced with Venture Global's proposed wetland mitigation.

4.4.2.2 Pipeline System

Construction and operation of the pipeline system would result in the permanent filling of 0.4 acre of ESS wetlands and <0.1 acre of PSS wetlands. These permanent impacts are necessary to construct the mainline valves, permanent access road to the mainline valves, and portions of the pipe trestle over the levee near Lake Hermitage Road, although some impacts are avoided by the HDD into the LNG terminal site. Additionally, establishment of metering station platforms would encompass a total area of 2.4 acres within open waters. As these platforms would be installed on elevated piles, the actual footprint of disturbance would be considerably less. In addition to the permanent impacts, construction of the pipeline system would result in temporary impacts on 947.1 acres of wetlands and open water: 64.5 acres of EEM wetlands; 3.5 acres of ESS wetlands; 0.1 acre of PEM wetlands; 2.3 acres of PSS wetlands; and 876.7 acres of EUB (open water) (see table 4.4-2).

Although the FERC Procedures specify a maximum pipeline construction right-of-way width of 75 feet in wetlands, an increase in the width can be approved if the applicant provides site-specific justifications. Venture Global has requested and provided justification for a 130-foot-wide pipeline construction right-of-way for portions of the pipeline where direct push installation would be utilized and a 300-foot-wide pipeline construction right-of-way for portions of the pipeline where the barge lay method would be utilized. We have reviewed the Project-specific Procedures and agree with Venture Global's justification for an increased construction right-of-way width. No permanent disturbance or right-of-way clearing would occur between HDD entry and exit pits. The FERC Procedures require Venture Global to restore preconstruction wetland contours to maintain the original wetland hydrology and to return all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the EI.

Ground-disturbing activities, including the clearing of temporary workspaces and excavation of the pipeline trench and flotation canals, could temporarily affect the rate and direction of water movement within wetlands. If contours and elevations are not properly restored, these effects could adversely impact wetland hydrology and revegetation by creating soil conditions that may not support wetland communities and hydrophytic vegetation at pre-construction levels. Mixing of soil layers could alter the biological components and affect the reestablishment of native wetland vegetation. The temporary stockpiling of soil and the movement of heavy machinery across wetlands could lead to inadvertent compaction and furrowing of soils, which could alter natural hydrologic patterns, inhibit seed germination, and increase seeding mortality. Heavy machinery could also introduce non-native and invasive species to the disturbed soil. Altered surface water flow patterns, stormwater runoff, runoff from disturbed areas, and accidental spills could also negatively affect wetland regeneration.

During and following construction, Venture Global would ensure that impacts are appropriately addressed through adherence to permit conditions and implementation of the protective measures in the Project-specific Plan and Procedures, construction SWPPP, and SPCC Plan. Protective measures include:

- minimizing vegetation clearing and disturbance;
- avoiding unnecessary vehicular traffic and equipment;
- installing and maintaining erosion and sedimentation control devices;
- restricting the duration of construction, to the extent practicable;
- using timber construction mats to create a temporary work surface in wet conditions; and
- using low-pressure ground equipment in wet conditions to minimize vegetation damage, soil compaction, and rutting.

Table 4.4-2 Summary of Wetlands on the Pipeline System (acres), Pipeline System Wetland Impacts												
	EEM		**ESS**		**PEM**		**PSS**		**Open Water**		**Total**	
	Temp	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**
SW Lateral TGP												
Pipeline Facilities	22.4	0.0	1.0	0.0	0.1	0.0	1.1	0.0	108.2	0.0	132.8	0.0
Aboveground Facilities	0.0	0.0	0.0	0.4	0.0	0.0	0.0	<0.1	0.0	2.4	0.0	2.8
ATWS	29.3	0.0	1.9	0.0	<0.1	0.0	1.2	0.0	394.8	0.0	427.2	0.0
Access Road	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Access Channels	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	322.6	0.0	322.6	0.0
Subtotal	**51.7**	**0.0**	**2.9**	**0.4**	**0.1**	**0.0**	**2.3**	**<0.1**	**825.6**	**2.4**	**882.6**	**2.8**
SW Lateral TETCO												
Pipeline Facilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ATWS	12.8	0.0	0.6	0.0	0.0	0.0	0.0	0.0	51.1	0.0	64.5	0.0
Subtotal	**12.8**	**0.0**	**0.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**51.1**	**0.0**	**64.5**	**0.0**
TOTAL	**64.5**	**0.0**	**3.5**	**0.4**	**0.1**	**0.0**	**2.3**	**<0.1**	**876.7**	**2.4**	**947.1**	**2.8**

4.4.3 Modifications to the FERC Procedures

As described above, Venture Global proposes to use its Project-specific Procedures by modifying our Procedures as necessary for this Project. We have reviewed these modifications and the site-specific justifications and have found the majority of them to be justified, particularly given the hydrology of the region, and adequately protective of the environment (see appendix C, table 2). Additional discussion on the most important of these modifications is presented below.

4.4.3.1 Site-specific Justification for Right-of-way Greater than 75 Feet

Section II.A.2 of our Procedures requires site-specific justifications for the use of a construction right-of-way greater than 75 feet wide in wetlands. Venture Global states that the Project requires a 130-foot-wide construction right-of-way for pipeline installation where the push method would be used, due to the need for a relatively wide and deep trench to ensure the required depth of cover in the wet, poorly cohesive, and easily sloughed substrate, and the consequent need for increased space to sidecast relatively high spoil volumes. Venture Global further states that the Project requires a 300-foot-wide construction right-of-way for pipeline installation in open waters, where the barge lay method would be used, to accommodate an approximately 100-foot-wide floatation channel for lay barge and supply barge access and up to approximately 100 feet on either side of the floatation channel for construction workspace to deposit sidecast trench material. The 300-foot-wide construction right-of-way would allow for safe and wholly waterborne construction.

We accept that this proposed modification is necessary because the combination of pipe size, the inundated or saturated soil conditions, and the pervasiveness and extent of wetlands and open water in the Project area makes the 75-foot-wide right-of-way infeasible. Although the requirement to identify specific wetlands that require more than a 75-foot-wide right-of-way remains, in this Project area the prevalence of wetlands results in a fairly uniform construction footprint. As a result, Venture Global proposes to construct the pipelines in a 300-foot-wide right-of-way in open water from TGP MPs 0.0 to 11.3 and TETCO MPs 0.0 to 7.9. The construction right-of-way width would be reduced to 130 feet when constructing in marshes from TGP MPs 11.3 to 14.3 and TETCO MPs 7.9 to 10.9.

Construction Equipment Staging and Storage of Hazardous Materials

Section IV.A.1.d of our Procedures requires all construction equipment to be parked (overnight) and fueled at least 100 feet from a wetland boundary. In construction locations where there is no reasonable alternative other than to locate upland refueling sites less than 100 feet from wetlands or waterbodies, the Project would maintain at least a 10-foot-wide setback. All refueling and equipment storage procedures, irrespective of proximity to wetlands or waterbodies, would be undertaken in accordance with Venture Global's SPCC Plan to reduce the potential for spills during construction and to mitigate the environmental impacts if a spill were to occur.

Section IV.A.1.e of our Procedures requires all hazardous materials (e.g., fuels, oils) to be stored at least 100 feet from a wetland boundary. Equipment used in wetlands and open water would often operate at long distances (up to several miles) from the nearest upland refueling station. To track the equipment out of the wetland or open water for refueling, possibly on multiple occasions, is logistically impractical and potentially more environmentally damaging than refueling in situ. To minimize the environmental damage caused by excessive tracking, towed fuel barges would accompany amphibious equipment as construction progresses. Equipment operators would be fully trained in refueling procedures and Venture Global's SPCC Plan.

Aboveground Facilities

Section VI.A.6 requires that aboveground facilities not be located in any wetland, except where the location of such facilities outside of wetlands would prohibit compliance with DOT regulations. Venture Global states that impacts on wetlands as a result of construction of the Project's aboveground facilities would be unavoidable and that all wetlands impacted would be appropriately mitigated. As a result, construction of the aboveground structures would result in no net loss of wetlands.

Extra Work Areas

Section VI.B.1.a requires applicants to 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. Due to the prevalence of open water and marsh in the Project area, several ATWSs are necessarily located in wetlands and waterbodies. These include ATWSs required at the mainline valve sites and HDD exit and/or entry locations, set-up sites for push method pipeline installations, bore exit and/or entry locations, and crossing sites of multiple foreign pipelines. Most of the ATWSs are required for HDD, push method pipeline installations, and bore crossings, methods that have been selected to minimize or avoid greater environmental impacts elsewhere. Locations where Venture Global has proposed to place ATWSs in or within 50 feet of wetlands are presented in table 4.4-3.

Table 4.4-3
Proposed Locations of Additional Temporary Workspace within Wetlands

TGP Approximate Milepost[a]	TETCO Approximate Milepost	Wetland ID	ATWS Size (acres)	ATWS Purpose	Justification
8.9	5.6	wlb007e	2.7	Foreign line crossing	Wetland expanse characterizes area. No upland alternative exists.
14.2	10.7	wlb002e, wlb002s, and wlb003s	5.4	Foreign line crossing	Wetland expanse characterizes area. No upland alternative exists.
14.4	11.1	wlb003s and wlb009s	1.4	Mainline Valve Site and Lake Hermitage Road crossing	Wetland expanse characterizes area. No upland alternative exists.

a All listed ATWS are located within wetlands.

We have reviewed these proposed ATWS locations and conclude this modification has been adequately justified. Because the majority of the Project area consists of open water and coastal marsh, siting these ATWS areas in upland areas is not feasible for this Project.

Access Roads

Section VI.B.1.C of our Procedures requires that 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, all other construction equipment shall be limited to one pass through the wetland using the construction right-of-way located in upland areas. Venture Global's construction is primarily located within wetlands and waterbodies, and certain work areas may require access via the construction right-of-way across wetland areas or waterbodies. The push method would be used to install portions of the lateral pipelines with limited equipment traffic crossing the wetlands. At certain locations, such as tie-ins or foreign line crossings, additional equipment would be required to complete the pipeline installation. To access these locations, multiple passes of construction equipment through the wetlands would be required, using the construction right-of-way. Access channels through open water would be used to mobilize construction equipment to install the majority length of the lateral pipelines using the barge lay method.

Section VI.B.1.D of our Procedures states that 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 wetlands. The Project would require one new permanent access road to access two mainline valve sites during Project operation; this road would also be used during construction. The Project would require one new temporary access road to access the pipe bridge and HDD sites during construction. Both roads cross some wetlands, but they represent the shortest travel distance to the sites and, given the extensive wetlands in their area, there are no practicable alternative routes that would result in less impact on wetlands. All impacts would be appropriately permitted and mitigated in accordance with applicable regulatory requirements.

Section VI.B.2.D requires the applicant to minimize the length of time that topsoil is segregated and the trench is open, and the applicant should not trench the wetland until the pipeline is assembled and ready for lowering in. The Project would use the push method for portions of the SW Laterals, requiring the excavation of the pipe trench prior to pipeline assembly in order for the assembled pipeline segment to be floated and lowered into the open trench.

Sediment Barriers

Section VI.B.3 of our Procedures states that sediment barriers will be installed immediately after initial disturbance of the wetland or adjacent upland. Venture Global proposes to install sediment barriers prior to the initial disturbance of wetlands or adjacent uplands. Subsections A, B, and C provide additional details regarding the construction of sediment barriers. Venture Global has accepted these, except in areas where the push method would be used for pipeline installation. In these areas, Venture Global would not install sediment barriers, as it would be unnecessary in areas sufficiently inundated to allow push construction.

4.4.4 Compensatory Mitigation

The USACE has a goal of "no net loss" of wetland function in the United States. This means that unavoidable wetland impacts must be offset by the creation, restoration, enhancement, or preservation of at least an equal amount of wetlands, which is referred to as compensatory mitigation.

As discussed in section 4.4.2.1, construction and operation of the LNG terminal would result in the permanent loss of 368.1 acres of PEM wetlands and the conversion of 2.8 acres of PFO wetlands to PSS/PEM wetlands. Construction and operation of the pipeline system would result in the permanent loss of 0.4 acre of wetland.

As required by 33 CFR 332.3, Venture Global is proposing compensatory mitigation that is commensurate with the amount and type of wetland impacts resulting from construction and operation of the Project. There are three mechanisms for providing compensatory mitigation: permittee-responsible compensatory mitigation, mitigation banks, and in-lieu fee mitigation. As part of the section 10/404 process, Venture Global would be required to develop a Compensatory Mitigation Plan to mitigate unavoidable wetland impacts. Venture Global proposes to use mitigation banks, an in-lieu fee program, or a combination of the two to mitigate for the wetland impacts of the Project. The plan would be subject to the review and approval by the USACE, New Orleans District, as part of the section 10/404 process. We would require that all federal authorizations, including these permits, be received prior to construction of the Project.

Construction of the pipeline facilities would temporarily impact 947 acres of wetlands and open water; however, only 2.8 acres would be permanently impacted by the pipeline. The pipeline would be constructed according to Venture Global's Procedures and any other applicable permit conditions. Temporarily impacted wetlands would be restored and monitored until restoration is successful. As discussed above, Venture Global would mitigate the impacts on wetlands through the USACE permitting process. We conclude that wetland impacts from pipeline construction would not be significant, and would be further reduced with the proposed mitigation.

4.5 VEGETATION

The LNG terminal and the pipeline system would be situated in the Deltaic Coastal Marshes and Barrier Islands Level IV Ecoregion, within the larger Mississippi Alluvial Plain (EPA, 2013). The Deltaic Coastal Marshes and Barrier Island Ecoregion is described as a mix of brackish and saline marshes and areas that are inundated by water.

The Louisiana Natural Heritage Program (LNHP) of the LDWF recognizes 68 natural communities in Louisiana. Elements of the Project, specifically the LNG terminal berthing facilities and the pipeline system, traverse habitats that exhibit characteristics that are consistent with several of these natural communities, including batture, saltmarsh, brackish marsh, intertidal mollusk reef, bay, tidal channel/creek, and coastal live oak-hackberry forest. In addition to these natural areas, the majority of the terminal site and portions of the pipeline system have been significantly altered by levees and drainage ditches/canals to create fastlands for agricultural use, and portions of the pipeline system traverse man-made navigation channels.

4.5.1 Existing Vegetation Resources

4.5.1.1 LNG Terminal

The terminal site is located on the western bank of the Mississippi River, with a majority of the site located within fastlands. As defined by OCM, fastlands are lands surrounded by publicly owned, maintained, or otherwise validly existing levees or natural formations that would normally prevent activities within the surrounding area from having direct and significant impacts on coastal waters.

The terminal site and properties bordering the site were historically used for agricultural purposes, which is classified as cultivated crops in National Land Use Land Cover data. Currently, the majority of the terminal site consists of fallow grassland and cattle pasture that is bisected by a series of man-made drainage ditches and drainage canals. These fallow grasslands and cattle pasture fall within the cultivated crops National Land Use Land Cover data classification in section 4.8.1. The segments of the terminal site that are south of SH 23 consists of herbaceous vegetative cover, and the area of the terminal site north of SH 23 consist of a mix of herbaceous areas, scrub/shrub areas, and forested areas. The Mississippi River and coastal marsh are the primary habitat types surrounding the fastlands (or fallow grassland and cattle pasture) where the terminal site is located. Table 4.5-1 presents the habitat communities within the Project area based on field surveys. Land use and land cover impacts are discussed in section 4.8.1 and table 4.8-1.

Table 4.5-1 Habitat Communities Affected by Construction and Operation of the LNG Terminal and Pipeline System (in acres)		
Habitat Community	**Construction Impacts**	**Operational Impacts**
LNG Terminal Site, Water-based Marine Facilities, and LNG Terminal Workspaces		
Palustrine emergent wetland (pasture)	372.6	368.1
Palustrine forested wetland (batture)	10.3	2.8[a]
Forested/scrub-shrub upland	85.7	82.6
Herbaceous upland (pasture)	157.6	161.1
Subtotal	**629.0**	**614.6[b]**
Pipeline System		
Palustrine emergent wetland	0.1	0.0
Palustrine scrub-shrub wetland	2.3	<0.1
Estuarine emergent wetland	64.5	0.0
Estuarine scrub-shrub wetland	3.9	0.4
Forested/scrub-shrub upland	32.5	0.0
Coastal live oak-hackberry forest (upland)	4.0	1.7
Subtotal	**107.3**	**2.1[c]**
TOTAL	**736.3**	**616.7**

a The 2.8 acres of operational impacts are conversion of the PFO habitat to PSS/PEM habitat and not permanent fill.
b The operational impact acreage of the terminal site is 636.5 acres; however, the entire operational area is not vegetated. Only 614.6 acres of the operational boundary are currently vegetated. The remaining 21.9 acres consists of open water or Mississippi River and developed commercial/industrial land that is not vegetated.
c The operational impact acreage for the pipeline system only includes permanent impacts from aboveground facilities and 1.7 acres of forested habitat that would be converted to maintained right-of-way. The remainder of the pipeline system would either be in upland herbaceous/scrub-shrub habitats, developed commercial/industrial land, or open water habitats.

Palustrine emergent wetland areas within the terminal site and adjacent workspace primarily consists of fallow pasture. These areas are located in the southwestern two-thirds of the Project area, south of SH 23. Venture Global suggests that the wetland hydrology for these areas appears to be a result of poorly maintained drainage ditches within the fastlands drainage system. According to Venture Global, the lack of maintenance has allowed these pasture areas to revert to wetlands. Species observed in these areas during field surveys include bigpod sesbania (*Sesbania herbacea*), eastern baccharis (*Baccharis halimifolia*), alligatorweed (*Alternanthera philoxeroides*), Bermuda grass (*Cynodon dactylon*), common rush (*Juncus effuses*), swamp smartweed (*Persicaria hydropiperoides*), mountain spikerush (*Eleocharis montana*), salt meadow cord grass (*Spartina patens*), great ragweed (*Ambrosia trifida*), coco yam (*Colocasia esculenta*), peppervine (*Ampelopsis arborea*), American buckwheat vine (*Brunnichia ovata*), and broadleaf cattail (*Typha latifolia*).

Palustrine forested wetlands within the terminal site are adjacent to the Mississippi River and consist of batture. Batture is a riverfront pioneer forest that occurs on newly formed sand bars and river margins between the natural levee crest and major streams/rivers. Canopy species observed in these areas during field surveys include black willow (*Salix nigra*), hackberry (*Celtis laevigata*), and American sycamore (*Platanus occidentalis*).

Forested scrub-shrub uplands at the terminal site occur on the northeastern portion of the site between SH 23 and the Mississippi River levee. The forested portions of this vegetation community consist of a woody canopy of green ash (*Fraxinus pennsylvanica*) greater than 20 feet in height with an understory of winged sumac (*Rhus copallinum*), poison ivy (*Toxicodendron radicans*), hyssopleaf thoroughwort (*Eupatorium hyssopifolium*), peppervine, muscadine (*Vitus rotundifolia*), southern dewberry (*Rubus trivialis*), and log fern (*Dryopteris celsa*). The scrub-shrub portion of this vegetation community consisted of woody shrubs less than 20 feet in height that consisted of Chinese tallow (*Triadica sebifera*), winged sumac, American beautyberry, black willow, green ash, and sawtooth blackberry (*Rubus argutus*) with a herbaceous understory that consisted of common carpet grass (*Axonopus fissifolius*), eastern woodland sedge (*Carex blanda*), and giant goldenrod (*Solidago gigantean*).

Herbaceous uplands (pasture) at the terminal site are located in the southwestern portion of the terminal site (south of SH 23). The vegetation composition is similar to the palustrine emergent wetlands described above. The dominant species observed consisted of rice button aster (*Symphyotrichum dumosum*), Bermuda grass, swamp smartweed, yellow foxtail (*Setaria pumila*), bahiagrass (*Paspalum notatum*), and great ragweed.

4.5.1.2 Pipeline System

The majority of the pipeline system is located in the Barataria Basin estuary system. This basin is bounded on the north and east by the Mississippi River, on the west by Bayou Lafourche, and on the south by the Gulf of Mexico (Lester, 2005). The Barataria Basin largely consists of bottomland hardwoods and fresh to brackish marshes. Vegetation communities crossed by the pipeline system include palustrine emergent wetlands (within fastlands near the LNG terminal), palustrine scrub-shrub wetlands (also within fastlands near the LNG terminal), estuarine emergent wetlands, estuarine scrub-shrub wetlands, and coastal live oak-hackberry forest.

The palustrine emergent wetlands along the pipeline system route are located adjacent to the terminal site within the fastlands system at SW lateral TGP MP 14.4 and SW lateral TGP MP 14.6. The vegetation within these areas is primarily herbaceous species consisting of Bermuda grass, bigpod sesbania, salt meadow cord grass, salt grass (*Distichlis spicata*), and common spikerush (*Eleocharis palustris*). Hydrology in these areas has been altered by ditching, pumping, and levees.

The palustrine scrub-shrub wetlands along the pipeline system route are within 0.5 mile of LNG terminal within the fastlands system at SW lateral TGP MP 14.8. The dominant vegetation within these areas consists of maritime marsh elder (*Iva frutescens*), eastern baccharis, rattlebush (*Sesbania drummondii*), and Chinese tallow.

The estuarine emergent wetlands along the pipeline system route frequently occur between SW lateral TGP MP 8.7 and SW lateral TGP MP 14.3. This vegetative community type includes areas of salt marsh and areas of brackish marsh, which are both considered natural communities by the LDWF. The primary species observed in salt marsh areas include smooth cord grass (*Spartina alterniflora*), salt meadow cord grass, salt grass, and black rush (*Juncus roemarianus*). The primary species observed in brackish marsh areas include saltmarsh bulrush (*Schoenplectus robustus*), smooth cord grass, salt grass, and salt meadow cord grass.

Estuarine scrub-shrub wetlands infrequently occur along the pipeline system route. Estuarine scrub-shrub wetlands are located at SW lateral TGP MP 12.0 and from SW lateral TGP MP 14.1 to SW lateral TGP MP 14.3. This community consists of Jesuit's bark (*Iva frutescens*) and groundsel tree (*Baccharis halimifolia*). Other plants found to a lesser degree in these systems include dwarf palmetto (*Sabal minor*), deciduous holly (*Ilex decidua*), yaupon (*I. vomitoria*), and lantana (*Lantana camara*). In some instances, saplings and trees are found in the estuarine scrub-shrub wetlands delineated within the survey area. These saplings and trees include sugarberry (*Celtis laevigata*), live oak (*Quercus virginiana*), water oak (*Q. nigra*), sweetgum (*Liquidambar styraciflua*), and Chinese tallow. There is one area of coastal live oak-hackberry forest along the pipeline system route from approximately SW lateral TGP MP 14.5 to SW lateral TGP MP 14.6. This vegetation community is considered a natural community by the LDWF. The dominant canopy species include live oak (*Quercus virginiana*), water oak (*Quercus nigra*), and hackberry, with an understory of dwarf palmetto (*Sabal minor*) and eastern baccharis.

The majority of the pipeline system is located in estuarine open water, which occurs frequently from SW lateral TGP MP 0.0 to SW lateral TGP MP 13.8. This community is basically devoid of vegetation. Field surveys were conducted for submerged aquatic vegetation along the pipeline route and barge access channels; however, no submerged aquatic vegetation was encountered. The portions of the pipeline system mapped as estuary open water consist of intertidal mollusk reefs (oyster leases crossed by the pipeline system), bays, and tidal channels/creeks, which are all considered natural communities by the LDWF, as well as man-made navigation channels, canals, and existing pipeline rights-of-way.

4.5.2 Construction and Operation Impacts and Mitigation

As summarized in table 4.5-1, a total of 736.3 acres of vegetation would be cleared during construction of the LNG terminal and pipeline system. In addition, there would be 81.9 acres of impacts on open water at the LNG terminal (Mississippi River, streams, and canals) and 846.0 acres of impacts on estuarine open water along the pipeline system; however, these would not require any vegetation to be cleared and thus are not included in table 4.5-1. Following construction, 614.6[1] acres at the LNG terminal and 2.1 acres along the pipeline system of formerly vegetated areas would be converted to operational areas. About 14.4 acres of temporary impacts on vegetative communities at the LNG terminal site would be restored following construction, and about 105.2 acres of temporary impacts on vegetated communities within the pipeline system would be restored following construction.

4.5.2.1 LNG Terminal

A total of 629.0 acres of vegetation would be cleared during construction at the terminal site (see table 4.5-1). Following construction, the majority of the vegetation at the terminal (614.6 acres) would be permanently converted to industrial use associated with operation of the

[1] The operational impact acreage of the terminal site is 621.9 acres of land and 14.6 acres of water based facilities; however, the entire operational area is not vegetated. Only 614.6 acres of the operational boundary are currently vegetated. The remaining 21.9 acres consists of waterbodies or developed commercial/industrial land that is not vegetated.

facility, resulting in the permanent loss of wetland pasture, batture, shrub/shrub, forested upland, and herbaceous upland pasture.

Construction at the terminal site would result in temporary impacts on 4.5 acres of palustrine emergent wetlands and 7.5 acres of palustrine forested wetlands. These areas would be restored post-construction according to Venture Global's Project-specific Plan and Procedures. The majority of impacts on wetlands would be permanent, resulting in the loss of 368.1 acres of palustrine emergent wetlands and 2.8 acres of palustrine forested wetlands (batture) conversion from palustrine forested wetlands to palustrine scrub-shrub/palustrine emergent wetlands. Venture Global is coordinating with USACE regarding the jurisdictional status of palustrine wetlands at the terminal site. It appears that these wetlands are a result of poorly maintained drainage ditches and fastland pumping systems. Mitigation for the loss of these palustrine emergent wetlands will be determined once coordination with the USACE is complete and permits have been issued. The conversion of the palustrine forested wetlands would be fully mitigated through implementation of Venture Global's Compensatory Mitigation Plan, which will require review and approval by the USACE New Orleans District. For a discussion of wetland mitigation, see section 4.4.4.

Venture Global's implementation of its Project-specific Plan and Procedures, which require the use of temporary and permanent erosion control measures, revegetation procedures, and post-construction monitoring, would further minimize impacts on vegetation communities within and adjacent to the terminal. Due to the limited vegetation diversity within the terminal site due to the nature of the land relative to the flood levee, we have determined that impacts on vegetation from construction and operation of the LNG terminal would be permanent, but minor.

4.5.2.2 Pipeline System

Wetland fragmentation would be minimized by routing the pipeline system through open water, where feasible. In emergent wetlands, vegetation within the construction workspace would be impacted during construction but would not be purposely cleared, other than through trench excavation. In forested areas, trees that must be removed would be cut flush with the ground, leaving the root system intact to minimize erosion, except in areas where root removal is required to create a safe and level work surface. Clearing and grading operations would incorporate procedures to:

- minimize vegetation removal from slopes, wetlands, and channel banks;
- prevent undue soil disturbance;
- restore ground contours to their original condition; and
- prevent topsoil erosion.

The pipeline system's permanent impacts on vegetation are associated with aboveground facilities and permanent access roads. The permanent pipeline right-of-way would be kept clear of trees in two 30-foot-wide corridors over each pipeline inside of the 80-foot-wide permanent right-of-way. Due to the operational needs of the pipeline system, <0.1 acre of palustrine emergent wetlands, 0.4 acre of estuarine emergent scrub-shrub wetlands, 1.7 acres of coastal live oak-hackberry forest would be permanently impacted by aboveground facilities and/or converted to a maintained herbaceous state as part of the operational right-of-way. Additionally, 2.4 acres of open water would be shaded by aboveground facilities.

Collocation of the pipelines would minimize impacts on vegetation communities during construction and operation of the pipeline system. Venture Global would implement its Project-specific Plan and Procedures, which require the use of temporary and permanent erosion control measures, topsoil segregation in select areas, testing and mitigation for soil compaction, post-construction monitoring, and limited routine vegetation maintenance. All disturbed areas would be routinely monitored in accordance with the Project-specific Plan and Procedures until restoration and revegetation are successful.

With the implementation of the minimization efforts described above, we conclude that construction and operation of the pipeline system would have a permanent, but minor, impact on vegetation communities.

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. In accordance with the Plant Protection Act of 2000 (7 U.S.C. 7701), 13 plants that could occur in Louisiana have been federally listed as noxious weeds (USDA NRCS, 2017), and one plant (Chinese tallow) has been designated as a noxious weed by the State of Louisiana (Louisiana Revised Statutes 3:1791).

Aquatic invasive species have been identified in the Barataria Basin and may occur in the Project area. These species include water hyacinth (*Eichhornia crassipes*), alligatorweed, common salivinia (*Salvinia minima*), and giant salvinia (*Salvinia molesta*) (LDWF, 2015a; Tulane/Xavier Center for Bioenvironmental Research, 2010). Field surveys at the terminal site and along the pipeline system route did not directly target invasive species; however, invasive exotic species were identified during the wetlands and waterbody field surveys. Surveys at the terminal site identified alligatorweed and Chinese tallow, and surveys along the pipeline system route identified Chinese tallow and lantana.

Venture Global would implement the Project-specific Plan and Procedures during construction and post-construction, which would include monitoring to ensure that ground disturbance and restoration activities minimize the spread of invasive species and noxious weeds. Section III.F.2 of the Project-specific Plan requires the development of 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. Venture Global has not notified the agencies of the specific measures it would implement to minimize the spread of invasive species and noxious weeds. Because this information will be useful to the agencies during post-construction monitoring, **we recommend that**:

- **<u>Prior to construction of the Project</u>, Venture Global should coordinate with the NRCS and LDWF to develop a Project-specific noxious weed control plan. Venture Global should file its Project-specific noxious weed control plan with the**

Secretary, including documentation of its consultation with the NRCS and LDWF, for review and written approval by the Director of the Office of Energy Projects (OEP).

4.5.4 Vegetative Communities of Special Concern

Vegetation communities of special concern may include ecologically important natural communities, threatened or endangered plant species, or other rare or imperiled plants in need of special protection or minimal disturbance.

Existing LNHP data (LNHP, 2015a), indicate that the pipeline system route would traverse an area of coastal live oak-hackberry forest. Observations during field surveys indicate that the pipeline system route traverses approximately 1,000 feet of this community (roughly between MPs 14.4 and 14.6 of the SW lateral TGP). Coastal live oak-hackberry forest is considered imperiled with a state ranking[2] of S1S2 (critically imperiled/imperiled) and a global ranking of G2 (imperiled). This natural community is formed on abandoned beach ridges in coastal Louisiana. These areas serve as important storm barriers and important wildlife habitat, providing vital resting habitat for trans-gulf-migrating birds. Of the 100,000 to 500,000 acres in Louisiana, only 2,000 to 10,000 acres remain (2 percent to 10 percent of pre-settlement extent). Threats to this community include residential development, road and utility construction, overgrazing, and the introduction of invasive exotic species (LDWF, n.d.[a]).

Field surveys mapped 4.0 acres of coastal live oak-hackberry forest within the footprint of the pipeline system. Of the 4.0 acres, 1.6 acres would be avoided by HDD, 0.7 acre would have a temporary impact and allowed to recover after construction, and 1.7 acres would be permanently converted from coastal live oak-hackberry forest to herbaceous uplands. Impacts on this vegetation community are unavoidable, as the non-federal levee immediately adjacent to the south of this community would be crossed via a pipe bridge to avoid impacts on the non-federal levee. To allow space for the pipe bridge, the pipeline system would impact a small portion of the coastal live oak-hackberry forest to establish an HDD site. From the HDD drill site to the LNG terminal, the pipeline system would be installed beneath the remaining area of coastal live oak-hackberry forest within the Project footprint via HDD. Traversing a portion of this community via HDD minimizes impacts on this habitat type and reduces fragmentation of the community. While 1.7 acres would be permanently impacted, the impacts would be 1.4 percent of the coastal live oak-hackberry stand traversed by the pipeline system.

In addition to the coastal live oak-hackberry natural community, six other natural communities of Louisiana occur within the Project area. These include batture (terminal site), saltmarsh (pipeline system), brackish marsh (pipeline system), intertidal mollusk reef (pipeline system), bay (pipeline system), and tidal channel/creek (pipeline system). The intertidal mollusk reef, bay, and tidal channel/creek natural communities are mostly unvegetated and are discussed further in section 4.6.1.

The batture habitat rarity rank for the state is S4S5 (apparently secure/secure), and the global ranking is G4/G5 (apparently secure/secure). This habitat type provides important wildlife

[2] Based on NatureServe Conservation Status Ranks: S=State, G=Global, 1=Critically Imperiled, 2=Imperiled, 3=Vulnerable, 4=Apparently Secure, and 5=Secure.

habitat and serves to minimize erosion along major river channels. While important, this community is not rare in the state or globally.

Salt marsh has a state rarity ranking of S3/S4 (vulnerable/apparently secure) and a global ranking of G5 (secure). Brackish marsh has a state rarity ranking of S3S4 (vulnerable/apparently secure) and a global ranking of G4 (apparently secure). While globally secure, these habitat types are vulnerable in south Louisiana due to threats such as:

- shoreline erosion and subsidence;
- commercial and industrial development;
- construction of roads, pipelines, and utilities;
- hydrologic alteration (channelization, levee construction, and dredging);
- contamination from spills and industrial discharge;
- fire suppression; and
- invasive exotic species.

The pre-settlement extent of marshland in Louisiana is estimated to be 500,000 to 1,000,000 acres. Currently, approximately 50 to 75 percent of the pre-settlement marsh remains (LDWF, n.d.[b], n.d.[c]). To minimize impacts on salt marsh and brackish marsh, Venture Global routed the pipeline system in open water, where feasible (over 90 percent of the pipeline system impacts are in open water). Additionally, Venture Global's implementation of its Project-specific Plan and Procedures, which require the use of temporary and permanent erosion control measures, revegetation procedures, and post-construction monitoring, would further minimize impacts on vegetative communities of special concern within and adjacent to the pipeline right-of-way.

4.6 WILDLIFE AND AQUATIC RESOURCES

4.6.1 Wildlife Resources

Wildlife species occurring in the vicinity of the LNG terminal and pipeline system are characteristic of the habitats provided by the vegetative communities that occur in these areas. Section 4.5.1 provides detailed information on the vegetative communities present in the vicinity of the Project based on National Land Use Land Cover data. Habitat types were identified based on aerial photography and field surveys. These habitat types are not the same as the National Land Use Land Cover data described in sections 4.8.1, although some naming conventions overlap. Aquatic resources and protected wildlife species are discussed in sections 4.6.3 and 4.7, respectively.

4.6.1.1 Existing Wildlife Habitats

The wildlife habitat types present in the vicinity of the LNG terminal and pipeline system include herbaceous wetlands, scrub-shrub wetlands, forested wetlands, herbaceous uplands (pasture), scrub-shrub uplands, forested uplands, and open water. Typical wildlife occurring within these habitat types are described below.

Wetlands typically support a diverse ecosystem that provides nutrients, cover, shelter, and water for a variety of terrestrial and aquatic wildlife species, including waterfowl, wading birds, raptors, mammals, reptiles, and amphibians. Typical wildlife associated with palustrine wetlands include white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), river otter (*Lutra canadensis*), rice rat (*Oryzomys palustris*), swamp rabbit (*Sylivagus aquaticus*), wood duck (*Aix sponsa*), least bittern (*Ixobrychus exilis*), green heron (*Butorides striatus*), red-winged blackbird (*Agelains phoeniceus*), southern leopard frog (*Rana utricularia*), bullfrog (*Rana catesbeiana*), cottonmouth (*Agkistrodon piscivorus*), and mud snake (*Farancia abacura*). Typical wildlife associated with estuarine emergent wetlands include raccoon, rice rat, nutria (*Myocaster coypus*), brown pelican (*Pelecanus occidentalis*), great blue heron (*Ardea herodias*), green heron, fiddler crab (*Uca rapax*), and salt marsh snake (*Nerodia clarkia*) (LDWF, 2014a, 2014b, 2014c; USGS, 2013b).

Herbaceous upland habitat is present at the LNG terminal site and consists of fallow pasture lands. No herbaceous uplands were identified along the pipeline system. Mammals typically associated with herbaceous upland habitat include white-tailed deer, striped skunk, spotted skunk (*Spilogale putorius*), cotton mouse, armadillo (*Dasypus novemcinctus*), raccoon, and eastern harvest mouse (*Reithrodontomys humulis*). Bird species include common yellowthroat (*Geothlypis trichas*), northern bobwhite, eastern bluebird (*Sialia sialis*), dickcissel (*Spiza americana*), rusty blackbird (*Euphagus carolinus*), red-tailed hawk (*Buteo jamaicensus*), northern harrier (*Circus cyaneus*), American robin (*Turdus migratorius*), cattle egret (*Bubulcus ibis*), and red-winged black bird. Typical reptiles and amphibians include chorus frog (*Psuedacris* spp.), western rat snake (*Pantherophis obsolete*), and garter snake (LDWF, 2014a, 2014b, 2014c; USGS, 2013b).

Forested and scrub-shrub upland habitat is present at the LNG terminal site between SH 23 and the Mississippi River. Forested upland habitat is present along the pipeline system between approximately TGP MPs 14.4 and 14.7. Scrub-shrub wetland habitat is present along the pipeline system at TGP MP 14.7 (small area) and from TGP MP 14.2 to TGP MP 14.4. Tree and shrub layers provide shelter and foraging habitat for various bird species and larger mammals. Organic material on the forest floor provides habitat for invertebrates, reptiles, smaller mammals, and amphibians. Mammals typically associated with forest habitat in the vicinity of the LNG terminal and pipeline system include white-tailed deer, gray fox (*Urocyon cinereoargenteus*), gray squirrel (*Sciurus carolinensis*), cotton mouse (*Sigmodon hispidus*), and striped skunk (*Mephitis mephitis*). Typical bird species include prothonotary warbler (*Protonotaria citrea*), wood thrush (*Hylocichla mustelina*), red-shouldered hawk (*Buteo lineatus*), Carolina chickadee (*Parus carolinensis*), loggerhead shrike (*Lanius ludovicianus*), eastern kingbird (*Tyrannus tyrannus*), brown-headed nuthatch (*Sitta pusilla*), pine warbler (*Dendroica pinus*), Northern bobwhite (*Colinus virginianus*), and tufted titmouse (*Parus bicolor*). Amphibians and reptiles include the green tree frog (*Hyla cinerea*), garter snake (*Thamnophis sirtalis sirtalis*), racer (*Coluber constrictor*), and pigmy rattlesnake (*Sisstrurus miliarius*) (LDWF, 2014a, 2014b, 2014c; USGS, 2013b).

Open water present within the LNG terminal site includes the Mississippi River and several drainage ditches and canal that are part of the fastlands system. Estuarine open water present within the pipeline system is extensive and consists of tidal channels, navigation channels, and bays. Typical wildlife associated with open water habitat includes wading birds, waterfowl, nutria, and other wildlife species dependent on a water environment (see additional discussion in sections 4.6.1.1).

4.6.1.2 Impacts and Mitigation

Construction of the LNG terminal would require vegetation clearing, grading, and filling to level the site. Construction of the LNG terminal would affect over 600 acres of vegetated wildlife habitat and approximately 100 acres of open water habitat (see table 4.5-1), which would result in a permanent reduction of these habitat types in the general vicinity of the LNG terminal. Due to the site's previous use as fallow pasture, vegetation species diversity is low, which lessens its value as habitat for wildlife.

Impacts on wildlife from construction of the LNG terminal would include displacement, stress, and direct mortality of some individuals. Vegetation clearing would potentially reduce suitable cover, nesting, and foraging habitat for some ubiquitous wildlife species. More mobile wildlife, such as birds and larger mammals, may relocate to similar habitats nearby when construction activities commence. However, smaller, less mobile wildlife (e.g., reptiles and amphibians) could be inadvertently injured or killed by construction equipment. The permanent reduction in available habitat within the LNG terminal, as well as the influx of individuals to other nearby areas, may increase population densities for certain species, resulting in increased inter- and intra-specific competition and reduced reproductive success of individuals.

Pilings would be installed during LNG terminal construction using impact hammer methods. Noise from pile-driving activities has the potential to alter wildlife behavior, including foraging and nesting activities within the Project area. Pile-driving noise would be intermittent and temporary, and preparatory activities likely would encourage mobile species to leave the immediate area prior to pile driving commencing. Less mobile species would be subject to noise effects. During construction, Venture Global would implement noise mitigation measures to reduce potential impacts on the human environment and wildlife from pile-driving activities. These measures may include use of one or more of the following:

- bubble curtains around the piles;
- ramp-up procedures at the beginning of each pile installation or when a delay of 15 minutes or more has occurred; and/or
- a cushioning system to reduce noise and maintain effectiveness of pile driving; and

Throughout construction and operation of the LNG terminal, Venture Global would follow its Project-specific Plan and Procedures and would implement protective measures for migratory and colonial nesting bird species. With adherence to the proposed mitigation measures and given the abundance of suitable habitat in adjacent areas, the impacts on wildlife habitats from construction and operation of the LNG terminal would be adequately minimized.

Wetland habitats support diverse ecosystems that provides nutrients, cover, shelter, and water for a variety of terrestrial and aquatic wildlife species. Construction and operation of the LNG terminal would result in the permanent loss of 340 acres of wetlands on the LNG terminal site. In addition, 28 acres of wetlands within the eastern workspace adjacent to the LNG terminal site would be permanently filled.

Operation of the LNG terminal would result in increased noise, lighting, and human activity that could disturb wildlife in the area. However, due to current industrial activities at other facilities along the Mississippi River, wildlife species in the area are expected to be acclimated to the noise and artificial lighting associated with these activities.

To minimize Project-related impacts on wildlife, Venture Global would implement its Project-specific Plan and Procedures, as well as its Spill Prevention Plan during construction, and would develop and implement an SPCC Plan for operations. Venture Global would also implement best management practices (BMPs), which typically include a combination of silt fencing, routine inspection, and good housekeeping techniques. A wetland compensatory mitigation plan would be developed by Venture Global to offset wetland impacts and their associated wildlife impact connection. Thus, we believe that impacts on wildlife associated with noise, light, and human activity would be expected to be minor.

4.6.2 Unique and Sensitive Wildlife Species

No public or conservation lands have been identified within or adjacent to the LNG terminal or pipeline system. Migratory birds may utilize portions of the Project area and areas adjacent to the Project area, as discussed below. Species protected under the ESA, the BGEPA, the MMPA, and by state endangered and threatened species regulations are discussed in section 4.7.

4.6.2.1 Migratory Birds

Migratory birds follow broad routes called flyways between breeding grounds in Canada and the United States and wintering grounds in Central and South America and the Caribbean.

Additionally, several species migrate from breeding grounds in the north to winter along the Gulf Coast, where they remain throughout the non-breeding season. The LNG terminal and pipeline system are within the Mississippi Flyway, which terminates at the Gulf Coast. Of the 650 species of birds known to occur in the United States, nearly 400 species occur along the Gulf Coast (Wilson and Esslinger, 2002). The Gulf Coast provides wintering and migration habitat for large 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 (Wilson and Esslinger, 2002). For these reasons, the Gulf Coast is considered one of the most important waterfowl areas in North America.

Migratory birds are federally protected under the MBTA (16 U.S.C. 703-712). The MBTA, as amended, implements protection of many native migratory game and non-game birds, with exceptions for the control of species that cause damage to agricultural or other interests. The MBTA prohibits the take of any migratory bird, or their parts, active nests, and eggs, where to "take" means to "pursue, hunt, shoot, wound, trap, capture, or collect."

Executive Order 13186 (January 2001) requires that all federal agencies undertaking activities that may negatively affect migratory birds take a prescribed set of actions to further implement the MBTA, and directs federal agencies to develop an MOU with the FWS that promotes the conservation of migratory birds. FERC entered into an MOU with the FWS in March 2011. The focus of the MOU is avoiding or minimizing adverse impacts on migratory birds and strengthening migratory bird conservation through enhanced collaboration between the two agencies.

Though all migratory birds are afforded protection under the MBTA, both Executive Order 13186 and the MOU require that Birds of Conservation Concern (BCC) and federally listed species be given priority when considering the effects on migratory birds. BCCs are a subset of migratory MBTA-protected species identified by the FWS as those in greatest need of additional conservation action to avoid future listing under the ESA. Executive Order 13186 states that emphasis should be placed on species of concern, priority habitats, key risk factors, and that particular focus should be given to addressing population-level impacts.

Bird Conservation Regions (BCR) are regions that encompass landscapes with similar bird communities, habitats, and resource management issues (North American Bird Conservation Initiative, 2017). BCRs were established to facilitate a regional approach to bird conservation and identify overlapping or conflicting conservation priorities. The terminal and pipeline system are within BCR 37 – Gulf Coastal Prairie (FWS, 2008). Typically 318 species of birds occur frequently within BCR 37 while another 45 species have migration patterns through BCR 37. Potential impacts on migratory birds that are also federally listed are described in section 4.7.1.2.

Colonial waterbirds, a subset of migratory birds, include a large variety of bird species that share two common characteristics: (1) they tend to gather in large assemblies, called colonies or rookeries, during nesting season, and (2) they obtain all or most of their food from the water (FWS, 2002). Colonial waterbirds demonstrate nest fidelity, meaning they return to the same rookery year after year. Rookeries are typically established in marshes or near the shores of ponds or streams. Although some colonial waterbirds (e.g., least terns) will nest in developed areas, many waterbirds (e.g., great blue heron, great egrets) are wary of human activity. Colonial nesting waterbirds that occur in the Project area include various herons, egrets, ibises, terns, gulls, pelicans, and other species. To minimize disturbance to nesting waterbirds, the FWS restricts construction activity within 1,000 feet of rookeries to the non-nesting season in Louisiana (table 4.6-1) (FWS, 2017a). A possible colonial-nesting waterbird area on an island in Barataria Bay occurs within a 2-mile radius of the pipeline system. The island is located between 600 and 1,800 feet from the pipeline system. Figure 4.6-1 shows the marshes that would be crossed by the pipeline system.

Table 4.6-1
Non-nesting Period for Nesting Colonial and Non-colonial Birds

Species	Period
Colonial Birds	
Anhinga	July to March 1
Cormorant	July to March 1
Great Blue Heron	August 1 to February 15
Great Egret	August 1 to February 15
Snowy Egret	August 1 to March 1
Non-colonial Birds	
Little Blue Heron	August 1 to March 1
Tricolored Heron	August 1 to March 1
Reddish Egret	August 1 to March 1
Cattle Egret	September 1 to April 1
Green-backed Heron	September 1 to March 15
Black-crowned Heron	September 1 to March 1
Yellow-crowned Heron	September 1 to March 15
Ibis	September 1 to April 1
Roseate Spoonbill	August 1 to April 1

In addition to the MBTA, the BGEPA provides additional protection to bald and golden eagles. Bald eagles nest in large trees near coastlines, rivers, and lakes. The bald eagle could winter or breed, and potential foraging and nesting habitat may exist, in areas near the LNG terminal site and pipeline route. The LDWF has not collected bald eagle survey data since 2008. However, during Venture Global's habitat surveys in 2015, numerous bald eagles were observed in the Project area. One inactive, 3-foot-diameter nest was observed during the survey. This nest could be from a bald eagle or other raptor species that occur in the Project area.

Figure 4.6-1
Marshlands Crossed by the Project
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

Source: Louisiana Department of Wildlife, Fur and Refuge Division, 2001,
Louisiana Coastal Marsh Vegetative Type (poly), Geographic NAD83, LDWF (2001), Lafayette, Louisiana, US.

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4.6.2.2 Impacts and Mitigation

The increased presence of humans, noise, and vibrations associated with Project activities would likely cause sensory disturbances of migratory birds. The resulting negative effects are expected to be intermittent and short term, occurring during work hours and ceasing after construction activities have moved from a given area. Displacement and avoidance of the area are direct responses to sensory disturbances. Birds may be injured or suffer mortality as an indirect effect of fleeing an area of disturbance. Sensory disturbances to adults could also result in nest abandonment, affecting egg-laying and potentially causing the mortality of young. In most cases, Project activities would be short-term and episodic. As such, sensory disturbance effects associated with these activities may affect individuals but would not likely have notable effects on any local populations of migratory birds. Permanent aboveground structures, such as the LNG terminal and meter stations would create potential localized sensory disturbances for the operational life of the Project, and thus would have more permanent effects.

The vegetation communities within the LNG terminal and pipeline system facilities provide potential habitat for migratory bird species, including songbirds, waterbirds, and raptors. However, much of the vegetated land associated with the LNG terminal and pipeline system facilities is previously disturbed, within or adjacent to existing facilities, and/or composed of agricultural land, all of which reduce bird nesting habitat value. Project construction would result in one-time direct impacts on migratory bird habitat due to vegetation clearing for the LNG terminal site. These construction activities could have indirect effects on migratory birds such as egg and young survival and result in bird displacement impacts on bird migration, nesting, foraging, and mating behaviors. Construction could also reduce the amount of habitat available for foraging and predator protection and would temporarily displace birds into adjacent habitats, which could increase the competition for food and other resources. The effect of clearing and grading for the LNG terminal would be permanent because these areas may not be restored to their preconstruction condition. Given the proposed mitigation measures above, we conclude that impacts on migratory birds from construction of the Project would largely be temporary and would not be significant.

To further minimize impacts on migratory birds, Venture Global proposes to implement the following measures, where practicable, to avoid impacts on migratory birds:

- clear areas with potential nesting habitat prior to the nesting season;
- conduct pre-construction nesting surveys and avoid active nests if migratory birds are observed;
- inspect construction equipment regularly for opportunistic wildlife species, including nesting migratory birds;
- follow reseeding recommendations from the NRCS for restoration of temporarily disturbed areas;
- stabilize the right-of-way to protect soil resources and promote restoration of temporarily disturbed areas; and

- adhere to the measures in FERC's Plan and Procedures, as well as the Venture Global SPCC Plan and SWPPP to minimize impacts on sensitive habitats.

Many migratory birds use natural light from the sun, moon, and stars for navigation. Artificial lighting can hide natural light sources, having unknown effects on birds at the population level. Fatalities to avian species due to artificial light are well documented. Potential impacts specific to migratory birds include injury or disorientation due to flaring and other artificial illumination. Avian fatalities are associated with attraction to light sources, especially in low light, fog, and when there is a low cloud ceiling (Orr et al., 2013). The terminal is designed to limit flaring events only to LNG carrier gas up / cool down operations, which may occur up to forty times a year. During operation of the LNG terminal, use of the marine and emergency flares would only occur during process upset conditions. To the extent practical, use of the flares during initial facility start-up would be limited to daylight hours, limiting potential impacts on birds, and, to the extent practical, would be planned to avoid inclement weather when the risk of bird mortalities from attraction to the flares would be the highest. Given that flaring would be limited to the initial start-up of the facility and LNG carrier gas up / cool down operations, we do not expect substantial impacts on migratory birds.

The LNG terminal and pipeline facilities would require adequate lighting for operations and safety. During construction, Venture Global would direct all nighttime lighting towards construction activity and use the minimum light level necessary to ensure site safety and security. Venture Global submitted a Facility Lighting Plan that included measures to reduce the impacts of facility lighting including downward-facing lights with shielding needed to meet regulatory standards and minimize illumination specifications. Facility lighting would be chosen to minimize the horizontal emission of light away from intended areas, and shielding would help minimize impacts on birds and other wildlife while providing the illumination needed to ensure safe operation of the facility. Venture Global conducted a visual assessment evaluating anticipated nighttime lighting conditions at the LNG terminal (see detailed discussion in section 4.8.6). Based on our reviews of the Facility Lighting Plan and the visual assessment, we have determined that the overall increase in nighttime lighting during construction and operation of the LNG terminal would result in impacts on migratory birds.

To minimize the effects of artificial lighting on migratory birds, outdoor lighting at the terminal and pipeline meter stations would be limited, shielded, and downward-facing to facilitate safe operations at night or during inclement weather. This would include using only white or red strobe lights at night, using the fewest number of lights as practicable, and using the minimum intensity and number of flashes per minute allowable. Solid red or pulsating red warning lights would be avoided when possible. Perimeter lighting at aboveground facilities would be turned off at night and would be used only when necessary for work conducted at night. Venture Global would continue to consult with the FWS and the LDWF regarding potential impacts on migratory birds in the Project area and would implement any additional measures determined through agency coordination. With the implementation of the mitigation measures described above, we conclude that operational impacts on migratory birds would not be significant.

Based on the FWS guidance, Venture Global should educate on-site personnel to be cognizant of colonial nesting waterbirds and conduct preconstruction surveys. Therefore, **we recommend:**

- **<u>Prior to construction</u>, Venture Global should conduct nesting bird colony surveys within the appropriate buffer area. Before the initiation of surveys, Venture Global should consult with the LDWF and FWS for appropriate survey methods, timeframes, and locations. The survey reports, any LDWF or FWS comments on the surveys, and Venture Global's proposed mitigation measures should be filed with the Secretary. Venture Global must receive written approval from the Director of OEP before construction or implementation of any mitigation measures may proceed.**

Due to the prevalence of suitable bald eagle habitat in the Project area, Venture Global has committed to conducting pre-construction surveys to identify bald eagle nests in the Project area. If a bald eagle nest is identified within 660 feet of Project activities, Venture Global would implement the recommendations in the National Bald Eagle Management Guidelines (FWS, 2007), which includes mitigation measures such as maintaining a specified distance between the nest and Project activities; maintaining natural areas between the nest and Project activities; and avoiding specific activities during the breeding season. Based on these proposed measures, we conclude that the Project would not impact bald eagles.

4.6.3 Aquatic Resources

4.6.3.1 Existing Aquatic Resources

LNG Terminal

Habitat for aquatic resources present within the LNG terminal site include the Mississippi River and 43 man-made drainage ditches/canals that are part of the fastland system. Of the 43 man-made drainage ditches/canals delineated, 38 are ephemeral, three are intermittent, and two are perennial. Additionally, six man-made drainage ditches/canals were delineated within the eastern workspace adjacent to the LNG terminal site and consisted of four perennial canals and two ephemeral drainage ditches. PEM and PFO wetlands are present at the terminal, and PEM wetlands are present within the eastern workspace. The hydroperiod of these wetlands is not sufficient to provide consistent habitat for finfish; however, these areas can support aquatic invertebrates and amphibians.

Waterbodies within the LNG terminal site are contained within the fastlands levee system. The primary connection to downstream waters is through a pumping station approximately 2 miles east of the terminal site, adjacent to Lake Judge Perez.

The LNG terminal site has 7,000 feet of shoreline along the Mississippi River. The Mississippi River has been designated by the LDEQ as supporting primary contact recreation, secondary contact recreation, drinking water supply, and fish and wildlife propagation; the river fully supports these designations with no impairments. The Mississippi River at the terminal site typically consists of freshwater; however, a salt water wedge moves along the river bottom and advances up the Mississippi River during periods of low flow. During periods of extreme low flow, the salt water wedge can reach as far as New Orleans. As flows increase, the salt water wedge is pushed back downstream.

The depth of the Mississippi River ranges from 0 feet at the shoreline to approximately 45 feet in the navigation channel, and the substrate are composed mainly of unconsolidated bottom sediment. Unconsolidated sediments provide foraging habitat for benthic organisms and fish. Up to 150 fish species have been found in the lower Mississippi River, and most are freshwater fishes. Common game fish include black and white crappie (*Pomoxis* spp.), bluegill (*Lepomis macrochirus*), catfish (*Ictalurus* spp., *Pylodictus olivaris*), largemouth bass (*Micropterus salmoides*), white and striped bass (*Morone* spp.), red drum (*Sciaenops ocellatus*), and spotted sea trout (*Cynoscion nebulosus*). Bait fish include skipjack herring (*Alosa chrysochloris*), gizzard shad (*Dorosoma cepedianum*), and threadfin shad (*Dorosoma petenense*) (Lower Mississippi River Conservation Committee, 2012).

Pipeline System

The pipeline system is located within the Barataria Basin and traverses 0.4 miles of palustrine wetlands and forested uplands from the LNG terminal to TGP MP 14.4, then from TGP MP 14.4 south to TGP MP 0.0, the pipeline system traverses a mix of estuarine scrub-shrub wetlands (brackish and salt marsh), estuarine emergent wetlands, and estuarine open water habitats with unconsolidated bottoms. Over 90 percent of the pipeline system traverses shallow open water.

The wetlands and open water habitats within the Barataria Basin traversed by the pipeline system are separated into subsegments by the LDEQ, with the designated uses for each subsegment defined individually. The subsegments crossed by the pipeline system include the following:

- Wilkinson Canal and Wilkinson Bayou;
- Bay Sanbois, Lake Judge Perez, and Bay De La Cheniere; and
- Barataria Bay.

The designated uses for all segments crossed include primary contact recreation, secondary contact recreation, fish and wildlife propagation, and oyster harvesting; the segments crossed by the pipeline system fully support all designated uses with no impairment. The estuarine wetlands and open waters provide appropriate habitat for many aquatic resources characteristic of south Louisiana estuarine marshes and open waters.

In shallow coastal estuaries, benthos is a key component of the ecosystem, and the Barataria Basin has a robust and diverse benthic community. Ninety-four different benthic species have been documented in Barataria Basin (Conner and Day, 1987). A commercially important benthic species within the Barataria Basin is the oyster (*Crassostrea virginica*). Though large oyster reefs are uncommon in the Barataria Basin, small oyster aggregations are common throughout the basin. Culling oysters in Louisiana is allowed only in designated, open public areas or private leased areas. The harvest season for oysters generally runs from the first Wednesday after Labor Day through April 30; however, the owner of an oyster lease or his duly authorized agents may harvest oysters during such times as are provided within the lease terms and conditions and as approved by the LDWF and LDNR (LDWF, 2015b). The Barataria Basin contains public oyster seed grounds and oyster leases as shown in figure 4.6-2. The pipeline system would not cross any public oyster areas but would traverse many private oyster leases. These private leases are identified in table 4.6-2 below.

Table 4.6-2
Private Lease Areas in Barataria Bay Crossed by Pipeline System

Milepost In	Milepost Out	Lease ID	Oyster Lease Crossed by Pipeline (feet)	Direct Impact Acreage (Construction acres)
SW Laterals				
0.0	0.3	2801915	0	0.9
0.0	0.5	3361309	2,345	45.2
0.3	0.7	3463410	363	6.0
0.5	0.9	3253007	1,973	26.5
0.8	1.4	3463010	1,961	19.9
0.9	1.3	2790215	0	6.1
1.2	1.5	2668513	0	1.3
1.3	2.0	3316508	2,568	33.1
1.6	2.5	3330908	3,138	42.9
2.1	2.5	3187307	22	1.3
2.4	2.7	3330808	632	8.9
2.6	4.4	2843807	4,309	60.2
3.2	4.3	3222207 b	3,255	57.2
3.5	4.5	2805407	900	7.6
4.2	4.5	2760507	1,188	9.1
4.3	4.7	2883207	0	2.2
4.4	4.9	2989107	820	6.1
4.5	4.7	2901007	0	0.1
4.7	4.8	3003407	44	0.5
4.7	4.9	2989007	742	3.4
4.9	5.0	2989307	480	3.2
5.0	5.0	3210207	0	0.2
5.0	5.2	2904207	778	6.8
5.1	5.5	3003707	1,585	12.4
5.5	5.7	3003107	380	4.2
5.5	5.9	2747207	1,076	7.5
5.7	6.0	2997807	0	0.1
5.8	6.0	3002807	915	7.8
6.0	6.9	3133307	4,101	33.5
6.8	7.2	3003207	1,326	22.4
7.1	7.5	3522512	318	4.1
7.2	8.1	2872907	1,078	9.3

Table 4.6-2 Private Lease Areas in Barataria Bay Crossed by Pipeline System				
Milepost In	**Milepost Out**	**Lease ID**	**Oyster Lease Crossed by Pipeline (feet)**	**Direct Impact Acreage (Construction acres)**
Barge Access Routes				
B0	B0.9	2732307 b	648	28.4
B0	B0.5	2829907	1,745	11.6
B0	B0.4	3366209	0	0.1
B0.7	B1.0	2814807 b	800	7.7
B1.1	B1.4	3369909	811	5.6
B1.4	B1.5	3384309	68	0.6
B1.5	B1.7	2874907	1,115	7.6
B1.6	B2.2	3495511	2,339	15.3
B2.1	B2.3	2801607	570	4.3
BB10.0	BB10.3	2852607	278	1.9
BB10.1	BB10.3	2866507	588	4.1
BB10.3	BB10.6	3345108	941	6.5
		Total	**46,199**	**543.6**

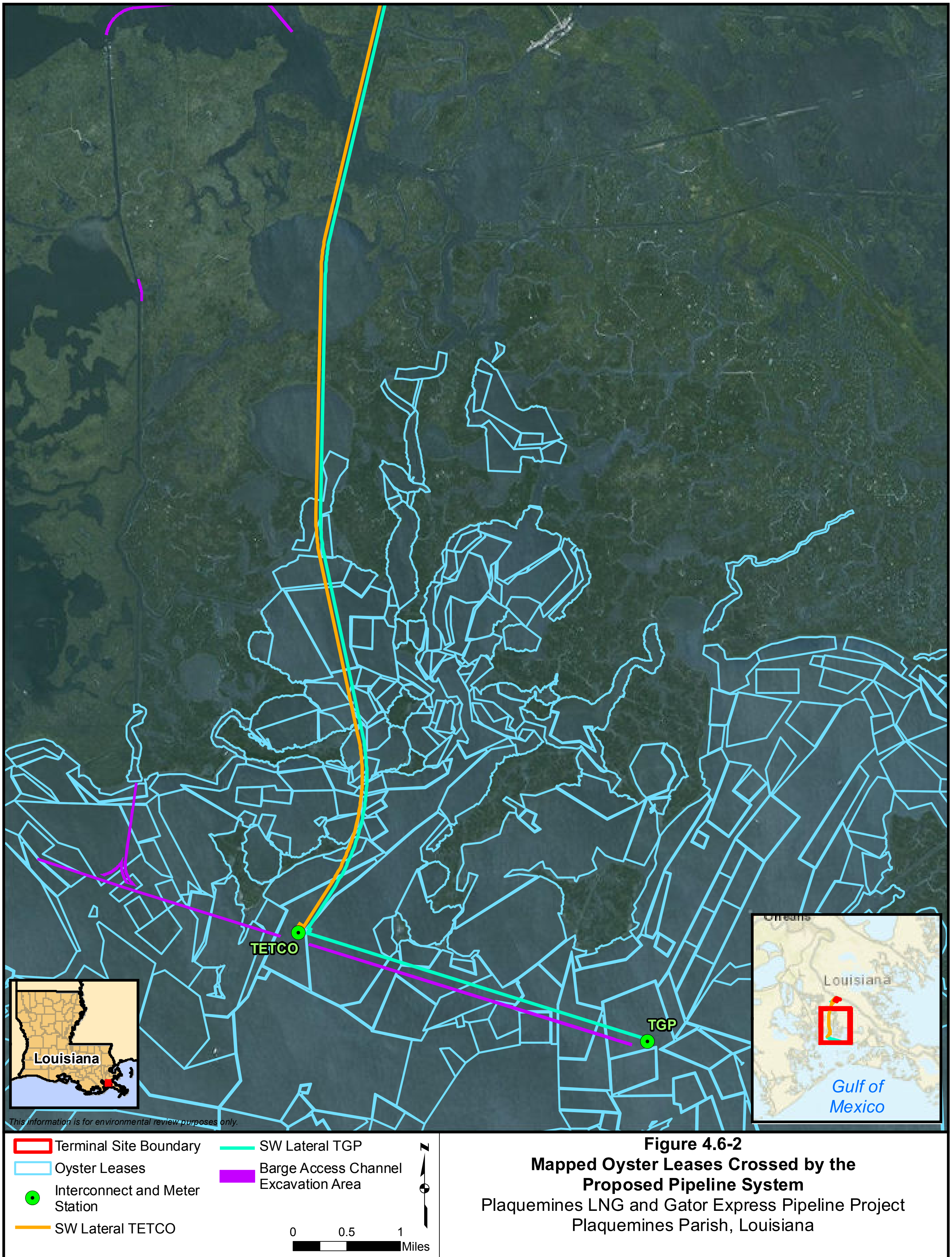

Figure 4.6-2
Mapped Oyster Leases Crossed by the Proposed Pipeline System
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

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Nektonic invertebrates such as shrimp and crabs are both ecologically and commercially important species in the Barataria Basin, with shrimp being one of the most dominant species in both numbers and biomass in the middle and lower Barataria Basin (Conner and Day, 1987) during certain periods of the year. Ecologically, these species are an important link in the estuarine food chain. Commercially important species include brown shrimp (*Penaeus aztecus*), white shrimp (*Penaeus setiferus*), and blue crab (*Callinectes sapidus*). The pipeline system is in Shrimp Area 09, Barataria Inside, which indicates that this shrimping area is within the Barataria Bay and inshore waters. Commercial and recreational shrimping occur in the Barataria Basin, with the spring shrimping season usually beginning in early to mid-May and extending to July, and the fall season usually beginning around mid-August and typically extending into December (LDWF, 2015c). The commercial crab season is open for most of the year. However, the LDWF has the authority to prohibit the use of crab traps in state waters for a maximum 16-consecutive-day period between February 1 and March 31 of each year and during a maximum 14-consecutive-day period, which includes the opening day of the spring inshore shrimp season (May), for the purpose of removing derelict or abandoned crab traps (LDWF, 2016).

Ninety-seven percent of commercially important species in the Gulf of Mexico depend on estuaries for some portion of their life cycle (Conner and Day, 1987). The Barataria Basin is an important nursery for commercially harvested fish species in the Gulf of Mexico. A total of 237 species of fishes have been recorded from the deltaic plain estuaries in Louisiana, with the Barataria Basin being the most diverse of any estuary in Louisiana (Connor and Day, 1987) with 186 species recorded. The composition of species within the Barataria Basin changes seasonally due to migratory patterns and life cycle of the species that inhabit the basin and prey availability. Representative species of finfish in the Barataria Basin include bay anchovy (*Anchoa mitchilli*), Atlantic croaker (*Micropogonias undulatus*), Gulf menhaden (*Brevoortia patronus*), spot (*Leiostomus xanthurus*), hardhead catfish (*Ariopsis felis*), sand seatrout (*Cynoscion arenarius*), Atlantic threadfin (*Polydactus octonemus*), striped anchovy (*Anchoa hepsetus*), gafftopsail catfish (*Bagre marinus*), Gulf pipefish (*Syngnathus scovelli*), spotted sea trout (*Cynoscion nebulosus*), red drum (*Sciaenops ocellatus*), and black drum (*Pogonias cromis*).

4.6.3.2 Impacts and Mitigation

LNG Terminal

Direct and indirect impacts on fishery resources in the Mississippi River from construction of the LNG terminal and marine facilities loading docks and temporary berthing structures for construction delivery may include the following:

- permanent alteration, addition, or removal of aquatic habitat (e.g., benthic habitat loss from permanent pile placement, introduction of vertical substrate habitat from piles, and shading or lighting at the LNG loading docks);
- temporary loss of food resources in the form of relatively immobile prey in the benthic environment;
- temporary increases in sedimentation and water turbidity within and immediately surrounding the construction work area;

- temporary disturbance of normal activities (e.g., foraging) and increased stress during in-water construction for Marine Facilities in the Mississippi River;
- introduction of pollutants; and
- mortality to individuals due to contact with construction equipment or exposure to elevated sound pressure levels.

No shoreline excavation is expected to occur and no dredging is planned.

Construction of the marine facilities would result in a localized increase in turbidity and suspended sediment levels. However, these impacts are expected to be temporary (i.e., confined primarily to the period of in-water activity and shortly thereafter) and limited to the area within and immediately adjacent to the LNG loading and marine facilities. No permanent or long-term water quality impacts are anticipated. Impacts on fisheries resources and supporting habitat as a result of construction and operation would occur in the Mississippi River from construction of the marine facilities.

The presence of the LNG loading docks would alter the existing aquatic habitat. The loading docks would be raised approximately 25 feet above the water, creating shading effects over the river substrate. Unconsolidated sediments within the river provide foraging habitat for benthic (bottom-dwelling) organisms and fish and are designated as EFH for red drum, shrimp, and reef fish (see discussion in section 4.6.4.1). Substrates within the Mississippi River are considered early successional due to frequent disturbance from maintenance dredging, propeller wash, and vessel traffic. Installation of over 300 piles to support the docks would act both to reduce foraging and benthic habitat for fish and provide a vertical substrate for marine life; thereby creating additional shelter and foraging opportunities for fish and mobile benthic species.

Impacts on potential fish habitat would be associated with the permanent loss of excavated drainage ditches that cross the LNG terminal site and the installation of the three permanent LNG berthing docks in the Mississippi River. Due to hydrologic separation from natural drainage flows in the fastland drainage ditches, which are often ephemeral, these features provide limited fisheries habitat. Construction measures employed to protect water quality would minimize any impacts on local fish resources that may remain at the LNG terminal site. The LNG loading dock platforms would be fixed approximately 25 feet above the existing water level on pilings, which would provide a substrate for algae, invertebrates, and other potential food sources for fish. The pilings would provide shade and also an area of refuge and protection for fish and other motile biota. It is expected that the LNG loading dock platforms would increase habitat diversity in the Mississippi River and have a net beneficial effect on fisheries resources. No significant commercial or recreational fisheries resources occur in the vicinity of the LNG terminal.

<u>Pile Driving</u>

Pile driving during construction of the marine facilities would temporarily increase underwater noise levels within the Mississippi River. Venture Global would install a combination of 48-inch-diameter, 36-inch-diameter, and 24-inch-diameter steel piles for the LNG loading docks, MOF, and temporary berthing structures (table 4.6-3). Piles would primarily be installed using an impact hammer during daylight hours. It is assumed that impact-driven piles would require approximately 4 hours of continuous driving for installation. Although pilings would be required for construction of the metering stations in Barataria Bay, an estimate of the number and sizes of pilings for this facility have not been provided by Venture Global.

Table 4.6-3
Pilings Sizes and Installation Methods for Project Facilities

Facility	Number	Size (inches)	Installation Method
LNG Loading Dock	75	48	impact hammer
MOF (36-inch)	175	36	impact hammer
MOF (48-inch)	75	48	impact hammer
Temporary Berth (west)	4	66	impact hammer
Temporary Berth (east)	3	66	impact hammer
Metering Stations	To be determined	12	Impact hammer/vibratory

Fish can be affected by noise both physiologically and behaviorally. The majority of research involves studies of the physiological effect of impact pile driving on fish due to changes in water pressure. Fish with swim bladders are more vulnerable to such pressure changes, which can cause capillaries to rupture or the swim bladder to rapidly expand and contract (Caltrans, 2001). Temporary loss of hearing also may occur as a result of exposure to noise from impact pile driving (Popper and Hastings, 2009; Popper et al., 2005). When caged juvenile Coho salmon (*Oncorhynchus kisutch*) were placed as close as 6.6 feet (2 meters) to steel piles being impacted, no fish mortality was observed (Ruggerone et al., 2008).

Potential effects on fish from exposure to continuous sound include temporary threshold shift (TTS), physical damage to the ear region, physiological stress responses, and behavioral responses such as startle response, alarm response, avoidance, and perhaps lack of response due to masking of acoustic cues. Most of these effects appear to be either temporary or intermittent, and therefore, probably do not significantly impact fish at a population level. Fish do react to underwater noise from vessels and move out of the way, move to deeper depths, or change their schooling behavior. The received levels at which fish react are not known and apparently are somewhat variable, depending upon circumstances and species of fish. To assess the possible effects of underwater project noise, it is best to examine project noise in relation to ambient continuous noises routinely produced by other projects and activities, such as shipping and fishing, and pulsive noises produced by pile-driving activities.

Existing underwater sound levels can serve as a baseline from which to measure potential impacts associated with Project activities. Knowing the background noise of an area is important to understanding the overall impact that the introduction of more noise could have on fishes. If background noise levels in the vicinity of the Project exceed effects thresholds, then fish would not be affected by any sound less than the already existing dominant noise levels. However, there is no current information regarding measurements of background noise in the vicinity of the Project area. Therefore, while it can be assumed that vessel noise associated with the Project would not add greatly to the already existing background vessel noise in the region, it cannot be assumed that the sound produced by pile driving would be completely masked by vessel noise, especially close to the hammer.

Table 4.6-4 provides the underwater noise thresholds for injury and behavioral disturbance for fish during marine pile-driving activities. For purposes of this analysis, examples of injury include permanent hearing loss and mortality. Noise impact thresholds for fish were determined by Venture Global using a spreadsheet that NMFS developed to assess the potential effects on fishes exposed to elevated levels of underwater sound during pile driving (Washington State Department of Transportation, 2016). Table 4.6-5 provides the underwater noise thresholds for injury and behavioral disturbance for fish during marine pile-driving activities. For purposes of this analysis, examples of injury include permanent hearing loss and mortality. Examples of behavioral disturbance include increased vulnerability to predators, inability to communicate, movement away from feeding grounds, temporary injuries, and inability to sense the physical environment.

Table 4.6-4
Underwater Noise Thresholds for Fish During Pile Driving Activity

Functional Hearing Group	Underwater Noise Thresholds[a]	
	Impact Pile Driving Disturbance Threshold	Injury Threshold
Fish $\geq$ 2 grams[b]	Behavior effects threshold 150 dB RMS	187 dB SEL_{cum}
Fish < 2 grams[b]	Behavior effects threshold 150 dB RMS	183 dB SEL_{cum}
Fish all sizes[b]	Behavior effects threshold 150 dB RMS	206 dB Peak

a From NMFS Technical Guidance for Assessing the Effects of Anthropogenic Noise on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts.
b From Caltrans' *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish* (Caltrans 2015).
Key:
dB = decibel
Peak = peak sound pressure
RMS = root-mean-square sound pressure
SEL_{cum} = cumulative sound exposure level

Table 4.6-5 Threshold Distance for Injury and Disturbance to Fish for Different Pile Diameters				
Type of Pile and Installation Method	Threshold Distance (feet/meters)			
	Physical Injury		Behavior Disturbance	
	Cumulative SEL dB re 1 µPA			
	Peak	Fish ≥ 2g	Fish < 2g	RMS
48-inch-diameter Steel Pile – Impact Driven[a]	61 / 18	7,067 / 2,154	7,067 / 2,154	32,808 / 10,000
36-inch-diameter Steel Pile – Impact Driven[a]	61 / 18	5,198 / 1,584	5,198 / 1,584	24,129 / 7,356
24-inch-diameter Steel Pile – Impact Driven[a]	38 / 12	2,413 / 736	2,413 / 736	28,132 / 1,585
12-inch-diameter Steel Pile – Impact Driven[a,b]	6.6 / 2	705 / 215	705 / 215	5,199 / 1,585
12-inch-diameter Steel Pile – Vibratory Driven	0.3 / 0.1	0.3 / 0.1	0.5 / 0.1	72 / 22

a Distances calculated using the NMFS Pile Driving Calculator.
b 12-inch-diameter piles would be used for construction of meter stations in Barataria Bay.
c Distances calculated using a formula for underwater practical spreading loss, $L_{receiver} = L_{source} - 15 \log (R_{receiver}/R_{source})$.
Key:
dB re 1 µPA = decibel re 1 micropascal
RMS = root-mean-square sound pressure
SEL = sound exposure level

Table 4.6-6 provides an estimate of near-source (10-meter) unattenuated sound pressures for in-water pile driving. Since the average sound pressure levels for 48-inch-diameter piles were not readily available, levels for 60-inch-diameter piles were used instead.

Table 4.6-6 Summary of Near-source (10-meter) Unattenuated Sound Pressures for In-water Pile Driving			
Type of Pile and Installation Method	Average Sound Pressure Measured in dB[a,b]		
	Peak	RMS	SEL
60-inch-diameter Steel Pile – Impact Driven	120[b]	195[c]	185[c]
36-inch-diameter Steel Pile – Impact Driven	210	193	183
24-inch-diameter Steel Pile – Impact Driven	207	194	178
12-inch-diameter Steel Pile – Impact Driven[d]	195	183	170
12-inch-diameter Steel Pile – Vibratory Driven[d]	171	155	155

a Data obtained from "Compendium of Pile Driving Sound Data" (Caltrans, 2007).
b dB = decibel
Peak = peak sound pressure
RMS = root-mean-square sound pressure
SEL = sound exposure level
c No data are available for the 48-inch-diameter piles that are proposed for the Project, so levels for the 60-inch-diamater piles were used instead.
d 12-inch-diameter steel piles would be used for construction of meter stations in Barataria Bay.

Venture Global primarily proposes to use an impact driven installation method, which has a higher sound level than vibratory installation. Underwater noise from pile driving would exceed the behavioral disturbance threshold for fish in the vicinity of the Project. If unmitigated, much of the proposed pile driving would also exceed the injury threshold for fish and the Project would have adverse impacts on aquatic resources in the Project area due to pile driving noise.

Though Venture Global has not yet committed to specific mitigation measures to minimize noise impacts on marine species, some typical underwater noise mitigation measures that could be considered include the following:

- use of ramp-up procedures at the beginning of each pile installation or when a delay of 15 minutes or more has occurred;
- placement of cushion blocks consisting of wood, nylon, or micarta between the pile and hammer to minimize the noise generated while driving the pile; and
- use of bubble curtains around the piles.

We believe it is necessary that Venture Global commit to specific noise mitigation measures to reduce the effect of underwater noise on marine species in the Project area. In addition, Gator Express Pipeline has not provided details about the number and sizes of piles for the metering facilities in Barataria Bay. Therefore, **we recommend that:**

- **<u>Prior to the end of the draft EIS comment period,</u> Venture Global should file with the Secretary, a detailed description of the final proposed pile driving activity including:**

  a. the number, diameter, and locations of all proposed piles at the metering facilities;

  b. the method of pile installation and the duration of pile driving activities at the metering facilities;

  c. a description of the measures developed in consultation with the NMFS that it would implement to reduce noise impacts on aquatic resources in the vicinity of all in-water pile-driving activities; and

  d. an analysis of the expected noise levels with mitigation.

<u>Other Underwater Noise Sources</u>

Natural sources of ambient/background noise include biological sources (i.e., various biological species), wind, waves, water flow, and rain. Human-generated sources can include vessel noise (e.g., commercial shipping/container vessels) and maritime activities. Various factors contribute to the background noise within the Project area. One of the major contributors to background noise in the Project area is commercial shipping traffic associated with the Mississippi River and the Port of New Orleans. Project construction activities would be temporary and would occur in areas that currently experience underwater noise from commercial and recreational boaters. During operation, the noise generation associated with visiting LNG carriers would be consistent with that produced by the multiple large ships that travel though the heavily used section of the Mississippi River on which the LNG terminal site would be situated. Generally, it is expected that the background noise within the Mississippi River is dominated by large vessels (e.g., tankers, container ships) that produce source levels of 180 to 190 decibel (dB) re 1 micropascal root-mean-square (μPA_{RMS}) at frequencies between 200 and 500 hertz (Jasney et al., 2005). We conclude that the noise from Project construction (excluding pile driving) and LNG carriers during operations would not be excessive and would not result in negative noise impacts on the biological community.

Stormwater Runoff

Construction activities at the LNG terminal would require the removal of vegetation cover at the site and exposing the underlying soils to wind and rain, which would increase the potential for soil erosion and sedimentation of aquatic habitat. Similarly, during operation of the LNG terminal, 614.6 acres of currently vegetated land would be converted to impervious or semi-pervious surfaces associated with aboveground facilities and plant roads, which would increase stormwater runoff into adjacent vegetated and open water habitats. Potential impacts from stormwater runoff on aquatic resources include increased turbidity and levels of suspended solids. To minimize impacts on aquatic resources due to stormwater runoff, Venture Global would conduct land-disturbing activities in compliance with its LPDES General Permit for stormwater discharges; Project-specific Construction SWPPP; and Project-specific Plan and Procedures. Based on the inherent environmental protection afforded by these regulations and permits, indirect impacts on aquatic species due to stormwater discharges are not expected to be significant.

Ballast Water

Ballast water would be discharged as an LNG carrier is loading cargo. The general use, discharge, and regulation of ballast water is discussed in section 4.3.2.2. Ballast water that would be discharged in the LNG berthing area would be composed mainly of Gulf of Mexico water, which would exhibit water quality parameter concentrations different from those of the Mississippi River. The effects of ballast water discharges on four ambient water quality parameters (temperature, pH, dissolved oxygen, and salinity) are described in section 4.3.2.2. Ballast water is stored in the ship's hull; as a result, the temperature of discharged water is not expected to deviate substantially from ambient water temperature. The pH of ballast water would be similar to or slightly higher than ambient water within the river. However, this difference would not be outside the tolerance range of resident species, and we believe impacts would be temporary and negligible.

Surface water within the Mississippi River is generally considered fresh, although a salt-wedge intrusion along the bottom can occur during periods of low rainfall and high tides. During and immediately following ballast water discharges, benthic aquatic species may be affected by higher salinity levels because the higher salinity ballast water would sink to the lower portion of the river due to its higher specific gravity relative to the ambient water. However, ships moving along the river near the berthing area would displace water, circulating it into, around, and out of the berthing area. Therefore, any increased salinity levels resulting from ballast water discharges would be temporary. Resident species within the river are euryhaline (able to live in waters with a wide range of salinity), and the salinity of seawater is well within their tolerance range. Therefore, we have determined that increases in salinity from ballast water discharges would be temporary and not likely to adversely affect aquatic resources.

Dissolved oxygen levels below 4 mg/L are generally considered unhealthy for aquatic life, and levels below 2 mg/L are considered hypoxic and inadequate to support most aquatic life. As discussed in section 4.3.2.2, ballast water would contain low dissolved oxygen levels and could decrease existing dissolved oxygen levels within the immediate vicinity of the discharge point. Depending on the oxygen levels present in both the ballast and ambient water at the time of discharge, aquatic resources present in the vicinity of the discharge point could be exposed to dissolved oxygen levels considered unhealthy for aquatic life. The adaptability of resident species in the Mississippi River to natural spatio-temporal variation in oxygen levels, and the ability to move over a short distance to more suitable conditions, would minimizes the adverse impacts associated with ballast water discharges. Given that the amount of ballast water discharged into the river during each LNG vessel visit to the LNG terminal would make up only a very small percentage of the 400 billion gallons water flowing downstream, we conclude that impacts on aquatic resources from reduced dissolved oxygen would be temporary and minor.

Due to the volumes of ballast water often collected by vessels, a possibility exists that living marine organisms may enter ballast tanks. The larger macroorganisms that may be collected would likely die during transit; however, some of the smaller planktonic organisms could survive. An environmental concern associated with ballast discharge includes the risk of introducing exotic species in riverine and estuarine ecosystems. Loaded with water from the surrounding ports and coastal waters throughout the world, vessels can carry a diverse assemblage of marine organisms in ballast water that may be foreign and exotic to the ship's port of destination. Invasive aquatic species may cause algal blooms and hypoxic conditions, affecting all trophic levels and potentially resulting in a decline in biodiversity.

USCG regulations require that all vessels equipped with ballast water tanks that enter or operate in U.S. waters maintain a vessel-specific ballast water management plan and assign responsibility to the master or appropriate official to understand and execute the ballast water management strategy for that vessel (33 CFR 151.2026). Under these requirements, vessels must implement one of five strategies to prevent the spread of exotic aquatic nuisance species in U.S. waters. The IMO has adopted this regulation and requires each vessel to install and operate a ballast water management system (option 1 as currently defined).

Venture Global has stated that it would require LNG carriers to conduct complete ballast water exchange at least 200 nautical miles from any shoreline (option 4 as currently defined), except in extraordinary circumstances causing safety or stability concerns that would require a ballast exchange less distant from the shoreline, which is authorized under 33 CFR 151.2040. Venture Global has indicated that they adhere to all USCG ballast management regulations throughout the life of the Project.

Artificial Lighting (including flaring)

Temporary lighting would be installed and used during construction of the LNG terminal to facilitate construction activities during evening hours and meet applicable safety requirements. Construction of the LNG loading and ship berthing facilities and dredging would require additional overwater lighting during the construction period. However, artificial light sources can have undesirable effects on aquatic resources, such as altering foraging behavior and spatio-temporal patterns of species density. Artificial light emanating from coastal infrastructure has the potential to alter the feeding behavior of predatory fish and affect prey fish behavior, particularly schooling (Becker et al., 2012). Illumination of surface waters in the vicinity could cause artificially induced aggregations of small organisms that rely on sun or moonlight to determine movement patterns, resulting in increased predation by larger species. Generally, impacts on aquatic species would be minor as these species may change their feeding habits over time. Due to the industrial nature of the area surrounding the LNG terminal, aquatic species within the Mississippi River are likely acclimated to ambient light from surrounding industrial sources.

To minimize potential impacts on aquatic resources, Venture Global would direct all nighttime lighting towards the construction activity being conducted. Venture Global's Facility Lighting Plan indicates that lighting would be chosen to minimize the horizontal emission of light away from intended areas, and over-water lighting would be limited to the extent necessary to carry out marine operations or facility maintenance and would be shielded. Based on the existing light conditions along relevant portions of the Mississippi River and the likelihood that aquatic resources would acclimate over time to increased lighting at the LNG terminal, we have determined that impacts on aquatic resources from increased lighting during construction and operation of the LNG terminal would be minimized.

Mississippi River Traffic

LNG carrier visits to the LNG terminal would represent only a minor increase to the existing level of ship traffic in the Mississippi River; as such, operational impacts on fisheries resources (including those associated with noise as discussed earlier) are not anticipated.

Water Withdrawal and Discharge

Venture Global anticipates that water for hydrostatic testing of the LNG tanks, other storage tanks, and plant piping would be appropriated from the industrial canal south of the LNG terminal site. Water used for LNG terminal operations may be obtained from the Mississippi River, the Plaquemines Parish Water District, or a new well or wells to be located at the LNG terminal site.

The water withdrawal process could entrain fish eggs and juvenile fish present near the intake structures within the industrial canal. In accordance with its Project-specific Procedures, Venture Global would screen (0.25- to 1-inch mesh) intake hoses to limit the entrainment of larvae and pre-juvenile fish and invertebrates during water withdrawal. Venture Global would withdraw water at a rate of 1,200 gallons per minute and would place screened intake structures at the lowest possible elevation to reduce the impingement of biological organisms and debris on intake screens. Water intakes would be placed above the channel bed to avoid sediment disturbance. Also, test water would be transferred between LNG storage tanks to reduce the amount of water required for testing. With the implementation of these measures, impacts on aquatic resources as a result of water intake would not be significant.

Impacts associated with water discharges include local erosion and bed scour. Test water would be in accordance with the LPDES Hydrostatic Test Wastewater Discharge Permit requirements and would follow the Project-specific Plan and Procedures. The water would be tested for total suspended solids, oil and grease, and pH, and treated (if test results indicate that the water would not meet LPDES requirements) prior to being discharged to the Mississippi River.

Therefore, we have determined that impacts on aquatic resources due to the discharge of hydrostatic test water would be temporary and negligible.

<u>Inadvertent Spills</u>

During construction and operation, hazardous materials resulting from spills or leaks entering the Mississippi River could have adverse impacts on aquatic resources. The impacts are caused by either the physical nature of the material (e.g., physical contamination and smothering) or by its chemical components (e.g., toxic effects and bioaccumulation). These impacts would depend on the depth and volume of the spill, as well as the properties of the material spilled. To prevent spills and leaks, Venture Global would implement its Project-specific Spill Prevention Plan during construction and its SPCC Plan during operation of the LNG terminal. These plans outline potential sources of releases at the site, measures to prevent a release, and initial responses in the event of a spill (see detailed discussion in section 4.2.3). Given the impact minimization and mitigation measures described above, we conclude that impacts on aquatic resources would be temporary and minor.

Pipeline System

Waterbodies and wetlands that would be crossed by the pipeline system have the potential to support fish and other aquatic biota. Larval and juvenile fish rely on wetlands as refuge and foraging habitats. Pipeline construction impacts on fishery resources resulting from excavation/dredging for the pipeline and barge access routes would be temporary and may include the following:

- temporary noise disturbance during in-water construction;
- temporary increased sedimentation and water turbidity within and immediately surrounding the construction work area;
- direct mortality of individuals due to contact with construction equipment;
- temporary loss of food resources in the form of relatively immobile prey in the benthic environment;
- temporary and permanent alteration, addition, or removal of aquatic habitat cover; and
- introduction of pollutants.

Permanent impacts include the construction of the two meter stations in Barataria Bay. The meter station platforms would be raised approximately 25 feet above the water, thereby reducing shading effects to benthic habitat. The 12-inch-diameter piles supporting the platforms would act to remove or reduce benthic habitat used by fish for foraging, but would also provide a vertical substrate for marine life, creating additional fish foraging opportunities and shelter. No other impacts on fisheries resources are expected during daily operations. Some of the impacts mentioned above may occur during maintenance activities but would be infrequent, of limited duration, and therefore insignificant.

Pipeline system construction impacts on fisheries resources and habitat would occur primarily in estuarine wetlands and open water. Impacts would primarily be localized and temporary, with disturbed areas returning to preconstruction conditions following pipeline installation. The pipeline trench would be backfilled following construction, and the barge channels would be allowed to backfill naturally through sedimentation. The push method or barge lay method would be used for trenched pipeline installation across most waterbodies and wetlands. These methods are designed to minimize equipment use and disturbance during pipeline construction, although the crossing methods could result in temporary loss or modification of aquatic habitat, increases in sedimentation and turbidity levels, and alteration of vegetative cover. The majority of fish present within the waterbody at the time of construction activities would likely be displaced to similar nearby habitats; however, stress, injury, or death of individual fish may occur. Increased suspended sediment and turbidity levels may cause degradation of benthic and spawning habitat and decreased dissolved oxygen levels within and downstream of the crossing location. Temporary increases in suspended solids would decrease rapidly following the completion of in-water activities.

Venture Global has developed Project-specific Procedures as initially discussed in section 2.5.5.5. Venture Global is proposing to not adopt FERC's Procedure pertaining to seasonal restrictions on construction within waterbodies. Venture Global states that it would not adopt the seasonal construction restriction for its pipelines because of the length of the construction period and the need for an integrated schedule across the multiple Project facilities.

According to FERC's Procedures, not adopting the seasonal construction restriction must be "*expressly permitted…by the appropriate federal or state agency.*" We have included a recommendation (see section 4.3.2.3) requiring Venture Global to provide written approval from LDWF that no seasonal restrictions would be required by the state.

A PSS wetland, PEM wetland, and perennial stream (unnamed channel) would be crossed by the HDD method at the northern end of the pipeline route between MPs 11.3 and 11.5 of the SW lateral TETCO and MPs 14.6 to 14.8 of the SW lateral TGP, thereby avoiding direct impacts on these features. Venture Global estimates that HDD operations would require approximately 9.0 million gallons of water and hydrostatic testing of the pipelines would require approximately 9.5 million gallons of water (18.5 million gallons in total). Installing the pipelines using the HDD method would avoid or minimize impacts on fisheries, fish habitat, and other aquatic resources within and adjacent to waterbodies unless an inadvertent release of drilling mud were to occur. An inadvertent release of drilling mud (bentonite clay) into a stream would affect water quality and could impede fish movement, potentially resulting in stress, injury, and/or direct mortality of fish present in the vicinity of the release. Bentonite clay is non-toxic to aquatic organisms (Hair et al., 2002). However, bentonite clay sediment can interfere with oxygen exchange by gills and adversely affect filter feeders. If an inadvertent release occurs, Venture Global would implement the corrective action and cleanup measures outlined in its HDD Contingency Plan. We have reviewed this HDD Contingency Plan and find it acceptable. The HDD Contingency Plan would minimize potential impacts on aquatic resources, including the installation of berms, silt fence, and/or hay bales to prevent silt-laden water from flowing into waterbodies, or in the event of an in-water release, the use of temporary dams to isolate the drilling fluid and vacuum trucks to remove the released drilling mud.

Impacts on surface water and wetlands associated with construction of the pipeline facilities during and following construction would be addressed through adherence to the USACE, New Orleans District/LDNR permit conditions, CWA section 401 water quality certification requirements, and implementation of the protective measures in the Project-specific Plan and Procedures along with our recommendation. The applicant would minimize impacts by developing site-specific crossing plans for major waterbodies and by adhering to the procedures set forth in its final SPCC Plan, SWPPP, and HDD Contingency Plan. Surface water and wetland impact avoidance, minimization, and mitigation measures are addressed in sections 4.3.2.2 and 4.4.2.2, respectively.

Pile Driving

During construction of the two meter stations in Barataria Bay, multiple (to be determined) 12-inch-diameter steel piles would be installed during construction. Installation could result in noise impacts on fish similar to those discussed for the marine facilities in the Mississippi River (see above for LNG terminal). Currently, Venture Global plans to install the piles associated with the meter stations using either the impact hammer pile driving method or the vibratory pile driving method. Generally, vibratory pile driving takes much less time than impact-driven pile installation.

Underwater noise thresholds for injury and behavioral disturbance for fish and near-source (10-meter) unattenuated sound pressures for in-water pile driving are summarized in tables 4.6-5 and 4.6-6, respectively. Because Venture Global has not yet proposed any mitigation measures to reduce potential pile-driving noise impacts, we have included a condition (see section 4.6.2.3) requiring Venture Global to develop noise mitigation measures to be implemented during pile-driving activities.

Other Underwater Noise Sources

Underwater noise levels associated with barges and dredging/excavation in estuarine wetlands and open water along the pipeline system would also increase in the Project area during construction and intermittently during operation of the pipelines. Construction activities would be temporary and would occur in areas that currently experience underwater noise from other oil and gas operations in the vicinity. The mobility of marine species and the ability to leave any area of noise disturbance would minimize impacts from barge traffic and construction of the pipeline and meter stations.

Dredging of Barge Access Channels

Dredging within barge access areas would cross private oyster leases. According to the LDWF, lessees must be notified as part of the Coastal Use permitting process about projects occurring in their oyster lease. In addition, a water bottom assessment must be conducted on those portions of leases located within 1,500 feet of the pipeline system. Additional requirements to mitigate potential impacts on these oyster leases may be required by the LDWF as the permitting process continues.

Hydrostatic Testing - Water Withdrawal and Discharge

Venture Global anticipates that water for hydrostatic testing of the pipeline system would be withdrawn from Barataria Bay near the TGP and TETCO meter stations. The two discharge locations are the industrial canal south of the LNG terminal site and at the mainline valve site. Impacts associated with water discharges include local erosion and bed scour. Hydrostatic testing activities would be in accordance with the LPDES Hydrostatic Test Wastewater Discharge Permit requirements and would follow the Project-specific Plan and Procedures. Water intakes would be screened to reduce or eliminate the entrainment of fish and other aquatic organisms. The discharge water would be tested for total suspended solids, oil and grease, and pH, and treated (if test results indicate that the water would not meet LPDES requirements) prior to being discharged. Therefore, we have determined that impacts on aquatic resources due to the intake and discharge of hydrostatic test water would be temporary and negligible.

Vessel Traffic

Increased vessel traffic as a result of pipeline construction would represent a minor increase to the existing level of commercial and recreation vessel traffic within Barrataria Bay; therefore, impacts on fisheries resources as a result of construction vessel traffic (including those associated with noise as discussed earlier) are not anticipated. Once construction is complete, vessel traffic associated with operation of the pipeline system would be related to maintenance and would be negligible.

Inadvertent Spills

During construction of the pipeline system, a potential exists for the release of hazardous materials into canals and Barataria Bay, which could have adverse impacts on aquatic resources. These impacts would depend on the depth and volume of the spill, as well as the properties of the material spilled. To prevent spills and leaks during pipeline construction, Venture Global would implement its Project-specific SPCC Plan. Given the impact minimization and mitigation measures described above, we conclude that the probability of a spill of hazardous materials is small and any resulting impacts on aquatic resources would be temporary and minor.

4.6.4 Essential Fish Habitat

The MSA (Public Law 94-265 as amended through January 12, 2007, was established, along with other goals, to promote the protection of EFH during the review of projects to be conducted under federal permits, licenses, or other authorities 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. Federal agencies that authorize, fund, or undertake activities that may adversely affect 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, the Fish and Wildlife Coordination Act, and the ESA, to reduce duplication and improve efficiency (50 CFR 600.920(e)). Generally, the EFH consultation process includes the following steps:

- notification – The action agency should clearly state the process being used for EFH consultation (e.g., incorporating EFH consultation into an 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 Assessment should include the following:

  - a description of the proposed action;

  - an analysis of the effects (including cumulative effects) of the proposed action on EFH, 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 should provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH; and

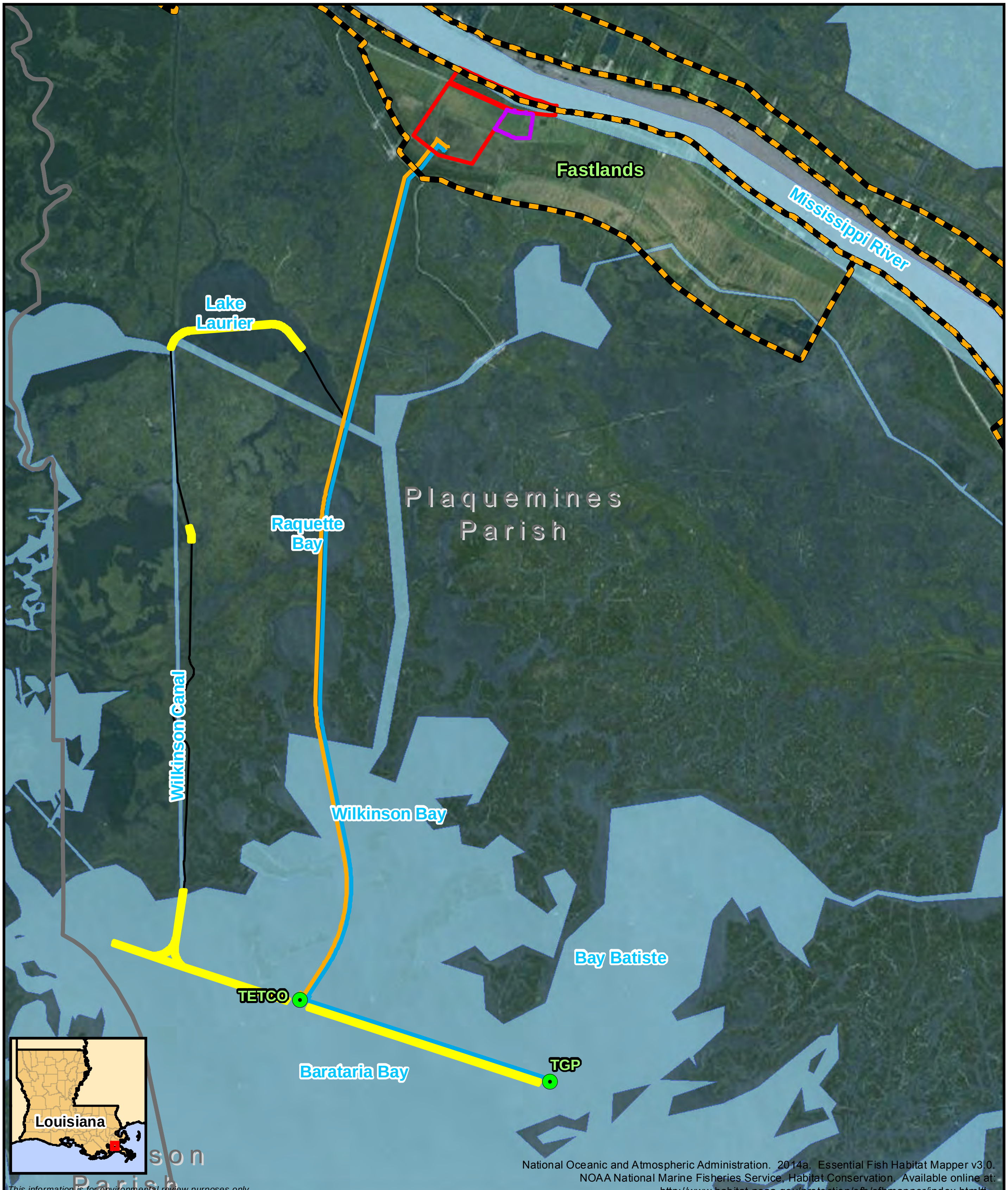
- agency response – Within 30 days of receiving the recommendations, the action agency must respond to NMFS. The action agency may notify NMFS that a full response to the conservation recommendations would be provided by a specified completion date agreeable to all parties. The response must include a description of measures proposed by the agency to avoid, mitigate, or offset the impact of the activity on EFH. For each conservation recommendation that is not adopted, the action agency must explain its reason to NMFS for not following the recommendation.

As recommended by NMFS, we are incorporating EFH consultation for the Project into our responsibilities under NEPA. As such, we are requesting that NMFS consider this draft EIS as initiation of EFH consultation.

4.6.4.1 Existing Essential Fish Habitat

The Project is in Gulf of Mexico Ecoregion 4: East Texas and West Louisiana, Mississippi Delta to Freeport. NMFS mapping shows EFH within the Project area, including the Mississippi River and portions of the Barataria Basin (NOAA, 2014a). Figure 4.6-3 shows the extent of EFH relevant to the Project areas. Correspondence between Venture Global and NMFS (NMFS, 2017) indicate that the portion of the Mississippi River located in the Project area does not provide EFH since managed fish species would not be common this far upriver (river mile 55). Therefore, we conclude that the LNG terminal facilities located in the Mississippi River would not effect EFH.

The remainder of the LNG terminal site lies adjacent to the Mississippi River on non-tidal fastlands that are hydraulically separated from surrounding marsh habitats. Correspondence between Venture Global and NMFS indicates that construction of the LNG terminal facility would not likely adversely impact habitat supportive of marine fisheries resources (NMFS, 2015a). The 80-acre eastern workspace adjacent to the LNG terminal site, like the LNG terminal, is also on non-tidal fastlands and, therefore, is not anticipated to affect EFH.



Essential Fish Habitat
Terminal Site Boundary
Eastern Workspace
Barge Access Channel Dredging/Excavation Area
Interconnect and Meter Station
SW Lateral TETCO
SW Lateral TGP
Barge Access Channel
Levee

N

1:126,720

0 1 2 Miles

Figure 4.6-3
Mapped Essential Fish Habitat Crossed by the Project
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR03_Plaquemines_RR03_2_3_2.mxd | REVISED: 02/15/2017 | SCALE: 1:126,720 DRAWN BY: JMS

The pipeline system is in the Estuarine Zone, as defined by the Gulf Council (NMFS, 2015a). EFH in the region is designated by the Gulf Council and NMFS through Fishery Management Plans. NMFS, in a letter to FERC (NMFS, 2015a), indicated that wetlands along the majority of the pipeline system are categorized as EFH for post-larval and/or juvenile life stages of white shrimp, brown shrimp, and lane snapper (*Lutjanus synagris*); all life stages of red drum; and adult gray snapper. Additionally, primary categories of EFH within the Project area include estuarine emergent wetlands, estuarine water column, and estuarine mud bottoms. Though submerged aquatic vegetation (SAV) occurs within the Barataria Basin, no SAV was observed during field surveys for the pipeline system.

NMFS (NMFS, 2015a) indicated that wetlands in the vicinity of the pipeline system provide nursery and foraging habitats supportive of a variety of economically important marine fishery species, including striped mullet (*Mugil cephalus*), Atlantic croaker, Gulf menhaden, spotted and sand sea trout, southern flounder (*Paralichthys lethostigma*), and blue crab. Some of these species serve as prey for other fish species managed under the MSA by the Gulf of Mexico Fishery Management Council, such as mackerels, snappers, and groupers, as well as highly migratory species managed by NMFS, such as billfish and sharks.

4.6.4.2 Impacts and Mitigation

Construction of the pipeline system would impact EFH for post-larval and juvenile life stages of white shrimp, brown shrimp, and lane snapper, all life stages of red drum, and adult gray snapper. Affected EFH includes benthic substrates and/or water column habitats in estuarine open water (collectively referred to in this assessment as estuarine open water) and estuarine emergent wetlands. Potential adverse impacts on EFH would primarily be temporary, while some permanent impacts may be beneficial. Temporary adverse impacts during construction would be minimized through adherence to the BMPs set forth in Venture Global's Project-specific Procedures, SWPPP, and SPCC Plan. Potential temporary and permanent impacts of pipeline system construction and operation on EFH are described below.

Temporary Habitat Modification

Approximately 775.4 acres of estuarine open water mapped as EFH and 423.9 acres of estuarine open water not mapped as EFH (in Lake Laurier, Barataria Bay, and Wilkinson Bay), along with approximately 64.5 acres of EEM wetlands, that can function as EFH, would be temporarily modified by dredging, excavation, and related activities within the workspace required for pipe installation, meter station construction, and barge access channels. Portions of the barge access channels would be dredged to increase the existing water depth (approximately 4 to 7 feet) to at least 8 feet to allow for passage of construction barges along the pipeline construction right-of-way and in existing channels providing access to the right-of-way. Construction disturbance would be temporary and localized to the construction area. Pipeline trenches would be backfilled with the dredged/excavated material. Material dredged from the barge access channels would be sidecast and, upon Project completion, the dredged/excavated portions of the channels would be allowed to backfill naturally over time to current bottom contours.

Potential impacts on EFH include sediment disturbance and temporary changes in water depth from dredging/excavation, although the benthic substrate would offer fundamentally similar habitat prior to and after dredging. Along the Louisiana coast, SAV is largely limited to depths no greater than 3 to 4 feet (LDWF, 2012). Any increase in water depth beyond this level could preclude the growth of SAV. However, no SAV was identified during Venture Global's field surveys at proposed dredging/excavation locations (ERM, 2017); therefore, no impacts on SAV are expected. Given the type of sediments in estuarine open water environment, benthic communities are expected to quickly recolonize after construction. Wetlands would be returned to the previous grade and are expected to revegetate within one growing season. Therefore, we have determined that any adverse impacts on EFH would be minor because of their temporary nature and limited spatial extent.

Temporary Loss of Benthic Invertebrates

Dredging/excavation would have temporary and localized effects on benthic substrates in the estuarine zone. Invertebrate food resources would be expected to recolonize to their former status within a few seasons. Because the effects would be temporary and limited in spatial extent, temporary loss of benthic invertebrates is expected to have a minor adverse impact.

Temporary Increased Turbidity

The Project has the potential to produce temporary turbidity plumes in the water column during in-water work activities, including pipeline construction, barge channel excavation, and hydrostatic test water discharge. In-water work may cause localized increases of suspended sediment and nutrient levels in the water column, and decreases in dissolved oxygen. Turbidity effects would be temporary and limited in spatial extent and result in minor adverse impacts on EFH.

Introduction of Pollutants

Potential surface water quality impacts associated with accidental spills or leaks of hazardous liquids would be avoided or minimized by restricting the locations and use of refueling and storage facilities, and by requiring cleanup in the event of a spill or leak. Impacts on surface waters during construction and operation would be mitigated by adherence to the Project-specific Procedures, SWPPP, and SPCC Plan. Through implementation of the BMPs, potential impacts on EFH due to pollutants would be of short duration and minimal.

Permanent Habitat Modification

Approximately 2.4 acres of estuarine open water would be permanently modified through the construction of the two meter stations in Barataria Bay. The meter station platforms would be fixed approximately 25 feet above the existing water level on pilings, which would provide a substrate for marine algae, invertebrates, and other potential food sources for fish. The relatively close proximity of multiple pilings may also provide an area of refuge and protection for fish and other motile biota, while the platforms may offer some shading. Because the meter station platforms would increase habitat diversity in Barataria Bay, they would likely have a net beneficial effect on EFH.

Based on the information provided above, EFH, including estuarine emergent wetlands, benthic substrates, and water column habitats, would be affected by pipeline construction.

Adverse effects would be temporary, localized, and minimal. Pre- and post-construction EFH acreage is not expected to change. Moreover, the pipelines have been routed through open water to the extent practicable, and construction methods have been selected that minimize potential degradation of EFH.

Following pipeline construction, affected wetlands and waterbodies would be returned to preconstruction conditions to the extent practicable, in accordance with the Project-specific Procedures and the conditions of USACE and LDNR permits. With the majority of wetlands in Barataria Bay being impacted by subsidence and erosion, complete restoration to pre-existing conditions is of concern, as noted by NMFS (2015). As noted above, if full recovery is not achieved within one growing season, Venture Global would consult with the USACE and LDNR to determine appropriate follow-up measures.

Marine Mammals

A total of 25 mammals protected under the MMPA may occur along the LNG transit routes in the Gulf of Mexico. Three of the species are also listed under the ESA and are addressed in section 4.7. The remaining 22 whale and dolphin species and their potential areas of occurrence along the LNG transit routes are described in table 4.6-7.

All marine mammals are federally protected under the MMPA. The MMPA established, with limited exceptions, a moratorium on the "taking" of marine mammals in waters or on lands under U.S. jurisdiction. "Take" is defined as the "harassing, hunting, capturing, or killing" of marine mammals. The 1994 Amendments to the MMPA define "harassment" as "any act of pursuit, torment, or annoyance" which:

- has the potential to injure a marine mammal or marine mammal stock in the wild (Level A Harassment); or

- has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild" (Level B Harassment).

LNG terminal operations would include LNG carriers moving between the Mississippi River and the Gulf of Mexico. As discussed for federally listed whales and sea turtles, there is the potential for interaction and injury during LNG carrier transit in the Gulf of Mexico. There is also a potential for bottlenose dolphins to occur in the Mississippi River, and they have been documented in Barataria Bay (Muth, 2016). Mitigation measures for non-listed marine mammals will be the same as those for listed whales and those noted in section 4.7.1.1 for manatees. Potential impacts on dolphins from pile driving during meter station construction would be similar to those discussed in section 4.7.1.1 for manatees.

Table 4.6-7
Non-ESA Listed Marine Mammals Potentially Occurring Along the LNG Transit Routes

Common Name	Scientific Name	Area Where Mammal May Occur
Dolphins		
Atlantic Spotted Dolphin	*Stenella frontalis*	Gulf of Mexico
Bottlenose Dolphin	*Tursiops trunctus*	Terminal, Pipeline System, Mississippi River, Gulf of Mexico
Clymene Dolphin	*Stenella clymene*	Gulf of Mexico
False Killer Whale	*Pseudorca crassidens*	Gulf of Mexico
Frasier's Dolphin	*Lagenodelphis hosei*	Gulf of Mexico
Killer Whale	*Orcinus orca*	Gulf of Mexico
Melon-headed Whale	*Peonocephala electra*	Gulf of Mexico
Pantropical Spotted Dolphin	*Stenella attenuate*	Gulf of Mexico
Risso's Dolphin	*Grampus griseus*	Gulf of Mexico
Rough-toothed Dolphin	*Steno bredanensis*	Gulf of Mexico
Short-finned Pilot Whale	*Globicephala macrorhyncus*	Gulf of Mexico
Spinner Dolphin	*Stenella longirostris*	Gulf of Mexico
Striped Dolphin	*Stenella coeruleoalba*	Gulf of Mexico
Whales		
Blainville's Beaked Whale	*Mesoplodon densirostris*	Gulf of Mexico
Bryde's Whale	*Balaenoptera edeni*	Gulf of Mexico
Cuvier's Beaked Whale	*Ziphius cavirostris*	Gulf of Mexico
Dwarf Sperm Whale	*Kogia sima*	Gulf of Mexico
Gervais' Beaked Whale	*Mesoplodon europaeus*	Gulf of Mexico
Minke Whale	*Balaenoptera acutorostrata*	Gulf of Mexico
North Atlantic Right Whale	*Eubalaena glacialis*	Gulf of Mexico
Pygmy Sperm Whale	*Kogia breviceps*	Gulf of Mexico
Sowerby's Beaked Whale	*Mesoplodon bidens*	Gulf of Mexico

Source: NMFS, 2012

4.7 THREATENED, ENDANGERED, AND OTHER SPECIAL STATUS SPECIES

Special status species are those species for which state or federal 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; species that are currently candidates for federal listing under the ESA; state listed threatened or endangered species; and species otherwise granted special status at the federal or state level (e.g., protected under the MMPA).

Under section 7 of the ESA, as amended, federal agencies are required to ensure that any actions authorized, funded, or carried out by the agency would not jeopardize the continued existence of a federally listed threatened or endangered species, or result in the reduction or adverse modification of the designated critical habitat of a federally listed species. As the lead federal agency, FERC is required to coordinate with the FWS and NMFS to determine whether federally listed threatened or endangered species or designated habitat are found in the vicinity of projects and to determine potential effects on those species or critical habitats.

For actions involving major construction activities that may affect listed species or designated critical habitat, the lead federal agency must prepare a Biological Assessment and submit it to the FWS and/or NMFS. If the action would adversely impact a listed species, the federal agency must also submit a request for formal consultation. In response, the FWS and/or NMFS would issue a Biological Opinion as to whether or not the federal action would likely jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

As required by section 7 of the ESA, we request that FWS and/or NMFS accept the information provided in this draft EIS as the BA for the Project. Furthermore, we request concurrence with our determination of effect for the federally listed species in table 4.7-1.

Based upon our review of publicly available information, agency correspondence, and field surveys, federally and/or state listed threatened or endangered species may occur in the vicinity of the terminal site and pipeline system. There is no critical habitat for federally listed species designated within the limits of construction for the Project.

Table 4.7-1 Federal and State Listed Species Potentially Occurring in the Vicinity of the Project				
Common Name ***Scientific Name***	**Federal Status**	**State Status**	**Project Component**	**Determination of Effect**
Mammals				
West Indian Manatee *Trichechus manatus*	Threatened[c]	Endangered	Pipeline	May affect, not likely to adversely affect
Blue Whale *Balaenoptera musculus*	Endangered[c]	Endangered	Terminal[d]	May affect, not likely to adversely affect
Fin Whale *Balaenoptera physalus*	Endangered[c]	Endangered	Terminal[d]	May affect, not likely to adversely affect
Sei Whale *Balaenoptera borealis*	Endangered[c]	Endangered	Terminal[d]	May affect, not likely to adversely affect
Sperm Whale *Physeter microcephalus*	Endangered[c]	Endangered	Terminal[d]	May affect, not likely to adversely affect
Birds				
Bald Eagle *Haliaeetus leucocephalus*	Delisted[a,b]	Endangered	Terminal and Pipeline	May affect, not likely to adversely affect
Brown Pelican *Pelecanus occidentalis*	Delisted	Endangered	Terminal and Pipeline	May affect, not likely to adversely affect
Peregrine Falcon *Falco peregrinus*	Delisted[b]	Threatened/ Endangered	Terminal and Pipeline	May affect, not likely to adversely affect
Piping Plover *Charadrius melodus*	Threatened	Threatened/ Endangered	Terminal and Pipeline	May affect, not likely to adversely affect
Red Knot *Calidris canufus rufa*	Threatened[b]	Not Listed	Terminal and Pipeline	May affect, not likely to adversely affect
Fish				
Gulf Sturgeon *Acipenser oxyrinchus desotoi*	Threatened	Threatened	Terminal and Pipeline	May affect, not likely to adversely affect
Pallid Sturgeon *Scaphirhynchus albus*	Endangered	Endangered	Terminal and Pipeline	May affect, not likely to adversely affect
Oceanic White-tip Shark *Carcharhinus longimanus*	Threatened	Not Listed	Terminal and Pipeline	May affect, not likely to adversely affect

Table 4.7-1 Federal and State Listed Species Potentially Occurring in the Vicinity of the Project				
Common Name ***Scientific Name***	**Federal Status**	**State Status**	**Project Component**	**Determination of Effect**
Giant Manta Ray	Threatened	Not Listed	Terminal and Pipeline	May affect, not likely to adversely affect
Reptiles				
Loggerhead Sea Turtle *Caretta*	Threatened	Threatened	Pipeline	May affect, not likely to adversely affect
Green Sea Turtle *Chelonia mydas*	Threatened	Threatened	Pipeline	May affect, not likely to adversely affect
Hawksbill Sea Turtle *Eretmochelys imbricate*	Endangered	Endangered	Pipeline	May affect, not likely to adversely affect
Kemp's Ridley Sea Turtle *Lepidochelys kempii*	Endangered	Endangered	Pipeline	May affect, not likely to adversely affect
Leatherback Sea Turtle *Dermochelys coriacea*	Endangered	Endangered	Pipeline	May affect, not likely to adversely affect

a Species protected under the BGEPA.
b Species protected under the MBTA.
c Species protected under the MMPA.
d Potential impact on whales from carriers in the Gulf of Mexico

4.7.1 Federally Listed Threatened and Endangered Species

Review of the FWS Information for Planning and Conservation System database and the FWS Louisiana Ecological Services list of endangered, threatened, and candidate species by county identified ten species as potentially present in Plaquemines Parish, including the West Indian manatee, piping plover, red knot, Gulf and pallid sturgeon, and five species of sea turtles (FWS, 2018a). The NMFS Southeast Region lists 12 federally listed species as potentially occurring in the Project area or along the LNG vessel transit route in the Gulf of Mexico, including Gulf sturgeon, oceanic whitetip shark, giant manta ray, four species of whales, and five species of sea turtles (NMFS, 2018).

Both the Gulf sturgeon and federally listed sea turtles are managed jointly by FWS and NMFS. The FWS jurisdiction over sea turtles is limited to their nesting habitat and there is no suitable nesting habitat in the Project area; therefore, sea turtles only fall under NMFS jurisdiction for the Project. Gulf sturgeon are under the FWS jurisdiction when in freshwater and NMFS when in estuarine waters. The FWS confirmed in correspondence with Venture Global that because the Mississippi River is freshwater at the LNG terminal site (river mile marker 55), it is under FWS jurisdiction (Trahan, 2016). However, along the majority of the pipeline route, NMFS has jurisdiction over Gulf sturgeon. Table 4.7-1 lists all of the federally listed species potentially occurring in the Project area.

No federally listed plant species were identified as occurring within 50 miles of the Project. A review of the FWS Environmental Conservation Online System indicated that designated critical habitat under FWS jurisdiction does not occur in the Project area and would not be affected by the Project (FWS, 2018b). In addition, the NMFS Southeast Region's GIS data for critical habitat only shows designated critical habitat for the loggerhead sea turtle in the vicinity of the Project area (NOAA, 2014b); however, this critical habitat is 12 miles south of the pipeline system.

Venture Global, acting as a non-federal representative of FERC initiated informal consultation with both the FWS and the NMFS. Based on correspondence with Venture Global (FWS, 2017b), the FWS indicated that the Project may affect four of the ten species identified above (West Indian manatee, red knot, piping plover, and pallid sturgeon). Venture Global submitted an informational and technical assistance request with the NMFS on September 24, 2015 and requested concurrence or additional comments from NMFS on January 18, 2017. Potential impacts from Project construction and operation on these federally listed species are discussed below.

4.7.1.1 Mammals

West Indian Manatee

The West Indian manatee is protected under both the ESA and the MMPA. In Louisiana, the manatee is regularly found in Lakes Pontchartrain and Maurepas and their associated coastal waters and streams (DOI, 2006). Manatees are found at depths ranging from approximately 5 feet to 20 feet in all types of coastal environments of the Gulf of Mexico and Atlantic Ocean (FWS, 1999). This species typically occurs in Louisiana coastal areas when water temperatures are warm. Fertl et al. (2005) reported that most manatee sightings in Louisiana occurred in June and July. Manatees are known to travel long distances up coastal waterways from the Gulf of Mexico (FWS, 2006). Year-round occurrence of manatees in the Project area is considered rare to uncommon, including in the Mississippi River and the bays of the Barataria Basin (NOAA, 2014b). The causes for the decline of manatees is generally related to human activity, entrapment in flood control structures, boat and barge collisions, poaching, habitat loss, and pollution (FWS, 1999). However, manatee occurrences in Louisiana appear to be increasing, having been regularly reported in southeastern Louisiana in the Amite, Blind, Tchefuncte, and Tickfaw rivers, as well as canals within the adjacent coastal marshes (FWS, 2013).

Project-related activities that could cause temporary impacts on manatees include:

- barge traffic associated with LNG terminal construction and operation of LNG carriers in Gulf of Mexico and Mississippi River shipping channels;
- pile installation during dock and meter station construction; and
- dredging/excavation associated with pipeline construction.

In areas of intense ship traffic, manatees can experience propeller or collision injuries; however, most of these injuries are caused by small, fast moving vessels. Increased traffic within the Mississippi River from LNG vessel transit to and from the LNG terminal could pose an increased risk to manatees from vessel strikes. Barges and LNG carriers could collide with manatees, which might cause injury or mortality, although such collisions would be unlikely on the Mississippi River, where established, well-traveled, deep-water shipping lanes are used. Although extremely rare in the general Project area, the manatee has been documented within local waterbodies and could occur along the portion of the LNG transit routes in Plaquemines Parish and the Gulf of Mexico. Even so, given the level of industrial activity and lack of foraging habitat within the Mississippi River, their presence near the terminal site and pipeline system is unlikely. Venture Global proposes to provide LNG ship captains with NOAA's Vessel Strike Avoidance Measures and Reporting for Mariners (NMFS, 2008), which outlines collision avoidance measures in order to minimize impacts on manatees from vessel strikes.

Pipe laying in coastal wetlands requires the use of barges and other equipment. Excavation and back-filling during pipeline construction through approximately 12 miles of open water could impact the West Indian manatee. Water depths in these area range from approximately 5 feet to 25 feet and could provide suitable habitat for manatees. About 8.9 miles of the existing navigation channel system in this area would be deepened by excavation/dredging to facilitate barge access to the construction right-of-way. Barge operation, excavation/dredging, and other construction activities could temporarily create disturbance and increase turbidity, which could displace manatees (if present), increase stress, and disrupt normal activities. These activities would be temporary, and conditions would return to normal shortly after construction. Operation of the pipeline system would not impact manatees.

Construction of the Project's LNG loading docks and temporary berthing structures on the Mississippi River, as well as meter station construction within Barataria Bay, would require pile driving. Temporary increased underwater noise levels could affect manatees and other marine mammals, including the bottlenose dolphin. Bottlenose dolphins, which are protected under the MMPA and managed by NMFS, are discussed later in this section.

Acoustical modeling and analysis was conducted by Venture Global using NMFS's Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NMFS, 2016). Under the NMFS guidance, marine mammals are categorized as low-frequency cetaceans, mid-frequency cetaceans, high-frequency cetaceans, Phocid pinnipeds, or Otariid pinnipeds. Because the manatee's hearing is most similar to mid-frequency cetaceans, for purposes of the hydroacoustical analysis, they were assessed for that group.

The underwater noise thresholds for injury and behavioral disturbance for mid-frequency cetaceans during pile driving activities are provided in table 4.7-2. For the purposes of this analysis, injury includes permanent hearing loss and mortality, and behavioral disturbances include movement away from feeding grounds, temporary injuries, increased vulnerability to predators, inability to communicate, and inability to sense the physical environment.

Table 4.7-2
Underwater Noise Thresholds for Marine Mammals During Pile Driving Activity

Functional Hearing Group	Underwater Noise Thresholds[b] Impact Pile Driving Disturbance Threshold	Injury Threshold
Mid-Frequency Cetaceans[a]	170 dB SEL_{cum}; 224 dB Peak	185 dB SEL_{cum}; 230 dB Peak

a From NMFS Technical Guidance for Assessing the Effects of Anthropogenic Noise on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts.
b dB = decibel
Peak = peak sound pressure
RMS = root-mean-square sound pressure
SELcum = cumulative sound exposure level

The near-source (10-meter) unattenuated sound pressures for in-water pile driving based on the impact pile driving method are provided previously in table 4.6-6. Table 4.7-3 provides a summary of the threshold distances for injury and disturbance of mid-frequency cetaceans during unmitigated impact pile driving.

Table 4.7-3 Threshold Distance for Injury and Disturbance to Mid-Frequency Cetaceans for Unmitigated Pile Driving		
	Threshold Distance[a]	
Type of Pile and Installation Method	Injury[b] (feet / meters)	Disturbance[c] (feet / meters)
60-inch-diameter Steel Pile – Impact Driven[d]	715 / 218	7,154 / 2,181
36-inch-diameter Steel Pile – Impact Driven	526 / 160.4	5,261 / 1,604
24-inch-diameter Steel Pile – Impact Driven	244 / 74.5	2,444 / 745
12-inch-diameter Steel Pile – Impact Driven[e]	71.5 / 21.8	715 / 218
12-inch-diameter Steel Pile – Vibratory Driven[e]	146.6 / 44.7	1,466 / 447

a Threshold distance for injury is the distance to which noise could result in injury (e.g., mid-frequency cetaceans within 715 feet may experience injury when 48-inch-diameter steel impact pile driving is occurring). Threshold distance for disturbance is the distance to which noise could result in deviation from normal behavior (e.g., mid-frequency cetaceans from 715 feet to 7,154 feet may deviate from normal behavior when 48-inch-diameter steel impact pile driving is occurring).
b Distance calculated using the Companion User Spreadsheet to the NMFS Technical Guidance for Assessing the Effects of Anthropogenic Noise on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts.
c Distances calculated by extrapolating the distance to permanent injury threshold according to the practical spreading loss equation, Lreceiver = Lsource – 15 log (Rreceiver/Rsource).
d No data are readily available for the 48-inch-diameter piles that are proposed for the Project, so levels for 60-inch-diameter piles were used instead.
e *No information was provided by the applicant – Venture Global would be required to supply complete data prior to publication of the final EIS.*

Impacts expected on manatees from pile driving activities suggest thresholds for injury and behavioral effects are possible if manatees are present in the Mississippi River or Barataria Bay. However, historical information on manatee distributions and occurrence previously presented supports the prediction that impacts would be highly unlikely from pile driving activities. Historically, manatees have not been common in these waterbodies, and the probability of their occurrence in the future is considered low. Additionally, food resources for manatees are not common in the Mississippi River or Barataria Bay, and manatees typically would not travel on a heavily industrialized portion of the Mississippi River where background noise levels are expected to be high. Also, in-stream noise at the terminal site is expected to attenuate to background levels within shorter distances than those presented due to channel sinuosity and the terminal location along the confined Mississippi River channel, which functions to attenuate the sound, resulting in a much more limited ensonified area. Where the meter stations are located in Barataria Bay, ambient noise conditions from oil and gas exploration activities and infrastructure are common and would likely mask pile driving noise levels.

While Venture Global has not yet committed to implementing pile driving noise mitigation measures, as discussed in section 4.6.3.2, we recommend in that section that Venture Global use noise mitigation to reduce potential noise impacts from pile driving on aquatic resources, which would include marine mammals. In addition, per past FWS recommendations for projects that use construction equipment within and near coastal waters of Louisiana, including the Mississippi River downstream of New Orleans, Venture Global would implement precautionary measures to minimize potential impacts on manatees during work in the river and adjacent waters, as applicable. These measures include, but are not limited to, work cessation within an established buffer zone if manatees are observed, vessel speed management, construction sign posting, and prompt reporting of sightings or collisions. To avoid injury to marine mammals, including manatees, Venture Global would implement protective measures within a 50-foot radius of the active work area, as recommended by the FWS.

An EI with marine mammal monitoring training and experience would be on-site during all pile-driving activities. The EI would observe the Mississippi River and estuarine open waters for marine mammals for 20 minutes prior to the onset of, and continuously during, pile-driving activities. If a manatee is spotted within 50 feet of the active work area, work would not begin or would be halted until the manatee has moved out of this buffer zone.

Based on the manatee's characteristics and habitat requirements, the lack of foraging habitat along the LNG transit route, the rarity of manatees in the Project area, Venture Global's proposed avoidance and minimization measures (as referenced in the preceding paragraph), implementation of the FWS-recommended measures (as referenced in FWS correspondence dated February 2, 2017), and our recommendation in section 4.6.3.2, we conclude that the Project *may affect, but is not likely to adversely affect*, the West Indian manatee.

Whales

The four federally listed whale species, blue whale, fin whale, sperm whale, and sei whale, occur off the coast of Louisiana in the Gulf of Mexico (NMFS, 2018). Their distribution is limited to the offshore ocean environment in depths greater than 200 meters (640 feet) (NOAA, 2012). Because the terminal site and pipeline system are not offshore, there would be no impacts on whales from Project construction. LNG carriers would travel through the Gulf of Mexico to the terminal site during Project operation, the potential for collisions between LNG vessels and whales would be minimized by established measures and procedures, including Fisheries Southeast Region Vessel Strike Avoidance Measures and Reporting for Mariners (NMFS, 2008), during transit. These are standard measures to be implemented to reduce the risk associated with vessel strikes or disturbance of protected marine species. Measures include, but are not limited to:

- maintaining watch for protected species;
- maintaining a buffer zone if species are sighted;
- reducing engine speed; and
- reporting collisions or any sightings of injured or dead species protected under federal law.

Venture Global would provide the NMFS (2008) document to LNG carrier captains and would advocate compliance with the identified measures. Implementation of the above-mentioned measures would minimize the risk of collisions with the four whale species protected under the ESA, as well as with all marine mammals protected under the MMPA. Compliance with the NMFS (2008) directive would result in minimal impacts on marine mammals. Based on these factors, the Project *may affect, but is not likely adversely affect*, the four federally listed whale species.

4.7.1.2 Birds

Red Knot

The red knot, which is listed as threatened under the ESA, is a 9- to 11-inch medium-sized shorebird. It has a long, sharp bill and long legs (NatureWorks, 2017). During the breeding season, it has a rust colored face, chest, and undersides and dark brown wings. In winter, it has a gray head, chest, and upperparts and a white belly. This bird has long greenish legs and a pointed black bill. The red knot breeds in the central Canadian arctic but occurs in Louisiana during spring and fall migrations and winter months (generally September through March).

No critical habitat has been designated for the red knot. Red knot breeding and roosting habitat do not occur in the Project area. Outside of breeding season, it is primarily found in intertidal, marine habitats, especially near coastal inlets, estuaries, and bays. Additionally, the Project would not impact any beach foraging habitat. The Project would have temporary impacts on potential salt and brackish marsh foraging habitat along the pipeline system right-of-way and barge access channels (FWS, 2015). Construction disturbance could temporarily displace individuals (if present) in marsh areas, resulting in increased stress and disruption of normal activities. The locations of the Project's aboveground facilities are not in areas that provide suitable habitat for the red knot, and suitable foraging habitat is abundant outside of the Project area. No permanent impacts on individuals of this species are anticipated.

No significant impacts on the red knot's breeding or nesting activities are expected based on temporary disturbance during pipeline system construction. As a result, we conclude that the Project *may affect, but is not likely to adversely affect* the red knot.

Piping Plover

The piping plover is listed as threatened under the ESA. The piping plover is a small shorebird approximately 7 inches long. These small, stocky shorebirds have a sand-colored upper body, a white underside, and orange legs (FWS, 2018c). During the breeding season, adults have a black forehead, a black breast band, and an orange bill. Breeding birds have a single black breastband, a black bar across the forehead, bright orange legs and bill, and a black tip on the bill.

The piping plover overwinters but does not breed in Louisiana, feeding at intertidal beaches, mudflats, and sand flats with sparse emergent vegetation (FWS, 2018d). Piping plovers typically move among sites as conditions change, but studies have indicated that they generally remain within a 2-mile-long area along the beach (FWS, 2015). The main threat to piping plovers is habitat loss. Development on beaches has reduced the amount of suitable wintering areas available. Disturbance by humans and domestic animals forces wintering and migrating birds to increase their energy expenditure and can also cause breeding plovers to abandon nests and young. Other threats include predation from raccoons, skunks, and foxes (FWS, 2011).

The FWS has designated several areas as critical habitat for the piping plover on beach shorelines of barrier islands located near the Project. The nearest critical habitat for the piping plover occurs on an unnamed island in the southern portion of Barataria Bay that is located approximately 6.5 miles south of the pipeline system. This sandy beach habitat would not be impacted by the Project, and the river bank at the terminal site is composed of rip-rap and concrete mattresses; therefore, there is no foraging habitat at the terminal site. The pipeline system will not impact areas of foraging habitat, such as intertidal beaches, mudflats, or sandflats. Based on these findings, we conclude that the Project *may affect, but is not likely to adversely affect*, the piping plover and would have no effect on piping plover designated critical habitat.

4.7.1.3 Fish

Gulf Sturgeon

Historically, the Gulf sturgeon occurred from the Mississippi River to Charlotte Harbor, Florida (TNC, 2018). The species was listed as federally threatened in 1991. Presently, this species' range is limited to the Suwannee River in Florida and west to the Pearl River in Mississippi and Louisiana. The FWS and NMFS share jurisdiction for the Atlantic sturgeon (Gulf subspecies), with the FWS having sole responsibility in fresh waters and NMFS having sole responsibility in marine waters. The two agencies share responsibility in estuarine waters based on the lead agency for the federal action. NMFS is responsible for all consultations with FERC for estuarine waters.

River systems supporting viable populations include the Pearl, Pascagoula, Escambia, Yellow, Choctawhatchee, Apalachicola, and Suwannee rivers. The Gulf sturgeon rarely occurs in the Mississippi River, due to the lack of spawning habitat (TNC, 2018). The best river habitat for Gulf sturgeon is a long, spring-fed, free-flowing river with a hard bottom and steep banks. As months get warmer, Gulf sturgeon migrate into brackish and salt water during the fall and feed in these waters throughout the winter months. In the spring, they migrate into fresh water rivers and remain through the summer months (Wakeford, 2001). Gulf sturgeon move from the saltwater estuaries and Gulf of Mexico bays to the upper reaches of their natal freshwater rivers to spawn. After spawning, the sturgeon spends the summer in the lower reaches of the river before moving back to the Gulf of Mexico in the fall.

Historically, the range of the subspecies included the Project area; however, currently, the species no longer occurs in the Mississippi River or in the Gulf of Mexico west of the Pearl River. The Pearl River lies approximately 47 miles northeast of the Project area, and the nearest critical habitat is approximately 22 miles east in Lake Borgne, Louisiana. Given that the Project is outside the range for the Gulf sturgeon, construction of the LNG terminal and pipeline are not expected to affect the Gulf sturgeon. Gulf sturgeon could occur in areas of the Gulf of Mexico traversed by LNG vessels during operation. However, Gulf sturgeon are bottom feeders and tend to linger near the bottom of the water column. Considering the low probability of occurrence and the bottom-dwelling behavior of Gulf sturgeon, we conclude that the Project *may affect, but is not likely to adversely affect*, Gulf sturgeon.

Pallid Sturgeon

The pallid sturgeon was listed as endangered under the ESA on September 6, 1990 (55 FR 36641-36647). Since its listing, the status of the species has improved and is currently stable. New information related to habitat extent and condition, abundance, and potential recruitment in the Mississippi and Atchafalaya rivers has improved our understanding of the species in these areas (FWS, 2014).

Pallid sturgeon are a bottom-oriented, large-river obligate fish inhabiting the Missouri and Mississippi rivers and some of their tributaries from Montana to Louisiana (Kallemeyn, 1983). Pallid sturgeon evolved in the diverse environments of the Missouri and Mississippi river systems. Floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters formed the large-river ecosystem that met the habitat and life history requirements of pallid sturgeon. Pallid sturgeon can be long-lived (15 to 20 years), with females reaching sexual maturity later than males (Keenlyne and Jenkins, 1993).

Habitat modification, including the construction of six Missouri River dams, as well as channelization in the lower Missouri and Mississippi rivers, has been the primary threat to the pallid sturgeon (Krentz, 2004). The contemporary downstream extent of pallid sturgeon territory ends near New Orleans, Louisiana, which is upstream of the Project area. Additionally, Kilgore et al. (2014) reported that no pallid sturgeon have been collected below Mississippi River mile marker 81; this is approximately 25 river miles upstream of the Project area.

Impacts on the pallid sturgeon (if present) could include increased turbidity and noise disturbance from pile driving during dock construction. Due to the low probability of pallid sturgeon occurring within the Project area, and since no dredging would occur in upstream spawning habitat, and per concurrence with the FWS (2017), we conclude that the Project *may affect, but is not likely to adversely affect*, the pallid sturgeon.

Oceanic White-tip Shark

The oceanic white-tip shark, listed as threatened under the ESA, has a stocky build and characteristically rounded dorsal and pectoral fins that are white-tipped. The species is globally distributed in temperate, subtropical, and tropical waters (Castro 1983). In the western Atlantic, it occurs from Maine to Argentina, including the Caribbean and Gulf of Mexico (Young et al., 2018). The oceanic white-tip shark is usually found offshore in the open ocean, on the outer continental shelf, or around oceanic islands in water greater than 600 feet deep. It exhibits a strong preference for the surface-mixed layer in warm waters above 68°F. However, it is capable of deep dives into cooler waters for brief periods of time.

The primary threat to the oceanic white-tip shark is overutilization of the species for commercial purposes (Young et al., 2018). It is harvested for its fins and suffers direct mortality as by-catch as part of commercial fish-harvesting practices.

Since the oceanic white-tip shark is primarily found in deep ocean habitats, we anticipate construction of the terminal and pipeline system would have no effect on the oceanic white-tip shark. Additionally, operation of the pipeline system would have no effect on this species. Once operational, LNG carriers that would call on the LNG terminal would traverse oceanic white-tip shark habitat. The LNG carriers would not likely have a direct affect on individuals. However, the LNG carriers have the potential to indirectly affect individuals by temporarily disrupting foraging. Therefore, we conclude that Project *may affect, but is not likely to adversely affect*, the oceanic white-tip shark.

Giant Manta Ray

The giant manta ray, listed as threatened under the ESA, is found worldwide in temperate, subtropical, and tropical waters (Miller and Klimovich, 2016). The manta genus is distinctive due to its size, terminal mouth, and long cephalic fins. There are two species in the manta genus—the giant manta ray and the reef manta ray (*Manta aflredi*). The giant manta ray can reach a width of 22 feet and weigh up to 1.5 tons. Its range in the western Atlantic extends from New Jersey in North America to Uruguay in South America and includes the Caribbean and Gulf of Mexico (Miller and Klimovich, 2016). According to Miller and Klimovich (2018), sightings are, with a few exceptions, often sporadic despite its large range. The areas presented by Miller and Klimovich where sightings are more frequent do not include the northern Gulf of Mexico. The giant manta ray is usually found offshore near productive coast lines within its range; however the giant manta ray has been observed in estuarine waters near ocean inlets (Miller and Klimovich, 2018).

The primary threat to the giant manta ray is overutilization for of the species for commercial purposes through direct harvest and as a result of by-catch. It is especially susceptible to purse seines and gillnets.

Since the giant manta ray is primarily found offshore and occasionally in estuarine environments, it is unlikely that construction of the terminal would affect this species. Since part of the pipeline system would be constructed in open, estuarine water, there is the potential that construction of the pipeline could affect individuals. However, this is unlikely since the southern extent of the pipeline system is over 7 miles from the nearest ocean inlet. We do not anticipate the operation of the pipeline system to affect the giant manta ray. Once operational, LNG carriers that would call on the LNG terminal would traverse giant manta ray habitat. The LNG carriers would not likely have a direct affect on individuals; however, the LNG carriers have the potential to indirectly affect individuals by temporarily disrupting foraging. Therefore, we conclude that Project *may affect, but is not likely to adversely affect*, the giant manta ray.

4.7.1.4 Reptiles

Sea Turtles

The FWS and the NMFS share federal jurisdiction for sea turtles per a 1977 MOU established joint jurisdictional authority for both the FWS and NMFS, with FWS responsible for sea turtles on land (nesting habitat) and the NMFS responsible for sea turtles in marine habitats (NMFS and FWS, 2015). Nesting in coastal Louisiana is extremely rare and has been observed at only two locations in recent years. In the summer of 2015, two loggerhead sea turtles nested on Grand Isle (Thibodeaux, 2016), which is over 10 miles from the SW lateral TGP meter station. The second closest nesting habitat is located east of the Mississippi River in the Breton National Wildlife Refuge on the Chandeleur Islands (Dow et al., 2007). Based on the geographic separation between the Project area and these locations, facility construction and operation is not likely to impact adult nesting sea turtles. No critical habitat for nesting sea turtles occurs in Louisiana. The nearest critical habitat for the any sea turtle is LOGG-S-02 Sargassum for loggerhead sea turtles, which is a large section of the offshore Gulf of Mexico. This area occurs approximately 12 miles south of the pipeline system (NMFS, 2014). Based on this information, there would be no impacts on nesting sea turtles or nesting habitat. The discussion below concerns the potential presence of, and impacts on, sea turtles in marine/estuarine habitat in the Project area.

All of the five federally listed sea turtles (leatherback sea turtle, Kemp's ridley sea turtle, loggerhead sea turtle, green sea turtle, and hawksbill sea turtle) are common to both estuarine and marine environments along the southeastern coast of Louisiana. The presence of sea turtles in the Mississippi River at the terminal site is not documented (NOAA, 2014b) and, because of the consistent freshwater environment, their presence is considered unlikely and no impacts are expected from construction at the LNG terminal site. All five species occur in portions of the Project area that would be crossed by the two lateral pipelines (SW lateral TGP and SW lateral TETCO), including Barataria Bay and Wilkinson Bay (NOAA, 2014b).

The endangered leatherback sea turtle is named for its unique shell, which is composed of a layer of thin, tough, rubbery skin strengthened by thousands of tiny bone plates that makes it look "leathery." The carapace is dark grey or black with white or pale spots, while the plastron is whitish to black and marked by five ridges (Sea Turtle Conservancy, 2017). They are commonly regarded as open-ocean, pelagic animals, but are also known to forage in coastal waters during breeding. The leatherback sea turtle is highly migratory, preferring open ocean habitat outside of breeding season. The only known breeding sites identified in North America include southeast Florida, Puerto Rico and the U.S. Virgin Islands. The species is considered rare along the Gulf Coast; however, juveniles or adults can be present year-round (January through December) (NOAA, 2014b).

The endangered Kemp's ridley sea turtle is one of the smallest of the sea turtles, with adults reaching about 2 feet in carapace length and weighing up to 100 pounds. It has been documented off the coast of Louisiana more than any other sea turtle. Nesting occurs from April to June, during which time the turtles appear off the Tamaulipas and Veracruz coasts of Mexico. This species is not known to nest on the Louisiana coast; however, it could utilize the estuarine and offshore waters for foraging and migration during the non-nesting season. Juvenile Kemp's ridley sea turtles are common and considered abundant in the coastal waters of Barataria Bay and Wilkinson Bay from April through September, and adults are common during the spring and summer near the mouth of the Mississippi River (NOAA, 2014b; Fuller et al., 1987). This species' foraging habitat is the nearshore and coastal waters of the northern Gulf of Mexico (especially Louisiana waters) as well as the Gulf of Campeche in the southern Gulf of Mexico. Kemp's ridleys are often found in salt marsh habitats.

The threatened loggerhead sea turtle prefers to feed in coastal bays and estuaries, as well as in shallow waters of the continental shelf, and may occur in estuaries, coastal streams, salt marshes, and river mouths. The distribution of loggerheads in Louisiana coastal waters is similar to that of Kemp's ridley sea turtles; however, their abundance is greater west of Freeport, Texas. Within Barataria Bay and Wilkinson Bay, both juveniles and adults are common, occurring from March through November (NOAA, 2014b). Although designated critical habitat (LOGG-S-02) for the loggerhead sea turtle occurs in waters just offshore of the Mississippi River delta, the Project would not impact this designated critical habitat.

Green sea turtle (threatened) adults are 3 to 4 feet in carapace length and the largest of the Cheloniidae family. Green sea turtles are found in all temperate and tropical waters throughout the world. In the Gulf of Mexico this species has been primarily documented in Texas embayments where they frequent shallow water areas where marine grasses and algae occur. They are rare in the open ocean and are not common to Louisiana coastal waters. Green sea turtles nest on open, sloping beaches that have minimal disturbance. Adults and juveniles are occasionally found in Barataria Bay and Wilkinson Bay between the months of March and November (NOAA, 2014b).

The endangered hawksbill sea turtle is one of the smaller sea turtles, with adults approximately 2.5 to 3 feet in carapace length. Hawksbill sea turtles are widely distributed throughout the Caribbean Sea and western Atlantic Ocean. They occur in shallow coastal areas, oceanic islands, rocky areas, and coral reefs. This species is not common in both inshore or offshore waters of Louisiana, and their occurrence in Barataria Bay and Wilkinson Bay is considered very rare. If present, they would occur from March through October (NOAA, 2014b).

During construction of the pipeline system in estuarine open waters, temporary impacts on sea turtles, including reduced water quality or interactions with barges and other vessels, could result from pipe trenching and dredging/excavation for barge flotation channels. Pile driving activities for meter station construction would increase in-water noise levels and could result in potential injury or behavioral changes. If sea turtles are present at the time of construction, these activities could temporarily cause displacement, increase stress, and/or disrupt foraging. The meter stations are located in a portion of Barataria Bay where oil and gas exploration activities and infrastructure are common and where operational maintenance regularly occurs. As a result, impacts would be short term and minimal. The following provides information related to pile driving impacts on sea turtles based on Venture Global's analysis.

Anthropogenic noise effects on sea turtles is largely unknown. Moein et al. (1995) and McCauley et al. (2000) showed that sea turtles avoid seismic signals at levels between 166 dB re 1 micropascal (μPA) and 179 dB re 1μPA. For this analysis, an un-weighted sound pressure level of 166 dB re 1 μPA_{RMS} has been used as the criterion for onset of behavioral effects. Per Popper et al. (2014), sound pressure levels of 210 dB cumulative sound exposure level (SEL_{cum}) re 1 $\mu Pa^2 s$ and 207 peak sound pressure level (dB Peak) re 1 μPA are used as the criterion for injury to sea turtles.

Sea turtle threshold distances for physical injury and behavior disturbance are based on the pile types and installation methods associated with the Project. The measured single-strike level SEL_{cum} at 10 meters for vibratory-driven 12-inch-diameter piles has been adjusted to 196.6 dB based on the equation,

$$SEL_{cum} = SEL_{single\ strike} + 10 * \log(14{,}400 \text{ seconds of driving per day}).$$

Underwater noise levels expected to be generated from pile driving is provided in table 4.7-4. These noise levels are not expected to disturb sea turtles beyond the immediate vicinity of the proposed activity. We recommend in section 4.6.3.2 that Venture Global develop noise mitigation measures that it would implement during pile-driving activities, which would minimize the impacts on all aquatic resources, including sea turtles.

Table 4.7-4 Threshold Distance for Injury and Disturbance to Sea Turtles for Different Pile Types			
	Threshold Distance (feet / meters)[a]		
	Physical Injury		Behavior Disturbance
Type of Pile and Installation Method	Peak (207 dB)	Cumulative SEL (210 dB)	RMS (166 dB)
12-inch-diameter Steel Pile – Impact Driven[b]	5.2 / 1.6	32.8 / 10	446 / 136
12-inch-diameter Steel Pile – Vibratory Driven[b]	0.3 / 0.1	4.3 / 1.3	6.6 / 2

a dB = decibel
Peak = peak sound pressure
RMS = root-mean-square sound pressure
SEL = sound exposure level
b Distances calculated using a formula for underwater practical spreading loss, Lreceiver = Lsource – 15 log (Rreceiver/Rsource).

Injury or mortality to sea turtles from dredging/excavation activities is not expected. The barge-mounted clam-bucket (or equal) dredge proposed for pipeline construction is not known to cause sea turtle mortality because the slow speed of the barge allows sea turtles to disperse in advance of construction activities (NMFS, 2015b). Dredging/excavation could have indirect temporary impacts on foraging habitat by disturbing vegetation and increasing turbidity. Impacts on sea turtles and their habitat would be insignificant given the abundant foraging habitat in adjacent areas, the turtles' ability to disperse to adjacent habitats, and the temporary nature of the impacts.

Impacts on sea turtles from collisions with barges or other construction and operation vessels could result in sea turtle injury or mortality. The relatively slow speed and sea turtle maneuverability would make the chance of striking a sea turtle unlikely. Adoption of NMFS guidance (NMFS, 2008) would minimize the potential for injury and mortality of sea turtles from vessel strikes; therefore, we conclude that the Project *may affect, but is not likely to adversely affect* leatherback, Kemp's ridley, loggerhead, green and hawksbill sea turtles.

Although Venture Global has received concurrence from the FWS in a letter dated February 3, 2017, this correspondence will be more than 1-year old by the time construction could begin on the Project. In addition, we have not yet completed consultation with the NMFS. To ensure compliance with section 7 of the ESA, **we recommend that**:

- **Venture Global should not begin construction of the Project until:**

  a. FERC staff receives comments from the NMFS regarding the proposed action;

  b. FERC staff completes formal consultation with the NMFS, if required; and

  c. Venture Global has received written notification from the Director of OEP that construction or use of mitigation may begin.

4.7.2 State-listed Species

Based on information obtained from the LDWF, 16 state listed threatened or endangered species are known to occur within Plaquemines Parish (LDWF, 2018). Twelve of the 15 state listed species (see table 4.7-1) are also federally listed and are discussed above in section 4.7.1. No impacts on state listed species are expected from construction or operation of the Project.

Louisiana statutes governing wildlife species protection status are contained in Louisiana Revised Statutes (LRS) 56 (Wildlife and Fisheries), while relevant rules and regulations adopted by the Louisiana Wildlife and Fisheries Commission and the Secretary of the LDWF are found in LAC 76.

Take or harassment of wildlife species listed by the State of Louisiana as endangered or endangered or under the federal ESA is a violation of state law. Three state-listed species are known to occur in Plaquemines Parish:

- bald eagle – state endangered;
- brown pelican – state endangered; and
- peregrine falcon – state threatened/endangered.

The potential presence of bald eagles in the Project area and potential impacts on the species, along with mitigation measures to be implemented, are discussed in sections 4.6.2.1 and 4.6.2.2, respectively. The two remaining species, peregrine falcon and brown pelican, are discussed below.

Peregrine Falcon

During migration periods, the peregrine falcon is present throughout Louisiana. The bird may overwinter in coastal marshes and lakes, but is considered rare in the Barataria Basin. It is most often observed over marshes, mudflats, and beaches during migration, where it feeds on shorebirds and waterfowl (Conner and Day, 1987). Peregrine falcons can be found overwintering in areas with available prey, including farmland, marshes, lakeshores, river mouths, and tidal flats, all of which could occur in the Project area. Peregrine falcons were observed during applicant-directed habitat surveys of the Project area in December 2015.

Potential impacts on peregrine falcon are similar to those discussed for other birds and wildlife in section 4.6, including temporary noise and other disturbance from construction activities, temporarily altered foraging and roosting habitats, and permanent loss of foraging and roosting habitats. Mitigation measures to reduce impacts on peregrine falcon are the same as those described in section 4.6.2.2 for birds and other wildlife.

Brown Pelican

The brown pelican was listed as endangered under the ESA in 1970, but was delisted in 2008 due to recovery. The brown pelican is currently a state listed “rare” species. Today, the brown pelican primarily occurs in coastal marine and estuarine environments along the Gulf of

Mexico coast from Mississippi to Texas, as well as along the Pacific Coast from Canada to South America, and in the West Indies. Nesting colonies primarily occur on offshore islands away from terrestrial mammal predation and human disturbance, and could occur on the island in Barataria Bay where a colonial-nesting waterbird area has been documented by the LNHP (Venture Global, 2017). Brown pelicans were observed during applicant-directed field surveys of the Project area in December 2015.

Potential impacts on brown pelicans are similar to those discussed for birds and other wildlife in section 4.6.2.1, including temporary noise and other disturbance from construction activities and temporarily altered marine and estuarine habitats from construction of the pipeline system. There would be no permanent loss of marine and estuarine habitats. However, nesting colonies of brown pelicans could be affected should they occur adjacent to the Project area on the island in Barataria Bay.

Mitigation measures to reduce impacts on brown pelican are the same as those described in section 4.6.1.2 for birds and other wildlife and in section 4.6.2.2 regarding the colonial-nesting bird area.

4.8 LAND USE, RECREATION, AND VISUAL RESOURCES

4.8.1 Land Use

Venture Global leases the terminal property and would construct its facilities on primarily undeveloped land on the west side of the Mississippi River at mile marker 55. The LNG terminal would be on land bounded by undeveloped land and coastal marshlands to the south and west and fastlands to the east.

The Project would affect seven general land use types based on the National Land Use Land Cover (LULC) database (USGS, 2011). The definitions of each land use type is as follows:

- **Cultivated Crops**: Includes active cropland, pasture, and or hayfields;
- **Developed Commercial/Industrial**: Includes power or utility stations, manufacturing or industrial plants, paved areas, commercial facilities, and roads;
- **Herbaceous**: Includes non-forested uplands;
- **Open Water**: Includes waterbodies such as bays, bayous, and streams;
- **Wetlands**: Includes emergent, scrub-shrub, and wooded wetlands;
- **Shrub-Scrubland**: Includes upland shrub-scrubland; and
- **Forest**: Includes upland forest.

Table 4.8-1 summarizes the acreage of each land use type that would be affected by the LNG terminal and pipeline system. For a discussion on habitat types and field surveys, see section 4.5.1.

Table 4.8-1 Land Use Requirements for the Project[a, b]								
Site Component	**Cultivated Crops (acres)**	**Developed Commercial/ Industrial (acres)**	**Herbaceous (acres)**	**Open Water (acres)**	**Wetland (acres)**	**Scrub-Shrub (acres)**	**Forested (acres)**	**Total (acres)**
	Temp / Perm	**Temp / Perm**	**Temp / Perm**	**Temp / Perm**	**Temp / Perm**	**Temp / Perm**	**Temp / Perm**	**Temp / Perm**
Terminal Site								
Terminal Facilities	0.0 / 438.9	0.0 / 10.1	0.0 / 2.0	0.0 / 0.0	0.0 / 6.0	0.0 / 1.3	0.0 / 76.2	**0.0 / 534.5**
Land-Based Marine Facilities	0.0 / 0.0	0.0 / 1.1	0.0 / 0.0	0.0 / 0.0	0.0 / 6.3	0.0 / 0.0	0.0 / <0.1	**0.0 / 7.4**
Temporary Workspace	2.0 / 0.0	4.3 / 0.0	0.0 / 0.0	1.3 / 0.0	5.5 / 0.0	0.0 / 0.0	<0.1 / 0.0	**13.1 / 0.0**
Water-Based Marine Facilities	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 10.7	0.0 / 3.9	0.0 / 0.0	0.0 / 0.0	**0.0 / 14.6**
Utility Workspace	4.1 / 0.0	2.3 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	**6.4 / 0.0**
Eastern Workspace	0.0 / 80.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	**0.0 / 80.0**
Marine Workspace	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	69.9 / 0.0	2.8 / 0.0	0.0 / 0.0	0.0 / 0.0	**72.7 / 0.0**
Terminal Total	**6.1 / 518.9**	**6.6 / 11.2**	**0.0 / 2.0**	**71.2 / 10.7**	**8.3 / 16.2**	**0.0 / 1.3**	**<0.1 / 76.2**	**92.2 / 636.5**
Pipeline System								
SW Lateral TGP								
Pipeline	0.0 / 0.1	0.0 / 0.1	0.0 / 33.0	281.2 / 92.6	38.5 / 2.2	0.0 / 0.0	0.0 / 0.0	**319.7 / 128.0**
Meter Station, MLV Site	0.0 / 0.0	0.0 / 0.3	0.0 / 0.0	62.5 / 8.9	0.0 / 0.1	0.0 / 0.0	0.0 / 0.0	**62.5 / 9.3**
ATWS	0.0 / 0.0	0.0 / 0.2	1.8 / 0.0	35.2 / 0.0	9.2 / 0.0	0.0 / 0.0	0.0 / 0.0	**46.4 / 0.0**
Access Road and Barge Channels	0.0 / 0.0	0.0 / <0.1	0.1 / 0.0	322.5 / 0.0	0.7 / 0.0	0.0 / 0.0	0.0 / 0.0	**323.3 / <0.1**
SW Lateral TETCO								
Pipeline	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	40.1 / 0.0	19.9 / 0.0	0.0 / 0.0	0.0 / 0.0	**60.0 / 0.0**
Meter Station, MLV Site	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	**0.0 / 0.0**

Table 4.8-1 Land Use Requirements for the Project[a, b]								
Site Component	**Cultivated Crops (acres)**	**Developed Commercial/ Industrial (acres)**	**Herbaceous (acres)**	**Open Water (acres)**	**Wetland (acres)**	**Scrub-Shrub (acres)**	**Forested (acres)**	**Total (acres)**
	Temp / Perm	**Temp / Perm**	**Temp / Perm**	**Temp / Perm**	**Temp / Perm**	**Temp / Perm**	**Temp / Perm**	**Temp / Perm**
ATWS	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	3.0 / 0.0	1.7 / 0.0	0.0 / 0.0	0.0 / 0.0	**4.7 / 0.0**
Access Road and Barge Channels	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
Pipeline Total	**0.0 / 0.1**	**0.0 / 0.6**	**1.9 / 33.0**	**744.5 / 101.5**	**70.0 / 2.3**	**0.0 / 0.0**	**0.0 / 0.0**	**816.6 / 137.3**
PROJECT TOTAL	**6.1 / 519.0**	**6.6 / 11.8**	**1.9 / 35.0**	**815.7 / 112.2**	**78.3 / 18.5**	**0.0 / 1.3**	**<0.1 / 76.2**	**908.8 / 773.8**

a An “undisturbed area” totaling 77.0 acres located within the LNG terminal site is not included in this table because it will not be impacted.
b Construction impacts acreages are the sum of the temporary and operational impact acreages.

4.8.1.1 LNG Terminal

The LNG terminal, including adjacent workspaces, would permanently occupy 625.8 acres of land, the water-based marine facilities would permanently occupy 10.7 acres, and an additional 92.2 acres would be temporarily occupied by workspaces. The site is currently zoned as Flood Plain and is primarily undeveloped. The majority of the permanent terminal site, including adjacent workspaces (approximately 518.9 acres, or 81 percent), is cultivated cropland that historically has been used for sugar cane production but currently used for cattle grazing and hay production. The remainder of the terminal site, including adjacent workspaces, includes 76.2 acres of forested land, 17.8 acres of developed commercial/industrial land, 24.5 acres of wetland, 1.3 acres of scrub-shrubland, and 2.0 acres of herbaceous land. Figure 4.8-1 shows the detailed land uses at the LNG terminal. Each of these detailed land uses fall within one of the seven general categories

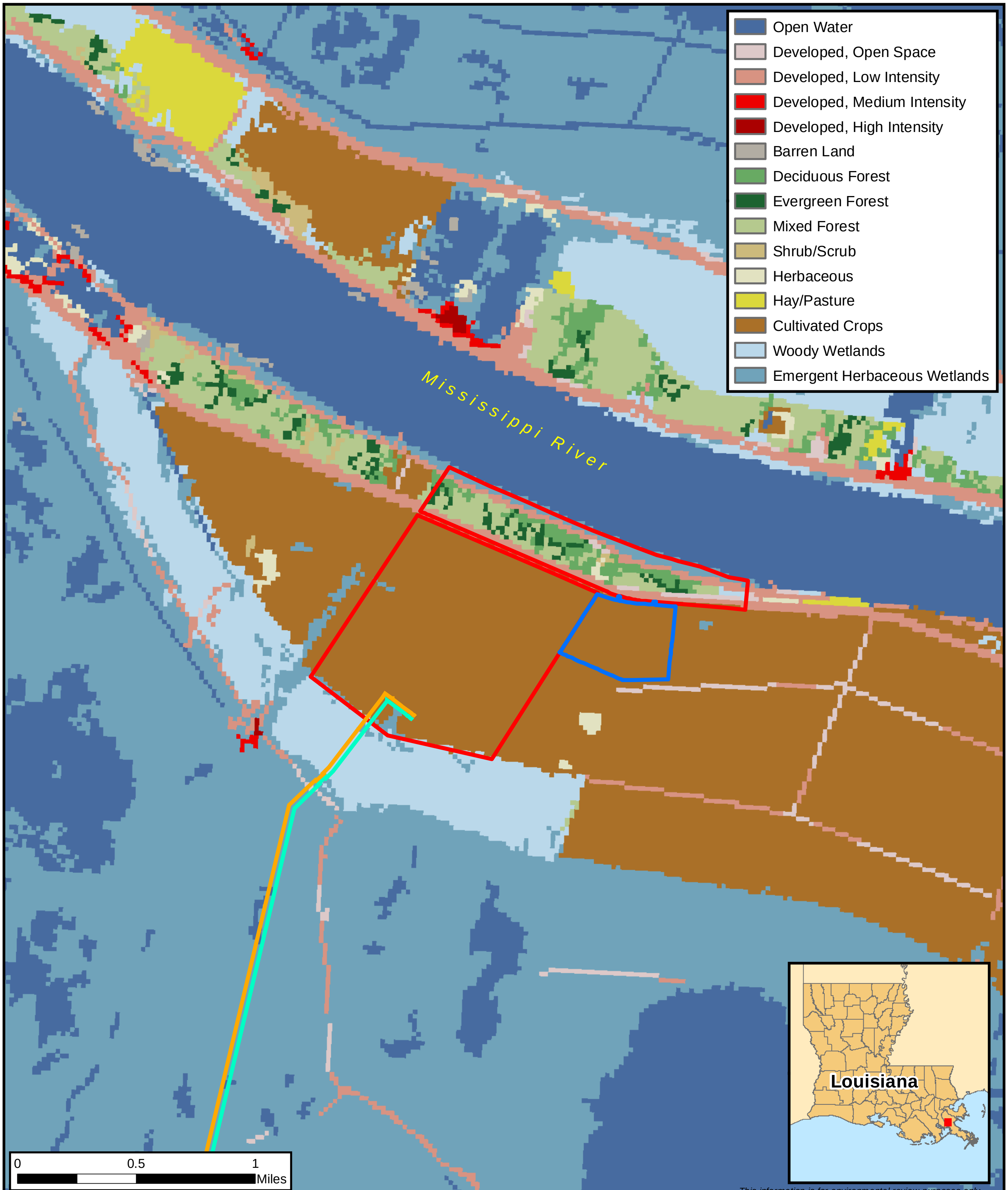
Access Roads

The proposed terminal site would be accessed via SH 23 in addition to two permanent access roads that would be constructed for the terminal site. The permanent access road impacts are included in the previously provided terminal acreages and primarily consist of cultivated cropland.

4.8.1.2 Pipeline System

The proposed 15.1-mile-long, SW lateral TGP and 11.7-mile-long SW lateral TETCO would be collocated and constructed on newly created right-of-way. The pipelines would generally require a total construction corridor ranging from 130 feet to 300 feet, depending on the construction method used for a particular section. The conventional lay method and push lay methods would require a construction corridor of 130 feet, consisting of a permanent right-of-way of 80 feet plus 50 feet of temporary construction workspace. The 300-foot-wide right-of-way required for the barge lay sections would consist of a permanent right-of-way of 250 feet and 50 feet of temporary construction workspace. Construction of the SW lateral TETCO during Phase II would disturb an 80-foot-wide portion of the same construction right-of-way used for the SW lateral TGP during Phase I for conventional lay and push lay segments. For barge lay segments, construction of the SW lateral TETCO during Phase II would disturb a 250-foot-wide portion of the same construction right-of-way used for the SW lateral TGP during Phase I.

The predominant land use types affected by construction of the pipeline, including the construction right-of-way, would be open water (846.0 acres), wetlands (72.3 acres), and herbaceous land (34.9 acres). Cultivated cropland and developed commercial/industrial land would account for just 0.1 acre and 0.6 acre, respectively. Figure 4.8-2 shows the detailed land uses along the pipeline system. Each of these detailed land uses fall within one of the seven general categories



Terminal Site Boundary
Eastern Workspace
SW Lateral TETCO
SW Lateral TGP

N

Figure 4.8-1
USGS Land Cover Types at the Terminal Site
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

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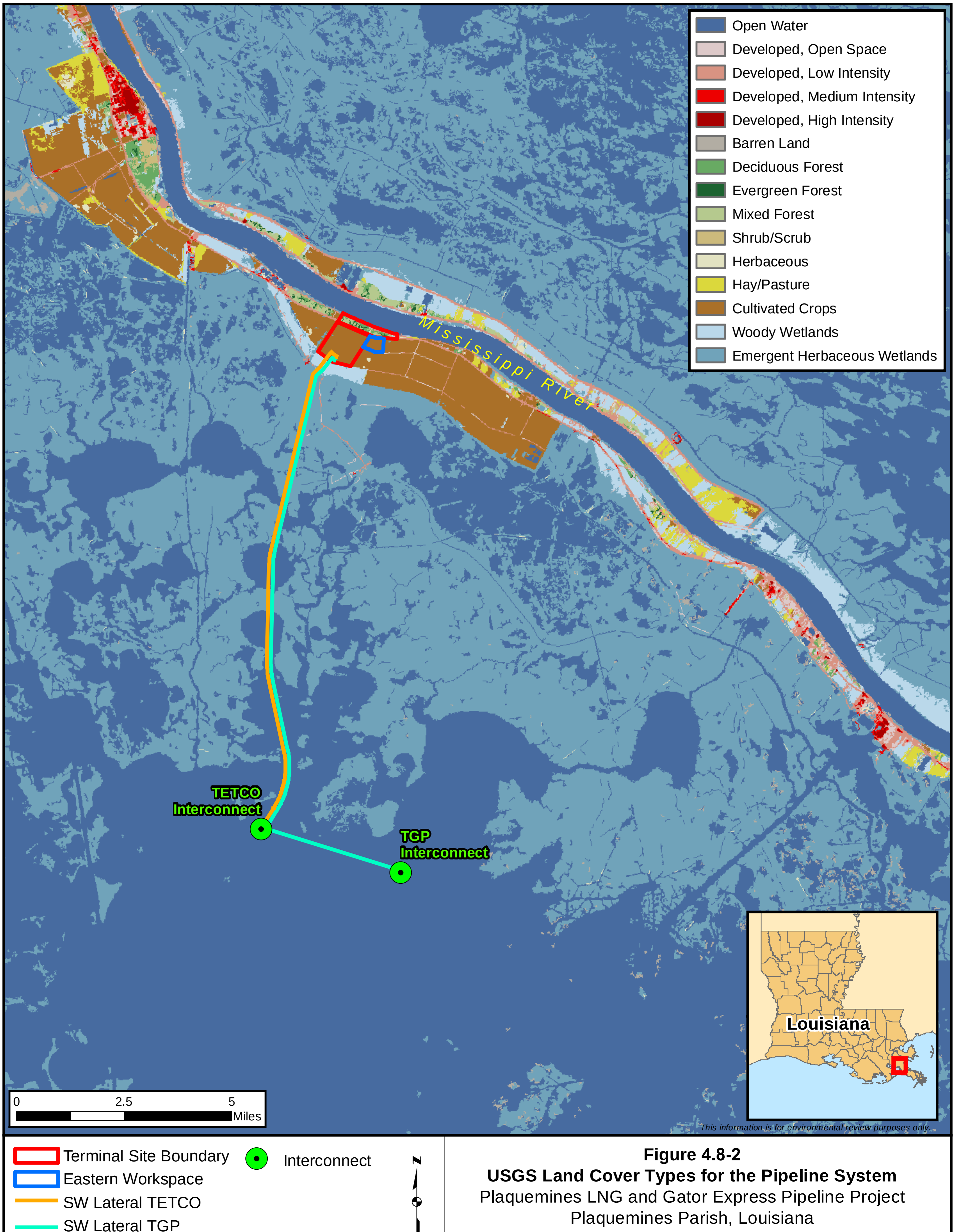

Figure 4.8-2
USGS Land Cover Types for the Pipeline System
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

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Access Roads

The Intracoastal Waterway would be used for delivery of coated pipe via barge to the Project area. Walker Road and SH 23 would likely serve as the primary routes to transport the joints from the barge dock location to the pipe stringing areas. One temporary and one permanent access road would be required for the pipeline system. The permanent access road would impact less than 0.1 acre of land, while the temporary access road would impact 0.7 acre of land primarily consisting of wetlands.

4.8.1.3 Land Use Impacts and Mitigation

Impacts on cultivated cropland, developed commercial/industrial, herbaceous land, and forest are discussed below. Impacts on open waters and wetlands are discussed in sections 4.3.2.2 and 4.4.2, respectively.

Cultivated Cropland

<u>LNG Terminal</u>

The LNG terminal would be located on cultivated croplands historically used for sugar cane production and cattle grazing. Soils classified as prime farmland would be affected by the Project (see section 4.2.1.2). However, no specialty crops would be affected during construction or operation of the Project facilities.

Construction at the proposed terminal site would permanently affect approximately 518.9 acres of cultivated cropland, while 6.1 acres would be temporarily affected. Impacts on cultivated cropland within the terminal site would include the permanent loss of production during construction and after construction is completed. Impacts could also include soil rutting or compaction due to construction equipment. Operation of the Project would result in the permanent conversion of the 518.9 acres of agricultural lands to industrial/commercial use.

Although construction and operation of the LNG terminal represents a permanent loss of cultivated cropland, the Project would be consistent with the Port of Plaquemines Master Plan as being fully developed and not designated as future agricultural uses. Therefore, the Project would not represent a significant impact on agricultural uses within the area.

<u>Pipeline System</u>

The SW lateral TGP pipeline would affect approximately 0.1 acre of cultivated cropland within the 130-foot-wide right-of-way. The SW lateral TETCO would be collocated within the same right-of-way as the SW lateral TGP and construction of the SW lateral TETCO would not affect any additional cultivated croplands. Impacts on 0.1 acre of cultivated cropland would include the permanent loss of production and could include soil rutting or compaction due to construction equipment. Operation of the Project would result in the conversion of only 0.1 acre of agricultural land to industrial/commercial.

Although construction and operation of the pipelines represent a permanent loss of agricultural land, the Project would be consistent with the Plaquemines Parish Master Plan for development. Therefore, the Project would not represent a significant impact on agricultural uses within the area.

Developed Commercial/Industrial

LNG Terminal

Construction of the LNG terminal would affect 17.8 acres of developed commercial/industrial lands. The majority of this land consists of roads and levees along the Mississippi River. Construction impacts on these industrial/commercial areas during construction would include increased dust from exposed soils, construction noise, and traffic congestion. Dust and noise levels would be minimized, as described in section 4.11.1.4 and 4.11.2.3, respectively. Impacts on traffic are discussed in section 4.9.8.1. Operation of the LNG terminal would permanently affect 11.2 acres and would remain developed commercial/industrial use.

Pipeline System

Construction of the SW lateral TGP would permanently affect 0.6 acre of developed commercial/industrial land, consisting largely of roads. No additional developed commercial/industrial land would be affected by construction of the SW lateral TETCO. Impacts during construction could include increased dust from exposed soil, construction noise, and impacts on traffic flow.

Herbaceous Lands

LNG Terminal

Herbaceous land at the terminal site primarily includes open herbaceous areas located north of SH 23. Herbaceous land totaling 2.0 acres would be affected by construction and operation of the LNG terminal. Construction impacts would include clearing of vegetation, and the lands would be permanently converted from open lands to industrial/commercial.

Pipeline System

Herbaceous lands affected by the pipelines would include 34.9 acres of open herbaceous area to the south of Lake Hermitage Rd. The affected open herbaceous land would all be located within the right-of-way for the pipeline, temporary access roads, and ATWS. Construction-related impacts on herbaceous open land would include the removal of vegetation and disturbance of soils. However, following construction, the 33.0 acres within the permanent right-of-way used for pipeline construction and the 1.9 acres temporarily used for access and ATWS would be allowed to revert to preconstruction condition.

Scrub-Shrub

LNG Terminal

One small patch of scrub-shrub land at the terminal site is located between the Mississippi River levee and SH 23. This area is 1.3 acres in size and is located within the operational footprint of the LNG terminal. This would result in the scrub-shrub land being converted to herbaceous land or developed commercial/industrial land.

Pipeline System

No scrub-shrub land would be affected during construction or operation of the pipeline system.

Forest

LNG Terminal

Forest land at the terminal site is primarily located north of SH 23 and includes deciduous, evergreen, and mixed forest. Construction and operation of the LNG terminal would affect 76.2 acres. An additional 12.0 acres of forest at the terminal site would remain undisturbed. All of the forest land within the liquefaction site would be permanently converted to developed commercial/industrial land. Construction impacts on disturbed forest land would result in the permanent removal of trees and other vegetation.

Pipeline System

No forest land would be affected during construction or operation of the pipeline system.

Residential

LNG Terminal

Some low-density residential areas are located approximately 0.2 miles off of Lake Hermitage Road to the west and southwest of the terminal site. However, no residential land is located within or adjacent to the terminal site.

Pipeline System

Similar to the terminal, the closest residential area is located off of Lake Hermitage Road. Residential areas are not located within or adjacent to the pipeline system rights-of-way. Venture Global is not anticipated to require any residential properties for construction access. Construction impacts on these residential properties during construction would include construction noise and traffic congestion. Dust and noise levels would be minimized, as described in section 4.11.1.4 and 4.11.2.3, respectively.

4.8.2 Landowner and Easement Requirements

4.8.2.1 LNG Terminal

Venture Global currently leases the 632-acre site for the proposed terminal site. The property is owned by the Port of Plaquemines. A lease option agreement grants Venture Global the exclusive right to lease the terminal site for up to 70 years. Additionally, a USACE maintained levee along the Mississippi River is controlled by the federal government but resides within port owned property. Aside from the Port of Plaquemines and the USACE, no lands owned or managed by federal, state, or local agencies would be directly affected by the LNG terminal.

4.8.2.2 Pipeline System

Construction and operation of the SW lateral TGP and SW lateral TETCO would require a total of 953.9 acres of land, with all but one parcel being privately owned land. Venture Global would need to secure easements that convey temporary and permanent rights-of-way. For the aboveground facilities, Venture Global would obtain easement agreements or purchase the land outright.

An easement agreement would specify compensation to a landowner for the right of Venture Global to use the property during construction and operation of the pipeline system. The easement agreement would address damages to property during construction, restrictions on permitted uses within the permanent right-of-way, and post-construction restoration specifics.

If an easement cannot be negotiated with a landowner and the Project has been certified by FERC, Venture Global could use its right to eminent domain under section 7(h) of the Natural Gas Act and the procedure set forth under the Federal Rules of Civil Procedure (Rule 71A) to obtain the right-of-way and construction areas. Venture Global would still be required to compensate the landowner for the right-of-way and any damages incurred during construction. The level of compensation would be determined by a court according to state or federal law.

4.8.3 Planned Developments

4.8.3.1 LNG Terminal

There are no residential areas or subdivisions currently proposed within a 0.25-mile radius of the terminal site according to the Plaquemines Parish Department of Permits, Zoning, and Planning. There are also no commercial/industrial projects planned or announced within a 1-mile radius of the terminal site. The closest commercial/industrial facility planned near the terminal site is the proposed Gulf Coast Methanol Complex, which would be located 2.2 miles northwest. Upgrades to existing levees planned by USACE, as well as relocation of existing drainage canals by the Plaquemines Parish Government, are adjacent to the terminal site. Each of these projects, as well as other planned commercial/industrial development projects in the broader area, are discussed in the cumulative impact analysis provided in section 4.13.

Plaquemines Parish published a draft, final Comprehensive Master Plan in 2012, which designates future land uses on all developable properties within the parish. The plan's future land use maps are include in the "Land Use" technical addendum to the "Community Assessment." The 636-acre site of the LNG terminal has three future land use designations on different portions of the site, including "port terminal complex," "major industries," and "business park." The LNG terminal, a private port terminal with a major industrial component, is largely consistent with the future land use designations. The majority of the site is designated "port terminal complex" and "major industries," while a minority portion is "business park," itself a type of non-residential/ non-agricultural use.

4.8.3.2 Pipeline System

There are no residential areas or subdivisions currently proposed within a 0.25-mile radius of the pipeline system nor commercial/industrial projects planned or announced within a 1-mile radius of the pipeline system, according to the Plaquemines Parish Department of Permits, Zoning, and Planning. Upgrades to existing levees adjacent to the pipeline system are planned by the USACE. Plaquemines Parish is relocating drainage canals adjacent to the pipeline system as a result of the USACE levee project. These canals would not be affected by the Project. These projects, as well as other planned commercial/industrial development projects in the broader area, are discussed in the cumulative impact analysis provided in section 4.13.

4.8.4 Recreation and Special Interest Areas

Construction and operation of the LNG terminal and pipeline system would not directly affect designated recreational areas or special interest areas. There are three wildlife refuges, a private conservation area, one historic park and preserve, five restoration areas, and three public marinas located in proximity to the Project. These recreational and special interest areas are discussed below and shown in figure 4.8-3.

Wildlife Refuges and Preserves/Conservation Area

There are no wildlife refuges, preserves, or conservation areas located within 16 miles of any Project workspace. The three wildlife refuges located in Plaquemines Parish Breton National Wildlife Refuge, Delta National Wildlife Refuge, and Pass A Loutre State Wildlife Refuge, are all located over 35 miles from any Project workspace and would not be impacted by Project construction or operation activities. A private conservation area, Woodland Trail and Park, and a preserve, Jean Lafitte National Historic Park and Preserve are both located over 16 miles from any Project workspace and would not be impacted by Project construction or operation.

National Estuary and Restoration Areas

The Barataria-Terrebonne National Estuary is located between the Mississippi and Atchafalaya Rivers in south Louisiana. The estuary's watershed includes the terminal site and pipeline system right-of-way. The Barataria-Terrebonne estuarine complex became a National Estuary in 1990, and the Barataria-Terrebonne National Estuary Program was created under the EPA administered National Estuary Program (NEP). The goal of the NEP is the prevention of activities that: (1) threaten an estuary's public water supply; (2) are harmful to shellfish, fish, and wildlife populations; and (3) negatively impact recreational opportunities for estuary residents. Venture Global would be required to adhere to any NEP recommendations that have been adopted by LDEQ, LDNR, and/or USACE as conditions to a permit.

Terminal Site Boundary
SW Lateral TETCO
SW Lateral TGP
Interconnect and Meter Station

Figure 4.8-3
Recreational Use Areas within 5 miles of Proposed Project
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

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Construction of the pipelines would require dredging of channels within the Barataria-Terrebonne estuary to provide temporary access for pipeline lay barges and support vessels. Trenching would also be required in areas where the pipeline would be located in open water. Recreational boaters in the Barataria-Terrebonne estuary may be temporarily prevented from using channels during dredging operations. Users may also observe a temporary increase in barge traffic during construction of the pipeline system. Venture Global would mark construction areas with warning signs and navigation lights to ensure the safety of recreational boaters. Impacts on boaters would be temporary and minor.

Several existing and proposed restoration sites managed by the Louisiana Coastal Protection and Restoration Authority are located in the Barataria Basin near the pipeline system. Barataria-Terrebonne National Estuary Program Gulf Ecological Management Site is located approximately 1.0 mile from the pipeline system. The Barataria-Terrebonne National Estuary Program Gulf Ecological Management Site Program is an initiative of the Gulf of Mexico Foundation, the EPA Gulf of Mexico Program, and five Gulf of Mexico states to restore lost or damaged sensitive habitats. Venture Global is consulting with the regulating agency to avoid or minimize potential impacts on this restoration area. Impacts on the restoration area are expected to be minor and temporary.

Lake Hermitage Marsh Creation (BA-42), Fringe Marsh Repair, West Pointe a lá Hache Siphon Diversion, and Bayou Grande Cheniere Marsh and Ridge Restoration are four other restoration areas located between 3.0 miles and 7.7 miles from any Project component. No impacts are anticipated at these restoration areas from either direct contact or indirect tidal influences.

Public Marinas

West Pointe a lá Hache Marina is located 0.4 mile northeast of the terminal site. The marina is located off of the Back Levee Canal that parallels the east bank of the Mississippi River. Lake Hermitage Marina is located 1.8 miles to the east of the SW lateral TGP. The marina consists of a boat launch off of West Bayou Lane in the Hermitate Bayou. St. Jude Hump Public Boat Launch is located 1.8 miles southeast of the terminal site. Woodland Plantation is located 0.8 mile east of the terminal site. None of these facilities are expected to be impacted by the Project.

Military Installations

The Military Aviation and Installation Assurance Siting Clearinghouse coordinated with the DoD for an informal review of the Project. In correspondence sent to the Commission on June 4, 2018, the Military Aviation and Installation Assurance Siting Clearinghouse concluded that the Project would have a minimal impact on military training and operations conducted in the area. No mitigation was recommended, but further communication with the Military Aviation and Installation Assurance Siting Clearinghouse was requested. As such, we will continue to include the Military Siting Clearinghouse in all notifications as the NEPA process continues.

4.8.5 Hazardous Waste Sites

Review of regulatory databases revealed two hazardous waste sites located within 5.0 miles of the terminal site. Both sites, Elmwood Marine Services and International Marine Terminals, are located over 1 mile from the terminal site and are reported to be in compliance, with no violations. Although not anticipated, if hazardous waste is encountered during construction, Venture Global would stop work in the vicinity of the hazardous waste and implement the Project's SPCC Plan outlining the steps to be taken, including reporting, coordination, and clean up.

4.8.6 Visual Resources

"Visual resources" refers to the composite of basic terrain features, geologic features, hydrologic features, vegetation patterns, and anthropogenic features that influence the visual appeal of an area for residents or visitors. In general, impacts on visual resources may occur during construction when large equipment, excavation activities, spoil piles, and materials are visible to local residents and visitors. During operation, impacts on visual resources would occur when facilities, or portions of facilities, and their lighting are visible to residents and visitors. The degree of visual impact resulting from the Project would be highly variable among individuals, and would typically be determined by the general character of the existing landscape and the visually prominent features of the Project facilities.

The region of influence for the evaluation of visual resources includes a 2-mile buffer around the Project. This distance provides for the maximum distance at which the tallest Project feature would be visible and recognizable. This area also comprises the Project viewshed (i.e., the area that would have visibility of the Project).

4.8.6.1 LNG Terminal

The area surrounding the LNG terminal site includes industrial operations, agricultural and undeveloped land, and a few small residential communities. Traveling 6 miles north of the site on SH 23 viewers can see the largest existing industrial operation in the area, a petrochemical plant (Phillips 66 Alliance Refinery). Closer to the LNG terminal site, just over one mile north, is a coal transfer facility, International Marine Terminals. Across the river is another coal transfer facility, United Bulk Terminal, and a cargo handling terminal, Associated Terminals, both within two miles. Visible on-site features at the coal transfer facilities include large coal stockpiles, conveyance systems, permanent metal office buildings, temporary office buildings, docks, berthing areas, and dirt or gravel piles. The cargo handling terminal on the other side of the river specializes in the transfer of grain between barges and ocean vessels, and its most conspicuous features are numerous rows of floating barges and a massive floating grain elevator. Although Phillips 66 Alliance Refinery is 6 miles from the Project site, the visible facilities include aboveground storage tanks, stacks, permanent metal and brick office buildings, temporary office buildings, berthing areas, dock loading arms/cranes, and large graveled parking and laydown areas. Directly across the Mississippi River from the LNG terminal site is fallow and unmaintained agricultural land. The LNG terminal site, itself, is currently unmaintained agricultural, bounded by more agricultural land on both sides. The primary viewers within the terminal site viewshed include local residents, drivers (including business owners and employees), visitors for the existing industrial businesses along SH 23 and within the vicinity of the terminal site, and recreational and commercial users of the Mississippi River and its local environs.

After completion of construction, the LNG terminal would include four LNG storage tanks (188 feet tall), as well as cold flare (280 feet tall), warm flare (280 feet tall), low-pressure flare

(175 feet tall), and marine vapor control (100 feet tall) facilities. Lighting also would be used at the terminal site during evening activities and for safety.

Venture Global conducted a visual assessment for the terminal site and pipeline system, which included the review of views from ten key observation points (KOPs). The assessment considered viewer sensitivity (i.e., expectations of the observed areas) and visual quality. Visual impacts were described as minor, moderate, or significant utilizing the definitions provided below.

- **Minor Impact**: The Project would be minimally visible to a low number of sensitive viewers, and distance or compatibility with existing land uses would not make the Project stand out.

- **Moderate Impact**: The Project would be minimally visible to a moderate number of sensitive viewers; Project elements would result in an increase in the industrial viewshed that is incompatible with existing land uses.

- **Significant Impact**: The Project would be highly visible to a large number of sensitive viewers and would negatively affect the quality of the visual landscape.

The ten KOP locations included the following:

- KOP-1 End of Squirrel Road – View to Northeast – Towards Terminal Site;

- KOP-2 Mainline Valve Site – View to Northwest – Towards Lake Hermitage Road;

- KOP-3 Lake Hermitage Road – View to Northeast – Towards Terminal Site;

- KOP-4 Lake Hermitage Road and East Shirley Road – View to East – Towards Terminal Site;

- KOP-5 End of Suzie Street – View to Southeast – Towards Terminal Site;

- KOP-6 SH 23 – View to West – Towards Terminal Site;

- KOP-7 Shed off SH 23 – View to West – Towards Terminal Site;

- KOP-8 Griffen Community Center – View to South – Tree buffer;

- KOP-9 Davant Park – View to South – Tree buffer; and

- KOP-10 SH 15 Towards United Bulk Terminal – View to West - Existing Industrial View.

Based on a review of these KOPs, visual impacts associated with the terminal site would be experienced during construction, when the site landscape would be temporarily dominated by heavy equipment, materials storage, and infrastructure. These impacts would be at least partially visible to local residents, drivers/visitors along SH 23, visitors to nearby marinas, and boaters on the Mississippi River and on open waters south of the terminal site. Other potential viewers include users of those areas developed for industrial purposes along the Mississippi River north of the terminal site. Viewers would not likely be present in the remaining areas surrounding the terminal site, as these areas largely consist of marsh and pasture land.

Residents would have views of the terminal site during construction. The closest residence is 0.14 mile southwest of the site, and low-lying vegetation would not block the entirety of construction activities. Visual screening may be present for other residences with existing scrub-shrub and tree cover.

Residential views of the facility would include the construction of the trestle bridge crossing SH 23 and the federal levee on the Mississippi River. The temporary aerial conveyor system would be visible, as well. This conveyor system would be situated approximately 370 feet north of the trestle bridge and would be supported on a similar trestle system. Construction lighting also may be visible, as temporary light-emitting diode fixtures would be installed on buildings or wooden poles, and portable lighting would also be installed. Increased barge traffic during construction also may be visible from some of the residential areas near the terminal site.

Drivers (including residents, commuters, business owners and employees, and/or visitors) along SH 23 would be able to see the terminal site on either side of the highway. As previously noted, SH 23 is a National Scenic Byway. While this area of the byway is dominated by industrial views, Project construction (and eventual operation) would be visible. Among the features that would be visible would be the trestle bridge, the aerial conveyor, the perimeter wall, and other infrastructure. The perimeter wall would provide some visual buffer, although it would not shield the full view of the terminal site.

Two recreational use areas are within the 2-mile evaluation area for visual resources (an unnamed public boat launch and the Davant Community Center), and construction lighting may be visible to recreational users in these locations. In addition, recreational boaters on the Mississippi River would have views of the construction activities and equipment at the terminal site as well as the progressing infrastructure. Some visual screening would be present due to existing tree lines and the levee on the east bank of the river and the sunken grade of land north of the levee.

In general, construction would be anticipated to generate minor impacts due to the industrial nature of the terminal site and its surroundings, as well as the temporary nature of the activities and presence of construction equipment. The primary land use is industrial, due to the presence of commercial shipping, oil and gas facilities, coal facilities, and agricultural industries. In this manner, the construction activities would not detract from the overall industrial appeal of the area. While views of the terminal site from SH 23 are present, the existing views are of industrial facilities and activities. The construction at the terminal site would add to these occurrences, but the Project construction would not be inconsistent with the surroundings (i.e., minor impact).

During operation, views of the operating LNG terminal may include exterior plant lighting, air navigation lighting, LNG storage tanks, electric power generation facilities, liquefaction heat exchangers, air coolers, and the flare stack. Exterior plant lighting would primarily consist of full cutoff types that would be directed toward the ground. Where possible, floodlight mast locations would be directed to avoid light emissions on land and water. According to Venture Global, flaring would be anticipated to occur twice a year for start-up and shutdown purposes, while marine flaring would be estimated to occur up to 12 times per year. Views of the flaring would be visible to some viewers, but it also would be partially obscured by the floodwall. The floodwall crest is anticipated to be +26 feet NAVD88 at the terminal site.

Other views during operation would include intermittent views of the LNG carriers that would be docked at the LNG terminal. These views would occur along the stretch of the Mississippi River between the Gulf of Mexico and the terminal site. Residents and recreational boaters may have views of these activities.

During operation, the facilities at the terminal site would be visible to residents, drivers, and recreational/commercial users. As the terminal site is a greenfield location, additional lighting and facilities would be added to the local environment. Although the area is considered industrial in nature, there are presently no industrial facilities of this magnitude visible from the nearest residences. Therefore, the LNG facility could have an adverse impact on the residents, drivers, and recreational/commercial users of the area.

4.8.6.2 Pipeline System

As noted in section 4.8.6.1, a visual resource assessment was conducted to evaluate the potential of the Project to impact visual resources. For this assessment, the pipeline system was considered with regard to its construction and operation.

The study area for this assessment included portions of the 2-mile area used for the terminal site as well as the footprint of the pipeline system and its immediate surroundings. The pipeline system generally would be located in rural areas and, in some locations, areas previously disturbed by other development. The viewer groups associated with these areas primarily would include residents and recreational or commercial boaters. The closest local residences are located on Gator Road, approximately 0.3 mile northwest of the HDD crossing of Lake Hermitage Road; another residence is located approximately 0.8 mile from the pipeline system.

Visual impacts associated with construction of the pipeline system would be anticipated to include the removal or alteration of existing vegetation and the exposure of bare soils, as well as earthwork and grading scars associated with heavy equipment tracks, trenching, and machinery and tool storage. These activities may be visible to observers, including residences located within 1.0 mile of the pipeline system. Existing vegetation outside of the workspaces may provide some buffer, but noticeable changes would result from the changes within the footprint and workspaces of the pipeline system or the construction of the pipeline system.

Barges associated with construction of the pipeline system would utilize open water areas associated with the barge access channels. A short-term change in visual resources would be noticeable to recreational and commercial boaters in proximately to the workspaces due to the activity. Occupants of other vessels traveling on the barge access channels would be able to see large equipment, pipe joints, and materials being transported to the active construction sites.

As part of pipeline system construction, a pipe bridge also would be built. This bridge would be located approximately 80 feet north of Lake Hermitage Road and would be visible to residents living in the Deer Range Campsites Subdivision and the Suzie Bayou Campsites Subdivision. KOP 2 was used to evaluate the potential for impacts associated with this Project component. While the bridge would be noticeable during construction and operation, the analysis showed that existing tree cover and vegetation offered effective screening, thereby preserving the mix of rural and industrial features within the landscape.

Due to the temporary nature of construction and Venture Global's plans to restore areas to pre-construction conditions (following the Project-specific Plan and Procedures), impacts associated with construction of the pipeline system on visual resources would be minor.

Operational impacts associated with the pipeline system would be anticipated to occur in locations surrounding the permanent aboveground facilities, including the meter stations, mainline valves, and the pipe bridge. The meter stations would be situated in open areas and would be seen by recreational or commercial boaters. As shown by the description of the surrounding area, similar aboveground pipeline infrastructure is common in this area of Louisiana; therefore, the presence of these stations would not detract from the overall industrial nature of the area. The mainline valve site located south of Hermitage Road would not be anticipated to create a visual disturbance due to its relatively small size. While the pipe bridge would be noticeable, as aforementioned for construction, existing vegetation would provide a small visual cover.

As much of the pipeline system is located in rural or industrial areas, the Project would be anticipated to cause minor impacts with regard to visual resources. Existing vegetation would help to provide some visual buffer from the operation of the pipeline system. In addition, for those areas where vegetation would be removed or altered, pre-Project conditions would be restored.

4.8.7 Coastal Zone Management

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 Louisiana, the OCM administers the state's Coastal Zone Management Program and is the lead state agency that performs federal consistency reviews. As such, the LDNR evaluates activities or development affecting land within Louisiana's coastal zone for compliance with the CZMA through a process called a "federal consistency" review.

The Project is entirely located within the Louisiana Coastal Management Zone. A CUP would be required from the LDNR for development activities taking place in the coastal zone. The Project would be designed and built in compliance with conditions set forth in by the CZMA. On June 8, 2017, Venture Global submitted an application to the LDNR for a CUP, which also seeks a consistency determination for CZMA. Venture Global agrees to construct and operate the project in compliance with conditions that would be set forth in the FERC authorization, the USACE section 404/10 and 408 permits, and the LDNR OCM's CUP. Venture Global would be required to obtain all relevant federal permits before receiving FERC authorization to proceed with construction including a determination of consistency with the Coastal Zone Management Plan issued by LDNR. **We recommend that:**

- **Venture Global should not begin construction of the Project until it files with the Secretary a copy of the determination of consistency with the Coastal Zone Management Plan issued by the LDNR.**

4.9 SOCIOECONOMICS

Construction and operation of the terminal site and the pipeline system could affect socioeconomic conditions in the region. We estimate the duration of these effects—temporary, short term, long term, or permanent—and their intensity—negligible, minor, or significant. In this context, short-term impacts could continue for up to 5 years following construction, and long-term impacts could continue beyond 5 years but less than the operational life of the Project. These definitions differ from those given in the introduction to section 4.0 because the timescale of socioeconomic conditions differs from that of natural environmental resources. We determined intensity levels by reviewing quantitative and contextual data and making qualitative assessments. Negligible indicates an impact would not be noticeable or measurable. A minor impact would be a noticeable change but would not affect the overall function or quality of the socioeconomic resource (e.g., housing market, public service provision, economic activity, etc.) at the community scale. A significant impact would change, either positively or negatively, the function or quality of the socioeconomic resource at the community scale for the duration indicated. We also describe impacts as direct or indirect, or beneficial or adverse, when the distinctions are appropriate or clarifying.

Given the scale of the Project, the affected area is defined as three contiguous parishes, including Plaquemines (the location of the Project), Jefferson, and Orleans Parishes. Figure B-7 in appendix B, depicts the region of influence discussed in this document. While the emphasis of this assessment is on Plaquemines Parish, the three parishes listed above all contain communities within commuting distance of the Project, and, thus, are places where workers and workers' families would seek housing and public services. While some of the benefits and pressures of the Project may occur throughout the region, the strongest economic effects from increased demand for workers, materials, and services along the supply chain would likely occur in the affected area. These communities would likely capture most of the local tax revenues stemming from the Project, but they would also take on new public service expenditures. In addition, the affected area could experience transportation effects on roads and waterways.

We gave special consideration to the area referred to as the southern west bank of Plaquemines Parish, directly south of the Project, which is composed of 26 named communities and an estimated 4,828 residents. These residents rely on SH 23 for conveyance outside the southern west bank, and are vulnerable if travel on SH 23 becomes blocked or restricted. The Point a lá Hache ferry south of the terminal site provides transport between the east and west banks, but only transports about 40 vehicles at a time. We also evaluated the potential for the Project to disproportionately affect nearby populations that qualify as environmental justice communities.

4.9.1 Population

Table 4.9-1 provides selected population, density, and land area statistics for the affected area and the state.

Table 4.9-1 Population, Density, and Land Area Statistics in the Affected Area					
Geographic Area	Population 2000[a]	Population 2010[b]	Population 2016, Estimate[c]	Population Density 2016, Estimate (persons per square mile)	Land Area[b] (square miles)
Louisiana	4,438,976	4,533,372	4,645,670	108	43,204
Plaquemines Parish	26,757	23,042	23,584	30	780
Belle Chasse	*9,848*	*12,679*	*13,709*	-	-
Census Tract 504[d]	*3,428*	*3,069*	*3,676*	-	-
Southern West Bank[e]	*10,456*	*3,013*	*4,828*	-	-
Jefferson Parish	455,466	432,552	435,204	1,470	296
Orleans Parish	484,674	343,829	382,922	2,266	169
Affected Area Total	**966,897**	**799,423**	**841,710**	**3,766**	**1,245**

a U.S. Census Bureau, 2000
b U.S. Census Bureau, 2010
c U.S. Census Bureau, 2017a
d The terminal site and pipeline system are in Census Tract 504.
e In this assessment, the southern west bank of Plaquemines Parish refers to all of the land for the terminal site on the west bank of the Mississippi River. It comprises partial territory in Census Tract 504 and Census Tracts 505 through 508, depicted in figure B-8, appendix B.

Plaquemines Parish is a peninsula in the Gulf of Mexico bisected by the Mississippi River. Plaquemines Parish's land area is almost twice as large as Jefferson and Orleans Parishes combined, but its population is less than 25,000 people. Most parish lands are within a designated floodplain, and much of these are coastal wetlands (Plaquemines Parish, 2012). The parish population is largely concentrated in communities along SHs 23 and 39, which follow the west and east banks of the Mississippi River, respectively. Belle Chasse, approximately 20 miles north of the terminal site on the west bank, is the most populous community in Plaquemines Parish, consisting of over half of the parish's residents. All parish communities are unincorporated.

Plaquemines, Jefferson, and Orleans Parishes are part of the Greater New Orleans Region. Many communities in Jefferson Parish are within 50 miles of the Project. The boundary of Orleans Parish is coterminous with the limits of the city of New Orleans, and its closest boundary is about 35 miles north from the terminal site.

The estimated 2016 population levels in all three parishes are lower than in 2000, chiefly because so many people left the region after Hurricane Katrina in 2005. The 2016 population of Belle Chasse, however, is larger than pre-Hurricane Katrina levels (i.e., before 2005), and so is the population in Census Tract 504, the census tract that contains the terminal site. The southern west bank area, stretching from around Port Sulphur to the southern tip of Plaquemines Parish, did not regain its population after Hurricane Katrina. For the purpose of this analysis, the southern west bank is defined as all parish land south of the terminal site on the west bank of the Mississippi River. It comprises partial territory in Census Tract 504 and Census Tracts 505 through 508, depicted in figure B-8 in appendix B.

As shown in table 4.9-2, Venture Global expects that construction of the terminal site would occur in two 35-month phases, with start dates spaced 18 months apart. Thus, construction on the LNG terminal would be continuous for about 4.5 years. The pipeline system would also be constructed in two phases, each less than a year in duration, overlapping with the LNG terminal construction. Each phase of the LNG terminal's construction would average 1,400 workers and rise to 2,200 workers for a 6-month peak. However, the number of workers on-site would typically be higher during the 18 months of terminal construction phase overlap. During this 1.5-year period, the total number of workers at the terminal site could range from 2,300 to 3,200, and would average 2,800 workers for 1 year.

Table 4.9-2
LNG Terminal and Pipeline System Workforce and Duration

Phase/Facility	Workforce			Duration[a]		
	Phase I	Phase II	Terminal Site Phase Overlap	Phase I	Phase II	Terminal Site Phase Overlap
Construction						
Terminal Site						
Average	1,400	1,400	2,800	35 months	35 months	12 months
Peak	2,200	2,200	2,300–3,200	6 months	6 months	3 months + 3 months
Pipeline System						
Average	250	100	ND	9 months	7 months	ND
Peak	350	150	3,700	1 month	1 month	1 month
Operation						
Terminal Site	250			30 years (minimum)		
Pipeline System[b]	NA			50 years (minimum)		

a Phase II of the terminal site construction would overlap with Phase I for about 18 months, and the start-to-end construction period would be 4.5 years.
b Pipeline system facilities would be maintained by staff who are based at the terminal site.
Key:
ND = Not determined
NA = Not applicable

The pipeline system construction workforce would be much smaller, ranging from 100 to 500 workers. Venture Global has not determined the specific timing of the pipeline system phases. Thus, to be conservative, they assume that peak construction of both pipeline laterals could overlap, resulting in 500 workers on-site for 1 month. Moreover, they assume that LNG terminal peak construction could overlap peak construction of both pipeline system laterals, demanding a total workforce of 3,700 workers at the terminal and pipeline system sites for 1 month.

Given the existing oil and gas and port industries in the affected area, Venture Global expects at least 50 percent of the construction workforce would be hired from people already residing within the affected area. These local workers would not affect the population. The remaining workers, once hired, would increase the population temporarily for the duration of their employment. Because the LNG terminal has a multi-year construction period, some non-local workers may bring householders, e.g., spouses, partners, and/or children, to the area. For this evaluation, we assumed the average number of non-local workers associated with LNG terminal construction would bring householders, each with 2.6 persons per household based on the state average, to the area (U.S. Census Bureau, 2017b). Further, we assumed non-local pipeline system construction workers would not bring householders to the area because of the short construction periods, nor would additional LNG terminal employees hired during peak periods.

From these assumptions, we estimated that 1,820 non-local workers and householders could relocate to the affected area to support each phase of LNG terminal construction. During the period when the LNG terminal's Phases I and II overlap, that number could rise to an average of 3,640 non-local workers and householders. If peak construction periods of the LNG terminal and pipeline system overlap, up to 4,090 non-local workers and householders could temporarily reside in the affected area at one time during 1 month.

The affected area population is more than 840,000, so the non-local worker households would increase the population by less than 1.0 percent, including during peak construction. Of course, non-local workers would not evenly distribute through the affected area, and we expect many non-local workers would seek residence in communities with rental housing within a 1-hour commute or less. Belle Chasse, the largest community in Plaquemines Parish, is about a 30-minute commute away. Several other communities in Jefferson Parish (e.g., Timberlane, Terrytown, Gretna, Harvey, and Marrero) are within a 45-minute commute of the terminal site, as are several neighborhoods in New Orleans, and we assume any could appeal to non-local workers.

Based on the comparison of workers and householders with the existing population, we conclude that construction of the Project would have a minor, short-term effect on population levels in communities in the affected area. In forming this conclusion, we also considered the effect of non-local worker households' on housing and public services, which are evaluated in sections that follow. We acknowledge that the population increase would be more apparent in communities closest to the Project site with rental housing and amenities, especially in Belle Chasse, which currently has a low estimated rental vacancy rate of less than 3 percent, though this estimate has a wide margin of error (U.S. Census Bureau, 2017c). In the short term, the population increase could increase demands for services and housing, but may also create economic benefits in the affected area, which still has a smaller population than in 2000, pre-Hurricane Katrina.

During operation, the Project would require 250 full-time workers. Given the existing oil and gas and industrial port economies in the region, we expect at least 50 percent of operations workers would be hired from within the affected area. The remaining 125 workers, with assumed household sizes of 2.6 persons, would effectively translate into 325 new residents in the region. We conclude that the non-local workers hired during operation, along with their householders, would have a minor, permanent impact on the affected area's population.

4.9.2 Economy and Employment

The Greater New Orleans Region's economy is deeply invested in the oil and gas industry, and Plaquemines Parish has been on record as contributing 25 percent of annual state severance revenues from local oil and gas production (Scott and Richardson, 2015; Greater New Orleans, Inc., n.d.). The Plaquemines Port, Harbor, and Terminal District is one of the top ports by annual cargo tonnage in the country and was ranked 11th largest in 2016 (USACE, 2018). The port district occupies the southernmost 70 miles of the Mississippi River, and its primary cargoes are oil- and gas-related products, chemicals, coal, and grains. Another major employer is Naval Air Station Joint Reserve Base New Orleans in Belle Chasse, which employs over 5,000 people and provides $340 million to the local economy (Purpura, 2013; Plaquemines Port, Harbor, and Terminal District, 2018). Commercial fishing is another defining industry in Plaquemines Parish, and is evaluated separately in section 4.9.3.

An estimated 88,000 jobs were lost in the aftermath of Hurricane Katrina in 2005. However, southeast Louisiana had high job growth in the ensuing years, such that the New-Orleans-Metairie-Kenner metropolitan statistical area had the highest employment growth rate among the 100 largest metropolitan statistical areas in the country between 2005 and 2011 (Rho et al., 2012). Unemployment rates at the state and local levels are currently low at around 5 percent, reflecting the national trend of shrinking unemployment among workers actively seeking jobs.

Table 4.9-3 provides selected economic and employment information about the affected area.

Table 4.9-3
Existing Economic Conditions in the Affected Area

Geographic Area	Per Capita Income [a]	Civilian Labor Force [b]	Top Industry Sectors by Employment[a]	2016 Unemployment Rate[b] (%)
Louisiana	$25,515	2,112,320	• Ed, Health, Social • Retail trade • Arts, Accom, Food • Pro, Mngmt, Admin • Construction	5.1
Plaquemines Parish	$25,359	10,149	• Ed, Health, Social • Ag, Fish, Hunt, Mine • Arts, Accom, Food • Construction • Manufacturing	4.6
Jefferson Parish	$28,067	215,779	• Ed, Health, Social • Arts, Accom, Food • Pro. Mngmt, Admin • Retail Trade • Construction	4.5
Orleans Parish	$28,444	179,465	• Ed, Health, Social • Arts, Accom, Food • Pro, Mngmt, Admin • Retail Trade • Construction	5.1

a U.S. Census Bureau, 2017d
b Bureau of Labor Statistics, 2018
Key:
Ed, Health, Social: Educational services, and health care and social assistance
Arts, Accom, Food: Arts, entertainment, and recreation, and accommodation and food services
Pro, Mngmt, Admin: Professional, scientific, and management, and administrative and waste management services
Ag, Fish, Hunt, Mine: Agriculture, forestry, fishing and hunting, and mining

Per capita income in Plaquemines Parish and the state are roughly equivalent, while it is higher in somewhat more affluent Jefferson and Orleans Parishes. The majority of the civilian labor force in the affected area resides outside of Plaquemines Parish.

The combined industry sector of educational services and health care and social assistance is the largest sector by employment in the U.S., and it is also the largest in the affected area (U.S. Census Bureau, 2017d). Of the three parishes, Plaquemines Parish has the lowest concentration in that sector, and it is also distinguished by having the second largest concentration of employment in the agriculture, forestry, fishing and hunting, and mining sector. The mining category includes oil and natural gas extraction, and both it and fishing are important industries in Plaquemines Parish. Construction is the fourth largest employment sector in Plaquemines Parish and the fifth largest in Jefferson and Orleans Parishes. This indicates some residents in the affected area have construction experience and could potentially benefit from the job opportunities associated with Project construction.

Venture Global estimates the Project's total construction cost would be $8.5 billion, including workforce salaries and material and equipment costs. Venture Global estimates 10 percent of Project costs would be spent locally or regionally, based on their analysis of industrial projects recently constructed in the Gulf Coast region and the local and regional contractors they plan to hire. Venture Global would purchase permanent equipment locally and also lease construction machinery like cranes, lifts, pump trucks, flatbed trucks, dump trucks, excavators, and front end loaders. Locally procured services would include limited design and engineering services, waste disposal, sanitary services, food services, and security. In addition, local distributors would supply fuel to operate the dredging equipment, pumps, earth-moving equipment, trucks, and diesel generators for the Project.

The Project's workforce needs are laid out in table 4.9-3, and at its peak, the workforce could number up to 3,700, but only for a 1-month period. More typically, the workforce would range from 1,400 to 2,800 on the terminal site, and an additional 100 to 250 persons would work on the pipeline system, depending on the construction phase. Project construction salaries are estimated to be $70,000 per year, excluding benefits, though the duration of any one employee's employment would vary widely from a few months or less to several years. The construction and related activities required would create short-term business opportunities for local suppliers and service providers and likely boost revenues along their supply chain, supporting job growth in related industries. The Project may increase competition for local supplies, which would increase costs for some market participants and increase revenues for others.

Overall, we conclude that construction of the Project would generate minor, short-term economic benefits in the affected area, which consists of three parishes in the Greater New Orleans Region. This benefit would accrue during the 4.5 years of construction and a year or two after while Project-related dollars moved through the local economy. In Plaquemines Parish, a rural community compared with the other parishes in the affected area, the economic benefit could be significant depending on the number of workers who lived in the parish and the amount of spending that occurred there. At its peak, the construction workforce would represent a 38-percent increase in the number of workers employed in Plaquemines Parish. The peak construction workforce would represent just a 1-percent increase in the number of workers employed in the broader affected area. We assume approximately half of construction workers would be hired from within the affected area, given that construction is among the top five employing industries in the region. This could be a substantial benefit to local workers and their communities.

Once hired, the construction workforce, ranging from 1,400 to 3,700 individuals, would spend money in the local communities and induce economic benefits in other industries like retail, accommodations, and food service. The labor requirements of the Project would increase demand for general and specialized workers during construction, which could increase labor costs generally for construction projects and petrochemical-related developments in the region, creating a mix of benefits and consequences, depending on the market participant.

During operation, 250 workers would be hired permanently to operate the LNG terminal and, as needed, the pipeline system, earning salaries of $75,000 to $90,000, excluding benefits. We assume half of these workers would be hired locally, given the mature oil and gas industry in the affected area and local workers with relevant experience. The operations workforce would increase the number of employed workers in the affected area less than once percent, but at the level of Plaquemines Parish, the workforce would increase the employed workforce by three percent. For the duration of the Project, at least 30 years, Venture Global expects to spend approximately $20 million annually on local materials, land leases, and water, sewer, and waste disposal utilities. We conclude that operation of the Project would have minor, permanent beneficial impacts on local employment and the economy in the affected area. Depending on the number of workers who move to Plaquemines Parish and the vendor contracts established there, the employment and economic benefit to the parish could be greater.

4.9.3 Commercial Fishing

The commercial fishing fleet in Plaquemines Parish is one of the largest in the lower 48 states and ranked the largest around 2010, per the Plaquemines Parish Comprehensive Master Plan (Plaquemines Parish, 2012). The parish's highest grossing species are shrimp, menhaden, and oysters; combined, their gross farm earnings valued $117 million in 2014 (Louisiana State University, 2017). The commercial fishing industry in Plaquemines Parish has experienced substantial setbacks in the last two decades but has been able to rebound to some extent after each event. Setbacks include Hurricane Katrina in 2005, the Deepwater Horizon drilling rig explosion in 2010, and recent freshwater diversion projects that adversely affected the oyster harvests in the short term.

The highest concentration of commercial fishing ports and marinas in Plaquemines Parish is south of the terminal site, especially in the communities of Empire, Buras, Triumph, and Boothville-Venice. Some commercial marinas exist closer to the terminal site (i.e., Myrtle Grove Marina to the north), but the commercial fishing hub is several miles south of the terminal. Likewise, the Mississippi Delta region and the river's tributaries south of the terminal experience the highest concentration of commercial fishing activity compared with river waters near the terminal and further north.

In this assessment, we considered whether construction or operation of the terminal site would restrict access to fishing grounds or impede commercial fishing boat traffic. (Section 4.6 addresses the Project's potential ecological and/or biological impacts on fish species.) As discussed in section 4.9.8.2, we estimate that over the 4.5-year construction period, terminal construction supply barges would average 7 to 8 barges, or 15 barge transits, per day outside the overlap period of Phase I and II construction, and 30 transits per day during the 18-month overlap period. Delivery barges and any additional supply ships would peak at around 60 transits per day during several months of the overlap period. The various origins of the construction support vessels are not known at this time, but we assume they could voyage from ports north or south along the Mississippi River, from inland bayous and canals west of the west bank, or from the Gulf of Mexico.

During peak construction vessel traffic, the vessels could be noticeable to commercial fishermen departing or arriving at port or in transit. Construction vessels' presence during this peak time could potentially affect fishing vessels voyages adversely, e.g., by slightly delaying transits or slightly increasing idle time and fuel costs, compared with current conditions. Construction supply barges and other vessels would have negligible effects outside this peak period, given the frequency with which barges and other supply vessels already transit the Mississippi River. Construction vessels are likely to transit established shipping routes that handle cargo-laden vessels such that their transits are not likely to affect any commercial fishing grounds differently from current cargo traffic. Thus, we conclude that the greatest effects from vessel traffic during terminal construction would be minor and temporary.

The frequency of LNG carrier traffic during operation of the terminal would be much less than the frequency of construction vessel traffic—an estimated one LNG carrier or less per day, or six LNG carriers per week (see Section 4.9.8.2 Marine Transportation). However, these carrier vessels would be much larger than construction vessels. The LNG carriers would originate from the Gulf of Mexico and travel established shipping lanes and routes transited by other commercial cargo traffic. Because of the width of the Mississippi River, the LNG carrier would not prohibit other vessels from traveling abreast or passing in the waterway north of the delta. However, the passes through the delta region into the main body of the river are narrower, and commercial fishing vessels that voyage through the Southwest Pass could be impacted during LNG carriers' transits through the pass. Impacts could potentially include minor delays or minor increases in fuel costs from increased idle time. We do not expect more than negligible effects on fishermen's catch from these minor delays, especially because other passes provide access to the Gulf of Mexico and because Local Notices to Mariners from the USCG would permit fishermen to schedule their voyage plans most efficiently. Moreover, large cargo vessel traffic already regularly occurs in this region (see Section 4.9.8.2 Marine Transportation). We conclude that effects on commercial fishing from near-daily LNG carrier transits would be permanent but minor.

In Louisiana, oysters are harvested from public oyster grounds and privately leased areas. The pipeline system would cross private lease areas in Barataria Basin, as described in section 4.6.3.1. LDWF and LDNR require water bottom assessments of lease areas within prescribed distances of installation activities, not more than 2 years before the start of construction. Venture Global has performed the necessary surveys (see section 4.6.3 for further discussion), but would consult further with LDWF and LDNR to confirm impacted oyster leases and the adequacy of its water bottom assessments to date. Furthermore, Venture Global intends to conduct financial impact evaluations on individual leases and work with leaseholders and the state to determine compensation for leaseholders. With consideration of Venture Global's commitments, we conclude that the pipeline system construction would have short-term direct impacts on commercial fishing. However, to ensure the successful implementation of these consultations, **we recommend that**:

- **<u>Prior to construction of the pipelines</u>, Gator Express Pipeline should file with the Secretary documentation that:**

  a. LDWF and LDNR have confirmed the adequacy of the water bottom assessments; and

  b. consultations with any affected oyster lease holders and the State of Louisiana regarding compensation are complete.

4.9.4 Taxes and Revenues

The Project would generate taxes and other revenues at the local and state levels during construction and operation. During construction, the Project's main contribution to parish governments would be sales tax revenues. The majority of these revenue increases would be indirect effects of Project construction, as it stimulates activity along the supply chain and provides businesses and workers with disposable income to spend locally. Venture Global estimates construction workers would spend 40 to 60 percent of their wages locally, and at least some of those expenditures would be subject to sales tax. In the affected area, the average local sales tax rate is 4.75 percent. As discussed in section 4.9.2, Venture Global estimates 10 percent of Project costs would be paid to local and regional suppliers of materials, equipment, and services, constituting some of the direct economic and tax benefits of the Project. Local procurement of concrete, fuel supplies, permanent equipment, leased equipment, and miscellaneous consumable materials would be taxed at the average local sales tax rate of 4.75 percent and the state sales tax rate of 4.45. .In addition to state sales taxes, income taxes generated by the Project would increase government revenues at the state level. The wages of Project workers would be subject to Louisiana state income tax, as would wages of other workers whose jobs or level of activity were supported indirectly by the Project.

Louisiana Economic Development evaluated the potential tax impact from Project construction activities, direct wages, indirect wages, and induced purchases, and estimated $131.3 million in state tax revenues and $34.8 million in local tax revenues, for a total of $166.1 million. This translates into approximately $7 million in local tax revenues generated annually over the 4.5 years of construction, some or most of which would be captured in the affected area. In Plaquemines Parish, general fund tax revenues were $23.7 million in 2017 (Plaquemines Parish, 2018). In Jefferson and Orleans Parishes, general fund tax revenues were $355.3 million and $403.0 million, respectively, in 2017 (Jefferson Parish, 2018; Orleans Parish, 2018). We conclude that Project construction would have a minor, beneficial, short-term effect on local government revenues in the affected area and in Plaquemines Parish, given that the parish's current tax revenues are less than $25 million. Project construction would provide a minor, short-term boost to state revenues.

During operation, the Project would pay sales and ad valorem taxes and generate income taxes on its annual payroll of $21 million. Venture Global estimates spending several million dollars annually on local materials and public utilities (water and sewer provided by Plaquemines

Parish Water Works District, and waste disposal partially facilitated by Plaquemines Parish). The local material purchases would generate sales tax and the utility payments would support Plaquemines Parish service providers. The 250 permanent employees, whose salaries would generate income tax, would spend money locally on housing and consumer goods and services, increasing ad valorem and sales tax revenues.

Typically, the largest local tax contribution during operation of a development this size is ad valorem taxes. Louisiana's Industrial Tax Exemption Program (ITEP) waives property taxes on approved developments for 5 years, with a possible extension of another 5 years. At the time of publication, the Louisiana Board of Commerce and Industry had approved Venture Global's application for the ITEP exemption for the LNG terminal; the Governor's approval was still pending. The pipeline system is not eligible for ITEP and would generate ad valorem taxes in year one of operation. At least by the eleventh year of operation, Plaquemines Parish would begin collecting ad valorem taxes from both the LNG terminal and the pipeline system, and these could be substantial given the $8.5 billion estimated value of the Project.

We conclude that once operational, the Project would have a minor, permanent, beneficial impact on local tax revenues in the affected area. If a substantial portion of local tax revenues accrue in Plaquemines Parish because materials and services are purchased there or a large percentage of the workforce resides there, the tax revenue increase in the parish could be substantial relative to the general fund's annual tax collection. Once the full value of ad valorem taxes are assessed on the Project, the local tax revenue increase in Plaquemines Parish would provide additional benefits to the local economy.

4.9.5 Housing

Table 4.9-4 provides information about housing and accommodations in the affected area.

To evaluate the impact of Project construction on housing, we considered two key data points:

- the average number of non-local workers employed during each 3-year phase of LNG terminal construction: 700; and

- the largest possible number of non-local workers employed by the Project at one time, assuming peak construction of the LNG terminal and both pipeline system laterals coincide: 1,850.

During construction, most non-local workers would seek rental housing or other temporary accommodations like hotels and motels or recreational vehicle (RV) campgrounds. The U.S. Census Bureau (2017e) estimates that 14,035 vacant units are currently for rent in the affected area, and 9,341 more are seasonal, recreational, or occasional use units. In similar scenarios, owners of seasonal use units have rented them to temporary workers when demand increases.

At least some construction workers would reside in hotels or RV campgrounds, depending on their length of hire. The affected area has an abundance of hotel rooms because of the relatively close proximity to New Orleans. RV campgrounds are less plentiful but could accommodate some minority percentage of workers, depending on how many spaces are unoccupied.

Table 4.9-4 Housing and Accommodations in the Affected Area										
				Vacant Housing [a, b]			Accommodations [c]			
Parish	Total Units [a]	Home-owner Vacancy Rate(%) [a]	Rental Vacancy Rate(%) [a]	Total Vacant	For Rent	Seasonal	Hotels	Hotel Rooms [d]	RV Campgrounds	RV Spaces
Plaquemines	9,866	1.4	2.9	1,222	79	540	15	450	2	133
Jefferson	189,170	2.1	8.4	19,978	6,044	2,529	27	3,400	5	297
Orleans	192,358	2.6	8.6	37,514	7,912	6,272	122	18,300	8	515
Affected Area Total	**391,394**	**NA**	**NA**	**58,714**	**14,035**	**9,341**	**164**	**22,150**	**15**	**945**

a U.S. Census Bureau 2017c
b U.S. Census Bureau 2017e
c Louisiana Office of Tourism, 2015; Louisiana Travel, 2015; Jefferson Parish Convention and Visitors Bureau, 2015; New Orleans Convention & Visitors Bureau, 2015; Plaquemines Parish Office of Tourism, 2015; Canal Street Beat, 2013; RVParking.com, 2015
d For Orleans Parish, an estimate of 150 rooms per hotel was used.
Key:
Seasonal: Seasonal, Recreational, or Occasional Use Units
Hotels: Hotels, Motels, Inns, or Lodges
NA: Not applicable

In total, 23,376 for-rent and seasonal units are vacant in the affected area, and it has a supply of 23,095 hotel rooms and RV campground spaces. Some of the vacant units would be infeasible options, and many of the hotel rooms and campground spaces would be unavailable. However, given the supply compared with the Project workforce maximum, we conclude that the housing and accommodations market would experience minor, short-term impacts. Effects would be more noticeable in some communities than in others, though they would be short term. Non-local workers would increase demand, which would benefit proprietors and rental unit owners and increase competition among tenants in the affected area. The rental vacancy rates in the region do not reflect a remarkably competitive market, so we conclude that construction workers would not create undo hardships for other individuals seeking temporary housing. Thus, any adverse impacts would be temporary and minor.

During operation, the estimated 175 non-local workers hired permanently would not affect housing in the affected area, though their purchase or rental of local housing would benefit some individuals.

4.9.6 Property Values

For purposes of the property value analysis, we evaluated the terminal and pipe bridge as one entity because they are aboveground features that are nearly adjacent and they would be expected to have a similar effect. The terminal and pipe bridge would be constructed on an undeveloped site owned by the Plaquemines Port, Harbor, and Terminal District, the majority of which was formerly a sugar cane agricultural field. The frontage on the river between SH 23 and the waterfront has not been developed in recent history. The majority of the LNG terminal site is designated as "port terminal complex" and "major industries" according to the Parish's Master Plan as described in section 4.8.3.1.

The unique economic, fiscal, and environmental conditions in a community, as well as mitigation measures associated with a project, lead to varying effects, including no effect, on neighboring property values (Gabe et al., 2005). To investigate potential effects from the terminal on the values of nearby properties, we identified studies that assessed similar kinds of industrial development. In the case of Cove Point LNG, commissioned in 1978 in Maryland, 323 of 377 homes within 1 mile of the facility were built after commissioning (Maryland Department of Natural Resources, 2014). This indicates that land in proximity to the LNG terminal maintained value sufficient to encourage new development. In the case of Cove Point LNG, the terminal was partially screened from residential properties by forest cover and topography.

In a study of fossil fuel power plants constructed in the 1990s in neighborhoods across the United States, housing units within 2 miles of newly commissioned power plants were found to experience a minor decrease (3 to 5 percent) in rents and mortgages compared with housing 2 to 5 miles away (Davis, 2010). The transferability of this finding to the Plaquemines LNG terminal is limited because power plants may be perceived as more undesirable local land uses than LNG storage facilities and terminals (Gabe et al., 2005).

One peer-reviewed study found that housing values were higher near LNG facilities than elsewhere, all other variables being equal (Clark and Nieves, 1994). In yet another study prepared for residents in the town of Harpswell, Maine, a consulting group interviewed local realtors and concluded that proximity to a LNG terminal would depress residential property values up to 2 miles away from the Project boundary (Yellow Wood Associates, Inc., 2004). Finally, a composite study that examined peer-reviewed studies of different types of industrial developments such as landfills, Superfund sites, nuclear power plants, and large manufacturing facilities did not find a consistent trend characterizing how these industrial uses impacted property values (Regional Economic Studies Institute of Towson University, 2004).

Although studies to date are sometimes contradictory or inconclusive, one consensus seems to be that properties beyond 2 miles are too far away to experience measurable property value impacts from industrial facilities (e.g., Maryland Department of Natural Resources, 2014; Davis, 2010; Gabe et al., 2005; Yellow Wood Associates, 2004). Likewise, proximity is a chief factor influencing whether a facility could impact residential property values (e.g., Davis, 2010, Yellow Wood Associates, 2004). Two camp communities are located off Lake Hermitage Road south of the terminal site. Camp communities are "residential communities built outside levee protection zones in marshland and swamp-like areas with limited infrastructure, characterized by a part-time or seasonal resident population often engaging in commercial fishing or recreational fishing" (Plaquemines Parish, 2012). Lots in the Deer Range camp community range from 750 feet to 3,000 feet (0.6 mile) from the terminal boundary, and the community consists of the Deer Range Campsites Subdivision and the Suzie Bayou Campsites Subdivision, discussed in section 4.10.1.

The second camp community on Lake Hermitage Road is 2.6 miles southeast (3 miles driving distance), and occupants would drive past the terminal site on their way to SH 23.

The closest residential development on the west bank that is *not* a camp community is a subdivision around a canal approximately 2.3 miles northwest on SH 23. The parish's draft, final Comprehensive Master Plan designates the future land use of this subdivision as a marina/harbor complex, which encourages a mix of commercial and residential uses centered on the waterfront feature(s). The closest residential property on the east bank is the community of Davant, northeast of the terminal and approximately 0.8 mile away. The future land use is designated as small community mixed use. No new developments with a residential component are proposed within 0.25 mile of the terminal site. Moreover, the parish's draft, final Comprehensive Master Plan does not designate any future land use with residential components on west bank properties within several miles of the terminal that do not already have residential uses.

Perception factors heavily into the effect new development has on nearby property values, and so we considered the context of the terminal and pipeline system and their aesthetic and health impacts. In Plaquemines Parish, the oil and gas industry is mature, and related developments are prevalent. Thus, local perception of the Plaquemines LNG terminal would be influenced by residents' familiarity with other oil and gas-related infrastructure on the west and east banks. Appearance and noise emitted from an industrial facility also influence perception, and these factors were evaluated in Section 4.10 Cultural Resources and Section 4.11 Air Quality and Noise. We did not find that the terminal's noise output would be significantly adverse, but rather would comply with noise level requirements and avoid impacting noise-sensitive areas. Our evaluation of the terminal's visual change of the landscape is discussed in section 4.8.6, and we acknowledge that no other industrial facilities of similar scale are visible from the nearest residences. The terminal would be surrounded by a 26-foot floodwall, partially screening facilities, but the storage tanks, stacks, and other tall components would be visible above the floodwall. Perceived health risks could also factor into property values of nearby residences. We conducted rigorous investigations of air emissions and safety, reported in sections 4.11 and 4.12, and found that Venture Global has designed a project that meets state and federal air quality and safety standards.

We estimate that the terminal and pipe bridge could have a long-term, minor effect at the community level on property values, although we cannot predict the effects on any individual property. We assume effects on the camp community 2.6 miles from the terminal would be minimal, as would effects on the marina/harbor complex community on SH 23 and the Davant community across the river. The Deer Range camp community within 2 miles of the terminal is discussed below. In our evaluation, we considered that Plaquemines Parish has a substantial existing oil and gas-related industry. For example, International Marine Terminals' coal terminal and Phillips 66 Alliance Refinery on SH 23 are 1.3 miles and 6.7 miles driving distance, respectively, from the terminal site,. We consulted the draft, final Comprehensive Master Plan for Plaquemines Parish and found that it designates a mix of future land use types on the terminal site, i.e., "business park," "port/terminal complex," and "major industries" (Plaquemines Parish, 2012). The plan's future land use map indicates a less intense use "business park" on the portion of the site closest to the Deer Range camp community, but large tracts adjacent and southeast of the terminal are designated "major industries."

Most of the houses in the Deer Range camp community are not likely year-round residences, but rather seasonal or recreational homes for recreational and commercial fishermen. This may or may not affect whether their property values would be impacted by development of an LNG terminal. Some of the houses are very close to the terminal site boundary, though most are oriented toward interior canals, and their view of the terminal would be somewhat shielded by vegetation and a 26-foot-high perimeter floodwall. Furthermore, the terminal would not have a public access road to Lake Hermitage Road. We assume individual properties in the Deer Range community could experience a property value change if the terminal is constructed; however, we cannot determine the extent of this change considering this constellation of factors and many others at play when a potential buyer considers a property.

The other components of the pipeline system are not expected to have more than negligible effects on property value in the region. The aboveground meter and valve stations would be on the terminal site behind the floodwall or else in Barataria Basin, out of sight of any residential or commercial properties. With the exception of the pipe bridge, all segments of the pipe would be buried, largely under wetlands and open water but also under some undeveloped upland that is designated as agricultural in the parish's draft, final Comprehensive Master Plan Future Land Use Map. Pipeline easements do not prohibit agricultural activity directly above, so this would not affect certain individual property owners' agricultural activities.

Finally, several studies have found limited to no effects of natural gas pipelines on the property values of neighboring or nearby property values (e.g., Integra Reality Resources, 2016; FERC, 2014; Diskin et al., 2011; PGP Valuation Inc., 2008; Allen, Williford, and Seal, Inc., 2001). Thus, we conclude that the pipeline system (not including the pipe bridge), would have a negligible, permanent effect on the collective property value of the traversed land.

4.9.7 Public Services

Table 4.9-5 provides an inventory of selected public services in the affected area, including public education, fire protection, law enforcement, and health care.

Table 4.9-5
Public Services in the Affected Area

Parish	Public Schools [a]	Students [a]	Fire Departments [b]	Police Departments, Sheriff's Offices [c]	Hospitals [d,e]
Plaquemines	8	5,036	8	1	1
Southern West Bank	3	1,115	5	1	1
Jefferson	86	47,977	18	7	6
Orleans	87	43,670	9	1	7
Affected Area Total	**181**	**96,683**	**35**	**9**	**14**

a Plaquemines Parish School Board, 2015; Jefferson Parish School District, 2015; Tulane University, 2014
b U.S. Fire Administration, 2016
c USACOPS, 2016
d Jefferson Parish Medical Society, 2016; Orleans Parish Medical Society, 2014; Plaquemines Parish Government, 2016
e Totals do not include long-term extended care, psychiatric care, rehabilitation, or labor delivery and women's services hospitals.

In general, the parishes have school, public safety, and hospital services that are commensurate with their populations. The reported number of police and sheriff's departments are not directly comparable because areas of responsibility differ—departments responsible for larger areas have more deputies. For example, the New Orleans Police Department is a large police force that patrols all of Orleans Parish, while Jefferson Parish policing is divided among several municipal police departments and the sheriff's office. Plaquemines Parish law enforcement is the Sheriff's Office, with headquarters in Belle Chasse and additional offices on the east and west banks.

Offsite: Given our finding that the population increase by non-local workers and householders associated with the Project would be short term and minor, we conclude that their additional demand for fire, safety, and medical services would also be short term and minor. The services are adequate in the affected area, and we do not find that relocated households associated with construction would place an undue burden on them. Moreover, local revenues and economic stimulus generated by Project construction could indirectly increase funds available to public safety departments and hospitals in the future. During operation, the needs of the 125 non-local workers hired during operation would not affect the current level of service by local fire, safety, and medical service providers.

To estimate the number of school-aged children that could accompany non-local construction workers and increase enrollment at local schools, we assumed the 1,400 non-local workers associated with overlapping phases of the LNG terminal were the workers most likely to relocate children. As discussed in section 4.9.1, we estimated the households of these non-local workers would comprise 3,640 people. In Louisiana, the proportion of 5- to 17-year-olds is 17.4 percent, so assuming this proportion among the non-local worker households, 633 school-aged children could move to the affected area. Given the comparatively large student body in the affected area, these additional children would have minor, short-term effects on the public school system. During operation, we expect an even smaller number of school-aged children to accompany non-local hires. Therefore, the Project's effect on schools would be minor and permanent during operation.

On-site: During construction and operation, Venture Global would supply at least some security, fire safety, and medical services on-site. According to Venture Global's current plans, the Plaquemines Parish Fire District would provide backup fire protection, to be described in the Project's final version of the Emergency Response Plan. To that effort, Venture Global would provide specialized training to the Myrtle Grove and/or Lake Hermitage Volunteer Fire Stations, located 3.0 miles north and 4.4 miles southwest, respectively. If persons on-site needed medical care beyond that provided on-site, they could visit the Plaquemines Parish Medical Center, 13 miles south in Port Sulphur, or the Ochsner Medical Center, West Bank, 25 miles north in Jefferson Parish. Plaquemines Parish Medical Center provides most medical services except major surgery, while Ochsner Medical Center, West Bank is a 180-bed full-service facility. The nearest law enforcement office is the Plaquemines Parish Sheriff's Office in Port Sulphur, and 20 patrol deputies are assigned to the west bank region that includes the Project site. We conclude that on-site activities during construction and operation of the Project would have a minor effect on public services at the level of the affected area.

Southern west bank: The communities in the southern west bank of Plaquemines Parish could be vulnerable if an emergency or catastrophic event occurred at the LNG terminal and prohibited travel along SH 23. Therefore, we inventoried the public safety and medical services that are present in the southern west bank to determine services locally available in the event of a road closure. We also identified the Plaquemines Parish schools south of the terminal site to establish whether school-aged children in the southern west bank typically commute past the terminal site to attend school.

During localized emergency incidents at the LNG terminal and other events that might close local highways, e.g., flooding, the Sheriff's Office can direct traffic to the levee system of the parish. Alongside the LNG terminal, this is the berm between SH 23 and the Mississippi River with a narrow, gravel track road on top, so that travel would be limited to one-lane, one-way. Also available for transportation is the Point a lá Hache ferry at West Pointe a lá Hache. The average ferry vessel fits 40 vehicles, and typically runs every 30 minutes between the west and east banks.

Plaquemines Parish law enforcement is the Sheriff's Office, with headquarters in Belle Chasse. The Project facilities are within the Patrol Division's 2nd District, which extends from Myrtle Grove to Venice with approximately 20 deputies and an office in Port Sulphur. The Sheriff's Office Marine Search and Rescue team are also based in Port Sulphur and respond to emergencies on the rivers and bayous, such as lost boaters and disabled vessels. In addition to its 60 patrol deputies and special division officers, the Sheriff's Office has a Reserve Division of around 21 deputized volunteers that assist during special events and emergencies like road races and hurricane evacuations (Plaquemines Parish Sheriff's Office, n.d.).

Lake Hermitage Volunteer Fire Station in Port Sulphur and Boothville Volunteer Fire Station are both in the southern west bank. Typically, volunteer firefighters are "on call," so they may or may not be in the southern west bank at the time of an incident. The firefighters at Lake Hermitage may receive specialized training sponsored by Venture Global to serve as backup firefighters to aid incidents at the LNG terminal.

Described above, the Plaquemines Parish Medical Center in Port Sulphur serves all of Plaquemines Parish and is located in the southern west bank. It provides emergency care, but not major surgery. Plaquemines Parish has an ambulance service with a post in Port Sulphur, collocated with the volunteer fire department.

The southern west bank has two elementary schools, one combination middle school/high school, and one learning center geared toward high school-aged children. Thus, local schools are available to school-aged residents of the southern west bank. In the event of a LNG terminal emergency that necessitated closure of SH 23, students who commute north of the LNG terminal to attend another school would be most vulnerable to disruptions- either because they could not return home or drive to school. However, this vulnerability is minimized given the availability of schools south of the LNG terminal.

In sum, the southern west bank has a sheriff's office, a marine search and rescue team, two fire stations, a comprehensive medical center, an ambulance service post, and public schools for K-12 students. The presence of these services would reduce local residents' vulnerability should an emergency event occur at the terminal and require temporary closure of SH 23. Although we find that, in general, the Project would not have a significant adverse impact on the availability of public services in the southern west bank, we discuss the potential for a catastrophic event at the terminal blocking access on SH 23 as an issue of environmental justice (see Section 4.9.9 Environmental Justice).

4.9.8 Transportation

The Project would generate traffic on roads and waterways during construction and operation. Within the affected area, major road corridors include Interstate 10 (I-10), Interstate-310 (I-310), Interstate-610 (I-610), U.S. Highway 171 (US 171), and U.S. Highway 90 (US 90), also referred to as the West Bank Expressway. Locally important road corridors in Plaquemines Parish include SH 23, SH 39, and SH 406, but SH 23 is the only road that accesses the LNG terminal and the parking area and workspace associated with the pipeline system. Thus, SH 23 is the pinch point in the roadway network that would be used by Project-related vehicles; therefore, the traffic analysis examines potential build-up on SH 23 to determine whether significant effects would occur. The Project would generate vessel traffic on the Mississippi River through construction and operation of the LNG terminal and would use canals in Barataria Basin to facilitate construction of the pipeline system. Traffic in both waterbodies are evaluated in the marine transportation section that follows.

4.9.8.1 Roadway Transportation

Because of the narrow geography of Plaquemines Parish, only one arterial road, SH 23, directly serves the Project. SH 23 runs parallel to the Mississippi River on the west bank, and SH 39 runs along the east bank. Because the river is wide, river crossings are limited. The closest bridge crossing to the terminal site is the US 90 crossing in New Orleans, approximately 30 miles north. The closest ferry crossings are 22 miles north in Belle Chasse and 6.8 miles south in West Pointe a lá Hache. The Point a lá Hache ferry runs every thirty minutes on weekdays and about every hour on weekends, from 6:00 a.m. to 10:00 p.m. 7 days a week. The Point a lá Hache ferry vessel carries 40 vehicles, though the parish operates another ferry that transports 72 vehicles at a time.

DOTD characterizes SH 23 as a minor urban arterial in Belle Chasse and a minor rural arterial south of Belle Chasse, to its terminus in Boothville-Venice (DOTD, 2014). DOTD traffic counts near the terminal site range from 9,271 vehicle trips daily near Belle Chasse to 7,074 trips near Port Sulphur (DOTD, 2015).

Venture Global prepared a Traffic Management Plan for Terminal Site Construction and an additional plan for pipeline system construction (appendix E). As part of the plan for terminal site construction, Venture Global considered the traffic generated by all LNG terminal and pipeline system construction workers because all would utilize SH 23 to access the Project site. A traffic simulation study showed that, without mitigation, traffic on SH 23 would become heavily congested during the morning commute hour as vehicles backed up behind two construction entrances at the terminal site. Heavy congestion was predicted during peak construction periods during the workers' morning commute between 6 a.m. and 7 a.m., assuming a construction workforce of 3,300 and one vehicle per person. This workforce number is not as high as the largest potential workforce we estimated in section 4.9.1 if all peak periods overlap. However, the duration of the largest potential peak would only be 1 month, and LNG terminal and pipeline system peak periods may not overlap. Thus, we found the 3,300 workforce estimate to be appropriate.

Through multiple simulation runs, the simulation study identified a combined group of mitigation measures that would eliminate traffic queues near the LNG terminal entrances and elsewhere on SH 23 and maintain an acceptable level of service on SH 23. The mitigation measures captured in the Traffic Management Plan for Terminal Site Construction are as follows:

- position personnel checkpoints at the entrances to construction sites from the on-site parking lot, rather than at SH 23 access points;
- limit the number of available passenger car parking permits on the designated parking lots to maintain carpooling of at least two people per vehicle;
- limit use of the LNG terminal's secondary access point from SH 23 to construction management only;
- construct auxiliary turning lanes along SH 23 at its intersection with the LNG terminal's main access point;
- minimize the use of external trucks by transporting most construction freight by water;
- station a police officer to control traffic at the proposed intersection of SH 23 and the main construction entrance during commuting rush hours; and
- eliminate truck traffic to the Marine Facilities or any other Project site during commuting rush hours.

The plan also calls for providing a continuous on-site bus shuttle service from the terminal parking lot to work locations. The parking lot is on-site and anywhere from 0.2 to 0.7 mile away from various work locations, so this measure is intended to ensure terminal workers arrive at their specific location on a timely basis. It would not affect traffic on SH 23. More information about pipeline employee parking and transport is provided later in this section.

Venture Global proposes to install a temporary bulk material conveyor and cement handling equipment between the Bulk Carrier Mooring Facility on the Mississippi River and the terminal site south of SH 23. The conveyor and piping would be located overhead on a trestle across SH 23. Transporting materials for terminal construction with this system would preclude the need for the same materials to be trucked across SH 23, thereby avoiding associated traffic congestion. Design efforts are currently underway.

Implementation of the mitigation measures described above would limit the terminal site's construction impacts on traffic to minor and short term. This Traffic Management Plan for Terminal Site Construction is predicated on the current Construction Execution Plan, such that if conditions are modified, the Traffic Management Plan may require further evaluation and potential modification. Venture Global intends to implement these measures assuming the current

Construction Execution Plan remains substantively the same. If roadways are damaged because of construction-related traffic, Venture Global would repair or reconstruct the damaged roadway to pre-construction condition.

Pipeline construction workers would commute to a designated parking area near Myrtle Grove Marina off of SH 23, or to the selected contractor staging yard with frontage on SH 23 (see appendix E). Based on their traffic management plans, Venture Global intends for some percentage of pipeline workers to carpool, such that during peak construction of a single pipeline, total employee vehicles would not exceed 100 vehicles. Commuter movements would occur primarily between 5:00 a.m. and 6:00 a.m. and at 6:00 p.m., generally 6 days a week and up to 7 days a week. From Myrtle Grove Marina, 25-person capacity crew boats would transport pipeline workers to contractor lay barges stationed along the pipeline right-of-way or to temporary workspaces. Venture Global estimates that collective traffic on SH 23 associated with pipeline construction would average 175 vehicles daily, including employee vehicles and heavy truck deliveries.

Pipeline construction activities and semi-truck deliveries could cause traffic delays or other impacts, but adverse traffic effects are not expected to be severe or of long duration. Pipe segments for both laterals would be transported by barge from a pipe coating plant directly to a lay barge along the pipeline right-of-way or offloaded at a dock at the terminus of Walker Road. Delivering pipe directly to construction lay barges would greatly reduce semi-truck transport on SH 23, and the effects of this barge transport on inland waterways is discussed in Section 4.9.8.2 Marine Transportation. Because of the location of the barge offloading dock, semi-trucks would travel Walker Road frequently through the construction period.

The other local road that would experience noticeable traffic effects is Lake Hermitage Road. Pipeline installation methods include two road bore crossings across Lake Hermitage Road south of the terminal site—one for each lateral. If the road bore installation required a temporary road closure, Venture Global would avoid closing it during peak traffic hours and would coordinate with appropriate officials to minimize impacts.

The Traffic Management Plan for the Pipeline System identified several measures to reduce impacts from construction activities and heavy truck trips on public roads:

- provide road signage alerting drivers to pipeline system construction activities and potential traffic delays;
- utilize flagmen, as needed, when equipment is crossing a road or traveling along a public roadway;
- adhere to state and county vehicle weight limit regulations and removal of excess soil that may be left on the road surface from construction equipment crossings;
- implement dust control measures, as necessary, in dry weather, especially on roads with unpaved surfaces such as Walker Road and Lake Hermitage Road;

- place additional signage on Lake Hermitage Road where a variety of construction activities would occur, including a bored road crossing operation, construction related to the installation of a main line valve, and an aboveground pipe bridge used to cross an existing non-federal levee; and

- should a temporary road closure be required, the contractor should avoid closing Lake Hermitage Road during peak traffic hours and coordinate construction activities with appropriate local and state officials to avoid or minimize potential traffic delays/impacts.

Venture Global intends to implement these mitigation measures assuming the current Construction Execution Plan remains substantively the same. Assuming implementation of the mitigation measures, we expect impacts on public roadways from pipeline system construction activities would be minor and temporary. Construction of each pipeline would last less than 1 year, and the volume of traffic generated by construction would be under 400 trips per day. Finally, installation would involve only two public road crossings.

4.9.8.2 Marine Transportation

The proposed terminal fronts the Lower Mississippi River at river mile marker 55. Roughly defined as the river section from Baton Rouge to the Gulf of Mexico, the Lower Mississippi River is flanked by four of the top 11 U.S. ports by tonnage, including the top port, the Port of South Louisiana, between Baton Rouge and New Orleans (USACE, 2018). As such, the Lower Mississippi is heavily transited by tankers, cargo ships, and tugs and barges, in addition to recreational vessels, fishing vessels, and cruise ships. As discussed in section 4.9.2, the Plaquemines Port, Harbor, and Terminal District is the 11th largest port by tonnage and hosts around 20 terminals, which receive vessels regularly (Plaquemines Port, Harbor, and Terminal District, 2018). In addition to these vessels, ocean-going vessels that call on New Orleans, South Louisiana, or Baton Rouge also transit the river section in the Plaquemines Port, Harbor, and Terminal District. The Crescent River Pilots Association, whose members pilot foreign-flagged, ocean-going vessels that transit between Pilottown near the southern tip of Plaquemines Parish and New Orleans, pilot over 16,000 transits annually, an average of over 44 transits each day. Considering that ocean-going vessels are a minority percentage of total transits along the Lower Mississippi River, vessel transit numbers likely reach up to several hundred daily in the vicinity of the LNG terminal. U.S. flagged cargo ships, Navy vessels, tugs and barges, fishing vessels, recreational boats, and ferries are examples of other vessel types that regularly transit the river. At river marker 55, the river width is nearly 0.5 mile, which allows multiple vessels to travel abreast.

During terminal construction, barges would deliver materials, equipment, and modular plant components to three temporary marine delivery facilities constructed along the terminal's river waterfront. These temporary facilities are described in section 2.1.1.7. On average, seven to eight barges per day would call on the marine facilities during each 35-month phase of terminal construction. In practice, barge deliveries would be more concentrated at the beginning of construction of each phase, when bulk material carrier barges deliver rock, structural fill, and cement required for site preparation. Examples of other materials that would be delivered by barge include pipe piles, concrete piles, sheet piles, steel, modules, sand, and stone. We assume that, during initial construction of each phase, barge deliveries would reach three times their daily average, about 23 barges per day. By the latter half of construction, we assume deliveries would decrease to one half the daily average, about four barges per day. Thus, during the initial months of overlap of Phase I and II construction, we assume barge calls would total around 27 deliveries per day, for a total of 54 transits daily. Venture Global has stated that other supply ships besides barges would deliver equipment or materials through the construction phases. We assume these ship transits would be minor compared with barge transits, including during the initial months of construction when primary deliveries would be fill materials. Thus, we estimate peak vessel transits would be around 60 trips during the initial months of Phase II construction, which would overlap with the second half of Phase I construction.

To summarize, over the 4.5-year construction period, terminal supply barges would average 15 barge trips per day outside the overlap period and 30 trips per day inside the 18-month overlap period. Supply ships and barges would peak at around 60 trips per day during several months of the overlap period. Venture Global describes the typical visiting barge as 250 feet long and 52 feet wide. Based on the range of dimensions of petroleum oil and chemical tank ships and general dry cargo ships, the terminal supply barges would be approximately one-quarter to one-eighth the size of the largest vessels that typically navigate the Lower Mississippi River. The width of the river near the terminal site is almost 0.5 mile (2,500 feet), and we assume vessels of all sizes make several hundred transits along the Lower Mississippi River daily. Through the course of construction, supply vessels would generally constitute a minor, temporary increase in vessel traffic. During the first several months when Phase II overlaps with Phase I, construction vessel traffic could reach 60 transits daily, representing a 10 percent or more increase above existing traffic. These transits, primarily by 52-foot-wide barges, would be noticeable, and they could potentially affect other vessels' voyage planning or navigation decisions during periods of elevated traffic. However, we do not find that the peak vessel traffic would be significantly adverse or significantly impede traffic. Other vessels could transit abreast of barges given the width of the river, and the period of elevated barge traffic would be brief. Moreover, the USCG Vessel Traffic Service-Lower Mississippi River manages traffic in the waterway and functions to maintain safe and efficient vessel transits.

Venture Global estimates that upon full build-out, the terminal could receive a maximum of six LNG carriers per week transiting in from the Gulf of Mexico. State-commissioned river pilots would board the LNG carriers during their voyage along the Mississippi River, per statutory requirements designed to ensure persons with local knowledge of the waterway are onboard to minimize accidents. The Associated Branch Pilots board and direct navigation on foreign-flagged, deep-draft vessels transiting between Southwest Pass at the mouth of the river and Pilottown, an island in southern Plaquemines Parish. The Crescent River Port Pilots' Association board foreign-flagged, deep-draft vessels between Pilottown and New Orleans. Thus, during each voyage, an LNG carrier calling at the terminal would be boarded by two pilots inbound and two pilots outbound who would direct navigation along the 65-mile-long transits each way.

As part of the required Waterway Suitability Assessment process (33 CFR 127.009), Venture Global met with the USCG from March 1–3, 2016, during a Waterway Suitability Assessment workshop. Their final Waterway Suitability Assessment was submitted in October 2016, and on January 23, 2017, the USCG issued a Letter of Recommendation stating that the Lower Mississippi River is suitable for LNG traffic associated with the Project in accordance with the guidance in USCG's Navigation and Vessel Inspection Circular (NVIC) 01-2011. Before the terminal is commissioned, the USCG would establish the maximum number of LNG carriers allowed per year. To date, the Captain of the Port has not recommended establishing moving safety and security zones around LNG carriers associated with the terminal. This is consistent with current protocols for vessel carriers of liquefied hazardous gas on the Mississippi River near the terminal, which transit without security zone restrictions.

Although the annual maximum number of LNG carrier calls has not been prescribed, we assume an average of six to seven LNG carriers would call on the terminal weekly. The carriers would not restrict the travel of other vessels in the river around them, and each would be under navigation direction of a local, state-commissioned pilot. The vessel carriers would be consistent with other large tankers and cargo ships that transit the river to the southern Louisiana port districts. We assume current traffic in the vicinity of the terminal consists of several hundred transits per day, by vessels of all types and sizes. Given these factors, we conclude that the effect of terminal operation on marine transportation would be permanent but minor.

As mentioned in section 4.9.8.1, Roadway Transportation, Venture Global would use barges to transport pipe directly from a pipe-coating plant, such as the Bayou Coating plant in New Iberia, to lay barges in the pipeline construction workspace or an offloading dock at the terminus of Walker Road (see appendix E). These barge deliveries would average one every other day during the 5- and 7-month construction periods of each lateral. In the event that pipeline construction phases overlap at all, barge deliveries could increase to one per day, still a minimal increase in vessel traffic. Rake-haul type barges and lay barges would use Wilkinson Canal and Barataria Bay Waterway to access the pipeline right-of-way and workspaces. These Project barge access routes are shown in appendix E. Venture Global plans to dredge discrete portions along the Wilkinson Canal and lateral routes connecting it and Barataria Bay Waterway to the pipeline right-of-way, as discussed in section 4.3.2.2.

Crew boats carrying 25 persons each would transport pipeline workers from Myrtle Grove Marina along Wilkinson Canal to lay barges along the pipeline construction site. In Phase I, crew boats would average 10 vessels per day and increase to 14 vessels per day during the 1-month peak construction period. In the event that phase construction overlaps, crew boat traffic could average 14 vessels per day. The crew boats would remain on-site until they delivered workers back to Myrtle Grove Marina at the end of the work period (see "proposed employee transport route" in appendix E).

Venture Global has met with Coastal Protection Restoration Authority (CPRA) to discuss the pipeline construction plan and associated barge traffic, because CPRA is managing the Barataria Bay Rim Marsh Creation and Renourishment Project, a site with an access canal that intersects one of the barge access channels (Allen et al., 2017). During the meeting, the parties concluded that the barge access channel is sufficiently wide such that, even if construction overlapped, the width of the barge access channel and the intermittent vessel movements associated with both projects would preclude direct or indirect impacts on either project (Allen et al., 2017). Given this finding and the low average level barge traffic associated with pipeline construction, we conclude that pipeline construction impacts on marine transportation would be minor and temporary. Crew boat traffic numbers would be higher than barge trips, but we do not find that these would be more than a minor change.

4.9.9 Environmental Justice

Executive Order 12898 (59 Federal Register [FR] 7629) established a federal policy under which federal agencies must identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low-income populations. Consistent with Executive Order 12898, the CEQ calls on federal agencies to actively scrutinize the following issues with respect to environmental justice (CEQ, 1997):

- racial and economic composition of affected communities;
- health-related issues that may amplify project effects on minority or low-income individuals; and
- public participation strategies, including community or tribal participation in the process.

The CEQ (1997) advises using demographic and poverty-level data published by the U.S. Census Bureau to identify minority and low-income populations in affected areas. According to federal guidance documents, minority populations are present in an affected area where racial and ethnic minority groups exceed 50 percent or are "meaningfully greater" than in the general population of the larger surrounding area, referred to as a reference area (CEQ, 1997; EPA, 1998). A report by the Federal Interagency Working Group on Environmental Justice and NEPA Committee (2016) states, "The meaningfully greater analysis requires the use of a reasonable, subjective threshold (e.g., 10 or 20 percent greater than the reference community)."

In this environmental justice analysis, we defined the affected area as the census tract occupied by the Project facilities and the census tracts south of the Project that depend on SH 23 for egress and ingress. The census tract, which generally comprises between 600 and 3,000 residents, was selected based on guidance from the EPA (1998) that each area under investigation should be an "appropriate unit of geographic analysis" that does not "artificially dilute or inflate the affected minority population." Plaquemines Parish served as the reference area representing the general population. We used a 10 percent threshold to determine if minority populations were "meaningfully greater" in an affected area (the census tract) compared with the reference area (the parish) and were thus potential environmental justice communities.

As with minority populations, low-income populations in an affected area can be identified as potential environmental justice communities by comparing the affected area to a reference community (Federal Interagency Working Group on Environmental Justice and NEPA Committee, 2016). We used poverty status statistics estimated by the U.S. Census Bureau to estimate the percentage of low-income individuals in the affected area census tracts. If the percentage of individuals at or below the poverty level in an affected area census tract was greater than the percentage in Plaquemines Parish, we identified the affected census tract as a potential environmental justice community.

Table 4.9-6 summarizes the minority and ethnic percentages in the affected areas, the parish, and the state, and also their percentage of individuals at or below the poverty level. Census tracts that have been identified as environmental justice communities are shaded in grey. Figure B-8 in appendix B depicts the boundaries of Census Tracts 504-508 on the west bank of Plaquemines Parish.

Four of the five census tracts in the affected area are potential environmental justice communities. Three census tracts have total minority and poverty-level percentages that exceed the thresholds defined above, including the census tract that contains the terminal and pipeline system sites. One census tract has a poverty-level percentage that exceeds the defined threshold.

Under general construction and operation conditions, the Project would not disproportionately impact human health or environmental conditions in Census Tracts 505, 506, and 508 because of their distance from Project activities—9.6 or more miles away. However, residents in these census tracts would be vulnerable if a catastrophic incident or other emergency occurred on the terminal site that limited or restricted vehicle travel on SH 23.

Table 4.9-6 Minority and Income Statistics in the Affected Census Block Group, the Parish, and the State, 2012-2016 Estimates [a,b,c]											
Geographic Area	**Total Population**	**White (non-Hispanic) (%)**	**Black (%)**	**American Indian (%)**	**Asian (%)**	**Pacific Islander (%)**	**Other Race (%)**	**Two or More Races (%)**	**Total Hispanic, of any race (%)**	**Total Minority (%)**	**Total At or Below Poverty Level (%)**
Louisiana	4,645,670	59.3	31.9	0.5	1.7	0.0	0.2	1.6	4.8	40.7	19.7
Plaquemines Parish	23,584	66.2	20.5	0.8	3.6	0.0	0.1	2.6	6.2	33.8	17.2
CT 504 [d]	3,676	46.4	41.4	1.7	4.6	0.0	0.0	1.6	4.4	53.6	25.5
CT 505 [e]	1,432	23.9	66.7	2.5	0.6	0.0	0.0	5.7	0.6	76.1	48.8
CT 506 [f]	926	53.7	25.7	0.0	14.4	0.0	0.0	2.3	4.0	46.3	30.0
CT 507 [g]	1,264	83.1	0.0	0.0	13.6	0.0	1.8	1.4	0.0	16.9	16.4
CT 508 [h]	1,206	62.3	15.8	1.9	8.5	0.0	0.0	5.4	6.1	37.7	40.0

a U.S. Census Bureau, 2017f
b U.S. Census Bureau, 2017g
c Data for all geographic areas based on the U.S. Census Bureau 2012-2016 American Community Survey
d Includes Project LNG facility and pipeline system sites
e Includes Port Sulphur Census Designated Place (CDP)
f Includes Empire CDP
g Includes Buras-Triumph CDP
h Includes Boothville-Venice CDP
Key:
CT: census tract
Grey highlighted values indicate percentage exceeds thresholds defined in text, and is an environmental justice population.

Within Census Tract 504, where the Project is located, the closest community is Deer Range camp community, made up of the Deer Range Campsites Subdivision and the Suzie Bayou Campsites Subdivision. Camp communities are "residential communities built outside levee protection zones in marshland and swamp-like areas with limited infrastructure, characterized by a part-time or seasonal resident population often engaging in commercial fishing or recreational fishing" (Plaquemines Parish, 2012). Residential structures in the Deer Range camp community range from 750 feet to 3,000 feet (0.6 mile) from the terminal boundary. A vegetative buffer partially screens the terminal site from them. Also, a 26-foot-high floodwall would be erected around the perimeter, but the storage tanks, stacks, and other tall features would not be shielded.

Another camp community is located 2.6 miles southeast (3 miles driving distance) on Lake Hermitage Road, and occupants would drive past the terminal site on their way to SH 23. Both of these communities use Lake Hermitage Road to access SH 23, north of the terminal site.

One other relatively close development with residential property is 2.3 miles northwest on SH 23, designated as marina/harbor complex in the Parish's Draft Final Comprehensive Land Use Plan. The plan defines this use as area "around commercial and recreational marina and harbors, including docks, with water-related commercial such as bait shops, seafood markets, small-scale seafood processing, boat services, hotels, condominiums and other residential, restaurants, outdoor recreation, water-related tourist services, and public uses." (Plaquemines Parish, 2012)

Disproportionately high and adverse environmental or human health impacts from the terminal are not expected. Air emissions from terminal construction and operations must comply with National Ambient Air Quality Standards, established to protect human health and the health of flora and fauna, and Venture Global has demonstrated compliance with these standards as well as the standards of the Louisiana Toxic Air Pollutant Program (see Section 4.11 Air Quality and Noise). Noise produced during terminal construction and operations must also comply with federal regulations, and Venture Global has demonstrated the terminal's noise output would not exceed regulatory limits.

The residences closest to the pipeline workspace are 1,500 feet away, or approximately 0.3 mile. Pipeline construction activities would last approximately one-half year for each phase, after which the surface would be immediately restored and ongoing impacts during operation would be negligible. No compressor stations would be built or augmented as part of the Project. Nearby residents with recreational vessels may encounter construction barge vessels in inland waterways, but these Project barges are not expected to impede traffic or have other significant impacts given the estimated low traffic volume (see Section 4.9.8.2 Marine Transportation). Like the LNG terminal, pipeline construction and operation must meet prescribed air and noise standards designed, in part, to protect human health, and Venture Global has demonstrated compliance through extensive modeling of its Project design.

Thus, we do not expect the residential communities closest to the Project to experience disproportionate impacts on their human health or environment. However, communities in Census Tract 504 that access SH 23 south of the LNG terminal site would be vulnerable in the event of a catastrophic event at the LNG terminal that limited or restricted vehicle travel on SH 23, just like the residents in the census tracts to the south. The camp communities southwest and south of the LNG terminal access SH 23 north of it, but other subdivisions in Census Tract 504 access SH 23 south of the LNG terminal. We find this vulnerability on minority and low-income communities in the southern west bank indicates the need for targeted outreach to these communities. The Department of Transportation regulations require LNG operators to coordinate with appropriate local officials in preparation of an emergency evacuation plan. See section 4.12.4.6, Onsite and Offsite Emergency Response Plans.

CEQ (1997) environmental justice guidelines emphasize public participation during the permitting and development of a project. Moreover, the EPA (2011a) environmental justice guidelines recommend enhancing opportunities for residents to participate in the decision-making process.

Such direct outreach occurred at the Project's community open houses. Venture Global held two community open house, hosted in Plaquemines Parish on September 15, 2015, and Jefferson Parish on September 16, 2015. Project staff representing multiple disciplines and FERC representative attended, and thus were available to answer questions and hear comments from the public. About 75 participants attended the open houses. In accordance with the NEPA guidance, FERC sponsored a Project scoping meeting on October 21, 2015, in Plaquemines Parish. Beforehand, Project representatives were available to answer questions from the public.

Overall, there is no trend toward placing facilities near minority populations or populations below the poverty level. We have determined that the Project would not disproportionately affect low-income or minority populations.

4.10 CULTURAL RESOURCES

Section 106 of the NHPA, as amended, requires that FERC take into account the effect of its undertakings on properties listed, or eligible for listing, on the NRHP, as well as to afford the ACHP an opportunity to comment on the undertaking. Venture Global, as a non-federal party, is assisting FERC in meeting its obligations under section 106 of the NHPA 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 have the potential to affect historic properties (i.e., cultural resources listed or eligible for listing on the NRHP). Historic properties include pre-contact or historic archaeological sites, districts, buildings, structures, and objects, as well as locations with traditional value to tribes or other groups. 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. Based on these criteria, historic properties are those properties:

a) that are associated with events that have made a significant contribution to the broad patterns of our history; or

b) that are associated with the lives of persons significant in our past; or

c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

d) that have yielded, or may be likely to yield, information important n pre-contact or history.

Venture Global completed a records review and cultural resources surveys of the terminal site and pipeline system proposed route in Plaquemines Parish, Louisiana. The investigations covered both archaeological and architectural resources.

4.10.1 Terminal Site

The area of potential effects (APE) for these investigations was defined as the 632.0-acre tract and marine facilities where construction would take place and for which direct effects were evaluated. An additional 100 acres that have been proposed for use as temporary workspace east of the terminal site also were reviewed. The marine facilities, located on the Mississippi River, also are included in the APE. However, although there is dredge for barge access, no dredging would be required for facility construction or for LNG carriers to access the berthing area.

To account for potential off-site viewshed impacts that the terminal facilities may have on aboveground historic resources, the APE also includes areas to be evaluated for indirect effects. This includes a 1.0-mile-wide buffer extending out from the terminal site boundary. No previously recorded individual historic structures were identified within the 1.0-mile-wide buffer area as part of the records review.

No new archaeological sites were identified; however, the records review identified five previously recorded archaeological sites partially or wholly within the APE. These sites are listed below.

- 16PL173: This resource is a historic twentieth-century site consisting of a concrete foundation.
- 16PL189: This archaeological site is a brick platform for a nineteenth-century steam-powered water wheel.
- 16PL191: This resource consists of the remnants of a twentieth-century agricultural bridge.
- 16PL266: This archaeological site is a historic railroad; no remains of it were identified within the terminal site.
- 16PL102: This resource contains surface and subsurface deposits, including buried intact brick features, associated with a nineteenth-century industrial sugar mill located within the Deer Range Plantation.

No cultural materials were encountered at the location of 16PL173. 16PL189 was intact, but the resource consisted of architectural remains that did not meet the NRHP criteria. It was recommended ineligible for the NRHP and that no further work was needed. 16PL191 consists of the remaining posts from a bridge across an agricultural canal in the floodplain of the Mississippi River. The remaining materials of the bridge had deteriorated. 16PL266 is the New Orleans and Lower Coastal Railroad, which parallels the river and runs through the terminal site. Within the terminal site, all aspects of the railroad were removed, and no associated artifacts or features were identified. These sites were recommended as ineligible for the NRHP, and the investigations indicated that no further work was needed. The remaining components of these archaeological sites have the potential to be physically damaged by ground disturbance and associated activities occurring at the terminal site.

16PL102, also known as the Deer Range Mill site, is an industrial site located on the south bank of the Mississippi River on either side of the levee. It was initially recorded in 1983 as part of an inventory conducted for the National Park Service's comprehensive cultural resource management plan for the USACE, focusing on the lower Mississippi Valley. A portion of the site had been destroyed due to construction of the levee. The site was recommended for additional testing. Venture Global has committed to avoiding the resource and to protecting the site by fencing.

On June 22, 2015, prior to the initiation of fieldwork, a letter was submitted to the SHPO to introduce the Project. A draft report documenting the cultural resource investigations for the terminal site was submitted to the SHPO on December 30, 2015. In a letter dated January 7, 2016, the SHPO concurred that no historic properties would be affected by the facilities, provided 16PL102 would be avoided during construction and operation of the Project. On June 11, 2016, a site avoidance plan for 16PL102 was submitted to the SHPO for review and comment. The SHPO concurred with this plan on August 22, 2016. An additional letter was submitted to the SHPO on

February 2, 2017, for the adjacent temporary workspace of about 100 acres. The SHPO responded on February 17, 2017, with its concurrence that 16PL173 is not eligible for the NRHP and that no effects on historic properties would occur at the terminal site and adjacent workspace.

The February 17, 2017, SHPO response letter indicated the need for the submittal of the final report for No. 22-5141-1 and the site form for 16PL173. The final report for the Terminal Site Addendum and updated site form for 16PL173 was provided to the SHPO on August 2, 2018.

The results of a remote sensing (sonar) survey for the marine facilities was submitted to the SHPO on March 6, 2017. A large, rectangular-shaped anomaly, approximately 200 feet long by 27 feet wide, was encountered. The anomaly has a relief of 15 feet above the surrounding river bottom and may be a sunken barge associated with recent commercial activity. The SHPO concurred with no historic properties being affected on March 28, 2017.

4.10.2 Pipeline System

For the pipeline system, the direct APE includes three components: the construction workspace for the pipelines, access roads, and appurtenant aboveground facilities; the dredged portions of the barge access routes; and the barge staging area. To account for potential off-site viewshed impacts that the pipeline system facilities may have on historic structures, the APE also includes areas to be evaluated for indirect effects. This includes a 0.5-mile-wide buffer on either side of the mid-line of the pipelines and a 0.5-mile-wide buffer on either side of the barge access channels.

In order to determine if archaeological resources or historic structures were present within the APE, an approximately 300-foot-wide survey corridor along the pipeline route was investigated by airboat survey in open water and inundated marshland and by pedestrian and/or shovel test surveys in areas that were not inundated. In areas where additional temporary construction workspace would be required, the survey corridor was expanded.

No archaeological resources or historic structures were identified within the pipeline construction rights-of-way, additional temporary workspace, or construction footprints of the temporary and permanent access roads. Additionally, no historic structures were identified within 0.5 mile of the pipeline system or its associated workspaces. No known or previously identified sites are present.

A draft report documenting the cultural resource investigations for the pipeline system was submitted to the SHPO on January 27, 2016. In a letter dated February 8, 2016, the SHPO concurred with the findings of the report and stated no further concerns in the survey area. On September 22, 2016, a letter report was provided noting Project modifications. The SHPO responded on October 12, 2016, noting its concurrence with no historic properties affected.

The following areas were not field surveyed, which totals to about 152 acres, as they were revisions to the initial APE:

- a 25-foot-wide workspace on either side of the Phase I and Phase II construction workspace between approximate MPs 5.5 and 11.4 (SW Lateral TGP);

- additional temporary workspace near MPs 7.0, 9.0, and 14.2 (SW Lateral TGP) where the pipeline route crosses foreign pipelines;
- workspace for the TGP meter station platform at MP 0.0 (SW Lateral TGP);
- workspace for the TETCO meter station platform at MP 3.4 (SW Lateral TGP);
- workspace associated with the pipe bridge across the non-federal levee and HDD exit north of Lake Hermitage Road (near MP 14.2 [SW Lateral TGP]);
- a barge staging area near MP 11.0 (SW Lateral TGP); and
- portions of the barge access routes to be dredged.

4.10.3 Tribal Consultation

As part of this Project, tribal consultation was conducted by Venture Global and FERC with the following tribes:

- Alabama-Coushatta Tribe of Texas;
- Chitimacha Tribe of Louisiana;
- Choctaw Nation of Oklahoma;
- Coushatta Tribe of Louisiana;
- Jena Band of Choctaw Indians;
- Mississippi Band of Choctaw Indians;
- Seminole Nation of Oklahoma;
- Seminole Tribe of Florida; and
- Tunica-Biloxi Indians of Louisiana.

Table 4.10-1 provides a summary of the correspondence, including information sent and received by FERC, the tribes, and Venture Global.

Table 4.10-1
Correspondence with Federally Recognized Tribes

Date	Document/Topic	Action Taken
June 22, 2015	Introductory Letter	Letter from Venture Global to tribes
July 21, 2015	Request for cultural resources survey reports	Email response from the Jena Band of Choctaw Indians to Venture Global
August 3, 2015	Response noting that the Project is located within their area of historic interest and requesting Project information	Email response from the Choctaw Nation of Oklahoma to Venture Global
September 30, 2015	Information Update	Letter from Venture Global to tribes
November 17, 2015	Request for cultural resources surveys	Email response from the Choctaw Nation of Oklahoma to Venture Global
November 18, 2015	Request for consulting party status under Section 106, a map showing the Project and all archaeological sites within 1.0 mile of the APE, a copy of all survey reports, and a copy of the EIS	Letter response from the Choctaw Nation of Oklahoma to FERC
February 16, 2016	Provision of reports	Letter response from Venture Global to the Choctaw Nation of Oklahoma and the Jena Band of Choctaw Indians
April 13, 2016	Consultation Letter	Letter from FERC to tribes
October 21, 2016	Response to Information Request	Letter response from Venture Global to the Choctaw Nation of Oklahoma and the Jena Band of Choctaw Indians
November 22, 2016	Comments noting need to notify the tribe in case of inadvertent discovery	Email response from the Choctaw Nation of Oklahoma to Venture Global
January 12, 2017	Information Update	Letter from Venture Global to tribes
January 12, 2017	Introduction Letters	Letter from Venture Global to the Seminole Nation of Oklahoma and the Seminole Tribe of Florida
February 8, 2017	Lack of presence of resources; request for list of flora; and deferring to other tribes	Response from the Seminole Nation of Oklahoma to Venture Global
February 13, 2017	Response with report addendum(Phase I Cultural Resources Report LNG Terminal Site: 100 acre land Parcel report) and a revised copy of the unanticipated discoveries plan	Response from Venture Global to the Choctaw Nation of Oklahoma and the Jena Band of Choctaw Indians
March 29, 2017	Comments to unanticipated discoveries plan and concurrence on Phase I Cultural Resources Report LNG Terminal Site: 100 acre land Parcel report	Email response from the Choctaw Nation of Oklahoma to Venture Global

Table 4.10-1 Correspondence with Federally Recognized Tribes		
Date	**Document/Topic**	**Action Taken**
April 11, 2017	Concurrence with finding of no effect and request for adherence to unanticipated discoveries procedures	Email response from the Jena Band of Choctaw Indians to Venture Global
June 22, 2017	Provision of flora list	Letter response from Venture Global to the Seminole Nation of Oklahoma
June 23, 2017	Information summarizing remote-sensing data	Email response from Venture Global to the Choctaw Nation of Oklahoma

On June 22, 2015, Venture Global provided Project introduction letters to the following tribes:

- Alabama-Coushatta Tribe of Texas;
- Chitimacha Tribe of Louisiana;
- Choctaw Nation of Oklahoma;
- Coushatta Tribe of Louisiana;
- Jena Band of Choctaw Indians;
- Mississippi Band of Choctaw Indians; and
- Tunica-Biloxi Indians of Louisiana.

Update letters and emails were provided to each of these tribes on September 30, 2015, October 22, 2015, and January 12, 2017, by Venture Global. In addition, FERC sent consultation letters to the tribes on April 13, 2016.

The Choctaw Nation of Oklahoma provided a response on August 3, 2015, noting that the Project is located within their area of historic interest and requested Project information. After receipt of the October 2015 follow-up, the tribe also responded on November 17, 2015, noting the need for a cultural resources survey. In a letter to FERC dated November 18, 2015, the Choctaw Nation of Oklahoma requested the following: consulting party status under Section 106, a map showing the Project and all archaeological sites within 1.0 mile of the APE, a copy of all survey reports, and a copy of the EIS. Venture Global provided cultural survey information to the tribe on February 16, 2016, October 21, 2016, and February 13, 2017 (see Table 4.10-1). The EIS will be made available to the tribes upon publication of the draft.

Additional information was provided to the Choctaw Nation of Oklahoma by Venture Global on October 21, 2016. The tribe provided comments on November 22, 2016. Venture Global then provided a report addendum and a revised unanticipated discoveries plan on February 13, 2017. The tribe responded on March 29, 2017, noting the need for tribal consultation if sites are found. They concurred with the findings in the Phase I Cultural Resources Report for the terminal site's 100-acre land parcel, and they requested to be notified in the event of an unanticipated discovery. On June 23, 2017, Venture Global sent a letter report to the Nation summarizing the remote-sensing survey data.

The Jena Band of Choctaw Indians responded on July 21, 2015, requesting the cultural resources survey reports. Venture Global provided this information, consisting of the *Phase I Cultural Resource Report LNG Terminal Site, Plaquemines Parish, Louisiana* and the *Phase I Cultural Resource Report Lateral Pipelines, Plaquemines Parish, Louisiana*, on February 16, 2016. Additional information was then provided by Venture Global on October 21, 2016, with the site avoidance plan, the Unanticipated Discovery Plan, and an addendum report. Venture Global then provided a report on the 100-acre land parcel for the terminal site and a revised copy of the Unanticipated Discovery Plan on February 13, 2017. The Jena Band of Choctaw Indians, on April 11, 2017, concurred with the finding of no effect on cultural and historic properties. The tribe further requested that all inadvertent discovery procedures be followed in the event that an unanticipated discovery occurs.

On January 12, 2017, a Project introduction letter also was provided to the Seminole Nation of Oklahoma and the Seminole Tribe of Florida. On February 8, 2017, the Seminole Nation of Oklahoma responded that they were not aware of any historic resources that would be affected by the Project and requested a list of flora within the Project area. The Seminole Nation of Oklahoma deferred to another tribe and the SHPO recommendation. On June 22, 2017, Venture Global provided a list of flora for the area to the Seminole Nation of Oklahoma.

4.10.4 Unanticipated Discovery Plan

Venture Global has prepared an Unanticipated Discovery Plan to be implemented in the event that previously unreported cultural resources or human remains are encountered during construction of the Project. This plan provides for the notification of interested parties, including the SHPO, tribes, and appropriate officials. The plan was submitted to the Louisiana SHPO on January 27, 2016. Comments were received on February 8, 2016. A copy of the final plan would be kept on site during construction, and field management staff would be trained for the procedures contained within it. A letter was sent to the SHPO on February 2, 2017, providing the revised plan. Due to comments received by tribes, an update was provided to the Louisiana SHPO on June 29, 2017. FERC staff has reviewed the Unanticipated Discovery Plan and find it acceptable.

4.10.5 Compliance with the National Historic Preservation Act

Compliance with Section 106 of the NHPA has not been completed for the Project. To ensure that FERC's responsibilities under the NHPA and its implementing regulations are met, **we recommend that:**

- **Gator Express Pipeline should not begin construction of facilities and/or use of (all) staging, storage, or temporary work areas and new or to-be improved access roads until:**

a. Gator Express Pipeline files with the Secretary comments on reports and plans from the Louisiana SHPO;

b. The ACHP is afforded an opportunity to comment if historic properties would be adversely affected; and

c. FERC staff reviews and the Director of the OEP approves the cultural resources reports and plans, and notifies Gator Express Pipeline in writing that avoidance and/or treatment measures, as required, may be implemented and/or construction may proceed.

All materials filed with the Commission containing location, character, and ownership information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: "CUI//PRIV – DO NOT RELEASE."

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

This section describes the air quality conditions that would directly or indirectly be affected by construction and operation of the Project. The section summarizes federal and state air quality regulations that are applicable to the Project. The section also characterizes and quantifies the existing air quality and describes potential impacts the construction and operation of Project facilities may have on air quality.

The term "air quality" refers to the relative concentrations of pollutants in the ambient air. The subsections below describe well-established air quality 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, in terms of ambient air quality standards, regional designations to manage air quality known as Air Quality Control Regions (AQCR), and the on-going monitoring of ambient air pollutant concentrations under state and federal programs.

Combustion of natural gas would produce criteria air pollutants such as ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), and inhalable particulate matter ($PM_{2.5}$ 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 (VOCs), a large group of organic chemicals that have a high vapor pressure at room temperature; and oxides of nitrogen (NO_X). VOCs react with nitrogen oxides, typically on warm sunny summer days, to form ozone. Other byproducts of combustion are greenhouse gases (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 CO_2, methane (CH_4), and nitrous oxide (N_2O). The status of GHGs as a pollutant is not related to toxicity. GHGs are non-toxic and non-hazardous at normal ambient concentrations. GHGs are gases that absorb infrared radiation in the atmosphere. GHG emissions due to human activity are the primary cause of increased levels of all GHGs in the atmosphere 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 GHGs are typically quantified, expressed and regulated in units of carbon dioxide equivalents (CO_2e), where the potential of each gas to increase heating in the atmosphere is expressed as a multiple of the heating potential of CO_2 over a specific timeframe, or its global warming potential (GWP). The 100-year GWP of CO_2 is 1, CH_4 is 25 and N_20 is 298. To obtain the CO_2e quantity, the mass of the particular GHG is multiplied by the corresponding GWP.[1] The CO_2e value for each of the GHG compounds is summed to obtain the total CO_2e GHG emissions.

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 that become airborne by moving vehicles, earth (soil) transport, or wind erosion. Fugitive emissions, in the context of this EIS, would be fugitive emissions of methane from operational pipelines, the LNG terminal, and other aboveground facilities.

4.11.1.1 Regional Climate

Regional Climate

The Project would be located in Plaquemines Parish, Louisiana, where the climate is humid and subtropical with long, hot summers and short, mild winters. The humidity in the Project area is relatively high due to the proximity of the terminal site to the Gulf of Mexico and the Mississippi River (NOAA, 2016). Wind direction in the Project area is primarily from the south from May through December. During January and February, the prevailing winds are from the east-northeast, and in March and April the prevailing winds are from the north. Over the course of the year, mean wind speeds vary from 6 miles per hour (mph) to 10 mph, with peak gust winds ranging from 44 to 66 mph, depending on the month. The highest average wind speed of 10 mph (moderate breeze) occurs in February, March, and April. The lowest average wind speed of 6 mph (gentle breeze) occurs in July and August (National Climatic Data Center, 1997). Historical wind summaries are substantiated by analysis of wind data from the New Orleans International Airport meteorological station for 2010 through 2014. Analysis of this data reveals predominant winds from the south and south-southeast as well as significant contributions from the north. The average wind speed for the period is 3.8 meters per second (m/s) (or 8.6 mph) and calm winds (< 0.5 m/s) (or 0.2 mph) occur 98 percent of the time.

The Project area receives an annual average of 62.5 inches of rain. October is typically the driest month of the year, with a monthly mean of 3.5 inches, whereas June tends to be the wettest month, with a monthly mean of 8.1 inches. Snow events are rare, with an annual mean of 0.2 inch of snow, and are most likely to occur in February or December. Temperatures range from a monthly average of 55.3°F in January to a monthly average of 88.3°F in July and August (Southern Regional Climate Center, 2015).

4.11.1.2 Existing Air Quality

The LNG terminal and pipeline system would be located in the same general geographic area; therefore, this existing air quality discussion pertains to both parts of the Project.

Background Air Quality and Designation Status

The EPA, as required by the CAA, has established National Ambient Air Quality Standards (NAAQS) to protect public health (primary standards) and welfare (secondary standards). Primary standards are designed to protect human health, and secondary standards focus on the protection of plant and animal life, buildings, and other features in the public interest. Louisiana has adopted the federal primary and secondary NAAQS. The NAAQS reflect the relationship between pollutant concentrations and health and welfare effects. The NAAQS are codified in 40 CFR 50. The LDEQ has adopted the NAAQS.

Standards have been set for six principal pollutants that are called "criteria pollutants." These criteria pollutants are: ground-level ozone, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and airborne lead. Ozone develops as a result of a chemical reaction between NO_X and VOCs in the presence of sunlight. Accordingly, NO_X and VOCs are often referred to as ozone precursors. $PM_{2.5}$ may be directly emitted and can also be secondarily formed in the atmosphere as a result of SO_2 and NO_X emissions. SO_2 and NO_X are also referred to as $PM_{2.5}$ precursors. See the NAAQS standards at https://www.epa.gov/criteria-air-pollutants/naaqs-table.

Air Quality Control Regions and Attainment Status

An air quality control region is defined under 42 U.S.C. 7407(c) as "any interstate area or major intrastate area which the Administrator of the EPA deems necessary or appropriate for the attainment and maintenance of ambient air quality standards." Each AQCR, or portion(s) of an AQCR, is classified as either "attainment," "nonattainment," "unclassifiable," or "maintenance," with respect to the NAAQS.

Plaquemines Parish is located in the Southern Louisiana-Southeast Texas Interstate AQCR. Plaquemines Parish is designated as unclassifiable (and treated as attainment) for ozone, $PM_{2.5}$, and NO_2. For all other criteria pollutants, Plaquemines Parish is designated attainment.

Air Quality Monitoring and Existing Air Quality

The EPA, along with state and local agencies, created a network of ambient air quality monitoring stations that collect data on background concentrations of priority pollutants across the United States. To characterize the existing ambient air quality for the Project, available data were gathered from air quality monitoring stations that are nearest to the Project. The most recent validated data from these monitoring sites are presented in table 4.11-1, which compares the highest monitored data with the appropriate NAAQS standard for each criteria pollutant. All monitored data were below the NAAQS.

For ambient air monitoring in Louisiana, the LDEQ's Air Quality Assessment Division has developed a statewide network of stationary monitoring stations to collect direct measurements of air pollutant concentrations. Ambient air quality concentrations from 2012 through 2014 for areas near the Project are provided in table 4.11-1.

Data from the air monitoring sites are available through the EPA's Air Data database, which collects monitoring data nationwide. Venture Global has, in consultation with LDEQ, determined that ambient air quality at the following monitoring sites is representative of ambient air quality at the terminal site:

- Kenner station (Site ID 220511001), Jefferson Parish, as appropriate for the NOx and ozone background concentrations;
- Chalmette station (Site ID 220870007), St. Bernard Parish, as appropriate for the $PM_{2.5}$, and PM_{10} background concentrations;
- Meraux station (Site ID 220870004), St. Bernard Parish, as appropriate for the SO_2 background concentration; and

- Baton Rouge-Capitol station (Site ID 220330009), East Baton Rouge Parish, as appropriate for the CO background concentration, since this is the only site where information is available from EPA.

Table 4.11-1
Background Ambient Air Quality (2012 to 2014)

Air Pollutant	Averaging Period	Statistic (units)	Monitor Values 2014	Monitor Values 2013	Monitor Values 2012	Monitor Station
Sulfur Dioxide (SO_2)	1-hour	99th Percentile of daily 1-hour maximum (ppb)	17	24	29	Meraux, LA
Carbon Monoxide (CO)	1-hour	Not to be exceeded more than once per year (ppm)	4.9	2.1	2.2	Baton Rouge, LA
	8-hour		1.3	1.8	1.7	
Nitrogen Dioxide (NO_2)	1-hour	98^{th} percentile (ppb)	42	46	46	Kenner, LA
	Annual	Annual mean	N/A	N/A	N/A	
Ozone (O_3)	8-hour	Annual fourth-highest daily maximum 8-hour concentration (ppb)	71	66	71	Kenner, LA
Particulate Matter (PM_{10})	24-hour	Not to be exceeded more than once per year on average over 3 years (μg/m^3)	50	52	63	Chalmette, LA
Particulate Matter ($PM_{2.5}$)	24-hour	98^{th} percentile (μg/m^3)	18	15	25	Chalmette, LA
	Annual	Annual mean (μg/m^3)	10	7.8	10.5	
Lead (Pb)	Rolling 3-month	Not to be exceeded (μg/m^3)	0.006	0.005	0.009	Baton Rouge, LA

Key:
μg/m^3 = micrograms per cubic meter
LA = Louisiana
N/A = not available
NAAQS = National Ambient Air Quality Standards
ppb = parts per billion
ppm = parts per million
PM_{10} = particulate matter of 10 microns or less in diameter
$PM_{2.5}$ = particulate matter of 2.5 microns or less in diameter ppm = parts per million

4.11.1.3 Regulatory Requirements for Air Quality

Federal

New Source Review/Prevention of Significant Deterioration

New Source Review (NSR) is a pre-construction permitting program to ensure that air quality is not significantly degraded when a new source of air pollution is constructed, or an existing source is modified such that air pollutant emissions increase. NSR permits are legal documents that authorize a permittee to construct a source of emissions. Federal pre-construction review of certain large projects varies for attainment and nonattainment areas. Federal pre-construction review for major sources in nonattainment areas is referred to as “Nonattainment New

Source Review," while federal pre-construction review for sources in attainment areas is formally referred to as "PSD." A minor NSR permit is required as a pre-construction authorization for minor sources whose emissions are below the major source thresholds. Major source emission thresholds vary depending on the air quality designation, with lower thresholds applicable in nonattainment areas.

The LNG terminal would be permitted under the NSR PSD program.

If a new source or major modification of an existing source is subject to the PSD program requirements and is within 62 miles (100 kilometer) of a Class I area designated as pristine natural areas or areas of natural significance, the facility is required to notify the appropriate federal officials and assess the impacts of the project on the Class I area. The closest designated Class I area to the Project is the Breton National Wildlife Refuge, located about 95 kilometers east of the Project site; therefore, a PSD Class I analysis is required.

The LNG terminal would be a PSD major source, as the projected emissions for NO_x, CO, PM_{10}, $PM_{2.5}$, and total HAPs are above the major stationary thresholds as listed in 40 CFR Part 52.21(b)(1)(i)(a and b). Venture Global submitted a major source air permit application to the LDEQ for PSD review in September 2015; a PSD permit application addendum on June 23, 2017; and supplemental information on June 8, 2018. Five additional supplemental information packages for the air permit application have been submitted to LDEQ through August 28, 2018. The air permit application is still under review.

<u>New Source Performance Standards</u>

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 following:

- **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.** This subpart applies to the 12 hot oil heaters at the LNG terminal.

- **40 CFR Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (including Petroleum Liquid Storage Vessels).** This subpart applies to the iso-pentane storage tanks at the LNG terminal.

- **40 CFR 60 Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (CI ICE).** This subpart sets emission standards for oxides of nitrogen and nonmethane hydrocarbons, hydrocarbons, NOx, CO, and PM. This subpart applies to the diesel engine emergency generators and to the diesel engine emergency fire pumps, since the latter would be manufactured as certified National Fire Protection Association firewater pump engines after July 1, 2006.

- **40 CFR 60 Subpart KKKK – Standards of Performance for Stationary Combustion Turbines.** Subpart KKKK regulates emissions of NO_X and SO_2. The ten turbines at the power generating facility would be subject to NSPS Subpart KKKK. The turbines would meet the less than 42 parts per million (ppm) NO_X emission limit specified in 40 CFR 60.4320(a) and 40 CFR 60 Subpart KKKK, table 1, for a new turbine with a heat input at peak load higher heating value in excess of 850 MMBtu/hour firing fuels other than natural gas. The turbines would also be subject to SO_2 emission limitations in Subpart KKKK.

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 40 CFR 63, which are also known as the Maximum Achievable Control Technology 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 tons per year (tpy) of any single HAP or 25 tpy of total HAPs.

Applicable NESHAPs for the Project, based on the types of emission units and the expected date of installation, include the following:

- **40 CFR 63 Subpart A – General Provisions**. Subpart A contains the general requirements applicable to all emission units subject to 40 CFR 63.

- 4**0 CFR 63 Subpart YYYY**. The turbines must comply with the initial notification requirements of 40 CFR 63.6145.

- **40 CFR 63 Subpart ZZZZ – NESHAPs for Stationary 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. Separate sections of the rule apply to engines rated greater than 500 horsepower and less than 500 horsepower. Engines greater than 500 horsepower used on-site will need to meet the initial notification requirement of 40 CFR 63.6645(f). For engines less than 500 horsepower used on-site, the Project would comply with NSPS Subpart IIII for these emission units. No other requirements of 40 CFR 63 Subpart ZZZZ apply.

- **40 CFR 63 Subpart DDDDD – National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters.** The Project must conduct a fuel specification analysis for mercury.

The proposed hot oil heaters would be new process heaters, as defined in 40 CFR 63.7575, and would be subject to requirements for new units from unit startup. These requirements include an initial notification of startup. The heaters are required to have a tune-up every 5 years and an annual compliance report must be submitted.

In addition to the above, Venture Global would follow the record-keeping requirements outlined in 40 CFR 63.7555 and 63.7560.

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. In this case, the EPA has delegated to the LDEQ the authority to issue title V permits.

The definition of a "major source" under title V varies according to which pollutants are emitted from the source and the attainment designation of the area where the source is located. In general, a source is considered major for title V if it emits or has the potential to emit 100 tpy or more of any regulated pollutant, 10 tpy or more of any single HAP, 25 tpy or more total HAPs, or 100,000 tpy of CO_2e and 100 tpy GHGs on a mass basis.

Total emissions from the LNG terminal would exceed title V thresholds for $PM_{2.5}$, NO_X, SO_2, and CO. The permit application submitted to the LDEQ serves as both an NSR PSD application and a title V application.

General Conformity

The General Conformity Rule is 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 requires that federal actions in nonattainment areas or air quality areas subject to a maintenance plan conform to the SIP for the attainment and maintenance of the NAAQS. General Conformity regulations do not apply to the Project because the Project is located in an attainment area.

Greenhouse Gas 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 where the aggregated maximum heat input from all combustion sources is greater than 30 MMBtu/hour and that emit greater than or equal to 25,000 metric tpy of GHGs (reported as CO_2e).

Venture Global would be required to report emissions in accordance with the reporting rule as emissions are expected to be greater than 25,000 metric tons per year.

Applicable Louisiana Air Quality Requirements

The LDEQ is the lead air permitting authority for the Project. The LDEQ's air quality regulations are codified in LAC 33:III.1-59. The regulations incorporate the federal program requirements listed in 40 CFR 50-99 and establish permit review procedures for all facilities that can emit pollutants to the ambient air. New facilities are required to obtain an air quality permit prior to initiating construction. LAC 33:III.1-59, set forth the air quality regulations for emission sources in Louisiana. In addition, LAC 33:III.1 delegates authority to the LDEQ to maintain air quality resources in Louisiana and enforce LDEQ air quality regulations. The following regulations may be applicable to the Project:

- Chapter 2 – Rules and Regulations for the Fee System of the Air Quality Control Program;
- Chapter 5 – Permit Procedures;
- Chapter 9 – General Regulations on Control of Emissions and Emission Standards;
- Chapter 11 – Control of Air Pollution from Smoke;
- Chapter 13 – Emission Standards for Particulate Matter;
- Chapter 15 – Emission Standards for Sulfur Dioxide;
- Chapter 21 – Control of Emission of Organic Compounds;
- Chapter 51 – Comprehensive Toxic Air Pollutant Emission Control Program;
- Chapter 56 – Prevention of Air Pollution Emergency Episodes; and
- Chapter 59 – Chemical Accident Prevention and Minimization of Consequences.

4.11.1.4 Construction Air Emissions, Impacts and Mitigation

Venture Global anticipates it would commence a two-phased construction approach for the proposed liquefaction facility in 2019. Phase I is anticipated to last approximately 35 months, with service of the first liquefaction train initiated in 2022. Construction of Phase II would commence approximately 2 years after the construction of Phase I and would also take approximately 35 months to complete. The SW lateral TGP pipeline would be installed during the Phase I construction process, beginning in 2019, while the SW lateral TETCO pipeline would be constructed concurrently with Phase II facilities. The Project is anticipated to be fully complete and operational by 2024.

Liquefaction Terminal Construction

Construction of the terminal site and pipelines would result in short-term increases in emissions of air pollutants due to the use of equipment powered by diesel fuel or gasoline engines and the generation of fugitive dust due to the disturbance of soil and other dust-generating activities. The following construction activities would generate emissions:

- terminal site and pipeline route preparation (clearing, grading, trenching foundation preparation, etc.);
- construction of a material unloading facility, a bulk carrier mooring facility, and a barge mooring facility;
- installation of terminal site equipment;
- installation of the pipeline and associated interconnections, meter stations, etc.;
- operation of off-road equipment, vehicles, and trucks during construction;
- operation of a portable concrete batch plant;
- operation of on-road material delivery trucks;
- operation of marine vessels such as tug boat/barges to deliver bulk material; and
- construction workers' commuting vehicles.

The construction phase of the Project also includes construction of three marine facilities to receive materials to be used to construct the LNG terminal and pipeline system. Construction emissions are not subject to air quality permitting but may be subject to certain Louisiana regulations regarding prevention of general nuisance odors and dust. Construction equipment fuel must be compliant with federal regulations for diesel and gasoline fuel.

Estimated construction emissions are shown in table 4.11-2. Although construction-related emissions would cease after construction is completed, the quantity of pollutants emitted each year for over 4.5 years would be substantial. The majority of the construction emissions would be produced by off-road heavy equipment such as bulldozers, backhoes, trucks, etc., but some emissions would also be produced by on-road vehicles such as delivery trucks and construction worker commuting vehicles. The quantity of emissions from construction equipment was determined based on the duration of use, type of construction activity, and number and type of vehicles and engine-powered equipment in use at any point in time. Earth-moving equipment and other mobile sources may be powered by diesel or gasoline engines, which are sources of combustion-related emissions that include CO, NO_X, PM_{10}, $PM_{2.5}$, SO_2, VOCs, GHGs, and HAPs.

Table 4.11-2 Construction Emissions (tons per year)								
Construction Activity	**NO_X**	**CO**	**VOC**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**HAPs**	**CO_2e**
Year 1								
Terminal[a]								
Off-road equipment	679.2	198.5	52.0	31.6	30.6	0.6	6.8	99,161
On-road vehicles	107.3	937.6	19.5	2.4	2.2	0.8	5.3	120,576
Marine vessels	7.5	4.5	0.4	0.4	0.4	0.0	Na	571
Construction activity fugitive dust[b]	N/A	N/A	N/A	17.5	2.6	N/A	N/A	N/A
Concrete batch plants	0.6	5.2	0.3	0.8	0.8	0.3	0.03	1,022
Total year 1	794.6	1,145.8	72.2	52.7	36.6	1.7	12.1	221,330
Year 2								
Terminal								
Off-road equipment	826.5	228.4	61.3	36.0	34.9	0.7	8.1	119,001
On-road vehicles	128.2	1,120.1	23.4	2.9	2.6	1.0	6.4	144,046
Marine vessels	8.0	4.9	0.4	0.4	0.4	0.0	Na	611
Construction activity fugitive dust	N/A	N/A	N/A	20.9	3.1	N/A	N/A	N/A
Roadway fugitive dust	N/A	N/A	N/A	1.6	1.5	N/A	N/A	N/A
Concrete batch plants	1.4	12.4	0.7	1.6	1.5	0.8	0.1	2,452
Terminal subtotal	964.1	1,365.8	85.8	63.4	44.0	2.5	14.6	266,110
Pipeline (Southwest Lateral TGP Pipeline)[c]								
Off-road equipment	17.2	45.7	3.1	1.2	1.2	0.0	0.4	3,493
On-road vehicles	11.4	90.5	1.9	0.3	0.2	0.1	0.5	11,909
Marine vessels	13.6	6.9	0.7	1.0	1.0	0.0	Na	968
Construction activity fugitive dust	N/A	N/A	N/A	16.8	2.2	N/A	N/A	N/A
Roadway fugitive dust	N/A	N/A	N/A	0.2	0.0	N/A	N/A	N/A
Pipeline subtotal	42.2	143.1	5.7	19.5	4.6	0.1	0.9	16,370
Total year 2	1,006.3	1,508.9	91.5	82.9	48.6	2.6	15.5	282,480
Year 3								
Terminal								
Off-road equipment	1,538.4	430.1	114.5	67.6	65.6	1.3	15.1	222,662
On-road vehicles	128.1	1,123.4	23.4	2.9	2.6	1.0	6.4	144,344
Marine vessels	11.1	6.3	0.6	0.7	0.6	0.0	Na	823
Construction activity fugitive dust	N/A	N/A	N/A	20.9	3.2	N/A	N/A	N/A
Concrete batch plants	0.8	7.3	0.4	0.8	0.7	0.5	0.0	1,430
Total year 3	1,678.4	1,567.1	138.9	92.9	72.7	2.8	21.5	369,259

Table 4.11-2 Construction Emissions (tons per year)								
Construction Activity	**NO_X**	**CO**	**VOC**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**HAPs**	**CO_2e**
Year 4								
Terminal								
Off-road equipment	865.4	239.8	64.2	37.7	36.5	0.8	8.4	126,268
On-road vehicles	128.6	1,123.7	23.4	2.9	2.6	1.0	6.4	144,507
Marine vessels	1.8	1.2	0.1	0.1	0.1	0.0	Na	142
Construction activity fugitive dust	N/A	N/A	N/A	21.0	3.2	N/A	N/A	N/A
Terminal subtotal	995.8	1,364.7	87.7	61.7	42.4	1.8	14.8	270,917
Pipeline (Southwest Lateral TETCO Pipeline)[c]								
Off-road equipment	6.7	21.7	1.4	0.5	0.5	0.0	0.2	1,529
On-road vehicles	6.8	59.8	1.2	0.2	0.1	0.1	0.3	7,692
Marine vessels	7.9	4.0	0.4	0.6	0.6	0.0	Na	563
Construction activity fugitive dust	N/A	N/A	N/A	6.0	0.6	N/A	N/A	N/A
Pipeline subtotal	21.4	85.5	3.0	7.3	1.8	0.1	0.5	9,784
Total year 4	1,017.2	1,450.2	90.7	69.0	44.2	1.9	15.3	280,701
Year 5								
Terminal								
Off-road equipment	855.5	230.6	62.2	35.9	34.8	0.7	8.2	122,997
On-road vehicles	124.3	1,118.2	23.1	2.7	2.4	1.0	6.3	142,817
Marine vessels	4.1	2.1	0.2	0.3	0.3	0.0	Na	292
Construction activity fugitive dust	N/A	N/A	N/A	20.9	3.1	N/A	N/A	N/A
Total year 5	983.9	1,350.9	85.5	59.8	40.6	1.7	14.5	266,106
Year 6								
Terminal								
Off-road equipment	69.2	21.4	5.2	3.0	2.9	0.1	0.7	12,078
On-road vehicles	10.3	92.9	1.9	0.2	0.2	0.1	0.5	11,860
Construction activity fugitive dust	N/A	N/A	N/A	1.7	0.3	N/A	N/A	N/A
Total year 6	79.5	114.3	7.1	4.9	3.4	0.2	1.2	23,938

a Includes construction of the three marine terminals.
b Includes handling of soil stabilization materials.
c Includes construction emissions from meter and regulator station construction.
Key:
CO = carbon monoxide
CO_2e = carbon dioxide equivalent
HAPs = hazardous air pollutants
N/A = not applicable
na = not available
NO_X = nitrogen oxides
PM_{10} = particulate matter equal to or less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$ = particulate matter equal to or less than 2.5 micrometers in aerodynamic diameter
SO_2 = sulfur dioxide
VOC = volatile organic compounds

Fugitive dust emissions are produced by off-road equipment travel on exposed soils, working of soils (grading, trenching, earth moving, etc.) by off-road equipment, transport and handling of bulk materials from dumping, unloading via conveyors, and temporary storage piles. Fugitive dust may also be produced by native soil improvement and stabilization activities. This activity would be required on approximately 520 acres near SH 23—across the eastern workspace—and on the three access roads leading to the temporary marine delivery facilities. Soil improvement and stabilization would be undertaken in situ across all these areas by mixing one or more commonly used stabilizers (e.g., crushed stone, sand, portland cement, and hydrated lime) into the native soil.

Marine vessels consisting of bulk carriers and barges pushed by tug boats would deliver bulk material (fill, soil stabilization materials, etc.), equipment, and other supplies needed for construction.

Pipeline Construction Emissions

As shown in table 4.11-2, pipeline construction emissions for Phase I are expected to occur in year 2 of Project construction, and pipeline construction emissions for Phase II in year 4 of construction. Pipeline site preparation and construction activities would generate fugitive dust from clearing, trenching, backfilling, grading, and traffic on paved and unpaved areas, as well as fuel combustion emissions from the construction equipment. The internal combustion engines powering most of the pipeline construction equipment and vehicles would burn ultra-low-sulfur diesel fuel, and the remaining vehicles would burn gasoline. Equipment used for the pipeline construction activities would include various earthmoving equipment (bulldozers, backhoes, trenchers, graders, and compactors), cranes, forklifts, compressors, pumps, trenchers, stringing trucks, welding rigs, generators, and miscellaneous trucks.

Emissions from pipeline construction equipment are produced in the area of active pipeline construction. These emission sources move as construction proceeds along the pipeline right-of-way and therefore are present only for a short time near any location along the pipeline route.

Mitigation - Construction Emissions

Construction equipment would be operated on an as-needed basis, depending on the construction task. Emissions would be minimized by maintaining the equipment in accordance with the manufacturer's recommendations, minimizing idling time of engines whenever feasible, and using fuels compliant with current regulations.

Fugitive dust emissions during construction would be controlled in accordance with LAC 33:III.13 and with a fugitive dust control plan prepared by Venture Global. The fugitive dust control plan addresses dust emissions and control procedures for the following categories of activities:

- general guidelines for all areas and activities for controlling dust during high winds, applying control measures around the clock as needed, locating temporary facilities to avoid dust impacts on public roads, monitoring dust control activities to determine adequacy, and revising the plan as needed;

- staging areas;
- stockpiles;
- earthmoving operations;
- on-site bulk material handling;
- off-site bulk material handing;
- trackout prevention and cleaning;
- enclosed work areas;
- paved haul roads and public roads;
- unpaved parking lots; and
- crushers and grinder mills.

In general, the control measures specified for each of these activities consist of limiting vehicle speed, applying and maintaining dust suppressant (water, etc.), designing storage piles to minimize wind-blown dust generation, limiting the height of stockpiles and the drop distance of material, preventing spillage and cleaning up spilled material as soon as possible, covering loaded haul trucks and limiting freeboard, and preventing track out.

Conclusion

Project construction would produce substantial emissions over a multi-year period. Venture Global would fuel, operate, and maintain construction equipment and other vehicles used during construction in compliance with current federal fuel requirements and with manufacturers' recommendations. Venture Global would also implement a fugitive dust control plan to reduce production of fugitive dust. Nevertheless, construction would produce quantities of criteria pollutant emissions over a multi-year period that would result in elevated levels of pollutants near the Project area and potential intermittent exceedances of certain NAAQS. However, due to the length of time, and dynamic intermittent nature of construction, we do not expect that these construction emission impacts to result in significant local or regional impacts on air quality.

4.11.1.5 Operational Air Emissions, Impacts and Mitigation

The proposed facilities are described in detail in section 2.0. Relevant portions of the Project description pertaining to potential operational air emission sources at the LNG terminal include the following:

- gas gate station where the gas stream would be split into two streams, one for process feed to the liquefaction plant and the other for fuel gas supply[3] to the electric power generation facilities;

- feed gas pretreatment to remove CO_2, H_2S, and water using an acid gas removal unit, H_2S removal unit and a dehydration unit. Emissions would occur from four thermal oxidizers that would be used to treat the CO_2-rich acid gas stream;

- six hot oil heaters serving various heat needs throughout the LNG terminal;

- flares consisting of three separate flare structures: a warm/cold flare structure containing two separate flare headers, a low pressure vent flare structure for low velocity marine loading flaring, and a marine vapor control structure for LNG carrier gas up/cool down operations;

- combined cycle gas turbine (CCGT) driven power plant to be constructed in two equal phases, ultimately reaching a generating capacity of 1,420 megawatts (MW) in combined cycle mode. This facility would provide plant power and power to the electric drive refrigerant compressors. Each phase would consist of five CCGTs with initial operation in each phase consisting of two of the gas turbines operating in simple cycle mode. When in combined cycle mode, duct burners combusting natural gas would produce emissions in addition to the gas turbines. In addition, two simple cycle aeroderivative combustion turbines would be used during facility start up events and to provide supplemental power as needed;

- 14 standby diesel engine electric power generator sets;

- four diesel-engine-driven firewater pumps; and

- equipment and piping fugitive emissions and storage tank emissions.

The LNG terminal would utilize electric-motor-driven compressors to boost incoming gas pressure and electric motor refrigeration compressors. No air pollutant emissions are directly associated with this equipment.

The pipeline system would not require installation of compressors for natural gas transport. Minor quantities of emissions would occur from pig launchers and receivers, meter stations, block valves, and fugitive emissions from pipeline components.

The Project would be operated in two modes: interim and final. The interim mode would consist of partial operation of the full capacity of the power generation facility and liquefaction plant; as construction of the power plant and liquefaction blocks is completed, they would be brought into operation. During the interim mode, operation and construction emissions would

3 Natural gas feed for power generation would be supplemented with boil-off gas and other fuel gas streams generated in the liquefaction plant.

occur simultaneously. The final operating mode would consist of full facility operation (Phases I and II) after Phase II construction is completed.

During the interim operating mode, in each phase, up to two of the heavy-duty frame combustion turbines would be operated in simple-cycle mode for up to 2 years. In addition, one simple-cycle aeroderivative combustion turbine would be installed and operated. In the first 2 years during construction, a concrete batch plant would be operated. The batch plant would produce emissions from diesel engine-powered electrical generators and fugitive particulate from cement bin vents and other material-handling operations.

Operation of the Project in final operating mode would result in long-term air emissions from the following stationary and mobile sources.

Terminal Site (Phases I and II combined)

<u>Power Plant Facility:</u>

Two power islands with a total generating capacity of 1,420 MW. Each island would consist of:

- five (80 MW each) combined-cycle heavy-duty frame combustion turbines with low NO_X combustion design;
- one aeroderivative combustion simple-cycle turbine (30 MW) for black start events and to provide supplemental power when needed, equipped with NO_X reduction measures consisting of dry low-NO_X combustors and selective catalytic reduction (SCR);
- five natural-gas-fired duct burners and heat recovery steam generators (HRSGs) with low NO_X burner design;
- SCR utilized on the combined combustion turbine and duct burner system; and
- fugitive emissions from pipe flanges, valves, and other components.

<u>Liquefaction Facility:</u>

- 18 liquefaction blocks;
- four 200,000 m^3 LNG storage tanks;
- six gas pretreatment systems, each containing equipment for hydrogen sulfide removal, acid gas removal with an amine unit to remove CO_2, and a dehydration unit;
- four acid gas thermal oxidizers;
- fourteen diesel-fired engines driving emergency electrical generators;
- six natural-gas-fired hot oil heaters;

- six total flares consisting of two cold flares, two warm flares, a low-pressure flare, and a marine loading flare;
- two diesel-engine-driven firewater pumps;
- two diesel fuel storage tanks (66,577 gallons each) for the power island emergency generators. Other generators would utilize day tanks for diesel storage;
- refrigerant storage tanks, solvent surge tanks, and amine flash drums; and
- fugitive emissions from piping components;

<u>Pipeline</u>

- pig launcher/receivers;
- small diesel-engine-driven emergency generator;
- meter stations;
- block valves; and
- fugitive emissions from piping components such as flanges and smaller valves.

<u>Marine Vessels</u>

- LNG carriers maneuvering in the safety zone and at berth (hoteling emissions);
- escort tug boats; and
- security vessels.

Emissions Common to All Facilities

- vehicle travel emissions from fuel combustion and fugitive dust generation.

Interim Operating Period Emissions

As described more fully above, Venture Global proposes to develop the facility in two phases over a 6-year period. In year 1, only construction is expected to occur. During years 2 through 6 of construction, heavy-duty frame turbines in simple-cycle mode and liquefaction blocks would be commissioned and brought online as they are completed. Thus, there would be concurrent construction and operational emissions during this period. The interim period construction and operational emissions are shown in table 4.11-3.

Table 4.11-3
Combined Construction and Operation Emissions Years 1 through 6

Year	Facility Scenario	NO_X	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	Total HAPs	CO_2e
1	Const Phase I	794.6	1,145.8	72.2	1.7	52.7	36.5	12.2	221,330
2	Const Phase I	1,006.1	1,508.9	91.4	2.6	81.4	47.1	15.4	282,480
	Operating Scenario 1	527.3	961.2	48.6	49.2	94.0	93.7	7.8	2,219,004
	Total	***1,533.4***	***2,470.1***	***140.0***	***51.8***	***175.4***	***140.8***	***23.2***	***2,501,484***
3	Const Phase I	1,678.4	1,567.1	138.9	2.8	92.9	72.7	21.5	369,260
	Operating Scenario 1	527.3	961.2	48.6	49.2	94.0	93.7	7.8	2,219,004
	Total	***2,205.7***	***2,528.3***	***187.5***	***52.0***	***186.9***	***166.4***	***29.3***	***2,588,264***
4	Const Phase II	1,017.2	1,450.2	90.8	1.8	68.8	44.2	15.3	280,701
	Operating Scenario 2	462.1	739.9	71.5	57.5	187.1	187.1	15.3	3,868,064
	Total	***1,479.3***	***2190.1***	***162.3***	***59.3***	***255.9***	***231.3***	***30.6***	***4,148,765***
5	Const Phase II	984.0	1,350.9	85.5	1.7	59.8	40.6	14.5	266,105
	Operating Scenario 3	966.0	1,590.0	110.3	105.6	276.1	276.1	22.2	6,041,276
	Total	***1,950.0***	***2,940.9***	***195.8***	***107.3***	***335.9***	***316.7***	***36.7***	***6,307,381***
6	Const Phase II	79.6	114.3	7.1	0.2	5.0	3.4	1.2	23,938
	Operating Scenario 3	966.0	1,590.0	110.3	105.6	276.1	276.1	22.2	6,041,276
	Total	***1,045.6***	***1,704.3***	***117.4***	***105.8***	***281.1***	***279.5***	***23.4***	***6,065,214***
7	Operating Scenario 4	902.3	1,381.0	133.9	114.7	371.8	371.8	29.9	7,692,788

Scenario 1: Phase I turbine interim operating mode plus concrete batch plant operations
Scenario 2: Phase I turbine final operating mode
Scenario 3: Phase I turbine final operating mode plus Phase II turbine interim operating model
Scenario 4: Phases I and II turbine final operating mode (full facility operational).
Key:
CO = carbon monoxide
CO_2e = carbon dioxide equivalent
HAPs = hazardous air pollutants
NO_X = nitrogen oxides
PM_{10} = particulate matter equal to or less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$ = particulate matter equal to or less than 2.5 micrometers in aerodynamic diameter
SO_2 = sulfur dioxide
VOC = volatile organic compounds

Final Operational Emissions

Final (full facility) operational emissions are presented in table 4.11-4. Stationary combustion sources primarily include emergency use engines, gas turbines, hot oil heaters, thermal oxidizers, and flares. Mobile source emissions would be produced by LNG carriers and tug/escort vessels, worker commuting, and routine deliveries to the terminal by truck. Non-combustion sources include storage tanks, LNG loading and transfer operations, and fugitive emissions from pipeline and equipment leaks. Non-combustion emissions would occur from the LNG terminal facilities, pipeline, and meter stations, as well as from up to six pipeline pigging events per year.

Table 4.11-4
Final Operational Emissions[a]

Source	Tons Per Year								
	NOx	CO	VOC	PM_{10}	$PM_{2.5}$	SO_2	HAPs	Louisiana TAPs	CO_2e
Terminal	902	1,381	134	372	372	115	30	354	7,692,788
Pipeline[b]	0.02	0.04	0.01	0.00	0.00	0.00	0.00		3.1
Fugitive[c]			2.3				0.1		6,525
Marine Vessels	140	72	22	7.4	6.7	12.6			31,942
Mobile Sources[d]	15.3	147.6	3.0	0.3	0.3	0.1	0.8		18,541
Total	**1,057**	**1,601**	**161.3**	**379.7**	**379.0**	**127.7**	**30.9**	**354**	**7,749,799**

a Emissions shown for the terminal represent Scenario 4, final operating mode of Phases I and II.
b Emissions shown for the pipeline include emissions for the TGP and Tetco laterals and associated meter and regulator stations.
c Fugitive emissions include the terminal, TGP lateral, Tetco later, and associated meter and regulator stations combined.
d Mobile source emissions represent tail pipe exhaust emissions.
Key:
CO = carbon monoxide
CO_2e = carbon dioxide equivalent
HAPs = hazardous air pollutants
NO_X = nitrogen oxides
PM_{10} = particulate matter equal to or less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$ = particulate matter equal to or less than 2.5 micrometers in aerodynamic diameter
SO_2 = sulfur dioxide
TAPs = toxic air pollutants per Louisiana Code 33:III Chapter 51
VOC = volatile organic compounds

Mitigation Measures

Venture Global has prepared an air permit application and submitted the application to the LDEQ for review. The application review process will evaluate all proposed emission rates and control technologies for compliance with applicable regulations. Venture Global is also required to prepare an air quality impact analysis to demonstrate that proposed emission rates on a short-term and annual basis would not result in ambient pollutant concentrations that exceed ambient air quality standards. An air permit to construct and operate the facility will not be issued unless the applicant demonstrates the Project's ability to meet all emission rates, control technology requirements, and ambient air quality standards.

Venture Global has prepared a Best Available Control Technology (BACT) analysis for the stationary emission sources at the terminal. A BACT analysis is used to identify the maximum degree of emission reduction for air pollutants, taking into account technical feasibility, energy, other environmental, and economic impacts. A summary of the Project's proposed BACT as submitted in the air permit application to LDEQ is provided in appendix F.

In general, most of the Project's combustion sources other than emergency equipment would utilize natural gas fuel. Use of natural gas as fuel results in lower emissions of particulate matter and SO_2 from combustion sources. Additional BACT measures to be used on all combustion devices include good combustion practices, proper operation and maintenance, and proper equipment design. Diesel-fueled emergency equipment would use ultra-low sulfur diesel with a fuel sulfur content equal to or less than 15 ppm in compliance with regulatory requirements.

In the power generation portion of the terminal during the interim operating mode, the simple-cycle, heavy-duty frame combustion turbines would use dry low NO_X combustor design; in the final operating mode, the combined-cycle, heavy-duty frame combustion turbines and duct burners would use low NO_X burner designs, and the combined exhaust would be treated by SCR to reduce NO_X emissions. The two aeroderivative turbines would utilize dry low NO_X and SCR to reduce emissions of oxides of nitrogen. However, normal use of SCR results in some of the ammonia used in the SCR process to pass unreacted through the SCR and emitted to the atmosphere. According to the BACT analysis, catalytic oxidation would be used on the combined-cycle gas turbines/duct burner exhaust to reduce emissions of carbon monoxide and volatile organic compounds.

Thermal oxidizers would be used to treat the sour gas from the acid gas removal units to convert hydrogen sulfide to SO_2. These units would use low NO_X burners to lower emissions of NO_X.

In order to identify leaking equipment such as valves, flanges, and seals, Venture Global would use a site-specific program utilizing a combination of design and auditory/visual/olfactory leak detection methods. Auditory/visual/olfactory leak detection would involve control system monitoring and routine visual inspections and observations (such as fluids dripping, spraying, misting, or clouding from or around components), sound (such as hissing), and smell. Leaks detected in this manner would be immediately recorded and scheduled for repair in accordance with all applicable laws.

4.11.1.6 Air Quality Impact Analysis

Breton NWR Class I Area Air Quality Modeling

Venture Global followed the Federal Land Managers' Air Quality Related Values Work Group's Phase I Report – Revised (NPS, 2010) to determine the Project's air quality impacts on Class I areas to support the air permit application for the Project.

If a new source or major modification of an existing source is subject to PSD review and is (1) within 62 miles (100 kilometers) of a Class I area; or (2) farther than 31 miles (50 kilometers) from a Class I area, and the emission to distance (Q/D) ratio is greater than 10, the facility is required to notify the appropriate federal officials and assess the impacts of the proposed Project on the Class I area. The emission value used in the Q/D ratio is the sum of emissions of SO_2,

$PM_{2.5}$, NO_X, and sulfuric acid in tons, and where D is distance in kilometers between the source and the Class I area.

The Breton National Wildlife Refuge (NWR) Class I area is approximately 95 kilometers from the Project; the Q/D value is 19.6; therefore, a Class I air quality impact analysis is required. The next closest Class I area is the Sipsey Wilderness Area in Alabama, which is 567 kilometers to the northeast of the Project site. The Q/D value for the Sipsey Wilderness area is 3.3, which is less than the threshold value of 10; therefore, a refined Class I area air quality analysis is not required for the Sipsey Wilderness area.

The Federal Land Manager (FLM) for the Breton NWR is the FWS. Class I air quality modeling was performed to evaluate compliance with the Class I area Significant Impact Levels (SILs) and Class I area Air Quality Related Values (AQRVs) for Breton NWR. The AQRVs evaluated for Breton NWR are nitrogen and sulfur deposition and visibility degradation. The FLM reviewed the procedures and protocol used to conduct the modeling, reviewed the modeling results, and concluded that, based on the report reviewed, the Project would not have significant additional impact on air quality-related values at the Breton NWR and did not request additional analyses.

Models Used

The AERMOD model and the CALPUFF model were used for the analysis. AERMOD was used to evaluate impacts compared to the Class I area PSD SIL; CALPUFF was used to evaluate AQRVs (deposition and visibility).

AERMOD is EPA's preferred regulatory air quality dispersion model for source to receptor distance of up to 50 kilometers. Five years (2011 through 2015) of hourly meteorological data from New Orleans and upper air data from Slidell, Louisiana, were used. Receptor locations (points where the model calculated concentration values) were located along an arc 50 kilometers from the Project in the direction of the Breton NWR. This analysis was used to determine whether further air quality standard (NAAQS) analyses and PSD air quality concentration increment analysis with a long-range transport model at receptors at the Class I area boundary were necessary.

CALPUFF Version 5.8.5, the current model version approved by the EPA, is a long-range (beyond 50 kilometers) air pollutant transport, deposition, and chemical transformation model. CALPUFF uses a sophisticated meteorological data set that consists of a gridded network of meteorological data points spaced 4 kilometers apart over a regional area of the southeast United States. The meteorological data set was obtained from previous modeling studies conducted in the region and covered a 3-year period from 2001 to 2003. Receptor locations for the Breton NWR were obtained from the National Park Service Air Resource Division.

Emission Rates

Venture Global performed the Class I area modeling using the stationary source emission rates and source parameters used in the Class II area modeling study. The following separate emission scenarios, reflecting the phased development of the Project and their corresponding emission rates, were modeled:

- interim operating emission scenario 1, consisting of the Phase I turbine interim operating mode and Phase I concrete batch plant operations;

- interim operating emission scenario 3, consisting of full operation of Phase I and Phase II turbine interim operating mode; and

- final operating scenario 4, consisting of full operation of the Project.

For the Class I area SIL analysis using AERMOD, maximum hourly emission rates were input to the model for the 1-hour, 3-hour, and 24-hour averaging periods. Annual average emission rates were used for the annual SIL analysis.

Mobile source emissions were not included in any of the scenario analyses. Also, concurrent construction emissions occurring during interim emission scenario 1 and interim emission scenario 3 were not included in the modeling. These mobile source emissions and construction emissions are not required to be included in Class I modeling for air permitting purposes. However, they can be considered for NEPA evaluation purposes.

Significant Impact Level (SIL) Modeling Results

Table 4.11-5 summarizes the Class I SIL modeling results. All modeled concentrations at a 50-kilometer distance from the Project in the direction of Breton NWR were found to be less than the SIL value. Based on these results, no further analysis for Class I area increments is required.

However, scenario 1 and scenario 3 results do not include emissions associated with construction, and none of the scenarios include emissions from mobile sources associated with the Project. These emissions (primarily construction emissions) add significantly to the emission rate from the Project during the 5 years of concurrent construction and operation. Addition of these emissions to the model input would increase the maximum modeled results to values that may approach the SIL.

Table 4.11-5
Class I Area SIL Model Results

Pollutant	Averaging Period	Maximum Result over Five Years ($\mu g/m^3$)	SIL ($\mu g/m^3$)
Scenario 1			
NO_2	Annual	0.01	0.1
PM_{10}	24-hour	0.08	0.3
	Annual	<0.005	0.2
$PM_{2.5}$	24-hour	0.08	0.27
	Annual	<0.005	0.05
SO_2	3-hour	0.42	1.0
	24-hour	0.08	0.2
	Annual	<0.005	0.1
Scenario 3			
NO_2	Annual	0.02	0.1
PM_{10}	24-hour	0.16	0.3
	Annual	0.01	0.2
$PM_{2.5}$	24-hour	0.16	0.27
	Annual	0.01	0.05
SO_2	3-hour	0.83	1.0
	24-hour	0.16	0.2
	Annual	<0.005	0.1
Scenario 4			
NO_2	Annual	0.02	0.1
PM_{10}	24-hour	0.23	0.3
	Annual	0.01	0.2
$PM_{2.5}$	24-hour	0.23	0.27
	Annual	0.01	0.05
SO_2	3-hour	0.85	1.0
	24-hour	0.16	0.2
	Annual	<0.005	0.1

Key:
$\mu g/m^3$ = micrograms per cubic meter
NO_2 = nitrogen dioxide
PM_{10} = particulate matter equal to or less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$ = particulate matter equal to or less than 2.5 micrometers in aerodynamic diameter
SIL = Significant Impact Level
SO_2 = sulfur dioxide

Deposition Model Results

Deposition analyses for sulfur and nitrogen in the Breton NWR were performed using the CALPUFF model. Deposition results were compared to deposition analysis thresholds (DATs) established by the FLM's guidance report for Nitrogen and Sulfur Deposition Analyses. The DAT values for eastern U.S. Class I areas are 0.01 kilograms per hectare per year for sulfates and nitrates.

The sulfate deposition analysis included wet and dry fluxes of SO_2 and sulfate to surface receptors to determine total sulfur loading at receptor locations in the Breton NWR. The nitrate deposition analysis included wet and dry fluxes of nitrates and nitric acid and dry flux of oxides of nitrogen to determine total nitrogen loading at the receptor location in the Breton NWR. Results of the modeling are shown in table 4.11-6. All results are below the DAT values for eastern U.S. Class I areas; therefore, Project emissions as modeled are not expected to affect sulfur and nitrogen deposition at the Breton NWR. However, scenario 1 and scenario 3 results do not include emissions associated with construction, and none of the scenarios include emissions from mobile sources associated with the Project. Although these emissions add significantly to the emission rate from the Project during construction, addition of these emissions to the model input is not likely to increase deposition rates that would exceed the DAT values shown in table 4.11-6.

Table 4.11-6
Sulfur and Nitrogen Deposition Modeling Results

Meteorological Data Year	Deposition Species	Scenario 1 (kg/ha/yr)	Scenario 3 (kg/ha/yr)	Scenario 4 (kg/ha/yr)	Deposition Analysis Threshold (kg/ha/yr)
2001	Nitrates	0.0011	0.0020	0.0020	0.01
	Sulfates	0.0012	0.0024	0.0025	0.01
2002	Nitrates	0.0009	0.0016	0.0016	0.01
	Sulfates	0.0008	0.0017	0.0018	0.01
2003	Nitrates	0.0011	0.0020	0.0019	0.01
	Sulfates	0.0011	0.0023	0.0024	0.01

Key:
kg/ha/yr = kilograms per hectare per year

Visibility Analysis Results

Visibility at the Breton NWR could be affected by a plume from the Project or the Project's contribution to regional haze. Typically, the direct effect of a plume on a Class I area causes a color or contrast difference with the background sky or terrain such that the plume is visible and detracts from viewing the background sky or terrain. This visibility impairment is typically of concern when an emission source is within 50 kilometers of a Class I area. Beyond this distance, the plume has dispersed such that its effect is not discernible as a plume against a background view. However, beyond 50 kilometers, the particulates in the plume may contribute to regional haze. The separation distance between the Project and the Breton NWR is greater than 50 kilometers; therefore, the Project analysis only considered impacts on regional haze.

The amount of visibility reduction is determined by the increase in light extinction. An increase in light extinction describes the increase in the amount of ambient light that is scattered by an increase in particles and gases in the atmosphere. As more light is scattered, visibility of a distant object is reduced. The FLM generally accepts a 5 percent increase in light extinction on a 24-hour average period basis as a visibility reduction threshold. If the increase in light extinction is less than 5 percent, no further analysis is needed. The EPA recommends using the 98th percentile value of the modeled 24-hour visibility values to account for the CALPUFF model's tendency to conservatively estimate actual visibility effects.

The visibility analysis used a background light extinction value calculated according to procedures contained in the 2010 FLAG report (NPS, 2010). This value is used in conjunction with the predicted visibility impacts from Project emission to determine whether the Project would contribute to a greater than 5 percent increase in light extinction and hence a reduction in visibility. The visibility analysis results are shown in table 4.11-7.

Similar to the other Class I area analyses, scenario 1 and scenario 3 results do not include the effects of emissions associated with construction, and none of the scenarios include emissions from mobile sources associated with the Project. These emissions (primarily construction emissions) add significantly to the emission rate from the Project during the 4.5 years of concurrent construction and operation. Addition of these emissions to the visibility model input would increase the percentage change in visibility to values that approach the 5 percent daily threshold change value. Additional modeling would be required to determine whether visibility thresholds would be exceeded.

Table 4.11-7
Visibility Analysis Results

Year	Scenario 1 (% change)	Scenario 3 (% change)	Scenario 4 (% change)	Visibility % Change Daily Value Threshold
2001	0.65	1.66	2.30	5
2002	0.65	1.47	1.85	5
2003	0.80	1.86	2.38	5

Class II Area Modeling – Stationary and Mobile (Vessel) Sources

Impacts on Ambient Criteria Pollutant Concentrations

Venture Global conducted an air quality dispersion modeling analysis for stationary sources to estimate ambient criteria pollutant concentrations in the vicinity of the Project for pollutants subject to PSD. The analysis followed EPA PSD modeling procedures. A preliminary impact analysis, known as a SIL analysis, was performed, followed by a full impact analysis and PSD increment analysis. The analysis used the EPA's AERMOD, version 15181, to predict maximum short-term and annual concentrations within a 50-kilometer radius of the Project. The 50-kilometer radius is the distance approved for modeling compliance demonstrations for regulatory purposes.

The preliminary impact, full NAAQS, and PSD increment analyses used 5 years of hourly meteorological data, and land use and terrain height data. Existing ambient background pollutant concentration data were used in the full NAAQS analysis. Locations (receptors) where pollutant concentrations were calculated by AERMOD were distributed throughout the analysis area using either a grid of points or specific locations known as discrete receptors. The number and distribution of receptors varied depending on the requirements of the analysis being conducted.

Meteorological Data

The stations selected to represent the Project site conditions were New Orleans International Airport for surface meteorological conditions and Slidell, Louisiana, for upper air conditions. These stations are the closest to the Project site. The meteorological data covered the January 1, 2011, to December 31, 2015, time period. The meteorological data were processed for use in the model according to PSD modeling guideline procedures. The meteorological data were used in the SIL analysis, the full NAAQS analysis, and the PSD increment analysis.

Land Use and Terrain

The Project site is mainly rural with a relatively small amount of industrial development. Terrain elevations do not vary much throughout the Project area. Terrain elevation data from the USGS's National Elevation Dataset were processed using the AERMAP version 11103 terrain processor so that the data could be used by AERMOD. These data were used to assign elevations to each receptor.

Modeling Scenarios

Venture Global developed four emission scenarios to describe the emissions from successive phases of development and operation of the Project. These scenarios are as follows:

- Scenario 1: simple-cycle turbine interim operations plus Phase I concrete batch plant operations;
- Scenario 2: final turbine operating model (combined-cycle operation) for Phase I of development;
- Scenario 3: scenario 2 plus simple-cycle turbine interim operations in Phase II; and
- Scenario 4: full facility operation.

Scenario 3 and 4 are the scenarios with the highest potential to emit air pollutants. Due to the differences between scenarios in terms of equipment that would be operated and the operating mode of the gas turbines (simple cycle versus combined cycle), the maximum potential to emit for NO_X and CO occurs under Scenario 3, whereas Scenario 4 results in the highest potential to emit for PM_{10}, $PM_{2.5}$, and SO_2. These scenarios were modeled in the SIL, full NAAQS, and PSD increment analyses.

Secondary Formation of $PM_{2.5}$

Particulate matter $PM_{2.5}$ can be directly emitted from an emission source and modeled as is done for gaseous pollutants. $PM_{2.5}$ may also form from gaseous pollutants emitted from the emission source. EPA guidance calls for PSD permit applications to address the potential for secondary formation of $PM_{2.5}$ in the atmosphere due to emissions of NO_X (which forms nitrate particulate matter) and SO_2 (which forms sulfate particulate matter). Venture Global performed an assessment of the potential formation of secondary $PM_{2.5}$ from the Project in accordance with the hybrid qualitative/quantitative assessment Case 3 from EPA guidance.

The maximum modeled direct $PM_{2.5}$ concentrations typically do not occur where maximum secondary $PM_{2.5}$ impacts occur because the emissions of NO_X and SO_2 from the Project would require time in the atmosphere to form particulate nitrates and sulfates. Typically, secondary $PM_{2.5}$ maximum occurs further downwind due to transport of NO_X and SO_2 and time required for the transformation to $PM_{2.5}$. Consequently, the maximum secondary $PM_{2.5}$ impacts would not occur close to the Project site where the maximum direct $PM_{2.5}$ impacts are expected to occur.

The Case 3 secondary $PM_{2.5}$ analysis procedure consists of several steps:

- establishing the role that nitrates and sulfates have in the total formation of $PM_{2.5}$ in the region;
- comparing the relationship of regional emissions of NO_X and SO_2 to locally monitored values of $PM_{2.5}$ that have data showing the composition of total $PM_{2.5}$ (e.g., sulfate, nitrate);
- comparing the Project's NO_X and SO_2 emissions to regional NO_X and SO_2 emissions; and
- developing an estimate of the expected secondary $PM_{2.5}$ that could form due to Project emissions.

Monitoring data were used from the closest site with $PM_{2.5}$ data showing sulfate and nitrate composition to establish the role each has in total $PM_{2.5}$. The monitor is located in Baton Rouge, Louisiana (monitor ID 22-033-0009). This monitor is located in an urban area and reflects a higher degree of development, hence higher sulfate and nitrate values, than the Project site. The composition data are used to determine whether one of these materials (sulfate and nitrate) is more prevalent in total $PM_{2.5}$. The data for 2013 and 2015 indicated that sulfate is approximately 20 percent of the $PM_{2.5}$ and nitrate is approximately 6 percent. Thus, sulfate is more prevalent in total $PM_{2.5}$ than nitrate. Venture Global also used data from 2013 and 2015 to determine the change in nitrate and sulfate concentration.

The Project's analysis also compiled NO_X and SO_2 regional emissions within 50 kilometers of the Project site for the same 2 years used in the monitoring data analysis. The Project's NO_X emissions would be 6 percent of the total regional NO_X emissions, and the Project's emissions of SO_X would be 3 percent of the total regional SO_X emissions. The change in total NO_X and SO_2 emissions from 2013 to 2015 was also compared to the Project's estimated emissions and to the change in annual $PM_{2.5}$ concentration at the closest $PM_{2.5}$ monitor to the site. This monitor is in Marrero, Louisiana; note that this monitor does not collect data on which chemical species make up the total $PM_{2.5}$ concentration.

Using this analysis procedure, the applicant estimated a combined contribution to nitrate and sulfate concentrations of less than 0.01 micrograms per cubic meter ($\mu g/m^3$) for interim emission scenario 3 and for operating emission scenario 4. This is less than the annual $PM_{2.5}$ SIL of 0.3 $\mu g/m^3$. Consequently, the emissions of NO_X and SO_2 associated with the Project would not be expected to cause significant formation of secondary $PM_{2.5}$ in the region.

<u>SIL Analysis – Stationary Sources</u>

The SIL analysis is a preliminary analysis used to determine whether a project would have significant impacts that require further analysis using more detailed procedures. Venture Global conducted the SIL analysis for pollutants emitted above thresholds that subject them to PSD. In this analysis, the Project's potential to emit PSD pollutants is evaluated to determine whether it may have significant impacts on air quality in the area surrounding the facility. The pollutants evaluated are CO, NO_2, PM_{10}, $PM_{2.5}$, and SO_2.

Modeled concentrations are compared to the respective EPA SILs. If the maximum modeled concentration at all receptor locations is less than the SIL, then the impact is considered to be less than significant with respect to the NAAQS and PSD increment for that pollutant and averaging period combination, and further analysis is not required. If the maximum modeled concentration is greater than the SIL, or if the SIL plus a relevant background concentration exceeds the corresponding NAAQS, then an NAAQS full impact analysis and a PSD increment analysis are required.

Pursuant to EPA guidance specific to modeling $PM_{2.5}$, an analysis was performed to determine whether the $PM_{2.5}$ SIL is applicable for use in comparison with preliminary model results. The test consists of determining the difference between the NAAQS and $PM_{2.5}$ monitored background and comparing it to the SIL. If the result is greater than the SIL, there is sufficient evidence to conclude that model results below the SIL would not cause or contribute to a violation of the NAAQS, and no cumulative analysis is needed. Venture Global used data from the Marrero monitoring station, located in an urban part of New Orleans, to conservatively represent background $PM_{2.5}$ at the more rural Project site. The result of the analysis show that the difference is significantly greater than the SIL, and therefore provides sufficient evidence that model results below the SIL would not cause or contribute to an NAAQS violation and do not require a cumulative modeling analysis.

The modeled impact also is compared to the significant monitoring concentration (SMC). Impacts greater than the SMC indicate that Project-specific air quality measurements may be needed to characterize existing background air quality within the Project's impact area. A project that has an impact greater than the SMC may require preconstruction monitoring via the installation of on-site air quality monitors.

A fence-line grid and set of four additional receptor grids were used to locate receptors throughout the 50-kilometer modeling radius surrounding the Project site. The receptor grids are defined as follows:

- fence-line grid consisting of receptors spaced at 100-meter intervals along the property line;
- a finely spaced grid consisting of receptors spaced 100 meters apart extending 1 kilometer in all directions from the property line;
- a first coarse grid with 500-meter receptor spacing extending from 1 to 5 kilometers in all directions from the property line;
- a second coarse grid with 1,000-meter receptor spacing extending from 5 to 10 kilometers in all directions from the property line; and
- a third coarse grid with 5,000-meter receptor spacing extending from 10 to 50 kilometers in all directions from the property line.

Table 4.11-8 lists the SIL and SMC concentration values, the preliminary modeling results, and radius of influence distance for pollutant/averaging period results that are above the respective SILs. This comparison determines the additional analyses that were required to demonstrate the Project's impact on the surrounding air quality and compliance with standards. The preliminary modeling results demonstrated that the Project would exceed the corresponding SILs for 1-hour NO_2, annual NO_2, 24-hour $PM_{2.5}$, 1-hour SO_2, and 3-hour SO_2. Therefore, Venture Global conducted a full impact analysis for these pollutant/averaging period combinations.

Based on prior LDEQ guidance and precedent on other similar projects in Louisiana, Venture Global determined that on-site preconstruction air quality monitoring would likely not be required because preliminary assessment modeling demonstrated that maximum modeling results are below the respective SMCs. For use in cumulative modeling, Venture Global proposed to the LDEQ use of an appropriate data set of background data collected at existing monitors in the region. These data were subsequently approved by the LDEQ.

Table 4.11-8 Preliminary Model Results – Stationary Sources							
				Preliminary Maximum Modeled Concentration ($\mu g/m^3$)		Radius of Influence for SIL Analysis (km)	
Pollutant	Averaging Period	SIL ($\mu g/m^3$)	SMC ($\mu g/m^3$)	Scenario 3	Scenario 4	Scenario 3	Scenario 4
CO	1-hour	2,000	n/a	1,709.2	1,709.2	Below SIL	Below SIL
	8-hour	500	575	156.2	156.2	Below SIL	Below SIL
NO_2	1-hour	7.5	n/a	17.8	21.2	17.92	17.92
	Annual	1	14	1.4	1.5	1.21	1.25
PM_{10}	24-hour	5	n/a	2.8	3.3	Below SIL	Below SIL
	Annual	1.0	10	0.3	0.4	Below SIL	Below SIL
$PM_{2.5}$	24-hour	1.2	4	2.4	2.7	3.47	6.10
	Annual	0.3	n/a	0.2	0.3	Below SIL	Equal to SIL
SO_2	1-hour	7.8	n/a	8.8	8.9	1.50	1.50
	3-hour	25	n/a	75.4	75.4	0.76	0.76
	24-hour	5	13	5.0	5.0	Below SIL	Below SIL
	Annual	1	n/a	0.1	0.1	Below SIL	Below SIL

Key:
$\mu g/m^3$ = micrograms per cubic meter
CO = carbon monoxide
km = kilometers
NO_2 = nitrogen dioxide
PM_{10} = particulate matter equal to or less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$ = particulate matter equal to or less than 2.5 micrometers in aerodynamic diameter
SIL = Significant Impact Level
SMC = Significant Monitoring Concentration
SO_2 = sulfur dioxide

Full NAAQS (Cumulative) Modeling Analysis – Stationary Sources

Emission sources included in the full NAAQS modeling included the Project emission sources plus non-project off-site emission sources. The radius of influence (ROI) shown in table 4.11-8 defines the circular area around the Project known as the area of influence (AOI). Based on LDEQ guidance, the Project AOI radius, plus a 20-kilometer distance beyond the AOI radius, was evaluated for the presence of major emission sources (i.e., greater than 250 tpy) for the cumulative analysis. Venture Global queried a publically available LDEQ database (the Emissions Reporting and Inventory Center [ERIC]) to extract the non-project emission source inventory data. Additional LDEQ data sources such as the Electronic Document Management System (EDMS), emission source data at similar facilities, and LDEQ guidance on default values were used to fill in missing data in the off-site emission source inventory.

In addition to the contribution of facility emissions and off-site emissions sources, background monitor data were added to modeled results. The background monitor data represents all other emission sources in the modeling area such as minor stationary sources, area sources, and mobile sources.

In the SIL analysis, all NO_X emitted from the Project is conservatively assumed to convert to NO_2. In the full NAAQS analysis, guidance allows the use of a refined conversion ratio that reflects a more realistic conversion process. The Project followed appropriate EPA guidance regarding selection and use of conversion ratios for determining the amount of total NO_X emitted converted to NO_2. The analysis used the Tier 2 Ambient Ratio Method, which prescribes that 80 percent of emitted NO_X converts to NO_2 for the 1-hour averaging period, and 75 percent of the NO_X emitted converts to NO_2 for the annual average period.

Emission scenarios 3 and 4, described above, were modeled in conjunction with off-site emission sources to evaluate NAAQS compliance. For short-term averaging periods (1-hour, 3-hour, 8-hour, and 24-hour), emissions were based on hourly maximum emission rates for continuously or near continuously operating emission sources. Long-term (annual) averaging period emission rates were based on an average annual emission rate that takes into account periods of the source not operating.

Intermittent sources—that is, equipment that operates only a few hours per year or on an emergency basis—were included in the modeling, where appropriate, with emission rates derived based on EPA guidance (EPA, 2011b).

Stack and building locations and dimensions were input to AERMOD to assess potential downwash effects. This data were used with EPA's currently approved version of the Building Profile Input Program – Plume Rise Model Enhancements software (version 04274) to develop wind direction-specific building profiles.

Table 4.11-9 shows the modeling results for the NAAQS assessment. The table shows that all predicted concentrations were less than the NAAQS except for 1-hour NO_2. To address the 1-hour NO_2 exceedance, a "culpability analysis" was performed. A culpability analysis looks not only at the maximum values shown in table 4.11-5, but also at the contribution of the Project to each individual exceedance over all receptors and modeled hours. EPA guidance provides that a Project is considered to be in compliance with the NAAQS if its contribution to each individual modeled exceedance is less than the SIL. None of the Project's contributions to modeled NAAQS exceedances are greater than the SIL for 1-hour NO_2. Therefore, the Project would not significantly contribute to any of the modeled NAAQS exceedances and is shown to be in compliance with the NAAQS.

Table 4.11-9 NAAQS Assessment Results – Project Stationary Sources and Off-Site Cumulative Sources						
Scenario	**Pollutant**	**Averaging Period**	**Model Predicted Concentration (µg/m³)[a]**	**Background Concentration (µg/m³)**	**Total Concentration (µg/m³)**	**NAAQS (µg/m³)**
Scenario 3	NO_2	1-hour	Note b	Note b	5,436.3	188
		Annual	4.5	35.1	39.6	100
	$PM_{2.5}$	24-hour	184.1	18.6	202.6	35
	SO_2	1-hour	424.1	49.5	473.7	196
		3-hour	216.6	62.3	278.8	1,300
Scenario 4	NO_2	1-hour	Note b	Note b	20,836.9	188
		Annual	4.6	35.1	39.6	100
	$PM_{2.5}$	24-hour	737.9	18.6	756.5	35
	SO_2	1-hour	424.1	49.5	473.7	196
		3-hour	216.6	62.3	278.9	1,300

a Model predicted concentration shown is the value corresponding to the statistical nature of the NAAQS. This value is different than the maximum modeled value used in the SIL analysis.
b The analysis for the 1-hour NO_2 concentration involved use of seasonal (e.g., winter, spring, summer, fall) background concentration values added to the model predicted concentration. The total concentration shown for 1-hour NO_2 is the maximum value from this analysis.
Key:
µg/m³ = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards
NO_2 = nitrogen dioxide
$PM_{2.5}$ = particulate matter equal to or less than 2.5 micrometers in aerodynamic diameter
SO_2 = sulfur dioxide

Exceedances of the NAAQS are shown for both scenarios for 1-hour NO_2, 1-hour SO_2, and 24-hour $PM_{2.5}$. However, based solely on this step of the analysis, it is unknown whether the Project is contributing above the SIL at receptor locations that show an exceedance of the NAAQS. Therefore, Venture Global conducted a statistical analysis per EPA modeling guidance and the Project's approved modeling protocol that involves a detailed examination of each cumulative emission source's contribution, including the Project's, to predicted NAAQS exceedances at all receptors. Based on this additional analysis, it was found that the Project did not contribute above the applicable SIL at any of the receptor locations where a modeled NAAQS exceedance was predicted. Therefore, the Project demonstrated compliance with the NAAQS based on the emission scenarios modeled. However, the modeling analysis did not consider the concurrent construction emissions that are projected to occur during Scenario 3.

Modeling Including Mobile (Vessel) Emission Sources

Venture Global prepared an additional modeling analysis that included only Project stationary sources (no off-site cumulative sources were included) with the Project's LNG carriers and support vessels. The analysis consisted of modeling the impact of the emission, adding in a background value from monitoring stations used in the PSD modeling analysis, and comparing the total concentration to the applicable NAAQS. Vessels were modeled for maneuvering activities within the moored safety (security) zone and hoteling at the terminal, and also within the moored safety (security) zone. The mobile sources during maneuvering activities included one LNG carrier and four tug boats, while the sources during the hoteling activities included one LNG carrier and one tug boat. Venture Global conducted the modeling analysis for the terminal plus LNG carrier and supporting vessel mobile emissions, with background concentrations, and compared these concentrations to the NAAQS.

The position and emission rates for the vessels included in the modeling varied for short-term (e.g., 1-hour, 3-hour, 8-hour, and 24-hour) periods compared to the annual period. For the short-term modeling periods of 1, 3, and 8 hours, one LNG carrier and three attendant tug boats were assumed in the safety zone performing maneuvering activities, with one LNG carrier and one tug boat docked at the terminal. For the 24-hour short-term modeling period, two LNG carriers were modeled as docked at the terminal with two tug boats standing by. For the annual modeling period, LNG carriers were located at all three loading docks along with their attendant support vessels. For operation of stationary sources in the modeling, scenarios 3 and 4 described earlier were included. Thus, the following combinations of stationary and vessel sources were modeled:

- Scenario 3 – Phase I final operating mode (gas turbines in combined-cycle operation), plus Phase II interim operating mode (Phase II gas turbines in simple-cycle operating mode), plus marine vessels; and

- Scenario 4 – Final operating model for the terminal (Phase I and Phase II) plus marine vessels.

The NAAQS Assessment results in table 4.11-10 show compliance with the NAAQS. The combined stationary/marine vessel modeling analysis was not carried through to include the off-site cumulative emission source inventory as was done for the PSD modeling.

Table 4.11-10 NAAQS Assessment Results – Project Stationary and Vessel Sources						
Scenario	Pollutant	Averaging Period	Model Predicted Concentration ($\mu g/m^3$)[a]	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
Scenario 3	CO	1-hour	1,675.2	5,713.6	7,388.7	40,000
		8-hour	147.9	2,290.0	2,437.9	10,000
	NO_2	1-hour	Note b	Note b	84.0	188
		Annual	1.4	35.1	36.5	100
	$PM_{2.5}$	24-hour	1.8	18.6	20.4	35
		Annual	0.2	7.9	8.1	12
	PM_{10}	24-hour	2.4	75.0	77.4	150
	SO_2	1-hour	8.0	49.5	57.5	196
		3-hour	11.4	62.3	73.7	1,300
		24-hour	3.0	21.8	24.8	365
		Annual	0.1	14.1	14.2	80
Scenario 4	CO	1-hour	1,675.2	5,713.6	7,388.7	40,000
		8-hour	147.9	2,290.0	2,437.9	10,000
	NO_2	1-hour	Note b	Note b	84.0	188
		Annual	1.5	35.1	36.6	100
	$PM_{2.5}$	24-hour	2.0	18.6	20.6	35
		Annual	0.3	7.9	8.2	12
	PM_{10}	24-hour	2.5	75.0	77.5	150
	SO_2	1-hour	8.1	49.5	57.6	196
		3-hour	11.4	62.3	73.7	1,300
		24-hour	3.0	21.8	24.8	365
		Annual	0.1	14.1	14.2	80

a Model predicted concentration shown is the value corresponding to the statistical nature of the NAAQS. This value is different than the maximum modeled value used in the SIL analysis.
b The analysis for the 1-hour NO_2 concentration involved use of seasonal (e.g., winter, spring, summer, fall) background concentration values added to the model predicted concentration. The total concentration shown for 1-hour NO_2 is the highest value from this analysis.
Key:
$\mu g/m^3$ = micrograms per cubic meter
CO = carbon monoxide
NAAQS = National Ambient Air Quality Standards
NO_2 = nitrogen dioxide
PM_{10} = particulate matter equal to or less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$ = particulate matter equal to or less than 2.5 micrometers in aerodynamic diameter
SO_2 = sulfur dioxide

Additional Impact Analyses

The PSD modeling analysis also requires additional assessments of potential impacts from air emissions on Class I areas; soil, vegetation, and wildlife; and additional or induced growth.

The additional assessments were based on the results of the NAAQS analysis and are summarized below.

The nearest Class I area is the Breton National Wildlife Refuge. Venture Global performed a modeling analysis to evaluate potential air quality and visibility impacts on sulfate and nitrate deposition. This is discussed in section 4.11.1.6.

The secondary NAAQS are set at levels designed to protect soil, vegetation, and wildlife. The NAAQS assessment demonstrates that the Project would comply with the primary NAAQS, which are more stringent (set at lower levels) than the secondary NAAQS. Therefore, the Project is not expected to result in significant impacts on soil, vegetation, or wildlife as a result of air pollutant emissions.

Additional Growth

Venture Global conducted a growth analysis to determine whether the Project could induce additional development that could lead to air quality impacts on the surrounding area. The Gulf Coast region historically has been a center for the oil and gas industry, and the Project would be of similar character. Raw materials, other supplies, and services to be used by the Project are currently available to serve existing oil and gas facilities, and it is believed that existing suppliers would be able to support the Project. Therefore, growth of the supply industry in the immediate area is not expected and will not lead to additional growth related air quality impacts.

The area surrounding the Project site contains an established road network and available workforce. Venture Global anticipates that the majority of the permanent workforce at the Project would be local hires already residing in the area. There would not be a large demand for development of new housing in the area. With little induced development, there would not be a large increase in emissions associated with residential growth.

In addition to the Class I visibility analysis discussed in section 4.11.1.6, Venture Global reviewed land uses that may be sensitive to reductions in visibility. The area examined was defined as the 3-kilometer area surrounding the Project, where potential PM_{10} concentrations could be above the SIL. No airports, state or federal parks, or other land uses sensitive to changes in visibility were identified.

Louisiana Toxic Air Pollutant Modeling – Stationary Sources

As part of the air permit application submitted to the LDEQ, Venture Global was required to conduct a modeling analysis for toxic air pollutants (TAPs) per LAC 33:III Chapter 51. TAPs include chemical compounds that are known, probable or suspected human carcinogens, and acute and chronic non-carcinogenic toxins. TAPs with a potential to emit above minimum emission rates specified in LDEQ's regulation may be subject to dispersion modeling. However, according to LDEQ regulations in LAC 33:III Chapter 51, emissions associated with the combustion of certain fossil fuels such as natural gas and gas streams with a heating value above 7,000 British thermal units (BTU) per pound of fuel are exempt from the modeling requirement. This exemption eliminates consideration of any TAP emissions from equipment burning natural gas.

Ammonia would be released from the selective catalytic reduction control technology units that would be installed on the combined-cycle, heavy-duty frame combustion turbines, aeroderivative combustion turbines, and the power facility. Since this TAP is not produced by combustion of virgin fossil fuels and is not a gas stream with a BTU per pound content greater than 7,000, it is subject to modeling.

The modeling procedures in LDEQ's Air Quality Modeling Guidance consist of three steps: an initial screening analysis, an initial refined analysis, and an additional refined analysis. Modeling followed previously established modeling procedures and receptor grids as used for the SIL analysis. For TAP modeling, the LDEQ requires that only the latest year of meteorological data (2015) in the 5-year data set be used. Ammonia emission rates from the combined cycle gas turbine and aeroderivative gas turbine stacks for emission scenarios 3 and 4 were modeled separately.

Venture Global conducted modeling in the initial screening analysis step. The maximum modeled concentration of ammonia is compared to 7.5 percent of the LDEQ ambient air standard for ammonia shown in LAC 33:III.51, Table 51.2. The results of the modeling are shown in table 4.11-11. Because the results are less than 7.5 percent of the ambient air standard, the modeling demonstration is complete and no further analysis is required.

Table 4.11-11
Ammonia Model Results – LDEQ Toxic Air Pollutant Analysis

Scenario	Averaging Period	Model Result ($\mu g/m^3$)	LDEQ AAS ($\mu g/m^3$)
3	8 hour	4.1	640
4	8 hour	5.0	640

Key:
$\mu g/m^3$ = micrograms per cubic meter
AAS = ambient air standard
LDEQ = Louisiana Department of Environmental Quality

4.11.1.7 Impacts on Ambient Ozone Concentrations

Venture Global prepared an ozone impact analysis in accordance with LDEQ Air Quality Modeling Procedures. An ozone impact analysis is required because a Project's potential to emit NO_X and VOC is above the 100-ton per year emission threshold prescribed by LDEQ.

The Project would be located in Plaquemines Parish, which is currently designated as an attainment area for the 2008 ozone NAAQS. In November 2017, the EPA published an initial round of final designations for the 2015 ozone NAAQS that included designating Plaquemines Parish as unclassifiable or in attainment for the 2015 ozone NAAQS.

Although the Project area is in attainment or unclassifiable for the Ozone NAAQS, there is one nearby area and two more distant areas of potential air quality concern in the larger region beyond Plaquemines Parish:

- parishes in the Baton Rouge Metropolitan Statistical Area that were only recently designated as in attainment for the 2008 ozone NAAQS (about 90 miles northwest of the Project site). These parishes were also very recently designated as attainment/unclassifiable for the 2015 ozone NAAQS after the LDEQ requested and EPA agreed with exclusion of certain exception event data from Ascension Parish and a submittal of certified 2017 monitoring data indicating attainment with the standard;

- the Beaumont/Port Arthur 2008 ozone NAAQS attainment area, a former nonattainment area in which ozone remains a concern and which is about 250 miles west of the Project site; and

- the Houston/Galveston/Brazoria 2008 ozone NAAQS nonattainment area, about 320 miles west of the Project site.

Due to the quantity of ozone precursor emissions (VOC and NO_x) from the Project and the proximity of the Project to these three areas, Venture Global performed an ozone modeling analysis to quantify the potential impact of the Project on ozone concentrations in the surrounding area. The analysis was performed in accordance with current EPA and LDEQ air quality modeling guidelines. The analysis evaluated interim operating scenario 3 and final operating scenario 4. Both scenarios were evaluated because scenario 3 has the highest NO_x emissions of the two scenarios, while scenario 4 has higher VOC emissions. However, interim operating scenario 3 only included stationary emissions sources and did not include concurrent construction emissions. As noted earlier, during construction, NOx and VOC emissions would be significantly higher than in the final operating model. As a result, ambient ozone concentration may be higher than shown for the final operating mode.

Photochemical Grid Model

The potential 8-hour ozone impact of Project emissions was quantified using a state-of-the-science regional photochemical grid model, the Comprehensive Air Quality Model with Extensions (CAMx) in conjunction with data for an ozone episode that occurred in the Baton Rouge region from August 17 through October 31, 2010. The LDEQ had prepared the ozone episode data as part of its submittal to EPA requesting redesignation of the Baton Rouge ozone nonattainment area to attainment for the 1997 8-hour ozone standard. These data and this study are fully described in the *Photochemical Modeling for the Louisiana 8-Hour Ozone State Implementation Plan Technical Support Document* (LDEQ, 2013). This modeling was conducted on a nested grid configuration of 22-mile (36-kilometer), 7.5-mile (12-kilometer), and 2.5-mile (4-kilometer) grid cells. In a photochemical grid modeling analysis, grid cells correspond to receptors. Consistent with the analysis by the LDEQ, the modeling for the Project was restricted to the 2.5-mile (4-kilometer) domain.

The modeling approach used in this analysis follows the EPA (2016) guidance for a "Refined or Second Tier" modeling study. The guidance specifies a step-wise approach for the analyses, beginning with a significant impact analysis followed by, if necessary, a cumulative analysis (second tier). Consistent with the guidance, the Project impact was assessed using the episode maximum daily 8-hour average concentration at receptors (as grid cells) on days where the ozone is estimated to be over 60 parts per billion (ppb) on more than five episode days (known as “high modeled days”). The emission sources and rates, land use and terrain, and other inputs were consistent with those used in the Class II PSD modeling analysis conducted for the Project and submitted to the LDEQ.

Venture Global conducted a preliminary modeling analysis for ozone in which the peak increases in ozone concentrations from the Project, as modeled with CAMx, were evaluated to determine whether they have the potential to have a significant impact on ozone in the area surrounding the facility. Modeled concentrations are compared to the EPA SIL for ozone; a draft SIL value of 1.0 ppb was established by the EPA in August 2016. If the modeled level is less than the SIL, then the impact is considered to be less than significant with respect to the NAAQS and no further analysis is required.

The modeled peak ozone impact from the Project is 2.45 ppb for scenario 3 and 2.47 ppb for scenario 4. Both exceed the draft ozone SIL of 1.0 ppb. Because the Project’s impact from the preliminary analysis exceeds the SIL, a cumulative modeling analysis for ozone impacts was performed.

The cumulative ozone modeling analysis was performed using CAMx as described above, but with the addition of background concentrations in the region. In accordance with the EPA guidance, a monitored design concentration value was used for the background values. The background monitor design value was obtained from the Houma-Thibodaux air quality monitor (AIRS ID: 220570004).

The 2016 Modeling Guidance specifies that the highest daily 8-hour maximum ozone contribution from the Project source on high modeled days at each receptor should be added to the monitored design value at that receptor. For this analysis, the maximum monitored design value in the Houma-Thibodaux area for 2013–2015 was used to conservatively represent the monitored design value at all receptors. The design value used in the analysis was 65 ppb.

The addition of the modeled Project impact of 2.45 ppb for scenario 3 and 2.47 ppb for scenario 4 to the monitored design concentration value of 65 ppb would not exceed either the 75 ppb 2008 ozone NAAQS or the 70 ppb 2015 ozone NAAQS for each scenario. Therefore, the Project would not cause or contribute to a violation of the ozone NAAQS. However, Project impacts during the interim operating mode including construction emissions would result in higher ozone impacts.

4.11.1.8 Summary Conclusion – Overall Air Quality

During the approximately 4.5-year construction period, residents in the vicinity of the Project would experience local impacts on air quality. During the period of combined construction and operation, nearby locations would experience larger air quality impacts due to the high level of emissions during certain years, and may exceed the NAAQS. These exceedances would not be persistent at any one time during these years due to the dynamic and fluctuating nature of construction activities within a day, week, or month. During operation, extensive modeling has indicted that the Project would have not have significant impacts on the local and regional air quality and Class I areas.

4.11.2 Noise

The noise environment can be affected during both construction and operation of the Project. The magnitude and frequency of environmental noise may vary considerably over the course of the day, throughout the week, and across seasons, in part due to changing weather conditions and the effects of seasonal vegetative cover. This section identifies the potential sources of noise, the magnitude of noise, and discusses the change in noise attributable to construction and operation of the Project.

Noise is defined as any unwanted sound. Sound is defined as any pressure variation that the human ear can detect. Humans can detect a wide range of sound pressures, but only the pressure variations occurring within a particular set of frequencies are experienced as sound. However, the acuity of human hearing is not the same at all frequencies. Humans are less sensitive to low frequencies than to mid-frequencies; therefore, noise measurements are often adjusted (or weighted) to account for human perception and sensitivities.

The ambient sound level of a region is defined by the total noise generated within the specific environment and usually comprises natural and man-made sounds.

Two measures used by some federal agencies to relate the time-varying quality of environmental noise with its known effect on people are the equivalent continuous sound level (L_{eq}) and the day-night average sound level (L_{dn}). The preferred single value figure to describe sound levels that vary over time is L_{eq}, which is defined as the sound pressure level of a noise fluctuating over a period of time, expressed as the amount of average energy. L_{dn} is defined as the 24-hour average of the equivalent average of the sound levels during the daytime (L_d – from 7:00 a.m. to 10:00 p.m.) and the equivalent average of the sound levels during the nighttime (L_n – 10:00 p.m. to 7:00 a.m.). Specifically, in the calculation of the L_{dn}, late night and early morning (10:00 p.m. to 7:00 a.m.) noise exposures are increased by 10 dB to account for people's greater sensitivity to sound during nighttime hours. In general, if the sound energy does not vary over the given time period, the L_{dn} level will be equal to the L_{eq} level plus 6.4 dB. The 6.4 dB difference between the L_{dn} and the L_{eq} is a result of the 10 dB nighttime addition for the L_{dn} calculation.

Decibels are the units of measurement used to quantify the intensity of noise. To account for the human ear's sensitivity to low level noises the decibel values are corrected to weighted values known as decibels on the A-weighted scale (dBA). The A-weighted scale is used because human hearing is less sensitive to low and high frequencies than mid-range frequencies.

Decibels are relative units that compare two pressures: the sound pressure and a reference pressure. The reference pressures typically used for air and water are not the same, and a direct comparison of values between in-air and underwater noises is not appropriate. Underwater sounds use a reference pressure of 1 μPa while in air sounds have a reference pressure of 20 μPa. For in-air sound levels, the reference pressure is often not explicitly stated, as is the case in this text. The reference pressure of underwater sounds is typically stated, and is presented in this text. This is done to remind readers of the different reference pressures between underwater and in air sound levels, and avoid direct comparison. Therefore, in this text, in air sound levels are presented in decibels while underwater sound levels are presented as "dB referenced to (re) 1 μPa." Underwater sound levels may also include a distance to indicate setback from the sound source. For example, a setback distance of 1 meter would be expressed as "dB (re 1 μPa) at 1 meter." Propagation distances in water are farther than in air because water is denser; however, loudness underwater diminishes quickly with distance from the sound source.

Table 4.11-12 lists relative dBA noise levels of common sounds measured in the environment and industry. A 3 dB change of sound level is considered to be barely perceivable by the human ear, a 5 or 6 dB change of sound level is considered noticeable, and a 10 dB increase is perceived as if the sound intensity has doubled.

Table 4.11-12
Sound Levels and Relative Loudness

Noise Source or Activity	Sound Level (dBA)	Subjective Impression [a]	Relative Loudness (perception of change)
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain	64 times as loud
Loud rock concert near stage	120	Uncomfortably loud	16 times as loud
Jet takeoff (2,000 feet)	100	Very loud	4 times as loud
Garbage disposal / food blender (2 feet)	80	Loud	Reference loudness
Vacuum cleaner (10 feet)	70	Moderate	1/2 as loud
Light auto traffic (100 feet)	50	Quiet	1/8 as loud
Quiet library, soft whisper (15 feet)	30	Very quiet	1/32 a loud
Wilderness with no wind or animal activity	25	Extremely quiet	No perceptible change

a Barnes et al., 1977; EPA, 1971

4.11.2.1 Noise Regulations

Federal Regulations

In 1974, the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA, 1974). This document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has determined that, to protect the public from activity interference and annoyance outdoors in residential areas, noise levels should not exceed an L_{dn} of 55 dBA. We have adopted this criterion and have used it to evaluate the potential noise impacts from the Project at noise sensitive areas (NSA). NSAs can be residences, hospitals, places of worship, temporary residences, and other areas that may have a greater sensitivity to noise than other locations. Due to the 10 dBA nighttime penalty added prior to calculation of the L_{dn}, for a facility to meet the L_{dn} 55 dBA limit, it must be designed such that actual constant noise levels on a 24-hour basis do not exceed 48.6 dBA L_{eq} at any NSA.

State and Local Regulations

The State of Louisiana has not adopted noise regulations applicable to construction and operation of the Project. Plaquemines Parish does maintain noise regulations within its Code of

Ordinances, Part 1 – Chapter for Local Self Government for Plaquemines Parish, Louisiana, Chapter 17 – Offenses – Miscellaneous, Article IX – Noise (Plaquemines Parish, Louisiana Municipal Code, 2015). The FERC noise limits are more stringent than Plaquemines Parish limits; therefore, the FERC noise limits represent the governing limits for the Project.

Section 17-133 of the noise article for Plaquemines Parish states the following:

For any source of sound, the sound level shall not exceed the maximum permissible sound level limit set forth in table 1 by fifteen dB (A) for all land use categories. Sound level measurement shall be made with a sound level meter using the A-weighing scale in accordance with the standards promulgated by the American National Standards Institute.

See table 4.11-13 for the maximum permissible sound level limit, referenced as “table 1” in the Plaquemines Parish noise article.

Table 4.11-13
Maximum Permissible Sound Levels by Receiving Land Use Category (*Table 1*)

Land Use Category	Time	Sound Level Limited dB(A)
Residential, noise sensitive area, public space	7:00 a.m.–10:00 p.m. 10:01 p.m.–6:59 a.m.	60 55
Multifamily dwelling	7:00 a.m.–10:00 p.m. 10:01 p.m.– 6:59 a.m.	50 45
Commercial, convention	7:00 a.m.–10:00 p.m. 10:01 p.m.– 6:59 a.m.	65 60
Industrial	At all times	75

4.11.2.2 Existing Sound Levels and Noise-sensitive Areas

The terminal site is located in a mixed industrial and rural area, with two small groups of residences over 0.5 mile from the center (0.2 mile from the nearest corner) of the terminal site. The primary noise sources currently in the area include wind, birds, insects, industrial facilities, marine traffic, and vehicular traffic on local roads. The pipeline system is located in a remote area of open water and wetlands, where noise levels are influenced by occasional recreational marine traffic and rural background sources. Additional noise from road traffic may be associated with the Lake Hermitage Road crossing the pipeline system. There are residences within 0.5 mile of the pipeline system, which could contribute to ambient noise levels at these residences during construction.

Residences, along with schools, recreational areas, and hospitals, are considered NSAs. Venture Global conducted an ambient noise survey at nine measurement locations. Venture Global identified several residences that would be considered NSAs. These residences were grouped into four NSA clusters containing multiple residences. Five other areas, identified as potential noise receptors (PNRs), were also included in Venture Global’s baseline ambient noise survey. Table 4.11-14 provides the distance and direction of each NSA and PNR cluster, and figure B-9 in appendix B identifies their location.

Table 4.11-14
Ambient Noise Level Survey Locations

NSA/PNR	Direction	Distance to Terminal Site (miles)[a]	Distance to Pipeline System (miles)[b]
NSA 1	NW	0.90	0.69
NSA 2	W	0.56	0.29
PNR 3	NNW	0.71	0.92
PNR 4	ENE	0.97	1.29
PNR 5	ENE	1.70	1.96
NSA 6	E	1.80	2.09
PNR 7	SSW	0.81	0.13
PNR 8	SW	0.97	0.95
NSA 9	NE	1.80	2.08

a Measured from the center of the terminal site.
b Measured from the nearest workspace.
Key:
NSA = noise-sensitive area
PNR = potential noise receptor

The ambient noise survey was conducted at each of the nine measurement locations over a 24-hour period using a calibrated sound level meter and analyzer and a field microphone equipped with a windscreen to minimize wind turbulence. The noise survey results for the four locations subsequently identified as NSAs are presented in table 4.11-15.

Table 4.11-15
Ambient Noise Level Survey Results

NSA	Daytime Ambient Noise Level (dBA)	Nighttime Ambient Noise Level (dBA)	24-Hour Ambient Noise Level (dBA)
NSA 1	46.5	44.5	51.3
NSA 2	46.9	45.9	52.5
NSA 6	52.4	47.9	55.3
NSA 9	46.5	43.2	50.3

Key:
dBA = A-weighted decibels
NSA = noise-sensitive area

The most common noise producing activities were noted as vessel traffic along the Mississippi River, construction activities, vehicle traffic along SH 23 and Lake Hermitage Road, and wildlife and birds. At NSA 6, the predominant noise during the day was related to nearby construction. As shown in the table above, the nighttime levels at NSA 6 are more in line with the other NSAs at night than during the day.

4.11.2.3 Construction Noise Impacts and Mitigation

LNG Terminal

Construction activities at the Project site would involve clearing and grading, placement of fill, installation of foundations for the planned Project facilities, other equipment settings, ancillary equipment, piping, and structures. Construction of the Project would cause temporary increases in ambient noise levels in the immediate vicinity of the construction sites. Construction operating hours would be from 7:00 a.m. to 7:00 p.m., Monday through Saturday. Land-based and marine-side pile driving, which is the loudest construction activity, is expected to also occur 6 days per week starting at 7:00 a.m., as well, but would end at 5:00 p.m. It is anticipated that the Project would require nighttime construction at the terminal site during the initial 6 to 12 months. The level of construction-related noise would also vary over the course of the construction period, depending on the construction phase in progress. In water and marine pile driving and the anticipated sound pressure levels effect on marine wildlife is discussed in section 4.6.3.2.

Noise levels resulting from construction equipment are dependent on several factors including the number and type of equipment operating, the level of operation, and the distance between sources and receptors. The loudest equipment during construction would contribute to a composite average or equivalent site noise level. Pile-driving activities are expected to produce the highest level of noise during construction of approximately 110 dBA at 50 feet. The composite noise level of all other heavy equipment that would be used during construction is expected to be approximately 90 dBA. For this EIS, the impacts on NSAs from land-based and marine-side pile driving are being evaluated, since they are the predominant noise-producing activity.

The evaluation of land-based and marine-side pile driving assumed that 12 pile drivers would be operating simultaneously for 16-months, which would be the worst-case scenario, according to Venture Global. Table 4.11-16 reports the predicted noise levels at each of the four NSAs, based on this worst-case scenario in Phase I of construction. Phase II would have the benefit of a constructed floodwall, and thus pile-driving noise levels would be greatly reduced (as compared to Phase I) due to the floodwall's indirect suppression of pressure waves. Venture Global based the predictive modeling on noise emanating from the center of the terminal site because that location would contain the most noise-making construction equipment.

Table 4.11-16
Predicted Noise Levels at NSAs During Pile Driving – Phase I

NSA	Distance from Center of Terminal Site (miles)	Predicted Noise Level L_{MAX} (dBA)
NSA 1	0.90	65.3
NSA 2	0.56	69.9
NSA 6	1.80	58.1
NSA 9	1.80	56.5

Key:
dBA = A-weighted decibels
L_{MAX} = Maximum sound level during a measurement period or noise event.
NSA = noise-sensitive area

A usage factor can be applied to the predicted pile-driving noise level because pile driving is not a constant noise. Venture Global anticipates a usage factor of 20 percent and applies it to the predictive noise levels from pile driving, as shown in table 4.11-17.

Table 4.11-17
Predicted Noise Levels at NSAs During Pile Driving and Applying 20 Percent Usage Factor

NSA	Baseline L_d (dBA)	Predicted Noise Level L_{MAX} (dBA)	Predicted Noise Level L_{MAX} (dBA) with Usage Factor	Increase on Baseline (dBA)
NSA 1	46.5	65.3	58.3	11.8
NSA 2	46.9	69.9	62.9	16.0
NSA 6	52.4	58.1	51.1	-1.3
NSA 9	46.5	56.5	49.5	3.0

Key:
L_{MAX} = Maximum sound level during a measurement period or noise event.
dBA = A-weighted decibels
L_d = daytime equivalent sound level (dBA)
NSA = noise-sensitive area
Lmax = highest sound measured by the sound level meter over a given period of time
Lmax with Usage Factor = highest sound measured by the sound level meter over a given period of time with consideration to Usage Factor for intermittent noise sources.

Noise impacts on NSAs during construction would be temporary and moderate, considering the predicted noise levels from land-based and marine-side pile driving range from 11.8 to 16.0 dBA greater than existing ambient noise levels during daytime hours at the two closest NSAs.

Venture Global has committed to implement mitigation measures to reduce land-based and marine-side pile-driving noise impact on NSAs. Venture Global would construct 5-meter-high noise protection walls around piling rigs for mitigation. As modeled, these noise barriers would reduce the increase of ambient noise levels to 0.4 dBA and 2.2 dBA at the two nearest NSAs. Without this mitigation, the increase above ambient noise levels would range from 11.8 dBA to 16.0 dBA.

While other mitigation measures (e.g., cushion pads) may equally be effective (and thus implemented), this modeling case demonstrates that the use of a noise protection wall near the piling rigs would reduce the noise contribution level to below the Commission's allowance of 10.0 dBA above ambient noise levels. If the noise protection walls are not a feasible option, several other mitigation measures would be considered, such as the following:

- plan construction operations to limit the number of piling rigs striking simultaneously;
- schedule pile-driving activities for LNG Loading Dock No. 1 and the utilities areas so that they would not occur simultaneously (and therefore the piling rigs would not strike simultaneously), because when the rigs are operating at the same time, the noise level at NSA 2 is nearing the allowable limit of ambient noise + 10 dBA allowance; and
- consider other types of piles during detailed design.

Pipeline System

During construction of the pipeline system, noise would be primarily generated by construction equipment, including HDD equipment, and pile installation activities. Noise associated with HDD and pile installation activities are further described below.

HDD construction involves various equipment and activities, including power generation, mobile equipment, and mixing pumps. Different equipment is used on the entry and exit side of the HDD section. Typical equipment used at the HDD entry side includes:

- drilling rig and engine-driven hydraulic power unit;
- engine-driven mud pump(s) and engine-driven generator set(s);
- mud mixing/cleaning equipment and associated fluid systems' shale-shakers;
- mobile equipment, including a crane, forklift, and/or truck(s);
- drill mud and make up tanks; and
- engine-driven lights.

Predicted noise levels at the closest NSA (NSA 2) associated with the HDD at Lake Hermitage Road are presented in table 4.11-18.

Table 4.11-18
Predicted Noise Level from Lake Hermitage Road HDD at NSA 2

HDD Site	Distance to NSA 2	Ambient Noise Level	Predicted L_{dn} of HDD (dBA)	Predicted L_{dn} HDD + Ambient L_{dn} (dBA)	Potential Change in Noise Level (dBA)
HDD Entry Site	1,610 feet	46.4	59.5	59.7	13.3
HDD Exit Site	1,925 feet	46.4	46.0	49.2	2.8

Key:
dBA = A-weighted decibels
HDD = horizontal directional drill
L_{dn} = day-night average sound level
NSA = noise-sensitive area

To minimize impacts on NSAs from HDD operations, Venture Global proposes to implement a sound curtain enclosure or acoustic barrier as necessary. Sound curtain enclosures would be used around the drilling rig and other stationary equipment during the HDD process. Sound curtain enclosures have been shown to provide 10 to 14 dBA of mitigation. To obtain a conservative estimate of the noise levels, it is assumed that 10 dBA of mitigation would be provided due to the sound curtain enclosure. Sound enclosures or acoustic barriers could also be used during dredging activities if nearby structures are occupied during barge access channel dredging.

Impacts associated with pipeline HDD and dredging activities would be temporary and minor at NSAs and PNRs. Further implementation of sound curtains or acoustic barriers, as necessary, would further minimize this temporary impact.

To insure that potential noise impacts on nearby NSAs are minimized to the extent practical, **we recommend that:**

- **<u>Prior to beginning the HDD at Lake Hermitage Road</u>, Gator Express Pipeline should file with the Secretary, for the review and written approval by the Director of OEP, an HDD noise mitigation plan for the crossing to reduce the projected noise level attributable to the proposed drilling operations at the nearby NSA. During drilling operations, Venture Global should implement the approved plan, monitor noise levels, and make all reasonable efforts to restrict the noise attributable to the drilling operations to no more than an L_{dn} of 55 dBA at the NSA.**

The pipe bridge that would be constructed north of Lake Hermitage Road would be used to traverse an existing non-federal levee. Two NSAs are located within 1 mile of pile installation activities associated with the pipe bridge at respective distances of approximately 3,900 and 1,600 feet. Construction activities at the pipe bridge would generally occur during the daytime and would occur over a period of 20 days involving 18 piles. Pile installation would involve an auger type drill rig instead of an impact rig as discussed in LNG terminal construction. An auger drill rig has an Lmax of 85 dBA at a distance of 50 feet. Use of an auger drill for pipe bridge pile installation would be estimated to produce a noise level of 54.3 dBA at NSA 2, located approximately 1,713 feet to the west. This would be a 7.9 dBA increase during daytime ambient noise levels.

Additional noise produced during pipeline construction would come from installation of piles for the metering stations and dredging along the barge access routes. Although no NSAs are within 0.5 mile of a proposed metering station, pile installation would create greater noise levels for possible boaters nearby. However, Venture Global anticipates that piles would be installed via a vibratory process for metering stations that produces less noise than impact pile driving.

Venture Global anticipates no dredging within the Mississippi River is needed and, therefore, NSAs near the terminal site would not be affected by dredging activities. However, during construction of the pipeline system, Venture Global would require water access to the construction site for barges and other vessels involved in dredging, pipe laying, equipment and materials deliveries, and spoil storage. Barge access to the work area would follow existing waterways, and the majority of the system is sufficiently deep (at least 8 feet) to allow free passage; however, some dredging would be required in four areas, totaling 8.9 miles, to facilitate access.

The nearest PNR to the areas to be dredged is a structure within a coastal marshland located approximately 265 feet south of Barge Access Channel No. 2. Approximately 24 additional structures are located near this structure but farther away along the Wilkinson Canal. These structures are vacation/seasonal homes accessible only by water and are considered NSAs. However, as a conservative measure, dredging noise levels at the nearest structure were evaluated for this EIS.

Dredging activities are anticipated to occur only during the daytime and are estimated to last for 1 month (17 days for excavation and 11 days for backfill). Dredging of the channel is expected to be required to support construction of both pipeline laterals, resulting in two separate dredging events. It is estimated that the dredging noise level (24-hour Leq) would be 84 dBA at a distance of 50 feet for this type of activity (FERC, 2002). This corresponds to a daytime sound level of 65.7 dBA at the nearest structure. The distance at which the noise related to dredging activities decreases to 55.0 dBA is approximately 900 feet. There are ten structures within a 900-foot radius of dredging activities.

Pipeline construction and dredge barge operation would be audibly noticeable at the nearest NSAs (in relation to the specific construction activity). Venture Global has committed to mitigation measures that would reduce noise from construction equipment to within acceptable thresholds. Furthermore, the recommendation made in this section regarding the HDD ensure noise impacts would not be significant during the pipeline system construction.

4.11.2.4 Operational Noise Impacts and Mitigation

LNG Terminal

Operation of the LNG terminal would produce noise on a continuous basis, but is expected to remain within applicable FERC limits. The primary noise-generating sources would be:

- steam power generation;
- fan-driven air-cooled heat exchangers;
- LNG refrigerant compressor electric motor drive units;
- mixed refrigerant and boil-off gas (BOG) compressor units;
- power plant electric generation units;
- inlet and discharge piping;
- expander units;
- packaged items; and
- LNG carriers.

Additionally, during the scoping period, one comment was received to address noise generated from flaring activities during normal LNG terminal operation. After initial facility start-up, during which flaring would occur, the LNG terminal is designed to limit flaring events only to LNG carrier gas up/cool down operations, which may occur up to 40 times a year. Due to the nature of the operations, the vapor routed to the marine loading flare (a low pressure flare) would be discharged at a low exit velocity. Consequently, Venture Global does not anticipate such flaring events would have noise impacts on NSAs during facility operation. Thus, flaring is not listed above as a noise generating activity.

We require that the noise attributable to the operation of a newly constructed facility must not exceed an Ldn of 55 dBA at any pre-existing NSA. The predicted noise levels due to LNG terminal operation at NSAs are listed in table 4.11-19. The predicted contribution from LNG terminal operation (Ldn 55.0 dBA) meets FERC's contribution threshold (Ldn 55.0 dBA) with implementation of mitigation measures, as discussed below.

Table 4.11-19
Predicted Noise Levels at NSAs from Terminal Operation

NSA	Ambient Noise Level L_{dn} (dBA)	Predicted L_{dn} of Terminal Operation (dBA)	Predicted L_{dn} Relative to FERC Threshold L_{dn} 55 (dBA)	Ambient L_{dn} + Predicted L_{dn} of Terminal (dBA)
NSA 1	51.3	51.6	-3.4	54.6
NSA 2	52.5	55.0	0.0	57.0
NSA 6	55.3	43.1	-0.9	55.5
NSA 9	50.4	50.8	-4.6	53.8

Key:
dBA = A-weighted decibels
FERC = Federal Energy Regulatory Commission
HDD = horizontal directional drill
L_{dn} = day-night average sound level
NSA = noise-sensitive area

Specifically, blowdowns associated with steam generation in the power island would have the greatest potential to affect NSAs during normal operation of the LNG terminal. Venture Global anticipates 5 to 25 blowdown events per year as a result of routine maintenance and/or planned shutdowns and restarts of the heat recovery steam generators. Other potential blowdown events associated with forced outages (equipment- or weather-based) are expected to be infrequent, with less potential impact on NSAs.

Each vent outlet associated with the heat recovery steam generators would be equipped with a silencer in order to limit the sound power level to a maximum of 115 dBA during blowdown events. The blowdown stack is closest to NSA 2 at approximately 2,300 feet. The sound level produced by this vent would be approximately 50 dBA at NSA 2, which is the closest NSA. Noise impacts on NSAs located farther away from blowdown stack would be less.

Venture Global plans to implement the following mitigation measures to reduce noise levels emanating from the LNG terminal during normal operations:

- liquefaction air coolers reduced to sound power level of 88 dBA per fan;
- elastomeric foam Class D mixed refrigerant compressor piping insulation;
- mixed refrigerant compressor blankets;
- steam turbine duct insulation D; and

- heat recovery steam generators would be equipped with silencers to limit the sound power level to a maximum of 115 dBA during blowdown events.

To ensure the above proposed and implemented mitigation measures reduce noise levels from LNG Terminal operations, including flaring events, to an acceptable level, **we recommend that:**

- **No later than 60 days after placing Phase I into service, Plaquemines LNG should file a full power load noise survey with the Secretary for the LNG terminal. If the noise attributable to operation of the equipment at the LNG terminal exceeds an L_{dn} of 55 dBA at the nearest NSA, within 60 days Plaquemines 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. Plaquemines LNG should 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.**

We also recommend that:

- **No later than 60 days after placing the entire LNG terminal into service, Plaquemines LNG should file a noise survey with the Secretary. If a full load condition noise survey is not possible, Venture Global should provide an interim survey at the maximum possible horsepower load within 60 days of placing the LNG terminal into service and provide the full load survey within 6 months. If the noise attributable to operation of the equipment at the LNG terminal exceeds an L_{dn} of 55 dBA at the nearest NSA under interim or full horsepower load conditions, Plaquemines LNG should 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. Plaquemines LNG should 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.**

With implementation of these noise reducing mitigation efforts, it is determined that operation of the LNG terminal would not exceed an Ldn 55.0 dBA at all NSAs. Nearby residents would hear operational activities, especially flaring/venting events, but the overall impacts would not be significant.

Pipeline System

The pipeline system would include new meter stations. There are no known NSAs or other PNRs within 0.5 mile of the proposed meter station locations. Because noise related to the metering station would be limited to construction, it is unlikely that the existence of the new facilities would markedly alter existing noise levels. Currently, Venture Global has not proposed mitigation measures to reduce the potential of elevated noise levels resulting from new meter station operation. Based on all available data, we do not anticipate an impact from elevated noise levels from pipeline system operation on any NSAs.

4.12 RELIABILITY AND SAFETY

4.12.1 LNG Terminal 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 LNG facilities and the operator's approach to risk management. The safety, security, and reliability of Plaquemines LNG's Project would be regulated by the DOT, USCG, and FERC.

In February 2004, the DOT, the 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 carrier vessel 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, 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 siting, design, construction, and operation. All three agencies have some oversight and responsibility for the inspection and compliance during the LNG facility'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 onshore LNG facilities under the Natural Gas Pipeline Safety Act (49 U.S.C. 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 U.S.C. 60101 et seq.), and 49 CFR 192. On August 31, 2018, DOT and FERC signed a Memorandum of Understanding (MOU) regarding methods to improve coordination throughout the LNG permit application process for FERC jurisdictional LNG facilities. In the MOU, DOT agreed to issue an 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 DOT's continuing authority and responsibility over a 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 Project. If the Project is authorized and constructed, the LNG facilities, as defined by 49 CFR 193, 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 over security plans for the waterfront facilities handling LNG and LNG marine traffic. The USCG regulations for water front facilities handling LNG are codified in 33 CFR 105 and 33 CFR 127. As a cooperating agency, the USCG assists 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 33 CFR 127. If the facilities are constructed and become operational, the waterfront facilities handling LNG 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 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 mitigations for the Commission to consider in the order. If the facilities are approved and the mitigations 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, FERC and the DoD (http://www.ferc.gov/legal/mou/mou-dod.pdf) entered into a MOU formalizing this process. In accordance with the MOU, FERC sent a letter to the DoD on April 1, 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 June 4, 2018, FERC received a response letter from the DoD Siting Clearinghouse stating that the Plaquemines LNG facility would have a minimal impact on military training and operations conducted in the area.

4.12.2 DOT Safety Regulatory Requirements and 49 CFR 193 Subpart B Determination

Siting LNG facilities 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 Plaquemines LNG to identify how the proposed design complies with the siting requirements of 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.[4]

DOT reviews the information and criteria submitted by Plaquemines LNG to demonstrate compliance with the safety standards prescribed in 49 CFR 193, Subpart B and issues an LOD to the Commission on whether the proposed facilities would meet the DOT siting standards. The LOD will evaluate the hazard modeling results and endpoints used to establish exclusion zones, as well as Plaquemines 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 the surrounding public. The LOD will serve as one of the considerations for the Commission to deliberate in its decision to authorize, with or without conditions, or deny an application.

The requirements in 49 CFR 193, Subpart B state that an operator or government agency must exercise legal control over the activities as long as 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 CFR193 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 American Society of Civil Engineers (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 lessor wind speed is justified or the most critical combination of wind velocity and duration for a 10,000-year mean return interval.

[4] 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 carrier and the last manifold or valve immediately before a storage tank.

As stated in 49 CFR 193.2051 under Subpart B, 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) 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.[5]

Taken together, 49 CFR 193 Subpart B and NFPA 59A (2001) require that flammable LNG vapors either from an LNG tank withdrawal impoundment or 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 three radiant heat flux levels which must be considered for LNG storage tank spills for as long as the facility is in operation:

- 1,600 Btu/ft^2-hr - This level can extend beyond the plant property line that can be built upon but cannot include areas that are used for outdoor assembly by groups of 50 or more persons; [6]

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[5] 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).

[6] The 1,600 Btu/ft^2-hr flux level is associated with producing pain in less than 15 seconds, first degree burns in 20 seconds, second degree burns in approximately 30-40 seconds, 1 percent mortality in approximately 120 seconds, and 100 percent mortality in approximately 400 seconds, assuming no shielding from the heat, and is typically the maximum allowable intensity for emergency operations with appropriate clothing based on average 10-minute exposure.

- 3,000 Btu/ft^2-hr - This level can extend beyond the plant property line that can be built upon but cannot include areas that contain assembly, educational, health care, detention or residential buildings or structures; [7] and

- 10,000 Btu/ft^2-hr - This level cannot extend beyond the plant property line that can be built upon. [8]

The requirements for design spills from process or transfer areas are more stringent. For LNG spills, the 1,600 Btu/ft^2-hr flux level cannot extend beyond the plant property line onto a property that can be built upon.

In addition, NFPA 59A (2001) Section 2.1.1 requires that factors applicable to the specific site with a bearing on the safety of plant personnel and 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 be considered to comply with part 193 Subpart B.[9]

On December 29, 2017, Plaquemines LNG provided the DOT with information related to the requirements in 49 CFR 193. In accordance with the August 31, 2018, MOU, DOT will issue a LOD to the Commission after DOT completes its analysis of whether the proposed facilities would meet the DOT siting standards. The LOD will evaluate the hazard modeling results and endpoints used to establish exclusion zones, as well as Plaquemines 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 the 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.

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 Project. If the facilities are approved

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7 The 3,000 Btu/ft^2-hr flux level is associated with producing pain in less than 5 seconds, first degree burns in 5 seconds, second degree burns in approximately 10-15 seconds, 1 percent mortality in approximately 50 seconds, and 100 percent mortality in approximately 180 seconds, assuming no shielding from the heat, and is typically the critical heat flux for piloted ignition of common building materials (e.g., wood, PVC, fiberglass, etc.) with prolonged exposures.

8 The 10,000 Btu/ft^2-hr flux level is associated with producing pain in less than 1 seconds, first degree burns in 1 seconds, second degree burns in approximately 3 seconds, 1 percent mortality in approximately 10 seconds, and 100 percent mortality in approximately 35 seconds, assuming no shielding from the heat, and is typically the critical heat flux for unpiloted ignition of common building materials (e.g., wood, PVC, fiberglass) and degradation of unprotected process equipment after approximate 10 minute exposure and to reinforced concrete after prolonged exposure.

9 The US DOT PHMSA's "LNG Plant Requirements: Frequently Asked Questions" item H1, https://www.phmsa.dot.gov/pipeline/liquified-natural-gas/lng-plant-requirements-frequently-asked-questions, accessed August 2018.

and constructed, Plaquemines LNG must comply with the requirements of 49 CFR Part 193 Subpart B and will be subject to DOT's inspection and enforcement programs.

4.12.3 USCG Regulatory Requirements and Letter of Recommendation

4.12.3.1 LNG Carrier Historical Record

Since 1959, LNG carriers have transported LNG without a major release of cargo or a major accident involving an LNG carrier. There are more than 370 LNG carriers 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 carrier arrivals at terminals in the U.S. For more than 40 years, LNG carrier 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 carriers, including minor collisions with other vessels of all sizes, groundings, minor LNG releases during cargo unloading operations, and mechanical/equipment failures typical of large vessels. Some of the more significant occurrences, representing the range of incidents experienced by the worldwide LNG carrier 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 carrier 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 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 carrier crew extinguished the fire and the LNG carrier completed unloading.

- **Khannur** had a cargo tank overfill into the 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 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 carrier, 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 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 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 marine vessels 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 tanker 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 carrier 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.

4.12.3.2 LNG Carrier Regulatory Oversight

The USCG exercises regulatory authority over LNG carriers under 46 CFR 154, which contains the United States safety standards for LNG carriers carrying LNG in bulk. The LNG carriers visiting the facility would also be constructed and operated in accordance with the 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 carriers 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 marine vessels) or a USCG Certificate of Compliance (for foreign flag marine vessels). These documents certify that the marine vessel is designed and operating in accordance with both international standards and the U.S. regulations for bulk LNG carriers under Title 46 CFR 154.

The LNG carriers that would deliver or receive LNG to or from the facility 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 carriers, as well as other cargo marine vessels 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 ship security alert system. These alarms transmit ship-to-shore security alerts identifying the marine vessel, its location, and indication that 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 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 carriers 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 U.S.C. Section 191); the Ports and Waterways Safety Act of 1972, as amended (33 U.S.C.

Section 1221, et seq.); and the MTSA of 2002 (46 U.S.C. Section 701). The USCG is responsible for matters related to navigation safety, LNG carrier 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 facility security plan review, approval, and compliance verification as provided in 33 CFR 105.

The USCG regulations in 33 CFR 127 apply to the marine transfer area of waterfront facilities between the LNG carrier and the last manifold or valve immediately before the receiving tanks. 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, emergency shutdown, gas detection, and fire protection, must comply with the regulations in 33 CFR 127. Under 33 CFR 127.019, Plaquemines 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 Preliminary WSA to the COTP with the LOI.

The Preliminary WSA provides an initial explanation of the port community and the 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 carrier 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 waterfront facilities handling LNG, the LNG carrier 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 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 carriers 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.

- 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 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 carrier'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 carriers 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 carriers 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.

4.12.3.3 Plaquemines LNG's Waterway Suitability Assessment

On June 17, 2015, Plaquemines LNG submitted a Letter of Intent to the COTP, Sector New Orleans to notify the USCG that it proposed to construct an LNG export terminal. On June 18, 2015, Plaquemines LNG submitted a Preliminary WSA to the COTP, Sector New Orleans. In the development of the Follow-On WSA, Plaquemines LNG consulted with the USCG and port stakeholders. Plaquemines LNG submitted the Follow-On WSA to the USCG on May 12, 2016.

4.12.3.4 LNG Carrier Routes and Hazard Analysis

As described in Plaquemines LNG's WSAs, an LNG carrier's transit to the terminal would begin in the Gulf of Mexico. The LNG carrier would travel approximately 90 miles in the Gulf of Mexico and the Lower Mississippi River to the LNG terminal. LNG carriers 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 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 carriers would be required to maintain voice contact with controllers and check in on designated frequencies at established waypoints.

The transit of an LNG carrier from the Gulf of Mexico up the Lower Mississippi River to the LNG terminal would be approximately 90 miles. Pilots would board the LNG carrier and be responsible for the passage of the LNG carrier throughout its entire transit. During the transit, the LNG carrier would pass by the towns and incorporated areas of Pilottown, Venice, Boothville-

Venice, Triumph, Buras, Empire, Port Sulphur, Bohemia, Pointe a la Heche, and Davant. The LNG carrier would also pass by several schools during its transit to the LNG terminal: the South Plaquemines High School, the South Plaquemines Elementary School, the McBride School, and the Saint Jude School.

NVIC 01-11 references the "Zones of Concern" for assisting in a risk assessment of the waterway. As LNG carriers proceed along the intended transit route, Hazard Zone 1 would encompass coastal areas along the Mississippi Delta, up through Port Sulphur, Bohemia, and Davant. Hazard Zone 2 would encompass a wider swath of coastal areas along the Mississippi Delta, up through Port Sulphur, Bohemia, and Davant. Hazard Zone 3 would encompass an even larger portions coastal areas along the Mississippi Delta, up through Port Sulphur, Bohemia, and Davant.

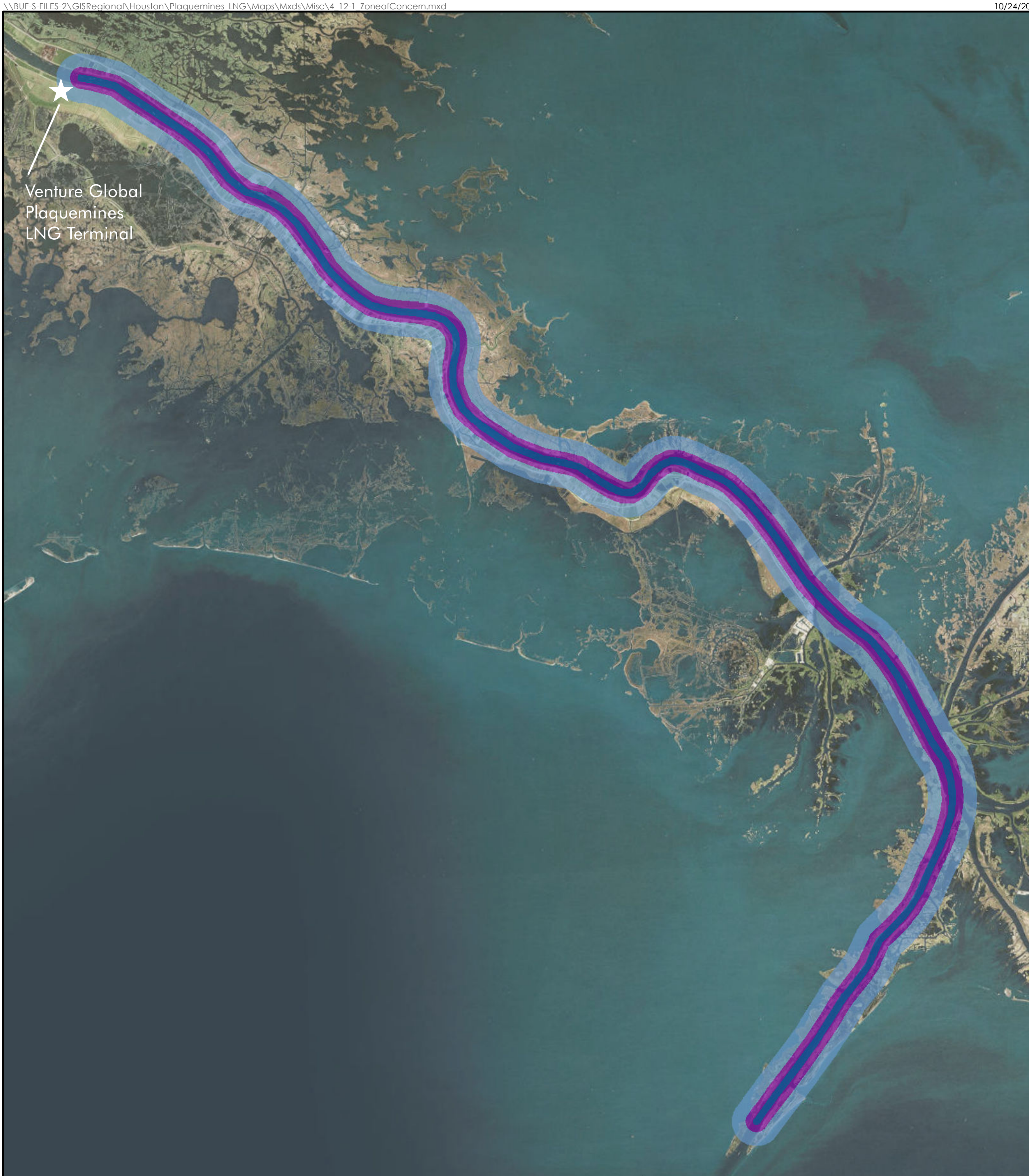
The areas impacted by the three different hazard zones are illustrated for both accidental and intentional events in figures 4.12-1 and 4.12-2, respectively.

4.12.3.5 Coast Guard Letter of Recommendation and Analysis

In a letter dated January 23, 2017, the USCG issued an LOR to FERC stating that the Lower Mississippi River be considered suitable for accommodating the type and frequency of LNG marine traffic associated with this Project. The recommendation was based on full implementation of the strategies and risk management measures identified to the USCG by Plaquemines LNG in its WSA.

Although Plaquemines LNG has suggested mitigation measures for responsibly managing the maritime safety and security risks associated with LNG marine 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. Accordingly, Plaquemines LNG is required to submit a report to the USCG identifying any changes in conditions, such as changes to the port environment, the LNG facility, or the LNG carrier route, that would affect the suitability of the waterway. Accordingly, Plaquemines LNG submitted its annual WSA update on January 23, 2018 and the USCG responded on March 5, 2018, stating the annual review met the requirements of 33 CFR 127.007(h)(1).

The USCG's LOR is a recommendation, regarding the current status of the waterway, to FERC, the lead agency responsible for siting the on-shore LNG facility. Neither the USCG nor FERC has authority to require waterway resources of anyone other than the applicant under any statutory authority or under the Emergency Response Plan (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 are necessary to safeguard the public health and welfare, critical infrastructure and key resources, the port, the marine environment, and the LNG carrier.



Accidental Sandia "Zone of Concern 1" (0 - 250m)
Accidental Sandia "Zone of Concern 2" (250 - 750m)
Accidental Sandia "Zone of Concern 3" (750 - 1700m)

N W E S

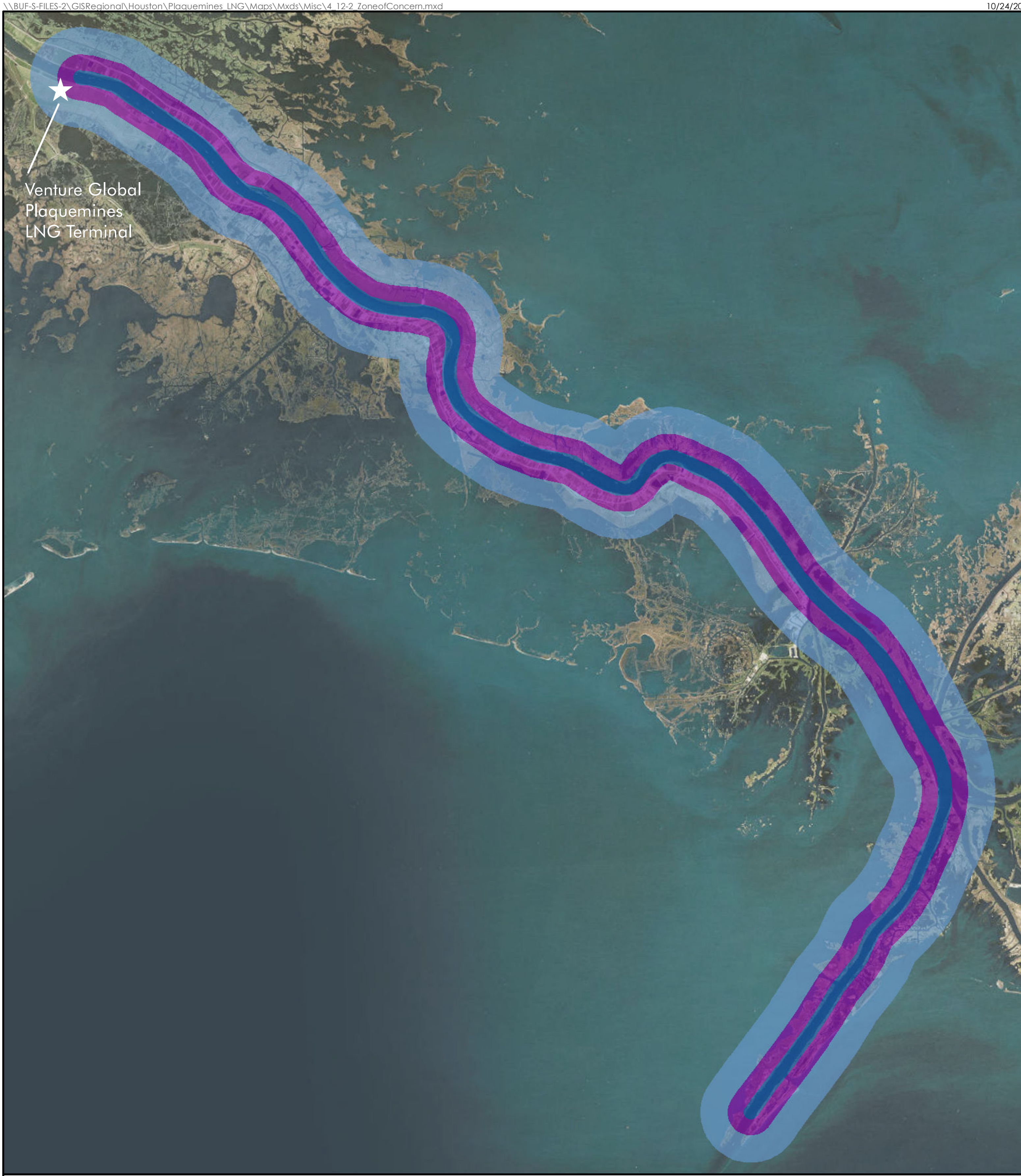
0 2.5 5 10 Miles

Figure 4.12-1
Accidental Sandia
"Zones of Concern"
Along LNG Transit Route

Plaquemines Parish,
Louisiana

ecology and environment, inc.
International Specialists in the Environment

Source: DigitalGlobe 2017, USGS 2018



Intentional Sandia "Zone of Concern 1" (0 - 500m)
Intentional Sandia "Zone of Concern 2" (500 - 1600m)
Intentional Sandia "Zone of Concern 3" (1600 - 3500m)

N W E S

0 2.5 5 10 Miles

Figure 4.12-2
Intentional Sandia
"Zones of Concern"
Along LNG Transit Route

Plaquemines Parish,
Louisiana

ecology and environment, inc.
International Specialists in the Environment

Source: DigitalGlobe 2017, USGS 2018

Under the Ports and Waterways Safety Act, the Magnuson Act, the MTSA, and the Safety and Accountability for Every Port Act, the COTP has the authority to prohibit LNG transfer or LNG carrier 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 carrier 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.

4.12.3.6 LNG Terminal Facility Security Regulatory Requirements

The security requirements for the proposed Project are governed by 33 CFR 105, 33 CFR 127, and 49 CFR 193 Subpart J. Title 33 CFR 105, as authorized by the Marine Transportation Security Act, requires all terminal owners and operators to submit a Facility Security Assessment (FSA) and a Facility Security Plan (FSP) to the USCG for review and approval before commencement of operations of the proposed Project facilities. Plaquemines LNG would also 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. Some of the responsibilities of the applicant include, but are not limited to:

- Designating a Facility Security Officer with a general knowledge of current security threats and patterns, security assessment methodology, LNG carrier 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 carrier stores and bunkers, and monitoring; ensuring that the TWIC program is properly implemented;

- Ensuring coordination of shore leave for LNG carrier personnel or crew change out as well as access through the facility for visitors to the LNG carrier;
- 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. In addition, an LNG facility regulated under 33 CFR 105 and 33 CFR 127 would be subject to the Transportation Worker Identification Credential (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 Transportation Worker Identification Credential 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 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 onshore component of LNG terminals, 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.

If the 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.

Plaquemines LNG provided preliminary information on these security features and indicated additional details would be completed in the final design demonstrating lighting coverage adequately cover the interior and perimeter of the site, including in liquefaction blocks, oily water treatment plant area, exterior of buildings, and along paths/roads of access and egress; demonstrate camera coverage adequately cover interior of plant, including a camera be provided at the top of each LNG storage tank; provide details of fencing or equivalent at road crossing that demonstrates it would restrict and deter access; demonstrate fencing set back from exterior power lines and trees and from interior hazardous piping and equipment by at least 10 feet; provide vehicle barriers and design details at controlled access points; and provide additional details on these security features and others in final design for review and approval. 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.

4.12.4 FERC Engineering and Technical Review of the Preliminary Engineering Designs

4.12.4.1 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.[10] 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 LNG facilities, we also evaluate the preliminary and final specifications for suitable materials of construction and for the 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 leak 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 FERC, lessons learned from the 1979 Cove Point accident lead 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 facilities that have electrical seal interfaces, we evaluated the preliminary designs and recommend in section 4.12.5 that Plaquemines 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 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. 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 the LNG terminal, we evaluated the preliminary design for mitigation of flammable vapor dispersion and ignition in buildings and combustion equipment to ensure they would be adequately covered by hazard detection equipment that could isolate and

[10] 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.

deactivate any combustion equipment whose continued operation could add to or sustain an emergency. We also recommend in section 4.12.5 that Plaquemines 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[11]. 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 onsite 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 startup after it passed through the gas heater at full operating pressure and temperature. To ensure that this potential hazard would be addressed, we recommend in section 4.12.5 that Plaquemines 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 4.12.5 that Plaquemines LNG provide, for review and approval, its 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 startup and shutdown. Also, in order to prevent other sources of projectiles from affecting occupied buildings and storage tanks, we recommend in section 4.12.5 that Plaquemines 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.

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 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.

[11] 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.

The primary concerns are those events that could lead to a hazardous release of sufficient magnitude to create an offsite hazard or interruption of service. In general, we consider 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 offsite public. These layers of protection are generally independent of one another so that any one layer would perform its function regardless of the initiating event or action, 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
- Onsite and offsite 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 offsite public. The review of the engineering design for these layers of protection are initiated in the application process and carried through to the next phase of the Project in final design if authorization is granted by the Commission.

The reliability of these layers of protection are informed by occurrence and likelihood of root causes of past incidents and the potential severity of consequences based on past incidents and validated hazard modeling. As a result of a preliminary engineering review, FERC staff will provide any suggested mitigation(s) to the Commission for consideration to include as requirements in the order. If a facility is authorized and recommendations are adopted as conditions to the order, FERC staff will continue its engineering review through final design, construction, and operation.

4.12.4.2 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 H_2S, CO_2, water, and heavy hydrocarbons. Most other designs would also propose a mercury removal system to safeguard their equipment and reduce the likelihood of potential losses of containment because mercury can react with damaging effects with downstream aluminum heat exchangers. While Plaquemines LNG expects the feed gas to be mercury free and mercury concentrations have been generally low in the U.S., mercury concentrations can still exceed typical specified mercury concentration limits for liquefaction facilities and no specific tests for mercury have been carried out to support that mercury does not currently exist in their proposed feed gas sources. Plaquemines LNG proposes to provide space and connections for a future mercury removal unit. To ensure these provisions are provided and feed gas mercury concentrations are monitored, we recommend in section 4.12.5 that Plaquemines LNG provide a means to limit mercury concentrations to less than 0.01 micrograms per normal cubic meter or alternatively provide monitoring for mercury by means of an analyzer or preventative maintenance inspections of the heat exchangers with provisions for a mercury removal package. The inlet gas would be conditioned to remove solids and water droplets prior to entering feed gas pretreatment processes. Once the inlet gas is conditioned, the feed gas would enter a knockout (KO) drum before flowing to a booster compressor. If the inlet gas pressure is sufficient, the booster compressor would be bypassed and the feed gas would flow through a feed gas heater to ensure the feed gas is an appropriate temperature prior to entering the non-regenerative H_2S removal beds to remove most of the H_2S. The feed gas would then contact an amine-based solvent solution in the acid gas absorber column to remove acid gas (i.e., CO_2 and trace amounts of H_2S carried over from the H_2S removal beds). Once the acid gas components accumulate in the amine solution, it is routed to an amine regenerator column where acid gas is released 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, trace amounts of H_2S, and trace amounts of hydrocarbons would be incinerated. The treated feed gas exiting the acid gas absorber column then enters the dehydration unit where a dryer inlet separator would recover bulk water and recycle it to the acid gas absorber column. After the dryer inlet separator, any remaining water in the feed gas would be removed in regenerative molecular sieve beds. During the molecular sieve bed regeneration process, the regeneration gas would remove water from the molecular sieve and would be routed to the acid gas absorber column. The treated gas would then flow to the liquefaction unit.

The Project proposes to install 36 liquefaction trains (2 trains per liquefaction block), each consisting of a brazed aluminum heat exchanger (BAHX). Heavy hydrocarbon removal would be integrated into the liquefaction process. In the initial BAHX pass, the treated feed gas would be precooled and would flow into a separator to remove the liquids. The vapor portion from the separator would reenter the BAHX and would be desuperheated, condensed, and sub-cooled into LNG. The liquid portion from the separator would flow into the debutanizer to further separate the condensate product (C4+) from the lighter hydrocarbons. The liquid condensate product within the debutanizer would be sent to the condensate system and the lighter hydrocarbons would be returned to the BAHX where it would also be desuperheated, condensed, and sub-cooled into LNG. The condensate product would be sent to the condensate surge drum where the condensate vapors would be directed to the hot oil furnace fuel gas system and the condensate liquids would be vaporized and directed into the fuel gas system. The LNG exiting the BAHX would flow to the LNG flash vessel before being routed to the 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 thermal exchange process driven by a single mixed refrigerant process comprised of a mixture of nitrogen, methane, ethylene, propane, and i-pentane. Methane would be provided from the BOG system and the other refrigerants required for the liquefaction process would be delivered as a liquid by truck and stored onsite for initial filling and use, as needed, for make-up.

After cooling the natural gas into its liquid form, LNG would be routed to and stored in four full-containment LNG storage tanks. During export operations, LNG stored within the LNG storage tanks would be sent out through multiple 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). The LNG would flow through a marine transfer line and multiple liquid marine transfer arms connected to a LNG carrier. In order to keep the marine transfer line cold between LNG export cargoes, a recirculation line would be provided so that the marine transfer line would not have to be cooled down prior to every LNG carrier loading operation. The LNG transferred to the LNG carriers would displace vapors from the LNG carriers, which would be sent back through a vapor marine transfer arm and vapor return line to the BOG header. Once loaded, the LNG carrier 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 be routed to the fuel gas system. 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, steam, nitrogen, and power generation. Hot oil would be used to provide the heat to the inlet feed gas heater, amine regenerator reboilers, regeneration gas heaters, debutanizer reboilers, condensate vaporizers, and fuel gas heaters. There would be three flare systems: warm (wet), cold (dry), and low pressure flares. Each system would be routed to a separate flare stack and would be designed to handle the vent gases from the process areas. Diesel would be stored in a dedicated tank to supply the backup power generators as well as in double walled daytanks for each diesel firewater pump. Gas turbine generators would provide electric power to the site. In addition, aqueous ammonia would be used in the selective catalytic removal process to reduce the NOx emissions created during power generation. Liquid nitrogen vaporizers would be used to supply gaseous nitrogen for various uses in the plant including pre-commissioning, start-up, and refrigerant make-up.

The failure of process equipment could pose potential harm if not properly safeguarded through the use of appropriate engineering controls and operation. Plaquemines 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. Plaquemines LNG would develop facility operation procedures after completion of the final design; this timing is fully consistent with accepted industry practice. We recommend Plaquemines LNG 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 also recommend in section 4.12.5 that Plaquemines 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 will 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 4.12.5 that Plaquemines LNG tag and label instrumentation and valves, piping, and equipment and providing car-seals/locks to address human factor considerations and improve facility safety and prevent incidents. We also recommend in section 4.12.5 that Plaquemines LNG develop and implement an alarm management program, for review and approval to ensure the effectiveness of the alarms. FERC staff will 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. The Project would have a plant-wide ESD system to initiate closure of valves and shutdown of the process during emergency situations. Furthermore, each Liquefaction block would have the individual shutdown capability to address local emergency conditions. Safety-instrumented systems would comply with ISA Standard 84.01 and other recommended and generally accepted good engineering practices. We recommend in section 4.12.5 that Plaquemines LNG file information, for review and approval, on the final design, installation, and commissioning of instrumentation and emergency shutdown equipment to ensure appropriate cause-and-effect alarm or shutdown logic and enhanced representation of the emergency shutdown system in the plant control room and throughout the plant.

In developing the FEED, Plaquemines LNG conducted a hazard identification review to identify potential hazards (both safety and environmental) associated with the facility location, site layout, process design, marine operations, simultaneous operations, and construction. In the application, Plaquemines LNG stated that a preliminary process hazard review was under development and would be submitted at a later date. However, this review has not been submitted. Therefore, we recommend in section 4.12.5 that Plaquemines LNG provide a preliminary process hazard review for review prior to the end of the draft EIS comment period.

A more detailed hazard and operability review (HAZOP) analysis would be performed by Plaquemines LNG 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 4.12.5 that Plaquemines LNG file the HAZOP study on the completed final design for review and approval. We will 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 4.12.5 that Plaquemines LNG file the resolutions of the recommendations generated by the HAZOP review so that FERC staff can monitor these resolutions. 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. Plaquemines 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. We also recommend in section 4.12.5 that Plaquemines LNG file all changes to their FEED for our review and approval. However, major modifications could require an amendment or new proceeding.

If the Project is authorized and constructed, Plaquemines LNG would install equipment in accordance with its design. We recommend in section 4.12.5 that the Project facilities be subject to construction inspections and that Plaquemines 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 4.12.5 that Plaquemines LNG provide semi-annual reports that include abnormal operating conditions and facility modifications. Furthermore, we recommend in section 4.12.5 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 sendout conditions, do not exceed the original basis of design.

4.12.4.3 Mechanical Design

Plaquemines LNG provided codes and standards for the design, fabrication, construction and installation of piping and equipment and specifications for the facility. The design specifies materials of construction and ratings suitable for the pressure and temperature conditions of the process design. Piping would be designed, fabricated, assembled, erected, inspected, examined, and tested in accordance with the ASME Standards B31.1, B31.3, B31.8, B36.10, and B36.19M. Valves and fittings would be designed to standards and recommended practices such as API Standards 594, 598, 600, 602, 607, and 609; ASME Standards B16.5, B16.9, B16.10, B16.11, B16.20, B16.21, B16.25, B16.34, B16.47, B16.48; and ISA Standard 75.08.01. 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 edition), as incorporated by 49 CFR 193, Subparts C, D, and E. Portions of the facility regulated under 33 CFR 127 for the marine transfer system, including piping, hoses, and loading arms 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.

LNG storage tanks must be design, fabricated, tested, and inspected in accordance with 49 CFR 193, Subpart D, NFPA 59A (2001), and API 620. In addition, Plaquemines LNG would design, fabricate, test, and inspect the full containment LNG storage tanks in accordance with API 625 and ACI 376. Other low-pressure storage tanks such as the amine, and condensate storage tanks, would be designed, inspected, and maintained in accordance with the API Standards 650 and 653. Concrete LNG storage tanks would also be designed in accordance with ACI 376. All LNG storage tanks would also include boil-off gas compression to prevent the release of boil-off to the atmosphere in accordance with NFPA 59A (2001) for an inherently safer design. Heat exchangers would be designed to ASME BPVC Section VIII standards; API Standards 530, 660, and 661; and the Tubular Exchanger Manufacturers Association standards. Rotating equipment would be designed to standards and recommended practices, such as API Standards 610, 611, 612, 613, 614, 616, 617, 618, 619, 670, 671, 672, 675, and 682; 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, and 2000; and other recommended and generally accepted good engineering practices. In addition, we recommend in section 4.12.5 Plaquemines 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, Plaquemines LNG would install equipment in accordance with its design and FERC staff would verify equipment nameplates to ensure equipment is installed based on approved design and conduct construction inspections including reviewing quality assurance and quality control plans to ensure construction work is performed according to Project specifications, procedures, codes and standards. We recommend in section 4.12.5 Plaquemines LNG provide semi-annual reports that include equipment malfunctions and abnormal maintenance activities. In addition, we recommend in section 4.12.5 that the Project facilities be subject to inspections throughout the life of the facility to verify that the plant equipment is properly maintained.

4.12.4.4 Hazard Mitigation Design

If operational control of the facilities were lost and operational controls and emergency shutdown systems failed to maintain the 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 (2001). As required by 49 CFR 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, emergency shutdown and depressurizing systems, and emergency response equipment, training, and qualifications. If authorized and constructed, all LNG facilities, as defined in 49 CFR 193, 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 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, emergency shutdown and depressurization systems, hazard control, firewater coverage, structural protection, and onsite and offsite emergency response to determine whether they would provide adequate protection of the LNG facilities as described more fully below.

Plaquemines LNG performed a preliminary fire protection evaluation to ensure that adequate mitigation would be in place, including spill containment and spacing, hazard detection, emergency shutdown and depressurization systems, hazard control, firewater coverage, structural protection, and onsite and offsite emergency response. We evaluated the fire protection evaluation and recommend in section 4.12.5 that Plaquemines 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 onsite and offsite 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.

Title 49 CFR 193.2181 under Subpart C specifies that each impounding system serving an LNG storage tank must have a minimum volumetric liquid capacity of 110 percent of the LNG tank's maximum design liquid capacity for an impoundment serving a single tank, unless surge is accounted for in the impoundment design. If authorized and constructed, all facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 Subpart C and would be subject to DOT's inspection and enforcement programs. For full containment LNG tanks, we also consider it prudent to provide a barrier to prevent liquid from flowing to an unintended area (i.e., outside the plant property). The purpose of the barrier is to prevent liquid from flowing off the plant property and does not define containment or an impounding area for thermal radiation or flammable vapor exclusion zone calculations or other code requirements already met by sumps and impoundments throughout the site. Plaquemines LNG proposes four (two constructed during phase 1, two constructed during phase 2) full-containment LNG storage tanks for which the outer tank wall would serve as the impoundment system. We verified that the LNG storage tank's outer concrete wall would have a liquid capacity of at least 110 percent of the inner LNG tank's maximum liquid capacity. In addition, Plaquemines LNG would also install a berm (i.e., 20-foot storm surge barrier) around the facility, which would prevent liquid in the storage tank area from flowing off-site in the event of an outer tank impoundment failure. We recommend in section 4.12.5 that any gated areas and water discharge through the storm surge barrier be evaluated during final design to confirm the ability of the storm surge barrier to serve as an LNG barrier.

Plaquemines LNG proposes to install an LNG Transfer Area Spill Impoundment Basin located between the LNG storage tanks that would collect a spill from the LNG transfer lines in the storage tank area. Plaquemines LNG proposes to install an LNG Spill Impoundment Basins located in each of the marine berth areas that would collect a potential spill from the LNG lines at the berth. Between these LNG tank and berth areas, Plaquemines LNG proposes to install a stainless-steel outer pipe to collect spills from the LNG transfer lines. However, due to the proximity of the LNG transfer lines to SH 23 and potential risk to the public, we recommend that containment be provided for this entire pipe-in-pipe system. We also recommend that where the piping system would cross over SH 23, the containment should be designed to withstand collisions or explosions, as discussed under the "Road" heading in the External Impact Review section, and also be demonstrated to withstand and capture the range of potential releases up to the full pipe diameter, considering the sudden cryogenic temperatures and the pressures of the releases. We also recommend in section 4.12.5 that the final design details of the pipe-in-pipe system be filed for review and approval.

In addition, Plaquemines LNG proposes to install a Process Area LNG Impoundment Basin near each of the two liquefaction trains to collect a potential spill from the liquefaction equipment and piping. Parts of the spill conveyance system are proposed to be constructed of steel, which would also need to be demonstrated to withstand the sudden cryogenic temperatures and pressures of the full range of potential spills, as steel typically needs a gradual cooldown to be prepared to handle cryogenic fluids. Plaquemines LNG would also provide a Refrigerant Impoundment Basin designed to contain a spill from the refrigerant storage tanks and refrigerant truck transfer area. Diked or curbed impoundments would be provided for each of the solvent, hot oil, diesel and aqueous ammonia storage tanks, as well as the diesel/hot oil truck transfer area. FERC staff was not able to verify the provision of containment for all significant amounts of hazardous liquids, such as for the condensate process area, liquid nitrogen storage area, the aqueous ammonia truck transfer area, and other hazardous fluid facilities. We recommend in section 4.12.5 that Plaquemines 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, for all of the DOT regulated facilities under 49 CFR 193, Subpart C, 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. These 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 evaluated whether all hazardous liquids are provided with spill containment and whether they would be sized based on the largest flow capacity from a single pipe for 10 minutes plus de-inventory volumes or the capacity of the largest vessel served, whichever is greater. Some of the proposed impoundment system details appear to need clarification or adjustment during the final design phase, including but not limited to: calculation of the total sizing spill for the ship transfer header considering all pumps in both LNG tanks at pump run-out rates unless an adequate mechanism is proposed to prevent this; sizing of troughs to include the total pump run out flow volumes; clarification of the design of the spill conveyance from the pipe rack to grade at road crossings; 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; and technical justification for any hazardous liquid tank impoundments sized for less than the maximum liquid inventory of the tank. We would verify adequate sizing of the final containment design during our final design review, based on our recommendation in section 4.12.6 for review and approval of the final details. In addition, Plaquemines LNG proposes a shorter spill duration for sizing the marine impoundments, which it attempts to justify based on demonstrable surveillance and shutdown provisions. FERC staff reviewed this justification and recommends that Plaquemines LNG provides spill containment of a 10-minute duration given the potential consequences of overflowing the spill containment.

FERC staff also generally evaluate the means to remove water and snow from impounding areas to ensure impoundment volumes would not be reduced through accumulations 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, 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. Plaquemines LNG indicated that the stormwater removal pumps for the LNG and refrigerant impoundments would be automatically regulated to remove rainwater and would be interlocked using low temperature and gas detectors to automatically shut off or prevent the pumps from operating when exposed to LNG or refrigerant temperatures or flammable gases. Plaquemines LNG would need to verify that the applicable sump pumps for DOT regulated impoundments meet the automatic shutdown controls and water removal requirements specified in 49 CFR 193, Subpart C. In addition, the curbed or diked impoundments are proposed to be equipped with a drain line and external isolation valve. Plaquemines LNG indicates that the drain valve would remain in the closed position at all times except for supervised drainage. We recommend that Plaquemines LNG consult with DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) on compliance with 49 CFR 193. If the facilities are approved and constructed, final compliance with the requirements of 49 CFR 193, Subpart C would be subject to DOT's inspection and enforcement programs.

If the Project is authorized and constructed, Plaquemines 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 capacity matches final design information. In addition, we recommend in section 4.12.5 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 further references NFPA Standards 30, NFPA 58, and NFPA 59 for additional spacing and plant layout requirements. If the facilities are approved and constructed, Plaquemines 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 to inform what fire protection measures may be necessary to reduce the risk of cascading damage. A pool fire at the proposed LNG Storage Tank Process Area Sump located between the four LNG storage tanks would result in high radiant heats at elevated pipe racks and troughs, as well as at the marine platforms from the LNG marine impoundments. In addition, we note that radiant heats greater than 4,000 Btu/ft^2-hr level from an impoundment fire could impact adjacent process equipment, refrigerant storage vessels, process vessels, and pipe racks. To mitigate impoundment and jet fires within the plant, Plaquemines LNG indicates that measures would be in place to prevent cascading events, including fire-safe ESD valves with fire resistant instrument and power cabling, depressurizion systems, fire and gas detectors, fire proofing of structural steel columns supporting critical equipment, deluge systems, water curtains, cellular foam blocks, and fire monitors and hydrants. However, details of these systems would be developed in the final design. We recommend in section 4.12.5 that Plaquemines LNG provide the final design of these thermal mitigation measures, for review and approval, to demonstrate cascading events would be mitigated. In addition, we recommend in section 4.12.5 that Plaquemines LNG provide an analysis, for review and approval, demonstrating the adjacent tank can withstand the radiant heat from which it would be exposed from a tank roof fire or adjacent tank roof fire.

To address impacts on plant buildings from fires or explosions, we evaluated external fire and explosion risks for all buildings and while some fires could impact electrical switchgear buildings, we did not find any credible fires or explosions that would impact the safety critical or occupied buildings. Furthermore, to minimize risk for flammable or toxic vapor ingress into buildings, we recommend in section 4.12.5 that Plaquemines 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 also recommend in section 4.12.5 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 4.12.5 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, Plaquemines LNG would finalize the plot plan, and we recommend in section 4.12.5 that Plaquemines LNG provide any changes for review and approval to ensure capacities and setbacks are maintained. If the facilities are constructed, Plaquemines LNG would install equipment in accordance with the spacing indicated on the plot plans, and we recommend in section 4.12.5 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 4.12.5 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

Plaquemines 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 (2001), NFPA 70, and API RP 500. 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, 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 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 Plaquemines LNG electrical area classification drawings to verify whether the Project would generally meet the electrical area classification requirements in NFPA 59A, 70, 497, and API RP 500 and found that some revisions would be needed to properly implement these classification areas, including but not limited to, illustrating Class 1 Division 1 and Division 2, as applicable, at all impoundment trenches, the LNG ship transfer connection, refrigerant truck transfer connection, diesel truck transfer connection, diesel and other combustible tank vents, power plant area, gas turbines, feed gas aftercoolers, mixed refrigerant (MR) coolers, and pig launchers. If the Project is authorized, Plaquemines LNG would finalize the electrical area classification drawings and would describes changes made from the FEED design. We recommend in section 4.12.5 that Plaquemines LNG file the final design of the electrical area classification drawings for review and approval. If facilities are constructed, Plaquemines LNG would install appropriately classed electrical equipment, and we recommend in section 4.12.5 that 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, we recommend in section 4.12.5 that 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, and panels provided with purge), and electrical equipment are appropriately de-energized and locked out and tagged out when being serviced.

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 (2001) and NFPA 70 at each interface between a flammable fluid system and an electrical conduit or wiring system. We recommend in section 4.12.5 that Plaquemines LNG provide, for review and approval, 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, Plaquemines 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. Therefore, our recommendation includes language indicating that Plaquemines LNG should provide the results of consultation with DOT PHMSA indicating that the proposed electrical process seal design would be considered to meet the design requirements of NFPA 59A (2001), as incorporated by 49 CFR 193.2101, and that Plaquemines LNG should provide a means to detect a range of leak sizes in either side of the seal. In addition, we recommend in section 4.12.5 that Plaquemines LNG file, for review and approval, 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 recommend in section 4.12.5 that Project facilities be subject to regular inspections throughout the life of the facility to ensure electrical process seals for submerged pumps continue to conform to NFPA 59A and NFPA 70 and that air gaps are being properly maintained.

Hazard Detection, Emergency Shutdown, and Depressurization Systems

Plaquemines 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 emergency shutdown, depressurization, or initiate appropriate procedures, and would meet NFPA Standard 72 and ISA Standard 12.13. However, we note that Plaquemines LNG did not make reference to ISA 12.13 publications, which provide performance requirements for flammable/combustible gas detectors. Additionally, Plaquemines LNG did not include a specification for hazard detection. Therefore, we recommend in section 4.12.5 that Plaquemines LNG provide specifications, for review and approval, of the final design of fire safety specifications, including hazard detection, hazard control, and firewater systems.

We also evaluated the adequacy of the general hazard detection 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). We also reviewed the fire and gas cause and effect matrices to evaluate the detectors that would initiate an alarm, shutdown, depressurization, or other action based on the FEED. As a result of that review, we recommend in section 4.12.5 that additional hazard detection be placed throughout the plant and supported by a performance based study, including near the diesel and hot oil tanks, steam turbine power plant, flare KO drums, ethylene packages, peaking generator, essential diesel generator, acid gas removal area, hot oil furnaces, thermal oxidizer, combustion air intakes and heating, ventilating, and air conditioning (HVAC) intakes of buildings. In addition, we recommend ESD pushbutton drawings of the final design be provided that demonstrate there is sufficient pushbuttons in each process area. We recommend in section 4.12.5 that Plaquemines 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, Plaquemines LNG would install hazard detectors according to its specifications, and we recommend in section 4.12.5 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 matrixes prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.5 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. Plaquemines LNG indicates hazard control layout and design 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 handheld, wheeled, and fixed fire extinguishing devices throughout the site based on the FEED. We also evaluated whether the spacing of the fire extinguishers meet NFPA 10. In addition, we evaluated whether clean agent systems would be installed in all electrical switchgear, and instrumentation buildings systems in accordance with NFPA 2001 and CO_2 systems in gas turbine enclosures in accordance with NFPA 12. Based on those reviews, we recommend in section 4.12.5 that CO_2 systems be installed in gas turbine enclosures in accordance with NFPA 12, portable extinguishers be provided near the metering station and pig launchers, and portable extinguishers be provided at the top of all tanks. We also recommend additional portable extinguishers be provided in the liquefaction blocks in accordance with travel distances of NFPA 10. Additionally, we recommend Plaquemines LNG provide portable extinguishers in all buildings and include clean agent systems in buildings housing instrumentation. In addition, we recommend in section 4.12.5 that Plaquemines LNG file additional information on 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 Project. If the Project is authorized and constructed, Plaquemines LNG would install hazard control equipment, and we recommend in section 4.12.5 that Project facilities be subject to periodic inspections during construction to verify hazard control equipment is installed in the field and functional prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.5 that Project facilities be subject to regular inspections throughout the life of the facility to verify in the field that hazard control coverage and 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 or cryogenic releases onto facility components to insignificant levels, passive fire protection (e.g. fireproofing structural steel) 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 in section 4.12.5 that 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[12] 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

[12] 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.

recommend in section 4.12.5 that Plaquemines 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 change as a result of these details or other changes in the final design of the Project.

If the Project is authorized and constructed, Plaquemines LNG would install structural cryogenic and fire protection according to its design, and we recommend in section 4.12.5 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 4.12.5 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

Plaquemines 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 to meet NFPA 59A (2001), 13, 15, 20, 22, and 24 requirements. We evaluate the adequacy of the general firewater coverage. We recommend in section 4.12.5 that Plaquemines LNG provide firewater coverage by two or more hydrants or monitors (or deluge systems) for all process areas that contain flammable or combustible fluids, including all three docks, diesel generators and storage, hot oil storage, and gas dehydration units. We recommend in section 4.12.5 that the LNG storage tanks be provided with firewater coverage. In addition, 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. In addition, where areas may be inaccessible or difficult to access in the event of an emergency, we recommend in section 4.12.5 that Plaquemines LNG install remotely operable monitors. We recommend in section 4.12.5 that Plaquemines LNG provide final firewater capacities for the monitors and hydrants in order to verify the appropriateness of the associated firewater demands of those systems and worst-case fire scenarios to size the firewater pumps. We recommend in section 4.12.5 that Plaquemines LNG clarify the water spray connection shown for the control building. We recommend in section 4.12.5 that Plaquemines LNG complete and document the firewater monitor and hydrant coverage test to verify that actual coverage area from each monitor and hydrant as shown on facility plot plan(s). We also recommend in section 4.12.5 that Plaquemines LNG complete and document the firewater monitor and hydrant coverage test to verify that actual coverage area from each monitor and hydrant as shown on facility plot plan(s).

We assessed whether the reliability of the firewater pumps and firewater source or onsite storage volume are appropriate. We recommend in section 4.12.5 that Plaquemines LNG specify the reducer on the suction side of the firewater pump to be eccentric or otherwise justify the use of an alternative reducer that will not cause air pockets to form and cause possible damage the firewater pump. We also recommend in section 4.12.5 that Plaquemines LNG install a flow measurement test device that reads into the control room and historian. In addition, we recommend in section 4.12.5 that Plaquemines LNG file an updated fire protection evaluation performed on the final design, for review and approval, where details are yet to be determined (e.g., manufacturer and model, and nozzle types) and where the final design could change as a result of these details or other changes in the final design of the Project. If the Project is authorized and constructed, Plaquemines LNG would install the firewater and foam systems as designed, and we recommend in section 4.12.5 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 4.12.5 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.

4.12.4.5 Geotechnical and Structural Design

Plaquemines LNG provided geotechnical and structural design information for its facilities to demonstrate the site preparation and foundation designs would be appropriate for the underlying 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 to demonstrate compliance with regulations under 49 CFR 193 and NFPA 59A (2001). 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 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 out 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.

Plaquemines LNG contracted Fugro to conduct geotechnical investigations to evaluate the existing soil site conditions and proposed foundation design for the Project. The existing site elevation ranges from -2 feet to -4 feet NAVD88. The site would be cleared, grubbed, and prepared using standard earthmoving and compaction equipment. Site preparation would result in a final grade elevation of -2 feet NAVD88 for the process area, and a final elevation of -3 feet in the laydown area. In addition, the site would be surrounded by a levee topped with a flood wall with a final top of wall elevation of +26 feet NAVD 88. Plaquemines LNG would not plan to dredge or reshape the Mississippi River with fill material in order to construct loading docks or the berthing area.

Fugro conducted 86 soil borings to depths ranging from 60 feet to 300 feet below existing grade, 10 cone penetration tests (CPTs) to depths ranging from 142 feet to 148 feet (or to refusal) below existing grade (b.e.g.), and 2 seismic cone penetration tests (SCPTs) to depths ranging to

143 feet below existing grade. Over 14 different tests were conducted on 486 recovered soil samples, including soil identification and classification tests (water content, Atterberg liquid and plastic limits, sieve tests), strength and compressibility tests (consolidation tests, shear tests, triaxial tests), corrosion potential tests (pH, sulfate, chloride, electrical resistivity, and carbonate content), and organic content tests in general accordance with pertinent American Society for Testing and Materials 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 them to more than adequately cover all major facilities, including the marine facilities, LNG storage tanks, liquefaction areas, pretreatment areas, flare system, buildings, power generation, and berms. We believe that an adequate number of test borings were performed and soil samples were collected for the facility, but will continue our 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 borings conducted, the site is composed of cohesive soils consisting of clay, silt, and silty clay to a depth of approximately 150 feet b.e.g., underlain by a layer of natural granular soils consisting of silty sand and clayey sand extending to a depth of approximately 175 feet b.e.g., underlain by another layer of cohesive soils consisting of clays and sandy clays to a depth of 300 feet b.e.g. where borings were terminated. The near-surface clays contain high amounts of preserved organic (vegetative) materials with some sand intermixed. Furthermore, the near-surface clays are plastic in nature could compress if not mitigated before the installation of foundations. Plasticity is a material property that directly influences deformation, which could risk the integrity of a foundation of corrective designs or replacement materials are not used. Due to the poor soil conditions at the Project site, Fugro has recommended the use of ground improvement measures to bring the site's soil conditions to an acceptable status. Corrosion tests indicate there is very high potential for corrosion of steel based on electrical resistivity results (chloride ion concentration generally indicated high and pH generally indicated mild to high corrosion potential), and a mild to moderate deterioration of concrete based on sulfate ion concentrations depending on location within the site. Based on these results, the Project has considerable potential for corrosion and concrete degradation in the design. Plaquemines LNG has indicated that it would provide engineering solutions consistent with standard practices.

Based on the subsurface conditions, shallow foundations would be suitable for only some lightly loaded, settlement insensitive structures; however, the majority of heavier loaded structures, including the LNG storage tanks, liquefaction trains, and many of the associated structures would require deep foundations in order to limit settlement to acceptable levels. The deep foundations would be supported by embedded pre-stressed precast square concrete piles, auger cast-in-place piles, displacement cast-in-place piles, and open-ended steel pipe piles. Fugro recommended that piles are proposed to be embedded to depths between an elevation of -80 feet and -220 feet NAVD88 depending on the equipment being supported, pile spacing, pile type, and pile diameter.

Regional 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 Fugro's geotechnical investigation at the Project site indicate the Project site could be impacted by regional subsidence at a rate of approximately 0.27 to 0.42 inches per year, and that subsurface conditions are generally ill suited for the facilities, unless adequate site preparation, foundation design, and construction methods are implemented. Because subsidence is a recognized concern in the area of the Project, Plaquemines LNG proposes to install all key liquefaction facilities on deep piles, including but not limited to: loading facilities and trestles, LNG storage tanks, LNG booster pumps, gas turbines, pre-treatment and liquefaction equipment, and all compressors and blowers. Plaquemines LNG has been recommended by Fugro to develop a monitoring plan for 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 stabilization of the fill materials during placement and compaction with monitoring settlement and systematic reworking, as needed. Foundations would be constructed with deep pile supports to protect equipment and interconnecting piping from differential movement. Earth-supported elements, such as the storm surge barrier 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 facilities.

The results of Plaquemines LNG's geotechnical investigation at the Project site indicate that subsurface conditions are generally suitable for the facilities, if proposed site preparation, foundation design, and construction methods are implemented appropriately.

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 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 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 Plaquemines LNG consider the effects of natural hazards, such as flooding, storm surge, and seismic activities, for plant site location. This will be covered in DOT PHMSA's LOD on 49 CFR 193 Subpart B. However, the LOD will not cover whether the facility is designated 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 LNG facilities, as defined by 49 CFR 193, would be subject to DOT's inspection and enforcement programs. The marine facilities would be subject to 33 CFR 127, which requires, if the waterfront facility handling LNG is in a region subject to earthquakes, that the piers and wharves must be designed to resist earthquake forces. In addition, USCG regulations under 33 CFR 127 incorporates by reference certain portions of NFPA 59A (1994) and ASCE 7-88 via NFPA 59A (1994). However, USCG regulations do not provide criteria for a region subject to earthquakes or the earthquake forces the piers and wharves are to withstand and NFPA 59A (1994) section referenced in 33 CFR 127 is for seismic design only and is applicable to stationary LNG containers, which would not be under

33 CFR 127. Therefore, we evaluated the basis of design for all facilities for all natural hazards under FERC jurisdiction, including those under DOT and USCG jurisdiction.

In addition, the facilities would be constructed to the requirements in the 2009 International Building Code (IBC), ASCE 7-05 for LNG facilities and the 2012 IBC and ASCE 7-10 for non-LNG facilities. 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. We also evaluated potential 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 4.12.5 that Plaquemines 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 Louisiana. If the Project is authorized and constructed, Plaquemines LNG would install equipment in accordance with its final design. In addition, we recommend in section 4.12.5 that Plaquemines LNG file, for review and approval, settlement results during hydrostatic tests of the LNG storage containers and periodically thereafter to verify settlement is as expected and does not exceed the applicable criteria in API 620, API 625, API 653, and ACI 376.

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, Plaquemines 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).[13] The location of the Project is within the Gulf Coast Basin geologic tectonic province. The Gulf Coast Basin is characterized as having thick sedimentary rocks above basement rock structures. The province's sedimentary strata thickens toward the south, with salt domes and relatively shallow listric growth faults that run parallel to the Gulf of Mexico Coastline. 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).

[13] USGS. Earthquake Hazards Program. Quaternary Fault and Fold Database of the United States. Website: https://earthquake.usgs.gov/hazards/qfaults/. Accessed: August 2018.

Plaquemines LNG conducted a site-specific growth fault analysis for the Project, involving field investigations and subsequent data evaluation. The Phase 1 Geologic Fault Study included the examination of growth faults in the region of the Project area. These growth fault systems have previously been assessed by the USGS as not capable of generating significant earthquakes, and these faults have not previously been considered as seismogenic sources. While growth faults are not a source of seismic hazard for the Project site, there may be a potential source of surface deformation. The closest mapped suspected surface faults are the South of Bayou Dupont Fault, Bayou Dupont Fault, Bayou Barataria Fault, and the Round Lake Fault. The Round Table Lake fault is located approximately 1 mile south of the site. The South of Bayou Dupont Fault, Bayou Dupont Fault, Bayou Barataria Fault each strike generally east-west and are located approximately 7 miles west of the site. Where the suspected faults are currently mapped, they do not extend into the site. If these faults do extend further east than they are currently mapped, the suspected faults could pose a risk to the site. An evaluation of topographic maps, aerial imagery, and light detection and ranging imagery maps indicate linear geomorphic features 5 miles southwest of the site that coincides with the Round Lake Fault. In addition, Fugro also evaluated subsurface structure maps of drilled oil and gas wells that indicate growth faults at depth with projections that are estimated to be approximately 2,000 feet south of the southern boundary of the site and one of the two identified coincides with the Rounnd Lake Fault southwest of the site. Visual observations of the site also did not show evidence of surface faulting. While Fugro found no credible evidence indicating that a surface fault extends into the site, a review of literature on surface faulting in the area has identified several known and suspected surface faults west and southwest of the site. These faults trend in the general direction of the site, although they are not shown to extend into the site. As such, the site is at a higher-than-normal risk of being impacted by a fault. As a result, Fugro recommends the logs of oil and gas explorations be interpreted to develop a higher degree of confidence as to the presence or absence of faults that could impact the site. Fugro has identified six well logs that would be useful for this purpose. These logs would be interpreted for offsets in stratigraphic markers indicative of subsurface faulting. It should be noted though that depending on the results of the interpretation of oil and gas well logs, further study using geophysically logged borings may be required to determine the presence or absence of a fault extending across the site. Therefore, we recommend Plaquemines LNG conduct further study using geophysically logged boring to determine the presence or absence of a fault extending across the site prior to initial site preparation.

While the presence of growth and seismogenic faults can require special consideration, the presence or lack of growth or seismogenic 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 gasses 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, we recognize Plaquemines LNG would also 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 18 CFR 380.12 (h) (5) continues to incorporate 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 (DE) 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 Recommended Provisions, and it is referenced directly by the 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 National Earthquake Hazards Reduction Program Recommended Provisions are not.

The geotechnical investigations of the existing site indicate the site is classified as Site Class E[14] in accordance with ASCE 7-05 and in accordance with IBC 2006 based on a site average shear wave velocity that ranged between 300 and 350 feet per second (Fugro, 2016a) in the upper 100 feet of strata. Sites with soil conditions of this type could experience significant amplifications of surface earthquake ground 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.

Fugro performed a site-specific seismic hazard study for the site. The study concluded that the LNG facility would have an OBE PGA of 0.036 g, an SSE PGA of 0.092 g, a 0.2-second design spectral acceleration value of 0.119 g, a DE 1.0-second design spectral acceleration at the site of 0.132 g and a DE PGA of 0.055 g (Fugro, 2016b). We 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[15] and Unified Hazard[16] tools for all occupancy categories (I-IV). We believe the SSE PGA, OBE PGA, and 5 percent-damped spectral design accelerations used by Plaquemines LNG are acceptable. These ground motions are relatively low compared to other locations in the United States. Based on the

[14] 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).

[15] https://earthquake.usgs.gov/designmaps/us/application.php

[16] https://earthquake.usgs.gov/hazards/interactive/

design ground motions for the site and the importance of the facilities, the facility seismic design is assigned Seismic Category I for LNG containers, systems required for isolation of LNG containers, and systems required for safe shutdown or fire protection. Seismic Category II structures include facilities and systems not included in Category I 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 III 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.[17] We have 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 the 2006 IBC 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 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, due to the low seismicity of the region, the potential for soil liquefaction to occur is low. In addition, Plaquemines LNG would address possible issues relating to the potential for soil liquefaction and loss of soil strength by using piles in the foundation design. Should soil improvement be required to counteract soil liquefaction, Plaquemines LNG would utilize ground improvement techniques (e.g., cementitious strengthening).

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 LNG terminal's low lying position would make it potentially vulnerable

[17] 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.

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). Hydraulic modeling conducted for off the coast of Louisiana in 2009, based off of historic submarine landslides, indicated that the maximum tsunami run-up could be as high as 13 feet above mean sea level. 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). Plaquemines LNG's *Seismic Hazard Assessment* report included a Tsunami Hazard Assessment for the Project area. There are four main submarine landslide hazard zones in the Gulf of Mexico including the Northwest Gulf of Mexico, Mississippi Canyon and Fan, the Florida Escarpment, and the Campeche Escarpment (USGS, 2009). Based on modeling and limited historical data, it is estimated that tsunamis generated from landslides would be more than 2 feet and less than 13 feet These tsunami run-up elevations are significantly less than the hurricane design storm surge elevations discussed below, so any tsunami hazard has already 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, Plaquemines 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. Plaquemines LNG states that all LNG facilities, as defined in 49 CFR 193, would be designed to withstand a 183 mph 3-second gust. The designed wind speed would also have a load factor of 1.6 applied in accordance with Chapter 2 of ASCE 7-05. Other Project facilities classified as Risk Category III would be designed in accordance with ASCE 7-10 to withstand a 170 mph 3-second gust, including the feed gas components; butane, propane, ethylene, and pentane storage drums and transfer pumps; condensate tank and components; heat recovery steam and gas turbine generators and associated and aqueous ammonia emission control systems; and instrument air, water, electrical and other utility components. Project facilities classified as Risk Category II would be designed to withstand a 157 mph 3-second gust including water treatment and sanitary waste components, sump pumps, admin building, warehouses, and guardhouses. 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 coastline in World Meteorological Organization, *Guidelines for Converting between Various Wind Averaging Periods in Tropical Cyclone Conditions*. These wind speeds are equivalent to approximately 7,000-year mean return interval or 0.25 percent probability of exceedance in a 50 year period for the site, based on whether ASCE 7-05 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). A 170 mph 3-second gust would equate to approximately a 2,750-year return period and weak Category 4 hurricane, and a 157 mph 3-second gust would equate to approximately a 1,200-year return period and moderate Category 3 hurricane. Plaquemines 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 Nuclear Regulation NUREG/CR-4461, Tornado Climatology of the Contiguous U.S. Rev. 2 (U.S. Nuclear Regulatory Commission, 2007). 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 NUREG/CR-4461 indicate a 100,000-year maximum tornado wind speeds would be approximately 140 mph 3-second gusts for the project site location. 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.

ASCE 7 also recognizes the facility would be in a wind borne debris region. Wind borne debris has the potential to perforate equipment and the LNG storage tanks if not properly designed to withstand such impacts. The potential impact is dependent on the equivalent projectile wind speed, characteristics of projectile, and methodology or model used to determine whether penetration or perforation would occur. Unfortunately, no criteria is provided in 49 CFR 193 or ASCE 7 for these specific parameters. However, NFPA 59A (2016) recommends CEB 187 be used to determine projectile perforation depths. In order to address the potential impact, we recommend in section 4.12.5 that Plaquemines LNG provide a projectile analysis, for review and approval, to demonstrate that the outer concrete impoundment wall of a full-containment LNG tank could withstand wind borne projectiles prior to construction of the final design. The analysis should detail the projectile speeds and characteristics and method used to determine penetration or perforation depths. We would compare the analysis and specified projectiles and speeds using established methods, such as CEB 187, and DOE and Nuclear Regulatory Commission guidance.

In addition, we evaluated historical tropical storm, hurricane, and tornado tracks in the vicinity of the Project facilities using data from NOAA's Historical Hurricane Tracker.[18] Between 1865 and August 2017, 45 hurricanes and tropical storms made landfall within 60 miles of the Project site. Of the 45 storm events, 5 were considered major hurricanes, defined as Category 3 or greater; including Unnamed (Category 4) hurricane in 1893, Unnamed (Category 4) hurricane

[18] NOAA. Historical Hurricane Tracker. Available at: https://coast.noaa.gov/hurricanes/. Accessed August 2018.

in 1915, Hurricane Betsy (Category 4) in 1965, Hurricane Camille (Category 5) 1969, and Hurricane Katrina (Category 3) 2005. During Hurricane Camille storm surges were observed to reach heights of up to 20 feet, and during Hurricane Katrina storm surges were observe to reach heights of up to 18 feet (USGS, 2004).

Potentials flood levels may also be informed from the 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 Insurance Rate Maps (FEMA, 1985) for Plaquemines Parish, Louisiana, the 100-year Base Flood Elevation for the Project site is +15.8 ft. NAVD88. We also recognize that a 500-year flood event has been recommended as the basis of design for critical infrastructure in publications, including ASCE 24, *Flood Resistant Design and Construction*. Therefore, we believe it is good practice to design critical energy infrastructure to withstand 500-year event from a safety and reliability standpoint for both SWEL and wave crests. The proposed design would be able to withstand a 500-year flood event. Furthermore, 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,[19] 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 two decades and defining upper bound scenarios as a guide for long-term adaptation strategies and a general planning envelope.

The entire LNG terminal site, with the exception of the marine facilities, would be enclosed for flood protection by construction of a levee topped with a floodwall. The floodwall top elevation is proposed to be +26 feet NAVD88 with levee crest elevations ranging from +24.5 feet to +27 feet NAVD 88. The channel-side earthen levee height is designed for a 500-year still water elevation (SWEL) of 19.1 feet NAVD88, a 500-year wave of 5.0 feet, and 1.1 feet of sea level rise and subsidence over the life of the Project, yielding an initial crest height of 25.2 feet with a final initial elevation of +26 feet NAVD88, which provides an over build allowance of 0.5 feet to account for downdraft effects on piles. Given the uncertainty in conditions and settlement, we recommend in section 4.12.6 that Plaquemines LNG file a plan for maintaining the levee and floodwall total elevation of +26 feet for the life of the Project.

We generally evaluate the design against a 500-year SWEL with a 500-year wave crest and sea level rise and subsidence. Using maximum envelope of water (MEOW) storm surge inundation maps generated from the Sea, Lake, and Overland Surge from Hurricanes (SLOSH) model developed by NOAA National Hurricane Center, a 500-year event would equate to a Category 2 Hurricane and approximately 9-12 feet MEOW.[20] 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

[19] 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.

[20] 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.

a result, we evaluated the storm surge against other sources using SLOSH maps that indicate a similar upper range of 6-9 feet MEOW for Category 2 Hurricanes, and also indicated 8-12 feet MEOW for Category 3 Hurricanes, 12-15 feet MEOW for Category 4 Hurricanes, and 15-20 feet MEOW for Category 5 Hurricanes.[21] This data suggests that Plaquemines LNG design may withstand Category 4 Hurricane storm surge SWEL equivalent to 1,000- to 10,000-year mean return intervals. In addition, wave heights would likely impact the channel side, but would not reach the landward side. We also would expect the sea level rise to be closer to the 1.1 feet intermediate projection provided by NOAA. Sea level rise projections are 1.1 feet over 30 years. However, 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 agree that the 26 feet NAVD88 post settlement storm surge floodwall would provide adequate protection of the Plaquemines LNG site and should be periodically monitored and maintained to assure the crest elevation would not be lower than 26 feet NAVD88 on the channel side. We also recommend in section 4.12.5 that Plaquemines 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 Louisiana.

The Texas and Louisiana Gulf Coast area is experiencing the highest rates of coastal erosion and wetland loss in the United States (Ruple, 1993). Louisiana experiences 90 percent of the coastal wetland loss for the continental United States. Of this erosion loss, six percent affects the basins in which this Project is located. Aerial photography taken from 1998 to 2015 indicates little or no shoreline loss on the Mississippi River adjacent to the Project site. Shoreline erosion could occur at the Project site and along the opposite shoreline as a result of waves, currents, and vessel wakes. To prevent erosion along the river bank, an articulated concrete mattress was installed by the USACE. Even though shoreline erosion is a concern for this geography, implemented mitigation measures would minimize erosion and scour impacts.

Landslides and other Natural Hazards

Landslides involve the downslope movement of earth materials under force of gravity due to natural or human causes. Due to the low relief across the LNG terminal there is little likelihood that landslides or slope movement at the LNG terminal would be a realistic hazard. In general, the clay soils have a comparatively lower risk of forming a landslide, subject to numerous other factors.

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[22] and Department of Homeland Security[23] of the nearly 1,500 volcanoes with eruptions since the Holocene period (in the past

[21] 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.

[22] United States Geological Survey. U.S. Volcanoes and Current Activity Alerts. Available at: https://volcanoes.usgs.gov/index.html. Accessed August 2018.

[23] Department of Homeland Security. Homeland Infrastructure. Foundation-Level data (HIFLD). Natural Hazards. hifld-geoplatform.opendata.arcgis.com. accessed Aug 2018

10,000 years) there are no known active or historic volcanic activity within 1,000 miles of the Project.

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.[24] The map indicates the Plaquemines LNG site could experience GMD intensities of 10-200 nano-Tesla with a 100-year mean return interval. However, Plaquemines LNG would be designed such that if a loss of power were to occur the valves would move into a fail-safe position. In addition, Plaquemines LNG is an export facility that does not serve any U.S. customers.

External Impact Review

To assess the potential impact from external events that are dependent on the site location, Plaquemines LNG provided FERC with a series of studies that evaluate transportation routes and land use and activities within and surrounding their site and the safeguards in place to mitigate the risk from events, where warranted. We reviewed these studies in coordination with other federal agencies to assess these impacts for potential vehicle impacts from nearby external roads and rail; aircraft impacts from nearby airports, heliports, and military facilities; pipeline incident impacts from nearby pipelines, and adjacent facilities that handle hazardous materials. Mitigation of impacts from use of internal roadways, rail, helipads, airstrips, or pipelines would also be considered as part of the engineering review done in conjunction with the NEPA review. FERC staff takes a risk-based approach in assessing the potential impact of the external events and on the adequacy of the mitigation. The risk-based approach is informed by data on the frequency of events that could lead to an impact and the potential severity of consequences to the Project and the resulting consequences to the public beyond the initiating events. The frequency is based on past incidents and the consequences is based on past incidents as well as hazard modeling of potential failures.

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. FERC staff uses 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. 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 the 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

[24] United States Geological Survey. Magnetic Anomaly Maps and Data for North America. Available at: https://mrdata.usgs.gov/magnetic/map-us.html#home. Accessed August 2018.

by barriers so that they are safe from damage by rail or vehicle movements. The marine facilities subject to USCG regulations, including 33 CFR 127.001, incorporate NFPA 59A (1994), which requires pipelines be located on the dock or pier so that they are not exposed to damage from vehicular traffic or other possible cause of physical damage. However, the DOT and USCG regulations and NFPA 59A (2001 and 1994) requirements do not prescribe or indicate what collision(s) or explosion(s) could reasonably be expected to cause the most severe loading. Therefore, FERC staff evaluated consequence and frequency data from these events to evaluate these potential impacts.

FERC staff evaluated the risk of the truck operations based on the consequences from a release, incident data from the 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 Plaquemines LNG.

Unmitigated consequences under worst-case weather conditions from catastrophic failures of trucks proposed at the site generally can range from 200-2,000 feet for flammable vapor dispersion, 850-1,500 feet for radiant heat of 5 kW/m^2 from fireballs, and 275-350 feet for radiant heat of 5 kW/m^2 from jet fires with projectiles from boiling liquid expanding vapor explosions (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 mi for flammable gases for potential impact distance) and DOT PHMSA for emergency response (0.5-1 mi for initial evacuation and 1 mi for potential BLEVEs for flammable gases). 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 25-200 feet for flammable vapor dispersion, and 75-175 feet for jet fires.

Incident data indicates hazardous material incidents are very infrequent (4e-3 incidents per lane-mile per year) and nearly 75-80 percent of hazardous material vehicular incidents occur during unloading and loading operations while the other 20-25 percent occur while in transit or in transit storage. In addition, approximately 99 percent of releases are 1,000 gallons or less and catastrophic events that would spill 10,000 gallons or more make up less than 0.1 percent of releases. In addition, less than 1 percent of all reportable hazardous material incidents with spillage result in injuries and less than 0.1 percent of all reportable hazardous material incidents with spillage result in fatalities.

During operation of the Project, Plaquemines LNG estimates 15 refrigerant make-up trucks, and one hot oil truck would be needed at the site annually. Plaquemines LNG did not provide an estimate for liquid nitrogen trucks, and these typically can range for export facilities from 50 to 155 per year. Plaquemines LNG indicated they do not plan to utilize any trucks for condensate removal or to deliver LNG.

SH 23 would bisect the LNG terminal between the process area, which includes the LNG storage tanks, and the marine berth area. The speed limit is 65 mph along SH 23 near the LNG terminal site. Plaquemines LNG provided a Traffic Management Plan for the LNG terminal during the construction period and describes the current usage of SH 23.

Plaquemines LNG provided a Road Safety and Reliability Impact Study (RSRIS). The RSRIS addresses potential safety and reliability impacts of proposed tanker trucks loaded or unloaded at the LNG terminal, and from commercial and recreational roadway traffic along SH 23. Plaquemines LNG has held several meetings with the Louisiana DOTD discussing a variety of mitigation measures to be adopted into the design of the pipe trestle crossing SH 23. One such mitigation measure would be to incorporate 42-inch-tall F-shaped or safety shaped reinforced concrete barriers along with tier type transition guardrails, as prescribed in the Louisiana DOTD "Bridge Design and Evaluation Manual" (July 2018), to provide protection to the pipe trestle supports that would be located in the median of SH 23. Also the process area would be protected from a vehicular incident from the 26-foot-tall storm surge barrier that surrounds the entire process area. The marine berth area would be protected by the Mississippi River levee that has an approximate height of 16 feet. Given the potential consequences of a vehicle impacting the LNG transfer line and SH 23 serving as the only road for evacuation, we recommend that Plaquemines LNG provide details of the vehicle collision protection at the road crossing of the LNG transfer line that demonstrate it can withstand impact from the most severe loading, including potential explosion loads from any trucks carrying hazardous materials.

With the implementation of our recommendation, we believe the proposed Project would not pose a significant increase in risk to the public because of the height of the pipe trestle clearance from SH 23, the setback distances of the process area and marine berth area, the fact the facilities would be protected by a storm surge floodwall and the Mississippi River Levee, and the vehicular barrier protection for the pipe trestle supports.

Rail

We generally review 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 Plaquemines LNG site and subsequently increase the risk to the public. 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 the 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 that applicants should evaluate the potential impact and loading on the dike due to 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. 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. The marine facilities subject to USCG regulations, including 33 CFR 127.001, incorporate NFPA 59A (1994), which requires pipelines be located on the dock or pier so that they are not exposed to damage from vehicular traffic or other possible cause of physical damage. However, the DOT and USCG regulations and NFPA 59A (2001 and 1994) requirements do not prescribe or indicate what collision(s) or explosion(s) could reasonably be expected to cause the most severe loading. Therefore, FERC staff evaluated consequence and frequency data from these events to evaluate these potential impacts

FERC staff evaluated the risk of the rail operations based on the consequences from a release, incident data from the DOT Federal Rail Administration and DOT PHMSA, and frequency of rail operations nearby Plaquemines LNG.

Unmitigated consequences under worst-case weather conditions from catastrophic failures of rail cars containing various flammable products generally can range from 300-3,000 feet for flammable vapor dispersion, 1,250-2,100 feet for radiant heat of 5 kW/m^2 from fireballs, and 450 -575 feet for radiant heat of 5 kW/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 (0.5-1 mi for initial evacuation and 1 mi for potential BLEVEs for flammable gases). 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 25-200 feet for flammable vapor dispersion, and 75-175 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 gallons or less and catastrophic events that would spill 30,000 gallons or more make up less than 1 percent of releases. In addition, less than 1 percent of hazardous material incidents result in injuries and less than 0.1 percent of hazardous material incidents result in fatalities.

Air

We generally review whether any aircraft operations would be associated with the Project (e.g., helipads) 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 the DOT's inspection and enforcement programs. DOT regulations under 49 CFR 193.2155 (b), Subpart C, require an LNG storage tank must not be located within a horizontal distance of 1 mile from the ends, or 1/4 mile from the nearest point of a runway, whichever is longer and that the height of LNG structures in the vicinity of an airport must comply with DOT FAA requirements. In addition, FERC staff evaluated the risk of an aircraft impact from nearby airports.

There would be no aircraft associated with the proposed 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 LNG terminal site is the Birdwin Airport, which is approximately 16 miles away to the southeast. There are nine heliports, two general aviation airports, and one naval air station within the 22-mile radius. The other airport within a 20-mile radius is the Braithwaite Park Airport, which is approximately 20 miles to the north. These are all farther than the 0.25-mile distance referenced in DOT regulations.

The DOT FAA regulations in 14 CFR 77 require Plaquemines LNG to provide a 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. The facilities include equipment taller than 200 feet and would utilize construction cranes that could reach up to 350 feet. Therefore, the regulations in 14 CFR 77 apply to that equipment and require Plaquemines LNG to provide notice to the FAA of its proposed construction. On January 16, 2017, Plaquemines LNG submitted notice to the FAA for an aeronautical obstruction study required under 14 CFR Part 77 for the tallest structure at its property boundaries. On January 25, 2017, DOT FAA issued a determination of no hazard to air navigation provided the structure is marked/lighted in accordance with FAA circular 70/7460-1 L change 1, Obstruction Marking and Lighting, a med-dual system - Chapters 4,8 (MDual), and 12.

In addition, FERC staff analyzed existing aircraft operation frequency data based on the airports identified above and their proximity to the LNG storage tank and process areas, the type and frequency of aircraft operations, take-off and landing directions, and the non-airport flight paths using the DOE Standard, DOE-STD-3014-2006, *Accident Analysis for Aircraft Crash into Hazardous Facilities*. DOE Standard 3014 uses a 22-mile radius from the hazardous facility as the threshold for consideration of hazards posed by airport and heliport operations. Per the DOE Standard 3014, heliports need only be considered if there are local overflights associated with facility operations and/or area operations; because Plaquemines LNG does not have facility or area-associated helicopter flights, and does not have an on-site heliport, the impact risk due to heliport operations is considered insignificant. The two general aviation airports, Birdwin Airport and Southern Seaplane Airport, are located 16.2 miles SE and 20.0 miles NNW of the site, respectively. The runway orientations and associated offsets of the runways of the two airports relative to Plaquemines LNG deems the threat from general aviation operations insignificant. Lastly, the New Orleans Naval Air Station is located 17.7 miles NNW of the site, with the orientation and associated offsets of its runways deeming threats from military aircraft operations also insignificant.

Based upon the DOT requirements, FAA determinations, and our review, we do not believe the proposed Project would 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 LNG terminal.

Pipelines

FERC staff generally reviews whether any pipeline operations would be associated with the proposed Project and whether any existing pipelines would be located near the site. FERC staff uses 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 4.12.7. If authorized and constructed, all LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 192 and 49 CFR 193 and would be subject to the DOT's inspection and enforcement programs. FERC staff evaluated the risk of a pipeline incident impacting the 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 the Project.

We identified one pipeline that is approximately 0.5 miles to the west of the terminal. We evaluated the potential risk from an incident from the pipeline and its' potential impacts by considering the design and operating conditions and location of the pipeline. Given the proximity of the pipeline to the Project and populations, we believe the proposed Project would not pose a significant risk or increase in risk to the public.

Hazardous Material Facilities and Power Plants

FERC staff 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 LNG terminal and whether the LNG terminal could increase the risk to the EPA RMP facilities and subsequently increase the risk to the public. There were no adjacent facilities handling hazardous materials identified by the site. The closest facilities handling hazardous materials are the Elmwood Marine Services and International Marine Terminals, which are both greater than one mile from the LNG terminal. The closest power plant identified was at a refinery approximately 7 miles from the terminal. Given the distance and position of the facilities relative to the populated areas near the LNG terminal, we do not believe the proposed Project would pose a significant increase in risk to the public.

4.12.4.6 Onsite and Offsite Emergency Response Plans

As part of its application, Plaquemines LNG submitted a draft ERP and indicated that it would be further developed with local, state, and federal agencies as well as other stakeholders. The emergency procedures would 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 facility would also provide appropriate personnel protective equipment to enable operations personnel and first responder access to the area. DOT regulations under 49 CFR 193.2905 under Subpart J require at least two access points in each protective enclosure to be located to minimize the escape distance in the event of emergency.

As required by 49 CFR 193.2509, under Subpart F, Plaquemines LNG would need to prepare emergency procedures manuals that provide for: a) responding to controllable emergencies and recognizing an uncontrollable emergency; b) taking action to minimize harm to the public including the possible need to evacuate the public; and c) coordination and cooperation with appropriate local officials. Specifically, 49 CFR 193.2509(b)(3) requires "Coordinating with appropriate local officials in preparation of an emergency evacuation plan…," which sets forth the steps required to protect the public in the event of an emergency, including catastrophic failure of an LNG storage tank.

Title 33 CFR 127.307 also requires the development of emergency manual that incorporates additional material, including LNG release response and emergency shutdown procedures, a description of fire equipment, emergency lighting, and power systems, telephone contacts, shelters, and first aid procedures. In addition, 33 CFR 127.207 establishes requirements for warning alarm systems. Specifically, 33 CFR 127.207(a) requires that the LNG marine transfer area to be equipped with a rotating or flashing amber light with a minimum effective flash intensity, in the horizontal plane, of 5,000 candelas with at least 50 percent of the required effective flash intensity in all directions from 1.0 degree above to 1.0 degree below the horizontal plane. Furthermore, 33 CFR 127.207(b) requires the marine transfer area for LNG to have a siren with a minimum 1⁄3- octave band sound pressure level at 1 meter of 125 dB referenced to 0.0002 microbars. The siren must be located so that the sound signal produced is audible over 360 degrees in a horizontal plane. Lastly, 33 CFR 127.207 (c) requires that each light and siren must be located so that the warning alarm is not obstructed for a distance of 1.6 km (1 mile) in all directions. The warning alarms would be required to be tested in order to meet 33 CFR 127. Plaquemines LNG would be required to meet the warning alarms requirements specified in 33 CFR 127.207.

In accordance with the EPAct 2005, FERC must also approve an emergency response plan covering the LNG terminal and LNG carrier transit prior to construction. Section 3A(e) of the NGA, added by Section 311 of the EPAct 2005, stipulates that in any order authorizing an LNG terminal, the Commission must require the LNG terminal operator to develop an ERP in consultation with the USCG and state and local agencies. 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) specifies that the ERP must 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 carriers that serve the facility. The Cost-Sharing Plan must specify what the LNG terminal operator would provide to cover the cost of the state and local resources required to manage the security of the LNG terminal and LNG carrier, and the state and local resources required for safety and emergency management, including:

- direct reimbursement for any per-transit security and/or emergency management costs (for example, overtime for police or fire department personnel);
- capital costs associated with security/emergency management equipment and personnel base (for example, patrol boats, firefighting equipment); and
- annual costs for providing specialized training for local fire departments, mutual aid departments, and emergency response personnel; and for conducting exercises.

The cost-sharing plan must include the LNG terminal operator's letter of commitment with agency acknowledgement for each state and local agency designated to receive resources.

Plaquemines LNG provided a draft of an ERP with its application. As part of FEED, we evaluated the initial draft of the ERP to ensure that it would cover the hazards associated with the Project. In addition, we recommend in section 4.12.5 that Plaquemines LNG provide additional information, for review and approval, on development of the ERP prior to initial site preparation. We also recommend in section 4.12.5 that Plaquemines LNG file, for review and approval, three-dimensional drawings, or other documentation, which demonstrate there is a sufficient number of access and egress locations. If this Project is authorized and constructed, Plaquemines LNG would coordinate with local, state, and federal agencies on the development of an ERP and cost-sharing plan. We recommend in section 4.12.5 that Plaquemines LNG provide periodic updates on the development of these plans and ensure they are in place prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.5 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.

4.12.5 Recommendations from FERC Preliminary Engineering and Technical Review

Based on our preliminary engineering and technical review of the reliability and safety of the 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>, Plaquemines LNG should file with the Secretary clarification on the intended use for the water spray connection at the control building shown on the firewater drawings.**
- **<u>Prior to the end of the draft EIS comment period</u>, Plaquemines LNG should file with the Secretary the preliminary process hazard review referenced in the application as under development and would be submitted at a later date.**
- **<u>Prior to initial site preparation,</u> Plaquemines LNG should file with the Secretary a study that determines the presence or absence of growth faults extending across the site using geophysically logged borings that is stamped and sealed by the professional engineer-of-record, registered in Louisiana.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in Louisiana:**

  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, Plaquemines LNG should file, in its Implementation Plan, the schedule for producing this information.

- **<u>Prior to commencement of service</u>, Plaquemines LNG should file with the Secretary a monitoring and maintenance plan, stamped and sealed by the professional engineer-of-record registered in Louisiana, for the perimeter levee**

that 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 these 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. Plaquemines LNG should submit specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 833 (Docket No. RM16-15-000), including security information, as critical energy infrastructure information pursuant to Title 18 of the Code of Federal Regulations, Part 388.113 (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 offsite emergency response, procedures for public notification and evacuation, and construction and operating reporting requirements will be subject to public disclosure. All information should be filed <u>a minimum of 30 days</u> before approval to proceed is requested.

- **<u>Prior to initial site preparation</u>, Plaquemines LNG should file an overall Project schedule, which includes the proposed stages of the commissioning plan.**
- **<u>Prior to initial site preparation</u>, Plaquemines LNG should file quality assurance and quality control procedures for construction activities.**
- **<u>Prior to initial site preparation</u>, Plaquemines LNG should file procedures for controlling access during construction.**
- **<u>Prior to initial site preparation</u>, Plaquemines LNG should develop an ERP (including evacuation) and coordinate procedures with the USCG; state, county, and local emergency planning groups; fire departments; state and local law enforcement; and appropriate federal agencies. This plan should include at a minimum:**

  a. **designated contacts with state and local emergency response agencies;**

  b. **scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;**

  c. **procedures for notifying residents and recreational users within areas of potential hazard;**

  d. **evacuation routes/methods for residents and public use areas that are within any transient hazard areas along the route of the LNG marine transit;**

  e. **locations of permanent sirens and other warning devices; and**

  f. **an "emergency coordinator" on each LNG marine vessel to activate sirens and other warning devices.**

  Plaquemines LNG should notify FERC staff of all planning meetings in advance and should report progress on the development of its ERP at 3-month intervals.

- **Prior to initial site preparation, Plaquemines LNG should file a 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. Plaquemines LNG should notify FERC staff of all planning meetings in advance and should report progress on the development of its Cost-Sharing Plan at 3-month intervals.**
- **Prior to construction of final design, Plaquemines LNG should include spill containment (e.g., a trough collection system) for the entire length of the pipe-in-pipe system between the LNG storage tanks and the marine berth area sized for a full guillotine rupture of the pipe-in-pipe line based on a 10-minute duration.**
- **Prior to construction of final design, Plaquemines LNG should file details of the pipe-in-pipe system design, including wall thicknesses, spacers, expansion bellows or loops, and transitions.**
- **Prior to construction of final design, Plaquemines LNG should file change logs that list and explain any changes made from the front-end engineering design provided in Plaquemines 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.**
- **Prior to construction of final design, Plaquemines LNG should file information/revisions pertaining to the response numbers 14 of its October 11, 2018, filing, response numbers 8, 15, 24, 25, 27, 39, 40, and 43 of its October 16, 2018, filing, and response numbers 11, 31, and 38 of its October 30, 2018, filing, which indicated features to be included or considered in the final design.**
- **Prior to construction of final design, Plaquemines LNG should file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.**
- **Prior to construction of final design, Plaquemines LNG should file drawings of the storage tank piping support structure and support of horizontal piping at grade including pump columns, relief valves, pipe penetrations, instrumentation, and appurtenances.**
- **Prior to construction of final design, Plaquemines LNG should file an up-to-date equipment list, process and mechanical data sheets, and specifications. The specifications should be in consistent units and 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, pressure 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);**

d. Security and Fire Safety Specifications (e.g., security, passive protection, hazard detection, hazard control, firewater).

- **<u>Prior to construction of final design</u>, Plaquemines LNG should specify and design their control systems and human machine interfaces in accordance with the ISA Standards 5.3, 5.5, 60.1, 60.3, 60.4, and 60.6, or other equivalent standards and recommended practices for designing control buildings, displaying graphic symbols for human machine interfaces, and consideration of other human factors.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should file three-dimensional plant drawings, or other documentation, to confirm plant layout for maintenance, access, egress, and congestion.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should file up-to-date process flow diagrams (PFDs) and piping and instrument diagrams (P&IDs). The PFDs should include heat and material balances. 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>, Plaquemines LNG should include a means to remove mercury as part of the design to limit concentrations to less than 0.01 micrograms per normal cubic meter or alternatively provide monitoring for mercury by means of an analyzer or preventive maintenance inspections of the heat exchangers and connections for a mercury removal package.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should file layout and design specifications of the pig trap, inlet separation and liquid disposal, inlet/send-out meter station, filters, and pressure control.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should file a car seal philosophy and a list of all car-sealed and locked valves consistent with the P&IDs.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should file documentation demonstrating that the recommendations from the Front End Engineering Design 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>, Plaquemines LNG should file a hazard and operability 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>, Plaquemines 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>, Plaquemines LNG should include LNG tank fill flow measurement with high-flow alarm.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should include BOG flow, tank density profile and temperature profile measurement for each tank.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should file cause-and-effect matrices for the process instrumentation, fire and gas detection system, and emergency shutdown 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>, Plaquemines 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>, Plaquemines LNG should specify the minimum distance required for valve maintenance, between the LNG loading header and the first valve in the discharge piping to the loading arm.**
- **<u>Prior to construction of final design</u>, Plaquemines 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>, Plaquemines LNG should include any isolation valves necessary for startup, operation, shutdown, restart, and maintenance procedures.**
- **<u>Prior to construction of final design</u>, Plaquemines 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>, Plaquemines LNG should specify that all drains from high-pressure hazardous fluid systems are to be equipped with double isolation and bleed valves or equivalent positive isolation.**
- **<u>Prior to construction of final design</u>, Plaquemines 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>, Plaquemines LNG should file pressure-relieving protection for flammable liquid piping segments (i.e., refrigerants, liquid hydrocarbons, condensate products) that can be isolated by valves.**
- **<u>Prior to construction of final design</u>, Plaquemines 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>, Plaquemines 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, as well as the sizing and design of the down-comer that would transfer spills from the tank top to the ground-level impoundment system.**
- **<u>Prior to construction of final design,</u> Plaquemines LNG should consult with the DOT PHMSA on compliance with 49 CFR 193 for the water removal design using drains.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should file electrical area classification drawings. The drawings should be updated with the latest design, including liquefaction blocks and full containment tanks, and demonstrate compliance with NFPA 59A, NFPA 70, NFPA 497, API 500, or equivalent, including but not limited to, illustrating Class 1 Division 1 and Division 2, as applicable, at all impoundment trenches, the LNG ship transfer connection, refrigerant truck transfer connection, diesel truck transfer connection, diesel and other combustible tank vents, power plant area, gas turbines, feed gas aftercoolers, mixed refrigerant (MR) coolers, and pig launchers.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should file detailed calculations to confirm that the final firewater 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>, Plaquemines 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 edition). Plaquemines LNG should also provide the results of consultation with the DOT PHMSA indicating that the proposed electrical process seal design would be considered to meet the design requirements of NFPA 59A (2001), as incorporated by 49 CFR 193.2101.**
- **<u>Prior to construction of final design</u>, Plaquemines 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>, Plaquemines LNG should file an analysis of the localized hazards to operators from a potential liquid nitrogen release and should also provide spill containment and low oxygen detectors to mitigate liquid nitrogen releases.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should file a drawing showing the location of the emergency shutdown buttons. Emergency shutdown buttons should be easily accessible, conspicuously labeled, and located in an area that would be accessible during an emergency.**

- **<u>Prior to construction of the final design</u>, Plaquemines LNG should install a plant-wide shutdown button or provide a human reliability analysis that demonstrates the multiple pushbutton approach does not significantly increase the risk compared to a plant-wide shutdown button.**
- **<u>Prior to construction of final design</u>, Plaquemines 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. The list should include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment. The hazard detection layout should be supported by a performance-based study that demonstrates releases that could results in an offsite hazard are detected by two or more gas detectors and flame detectors, including near the diesel and hot oil tanks, steam turbine power plant, flare KO drums, ethylene packages, peaking generator, essential diesel generator, acid gas removal area, hot oil furnaces, thermal oxidizer, combustion air intakes and HVAC intakes of buildings.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should account for the calibration gas of the hazard detectors when determining the lower flammable limit set points for methane, propane, butane, ethylene, and condensate.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should account for the calibration gas of hazard detectors when determining the set points for toxic components such as aqueous ammonia, natural gas liquids and hydrogen sulfide. Include a list of alarm and shutdown set points for each hazard detector.**
- **<u>Prior to construction of final design</u>, Plaquemines 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>, Plaquemines LNG should specify smoke detection in occupied buildings.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should specify hazard detection suitable to detect high temperatures and smoldering combustion products in electrical buildings and control room buildings.**
- **<u>Prior to construction of final design,</u> Plaquemines 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 of all fixed, wheeled, and hand-held extinguishers. 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. The drawings should illustrate portable extinguishers in accordance with NFPA 10 travel distances including, but not limited to, at the liquefaction blocks, near the metering station and pig launchers, on top of all tanks, and in all buildings.**

- **<u>Prior to construction of final design</u>, Plaquemines LNG should specify carbon dioxide systems installed in accordance with NFPA 12 or equivalent in gas turbine enclosures.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should specify clean agent systems installed in accordance with NFPA 2001 or equivalent in instrumentation buildings.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should file drawings and calculations for the structural passive protection systems to protect equipment and supports from cryogenic releases.**
- **<u>Prior to construction of final design</u>, Plaquemines 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 assesses the consequence of pressure vessel bursts and boiling liquid expanding vapor explosions. Trucks at the truck transfer station should be included in the analysis. Passive mitigation should be supported by calculations for the thickness limiting temperature rise and active mitigation should be justified with calculations demonstrating flow rates and durations of any cooling water will mitigate the heat absorbed by the vessel.**
- **<u>Prior to construction of final design</u>, Plaquemines 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 also include piping and instrumentation diagrams of the firewater and foam systems. The firewater coverage drawings should illustrate firewater coverage by two or more hydrants or monitors accounting for obstructions (or deluge systems) for all process areas that contain flammable or combustible fluids, including all three docks, diesel generators and storage, hot oil storage, gas dehydration units, and LNG storage tanks.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should specify remotely operated or automatic firewater monitors in areas inaccessible or difficult to access in the event of an emergency.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should specify firewater capacities for the monitors and hydrants.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should design the firewater pump shelter for maintenance access to the firewater pumps.**
- **<u>Prior to construction of final design</u>, Plaquemines LNG should specify that a firewater flow test meter is installed and 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 construction of final design</u>, Plaquemines LNG should specify the reducer on the suction side of the firewater pump to be eccentric or otherwise justify the use of an alternative reducer that will not cause air pockets to form and cause possible damage to the firewater pump.**

- **Prior to construction of final design, Plaquemines LNG should file an analysis of the structural integrity of the outer containment of the full containment storage tanks when exposed to a roof tank top fire or adjacent tank top fire.**
- **Prior to construction of final design, Plaquemines LNG should file drawings and specifications for protecting transfer piping, pumps, and compressors, etc. to ensure that they are located away from roadway or protected from inadvertent damage from vehicles.**
- **Prior to construction of final design, Plaquemines LNG should file specifications, drawings, and details of vehicle barriers at each facility entrance for access control.**
- **Prior to construction of final design, Plaquemines LNG should file specifications, drawings, and details of the vehicle collision protection at the SH 23 road crossing of the LNG transfer line that demonstrate it can withstand impact from the most severe loading, including potential explosion loads from any trucks carrying hazardous materials.**
- **Prior to construction of final design, Plaquemines LNG should file security camera drawings showing the location, areas covered, and features of the camera (e.g., fixed, tilt/pan/zoom, motion detection alerts, low light, and mounting height) to verify camera coverage of the entire perimeter with redundancies and cameras interior to the facility, including atop the LNG storage tanks, that would enable rapid monitoring of the LNG plant.**
- **Prior to construction of final design, Plaquemines LNG should file a photometric lighting simulation or other calculations that demonstrate lighting coverage adequately covers the interior and perimeter of the facility, including in liquefaction blocks, oily water treatment plant area, exterior of buildings, and along paths/roads of access and egress.**
- **Prior to construction of final design, Plaquemines LNG should file details of fencing with barbed or razor wire, or equivalent, at road crossing that would restrict and deter access.**
- **Prior to construction of final design, Plaquemines LNG should file drawings that clearly demonstrate fencing would be set back from exterior power lines and trees and from interior hazardous piping and equipment by at least 10 feet on either side of the fencing.**
- **Prior to commissioning, Plaquemines LNG should file a detailed schedule for commissioning through equipment startup. The schedule should include milestones for all procedures and tests to be completed: prior to introduction of hazardous fluids and during commissioning and startup. Plaquemines LNG should file with the Secretary documentation certifying that each of these milestones has been completed before authorization to commence the next phase of commissioning and startup will be issued.**
- **Prior to commissioning, Plaquemines LNG should file the 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.**

- **<u>Prior to commissioning</u>, Plaquemines LNG should provide procedures for removing the spent H_2S catalyst.**
- **<u>Prior to commissioning</u>, Plaquemines LNG should tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves.**
- **<u>Prior to commissioning</u>, Plaquemines LNG should file and maintain a detailed training log to demonstrate that operating, maintenance, and emergency response staff has completed the required training.**
- **<u>Prior to commissioning</u>, Plaquemines LNG should file detailed plans and procedures for: testing the integrity of onsite mechanical installation; functional tests; introduction of hazardous fluids; operational tests; and placing the equipment into service.**
- **<u>Prior to commissioning</u>, Plaquemines LNG should file the procedures for pressure/leak tests that address the requirements of ASME VIII and ASME B31.3.**
- **<u>Prior to commissioning</u>, Plaquemines 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>, Plaquemines LNG should equip the LNG storage tanks and adjacent piping and supports with permanent settlement monitors to allow personnel to observe and record the total and relative settlement between the LNG storage tank and adjacent piping. The settlement record should be reported in the semi-annual operational reports.**
- **<u>Prior to introduction of hazardous fluids</u>, Plaquemines LNG should file settlement results from the hydrostatic tests of the LNG storage containers and shall file a plan to periodically verify settlement is as expected and does not exceed the applicable criteria set forth in API 620, API 625, API 653, and ACI 376.**
- **<u>Prior to introduction of hazardous fluids</u>, Plaquemines LNG should complete 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.**
- **<u>Prior to introduction of hazardous fluids</u>, Plaquemines LNG should develop and implement an alarm management program to ensure effectiveness of process alarms.**
- **<u>Prior to introduction of hazardous fluids</u>, Plaquemines LNG should complete 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).**
- **<u>Prior to introduction of hazardous fluids</u>, Plaquemines LNG should complete and document foam system and sprinkler system acceptance tests.**
- **<u>Prior to introduction of hazardous fluids</u>, Plaquemines LNG should complete and document a clean agent acceptance tests.**

- **Prior to introduction of hazardous fluids, Plaquemines LNG should complete and document a pre-startup safety review to ensure that installed equipment meets the design and operating intent of the facility. The pre-startup 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.**
- **Plaquemines 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 first LNG, Plaquemines 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 FERC within 24 hours.**
- **Prior to commencement of service, Plaquemines 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 edition).**
- **Prior to commencement of service, Plaquemines LNG should file any preventive and predictive maintenance program that performs periodic or continuous equipment condition monitoring to ensure mechanical integrity of equipment.**
- **Prior to commencement of service, Plaquemines LNG should file procedures for offsite contractors' responsibilities, restrictions, and limitations and for supervision of these contractors by Plaquemines LNG staff.**
- **Prior to commencement of service, Plaquemines LNG should notify FERC staff of any proposed revisions to the security plan and physical security of the plant.**
- **Prior to commencement of service, Plaquemines 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 Maritime Transportation Security Act of 2002, and the Security 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 Plaquemines LNG or other appropriate parties.**

In addition, we recommend that the following measures should apply throughout the life of the facility.

- **The facility should 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, Plaquemines 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.

- **Semi-annual operational reports should be filed to identify changes in facility design and operating conditions; abnormal operating experiences; activities (e.g., LNG 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 offsite 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 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)" should be included in the semi-annual operational reports. Such information would provide FERC staff with early notice of anticipated future construction/maintenance at the LNG 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 within 24 hours and procedures for corrective action should be specified.**
- **Significant non-scheduled events, including safety-related incidents (e.g., LNG, condensate, 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 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 FERC staff within 24 hours. This notification practice should be incorporated into the LNG facility's emergency 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 a facility that contains, controls, or processes hazardous fluids;

g. any crack or other material defect that impairs the structural integrity or reliability of a facility that contains, controls, or processes 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 (MAOP; 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 LNG facility; 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 LNG terminal's 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 LNG facility to cease operations. Following the initial company notification, 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.

4.12.6 Conclusions on LNG Reliability and LNG Carrier Reliability and Safety

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

As a cooperating agency, the DOT assisted FERC in evaluating whether Plaquemines LNG's proposed design would meet the DOT's 49 CFR 193 Subpart B siting requirements. DOT will provide an LOD on the Project's compliance with 49 CFR Part 193 Subpart B. This determination will be provided to the Commission as further consideration to the Commission on 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 Part 193 would be made by the DOT staff.

As a cooperating agency, the USCG also assisted FERC staff by reviewing the proposed LNG terminal and the associated LNG carrier traffic. The USCG reviewed a Waterway Suitability Assessment submitted by Plaquemines LNG that focused on the navigation safety and maritime security aspects of LNG carrier transits along the affected waterway. On January 23, 2017, the USCG issued a Letter of Recommendation to FERC staff indicating the Lower Mississippi River could be made suitable for accommodating the type and frequency of LNG marine traffic associated with this 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 facility would be subject to the USCG's inspection and enforcement program to ensure compliance with the requirements of 33 CFR Part 105 and 33 CFR Part 127.

FERC staff conducted a preliminary engineering and technical review of the Plaquemines LNG design, including potential external impacts based on the site location. Based on FERC staff review, we recommend the Commission consider incorporating into the order a number of proposed 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 life of the facility to enhance the reliability and safety of the facility to mitigate the risk of impact on the public. With the incorporation of these mitigation measures and oversight, FERC staff believe that the 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 offsite public.

4.12.7 Pipeline System Safety

The transportation of natural gas by pipeline involves some incremental risk to the public due to the potential for accidental release of natural 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 auto-ignition temperature of 1,000 degrees Fahrenheit and is flammable at concentrations between 5.0 percent and 15.0 percent in air. An unconfined mixture of methane and air is not explosive; however, it may ignite and burn if there is an ignition source. 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.

4.12.7.1 Safety Standards

The DOT is mandated to prescribe minimum safety standards to protect against risks posed by pipeline facilities under Title 49, U.S.C. Chapter 601. The DOT's PHMSA 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 that set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety. The PHMSA's safety mission is to ensure 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.

Title 49, U.S.C. Chapter 601 provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing the federal standards. A state may also act as DOT's agent to inspect interstate facilities within its boundaries; however, the DOT is responsible for enforcement actions. Louisiana has delegated authority to inspect interstate pipeline facilities.

The DOT pipeline standards are published in Parts 190-199 of Title 49 of the CFR. Part 192 specifically addresses natural gas pipeline safety issues.

Under a MOU on Natural Gas Transportation Facilities (Memorandum) dated January 15, 1993, between the DOT and 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 FERC's regulations require that an applicant certify that it 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. Alternatively, an applicant must certify that it 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. FERC accepts this certification and does not impose additional safety standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert 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.

FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee, which determines if proposed safety regulations are reasonable, feasible, and practicable.

The pipeline and aboveground facilities associated with the Project must be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. The DOT specifies material selection and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion.

The DOT also defines area classifications, based on population density in the vicinity of the pipeline, and specifies more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline. The four area classifications are defined below:

Class 1 Location with 10 or fewer buildings intended for human occupancy.

Class 2 Location with more than 10 but less than 46 buildings intended for human occupancy.

Class 3 Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building, or small well-defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks in any 12-month period.

Class 4 Location where buildings with four or more stories aboveground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. For instance, pipelines constructed on land in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil and 18 inches in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock.

Class locations also specify the maximum distance to a sectionalizing block valve (e.g., 10.0 miles in Class 1, 7.5 miles in Class 2, 4.0 miles in Class 3, and 2.5 miles in Class 4). Pipe wall thickness and pipeline design pressures; hydrostatic test pressures; MAOP; inspection and testing of welds; and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas.

Currently, the entire pipeline system is in a Class 1 location. If a subsequent increase in population density adjacent to the right-of-way results in a change in class location for the pipeline, the operator would reduce the MAOP or replace the segment with pipe of sufficient grade and wall thickness, if required to comply with the DOT requirements for the new class location.

The US DOT Pipeline Safety Regulations require operators to develop and follow a written integrity management program that contain all the elements described in 49 CFR 192.911 and address the risks on each transmission pipeline segment. The rule establishes an integrity management program that applies to all high consequence areas (HCA).

The DOT has published rules that define HCAs where a gas pipeline accident could do considerable harm to people and their property and requires an integrity management program to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate for DOT to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCAs may be defined in one of two ways. In the first method an HCA includes:

- current class 3 and 4 locations;

- any area in Class 1 or 2 where the potential impact radius[25] is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle[26]; or

- any area in Class 1 or 2 where the potential impact circle includes an identified site.

An identified site is an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period; a building that is occupied by 20 or more persons on at least 5 days a week for any 10 weeks in any 12-month period; or a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate.

In the second method, an HCA includes any area within a potential impact circle, which contains:

- 20 or more buildings intended for human occupancy; or

- an identified site.

Once a pipeline operator has determined the HCAs along its pipeline, it must apply the elements of its integrity management program to those segments of the pipeline within HCAs. The DOT regulations specify the requirements for the integrity management plan at section 192.911. The pipeline integrity management rule for HCAs requires inspection of the pipeline HCAs every 7 years.

Currently, there are no HCAs along the pipeline system.

The DOT prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Each pipeline operator is required to establish an emergency plan that includes procedures to minimize the hazards of a natural gas pipeline emergency. Key elements of the plan include procedures for:

- receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;

- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;

- emergency system shutdown and safe restoration of service;

- making personnel, equipment, tools, and materials available at the scene of an emergency; and

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25 The potential impact radius is calculated as the product of 0.69 and the square root of the MAOP of the pipeline in psig multiplied by the square of the pipeline diameter in inches.

26 The potential impact circle is a circle of radius equal to the potential impact radius.

- protecting people first and then property, and making them safe from actual or potential hazards.

The DOT requires that each operator establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials. Plaquemines LNG would provide the appropriate training to local emergency service personnel before the pipeline is placed in service.

4.12.7.2 Pipeline Accident Data

The DOT requires all operators of natural gas transmission pipelines to notify the DOT of any significant incident and to submit a report within 30 days. Significant incidents are defined as any leaks that:

- caused a death or personal injury requiring hospitalization; or
- involved property damage of more than $50,000 (1984 dollars).[27]

During the 20-year period from 1995 through 2014, a total of 1,265 significant incidents were reported on the more than 300,000 total miles of natural gas transmission pipelines nationwide.

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 4.12-1 provides a distribution of the causal factors as well as the number of each incident by cause.

The dominant causes of pipeline incidents are corrosion and pipeline material, weld or equipment failure constituting 49.6 percent of all significant incidents. The pipelines included in the data set in table 4.12-1 vary widely in terms of age, diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline.

The frequency of significant incidents is strongly dependent on pipeline age. Older pipelines have a higher frequency of corrosion incidents and material failure, because corrosion and pipeline stress/strain is a time-dependent process.

[27] $50,000 in 1984 dollars is approximately $112,955.73 as of May 2015 (CPI, Bureau of Labor Statistics, 2015).

Table 4.12-1 Natural Gas Transmission Pipeline Significant Incidents by Cause (1996-2015) [a]		
Cause	**Number of Incidents**	**Percentage**
Pipeline material, weld, or equipment failure	354	27.0
Corrosion	311	23.7
Excavation	210	16.0
All other causes [b]	165	12.6
Natural forces [c]	146	11.1
Outside force [d]	84	6.4
Incorrect operation	40	3.1
Total	**1,310**	**100**

a All data gathered from PHMSA's Oracle BI Interactive Dashboard website for Significant Transmission Pipeline Incidents, https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Portalpages&NQUser=PDM_WEB_USER&NQPassword=Public_Web_User1&PortalPath=%2Fshared%2FPDM%20Public%20Website%2F_portal%2FSC%20Incident%20Trend&Page=Significant&Action=Navigate&col1=%22PHP%20-%20Geo%20Location%22.%22State%20Name%22&val1=%22%22

b All other causes include miscellaneous, unspecified, or unknown causes.

c Natural force damage includes earth movement, heavy rain, floods, landslides, mudslides, lightning, temperature, high winds, and other natural force damage.

d Outside force damage includes previous mechanical damage, electrical arcing, static electricity, fire/explosion, fishing/maritime activity, intentional damage, and vehicle damage (not associated with excavation).

The use of both an external protective coating and a cathodic protection system,[28] required on all pipelines installed after July 1971, significantly reduces the corrosion rate compared to unprotected or partially protected pipe.

Outside force, excavation, and natural forces are the cause in 34.2 percent of significant pipeline incidents. These result from the encroachment of mechanical equipment such as bulldozers and backhoes; earth movements due to soil settlement, washouts, or geologic hazards; weather effects such as winds, storms, and thermal strains; and willful damage. Table 4.12-2 provides a breakdown of external force incidents by cause.

Older pipelines have a higher frequency of outside forces incidents partly because their location may be less well known and less well marked than newer lines. In addition, the older pipelines contain a disproportionate number of smaller-diameter pipelines, which have a greater rate of outside forces incidents. Small diameter pipelines are more easily crushed or broken by mechanical equipment or earth movement.

Since 1982, operators have been required to participate in "One Call" public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of pipelines. The "One Call" program is a service used by public utilities and some private sector companies (e.g., oil pipelines and cable television) to provide preconstruction information to

[28] Cathodic protection is a technique to reduce corrosion (rust) of the natural gas pipeline through the use of an induced current or a sacrificial anode (like zinc) that corrodes at faster rate to reduce corrosion.

contractors or other maintenance workers on the underground location of pipes, cables, and culverts.

Table 4.12-2 Excavation, Natural Forces, and Outside Force Incidents by Cause (1996-2015) [a]		
Cause	**Number of Excavation, Natural Forces, and Outside Force Incidents**	**Percentage of All Incidents [b,c]**
Third party excavation damage	172	13.1
Heavy rain, floods, mudslides, landslides	74	5.7
Vehicle (not engaged with excavation)	49	3.7
Earth movement, earthquakes, subsidence	32	2.4
Lightning, temperature, high winds	27	2.1
Operator/contractor excavation damage	25	1.9
Unspecified excavation damage/previous damage	13	1.0
Other or unspecified natural forces	13	1.0
Fire/explosion	9	0.7
Fishing or maritime activity	9	0.7
Other outside force	9	0.7
Previous mechanical damage	6	0.5
Electrical arcing from other equipment/facility	1	0.1
Intentional damage	1	0.1
Total	**440**	**33.5**

a All data gathered from PHMSA's Oracle BI Interactive Dashboard website for Significant Transmission Pipeline Incidents, .
b Percentage of all incidents was calculated as a percentage of the total number of incidents natural gas transmission pipeline significant incidents (i.e., all causes) presented in table 4.12-1.
c Due to rounding, column does not equal 33.6 percent.

4.12.7.3 Impact on Public Safety

The service incidents data summarized in table 4.12-1 include natural gas transmission system failures of all magnitudes with widely varying consequences.

Table 4.12-3 presents the annual injuries and fatalities that occurred on natural gas transmission lines from incidents for the 5-year period between 2010 and 2014. The majority of fatalities from pipelines are due to local distribution pipelines not regulated by FERC. These are natural gas pipelines that distribute natural gas to homes and businesses after transportation through interstate natural gas transmission pipelines. In general, these distribution lines are smaller diameter pipes and/or plastic pipes, which are more susceptible to damage. Local distribution systems do not have large right-of-ways and pipeline markers common to FERC regulated natural gas transmission pipelines. Therefore, incident statistics inclusive of distribution pipelines are inappropriate to use when considering natural gas transmission projects.

Table 4.12-3 Injuries and Fatalities – Natural Gas Transmission Pipelines [a]				
	Injuries		Fatalities	
Year	Employees	Public	Employees	Public
2011	1	0	0	0
2012	3	4	0	0
2013	0	2	0	0
2014	1	0	1	0
2015	12	2	6	0

a All data gathered from PHMSA Pipeline Incident Flagged Files (USDOT, 2015).

The nationwide totals of accidental fatalities from various anthropogenic and natural hazards are listed in table 4.12-4 in order to provide a relative measure of the industry-wide safety of natural gas transmission pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. The data nonetheless indicate a low risk of death due to incidents involving natural gas transmission pipelines compared to the other categories. Furthermore, the fatality rate is much lower than the fatalities from natural hazards such as lightning, tornados, or floods.

The available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation. From 1996 to 2015, there were an average of 65 significant incidents, nine injuries and two fatalities per year. The number of significant incidents over the more than 303,000 miles of natural gas transmission lines indicates the risk is low for an incident at any given location. The operation of the pipeline system would represent a slight increase in risk to the nearby public.

Table 4.12-4 Nationwide Accidental Fatalities by Cause	
Type of Accident	**Annual Number of Deaths**
All unintentional deaths	146,571
Motor vehicle [a]	35,369
Poisoning [a]	38,851
Falls [a]	30,208
Pedestrians from vehicle crash[b]	5,977
Drowning [a]	3,391
Fire, smoke inhalation, burns [a]	2,760
Floods [c]	81
Tornado [c]	72
Lightning [c]	49
Hurricane [c]	47
Natural gas distribution lines [d]	13
Natural gas transmission pipelines [d]	2

a Accident data presented for motor vehicle, poisoning, falls, drowning, fire, smoke inhalation, and burns represent the annual accidental deaths recorded in 2013 (Centers for Disease Control and Prevention, 2013)

b National Highway Traffic Safety Administration 2017 data, October 2018

c Accident data presented for floods, tornados, lightning, and hurricanes represent the 30-year average of accidental deaths between 1985 and 2014 (NOAA, 2016)

d Accident data presented for natural gas distribution lines and transmission pipelines represent the 20-year average between 1996 and 2015 (USDOT, 2016b)

4.13 CUMULATIVE IMPACTS

In accordance with NEPA, we considered the cumulative impacts of the Project with other projects or actions within the geographic and temporal scope of the Project. As defined by CEQ, a cumulative effect is the impact on the environment that results from the incremental effects of the proposed action when added to other past, present, and reasonably foreseeable actions, regardless of what agency or person undertakes such actions (CEQ, 1997). Although the individual impact of each separate project may be minor, the additive effects of multiple projects can be significant. The potential direct and indirect impacts of the Project on environmental resources are described in previous sections of this EIS.

The purpose of this analysis is to identify and describe cumulative impacts that would potentially result from construction and operation of the Project. Inclusion of actions is based on identifying commonalities of impacts from other actions to the Venture Global's potential impacts on various environmental resources. To ensure that the analysis focuses on relevant projects and potentially significant impacts, this cumulative impacts analysis includes other actions meeting the following criteria:

- the action impacts a resource that would be affected by the Project;
- the action causes impacts within all or part of the geographic scope of the Project; and
- the action causes impacts within all or part of the temporal scope of the Project.

The regional landscape in the Project area has been significantly altered since the latter part of the nineteenth century, initially by agriculture and later by the development of industrial complexes, oil and gas support facilities, port facilities, residential and commercial centers, and attendant public infrastructure (schools, hospitals, roads, etc.). These developments, along with associated upgrades to flood protection and drainage systems (levees, ditches, pumping stations, etc.), have had a permanent impact on the regional landscape. Consistent with CEQ guidelines (2005), we have aggregated past actions that helped shape the current environment into our discussion of the affected environment in section 4.0. Thus, we discuss present and reasonably foreseeable actions in this section.

Based on our evaluations in section 4.0, the Project would have negligible or no impacts on groundwater, recreation, and cultural resources. As a result, the Project would not contribute to potentially significant cumulative effects on these three resources. However, the Project could contribute incrementally to cumulative impacts on other resources in the Project area.

Most present and reasonably foreseeable actions with impacts during the Project's temporal extent would commence construction or operation during the Project's construction period. One exception is a recently announced container terminal that is so early in the planning phase we assumed it would only overlap the Project's operation period. The Project anticipates construction would begin in 2019 and continue until 2024. Operation of Phase I facilities would commence in 2022, and Phase II facilities would be operational by 2024. The Project would continue operations for at least 30 years. Thus, actions identified in this assessment were those for which publicly available sources indicated that (i) some portion of construction would occur during years 2019-

2024, or (ii) some phase of operation would commence in 2019 or later. We also considered actions that commenced operation in 2017 or 2018 because their effects may not have been realized prior to the analyses in section 4.0.

Actions with resource impacts within the same geographic scope as the Project would occur within a prescribed distance from the Project, uniquely defined based on the characteristics of the resource and how far the Project's effects might extend. Geographic scope, then, defines how far out from the Project a cumulative impact could occur. Table 4.13-1 provides the geographic scope for each resource and the reasoning behind its establishment.

As in section 4.1 through 4.12, we use specific terms to describe the intensity and duration of cumulative impacts. The intensity of a cumulative impact could be negligible, minor, moderate, or significant. The duration of a cumulative impact could be temporary, short term, or long term if the resource would return to its preconstruction condition; otherwise, the impact would be permanent. Temporary impacts may continue for a few months after construction. For ecological and physical resources, short-term impacts could extend up to 3 years, and long-term impacts would last longer than 3 years. For socioeconomic resources, a short-term impact could extend up to 5 years, and a long-term impact would continue after 5 years.

Table 4.13-1 Resource-Specific Geographic Scope and Temporal Extent of Project Impacts		
Resource	**Geographic Scope**	**Reasoning**
Geology and Soils	Project workspace	Effects would not extend beyond the area of the Project's direct disturbance.
Groundwater	Aquifers within the HUC-12 subwatersheds directly affected by the Project	Because an HUC-12 subwatershed is a localized drainage basin, runoff, spills, etc., from the Project could travel across affected HUC-12 subwatersheds and affect aquifers beneath them.
Surface Waters and Aquatic Wildlife and Habitat	Waterbodies crossed by and downstream of the Project that are within the HUC-12 subwatersheds directly affected by the Project	Runoff, spills, discharges, etc., from the Project could travel across affected HUC-12 subwatersheds and drain into downstream waterbodies.
Wetlands	Wetlands within the HUC-12 subwatersheds directly affected by the Project	Runoff, spills, discharges, etc., from the Project could travel across affected HUC-12 subwatersheds and intercept wetlands.
Vegetation and Wildlife	Vegetation and wildlife communities within the HUC-12 subwatersheds directly affected by the Project	Runoff, spills, etc., from the Project could travel across affected HUC-12 subwatersheds and intercept the vegetative cover.
Land Use and Recreation	Land use within the broader west bank community and land cover within the HUC-12 subwatersheds directly affected by the Project; recreation within 1.0 mile of the Project	Land uses are planned at the community level; land cover that is not yet paved is partially affected by water flow patterns within the watershed or subwatershed.
Visual Resources	Common viewpoints from which Project or Project activities would be visible	Accounts for visual impacts at the viewshed level.
Socioeconomics	Plaquemines Parish and, to a lesser extent, Jefferson and Orleans parishes	Economic, housing, and public service impacts distribute through local jurisdictions and are not confined to the neighborhood or community around a development.
Roadway Traffic	West bank in Plaquemines Parish	Traffic flow effects from the Project would primarily impact SH 23, which runs the length of the west bank.
Vessel Traffic	Mississippi River in Plaquemines Parish and waterways in the Barataria Basin	The LNG terminal would generate traffic along the river, which would be concentrated in the reach within the parish; the pipeline system would generate traffic on west bank inland waterways.
Cultural Resources	Area of Potential Effect (as defined in section 4.10)	See section 4.10
Air Quality		
Construction	Concurrently constructed projects within 0.25 mile of the Project	Vehicle, vessel, and equipment emissions and dust generated during construction would not travel farther than 0.25 mile.
Operation	31-mile radius around LNG terminal	Matches EPA's distance for cumulative modeling of large PSD sources during permitting.
Noise		
Construction	Concurrently constructed projects within 0.25 mile of the Project and within 0.5 mile of HDD entry and exit points and pile-driving activities	Distances represent the furthest construction noise could potentially adversely affect NSAs, given the temporary duration.

Table 4.13-1 Resource-Specific Geographic Scope and Temporal Extent of Project Impacts		
Resource	**Geographic Scope**	**Reasoning**
Operation	1.0-mile radius around LNG terminal	Distance represents the furthest that operation noise could potentially adversely affect NSAs, given the permanent duration.
Key: EPA = U.S. Environmental Protection Agency HDD = horizontal directional drilling HUC = hydrologic unit code NSA= noise-sensitive area PSD = prevention of significant deterioration SH = State Highway		

4.13.1 Projects and Activities Considered

This analysis identified several different types of present, proposed, and permitted actions that could cause a cumulative impact when considered along with the Project. The actions were provided by Venture Global and by a general literature review of several online website sources including, but not limited to:

- FERC eLibrary;
- LDEQ;
- Louisiana Economic Development;
- USACE Regulatory Public Notices;
- Greater New Orleans, Inc., Regional Economic Development;
- Plaquemines Association of Business and Industry; and
- CPRA.

Table 4.13-2 summarizes the actions that have the potential for cumulative impacts because of their location and timing. The actions are mapped on figure 4.13-1. Of the 16 total actions, including the Project, there are:

- two non-jurisdictional facilities associated with the Project;
- six major industrial developments;
- one major transportation project;
- two drainage and shoreline protection projects;
- four wetland mitigation and restoration projects; and
- one dredging project.

Table 4.13-2 Present and Future Actions Considered in the Cumulative Impact Analysis[a]							
Action/ Proponent	**Closest Distance to Project (Location)**	**Project Type**	**Description**	**Estimated Construction Period or Start Date (years)[b]**	**Estimated Operation Period or Start Date (years)**	**Action Site (acres, feet, or miles)[c]**	**Resources that May Be Cumulatively Affected[d]**
Plaquemines LNG and Gator Express Pipeline Project	**0 miles**	**Major Industrial**	**Project nameplate capacity of 20.0 MTPA LNG export capacity**	**2019–2024**	**2022 (Phase I)**	**622 acres – LNG terminal 27 miles-pipeline system**	**All except groundwater, recreation, and cultural resources**
Entergy Electric Utility Connection/ Entergy Louisiana, LLC	0 miles, tie-in at LNG terminal	Non-jurisdictional Utility Line	Temporary tie-in using a 1,500-foot-long electrical line from an existing power line on SH 23 to a temporary construction electrical distribution center within the LNG terminal site. Ground disturbance would involve an electrical junction box, meters, and associated equipment. Following start-up of the LNG terminal power plant, the temporary line would be removed.	2019	2019–2021	1,500 feet within project workspace	None - the disturbed resources are accounted for in the evaluation of the LNG terminal in sections 4.1 through 4.12.
Plaquemines Parish Water Line Connection/ Plaquemines Parish Water Works	0 miles, tie-in at LNG terminal	Non-jurisdictional Utility Line	Temporary or permanent tie-in using a 1,500-foot-long aboveground pipeline from an existing water line along SH 23 to a distribution point at the LNG terminal site. Installation would require temporary ground disturbance. Status Venture Global's evaluation of water supply sources is ongoing, as are discussions with the parish; the 1,500-foot-long tie-in is one option of three alternatives and may not be selected.	2019	2019–2024	1,500 feet within project workspace	None - the disturbed resources are accounted for in the evaluation of the LNG terminal in sections 4.1 through 4.12.
NOLA Oil Terminal/ NOLA Oil Terminal, LLC	4 miles northwest of LNG terminal (west bank)	Major Industrial	New bulk liquid petroleum product blending, storage, and transfer terminal with up to 54 storage tanks having up to 8.2 million barrels capacity. This marine loading operation would receive various oil products (e.g., fuel oil, crude oil, heavy oil carbon black feedstock, and other materials) from barge or ship. Site still lacks feedstock pipeline connection. Permit status 2013: LDEQ Title V air and USACE permits issued 2013: Plaquemines Parish building permit issued 2016: LPDES permit issued	*Unavailable*	*Unavailable*	128 acres *Information about future pipeline connection unavailable*	Surface Water & Aquatic Wildlife; Wetlands; Veg & Wildlife; Land Use; Visual; Socioec - *net benefit*; Road Traffic; Vessel Traffic; Air Quality; Safety

Table 4.13-2 Present and Future Actions Considered in the Cumulative Impact Analysis[a]							
Action/ Proponent	**Closest Distance to Project (Location)**	**Project Type**	**Description**	**Estimated Construction Period or Start Date (years)[b]**	**Estimated Operation Period or Start Date (years)**	**Action Site (acres, feet, or miles)[c]**	**Resources that May Be Cumulatively Affected[d]**
Braithwaite Methanol Plant/ Castleton Commodities International Port Nickel, LLC	18 miles north of LNG terminal (Braithwite, east bank)	Major Industrial	New methanol manufacturing facility with 5,000-metric ton daily production capacity (1.8 million tons per annum). Feedstock natural gas to be supplied via pipeline, although this connection has not been identified. The final product to be stored on-site prior to being shipped off-site via marine vessels. Market conditions became unfavorable in period after permits first issued. The site is the former Amax Nickel site. <u>Permit status</u> 2014: LDEQ Title V air and USACE permits issued 2017: LDEQ issued extension of construction start-date (or binding agreement to construct) to June 29, 2019 2017: Extension requested for USACE permit	2019 (extension granted to delay construction start-date deadline to June 2019)	2021 (construction reported to require 2 years)	36 acres *Information on future pipeline connection unavailable*	Surface Water & Aquatic Wildlife Wetlands; Veg & Wildlife; Socioec- *net benefit*; Vessel Traffic; Air Quality;
Gulf Coast Methanol Complex/ IGP Methanol LLC	2 miles northwest of LNG terminal (Myrtle Grove, west bank)	Major Industrial	New methanol manufacturing facility with 200,000-metric ton daily production capacity. Feedstock natural gas to be supplied via ~13-mile-long lateral to Tennessee Gas Pipeline near Happy Jack, Louisiana. The final product, pure methanol, to be stored on-site prior to being shipped off-site via marine vessels. At full build-out, four operating units, each producing 1.8 million tons per annum. Estimated construction period is 5–7 years, with each phase staggered 18 months. <u>Permit status</u> 2018 LDEQ Title V air permit issued	2018–2025	2020 or 2021 (first phase)	140 acres – terminal ~13 miles – pipeline	Surface Water & Aquatic Wildlife ; Wetlands; Veg & Wildlife; Land Use; Visual; Socioec - *net benefit*; Road Traffic; Vessel Traffic; Air Quality; Safety

Table 4.13-2 Present and Future Actions Considered in the Cumulative Impact Analysis[a]							
Action/ Proponent	**Closest Distance to Project (Location)**	**Project Type**	**Description**	**Estimated Construction Period or Start Date (years)[b]**	**Estimated Operation Period or Start Date (years)**	**Action Site (acres, feet, or miles)[c]**	**Resources that May Be Cumulatively Affected[d]**
Pointe Celeste Container Terminal/ Plaquemines Port Harbor and Terminal District and American Patriot Holdings LLC	3 miles southeast of LNG terminal (Pointe Celeste, west bank)	Major Industrial	Container terminal equipped to receive 20,000 Twenty-Foot Equivalent Unit vessels or any post-Panamax vessel with three berths exceeding 60 feet. It would provide inland self-propelled vessel service to deliver containers to and from other ports on Mississippi and Illinois Rivers. Container terminal is part of Port District's plan to develop a modernized port facility on 4,200 acres of Port property. The Venture Global Project is considered one element of the new port. The container terminal, along with an envisioned breakbulk terminal, would comprise 1,000 acres. Status Pre-feasibility studies conducted to demonstrate project value. Current effort focused on attracting investors and a terminal operator.	*Unavailable*: overlap not assumed	*Unavailable*	Up to 1,000 acres	Surface Water & Aquatic Wildlife; Wetlands; Veg & Wildlife; Land Use; Visual; Socioec; Road Traffic; Vessel Traffic; Air Quality; Safety
Pointe LNG/ Pointe LNG LLC and Pointe Pipeline Company, LLC	8 miles southeast of LNG terminal (east bank)	Major Industrial	LNG export facility consisting of three liquefaction trains with combined production capacity of 6.0 MTPA. Project will include two gas supply pipeline laterals extending north and south, 3.2 miles and 3.4 miles respectively. Two LNG storage tanks of 160,000m^3 will be onsite, which will be surrounded by a floodwall. Power will be generated on-site by gas turbines. The leased property is the site of the proposed Louisiana LNG Project, which submitted a pre-filing process request in 2014 but was later abandoned. The founders of Pointe LNG are the same founders of the defunct Louisiana LNG.	2022–2025	2025	600 acres	Socioec; Vessel Traffic; Air Quality; Safety

Table 4.13-2 Present and Future Actions Considered in the Cumulative Impact Analysis[a]							
Action/ Proponent	**Closest Distance to Project (Location)**	**Project Type**	**Description**	**Estimated Construction Period or Start Date (years)[b]**	**Estimated Operation Period or Start Date (years)**	**Action Site (acres, feet, or miles)[c]**	**Resources that May Be Cumulatively Affected[d]**
Mid-Barataria Sediment Diversion Project/ Louisiana Coastal Protection and Restoration Authority	<u>Diversion structure:</u> 5 miles northwest of LNG terminal; <u>Targeted area:</u> portion of the Barataria Basin that encompasses the project (Lower Mississippi River and Barataria Basin)	Wetland Mitigation and Restoration	Project would restore marshes in the Barataria Basin by reintroducing sediment and nutrients that historically built up the area. Expected to reduce land loss in portion of the Barataria Basin by 20,000 to 32,000 acres over 50 years. The project would create an opening in the West Bank levee just north of Ironton, LA. <u>Permit status</u> October 2022: Target date for design completion and permit acquisition. Construction would start following permits and take 2 to 4 years.	2022–2026	2026	4.5 acres 20,000 to 32,000 acres – area benefited	Surface Water & Aquatic Wildlife - *net benefit*; Wetlands - *benefit*; Socioec - *net benefit*; Air Quality
NOV/NFL Hurricane Risk Reduction Project-Levee Upgrade/ USACE	0 miles (adjacent to pipeline system) and 0.3 mile south of LNG terminal (total project covers west and east banks)	Drainage and Shoreline Protection	In lower Plaquemines Parish, these complimentary projects involve upgrading or restoring existing levees and completing unconstructed authorized ones to achieve storm risk reduction. Seven levee reaches, comprising 58 miles, are being upgraded, either to a 20- to 25-year or 50-year storm level of risk reduction. Subset of NOV/NFL adjacent to the project (Plaquemines Parish non-federal levee project): 34 miles of levees from Oakville to St. Jude originally constructed by the parish to be replaced or modified, some of which will be incorporated into the NOV federal system. Upgraded levee will be crossed by the SW Laterals. Construction began in 2012 and is scheduled to finish in 2024. <u>Status of levee segment adjacent to the project</u> In design as of December 2016.	2012–2024 (Levee segment adjacent to the project: *construction date unavailable*)	Ongoing (Levee segment adjacent to the project: *by 2024*)	58 miles affected *(not all within geographic scope)*	Surface Water & Aquatic Wildlife -*net benefit*; Wetlands; Veg & Wildlife; Land Use - *benefit*; Road Traffic; Air Quality; Noise; Safety - *benefit*

Table 4.13-2 Present and Future Actions Considered in the Cumulative Impact Analysis[a]							
Action/ Proponent	**Closest Distance to Project (Location)**	**Project Type**	**Description**	**Estimated Construction Period or Start Date (years)[b]**	**Estimated Operation Period or Start Date (years)**	**Action Site (acres, feet, or miles)[c]**	**Resources that May Be Cumulatively Affected[d]**
NOV/NFL Hurricane Risk Reduction Project - Wetland Mitigation/ USACE	1 mile west of pipeline system (total project crosses four parishes)	Wetland Mitigation and Restoration	Wetland mitigation projects for some, but not all, of the NOV/NFL Hurricane Risk Reduction Project. The Environmental Assessment #543 discusses the impacts of creating and nourishing nine distinct marshes, three of which are within the HUC-12 subwatersheds intersected by the project: Delfelice (345 acres brackish marsh); Coleman (230 acres brackish marsh); Jesuit Bend (225 bottom land hardwood-wet and 95 acres swamp). Dredge material from 606 acres within Mississippi River would provide sediment.	2019	2021	Acres within geographic scope for wetlands: 670 acres non-forested wetlands 225 acres forested wetlands	Surface Water & Aquatic Wildlife - *benefit*; Wetlands - *benefit*; Vessel Traffic
NOV/NFL Hurricane Risk Reduction Project-Drainage Canal Relocation/ USACE and Plaquemines Parish Government	0 miles (adjacent to pipeline system) and 0.3 mile south of LNG terminal (west bank)	Drainage and Shoreline Protection	Because of the expansion of portions of the non-federal levee base, the existing drainage canal located on the levee's protected side would be filled; as part of the overall project, Plaquemines Parish government would redirect the water flow to the canal that fringes the southern edge of the terminal and improve it to accommodate the additional flow.	Prior to August 2024	By August 2024	~1.8 acres (80,000 square feet)[a]	Surface Water & Aquatic Wildlife-*benefit*; Wetlands; Road Traffic; Noise; Air Quality; Safety - *benefit*
Mississippi River Ship Channel Deepening, Venice to Gulf/ USACE and Louisiana Department of Transportation and Development	35 miles southeast of the terminal (Lower Mississippi River)	Dredging	Increase depth from 45 feet to 50 feet in the southernmost segment of the Mississippi River ship channel ~35 miles from river mile 13.4 above Head of Passes to river mile 22.0 below Head of Passes in Southwest Pass. This is the next phase of construction in an overarching plan to deepen the majority of the ship channel from Baton Rouge to Venice. Status Draft Integrated General Reevaluation Report and Supplemental Environmental Impact Statement was issued November 2016.	*Unavailable:* overlap not assumed	*Unavailable*	~400-foot length of canal along the 400-foot pipeline system workspace at the pipe bridge	Vessel Traffic; Socioec - *benefit;* Air Quality; Safety

Table 4.13-2 Present and Future Actions Considered in the Cumulative Impact Analysis[a]							
Action/ Proponent	**Closest Distance to Project (Location)**	**Project Type**	**Description**	**Estimated Construction Period or Start Date (years)[b]**	**Estimated Operation Period or Start Date (years)**	**Action Site (acres, feet, or miles)[c]**	**Resources that May Be Cumulatively Affected[d]**
SH 23 Improvement Project/ Louisiana Department of Transportation and Development	10 miles southeast of terminal (Happy Jack to Port Sulphur, west bank)	Major Transportation	Resurfacing 2-lane section of SH 23 between Happy Jack and Port Sulphur, Louisiana (almost 4 miles), and adding turning lanes in Port Sulphur at Civic Drive, Freeport Drive, and the entrance to Plaquemines Medical Center. Minor drainage work included replacing deficient cross drains. SH 23 is the main artery in the west bank and is the evacuation route.	Completed March 2017	2017	4-mile-long road section	Road Traffic - *benefit*
Bayou Grande Chenier Marsh and Ridge Restoration/ Coastal Protection and Restoration Authority	2 miles east of pipeline system (west bank)	Wetland Mitigation and Restoration	Creating and nourishing marsh and forested ridge habitat with dredged material from Mississippi River. Material would be hydraulically dredged and piped. <u>Status</u> Construction services agreement signed in January 2015.	*Unavailable*	*Unavailable*	Total wetlands: 486 acres 342 acres – created Approximately 132 acres – nourished 12 acres – forested ridge creation	Surface Water & Aquatic Wildlife - *net benefit*; Wetlands - *benefit*; Vessel Traffic; Air Quality
Barataria Bay Rim Marsh Creation and Nourishment/ Coastal Protection and Restoration Authority	2 miles west of pipeline system; adjacent to barge route for pipeline system construction (west bank)	Wetland Mitigation and Restoration	Creating marsh with dredged material from the Barataria Bay. The site is at the northwest end of the Barataria Bay, adjacent to Mud Lake. <u>Status</u> The project was approved for Phase I engineering and design in January 2016, and construction was scheduled for November 2020 through November 2021, pending funding approval. However, an update from Costal Protection shows status as "awaiting additional funding for implementation" through end of 2021.	2020-21, pending funding	2021, pending funding	Total wetlands: 517 acres 251 acres – created 266 acres – nourished	Surface Water & Aquatic Wildlife - *net benefit*; Wetlands - *benefit*; Vessel Traffic; Air Quality

Table 4.13-2 Present and Future Actions Considered in the Cumulative Impact Analysis[a]							
Action/ Proponent	Closest Distance to Project (Location)	Project Type	Description	Estimated Construction Period or Start Date (years)[b]	Estimated Operation Period or Start Date (years)	Action Site (acres, feet, or miles)[c]	Resources that May Be Cumulatively Affected[d]

a This table lists those activities that are most likely to contribute to cumulative impacts within the vicinity of the Project; it is not intended to provide an all-inclusive listing of activities in the region.
b Actions with "*unavailable*" construction dates are assumed to undergo construction concurrent with Project construction, unless otherwise noted.
c Some of the area within a project site may not be disturbed or affected by an activity.
d Actions' effects on listed resources are adverse unless otherwise noted as "*benefit*" or "*net benefi*t," implying some effect would be adverse.
e Abbreviated resource categories are as follows:
SurWater & Aquatic Wildlife = Surface Water and Aquatic Wildlife and Habitat
Veg & Wildlife = Vegetation and Wildlife
Socioec = Socioeconomics [jobs, revenues and stimulus, taxes, housing, and public services]
Safety = Safety and Reliability

Key:
HUC = hydrologic unit code
LDEQ = Louisiana Department of Environmental Quality
LNG = liquefied natural gas
LPDES = Louisiana Pollutant Discharge Elimination System
MTPA = million metric tons per annum
NFL = Non-Federal Levees
NOV = New Orleans to Venice
SH = State Highway
USACE = U.S. Army Corps of Engineers

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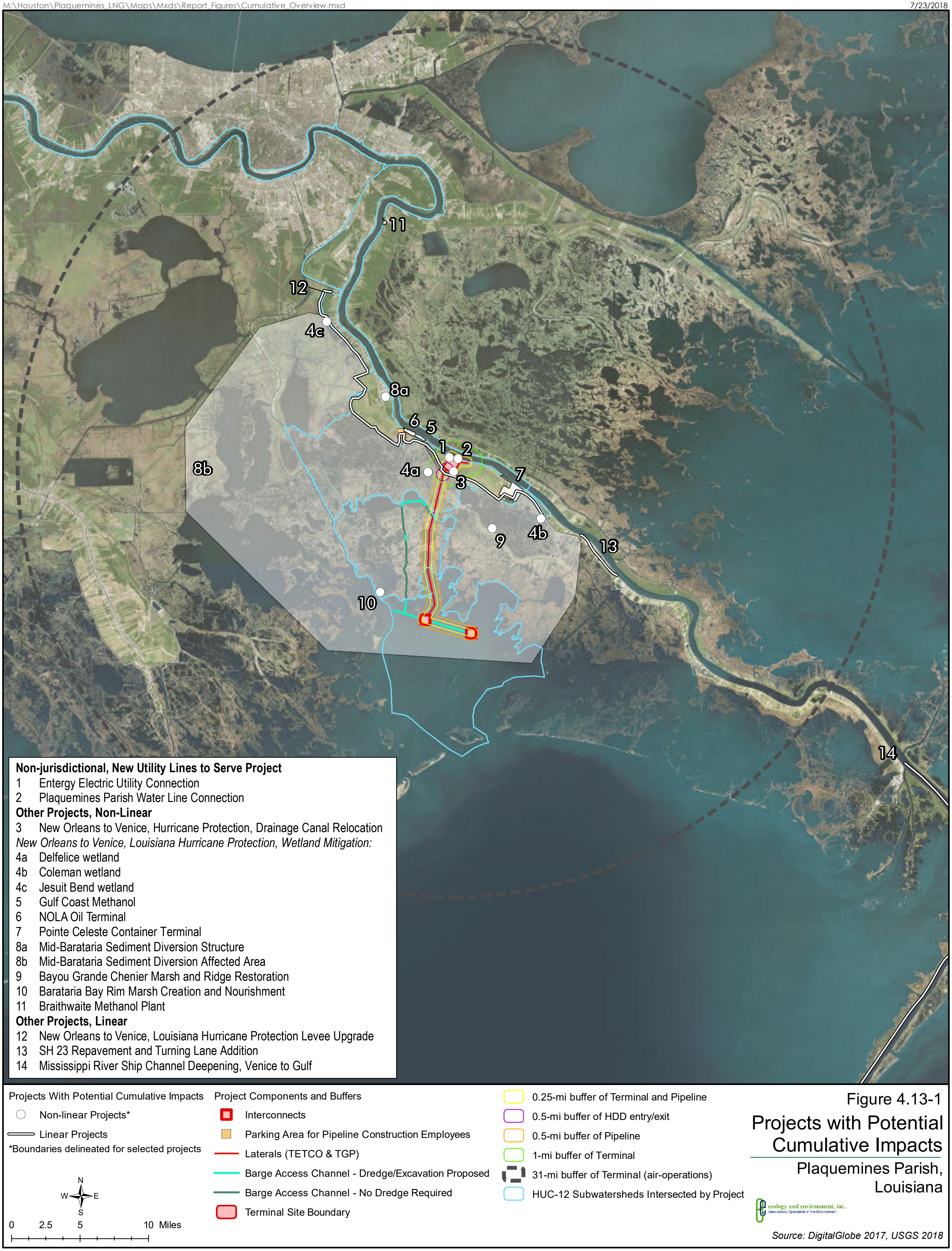


Figure 4.13-1
Projects with Potential Cumulative Impacts
Plaquemines Parish, Louisiana

As a simplifying assumption, we assumed permitted actions with unavailable construction start dates would be constructed concurrently with the Project. However, we did not assume concurrent construction with announced actions that are in an early planning stage and have not filed a permit application. Rather, we assumed these actions would eventually operate concurrently with the Project.

In the case of the Project and its vicinity, several planned actions identified within the geographic and temporal scope would not likely compound adverse impacts of the Project such that they would cause long-term or permanent degradation of a local environmental resource. Of the 14 identified actions, six are designed specifically to improve environmental quality or safety (i.e., the wetland nourishment and wetland creation actions and the levee and drainage canal improvements). Construction associated with these improvements would generate vessel traffic and associated air emissions and could adversely affect water quality and aquatic species during construction. However, the chief effects of these actions would be the restoration of different marsh types, improved surface water flow, and enhanced sedimentation patterns to mitigate wetland and other land loss. Whether constructed concurrently with each other and the Project, or in sequence during Project construction, these actions have low potential for tipping the scale and resulting in significant adverse cumulative impacts.

4.13.1.1 Non-jurisdictional Activities

Non-jurisdictional facilities are those components of an interstate natural gas transmission project or liquefied natural gas project that are not under the jurisdiction of FERC. The two non-jurisdictional actions—construction of an electrical utility tie-in and a water utility tie-in to serve the LNG terminal—are negligible in scale compared with the LNG terminal and the other major industrial developments identified in the geographic and temporal extent. Each utility tie-in would extend approximately 1,500 feet from existing utilities along SH 23, originating from the segment of SH 23 that passes through the LNG terminal site. Thus, almost all ground disturbance would occur within the LNG terminal site. The non-jurisdictional actions would not have any minor or greater impacts beyond those already accounted for in the evaluation of the LNG terminal.

4.13.1.2 Major Transportation Projects

One major transportation project had temporal and geographic overlap with the Project. The major transportation project—the recent resurfacing of SH 23 between Happy Jack and Port Sulphur, Louisiana, and the addition of turn lanes at three intersections—could potentially enhance or improve traffic flow in this part of lower Plaquemines Parish, a benefit to all potential developments in the region. The SH 23 improvement was completed after Venture Global conducted its LNG terminal and pipeline system transportation studies, so it was carried forward in this cumulative effects analysis.

The dredging project, which involves deepening 35 miles of the Mississippi River ship channel from the Gulf entrance to Venice, is intended to reduce transportation costs by decreasing the need for bulk carriers, tankers, and container ships to "light load" in order to reach inland ports (USACE New Orleans District, 2016). It would also permit easier maneuvering and reduce shoaling between each maintenance dredging cycle. The dredging location, at least 35 miles from the LNG terminal, would not contribute cumulative effects during the excavation. When completed, however, the channel deepening would improve vessel maneuvering and reduce the incidence of shoaling. The overall effect on vessel counts is unknown, though we assume the count of large vessels would increase. In balance, the dredging project would improve vessel transportation along the ship channel, negating its potential to cause a significant adverse effect cumulatively with other actions.

4.13.1.3 Major Industrial Developments

The remaining actions are major industrial developments planned or proposed along the lower Mississippi River. Three have acquired permits from LDEQ or USACE, or both, one was only recently announced in 2017 and one in 2018. Although we acknowledge and discuss the other actions on our list, we focus much of our analysis and scrutiny on these five projects. Two permitted actions are within 4 miles of the LNG terminal—the Gulf Coast Methanol Complex and NOLA Oil Terminal. NOLA Oil Terminal acquired its first federal permit in 2013 but has not yet commenced construction. A feedstock pipeline is a critical limiting factor for the proposed bulk liquid petroleum blending, storage, and transfer facility; and, to date, plans to construct or connect one have not been made public. The Gulf Coast Methanol Complex, classified as a major air emissions source, was issued an LDEQ air permit in January 2018. The methanol manufacturing plant would receive natural gas from Tennessee Gas pipeline and extract and refine methanol for use as a fuel, and as a fuel for plastics and other material manufacturing. The Braithwaite Methanol Manufacturing Plant on the east bank in Braithwaite, 18 miles from the LNG terminal, acquired its first major permit in 2014. However, the project is on hold as proponents seek financing. The Point Celeste Terminal was only recently announced in 2017 as a joint partnership between Plaquemines Port Harbor and Terminal District and American Patriot Holdings LLC to develop a container ship terminal on port-owned property 3 miles from the LNG terminal. They plan to negotiate agreements with upriver ports on the Mississippi, particularly in Memphis and St. Louis, to create a more efficient system of inland cargo delivery and transportation that could attract customers to the new container port. The parties are in the preliminary phase and seeking investor interest. Pointe LNG was announced in 2018 and is located approximately 8 miles southeast of the Project. It is expected to carry similar environmental impacts as the Project.

4.13.1.4 Drainage and Shoreline Protection Activities

Three drainage and shoreline protection activities are proposed or underway in the vicinity of the Project facilities.

The Mid-Barataria Sediment Diversion Project is proposed by the CPRA to restore the riverine and estuarine habitat between the Mississippi River and the Mid-Barataria basin. The reintroduction of freshwater and sediment to reestablish the deltaic process is expected to build, sustain, and maintain land and mimic historic deltaic sediment deposition (CPRA, 2012). The proposed diversion structure is approximately 5 miles northwest of the terminal site on the west bank of the Mississippi River, near river mile 61. Planning is underway, and completion of design and permitting is expected in October 2022. Construction is expected to commence shortly thereafter and last 2 to 4 years.

The New Orleans to Venice (NOV/NFL) Hurricane Risk Reduction Project is proposed by the USACE to provide storm risk reduction for Plaquemines Parish. The project involves upgrading approximately 90 miles of existing federal and non-federal levees on the east and west banks of the Mississippi River (USACE, 2016c). The geographic range of this activity will span from Phoenix to Bohemia on the east bank, and from St. Jude to Venice on the west bank. This is an ongoing activity and the USACE began awarding contracts in 2012, with the most recent contracts awarded in June 2016. Construction is anticipated to continue into 2024. Sections of this activity are adjacent to the terminal site and will be crossed by the SW Laterals.

This levee upgrade requires an expansion of the non-federal levee base during the NOV/NFL Hurricane Risk Reduction Project that will fill the existing drainage canal on the protected side, necessitating its relocation. Thus, the Plaquemines Parish government, with funds from USACE, intends to redirect the water flow to the canal that fringes the southern edge of the terminal and, to accommodate the additional flow. To date, the construction schedule for this activity has not been announced, although funds for this work were released by the USACE in 2016.

4.13.1.5 Marsh and Wetland Mitigation Activities

The NOV/NFL Hurricane Risk Reduction Project includes two wetland mitigation projects. These two projects are sponsored by the USACE and involve regional wetland mitigation initiatives totaling approximately 876 acres, including marsh creation, to offset the impacts of the New Orleans to Venice, Louisiana, Hurricane Protection Project (BA-0067). Construction start-up is scheduled for the 1st quarter of 2019, with completion scheduled for the 2nd quarter of 2021.

The Barataria Bay Rim Marsh Creation and Nourishment Project is sponsored by the CPRA and NRCS. The project would use dredged material from Barataria Bay to create approximately 251 acres of marsh and nourish approximately 266 acres of marsh to mitigate wetland loss in the area (USACE, 2015; Louisiana Coastal Wetlands Conservation and Restoration Task Force, 2016). The proposed site is located at the northwest end of Barataria Bay, adjacent to Mud Lake, and is approximately 9.6 miles southwest of the terminal site. Construction is scheduled for the 4th quarter of 2020 through the 4th quarter of 2021, pending funding approval.

The Bayou Grande Chenier Marsh and Ridge Restoration Project (BA-173) is sponsored by the CPRA and U.S. Fish and Wildlife Service. The project will create approximately 342 acres of marsh and 12 acres of forested ridge habitat at a site about 3.3 miles southeast of the pipeline system proposed route. The project also involves marsh nourishment. Material will be hydraulically dredged and piped from the Mississippi River for this purpose. Phase I engineering design has been completed, but no additional schedule details are publicly available at this time.

4.13.2 Potential Cumulative Impacts by Resource

Based on our evaluations in section 4.1 through 4.12, the Project would have only negligible impacts on groundwater, recreation, and cultural resources. As a result, the Project would not contribute to potentially significant cumulative effects on these three resources.

For each remaining resource, the following sections address the potential cumulative impacts from Venture Globals's Project and other projects identified within the cumulative impact area on specific environmental resources. We briefly summarize the anticipated Project-specific construction and operational impacts in order to associate the other projects' actions to potential impacts on the resources. In some cases, the resource area was too broad a category to evaluate collectively, and we identified impacts on a subset instead. For example, under land use we consider the change in the amount of agricultural land, not the change in land use categories generally. We advise the reader that when we summarize the effects of the Project, we assume that mitigation measures in section 4.1 through 4.12 would be implemented.

4.13.2.1 Geology and Soils

Aside from the non-jurisdictional utility lines, none of the actions in table 4.13-2 would occur within the workspaces of the Project, which comprise the geographic scope for cumulative effects on geologic resources and soils. Thus, geologic resources and soils affected by the Project would not sustain impacts from other present or foreseeable actions; therefore, no cumulative effects would occur. As stated in section 4.13.1, effects from the non-jurisdictional utility lines are already accounted for in sections 4.1 through 4.12 and, therefore, would not have additive or cumulative effects. The utility lines would be located on the LNG terminal site.

Although prime farmland is a subset of soils, it is also associated with land use and, as such, is discussed in the cumulative evaluation of land use on the west bank in section 4.13.2.6.

4.13.2.2 Groundwater

As described in the introduction to this section, our evaluation determined that construction of the LNG terminal and pipeline would have only negligible effects on groundwater. As a result, there would be no contribution to cumulative effects on this resource. Moreover, Venture Global would not withdraw groundwater for hydrostatic testing of the pipeline system facilities, nor would it use groundwater for hydrostatic testing of the LNG storage tanks, which constitute the largest user of hydrostatic test water among the LNG terminal facilities. Venture Global is considering three water sources, including local groundwater, for hydrostatic testing of the other LNG terminal facilities, which would amount to 17.3 million gallons. If selected, groundwater withdrawal by Venture Global would not affect the local potable water supply. The local groundwater is highly saline and unsuitable for use as potable water. The local water utility provides comprehensive service to residences and businesses in the area.

Based on these factors, we found that construction and operation of the Project would not likely affect groundwater resources. Given this low likelihood of occurrence, we conclude that the Project would not contribute to an adverse cumulative effect on groundwater resources within the geographic scope.

4.13.2.3 Surface Waters and Aquatic Wildlife and Habitat

Surface waters and aquatic wildlife and habitat are combined in this analysis because activities that affect surface waters also affect fish and other aquatic species such as marine mammals and sea turtles, as well as their habitats. The surface waters affected by the Project are the Lower Mississippi River and several waterbodies in the Barataria Basin (see tables 4.3-2 for specific waterbodies in the Barataria Basin). Our evaluation determined that the Project would have minor deleterious effects on these waterbodies and associated aquatic resources.

Excavation and pile driving to construct the LNG loading docking in the Mississippi River would increase suspended sediment and turbidity. Other in-water and shore-based construction activities—including use of in-water construction equipment, shore-based equipment, and vessel transits to and from the work site—could cause erosion and sediment resuspension. Pile driving in the river could injure or induce behavioral changes in fish or marine mammals and, should they occur, leaks or spills from the marine offloading facilities or construction support vessels could contaminate the river. During operation, stormwater that washes over the marine facilities would drain to the Mississippi River, while stormwater over the landward portion of the LNG terminal would be collected into sump pumps and eventually discharged into the Mississippi River via pipeline. LNG carriers calling at the terminal would discharge ballast water, increasing the potential to introduce invasive species, and their transits could cause sediment resuspension and erosion.

In the Barataria Basin, trenching and installation of the pipeline system and dredging of specific segments of the barge routes would increase suspended sediment and turbidity. Hydrostatic test water would be discharged into the basin, as would stormwater from the LNG terminal during construction, when stormwater would be directed to the canals bordering the site and then eventually pumped to Lake Judge Perez in the Barataria Basin. The other effect of hydrostatic testing would occur during its withdrawal, which would could entrain fish larvae and eggs. The majority of hydrostatic test water for the LNG terminal and pipeline system would be withdrawn from industrial canals in the Barataria Basin. Pile driving for two pipeline system metering stations in the Barataria Basin could injure or induce behavioral changes in fish, sea turtles, and marine mammals; and oyster reefs within the pipeline right-of-way would be removed. During operation, the only minor effect in the basin would be risk of a spill or leak from the pipeline system.

Ten other actions could occur within the geographic and temporal extent for cumulative impacts on surface waters, fish, and aquatic resources and also affect those same resources (see table 4.13-3). Four of the actions would benefit those resources in the Barataria Basin, and two of the actions would, at a minimum, improve drainage in and around the region. Although the site of Bayou Grande Chenier Marsh and Ridge Restoration is outside the HUC 12 subwatersheds intersected by the Project, we included the site because it would occur in the Barataria Basin only 2 miles from the pipeline system.

Cumulative Impacts on the Mississippi River

Given our assumptions about Project schedules, Gulf Coast Methanol Park, NOLA Oil Terminal, Braithwaite Methanol Manufacturing Plant, and the Mid-Barataria Sediment Diversion structure would be constructed concurrently with the LNG terminal between 2019 and 2024 and would also affect the Mississippi River. The major industrial facilities, including the Pointe Celeste Container Terminal when it comes online, would affect the river during operation,

Table 4.13-3 Other Actions with the Potential to Cumulatively Impact Surface Waters and Aquatic Wildlife and Habitat					
Action	**Site Area (acres/miles)**	**Closest Distance to Project**	**Affected Waterbodies with Potential Cumulative Impacts**	**Construction Overlap**	**Operation Overlap**
Project	**632 acres**	-	**Lower Mississippi River, Barataria Basin**	-	-
Gulf Coast Methanol	140 acres	2 miles	Lower Mississippi River	X	X
NOLA Oil Terminal	128 acres	4 miles	Lower Mississippi River, Barataria Basin (primarily Wilkinson Canal)	X	X
Pointe Celeste Container Terminal	up to 1,000 acres	3 miles	Lower Mississippi River		X
Braithwaite Methanol Manufacturing Plant	36 acres	18 miles	Lower Mississippi River	X	X
Actions with Net Benefits					
NOV/NFL Levee Upgrade	58 miles – not all within geographic scope	0 miles	Barataria Basin	X	X
NOV/NFL Drainage Canal Relocation	1.8 acres	0 miles	Barataria Basin	X	X
Mid-Barataria Sediment Diversion	4.5 acres – diversion structure on west bank	5 miles	Lower Mississippi River	X	X
	20,000 to 32,000 acres – marsh and open water to benefit from sedimentation	0 miles	Barataria Basin	-	X
NOV/NFL Wetland Mitigation	895 acres	1 mile	Barataria Basin	X	X
Bayou Grande Chenier Marsh and Ridge Restoration	486 acres	2 miles	Barataria Basin	X	X
Barataria Bay Rim Marsh Creation and Nourishment	517 acres	2 miles	Barataria Basin	X	X
Key: - = not applicable NFL = Non-Federal Levees NOV = New Orleans to Venice					

If the aforementioned actions were constructed concurrently, the chief concern about effects on river water quality would be increases in suspended sediments, turbidity, stormwater effluent and shoreline erosion from in-water construction, site-based modifications near the shore, and vessel traffic. In-water and shore-based construction activities associated with the methanol manufacturing plants and the NOLA Oil Terminal would be similar to those at the LNG terminal. The scale of shore-based construction associated with the NOLA Oil Terminal and Gulf Coast Methanol Complex would be commensurate with the LNG terminal—their sites each have approximately 5,000 feet of river frontage compared with the LNG terminal's 7,000 feet. Braithwaite Methanol Manufacturing Plant would require less shore-based construction because its frontage is about 3,000 feet, and proponents propose to modify existing docking facilities rather than construct new ones. Construction of the 4.5-acre Mid-Barataria Sediment Diversion structure would also increase suspended sediment loads and turbidity if the majority of construction activities occur in the river.

Similar to the LNG terminal, turbidity and suspended sediment increases from each action's construction would be localized and would be flushed through the system rapidly. The river discharges 400 billion gallons daily, indicating the volume of water that moves through it regularly. Turbidity and suspended sediment is high in the Mississippi River, even with the high flushing rates, such that turbidity and sediment contributions from the five actions occurring simultaneously, including the LNG terminal, would have a minor, temporary effect on water quality. For the reasons stated, sediment and turbidity effects would be similarly minor when the actions are operating and the Pointe Celeste Container Terminal is under construction, even though its river frontage is about 10,000 feet.

In addition to the physical environment that would minimize impacts on water quality, the regulatory environment would help ensure erosion, sediment loads, and effluents in stormwater discharges do not impair water quality during construction and operation. The LPDES program (Construction General Permit for stormwater discharges and a Project-specific SWPPP, as required under the CWA and Louisiana law) would require erosion control devices and sediment barriers at all of the industrial sites during construction until restoration or surface stabilization is complete. In compliance with the LPDES, the other actions would collect and process stormwater through oil/water separators or comparable filters to remove effluents. They would also test for hazardous materials prior to discharge.

Pile driving in the river from each of the actions could injure or induce behavioral changes in fish and marine mammals, though several mitigation measures exist that can minimize these adverse effects. Because Venture Global has not committed to specific mitigation measures, as currently proposed, pile driving to construct the loading docks at the LNG terminal would significantly injure or adversely affect fish in the vicinity, especially within 10 meters, and could affect marine mammals if any were present. As discussed in sections 4.6 and 4.7, bottlenose dolphins potentially occur in the river, while listed whales only occur offshore, and manatees are extremely rare in the Project area. Pile driving to support the other actions could injure fish near each site, but their pile-driving sound propagation would not accumulate with the effects of the Project to harm fish because they are too far away. Moreover, neither the actions alone nor combined would have population-level effects on fish because their area of effect would be minor compared with the adjacent river and the habitat therein.

The MMPA prohibits, with limited exceptions, harassment or take of any marine mammal. Thus, actions that would conduct pile driving are required to submit and implement mitigation plans. Although Venture Global has not committed to pile driving noise mitigation, we have recommended (see section 4.6.2.3) that Venture Global identify noise mitigation measures to be implemented to reduce the effect on aquatic resources. The other actions' proponents would likely be required to implement noise mitigation before commencing any pile driving. However, even if we assumed that the actions would involve pile driving without mitigation, they would not have a significant cumulative population-level effect on manatees because their occurrence in the river is so rare. The cumulative pile-driving activities could potentially have an adverse effect on the dolphin population. Individual dolphins could experience an adverse synergistic effect if they were harmed multiple times during the course of construction. However, at the population level, the cumulative effect on dolphins would not likely be significant.

The risk of spills or leaks of hazardous materials in the Mississippi River would increase if each action were constructed and commenced operation. All actions would require Section 10 Rivers and Harbors Act and/or Section 404 CWA authorizations from the USACE and corresponding Section 401 CWA Water Quality Certifications, which Venture Global acquired from LDEQ on October 1, 2018. These authorizations require that Project recipients implement a Spill Prevention Plan during construction and an SPCC Plan during operation. Because Venture Global is regulated under FERC, EI's would be present on-site during construction to ensure implementation of all measures intended to protect the environment. Though a spill or leak from any of the actions could be significant, it is unlikely that multiple actions would result in spills or leaks in the same relative timeframe to produce a significant cumulative effect given the regulatory environment regarding spill prevention. Thus, we considered the cumulatively increased risk to be minor.

All actions except the Mid-Barataria Sediment Diversion structure would generate increases in large, ocean-going vessel traffic with terminal destinations in the affected HUC 12 subwatershed segment of the river. These vessels would discharge ballast water while in berth, which would increase risk of introducing an invasive species into the Mississippi River. As required by the USCG's regulations (33 CFR 151.2026), vessels equipped with ballast tanks must implement one of five specified options to control nonindigenous species in waters of the United States. All ships calling at U.S. ports and intending to discharge ballast water must either carry out open-sea exchange of ballast water or ballast water treatment, in addition to fouling and sediment management. The USCG considers vessel traffic levels nationwide when establishing and updating ballast water management regulations. Hence, we found it reasonable to assume that USCG regulations would adequately manage the cumulative increase in susceptibility to invasive species from the vessel calls generated by the five cumulative actions, including the LNG terminal.

Cumulative Impacts on the Barataria Basin Waterbodies

Venture Global would trench and conduct other types of excavation to install the pipeline system. They would also dredge specific segments of the barge routes in the Barataria Basin. The supply barges transiting to and from the pipeline route would, themselves, increase turbidity by stirring up sediment, as would the vessels that ferry workers back and forth.

At this time, the other industrial actions have not publicized plans to trench or excavate in the Barataria Basin or transport supplies to their respective locations through associated waterways. Construction of the levee upgrade and the drainage canal relocation associated with the NOV/NFL Hurricane Risk Reduction Project could increase sediment in the runoff and cumulatively effect turbidity and suspended sediment in Barataria Basin waterbodies. These effects are typically adverse, but the Mid-Barataria Sediment Diversion action would actually increase sediment levels in the Barataria Basin *by design* to nourish and restore marsh vegetation. We conclude, then, that runoff, sediment, and turbidity effects from the other actions would not be significantly adverse, and, in balance, would likely be neutral.

At this time, the NOLA Oil Terminal is the only action known to include a plan to discharge treated water into waterbodies in the Barataria Basin in accordance with limits established by the LPDES. In 2016, the NOLA Oil Terminal was issued an LPDES permit to discharge industrial stormwater, fire test water, hydrostatic test water, and miscellaneous wastewater (e.g., from safety shower and eyewash stations) to a local drainage that drains to Wilkinson Canal. The limits and conditions of the permit were designed to avoid any negative impacts on the designated or existing uses of the receiving waterbody, though it does allow for changes in water quality as long as the change does not adversely affect designated or existing uses. In Wilkinson Canal, those uses are primary contact recreation, secondary contact recreation, and propagation of fish and wildlife.

During at least some portion of the LNG terminal's construction, stormwater would drain to adjacent industrial canals that flow to a pumping station, which discharges the treated water into Lake Judge Perez in the Barataria Basin. Eventually, stormwater on the LNG terminal site would be collected in sump tanks, treated, and pumped into the Mississippi River. Venture Global would discharge hydrostatic test water into the drainage canals along the pipeline system, and Venture Global may discharge some percentage of its hydrostatic test water into the industrial canal adjacent to the LNG terminal. Like NOLA Oil Terminal, Venture Global is required to demonstrate that its discharges would maintain the designated uses of the receiving waterbodies before an LPDES permit would be issued. All receiving waterbodies identified in Venture Global's Project plans have the same designated uses as those in Wilkinson Canal, plus oyster propagation, so effluent thresholds would be similar or more stringent. We acknowledge that both NOLA Oil Terminal and the Project would discharge into the Barataria Basin waterbodies, but their discharge points would be about 4 miles apart, limiting the potential for discharged water having an adverse cumulative effect on water quality. This, coupled with the requirements in the LPDES program, indicate that the cumulative adverse effects from the actions' discharges would be minor.

None of the other actions have publicized plans to conduct pile driving in the Barataria Basin. Thus, pile driving conducted for the pipeline meter stations would not accumulate with other underwater noise effects to harm wildlife. Venture Global would withdraw water from canals in the Barataria Basin for hydrostatic testing. Because Venture Global would have large, pressurized storage tanks, its test water budget would be up to an order of magnitude greater than NOLA Oil Terminal or Gulf Coast Methanol, activities that also could withdraw water from the Barataria Basin canals for hydrostatic testing. Venture Global would screen water intake hoses to minimize entrainment of larvae and pre-juvenile fish and would place them at the lowest possible elevation to reduce impingement of biological organisms. Although the Project's test water budget is large, mitigation would minimize effects to minor and temporary. Hydrostatic test water withdrawal by the other actions would be subject to the general LPDES program, which would manage withdrawal limits and practices to maintain use of the waterbodies for propagation of fish and wildlife. Thus, we conclude the cumulative adverse effect on fish and wildlife would likely be minor and temporary.

We considered that the NOV/NFL Project-related wetland mitigation, Bayou Grande Chenier Marsh and Ridge Restoration, and Barataria Bay Rim Marsh Creation and Nourishment actions would have net benefits on water quality, aquatic wildlife, and habitat in the Barataria Basin. Any negative effects on water quality from vessel traffic or in-water construction activities to support those actions would likely be negligible compared with vessel traffic and excavation and trenching activities to construct the pipeline system, and we have already determine that those effects would be minor.

4.13.2.4 Wetlands

Wetlands are protected by the CWA, and the USACE and LDEQ administer regulations and issues permits in scenarios in which coastal wetlands in Louisiana would be affected. Construction of the LNG terminal would permanently fill 368.1 acres of non-forested wetlands and convert 2 acres of forested wetlands to non-forested ones. Per the CWA, no development is permitted to have a significant adverse impact on wetlands, so Venture Global would be required to mitigate. Venture Global proposes to utilize an in-lieu of fee program, a method currently under review by the USACE as it reviews Venture Global's permit application submitted in 2017. The final mitigation plan must result in no net loss of function, though a net loss of wetland acreage would be permitted.

Construction of the pipeline system would permanently displace about 0.5 acre of non-forested wetlands to permit construction of the mainline valves, permanent access road to the mainline valves, and portions of the pipe trestle over the levee near Lake Hermitage Road. No additional wetlands would be permanently filled. Pipeline system construction activities would result in temporary clearing or other disturbance of 70.4 acres of non-forested wetlands. Venture Global would restore these wetlands in accordance with its Project-specific Procedures immediately following construction. In addition, pipeline installation would involve clearing and excavation in 867.7 acres of adjacent open water, which could adversely affect wetland hydrology and revegetation potential if contours and elevation are not properly restored. Post-construction reports, surveys, and inspections would all be required as part of Venture Global's wetland restoration plan and in-water construction permit, which is currently under review by the USACE.

Ten other actions could occur within the geographic and temporal extent for cumulative impacts on wetlands and could also affect those resources (see table 4.13-4). Although the site of Bayou Grande Chenier Marsh and Ridge Restoration is outside the HUC 12 subwatersheds intersected by the Project, we included the site because it would occur in the Barataria Basin only 2 miles from the pipeline system.

Table 4.13-4 Other Actions with the Potential to Cumulatively Impact Wetlands		
Action	**Closest Distance to Project**	**Wetland Impacts in Affected HUC-12 Subwatersheds**
Project	**-**	**370 acres – LNG terminal** **70 acres – pipeline system**
Gulf Coast Methanol	2 miles	up to 103 acres[a]
NOLA Oil Terminal	4 miles	up to 128 acres[a]
Pointe Celeste Container Terminal	3 miles	*Unavailable*
Braithwaite Methanol Manufacturing Plant	18 miles	0 acres
Mid-Barataria Sediment Diversion	0 miles	52 acres
NOV/NFL Levee Upgrade	0 miles	*Unavailable*
NOV/NFL Drainage Canal Relocation	0 miles	*Unavailable*
	Subtotal	**723 acres**
Action with Wetland Benefits		
NOV/NFL Wetland Mitigation	1 mile	895 acres – beneficial
Bayou Grande Chenier Marsh and Ridge Restoration	2 miles	486 acres – beneficial
Barataria Bay Rim Marsh Creation and Nourishment	2 miles	517 acres – beneficial
	Subtotal	**1,412 acres**

a Estimated from USGS land cover data (2011); assumes all wetlands on-site impacted.
Key:
- = not applicable
HUC = hydrologic unit code
NFL = Non-Federal Levees
NOV = New Orleans to Venice

Wetland impacts were recorded from permit applications or publicly available Project plans unless otherwise noted. In these other cases, we calculated wetlands on-site from USGS land cover data and, to be conservative, assumed all would be impacted.

The combination of the construction activities of the Project and the other actions would adversely impact more than twice as much wetland as the Project would alone within the geographic scope. However, per federal regulations, no action that disturbs more than 5 acres can cause a permanent loss of wetland function. In order to acquire necessary construction permits from the USACE, each proponent would have to demonstrate no net loss of wetland function through a wetland restoration plan or participation in a mitigation program. Because of this federally mandated protection measure, we conclude that cumulative adverse impacts from construction and permanent fill would be adequately mitigated.

4.13.2.5 Vegetation and Wildlife

Vegetation and upland wildlife are combined in this analysis because actions that affect vegetation also affect wildlife—vegetation is critical to wildlife food webs, and it also serves as habitat. Development of the LNG terminal and pipeline system would have temporary and permanent effects on upland and wetland vegetation, and because cumulative wetland impacts are discussed exclusively in the previous section, we restrict our focus in this section to uplands. A basic distinction among vegetation types is the presence or absence of trees or other woody species. While they have some overlap, the two groups each support basic wildlife types that would not be found in the other. They also perform non-habitat-related ecological functions that are indicated by the presence or absence of forest or woody vegetation. According to field surveys noted in section 4.5.1, the Project would permanently impact 82.6 acres of upland forest and scrub/shrub vegetation and 161.1 acres of herbaceous upland vegetation.

Six other actions could occur within the geographic and temporal extent for cumulative impacts on non-wetland vegetation and upland wildlife that could also affect these resources (see table 4.13-5). The upland portion of the Braithwaite Methanol Manufacturing Plant is outside of the geographic scope, i.e., the affected HUC 12 subwatersheds. The Braithwaite project property is on the east bank of the river, and only the shoreline of the property and planned in-water docks are in an affected HUC 12 subwatershed—the one consisting of a segment of the Mississippi River that also runs along the LNG terminal.

Table 4.13-5
Other Actions with the Potential to Cumulatively Impact Vegetation and Wildlife

			Selected Vegetation Impacts in Geographic Scope	
Action	**Distance**	**Area/Length**	**Forested and Scrub-Shrub Upland**	**Herbaceous Upland**
Project	**-**	**636 acres**	**82.6 acres**	**161.1 acres**
Gulf Coast Methanol	2 miles	140 acres	0 acres	0 acres
NOLA Oil Terminal	4 miles	128 acres	0 acres	0 acres
Pointe Celeste Container Terminal	3 miles	940 acres	25 acres	2 acres
NOV/NFL Levee Upgrade	0 miles	58 miles	Unavailable	Unavailable
NOV/NFL Drainage Canal Relocation	0 miles	Unavailable	Unavailable	Unavailable
Mid-Barataria Sediment Diversion Structure	5 miles	4.5 acres	Unavailable	Unavailable
Total	**-**	**-**	**107.6 acres**	**163.1 acres**
Total in affected HUC-12 subwatersheds			**2,484 acres**	**2,021 acres**

Key:
- = not applicable
HUC = hydrologic unit code
NFL = Non-Federal Levees
NOV = New Orleans to Venice

Based on their limited acreage of undeveloped woody and non-woody land cover, the actions with estimated vegetation impacts would constitute a negligible contribution to a cumulative adverse impact with the Project. In other words, these actions would not create more of an adverse effect on vegetation and wildlife beyond what is already accounted for in the evaluation of the Project in sections 4.5 through 4.7. Lacking detailed engineering drawings of the levee upgrade and drainage canal relocation projects, we did not estimate the vegetation disturbance and displacement within the affected HUC 12 subwatersheds associated with their construction. However, because much of the construction would be upgrading existing levee structures and rerouting drainage to an existing canal, we assume impacts on undisturbed swaths of vegetation would be minimal. We conclude that there would be no more than a minor, permanent cumulative impact on vegetation and associated wildlife.

4.13.2.6 Land Use

As noted in previous sections, the portion of the LNG terminal site south of SH 23 was historically used for sugar cane production and has been extensively ditched and drained. Most of the LNG terminal site is currently fallow agricultural land and used for cattle pasture. The proposed land use of the Project is major industrial; however, because it would receive large vessel calls for loading with LNG for export, this Project could also be considered a port/terminal complex. No agricultural uses would be preserved.

The geographic scope for land use is the west bank, and the temporal extent is any instance of overlap with the Project's construction or operation periods. Many actions fall within this scope, but we determined that the three other major industrial actions in the west bank had real potential to create adverse effects on the land use inventory in the west bank, whereas the others did not. We reasoned that the remaining actions—levee and drainage canal upgrades, wetland restoration, and a transportation improvement—could have indirect effects on land use but were not the types of actions that would contribute to significant adverse land use effects in a community. That said, we acknowledge that industrial developments are not necessarily adverse from a land use perspective; in fact, they are necessary and frequently economically beneficial uses in a society. To evaluate the proposed land uses' effect, then, we considered the existing context as well as future land uses envisioned by the parish as part of their master planning process.

Table 4.13-6 lists the planned or permitted developments we considered. We used the term "major industrial" to broadly identify any high-intensity use such as industrial manufacturing or an industrial port facility.

Plaquemines Parish published a draft, final Comprehensive Master Plan in 2012 (Plaquemines Parish, 2012) (Parish Plan). The Parish Plan assigned anticipated future land use designations to all developable properties and included the anticipated future land uses on maps in the "Land Use" technical addendum to the "Community Assessment." Future land use designations in a comprehensive master plan typically represent the collective input of community stakeholders, landowners, and planning professionals.

Table 4.13-6 Other Actions With Potential for Cumulatively Impact Land Use					
Action	**Site Area (acres)**	**Existing Land Use(s)**	**Planned/ Proposed Land Use**	**Future Land Use(s) per Parish Master Plan**	**Active Farming on Property?**
Project	**636 acres**	**Agricultural (Inactive farmland; active grazing land)**	**Major Industrial**	**Port/Terminal Complex/Major Industries/ Business Complex**	**No**
Gulf Coast Methanol	140 acres	Agricultural/ Undeveloped	Major Industrial	Major Industries/Agricultural	Yes, negligible
NOLA Oil Terminal	130 acres	Undeveloped	Major Industrial	Agricultural	No
Pointe Celeste Container Terminal	Up to 1,000 acres	Agricultural/ Undeveloped	Major Industrial	Port/Terminal Complex	Yes

After considering the overlapping actions, our chief concerns were conversion of parcels to higher intensity uses compared with their anticipated future land use designations in the Parish Plan, and the permanent conversion of agricultural land, including prime farmland. We believe these have the highest potential for becoming significant adverse cumulative land use effects in the west bank.

Of the overlapping actions, the Pointe Celeste Container Terminal is the only one that will permanently displace more than a negligible amount of actively cultivated farmland. Based on USCG land cover data (2011), almost 700 acres of the site is farmed. However, the property is Port-owned and targeted for development due to its location on a relatively wide portion of the river and other factors. The Parish Plan reinforces this future plan for development on the future site of the proposed container terminal.

The effect of implementing all the reasonably foreseeable developments would convert four sites within 4 miles of each other on the west bank to major industrial and port terminal complex land uses. Compared with the existing uses, this change would be readily apparent; however the majority of the acreage affected would be consistent with the Parish Plan. For instance, the majority of the 636-acre site of the LNG terminal consists of land designated as “major industries” and “port/terminal complex” in the Parish Plan. All of the nearly 1,000-acre site of the Pointe Celeste Container Terminal is designated as “port terminal complex” in the Parish Plan. Part of the 140-acre Gulf Coast Methanol site is designated with the future land use of “major industries.” Only the smallest site, the 130-acre proposed site of the NOLA Oil Terminal, lacks a “major industries” or “port/terminal complex” future land use designation on all or part of the site. Thus, we conclude that the cumulative land use change in this portion of the west bank would be mostly consistent with the Parish Plan.

4.13.2.7 Visual Resources

The operation of the LNG terminal could have an adverse impact on the residents, drivers, and recreational/commercial users of the area. Its presence on the landscape could adversely affect views from residences on Lake Hermitage Road, travelers on SH 23 and the Mississippi River, where recreational boating occurs. The LNG terminal would consist of numerous tall and bulky components, LNG loading docks, and ship berthing facilities developed on and adjacent to a site where only agricultural activities have occurred to date. In comparison, the pipeline system would minimally affect visual integrity or scenic quality in the Barataria Basin, because construction periods would not exceed 9 months and the overall visual quality would be restored in the months after installation. Moreover, we did not identify any other major industrial facilities proposed for installation or operation in the Barataria Basin. Thus, we limited our cumulative effects evaluation to the LNG terminal.

Two other major industrial facilities planned or permitted in the west bank are within the geographic scope and could adversely affect visual resources cumulatively with the LNG terminal (see table 4.13-7).

Table 4.13-7
Other Actions with the Potential to Cumulatively Impact Visual Resources

Activity	Distance from Project	Site area	River frontage	Tallest Stack Height	Readily Visible Features
Project	**-**	**632 acres**	**~7,000 feet**	**280 feet**	**Four LNG storage tanks, liquefaction trains, flare stacks, power generators, dock facilities**
Gulf Coast Methanol	2 miles	140 acres	~5,000 feet	200 feet	Storage tanks (shorter than LNG storage tanks), stacks, power generators, dock facilities
NOLA Oil Terminal	4 miles	130 acres	~5,000 feet	*Unavailable*	54 storage tanks, dock facilities

Key: - = not applicable

The other activities would not likely be visible from the residential communities on Lake Hermitage Road given their distance from the residences, topography, and intervening vegetation. However, if one or more actions would be visible from an individual residence that would also have a view of the LNG terminal, the cumulative effect would only be negligible compared with the LNG terminal's visual effect alone.

The cumulative actions would all be visible from SH 23, a scenic byway that is not heavily traveled by nature-oriented tourists. Within the 4-mile span that includes all of the foreseeable activity sites, the existing views are characterized by industrial operations, agricultural land, and undeveloped properties largely covered by scrub-shrub vegetation. International Marine Terminals, a coal distribution terminal a little more than one mile north of the LNG terminal site, is occupied by bulk piles of coal and a variety of heavy industrial equipment. Neither the river nor river vessel traffic can be seen from SH 23. In the opposite direction of the river, the view is characterized by large agricultural fields and residential development in Myrtle Grove. If the storage tanks, stacks, power generators, etc., required for each facility are constructed, their geometric forms and artificial texture would be high-contrast by comparison. The exposure to the viewers on SH 23 would be intermittent. As a result, the cumulative adverse effect on the visual integrity and scenic quality from the view provided by SH 23 would be moderate given the magnitude of the proposed changes and the duration of exposure experienced by those traveling on SH 23.

The cumulative actions would all be visible from the Mississippi River, which is transited by recreational vessels as well as commercial and industrial ones. We assume the viewer sensitivity of the recreational mariners and recreational boat passengers is moderate. Within the 4-mile stretch of the river between the LNG terminal and the proposed NOLA Oil Terminal are three existing industrial terminals serving the two coal export facilities and a cargo storage and distribution facility. If dock facilities and marine berths are constructed at the NOLA Oil Terminal, Gulf Coast Methanol Complex, and LNG terminal, as planned, the change would be noticeable but would not significantly deteriorate the visual integrity or scenic quality given the existing concentration of industrial marine terminal operations. Thus, we conclude the cumulative visual impact from the perspective of the Mississippi River would be minor.

4.13.2.8 Socioeconomics

In this case, we only evaluated the other major industrial projects in the geographic scope that could potentially have overlapping construction schedules. We were concerned with determining any significant or otherwise substantial adverse cumulative effects on socioeconomic resources that might result from concurrent construction. We acknowledge that the jobs creation and capital investments from the major industrial projects would benefit the region, but we did not delve deeper to evaluate the level of this positive cumulative effect. Nor did we consider the indirect economic benefits, i.e., ecosystem services, which might stem from the wetland restoration and drainage and levee system projects.

Four other actions could occur within the geographic scope and temporal extent for cumulative impacts on socioeconomic resources and could adversely affect those resources (see table 4.13-8). We identified the construction period of the Project as the period during which concurrent actions could have adverse socioeconomic effects, namely on housing and public services. We did not assume that the Pointe Celeste Terminal would be constructed concurrently.

Table 4.13-8
Other Actions with the Potential to Contribute to a Cumulative Adverse Effect on Socioeconomic Resources

Activity	Site Area	Capital Investment	Construction Workforce	Operation Workforce [a]
Project	**632 acres**	**$8.5 billion**	**1,400 to 3,700 [b]**	**250**
Gulf Coast Methanol Complex	140 acres	$3.6 billion; $900 million per production unit (4)	900	325
NOLA Oil Terminal	130 acres	Unavailable	Unavailable	Unavailable
Braithwaite Methanol Plant	36 acres	$1.2 billion	1,000	50
Pointe LNG	600 acres	$3.2 billion	Unavailable	Unavailable

a Included to demonstrate the scale of the action.
b The peak workforce estimate of 3,700 would only occur if all peak construction efforts on the LNG terminal and two pipeline laterals coincided for 1 month.

In section 4.9, we concluded that the Project's construction could have minor, temporary adverse impacts on others in the area seeking rental housing. We assumed that half of the workforce would be locally hired, leaving half to seek housing in the three parishes nearest the Project—Plaquemines, Jefferson, and Orleans. The Greater New Orleans area has an abundance of rental and short-term housing options. The concentration of this housing would require workers to commute up to an hour to their work site, but this drive time is not unusual in the industry.

We assumed that the at least half of the workforce hired by the other projects would also be local residents, for the same reasons we examined in section 4.9. Although the combined workforce of the developments would be high, exceeding 4,000 workers, with half assumed to be non-local hires, the greater New Orleans area could absorb 2,000 or more individuals seeking rental or short-term housing without significantly adversely affecting the housing market. Likewise, we conclude that existing public and safety services would be adequate, even with the addition of these non-local workers and their households.

4.13.2.9 Roadway and Vessel Traffic

Roadway Traffic

The construction workforce traffic that would be generated by the Project is high enough that several mitigation measures would be required to maintain uninterrupted flow on SH 23 in the vicinity of the LNG terminal. Venture Global will construct auxiliary turn lanes for southbound SH 23 at the LNG terminal's main entrance. In addition, Venture Global will construct a median lane for U-turns from southbound SH 23 to northbound SH 23 to accommodate construction traffic. These auxiliary lanes would prevent the temporary traffic impact during construction from becoming significantly adverse. The majority of construction materials would be delivered by barge directly to the site, minimizing traffic impacts from heavy traffic to negligible levels. We assume traffic impacts during operation would be minor given the comparatively small workforce.

Four other actions that may occur within the geographic and temporal extent of the Project could contribute to cumulative impacts, including more-than-negligible effects on cumulative roadway traffic, especially traffic on SH 23 (see table 4.13-9).

One action in table 4.13-9 had a beneficial impact on traffic in the region. The SH 23 Improvement Project consisted of resurfacing a 4-mile-long section of the road between Happy Jack and Port Sulphur and adding turning lanes to three intersections in Port Sulphur. The project was completed in March 2017, subsequent to the traffic impact assessments for the project. This is the only two-lane section of SH 23 in Plaquemines Parish, so this upgrade significantly improved the flow of traffic through Port Sulphur for locals as well as the freight and maritime industry (Louisiana Department of Transportation and Development, 2017). The remainder of SH 23 through the parish is four lanes.

Table 4.13-9 Other Actions with the Potential to Cumulatively Impact Roadway Traffic			
Activity	**Distance and Direction from the Project**	**Construction Workforce**	**Operation Workforce**
Project	**-**	**1,400 to 3,700** [a]	**250**
Gulf Coast Methanol Complex	2 miles northwest	900	325
NOLA Oil Terminal	4 miles northwest	*Unavailable*	*Unavailable*
Pointe Celeste Terminal	3 miles southeast	- [a]	*Unavailable*
SH 23 Improvement Project	10 miles southeast	- [b]	-

a We assumed Pointe Celeste Terminal construction would overlap with the Project's operation period but not its construction period.
b SH 23 improvement was completed in 2017.
Key:
- = not applicable
SH = State Highway

The other actions with construction overlap would have adverse effects on traffic. Both the Gulf Coast Methanol Complex and NOLA Oil Terminal would require large construction workforces that would commute back and forth along SH 23 to their worksites. IGP Methanol LLC estimates a construction workforce of 900 at the Gulf Coast Methanol Complex, though available documents do not clarify whether this estimate is an average or peak number. As demonstrated by the LNG terminal and pipeline system's workforce estimates, the size of a construction workforce in any given month fluctuates widely. The NOLA Oil Terminal site is approximately as large as the Gulf Coast Methanol Complex, and the development would include construction of 54 storage tanks. Thus, we assume the NOLA Oil Terminal construction workforce would be as large as the one estimated for the Gulf Coast Methanol Complex. Both developments would require substantial amounts of construction materials, equipment, and specialty parts, and we assume these would be delivered both by heavy trucks and by barges.

Based on our assumptions, the cumulative amount of material deliveries and the number of construction workers commuting to worksites within 4 miles of each other on SH 23 could double the number of LNG terminal and pipeline system construction workers alone at some point during the 4.5-year construction period. This cumulative adverse effect could be significant, and we would expect traffic delays on SH 23 during commute periods for construction workers. We based this finding on the conservative assumption that the NOLA Oil Terminal would be constructed concurrently with the Project and Gulf Coast Methanol Complex. In fact, the NOLA Oil Terminal is stalled; the website launched by its proponents has not been updated since 2016, and it has not broken ground despite acquiring its initial air and LPDES permits in 2013. As a result of the NOLA Terminal not going forward, the cumulative effect on SH 23 traffic would be less-than-significant.

Vessel Traffic on the Mississippi River

Vessel traffic during construction of the LNG terminal could peak at around 60 vessel transits per day for several months when Phase I and II overlap. Given the width of the river and the brief period, the vessel traffic increase would not be significantly adverse. During operation, LNG carrier vessel calls on the LNG terminal would average about one per day, or slightly less. The USCG issued a Letter of Recommendation advising that, upon review of Venture Global's Required Waterway Suitability Assessment, the Mississippi River in the vicinity of the LNG terminal was appropriate for LNG carrier traffic. Projected LNG carrier calls are six per week, thought the maximum number of transits would be established by the USCG before operation commences.

Five other actions could cumulatively affect vessel traffic levels in the Mississippi River (see table 4.13-10).

Table 4.13-10
Other Actions with the Potential to Cumulatively Impact Vessel Traffic on the Mississippi River

Activity	Distance and Direction from the Project	River Frontage (linear feet rounded to nearest 1,000)	Berths (number)	Vessel Traffic Types during Operation[a]	Estimated Construction Period or Start Date (years)[b]	Estimated Operation Period or Start Date (years)
Project	**-**	**7,000 feet**	**3 LNG Loading Berths**	**LNG carriers**	**2019–2024**	**2022 (Phase I)**
Gulf Coast Methanol	2 miles northwest	5,000 feet	N/A	Methanol carriers	2018–2025	2020 or 2021 (first phase)
NOLA Oil Terminal	4 miles northwest	5,000 feet	2 for post-panamax tankers	Tankers	*Unavailable*	*Unavailable*
Pointe Celeste Container Terminal	3 miles southeast	10,000 feet	3 deep draft and additional for inland vessel	Container ships, breakbulk cargo ships;	*Unavailable*: overlap not assumed	*Unavailable*
Braithwaite Methanol Plant	13 miles north	3,000 feet	3 deep draft	Methanol carriers	2019	2021
Pointe LNG	8 miles southeast	6,500 feet	1 LNG loading berth	LNG carriers	2022–2025	2025

a Not including support vessels.
Key:
N/A = Not available.

If peak construction periods of all identified actions overlap, the vessel traffic increase could delay voyages of other vessels in the Lower Mississippi River for a period of several months. At its peak, LNG terminal construction traffic could increase daily vessel transits by 10 percent or more for several months, constituting a temporary, noticeable increase in vessel traffic. Additional vessel traffic destined for the five other major industrial construction sites could begin to constrain the waterway. A mitigating factor is that material deliveries to a major industrial site are typically concentrated at the front end of a construction period, and then rapidly decline. Thus, the likelihood is low that the projects' peak vessel delivery periods to the respective sites would all overlap. The more likely outcome is that peak periods would stagger over the ensuing years, and some of the projects may never be constructed. We conclude that the overall cumulative adverse effect would be minor but acknowledge that vessel traffic increases could be more noticeable for a few months if some of the projects' peak vessel traffic periods overlap.

During operation, the LNG terminal would generate about one vessel call per day by an LNG carrier, which are very large vessels. We assume the two methanol manufacturing plants and the NOLA Oil Terminal would generate about one call per day each by a very large vessel, either a methanol carrier or a petroleum product tanker. Pointe LNG will have the capacity to load 100 LNG carriers per year (two per week). We assume that Pointe Celeste Container Terminal could generate up to two or three very large vessel calls by container and cargo ships in a day, and we conservatively assume it would average two very large ships per day. Based on these assumptions, the cumulative effect would be an addition of six to seven very large vessels to the Lower Mississippi River in the vicinity of the LNG terminal, averaging around 13 transits per day. The Crescent River Pilots Association estimate they pilot about 44 transits each day between Pilottown, near the southern tip of Plaquemines Parish, and New Orleans. Increasing piloted vessel transits in this stretch of the river from 44 to 57 per day, a 23 percent increase, would constitute a substantial increase. If the projects are all built as planned, the increase in piloted vessel traffic would require USCG Vessel Traffic Services - Lower Mississippi River to expend additional effort coordinating and managing the transits for safety and efficiency. The river pilots, who schedule voyages along the segment of the river in their jurisdiction, would have to increase coordination and management, but they would benefit from the increase in clients. The presence of USCG Vessel Traffic Services–Lower Mississippi River and the capacity of the Mississippi River to accommodate vessel traffic would mitigate the additional transits' effect on traffic flow, so we do not expect any increase in wait-times to be significantly adverse.

Vessel Traffic in Waterbodies of the Barataria Basin

The designated barge routes to the pipeline system are depicted on figures 4.13-1 and 4.13-2. Crew boats and barges would transport workers and materials, respectively, to the worksite, and their effect on local vessel traffic would be minor. The only other actions that would generate construction vessel transits through or near the barge routes are the Barataria Bay Rim Marsh Creation and Nourishment project and the "Delfelice" wetland, a mitigation wetland project associated with the NOV/NFL level upgrade. Venture Global has already met with the Coastal Protection Restoration Authority about the Barataria Bay Rim Marsh Creation and Nourishment project and established that their joint use of a canal would not interfere with the other's vessel transits (see section 4.9.8). We assume the vessel transits required in the course of construction the Delfelice wetland would be negligible. Thus, no cumulative effect on vessel traffic in or near the barge routes in the Barataria Basin would occur.

4.13.2.10 Cultural Resources

Based on fieldwork and desktop surveys, no known historic or archaeological properties, traditional cultural properties, or properties of religious or cultural importance to federally recognized tribes are present in the area of potential effect of the LNG terminal and pipeline system (see section 4.10). The SHPO has concurred that no historic properties are present on all but 152 acres of the total area of potential effect. Venture Global awaits a letter of concurrence from the SHPO on these remaining 152 acres, which include workspaces along the pipelines and meter stations, portions of barge access routes to the pipelines, and a barge staging area.

Based on surveys to date and correspondence with tribes, we do not expect the Project to contribute to a cumulative impact on cultural resources. Venture Global has prepared an Unanticipated Discovery Plan and would implement the plan in the unlikely event that an unreported cultural resource or human remains are encountered during construction. Recommendations in section 4.10 state that Venture Global should not begin construction until all SHPO reports and related comments are filed with FERC, ensuring that the SHPO's determination regarding the remaining 152 acres is reviewed and that FERC's responsibilities under the NHPA are met. Thus, we anticipate no cumulative impact on cultural resources.

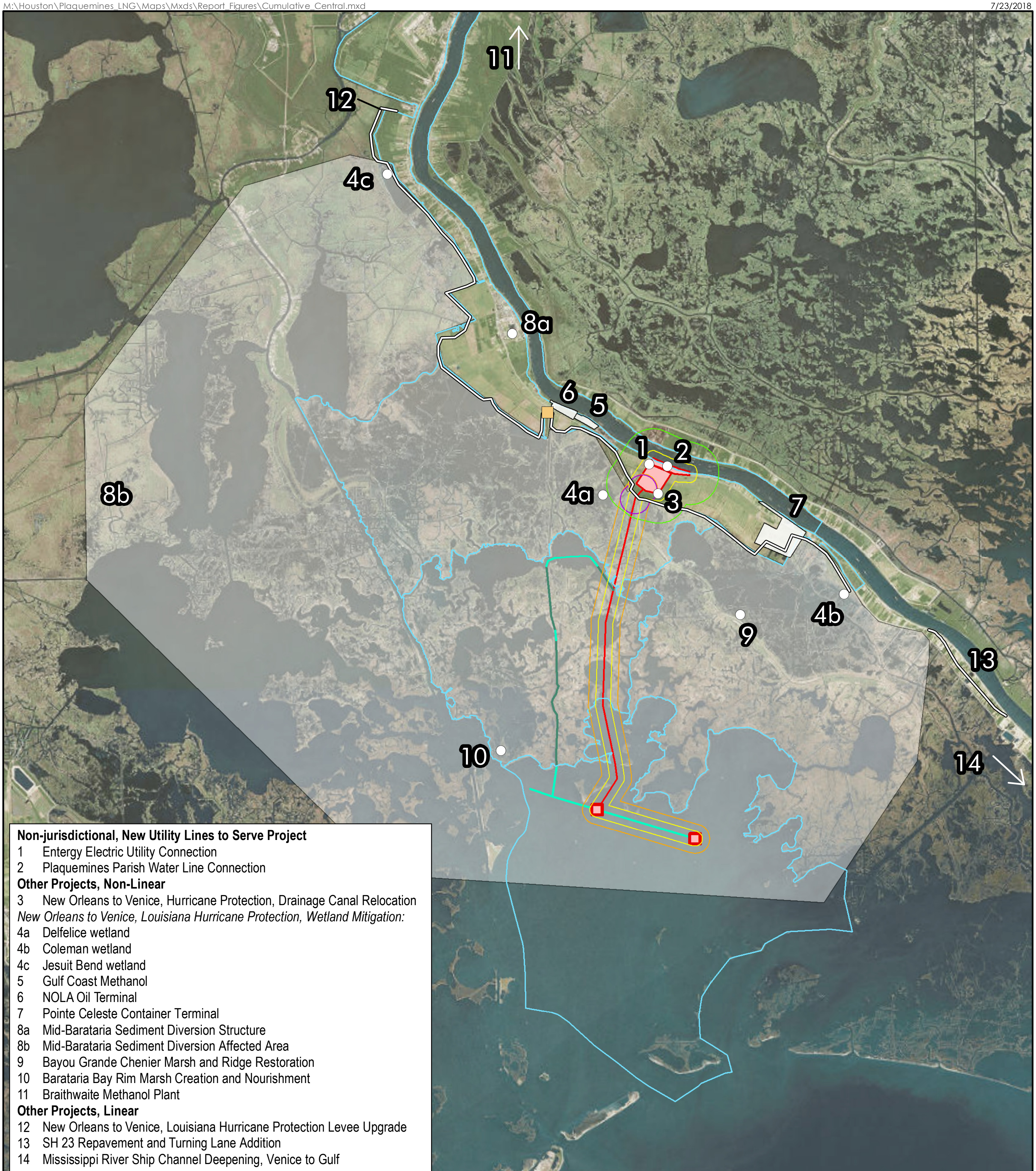
4.13.2.11 Air Quality

Project construction would produce significant quantities of criteria pollutant emissions over a multi-year period. During operation, the Project's impacts on ambient air quality would be required to comply with the NAAQS, designed to protect human health, flora, and fauna. Demonstration of compliance is required by LDEQ before any construction permits may be issued. Moreover, the potential ambient impacts from toxic air pollutants emitted during Project operation are subject to review by the Louisiana Toxic Air Pollutant Program. Venture Global has submitted an air permit application for operating emissions, currently under review by LDEQ. The same dispersion modeling used in the application is summarized in section 4.11, and based on the modeling results, we determined that the ambient air quality impact during operation would be below ambient air quality standards.

The only other actions within the 0.25-mile radius geographic scope for construction air emissions are the NOV/NFL levee upgrade and drainage canal relocation projects. These are linear projects that extend many miles. Within the geographic scope, earth-moving vehicles and equipment and other construction support vehicles would produce emissions temporarily while the levee segment adjacent to the pipe bridge is upgraded. The same would be true for the drainage canal relocation near the southern boundary of the LNG terminal. These comparatively minor emissions would not increase emissions appreciably beyond levels already accounted for in the Project's construction air impact evaluation in section 4.11. Therefore, we find no cumulative impact on air quality during the Project's construction.

All actions except the Mississippi River ship channel deepening south of Venice would occur within the geographic scope and temporal extent for cumulative impacts on air quality during operation of the LNG terminal. Aside from the major industrial developments, the other actions within scope would have no long-term or permanent air emissions, and any construction emissions they produce during the LNG terminal's operation would be negligible in comparison. Thus, we focused on these five developments upriver and downriver from the LNG terminal, centering our analysis on a future point in time when all developments would be operating concurrently.

Table 4.13-11 provides the modeled air emissions during operation of three of the five major industrial facilities that could add to the emissions produced by the LNG terminal. Emissions estimates are not available for the recently announced Pointe Celeste Container Terminal or Pointe LNG. Should they move forward, they would both require LDEQ permits.



Projects With Potential Cumulative Impacts
- Non-linear projects*
- Linear Projects

*Boundaries delineated for selected projects

Project Components and Buffers
- Interconnects
- Parking Area for Pipeline Construction Employees
- Laterals (TETCO & TGP)
- Barge Access Channel - Dredge/Excavation Proposed
- Barge Access Channel - No Dredge Required
- Terminal Site Boundary
- 0.25-mi buffer of Terminal and Pipeline
- 0.5-mi buffer of HDD entry/exit
- 0.5-mi buffer of Pipeline
- 1-mi buffer of Terminal
- HUC-12 Subwatersheds Intersected by Project

N W E S

0 1.25 2.5 5 Miles

Figure 4.13-2
Projects with Potential Cumulative Impacts
Plaquemines Parish, Louisiana

ecology and environment, inc.

Source: DigitalGlobe 2017, USGS 2018

Table 4.13-11 Other Activities within the Geographic and Temporal Scope for Cumulative Air Impacts during Operation							
Activity	**Distance**	**LDEQ Air Permit Status**	**Title V Category (minor/ major)**	**Triggers PSD? (yes/no)**	**Emissions from Five Criteria Pollutants[a] (metric tons per year)**	**Greenhouse Gas Emissions (metric tons of CO_2e per year)**	**LAC Regulated Toxic Air Pollutants (metric tons per year)**
Project	**-**	**In Process**	**Major**	**Yes**	**2,906**	**7,749,799**	**354**
Gulf Coast Methanol Complex	2 miles	Issued 2018	Major	Yes	726	2,533,377	146
NOLA Oil Terminal	4 miles	Issued 2013	Minor	No	83	N/A[b]	115
Braithwaite Methanol Manufacturing Plant	18 miles	Issued 2014	Major	No	431	746,626	77
Pointe Celeste Container Terminal	3 miles	No application submitted	Minor[c]	No[c]	Unknown	Unknown	Unknown
Pointe LNG	8 miles	No application submitted	Major[c]	Yes[c]	Unknown	Unknown	Unknown
Total	**-**	**-**	**-**	**-**	**4,146**	**10,979,319**	**-**

Sources: See table 4.13-2.
a carbon monoxide, sulfur dioxide, inhalable particulate matter, volatile organic compounds, and nitrogen oxide
b Not calculated. As a minor source, NOLA Oil Terminal proponent was not required to calculate greenhouse gas emissions.
c This classification is unconfirmed and based on professional judgment.
Key:
- = not applicable
CO_2e = carbon dioxide equivalent
LAC = Louisiana Administrative Code
LDEQ = Louisiana Department of Environmental Quality
N/A = Not available because estimate not required for minor sources per Title V
PSD = Prevention of Significant Deterioration
TBD = to be determined

Section 4.11 describes the air quality permitting regime, including the two most salient programs—Title V and the PSD program—implemented after adoption of the CAA. Under Title V, the LNG terminal, Gulf Coast Methanol Complex, and Braithwaite Methanol Manufacturing Plant are considered major air emissions sources. Based on PSD program thresholds, the LNG terminal and Gulf Coast Methanol Complex are considered major sources and the NOLA Oil Terminal is considered a minor source of emissions.

Three actions in table 4.13-11 have been issued their required air permits from LDEQ, covering both state and federal preconstruction requirements. In order to be eligible for their air emissions permit, each facility had to show that it "[would] not significantly contribute to any NAAQS exceedances" (LDEQ, 2018b). Moreover, the facilities' emissions, in combination with background emissions, could not exceed thresholds for Louisiana state-regulated toxic air pollutants. For unconstructed facilities with LDEQ permits, construction must begin within 18 months, and extensions may be applied for 12 to 18 months prior to expiration. Braithwaite Methanol Plant was granted an extension in 2017.

LDEQ is currently reviewing an air permit application from Venture Global for operation of the LNG terminal. The substance of that application is reported in section 4.11. Federal standards require modeling of a proposed facility's emissions along with other ongoing and background emissions to demonstrate compliance with the NAAQS. These "baseline" emissions include emissions of other permitted facilities that are not yet built, therefore Venture Global's air permit application included the emissions from the Braithwaite Methanol Plant and NOLA Oil Terminal. Based on the results of that analysis, the cumulative impact on air quality from operations emissions at these three facilities would not exceed the limits of the NAAQS. On the other hand, emissions from the Gulf Coast Methanol Complex were not included in Venture Global's analysis, nor were the LNG terminal's emissions incorporated in to IGP Methanol LLC's air permit application to LDEQ. LDEQ recently issued Gulf Coast Methanol Complex's air permit in January 2018. Because the emissions from that facility would accumulate with those from the LNG terminal, at this time we conservatively estimate that their cumulative effect could be significant because of the relatively small separation distance.

The two unpermitted actions in table 4.13-11 are still in early phases of planning or permitting. Pointe LNG, a proposed LNG manufacturing facility and export terminal, would trigger major source regulations, requiring it to model its regulated emissions in combination with emissions from the LNG terminal and the permitted projects in table 4.13-11. Pointe LNG would be required to demonstrate that the combined emissions do not exceed NAAQS thresholds before it became eligible to receive an LDEQ air permit, thus limiting its contribution to an adverse cumulative effect and ensuring the combined air pollution from regulated pollutants does not exceed health standards.

Pointe Celeste Container Terminal would require an LDEQ air permit for onsite, stationary sources like a backup emergency generator or a maintenance shop where solvents are used. However, most of its related emissions would not be regulated by LDEQ. Its greatest emission sources would likely be vessels that call at the container terminal combined with other mobile sources.

While emissions from facilities are well regulated and require ongoing inspection and compliance, cumulative emissions from large vessels that would call at major facilities once operation commences are not evaluated in CAA air permits. Given the quantities of marine diesel fuel burned by large ocean-going vessels, their emissions of SO_2 and NO_X from fuel combustion are a concern. The major industrial actions planned along the Lower Mississippi River would generate daily vessel calls by tankers, methanol carriers, and in the case of the Pointe Celeste Container Terminal, bulk carriers and container ships, all calling on terminals within approximately 21 miles of each other. NEPA evaluations include disclosure of these associated vessel emissions, and those associated with the LNG terminal operation are reported in section 4.11.

Although emissions from vessels calling on the six new industrial developments could contribute to an adverse cumulative effect on air quality, we do not expect the effect to be significant. Localized cumulative effects from vessel emissions would be short-lived, because vessel emissions near any of the facilities would dissipate shortly after the vessel passes by. While docked, vessels' main engines would typical operate at a very low load, known as hoteling, or go into stand-by mode, minimizing the vessels' emissions at berth.

Moreover, vessel emissions are regulated through international treaties and domestic regulatory standards, even though they are not addressed in LDEQ air permit applications at the project level. The United States is party to the International Maritime Organization, which has implemented fuel, engine, and vessel standards as a result of the International Convention of Prevention of Pollution from Ships, a treaty called "MARPOL" (EPA, 2017b). The resulting standards limiting SO_X and NO_X entered into force as early as 2005, and the most recent updates became effective in 2016. The international standards apply to U.S. vessels and foreign vessels. In addition, the EPA has adopted fuel standards and engine emission standards for engines installed on U.S. vessels under the authority of the CAA (EPA, 2017b).

Given these factors, we do not expect vessel emissions to significantly impair air quality.

4.13.2.12 Noise

Construction activities associated with the LNG terminal would have a moderate, temporary adverse effect on land-based NSAs. Land-based and marine-side pile-driving to install over 300 pile supports for the LNG loading docks would generate the loudest noise, while the composite noise level of all other heavy equipment would be somewhat less. Construction activities associated with the pipeline system would have minor, temporary effects on NSAs. Activities include pile driving at the pipe bridge and metering station locations, dredging along the barge access routes, HDD-related activities, and equipment operation. Operational noise emitted from the LNG terminal would have minor adverse effect on NSAs, while the metering stations associated with pipeline system would not affect NSAs with noise during operation.

Two other actions, in addition to the LNG terminal, could occur within the geographic and temporal extent for cumulative impacts on noise, summarized in table 4.13-12. These actions, the levee upgrade and associated drainage canal relocation, would have no associated operational noise. Thus, we limited our evaluation to cumulative noise impacts during construction of the Project and the additional actions.

The main source of noise during the levee upgrade and drainage canal relocation actions would be heavy earth-moving vehicles and other construction equipment. We do not expect that pile driving or HDD equipment would be used, which generate louder noise than other standard construction equipment. The Commission allows a 10.0 dBA increase above ambient noise levels at NSAs, and Venture Global has demonstrated that by constructing 5-meter-high noise protection walls around piling rigs, Venture Global would limit the increase of ambient noise levels to 0.4 dBA and 2.2 dBA at the two nearest NSAs. The NSAs are residences in the Deer Range camp community and are located 0.56 miles and 0.9 miles from the center of the LNG terminal site. These same NSAs are 1,600 and 3,900 feet from the pipe bridge, where Venture Global would conduct pile-driving of 18 piles over 20 days. The closest NSA would experience about an 8 dBA increase during those 20 days of pile driving. Finally, HDD activities to thread the pipe under the existing non-federal levee would be a similar distance from the NSAs. Venture Global would implement a sound curtain enclosure or acoustic barrier around the drilling rig and stationary equipment that would limit the noise level increase at the closest NSA to around 3 or 4 dBA. Pile driving to support the pipe bridge would not occur concurrently with HDD pipeline construction, but pile driving associated with the LNG loading docks could occur concurrently with one or both of these pipeline activities. We should note, however, that noise emissions are not additive, but rather accumulate, and blend such that the combined noise level is less than the sum.

Table 4.13-12
Other Activities within the Geographic Scope and Temporal Scope for Cumulative Noise Impacts during Construction

Activity	Distance from the Project Boundary	Construction Period	Noise during Operation?
Project	**-**	**2019–2024**	**Yes**
NOV/NFL Levee Upgrade	0 miles	By 2024	No
NOV/NFL Drainage Canal Relocation	0 miles	By 2024	No

Key:
- = not applicable
NFL = Non-Federal Levees
NOV = New Orleans to Venice

The NSAs referred to above are just a few hundred feet from the levee, where construction equipment and vehicles would eventually be used to perform the levee upgrade. Heavy trucks or equipment could be used concurrently to help implement the drainage canal relocation that is necessitated by the levee upgrade, but we assume only minor earthworks activities because the canal already exists. Thus, we considered noise from the canal relocation to be negligible.

- In the unlikely event that Venture Global's pile-driving and/or HDD construction activities overlap with USACE upgrades of the levee portion within 0.5 mile of the LNG terminal, the cumulative noise effects on the closest NSAs would be temporary and adverse, lasting for a few days or weeks. However, the likelihood of timing overlap is low. The USACE has not announced projected construction dates for this section of the levee, indicating that the construction start date could still be several years in the future. Venture Global, on the other hand, would commence and complete pile driving for the LNG loading docks within the first years of construction commencement in 2019. Moreover, Venture Global would be in regular communication with the local USACE district office to permit and coordinate all of its in-water construction.

4.13.2.13 Safety and Reliability

Potential impacts on public safety would be mitigated through implementation of applicable federal, state, and local rules and regulations for the proposed Project. These rules and regulations, described in section 4.12.1 and 4.12.2, would ensure appropriate standards would be applied to design and engineering, construction, operation, and maintenance to protect the public and avoid or minimize the potential for accidental or intentional incidents. The other LNG projects listed in table 4.13-2 would be required to follow the same rules and regulations, and other large industrial projects listed in table 4.13-2 would be subject to similar rules and regulations. These rules and regulations are intended to protect the public from the potential impacts of industrial projects singularly and cumulatively, and no significant cumulative impact on public safety is anticipated. Public services, including emergency services, would need to be appropriately sized to accommodate the population at the time the Project was constructed and operated. In addition, the Project and the other LNG projects would be required to prepare a comprehensive ERP (per 49 CFR 192.615) and identify the cost sharing mechanisms for funding these emergency response activities. These plans would minimize the potential for impacts on public safety from individual projects or when considered cumulatively with the other concurrent projects. In the unlikely event that major incidents occur at multiple facilities concurrently, the acute cumulative demand on emergency services would likely be significant; however, assistance from emergency service providers from neighboring parishes and communities would serve to mitigate the demand. We conclude that the impact of the Project, when considered cumulatively with the other concurrent projects, would not have a significant impact on demand for public services.

4.13.2.14 Climate Change

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. For example, a single large flood event or particularly hot summer are not indications of climate change, while a series of floods or warm years that statistically change the average precipitation or temperature over years or decades may indicate climate change.

Climate change has already resulted in a wide range of impacts across every region of the country and those impacts extend beyond atmospheric climate change and include changes to water resources, transportation, agriculture, ecosystems, and human health. Climate change is currently happening. The United States and the world are warming; global sea level is rising and acidifying; and certain extreme weather events are becoming more frequent and more severe. These changes are driven by an accumulation of GHG in the atmosphere through combustion of fossil fuels (coal, petroleum, and natural gas), combined with agriculture and clearing of forests. These impacts have accelerated throughout the end of the twentieth and into the twenty-first century. Although climate change is a global concern, for this analysis, we will focus on the potential cumulative impacts in the Gulf of Mexico coastal area.

The following observations of temperature, rainfall, and environmental impacts with a high or very high level of confidence are attributed to climate change in the Gulf Coast region (U.S. Global Change Research Program, 2014):

- temperatures cycled between warm and cool periods extending from 1930 to 1970, followed by temperature increasing by approximately 2°F from 1970 to the present;

- since 1970, there have been increasing numbers of days above 95°F and nights above 75°F, and decreasing numbers of extremely cold days;

- daily and 5-day rainfall intensities have increased;

- summers have been either increasingly dry or extremely wet, depending on location;

- due to a combination of sea level rise and soil subsidence, approximately 25 to 35 square miles of land off the coast of Louisiana is lost each year; and
- in southeast Louisiana, relative sea level is rising at a rate of 3 feet per 100 years;

The following summarizes anticipated changes due to continuing changes in climate in the Gulf of Mexico coastal area:

- climate models predict that winters are likely to become 3°F to 5°F warmer, while summers may become up to 3°F to 7°F warmer;
- lowland coastal areas are expected to receive less rainfall on average but experience more frequent intense rainfall events followed by longer drought periods;
- coastal areas along the Gulf of Mexico are flat; therefore, expected sea level rises may cause inundation in certain low lying areas;
- drought and sea level rise will create stressful conditions for coastal trees that are not adapted to higher salinity levels;
- other coastal species may also be stressed by sea level rise and warmer temperatures, prompting migration out of the area; and
- tropical storms and hurricanes may become more intense

Climate change in the Project region would have two effects that may cause increased storm surges: increased temperatures of Gulf Waters which would increase storm intensity, and a rising sea level. The ground elevation across the LNG terminal site would generally be leveled in the liquefaction and construction laydown areas and changed from its current irregular surface that ranges between -4 to -2 feet NAVD88 to a consistent -2 feet NAVD88. In addition, a floodwall would be constructed around a portion of the LNG terminal to protect against storm surge and potential wave action, providing sufficient protection for the facility up to the 500-year storm event.

The GHG emissions associated with construction and operation of the Project were identified and quantified in section 4.11. Based on the total annual potential emissions from the Project and associated marine vessel and vehicles traffic, Project operations would increase CO_2e emissions by 7,749,799 tpy.

GHG emissions from sources located at the terminal site would be minimized by application of EPA-approved BACT under the PSD permitting program. Venture Global prepared a BACT analysis for the proposed gas-fired turbines and associated duct burners, simple-cycle aeroderivative gas turbines, hot oil heaters, acid gas thermal oxidizer, fugitive emissions, and flares/purges at the terminal site, which was submitted to the LDEQ and EPA for review. CO_2e emissions from the turbines, hot oil heaters, and acid-gas thermal oxidizers would be minimized by implementing the following BACT measures:

- exclusively combusting low-carbon fuel gas;
- implementing good combustion practices;
- implementing proper operations and maintenance practices; and
- properly implementing insulation for surfaces above 120°F.

Use of gaseous combustion fuels, in preference over other fossil fuels such as fuel oil or coal, results in lower GHG emissions per unit of energy output. The proposed BACT emission limit for each turbine and associated duct burners is 520,455 tpy of CO_2e emissions, based on an annual total; the proposed BACT emission limit for each smaller aeroderivative simple-cycle combustion turbine is 134,901 tpy of CO_2e emissions, based on annual total per turbine; the proposed BACT emission limit for each hot oil heater is 104,114 tpy of CO_2e emissions, based on an annual total; and the proposed BACT emission limit for each acid-gas thermal oxidizer is 384,350 tpy of CO_2e emissions, based on an annual total (this limit includes emissions from the combustion of fuel gas and acid gas as well as emissions from the high-purity CO_2 inlet stream to the oxidizer from the acid-gas removal unit).

BACT for equipment leaks would be achieved through proper piping design, and the proposed BACT emission limit is 6,500 tpy of CO_2e emissions, based on an annual total.

BACT for the cold, warm, and LP vent flare pilot operations would be achieved through good management practices and proper flare design. The proposed BACT emissions limit for combined flare pilot operations is 3,916 tpy of CO_2e emissions, based on an annual total.

BACT for the cold, warm, and LP vent flare maintenance, startup, and shutdown and purge operations is also achieved through good management practices and proper flare design. The proposed BACT CO_2e emission limits for each flare are as follows: cold flare – 14,441 tpy; warm flare – 14,826 tpy; and LP flare – 13,980 tpy.

BACT was also evaluated for the marine loading flare for vessel gassing-up operations. The BACT selected is good management practices, proper flare design, and marine gas recovery for loading return gas with methane content of 80 percent or greater. The proposed BACT emission limit is 4,045 tpy of CO_2e, based on an annual total.

Venture Global also evaluated BACT for the proposed large essential emergency generator engines, smaller essential emergency generator engines, and firewater pump engines. The proposed BACT for these engines is good combustion practices, good operations and maintenance practices, properly implementing insulation for surfaces above 120°F, and limiting normal operations to 100 hours per year for each generator engine and 52 hours per year for each firewater pump engine. The proposed BACT emission limits are 2,411 tpy of CO_2e for the large essential emergency generator engines, 81 tpy of CO_2e for the smaller essential emergency generator engines, and 28 tpy of CO_2e for the firewater pump engines.

Venture Global provided an assessment of the feasibility of a carbon capture and storage (CCS) system to the LDEQ as part of the GHG permit application BACT analysis. Venture Global provided information on the technical and economic feasibility of developing and using CCS for the terminal site. This technology involves employing a method to capture carbon from the exhaust stream of the combustion units and then finding a method for permanent storage (injecting the recovered CO_2 underground through various means, including enhanced oil recovery, saline aquifers, and un-minable coal seams). In the GHG BACT analysis, Venture Global indicates that there is no commercially available CCS of the scale that would be required to control CO_2 emissions from turbines, thermal oxidizers, and flares such as those typically located at an LNG terminal. In addition, no long-term CO_2 storage facilities are located near the Project as the region does not have geological formations that support sequestration. Therefore, due to the costs and environmental impacts associated with additional infrastructure to send the carbon to a region where it could be properly stored or used for enhanced oil recovery, CCS is not a feasible or preferable alternative. Based on the magnitude of the estimated capital and annualized costs, Venture Global demonstrated that CCS is not economically feasible. Even if feasibility could be demonstrated, Venture Global noted that any CCS system would cause significant adverse energy and environmental impacts due to the additional water and energy needs for system operation, with the associated generation of additional GHGs and other criteria pollutants from natural gas firing in combustion units. The EPA and LDEQ are still evaluating the GHG permit application for the terminal site.

There is no standard methodology to determine whether, and to what extent, a project's incremental contribution to GHG emissions would result in physical effects on the environment for the purposes of evaluating the Project's impacts on climate change, either locally or nationally. Further, we cannot find a suitable method to attribute discrete environmental effects to GHG emissions. We have looked at atmospheric modeling used by the Intergovernmental Panel on Climate Change, EPA, National Aeronautics and Space Administration, and others, and we found that these models are not reasonable for project-level analysis for a number of reasons. For example, these global models are not suited to determine the incremental impact of individual projects, due to both scale and overwhelming complexity. We also reviewed simpler models and mathematical techniques to determine global physical effects caused by GHG emissions, such as increases in global atmospheric CO_2 concentrations, atmospheric forcing, and ocean CO_2 absorption. We could not identify a reliable, less complex model for this task, and we are not aware of a tool to meaningfully attribute specific increases in global CO_2 concentrations, heat forcing, or similar global impacts to project-specific GHG emissions. Similarly, the ability to determine localized or regional impacts from GHGs by use of these models is not possible at this time.

The emissions would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources, and contribute incrementally to future climate change impacts. Because we cannot determine the Project's incremental physical impacts on the environment caused by climate change, we cannot determine whether the Project's contribution to cumulative impacts on climate change would be significant.

4.13.3 Conclusion

Based on our evaluations of resources affected by the Project, geology; soils; surface waters and aquatic wildlife and habitat; wetlands; vegetation and wildlife; land use; visual resources; socioeconomics; vessel traffic; noise; and cultural resources would not sustain significant adverse cumulative impacts. In the case of geology and soils, no other present or foreseeable actions would occur within the geographic scope. Several actions would occur within the scope for surface waters and aquatic wildlife and habitat, and we assessed potential cumulative effects to the Mississippi River and the Barataria Basin. However, we found no significant adverse cumulative impact on water quality or aquatic wildlife populations or habitat from increases in turbidity, sediment, effluent discharge, ballast water discharge, increased erosion, risk of leaks and spills, or pile driving. Because federal regulations stipulate that an action disturbing more than 5 acres cannot cause a permanent loss of wetland function, we found that cumulative adverse impacts on wetlands would not be significant. The other identified actions within the area of disturbance of the Project would affect only a minimal amount of forested and herbaceous vegetated area compared with the Project, so the cumulative effect on vegetation and associated wildlife would be no more than minor.

Given the presence of New Orleans and the greater metropolitan region near the Project, existing temporary housing accommodations and public services could absorb the needs of the workforces on concurrent construction projects in Plaquemines Parish without creating significant socioeconomic adverse effects. Because field and desktop surveys and correspondence with tribes did not uncover any archaeological or historic properties in the area of potential effect of the LNG terminal or pipeline system, we do not expect any cumulative effect on cultural resources. A letter of concurrence from the SHPO on 152 acres of pipeline workspace and barge routes is still outstanding, but we have recommended that construction should not commence before all reports related to the NHPA are filed and reviewed.

Potential exists for noticeable impacts on land use and visual resources. The Project and three other foreseeable industrial actions on the west bank would convert agricultural and undeveloped land to major industrial uses. This change would be clearly noticeable, but the majority of the acreage affected by foreseeable activities would be consistent with the Parish Plan. We found that the cumulative visual effect from development of the major industrial actions on SH 23 would be moderate given the magnitude of change and intermittent exposure level of travelers on the highway.

The cumulative noise effects near certain residences in the Deer Range camp community could be adverse for a few days or weeks if Venture Global's pile-driving and/or HDD construction activities overlap with USACE upgrades of the levee portion within 0.5 mile of the LNG terminal. However, overlap of these activities is unlikely.

The only resource that could sustain significant adverse cumulative impact is air quality. Effects on ambient air quality during operation of the Project when combined with the Gulf Coast Methanol Complex operations could be significant, i.e., exceed the NAAQS. The Project's air quality application incorporated emissions from other permitted industrial actions in the vicinity, but not those from the Gulf Coast Methanol Complex.

We assessed the Project's annual GHG emissions, 7,749,799 tpy, and noted the GHG emissions of two other foreseeable actions for which GHG emissions have been calculated. The total estimated GHG emissions from the three projects is 10,979,319 tpy, while three other foreseeable industrial actions would generate additional GHG emissions which have not been quantified. Venture Global would implement multiple EPA-approved BACT to minimize GHG emissions and demonstrated through modeling in its air permit application to LDEQ and EPA the emission limits each BACT would achieve. Because of a lack of standard methodologies, we could not determine whether the Project's incremental contribution of GHGs would result in a physical effect on the environment, or whether the cumulative contribution of GHGs from multiple industrial facilities would be significant.

In this cumulative impact analysis, we established conservative assumptions about the other actions in the region. To the extent possible, we considered the most intense cumulative environmental outcomes that could reasonably be expected. In fact, the likelihood is low that all projects would go forward according to schedule or according to our assumptions that unscheduled projects would coincide with this Project.

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 were developed with input from the USACE, USCG, DOE, DOT, and EPA as cooperating agencies. The federal cooperating agencies may adopt the EIS per 40 CFR 1506.13 if, after an independent review of the document, they conclude that their permitting 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 analysis, if necessary.

We determined that construction and operation of the 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, open water habitats, vegetation, and land use would also occur as part of the Project. This determination is based on a review of the information provided by Venture Global and further developed from data requests; field investigations; scoping; literature research; alternatives analysis; and contacts with federal, state, and local agencies, as well as tribes and individual members of the public. As part of our review, we developed specific mitigation measures that we determined would appropriately and reasonably reduce the environmental impacts resulting from construction and operation of the Project. Therefore, we are recommending that our 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 anticipated impacts from the Project and our conclusions regarding impacts are provided below by resource area.

5.1.1 Geologic Resources

Construction and operation of the Project would not affect active mining or non-fuel mineral resources during construction or operation. The nearest non-fuel mineral resource is approximately 3 miles to the south and east of the pipeline system. Three plugged and abandoned former oil and gas wells are located within the proposed pipeline construction workspace. In addition to the aforementioned wells, 18 additional plugged and abandoned wells, one permitted well, and two producing wells (currently shut-in for future utility) are located within 0.25 mile of the proposed pipeline system workspace. To avoid impacts on the two producing wells, and to afford the owner(s) or their representative the opportunity to be on-site during construction activities, we have made a recommendation in section 4.1.2 that Gator Express Pipeline notify well owner(s) 72 hours prior to construction activities near the producing oil and gas wells located within 0.25 mile of the Project workspace and allow a representative to be present during construction.

The proposed pipeline system crosses two state mineral lease areas. Venture Global has indicated they will negotiate permanent easement rights and any necessary access restrictions with the lease owners.

In general, the potential for geologic hazards such as earthquakes, soil liquefaction, shoreline erosion and landslides, or a seismically generated tsunami to significantly affect construction or operation of the pipeline system is low. However, some hazards such as flooding and hurricanes could affect pipeline construction. Venture Global would construct the meter stations at an elevation to minimize potential impacts from flooding and hurricanes.

Impacts on geologic resources due to installation of the pipelines and meter stations would be primarily limited to construction activities and include disturbance by "prop-washing" for construction in open water locations. Such impacts resulting from trenching would be temporary because Venture Global would restore these areas to preconstruction contours to the maximum extent practicable.

The full design of the pipeline system is currently being developed. Venture Global has proposed a feasible design and committed to conducting additional detailed design work for if the Project is authorized by the Commission. Information regarding the development of the final design would need to be reviewed by FERC staff in order to ensure that the final design addresses the requirements identified in the FEED. Therefore, we are recommending (see section 4.3.2.1) that Venture Global file its final site preparation drawings and specifications, meter station foundation design drawings and calculations, and quality control procedures to be used for civil/structural design and construction on a schedule to be identified in its Implementation Plan.

We do not anticipate that any blasting would be required for construction of the proposed pipeline system. Based on the above discussion, in consideration of Venture Global's proposed mitigation and design criteria, and based on our recommendations, we conclude that the pipeline system would not markedly affect or be affected by geological conditions in the area.

5.1.2 Soils

Construction of the Project could affect soil resources by increasing the potential for erosion, compaction, and rutting. Based on the soil properties reviewed, none of the soils potentially affected by the Project is considered highly susceptible to erosion by wind or water. Due to fine textured soils and nearly level topography, no revegetation concerns were identified. However, most of the soils found at the terminal site are prone to compaction and are considered hydric. About 147 acres within the LNG terminal site and about 7 acres along the pipeline routes are designated as prime farmland.

Construction activities such as clearing, grading, excavation, backfilling, and the movement of construction equipment may affect soil resources at the LNG terminal site. In order to increase the load-bearing capacity of soils within the terminal site, soil modifications would be made through the addition of materials to the soil at the LNG terminal site such as lime or cement and a surface layer of aggregate.

Following construction, approximately 622 acres of soils at the LNG terminal site would be permanently impacted by paved or gravel plant roads or occupied by aboveground facilities. Venture Global would seed the remaining 92.2 acres within the terminal site with native vegetation recommended by the NRCS. Operation of the pipeline facilities meter stations and mainlines valves would affect 9.3 acres of open water and wetlands. The remaining acres of soils would be restored to preconstruction conditions and are anticipated to retain their former productivity.

To reduce the impacts of construction on soils, Venture Global would implement measures outlined in its Project-specific Plan and Procedures, which provide measures to control erosion and sedimentation during construction and to ensure proper restoration of disturbed areas following construction. The Project-specific Plan and Procedures include some modifications to our Plan and Procedures where Venture Global consider individual measures unnecessary, technically infeasible, or unsuitable due to local conditions (see appendix C tables 1 and 2, respectively). We agree that most of Venture Global's proposed modifications are reasonable and that its proposed alternative measures would achieve a comparable level of mitigation as the FERC measures.

In addition, disturbed areas would be monitored by Venture Global following construction for the first and second (as necessary) growing seasons in upland areas and at least 3 years in wetlands to ensure successful restoration. With implementation of the proposed mitigation measures and Project-specific Plan and Procedures, we conclude that impacts on soil resources would be adequately minimized.

5.1.3 Water Resources

5.1.3.1 Groundwater

The LNG terminal site and pipeline system route are underlain by multiple, stratified aquifer systems, including the Gramercy aquifer, Norco aquifer, Gonzales-New Orleans aquifer, and the "1,200 foot" aquifer. These aquifers are primarily saline in the vicinity of the Project and are not designated EPA sole-source aquifers. Drinking water in Plaquemines Parish is primarily from the Mississippi River. Venture Global may utilize groundwater sourced from a newly installed well or wells at the terminal site. Venture Global plans to utilize surface water for hydrostatic testing of the LNG tanks. The remaining 17,250,000 gallons anticipated to be required for construction of the LNG terminal would be sourced from either the Mississippi River, Plaquemines Parish Water District, or obtained from groundwater. No groundwater would be utilized during the construction of the proposed pipeline system.

Most of the construction activities associated with the LNG terminal and pipeline system facilities would involve shallow, temporary, and localized excavation, with the exception of the installation of groundwater wells and concrete and steel piles at the LNG terminal. Limited transmissivity data suggest that the Gramercy aquifer, Norco aquifer, Gonzales-New Orleans aquifer, and the unnamed 1,200-foot-thick sand aquifer will each have a transmissivity values greater than 10,000 square feet per day at the LNG terminal site. Aquifers with similar transmissivity values can typically yield greater than 300 gallons per minute for a properly constructed supply well. If new supply wells were to be installed at the LNG terminal site, one or more wells would be installed in the targeted aquifer to produce 600 gallons per minute for treatment and use. Concrete and steel piles required for the LNG storage tanks and LNG ship loading and berthing areas would be driven to a depth no lower than approximately 250 feet and are not expected to have direct impacts on the underlying aquifer, which is overlain by about 300 feet of surficial sediments.

Neither the LNG terminal site nor the pipeline system are within drinking water protection areas for public supply wells. The portion of the terminal within the batture habitat is within the source water protection area for the Pointe a la Hache water system and the Port Sulfur Water District and is discussed in detail below in the Surface Water section. Only one well is located within 1 mile of the LNG terminal site and pipeline system. This well is an artesian well located within the 80-acre construction yard (eastern workspace) adjacent to the LNG terminal. The well was intended for agricultural purposes; however, the water salinity is too high for agriculture use according to local farmers. Plaquemines LNG plans to plug and abandon the artesian well during construction. Since no other wells are located within a mile of the Project, it is unlikely that the Project will affect public or private supply wells.

Venture Global anticipates that surface water from the Mississippi River would be utilized for hydrostatic testing of the LNG storage tanks. In the event that a new well or wells is necessary at the terminal site to supply water for testing the piping and/or for use during operation of the terminal, the aquifers underlying the site can supply the estimated quantities without adverse impact. Because this information would be useful to the permitting agencies, we recommend in section 4.3.1.4 that Venture Global provide its final proposed hydrostatic test water sources, including details on the depth and location of any new water wells to be installed at the LNG terminal, prior to the close of the draft EIS comment period.

If Venture Global chooses to use groundwater as a source to satisfy water needs during construction, the local groundwater withdrawal would greatly increase the local groundwater usage; however, there is very little evidence of groundwater usage in the vicinity of the LNG terminal. Therefore, the localized effects of the LNG terminal groundwater use would not have a significant effect on the aquifers.

5.1.3.2 Surface Water

The Mississippi River at the LNG terminal site is a Navigable Waterway under section 10 of the Rivers and Harbors Act. According to Venture Global, the Mississippi River depth at the LNG terminal site is sufficient to support the terminal marine facilities. Therefore, no dredging within the Mississippi River would be required to construct and operate the Project. Construction of the terminal facilities would temporarily impact 72.7 acres of the Mississippi River, and operation of the LNG terminal would permanently impact 14.6 acres of the Mississippi River.

In addition to impacts on the Mississippi River, construction of the LNG terminal facility would impact 14.2 acres of man-made ditches within the LNG terminal Project area and 1.7 acres of man-made ditches within the eastern workspace adjacent to the LNG terminal site. These man-made ditches are part of the fastlands system. These impacts would primarily consist of filling the ditches to construct the LNG terminal.

In-water construction associated with the LNG loading and ship berthing facilities, ground disturbance, filling of waterbodies within the fastlands, and general construction activities within the LNG terminal site would result in localized, temporary increases in turbidity and suspended sediment levels. To minimize impacts on water quality, land disturbing activities would be conducted in compliance with the LPDES General Permit. In addition, Venture Global would implement its Project-specific construction SWPPP, Plan, and Procedures. Our procedures require that instream work within cool-water and warm-water fisheries must occur from June 1 to November 30; however, Venture Global has stated this would not be practical. We recommend in section 4.3.2.3 that Venture Global file with the Secretary written concurrence from the LDWF for the proposed instream construction windows. As a result, impacts on water quality from terminal construction are expected to be temporary and limited to the area within and immediately adjacent to the ship berthing facilities and within the fastland ditch system.

Operation of the LNG terminal would increase the amount of impervious surface, which would result in an increased volume of stormwater. Stormwater inside the terminal facilities would be collected through series of ditches into sumps. Sumps that service LNG spill impoundment basins and other facilities where hazardous materials may be present would be equipped with automatic shutoffs that activate when LNG or other solvents are present. This would prevent contaminated stormwater from being pumped from the facility. Sumps pumps within the floodwall would pump the stormwater to a stormwater header and then to the Mississippi River. Stormwater collected from the terminal marine facilities would be processed through oil/water separators prior to being discharged to the Mississippi River.

The majority of the pipeline system (approximately 12.1 miles) would be constructed in open water, including bays, canals, bayous, and unnamed channels. Additionally, portions of the barge access channels would require dredging to accommodate equipment and pipe delivery. In total, 48,015 feet of channel (322.6 acres) would be dredged through wheel washing and/or excavation. None of the surface waters impacted by the pipeline system are listed as National Wild and Scenic Rivers or designated Outstanding Natural Resource Waters. The majority of the surface waters traversed by the pipeline system are considered EFH and support some federal and state listed species. Potential impacts on EFH and federally and state-listed species are summarized in section 5.1.7. Venture Global would minimize potential impacts on surface waters by implementing the Project-specific Procedures.

During construction of the LNG terminal, barges and support vessels would deliver large equipment and materials to the MOF, and during operation, LNG vessels would call on the LNG terminal. The construction and operational vessel traffic may increase shoreline erosion and temporarily increase turbidity levels within the Mississippi River and along vessel transit routes. The shoreline at the terminal site is already armored, and any impacts on the existing armoring from terminal construction would be repaired. The existing armoring would prevent erosion of the adjacent shoreline by wave activity from vessels maneuvering within the berthing area. The Mississippi River currently functions as a navigation channel that provides deep-water access for maritime commerce. As such, use of the waterways by LNG carriers, barges, and support vessels during construction and operation of the LNG terminal would be consistent with the current use of active shipping channels, and associated impacts on water quality within the shipping channel would be minor.

Ballast water discharges at the LNG terminal could impact water quality by changing the salinity, temperature, pH, and dissolved oxygen level of water within the Mississippi River in the vicinity of the LNG terminal. Differences between the physiochemical composition of ballast water and the water present within the Mississippi River would vary depending on hydrologic conditions at the time of discharge. The primary potential impact on water quality due to ballast water discharge would be a temporary increase in salinity level. The Mississippi River is usually freshwater at the LNG terminal site. However, during periods of low flow, saltwater can push up the Mississippi River to the LNG terminal site and beyond. Ballast water, which would generally consist of open ocean water, would have a salinity of approximately 35 ppt (NOAA, 2018). In general, ballast water would have a higher salinity than the surrounding water at the LNG loading docks. The amount of ballast water discharged into the Mississippi River during each LNG carrier visit to the LNG terminal would make up a small percent of the water within the Mississippi River, as the Mississippi River discharges, on average, nearly 400 billion gallons per day into the Gulf of Mexico (NPS, 2018).

During construction and operation, spills or leaks of hazardous materials flushed into waterbodies could have an adverse impact on water quality. To prevent spills and leaks, Venture Global would implement its Project-specific SPCC Plans during construction and operation of the LNG terminal and pipeline system, which identify potential sources of releases at the site, measures to prevent a release, and initial responses in the event of a spill.

Venture Global would utilize 50,000 gallons of water, recycled over five uses, to test plant piping and tanks other than the LNG storage tanks. Venture Global would utilize 26,200,000 gallons of water for hydrostatic testing of the LNG storage tanks. The water for LNG storage tank hydrostatic testing would be transferred between tanks to conserve water. The water for testing plant piping and tanks other than LNG storage tanks may be sourced from nearby surface water, groundwater, or local utilities. The water for testing the LNG storage tanks would be sourced from an adjacent canal. Water would be withdrawn from the canal at a rate of 1,500 gallons per minute to minimize impingement of aquatic organisms and debris. The intake structure would be fitted with ¼-inch to ½-inch screens to minimize entrainment of aquatic organisms and debris. Small quantities of water used for hydrostatic testing may be discharged directly to the ground. Large discharges of hydrostatic test water would be treated, as necessary, and discharged to the Mississippi River, into adjacent drainage canals, or on-site in accordance with permit conditions. Pumps and energy dissipation devices would be used to control the discharge rate and limit scouring and erosion.

Venture Global estimates that 5,626,316 gallons would be required for hydrostatic testing of the SW lateral TGP pipeline and 3,997,658 gallons of water would be required for hydrostatic testing of the SW lateral TETCO pipeline. The water for testing the pipeline system would be sourced from a drainage canal near the terminal. The pumping rate would vary from 250 to 500 gallons per minute, and the water would be passed through a 0.25-inch to 0.5-inch mesh screen to block the uptake of various debris and aquatic biota. After testing, the water would be discharged back into the canal through an energy dissipating structure.

Where water from the nearby drainage canal is used to hydrostatically test the LNG storage tanks and pipeline system, chemical additives may be required during the testing process to neutralize bacteria and other components that can be corrosive. Before returning hydrostatic water to its surface water source, Venture Global would pass the water through 25- to 50-micron filters and an active carbon medium to remove suspended solids and neutralize or biodegrade the chemical additives. Following completion of the hydrostatic testing and prior to being discharged, the test water would be analyzed for total suspended solids, oil and grease, and pH in accordance with LPDES general permit LAG670000.

To reduce the impacts of construction on surface waters (wetlands and waterbodies), Venture Global would implement measures outlined in its Project-specific Plan and Procedures, which provide measures to control erosion and sedimentation during construction and to ensure proper restoration of disturbed areas following construction. The Project-specific Plan and Procedures include some modifications to our Plan and Procedures where Venture Global consider individual measures unnecessary, technically infeasible, or unsuitable due to local conditions (see appendix C tables 1 and 2, respectively). We agree that most of Venture Global's proposed modifications are reasonable and that its proposed alternative measures would achieve a comparable level of mitigation as the FERC measures. However, concerning the modification to Section V.B.1 of our Procedures that limits the time window for construction in waterbodies, we recommend in section 4.3.2.3 that Venture Global file with the Secretary written concurrence from the LDWF for the proposed instream construction dates that are outside of these windows.

With the implementation of Venture Global's Project-specific Plans and Procedures, the proposed mitigation measures discussed in this EIS, and our recommendation, we conclude that impacts on surface waters would be minimized.

5.1.4 Wetlands

Construction of the LNG terminal would result in the permanent filling of 368.1 acres of PEM wetlands, including impacts on wetlands within the eastern workspace. In addition, 2.8 acres of PFO wetlands would be permanently converted to PEM/PSS wetlands. In addition, about 12.0 acres of temporary impacts, affecting about 4.5 acres of PEM and about 7.5 acres of PFO, would result during construction of the terminal facilities. Once construction is complete, these areas of temporary impacts would be restored. Construction at the LNG terminal site has the potential to have secondary and indirect impacts on adjacent wetlands. Implementation of protective measures in the Project-specific Plan and Procedures, the SPCC Plan, and the SWPPP, including erosion and sediment controls, would minimize the impacts on adjacent wetlands.

Construction and operation of the pipeline system would result in the permanent filling of 0.4 acre of ESS wetlands and <0.1 acre of PSS wetlands. Additionally, 2.4 acres of permanent impacts on open water would result from construction of platforms for the aboveground facilities. In addition, construction of the pipeline system would result in temporary impacts on 947.1 acres of wetlands and open water: 64.5 acres of EEM wetlands; 3.5 acres of ESS wetlands; 0.1 acre of PEM wetlands; 2.3 acres of PSS wetlands; and 876.7 acres of EUB (open water).

Section II.A.2 of our Procedures requires site-specific justifications for the use of a construction right-of-way greater than 75-feet-wide in wetlands. Venture Global states that the Project requires a 130-foot-wide construction right-of-way for pipeline installation where the push method is used, due to the need for a relatively wide and deep trench to ensure the required depth of cover in the wet, poorly cohesive, and easily sloughed substrate, and the consequent need for increased space to sidecast relatively high spoil volumes. Venture Global further states that the Project requires a 300-foot-wide construction right-of-way for pipeline installation in open waters, where the barge lay method is used, to accommodate an approximately 100-foot-wide floatation channel for lay barge and supply barge access and up to approximately 100 feet on either side of the floatation channel for construction workspace to deposit sidecast trench material. The 300-foot-wide construction right-of-way would allow for safe and wholly waterborne construction.

We accept that this proposed modification is necessary because the combination of pipe size, the inundated or saturated soil conditions, and the pervasiveness and extent of wetlands and open water in the Project area make the 75-foot-wide right-of-way infeasible.

Our Procedures state that aboveground facilities should be located outside of wetlands, except where such siting would prohibit compliance with DOT regulations. Venture Global has proposed locating portions of aboveground facilities within wetlands, as there are no upland alternatives because the pipeline system is largely located in wetlands and open water. Additionally, based on comments received from the LDWF, the use of bank line stabilization material at the interface of marsh and open water for all pipelines installed via the open trench would mitigate loss of marsh from open water intrusion. We agree that locating some aboveground facilities is unavoidable in the Project area and concur with the LDWF that the pipeline construction methods and wetland compensation plan would result in no net loss of wetlands.

Venture Global is required to propose compensatory mitigation that is commensurate with the amount and type of wetland impacts resulting from construction and operation of the Project. There are three mechanisms for providing compensatory mitigation. These wetland mitigation mechanisms, in order of USACE preference, are: mitigation banks, in-lieu fee mitigation, and permittee-responsible compensatory mitigation. As part of the section 10/404 process, Venture Global would be required to develop a Compensatory Mitigation Plan to mitigate unavoidable wetland impacts. The Compensatory Mitigation Plan would be subject to review and approval by the USACE as part of the section 10/404 process.

5.1.5 Vegetation

A total of 629.0 acres of vegetated land would be cleared for construction of the LNG terminal. Following clearing activities, approximately 614.6 acres of vegetated land would be converted to industrial use associated with operation of the facility. Field surveys indicate a loss of 368.1 acres of PEM wetlands and the conversion of 2.8 acres of PFO wetlands to PSS/PEM wetlands. Much of the area affected by the terminal facility is former agricultural lands that are surrounded by levees and are dewatered through pumping specifically for agriculture use and development. These lands have been utilized as pasture lands in the past and exhibit limited diversity. Therefore, the impact on vegetation communities as a result of the LNG terminal construction would be minor.

Construction of the pipeline system would affect a total of 107.3 acres of vegetation, based on USGS Land Use Land Cover data. Field surveys indicate 0.1 acre of PEM wetlands, 2.3 acres of PSS wetlands, 64.5 acres of EEM wetlands, 3.9 acres of ESS wetlands, 32.5 acres of forested/scrub-shrub upland, and 4.0 acres of coastal live oak-hackberry uplands would be affected. Operation of the pipeline system would permanently impact <0.1 acre of PSS wetlands, 0.4 acre of ESS wetlands, and 1.7 acres of coastal live oak-hackberry forest. These permanent impacts are a result of the aboveground facilities.

The collocation of the pipelines would minimize impacts on vegetation communities during construction and operation of the pipeline system. Venture Global would also implement the Project-specific Plan and Procedures, which require the use of temporary and permanent erosion control measures, topsoil segregation in select areas, testing and mitigation for soil compaction, post-construction monitoring, and limited routine vegetation maintenance. All disturbed areas would be routinely monitored in accordance with the Project-specific Plan and Procedures until restoration and revegetation are successful. Because Venture Global has not notified the agencies of the specific measures it would implement to minimize the spread of invasive species and noxious weeds, we recommend in section 4.5.3 that Venture Global coordinate with the NRCS and LDWF as it develops a Project-specific noxious weed control plan.

With the implementation of the minimization efforts described above, we conclude that construction and operation of the pipeline system would have a minor impact on vegetation communities.

5.1.6 Wildlife and Aquatic Resources

5.1.6.1 Wildlife

Wildlife species occurring in the vicinity of the proposed LNG terminal and pipeline system are characteristic of the habitats provided by the vegetative communities that occur in these areas. Construction of the LNG terminal would impact 629.0 acres of vegetated wildlife habitat, of which, 614.6 acres would be permanently converted to industrial use. Based on field surveys, over 92 percent of the permanent impacts at the LNG terminal site are to current pasture and hay production land (cultivated cropland in USGS classification). In addition to the cultivated cropland impacts, operation of the terminal would result in permanent impacts on 82.6 acres of forested/scrub-shrub uplands and 2.8 acres of PFO wetlands (batture). Due to the site's history as pastureland, species diversity is low, which lessens its value as habitat for wildlife.

Operation of the LNG terminal would result in increased noise, lighting, and human activity that could disturb wildlife in the area. However, due to current industrial activities at other facilities on the Mississippi River, wildlife species in the area are expected to be acclimated to the noise and artificial lighting associated with these activities. Therefore, we expect impacts due to noise, light, and human activity during operation of the LNG terminal to be negligible. Birds could also be affected by flaring at the terminal. The terminal is designed to limit flaring events only to LNG carrier gas up/cool down operations, which may occur up to forty times a year. During operation of the LNG terminal, use of the marine and emergency flares would only occur during process upset conditions. To the extent practical, use of the flares during initial facility start-up will be limited to daylight hours, limiting potential impacts on birds, and, to the extent practical, will be planned to avoid inclement weather when the risk of bird mortalities from attraction to the flares would be the highest. Therefore, we find that occasional flaring during operation would not substantially impact migratory birds passing through the area.

Construction of the pipeline system would impact a total of 107.9 acres of vegetated wildlife habitat. The majority of the pipeline system would temporarily impact herbaceous and shrub/scrub habitats including 64.5 acres of EEM wetlands, 3.9 acres of ESS wetlands, 2.3 acres of PSS wetlands, 32.5 acres of forested/scrub-shrub upland, 0.1 acre of PEM wetlands, and 4.0 acres of coastal live oak hackberry forest, based on field surveys. These habitats would be restored post-construction. Construction of the pipeline system would permanently convert 1.7 acres of coastal live oak hackberry forest to maintained herbaceous right-of-way. In addition, 0.4 acres of ESS wetlands would be permanently converted into aboveground facilities for the pipeline system.

Individuals of some wildlife species would be affected by construction and operation of the facilities, but most impacts on wildlife would be short term and limited predominantly to the construction period. The forested and shrub scrub portions of the pipeline system would require some maintenance and mowing. However, the majority of the pipeline system consists of open water and herbaceous wetlands and would not likely require vegetation maintenance. With the implementation of the Project-specific Plan and Procedures, and due to the fact that abundant similar habitat is available for wildlife adjacent to the affected areas, we conclude that construction and operation of the pipeline system would have permanent but minor impacts on local wildlife populations and habitat.

The vegetation communities within the LNG terminal and pipeline system facilities provide potential habitat for migratory bird species, including songbirds, waterbirds, and raptors. However, much of the vegetated land associated with the LNG terminal and pipeline system facilities is previously disturbed, within or adjacent to existing facilities, and/or composed of agricultural land, all of which reduce bird nesting habitat value. Impacts on migratory birds and their habitat due to construction and operation of the Project would typically be similar to impacts on general wildlife resources. In addition, potential impacts specific to migratory birds include loss of habitat and injury or disorientation due to flaring and other artificial illumination.

Colonial nesting waterbirds that occur in the Project area include various herons, egrets, ibises, terns, gulls, pelicans, and other species. A possible colonial-nesting waterbird area on an island in Barataria Bay occurs within a 2-mile radius of the pipeline system. The island is located between 600 and 1,800 feet from the proposed pipeline system. Based on the FWS guidance, Venture Global would educate on-site personnel to be cognizant of colonial nesting waterbirds, conduct pre-construction surveys, and restrict construction activities within 1,000 feet of any identified rookeries. Based on adherence to the FWS restrictions and completion of preconstruction surveys, impacts on colonial nesting waterbirds due to construction and operation of the Project would be minimal.

The LNG terminal and pipeline facilities would require adequate lighting for operations and safety. During construction, Venture Global would direct all nighttime lighting towards construction activity and use the minimum light level necessary to ensure site safety and security. While the facility lighting plan for operation of the LNG terminal has not been fully developed, Venture Global expects the plan to include downward-facing lights with shielding needed to meet regulatory standards and minimize illumination specifications. Measures that may be included in the final facility lighting plan include: (i) light minimization through limited outdoor lighting at the terminal and pipeline meter stations; (ii) shielded and downward-facing lights to facilitate safe operations at night or during inclement weather; (iii) the use of only white or red strobe lights at night, using the fewest number of lights as practicable, and using the minimum intensity and number of flashes per minute allowable; (iv) avoidance of solid red or pulsating red warning lights when possible; and (v) turning off perimeter lighting at aboveground facilities at night and using them only when necessary for work conducted at night.

In accordance with the facility lighting plan, lighting would be chosen to minimize the horizontal emission of light away from intended areas, and shielding would help minimize impacts on birds and other wildlife while providing the illumination needed to ensure safe operation of the facility.

5.1.6.2 Aquatic Resources

All waterbodies potentially affected by the Project support warm-water fisheries. Habitat for aquatic resources present within the LNG terminal includes the Mississippi River and man-made drainages ditches/canals within the LNG terminal site. The aquatic resources potentially affected by the pipeline system consist of drainage ditches, wetlands (PSS, PEM, ESS, and EEM) and open water.

Activities associated with construction and operation of the LNG terminal with the greatest potential to impact aquatic resources include pile driving and vessel traffic. No dredging is proposed at the LNG terminal site. The proposed waterbody modifications, water withdrawals for hydrostatic testing, stormwater runoff, lighting, and inadvertent spills could also affect aquatic resources; although the implementation of the proposed mitigation measures, would reduce these impacts to minimal levels.

Construction of the LNG terminal marine facilities would result in localized, temporary increases in turbidity and suspended sediment levels. However, these impacts are expected to be temporary (i.e., confined primarily to the period of in-water activity and shortly thereafter) and limited to the area within and immediately adjacent to the LNG loading and marine facilities. No permanent or long-term water quality impacts are anticipated. Impacts on fisheries resources and supporting habitat as a result of construction and operation would occur in the Mississippi River from construction of the marine facilities.

Construction of the LNG terminal would require the installation of approximately 300 piles to support the proposed marine facility structures and meter stations. It is anticipated that aquatic species would largely avoid the pile-driving area when the piles are being installed, although some aquatic resources could experience stress or injury due to the underwater sound pressure levels. Even so, we determined that the Project would have adverse impact on aquatic resources in the Project area due to pile-driving noise. As a result, we believe it is necessary that Venture Global implement noise mitigation measures to reduce the effect of underwater noise on marine species in the Project area.

Although Venture Global has committed to general mitigation measures to minimize impacts from pile driving, we recommend in section 4.6.3.2 that, prior to the end of the draft EIS comment period, Venture Global file a description of the specific measures developed in consultation with NMFS that it would implement to reduce noise impacts on aquatic species.

During construction and operation of the LNG terminal, barges, support vessels, and LNG vessels would call on the LNG terminal, increasing ship traffic within the Mississippi River and Gulf of Mexico. Potential impacts on aquatic resources resulting from increased vessel traffic include shoreline erosion and resuspension of sediments, ballast water discharges, cooling water discharges, and increased noise levels. The Mississippi River shoreline at the LNG terminal site is currently armored to protect the shoreline from erosion, and the Mississippi River is currently a heavily utilized shipping channel. Therefore, associated impacts on aquatic resources due to increased shoreline erosion and resuspension of sediments would be negligible.

Ballast water discharges at the terminal would modify the temperature, pH, dissolved oxygen, and salinity of the water in the vicinity of the discharge. However, the impacts on water quality, and thus aquatic resources, due to changes in temperature and pH would be temporary and negligible. During and immediately following ballast water discharges, benthic aquatic species may be affected by higher salinity levels, although ships moving into and out of the LNG terminal marine facilities would displace water, circulating it into, around, and out of the berthing area. Therefore, any increased salinity levels resulting from ballast water discharges would be temporary and unlikely to adversely affect aquatic resources.

Dissolved oxygen levels below 4 mg/L are generally considered unhealthy for aquatic life, and levels below 2 mg/L are considered hypoxic and inadequate to support most aquatic life. As discussed in section 4.3.2.2, ballast water would contain low dissolved oxygen levels and could decrease existing dissolved oxygen levels within the immediate vicinity of the discharge point. Depending on the oxygen levels present in both the ballast and ambient water at the time of discharge, aquatic resources present in the vicinity of the discharge point could be exposed to dissolved oxygen levels considered unhealthy for aquatic life. The adaptability of resident species in the Mississippi River to natural spatio-temporal variation in oxygen levels, and the ability to move over a short distance to more suitable conditions, would minimizes the adverse impacts associated with ballast water discharges. Given that the amount of ballast water discharged into the river during each LNG vessel visit to the LNG terminal would make up only a very small percentage of the water flowing downstream, we have determined that impacts on aquatic resources from reduced dissolved oxygen would be temporary and minor.

During construction and operation, hazardous materials resulting from spills or leaks entering the Mississippi River could have adverse impacts on aquatic resources. The impacts are caused by either the physical nature of the material (e.g., physical contamination and smothering) or by its chemical components (e.g., toxic effects and bioaccumulation). These impacts would depend on the depth and volume of the spill, as well as the properties of the material spilled. To prevent spills and leaks, Venture Global would implement its Project-specific Spill Prevention Plan during construction and its SPCC Plan during operation of the LNG terminal. These plans outline potential sources of releases at the site, measures to prevent a release, and initial responses in the event of a spill (see detailed discussion in section 4.2.3). Given the impact minimization and mitigation measures described above, we conclude that the probability of a spill of hazardous materials is small and any resulting impacts on aquatic resources would be temporary and minor.

Pipeline system construction impacts on fisheries resources and habitat would occur primarily in estuarine wetlands and open water. Impacts would primarily be localized and temporary, with disturbed areas returning to preconstruction conditions following pipeline installation. The pipeline trench would be backfilled following construction, and the barge channels would be allowed to backfill naturally through sedimentation. The push method or barge lay method would be used for trenched pipeline installation across most waterbodies and wetlands. Although these methods are designed to minimize equipment use and disturbance during pipeline construction, the crossing methods could result in temporary loss or modification of aquatic habitat, increases in sedimentation and turbidity levels, and alteration of vegetative cover. The majority of fish present within the waterbody at the time of construction activities would likely be displaced to similar nearby habitats. However, stress, injury, or death of individual fish may occur. Increased suspended sediment and turbidity levels may cause degradation of benthic and spawning habitat and decreased dissolved oxygen levels within and downstream of the crossing location. Temporary increases in suspended solids would decrease rapidly following the completion of in-water activities.

During construction of the two pipeline meter stations in Barataria Bay, multiple (number to be determined) 12-inch-diameter steel piles would be installed during construction. Installation could result in noise impacts on fish similar to those discussed for the marine facilities in the Mississippi River. Venture Global plans to install the piles associated with the meter stations either by the impact hammer or vibratory pile-driving method. Generally, vibratory pile driving takes much less time than impact-driven pile installation. For the LNG terminal, Venture Global has agreed to general pile-driving mitigation measures discussed above to reduce noise impacts on fish, but we also recommend that Global Venture provide specific mitigation measures that will be used during pile driving at the metering stations.

Dredging within barge access areas would cross private oyster leases. According to the LDWF, lessees must be notified as part of the Coastal Use permitting process about projects occurring in their oyster lease. In addition, a water bottom assessment must be conducted on those portions of leases located within 1,500 feet of the pipeline system. Additional requirements to mitigate potential impacts on these oyster leases may be required by the LDWF as the permitting process continues. We included a recommendation in section 4.9.3 that Venture Global file with the Secretary documentation that the LDWF and LDNR have confirmed the adequacy of the water bottom assessments and that consultations with any affected oyster lease holders and the State of Louisiana regarding compensation have been completed.

Both the LNG terminal marine facilities and significant portions of the pipeline system are mapped as EFH. Correspondence between Venture Global and NMFS (NMFS, 2017) indicate that the portion of the Mississippi River located in the Project area does not provide EFH since managed fish species would not be common this far upriver (river mile 55). Therefore, the marine facilities located in the Mississippi River at the terminal site would likely have no effect on EFH.

Construction of the pipeline system would impact EFH for post-larval and juvenile life stages of white shrimp, brown shrimp, and lane snapper, all life stages of red drum, and adult gray snapper. Affected EFH includes benthic substrates and/or water column habitats in estuarine open water (collectively referred to in this assessment as estuarine open water) and estuarine emergent wetlands. Potential adverse impacts on EFH would primarily be temporary, while some permanent impacts may be beneficial. Temporary adverse impacts during construction would be minimized through adherence to the BMPs set forth in Venture Global's Project-specific Procedures, SWPPP, and SPCC Plan.

5.1.7 Threatened, Endangered, and Other Special Status Species

Based on our review of publicly available information, agency correspondence, and field surveys, a total of 16 federally listed threatened or endangered species may occur in Plaquemines Parish (see table 4.7.1). Also within Plaquemines Parish, there is designated critical habitat for piping plover and loggerhead sea turtles. Review of the FWS Information for Planning and Conservation System database and the FWS Louisiana Ecological Services list of endangered, threatened, and candidate species by county identified 10 species as potentially present in

Plaquemines Parish, including the West Indian manatee, piping plover, red knot, Gulf and pallid sturgeon, and five species of sea turtles (FWS, 2018a). The NMFS Southeast Region lists 12 federally listed species as potentially occurring in the Project area or along the LNG vessel transit route in the Gulf of Mexico, including Gulf sturgeon, oceanic white-tip shark, giant manta ray, four species of whales, and five species of sea turtles (NMFS, 2018). The FWS and NMFS split jurisdiction for six species, including the Gulf sturgeon and the five sea turtles (see section 4.7.1)

For the 16 species listed under the ESA, we have determined that the Project may affect but is not likely to adversely affect these species. This is based upon our review of the species habitat requirements, the low likelihood of the species to occur within the Project area, and Venture Global's commitment to implement mitigation measures in section 4.7. To ensure construction does not begin before FERC confirms compliance with section 7 of the ESA, we recommend in section 4.7.1.4 that Venture Global not begin construction of the Project until the staff completes formal consultation with the FWS/NMFS, if required.

Based on information obtained from the LDWF, 15 state-listed threatened or endangered species are known to occur within Plaquemines Parish (LDWF, 2018). Twelve of the 15 state listed species are also federally listed and are discussed above. The three species that are not federally listed are the bald eagle, peregrine falcon, and the brown pelican (see table 4.7.1). Suitable bald eagle habitat exists in the vicinity of the terminal site, but no known nests have been identified. Because of the potential for bald eagles to be nesting in the Project area, Venture Global has committed to conduct preconstruction surveys to identify active bald eagle nests within 660 feet of the Project area. If active bald eagle nests are found, Venture Global will follow appropriate mitigation measures according to the National Bald Eagle Management Guidelines to minimize or avoid impacts on individual bald eagles. Impacts on the peregrine falcon would be temporary and minor and primarily associated with seasonal disruption of foraging due to pipeline construction. Colonial waterbirds, such as the brown pelican, could potentially nest in the vicinity of the Project. Venture Global will implement measures to identify any nesting colonies prior to construction and would implement measures to prevent impacts on nesting brown pelicans. Based on the above, we have determined that the Project would not likely adversely impact state-listed species.

5.1.8 Land Use, Recreation, and Visual Resources

Construction of the LNG terminal and pipeline facilities would affect a total of 1,682.6 acres of land. Of this, 773.8 acres would be permanently affected by operation of the LNG terminal and pipeline facilities and 908.8 acres would be allowed to revert to the existing land use type after the completion of construction.

Construction of the LNG terminal would affect a total of 728.7 acres of land and water within the LNG terminal site, including the marine facility construction footprint and other workspaces adjacent to the terminal site. The USGS Land Use Land Cover data land use types affected during construction of the LNG terminal, including the marine facility construction footprint and other workspaces adjacent to the terminal site, would include cultivated crops, forested, open water, wetland, developed industrial/commercial, herbaceous, and scrub-shrub. Because the majority areas affected by construction and operation of the LNG terminal are master planned for "port/terminal complex" (Plaquemines Parish Master Plan, 2011), we have determined that impacts on land use would be negligible.

Venture Global currently leases the LNG terminal site. The property is owned by the Port of Plaquemines. A lease option agreement grants Venture Global the exclusive right to lease the terminal site for up to 70 years. Aside from the Port of Plaquemines property, no federally, state, or local agency owned or managed lands would be affected by the liquefaction facility. Likewise, the additional workspaces located adjacent to the LNG terminal site are also owned by the Port of Plaquemines, and Venture Global currently has the option to lease those lands involving additional workspaces. A USACE-maintained levee along the Mississippi River is controlled by the federal government but is located within port-owned property. Aside from the Port of Plaquemines and USACE, no federally, state, or local agency owned or managed lands would be directly affected by the LNG terminal.

Construction of the pipeline facilities would affect about 953.9 acres of land and open water. Because the activities involve new rights-of-way and easements, much of the land and open water affected by the pipeline facilities would be greenfield. The pipeline facilities would be constructed almost entirely within open water and wetlands, although small areas of herbaceous area and developed land would also be affected. Impacts on land use associated with construction and operation of the pipeline facilities would be temporary and minor, and all disturbed areas would be allowed to revert to preconstruction conditions after construction is complete. Venture Global would retain permanent easements over the header pipelines, which would be subject to vegetation maintenance and monitoring. The lands necessary for construction and operation of the pipeline and its associated facilities would consist of land currently owned or leased by Venture Global and other private land for which Venture Global would seek easement agreements with the owners.

No residential land is located within the footprint of the areas that would be affected by construction or operation of the LNG terminal and pipeline. The nearest occupied residences are 0.2 mile southwest of the terminal site. The nearest residence to any pipeline workspace is located approximately 0.3 mile northwest along Lake Hermitage Road. No residential areas or subdivisions are currently proposed within a 0.25-mile radius of the terminal site or pipeline workspaces, according to the Plaquemines Parish Department of Permits, Zoning and Planning. In addition, no commercial/industrial projects are planned or announced within a 1-mile radius of the terminal site or pipeline workspaces.

One designated management area, Barataria-Terrebonne National Estuary Program, Gulf Ecological Management Site, is located within 1 mile of the pipeline route and LNG terminal site. Recreational boating and fishing activities occurring within the proposed open water areas of the pipeline route and within the Mississippi River could be affected by construction of the pipeline and construction and operation of the LNG terminal due to increased noise, restrictions on vessel traffic in the immediate vicinity of the LNG terminal, and pipeline construction. Increased noise associated with construction of the pipeline would likely deter recreational users from fishing in the immediate vicinity of pipeline construction. Fishing and recreational boating within the Mississippi River near the terminal site is not popular; therefore, impacts would be minimal. During operation of the LNG terminal, delays to recreational users could result due to the moving security zone around LNG vessels during transit to and from the LNG terminal, which we expect would be intermittent and minor.

Other public areas, conservation lands, or special interest areas near the terminal site and/or pipeline routes include four local marinas between 0.1 and 1.8 miles from a Project workspace; Delta NWR; Breton NWR; Pass A Loutre State Wildlife Refuge; Woodland Trail and Park, a privately owned conservation land; and Jean Lafitte National Historic Park. Users of these areas may experience an increase in vehicular traffic and minor interruptions in traffic flow, particularly along SH 23 near the terminal site during construction. Vessel traffic to and from these areas may also be prevented from using established channels during pipeline construction. Because impacts on vessel traffic and vehicular traffic would be temporary, impacts are expected to be minor.

The LDWF regulates statewide fishing in addition to the harvest of crabs, crawfish, oysters, shrimp, and certain reptiles and amphibians. The Project does not encroach any public oyster areas. The closest public oyster area and active clutch planting is 5.3 miles southwest of the terminal site in Petit Bay Chene Fleur. Commercial fishing traffic is expected to experience minor, temporary impacts during pipeline constriction.

As stated in section 4.8, "visual resources" refer to any object or feature that is visible on a landscape and that influences the visual appeal of an area for residents, local workers, or visitors. Potential impacts on visual resources were considered for both the LNG terminal site and the pipeline system. The study area included a 2-mile buffer area from the Project (used primarily for the LNG terminal site) and the footprint of the pipeline system and its immediate surroundings. Present within the 2-mile buffer area are residences, commercial facilities, public recreational facilities, the Mississippi River, and SH 23 (a National Scenic Byway). The study area generally is characterized by industrial views, with other land uses as described herein. Beyond an approximately 2.0-mile radius, the infrastructure associated with the Project would likely blend into its surroundings, therefore, visual resources beyond the 2 miles are not considered.

The area surrounding the LNG terminal site currently includes industrial operations and associated facilities; the LNG terminal site would be in the viewshed of local residents, drivers, and visitors travelling along SH 23 and other nearby roadways. It also would be visible to recreational and commercial users of the Mississippi River.

Visual impacts associated with the LNG terminal site would be experienced temporarily during construction due to the presence of heavy equipment/personnel, lighting, materials storage, and infrastructure (e.g., the pipe bridge and temporary aerial conveyor system). Existing scrub-shrub and tree cover may provide some cover for those observers with potential views of the LNG terminal site; a perimeter wall also may block some of the views of the terminal site. Construction would be anticipated to generate minor impacts due to the industrial nature of the LNG terminal site and its surroundings, as well as the temporary nature of the construction activities.

During operation, views of the LNG terminal may include exterior plant lighting, air navigation lighting, LNG storage tanks, electric power generation facilities, liquefaction heat exchangers, air coolers, and the flare stack (with flaring anticipated to be twice a year for startup and shutdown and up to 12 times per year for marine flaring). Similar to the construction phase, the LNG terminal would be visible to residents, drivers, and recreational/commercial users. While new facilities would be present, the impacts associated with operation is expected to be minor, as the LNG terminal would be consistent with the industrial nature of the site and its surroundings. To minimize potential lighting impacts, the exterior plant lighting would primarily consist of full cutoff types, directed toward the ground, and where possible, floodlight mast locations would be directed to avoid light emissions on land and water.

The pipeline system generally would be in rural areas and areas previously disturbed by other utilities. During construction of the pipeline system, visual impacts would result from the presence of personnel and their workday activities, large construction equipment, and vehicles. Visual impacts associated with construction of the pipeline system would to include the removal or alteration of existing vegetation and the exposure of bare soils, as well as earthwork and grading scars associated with heavy equipment tracks, trenching, and machinery and tool storage. A pipe bridge also would be built that would be visible to outside viewers. Existing vegetation may provide some buffer to the construction, but noticeable changes would result from the changes within the footprint and workspaces of the pipeline system.

During construction of the pipeline system, barges would be utilized in open water areas associated with the barge access channels. A short-term change in visual resources would be noticeable to recreational and commercial boaters in proximity to the workspaces due to the activity. Occupants of other vessels traveling on the barge access channels would be able to see large equipment, pipe joints, and materials being transported to the active construction sites.

Operational impacts associated with the pipeline system would be anticipated to occur in locations surrounding the permanent aboveground facilities. Similar aboveground pipeline infrastructure is common in this area of Louisiana; therefore, the presence of these stations would not detract from the overall industrial nature of the area.

As much of the pipeline system would be located in rural or industrial areas, the pipeline system would be anticipated to cause minor impacts with regard to visual resources. Existing vegetation would help to provide some visual buffers from the operation of the pipeline system. In areas where vegetation would be removed or altered, pre-Project conditions would be restored according to the Project-specific Plan and Procedures as practicable.

The proposed LNG terminal would be located within the Louisiana Coastal Zone, and a CUP from the OCM would is required. Venture Global submitted its Joint Permit Application for activities within the Louisiana Coastal Zone to the USACE and the OCM in March 2018. Venture Global has not received its CUP and subsequent consistency determination from the OCM. We recommend that Venture Global file its consistency determination with the Secretary prior to any construction activities, if approved.

5.1.9 Socioeconomics

Construction of the Project would increase the population in Plaquemines, Jefferson, and Orleans Parishes during the 4.5-year construction period, though the increase would be minor in the affected area overall. Belle Chasse in Plaquemines Parish and other towns and neighborhoods nearby may experience a more noticeable increase, especially during peak construction. Assuming peak construction of the LNG terminal and both pipeline laterals overlap, the construction workforce would be about 3,700 workers for a 1-month period. More typically, the workforce would range from 1,400 to 2,800 on the LNG terminal site, and an additional 100 to 250 persons would work on the pipeline system, depending on the construction phase. Half of the workforce is expected to be hired locally. If the remaining workforce is hired from locations farther away, we estimate those workers and their households would number a maximum of 4,090 individuals that could relocate to the affected area. This total is based on a 1-month hypothetical peak workforce, and only a portion of workers was assumed to bring householders.

Project construction would generate local jobs, local spending on supplies and services, and other local economic benefits that accrue indirectly. Venture Global estimates 10 percent of Project costs would be spent locally or regionally over the 4.5 years of construction, and the total estimated Project cost is $8.5 billion. The Project's local expenditures and stimulus effects during construction would be at least a moderate benefit to local communities in Plaquemines, Jefferson, and Orleans Parishes, lasting through the 4.5 years of construction and for a year or two after construction ends. During operation, the economic and employment benefits would be permanent as Venture Global would hire 250 workers and spend approximately $20 million annually on materials, land leases, and utilities (water, sewer, waste disposal) for the foreseeable future.

During construction, the Project's tax contributions to the local and state economies would be minor, short-term benefits, consisting of approximately $7 million annually in local taxes and $26 million annually in state taxes over the 4.5 years of construction. During operation, tax contributions in the form of sales, payroll, and property taxes would provide benefits at both the state level and in the locally affected area, though the level of benefit directly contributed in Plaquemines Parish could increase. The LNG terminal may be granted a Louisiana Industrial Tax Exemption Program waiver on ad valorem taxes for up to 10 years, after which ad valorem taxes to the parish would be a substantial benefit to the local economy. The pipeline system would generate ad valorem taxes starting in year one of operation.

The LNG terminal would have a negligible impact on commercial fishing. The pipeline system, which crosses private oyster lease areas in Barataria Basin, would impact leaseholders of the traversed and adjacent oyster grounds. These impacts, however, would be mitigated to less than significant. The LDWF and LDNR require water bottom assessments of oyster lease areas within prescribed distances of installation activities, and Venture Global has conducted at least one assessment to date. Venture Global intends to conduct financial impact evaluations on individual oyster leases and work with leaseholders and the state to determine compensation for leaseholders. To ensure successful and timely completion of these consultations, in section 4.9.3 we recommend that consultations with any affected oyster leaseholders and the State of Louisiana are completed prior to construction.

Given the available housing and accommodations in the Greater New Orleans metropolitan area near the Project, the Project workforce's impact on housing in the affected area would be minor, though impacts on individual proprietors or tenants may be substantial. Workers and their householders who relocate to the affected area during construction and operation would have minor impacts on schools, hospitals, and public safety departments. The Project would provide some firefighting equipment on-site in case of an accident, but it would also provide specialized training to the nearby Myrtle Grove and/or Lake Hermitage Volunteer Fire Stations to serve as backup. The Project's impact on public safety services is expected to be minor, barring a catastrophic incident.

The Project's effect on roadway transportation would be mitigated to less than significant during construction. Venture Global intends to implement several mitigation measures that would avoid heavy traffic congestion and traffic queues on SH 23 near the LNG terminal during the workforce's commute hours. During construction of the pipeline system, signs and flagmen would be appropriately positioned to alert drivers of any construction activities that would affect local roads. After construction is complete, Venture Global would restore or reconstruct any damaged roadways. During operation, roadway impacts would be negligible. In addition, as required by the DOT regulations for LNG operators, Venture Global would develop emergency response plans in coordination with appropriate local officials.

5.1.10 Cultural Resources

As construction of the Project could directly affect cultural resources through ground disturbance associated with the construction, operation, and maintenance of the facility and pipelines, as well as indirectly by the presence of the personnel and associated activities (visual, auditory, or other secondary impacts), cultural resources surveys have been conducted, and consultation with the SHPO and tribes has occurred. The surveys and consultations were conducted to meet FERC's obligations for Section 106 of the NHPA.

The conclusions and recommendations resulting from SHPO review have been incorporated into this draft EIS. Potential survey work may be needed on 152 acres that were not previously assessed by Venture Global. Consultation with the SHPO is ongoing. Therefore, we recommend in section 4.10.5 that Venture Global not commence construction of its facilities until we can ensure that FERC has met its responsibilities under the NHPA and its implementing regulations.

5.1.11 Air Quality and Noise

5.1.11.1 Air Quality

Construction activities at the LNG terminal and pipeline system would generate criteria air pollutants, hazardous air pollutants, and greenhouse gas emissions during Phase I and Phase II of construction. Active construction would occur over a 70-month period. Construction activity would produce emissions from use of off-road equipment and vehicles; on-road vehicles, including delivery trucks and worker commuting; marine vessels delivering construction materials; supplies and equipment; and fugitive dust produced from vehicles and equipment operating at the site and from the handling of soils, fill material, soil stabilization components and concrete production. The duration of construction (5-plus years) and the quantity of pollutants emitted during each year of construction may have an impact on air quality.

As construction proceeds and components of the LNG terminal become ready for operation, Venture Global plans to enter into an Interim Operating mode. This mode would continue from year 2 of construction until the completion of Phase II construction. In this mode, the power-generating facility would operate in simple-cycle mode, with LNG liquefaction beginning as the LNG trains become operational. At the same time, construction on the remainder of the LNG terminal and pipeline would continue. During the Interim Operating mode, total emissions (construction plus interim operation) would be higher than during construction or operation alone. We have summarized emissions in the air quality discussion for the overlapping Interim Operating mode and continued construction.

At the completion of the Interim Operating mode, construction activities would cease and the facility would enter the final operating mode. Emissions would be produced from equipment at the power-generating facility and at the LNG terminal, and from marine vessels associated with transport of LNG from the LNG terminal. Emission controls at the LNG terminal would be fully operational during the final operating mode. Pipeline operation would generate only a minor amount of fugitive emissions; there is no compression associated with pipeline operation that would generate combustion emissions. An operational emission inventory was developed to provide an estimate of annual emissions during full LNG terminal operation.

The operational emission inventory for the final operating mode included the effects of certain mitigation measures used to reduce emissions. Mitigation is based on the applicant-prepared BACT analysis that was prepared as part of its air permit application to the LDEQ. Emissions of NO_X from the combined-cycle gas turbines, supplemental duct burners, and aeroderivative turbines at the power-generating facility would be reduced by using low NO_X combustion and SCR. Other mitigation measures proposed by Venture Global include (i) the use of catalytic oxidation on the exhaust of the combined gas turbine/duct burners to reduce CO and VOCs, (ii) use of natural gas as fuel, (iii) use of ultra-low sulfur diesel fuel in backup diesel engine electric generators and firewater pump engines, (iv) good combustion practices, (v) proper equipment design, and (vi) adherence to manufacturers' operating and maintenance procedures.

Modeling analyses were performed only for emissions from the final operating mode of the Project. Modeling analyses conducted for the Project and reviewed include the following:

- criteria pollutant dispersion modeling for emissions from the LNG terminal alone and in combination with marine vessels;
- cumulative dispersion modeling analysis for the LNG terminal (without marine vessels) as part of the air permit application to the LDEQ;
- a dispersion modeling analysis for Louisiana Toxic Air Pollutants, specifically ammonia (The use of SCR to control NO_X emissions results in the emission of ammonia, a Louisiana toxic air pollutant.);
- a Class I modeling analysis (without marine vessels) to evaluate Project stationary source effects at the Breton NWR Class I area; and
- an ambient ozone analysis using regional-scale photochemical grid modeling (without marine vessels).

The modeling studies were conducted according to modeling protocols reviewed by the LDEQ and other agencies. The modeling protocols were based on EPA and Louisiana modeling guidelines and requirements. The modeling demonstrated that the Project would comply with NAAQS, PSD increments, Louisiana toxic air pollutant limits for ammonia, and applicable Class I Area thresholds for the Project's stationary sources. The additional modeling conducted for the

LNG terminal in combination with marine vessels also demonstrated compliance with the NAAQS.

Based on the analyses conducted for the final operating mode of the Project and mitigation measures proposed in the BACT analysis, operation of the Project would result in quantifiable impacts but would be in compliance with applicable standards.

During the construction period, residents in the vicinity of the Project would experience local impacts to air quality. Concurrent emissions from staged construction, commissioning and start-up, and operation of the LNG terminal would temporarily impact local air quality, and could result in exceedances of the NAAQS in the immediate vicinity of the LNG terminal during these construction years. These exceedances would not be persistent at any one time during these years due to the dynamic and fluctuating nature of construction activities within a day, week, or month. During operation, extensive modeling has indicted that the Project would not have significant impacts on the local and regional air quality and Class I areas.

5.1.11.2 Noise

Construction activities at the LNG terminal would generate temporary increases in sound levels over the duration of both phases of construction. Construction activities would occur predominantly during the day, Monday through Saturday. Certain activities that produce higher levels of noise would have more condensed working timeframes. In particular, dredging would occur for only 1 month and be limited to daytime hours, and land-based pile driving would occur no later than 5 p.m. HDD may occur 24 hours per day but would be shrouded by sound curtains or an acoustic barrier to mitigate stray noise. The applicant has not provided its final design for the pile driving required for the marine facilities. We have recommended in section 4.6.3.2 that Venture Global identify the specific measures it would implement to reduce noise impacts on aquatic species in the vicinity of in-water pile-driving activities prior to the end of the draft EIS comment period.

The most prevalent sound-generating equipment and activity during construction of the LNG terminal is anticipated to be pile driving. Venture Global anticipates that impact-type pile drivers would be used during construction of the terminal facilities and auger type pile installation would be used to construct pipe bridges over levees. Onshore piles would be driven by up to 12 hydraulic piling rigs at a time. The use of one auger rig is anticipated during pipe bridge construction. Based on the construction schedule provided by Venture Global, land-based pile driving to create the foundations for the LNG storage tanks and other process equipment foundations and structures would occur over a period of 12 months, and pile driving associated with construction of the LNG loading and ship berthing area would occur over a period of 6 months.

Land-based pile driving is scheduled to occur in 10-hour shifts, 6 days per week, over a total of about 12 months. During land-based pile-driving operations, the estimated sound level at the nearest NSA when the maximum number of land-based pile-driving platforms are in use would be 65.4 dBA L_{max}. These levels would correspond to a moderate sound level and would be clearly audible. Based on the estimates provided by Venture Global, and because of the 12-month duration of the pile-driving activities, these sound levels may have a moderate adverse impact at the nearest NSAs. Venture Global proposes to implement mitigation measures to reduce land-based and marine-side pile-driving noise impacts on NSAs. Venture Global would construct 5-meter-high noise protection walls around piling rigs for noise reduction mitigation. As modeled, these noise barriers would reduce the increase in ambient noise levels at the two nearest NSAs from 11.8 dBA and 16.0 dBA (without mitigation) to 0.4 dBA and 2.2 dBA, respectively.

The most prevalent sound-generating equipment and activity during construction of the pipeline system is anticipated to be the HDD near Lake Hermitage Road. Venture Global estimates that an increase of 13.3 dBA L_{max} would be experienced at NSA 2; no other NSAs are expected to be affected. To minimize impacts on NSAs from HDD operations, Venture Global proposes to implement a sound curtain enclosure or acoustic barrier as necessary. Sound curtain enclosures would be used around the drilling rig and other stationary equipment during the HDD process. Sound curtain enclosures have been shown to provide 10 to 14 dBA of mitigation. Sound enclosures or acoustic barriers could also be used during dredging activities if nearby structures are occupied during dredging of barge access channels.

Dredging activities associated with barge access channels would increase noise levels above 10 dBA L_{max} at a structure approximately 265 feet away from a dredging area. Venture Global has committed to take measures to reduce noise levels to no greater than 10 dBA over L_{eq} ambient levels at this structure and other structures nearby.

LNG terminal operation is not expected to produce noise levels greater than 10 dBA over L_{eq} ambient levels at any NSA. Periodic operational blowdown events would be the greatest cause of stray noise emanating from the LNG terminal. The sound level produced by this vent will be approximately 50 dBA at NSA 2. Venture Global also plans to implement various mitigation measures to further reduce general operation noise not associated with blowdown events. With the implementation of the noise reducing mitigation efforts presented in section 4.11.2.4, we have determined that the terminal would be in compliance with our new facility noise level threshold of Ldn 55.0 dBA at all defined NSAs.

The only noise-producing facilities that would be associated with the pipeline system are the new metering stations. These facilities are not anticipated to affect ambient noise levels in the immediate vicinity or at an NSA.

Based on the analyses conducted, mitigation measures and noise barriers proposed, and with our additional recommendations, we conclude that construction of the Project would result in temporary and minor noise impacts on residents and the surrounding communities and that operation of the Project would result in permanent and minor impacts on the surrounding residents.

5.1.12 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 assess whether the proposed facilities would be able to operate safely, reliably, and securely.

As a cooperating agency, the DOT assists FERC staff in evaluating whether Venture Global's proposed design would meet the DOT's 49 CFR 193 Subpart B siting requirements. DOT will provide a Letter of Determination on the Project's compliance with 49 CFR 193 Subpart B.

This determination will be provided to the Commission for its consideration on whether to authorize or deny the Project. If the Project 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 reviewed the proposed LNG terminal and the associated LNG carrier traffic. The USCG reviewed a Water Suitability Assessment (WSA) submitted by Venture Global that focused on the navigation safety and maritime security aspects of LNG carrier transits along the affected waterway. On January 23, 2017, the USCG issued a Letter of Recommendation to FERC indicating the Lower Mississippi River would be considered suitable for accommodating the type and frequency of LNG marine traffic associated with this 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 facility 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 Venture Global design, including potential external impacts based on the site location. Based on this review, we recommend the Commission Order include a number of mitigation measures 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 life of the facility to enhance the reliability and safety of the facility. With the incorporation of these mitigation measures, we believe that the Venture Global Project 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 offsite public.

5.1.13 Cumulative Impacts

During the cumulative impact analysis, we identified 16 actions, including the Project, that warranted careful consideration based on geographic and temporal criteria we established for each environmental resource. Consistent with CEQ (2005) guidelines, the effects of past actions were aggregated into our assessments of affected environments in section 4.0. Thus, we focused the cumulative analysis on effects of the Project in combination with current and future actions. Six major industrial developments, including the Project, planned on the banks of the Mississippi River in Plaquemines Parish presented the highest potential for creating cumulative adverse effects along with the LNG terminal and pipeline system. These industrial developments, all within 21 miles of each other, include two methanol manufacturing facilities; two LNG manufacturing facilities and export terminals, including the Project; an oil blending, storage, and distribution facility; and a container shipping terminal. The remaining actions consist of two minor non-jurisdictional utility lines associated with the LNG terminal, two drainage and shoreline protection projects, four wetland mitigation and restoration projects, a dredging project to deepen part of the Mississippi River ship channel, and a very recently completed transportation improvement on a portion of SH 23.

Because the Project would not affect or have negligible impacts on groundwater, recreation and cultural resources, it would not contribute to adverse cumulative effects on those resources. Venture Global is still awaiting a letter of concurrence from the SHPO on 152 acres of pipeline system workspace and barge route and staging areas, but fieldwork and desktop surveys did not uncover any historic or cultural properties. Geology and soil resources affected by the Project would not experience cumulative effects because no other identified actions are within the cumulative geographic scope for those resources.

Based on our evaluations, surface waters and aquatic wildlife and habitat; wetlands; upland vegetation and wildlife; housing and public services (socioeconomic resources); vessel traffic; noise; and safety and reliability would experience minor adverse cumulative impacts. The cumulative land use effects would be noticeable, but the majority of the affected acreage would be consistent with the parish's Comprehensive Master Plan. The cumulative visual effects from development along the designated scenic byway SH 23 would be moderate given the magnitude of change and intermittent exposure level of residents. If all proposed actions were developed, the associated increase in piloted vessel traffic would be substantial, but the presence of USCG Vessel Traffic Services–Lower Mississippi River and the capacity of the Mississippi River to accommodate vessel traffic would mitigate the additional transits' effect on traffic flow. The cumulative noise effects near certain residences in the Deer Range camp community could be adverse for a few days or weeks if Venture Global's pile-driving and/or HDD construction activities overlap with USACE upgrades of the adjacent levee, but overlap of these activities is unlikely. We recommended that Venture Global coordinate its construction with the USACE.

We identified only air quality as having the potential to sustain significant adverse cumulative impacts. More information could illuminate whether cumulative effects on this resource would likely be significant or less than significant. Because we cannot determine the Project's incremental physical impacts on the environment caused by climate change, we cannot determine whether the Project's contribution to cumulative impacts on climate change would be significant.

Air Quality: The Clean Air Act and implementing regulations establish limits on pollutant emissions from major industrial developments, among others. Venture Global has prepared a modeling study of the LNG terminal's future effects on air quality that includes baseline emissions from existing and permitted activities within the vicinity. Venture Global included the future effects of the permitted Braithwaite Methanol Manufacturing Plant and NOLA Oil Terminal and demonstrated that their combined emissions would not exceed the NAAQS. However, Gulf Coast Methanol Park was recently issued an air permit in January 2018, and neither Venture Global nor IGP Methanol LLC, included the other's development in its modeling study. Therefore, we conservatively assume their cumulative emissions could exceed the NAAQS and significantly affect air quality.

The recently announced Pointe LNG project would trigger major source regulations and so would be required to conduct a cumulative air modeling study that captures estimated emissions from existing and permitted projects and projects in the advanced stages of permitting, including the LNG terminal. Pointe LNG must demonstrate that the combined emissions fall below NAAQS thresholds to obtain an air permit, ensuring the cumulative air quality effect from the LNG terminal, Pointe LNG, and the other actions would not exceed health and safety standards for regulated pollutants.

Emissions from vessels, vehicles, and other mobile sources associated with operation of the foreseeable industrial facilities along the Mississippi River could contribute to an adverse effect on air quality. Vessel emissions are not addressed in LDEQ regulations and air permit application requirements, but the International Maritime Organization, of which the U.S. is a member, promulgates emissions standards limiting SO_X and NO_X. Also, the EPA adopted emission standards on engines installed on U.S. vessels. Thus, the resulting cumulative effect of vessel emissions on air quality in the geographic scope of the Project is not likely to be significant.

5.1.14 Alternatives

As alternatives to the proposed action, we evaluated the No-Action Alternative, system alternatives for the proposed LNG terminal and pipeline system, alternative LNG terminal configurations, alternatives sites for the proposed LNG terminal, alternative routes for the pipelines, and alternative locations for the aboveground facilities associated with the pipeline system. While the No-Action Alternative would eliminate the short and long-term environmental impacts identified in the EIS, the stated objectives of the proposed action would not be met.

We evaluated system alternatives for the LNG terminal, including operating LNG import/export terminals with approved, proposed, or planned expansions to provide liquefaction and export capabilities, and stand-alone (greenfield) liquefaction terminals with approved, proposed, or planned liquefaction projects along the Gulf Coast in the southern United States. All of these were eliminated from further consideration as viable alternatives for reasons that include incompatible timeframes with in-service dates, capacity demands that would not meet Venture Global's customer commitments, and environmental impacts that were considered comparable to or greater than those of the proposed LNG terminal.

We evaluated three system alternatives to the proposed pipeline system and two major route alternatives along the preferred route. To serve as a viable system alternative to the preferred pipeline system, the pipeline would have to transport all or a part of the volume of natural gas required for liquefaction at the proposed terminal and cause less impact on the environment than the preferred pipeline system route. All three systems accomplished the goal of supply. However, two were eliminated because they did not provide an environmental advantage over the preferred route. The two route alternatives were evaluated but also eliminated because they did not provide an environmental advantage over the preferred alignment of the SW laterals.

We evaluated five sites for the LNG terminal, including the proposed site and four alternatives. In order to meet the stated objectives of the Project, we applied screening criteria to identify sites that would be reasonable and most likely to provide some environmental advantage over the proposed LNG terminal site. The screening criteria included deep berth waterfront access, property size, land use compatibility with an LNG terminal, site availability, proximity to natural gas pipelines and transmission lines, distance from population centers and residences, distance to the interstate highway system, local and state government support, and presence of wetlands within the site. The alternatives analysis concluded that the proposed site represents an acceptable site for the proposed LNG terminal because it is currently zoned for heavy industrial use, is sufficiently sized to allow optimal facility layout design, and would not require dredging to create berths. The proposed site also contains the lowest acreage of wetlands of the alternatives considered. Therefore, the loss of habitat diversity and function resulting from facility development would be generally less than that anticipated at the other sites. Additionally, from a visual impact perspective, the new LNG terminal would be consistent with the existing industrial development along the Lower Mississippi River at this location.

The proposed aboveground facilities would occur within or adjacent to the SW lateral pipeline route right-of-way, which would minimize the footprint and associated environmental impacts. The new aboveground facilities are not located near residences, and their footprint would overlap with pipeline workspaces that would be disturbed by construction. We did not identify any environmental concerns that require the need to identify and evaluate alternative aboveground facility sites.

We evaluated the arrangement of plant infrastructure to ensure compliance with federal siting and safety requirements. Aligning the major infrastructure components in sequence according to process flow minimizes the amount of cryogenic piping required and optimizes the site layout for process efficiency. The proposed site layout provides the adequate minimum practical distance between the LNG loading docks and the LNG storage tanks, and the administrative offices, maintenance facilities, and the central control room are well separated from the main plant. The proposed location of each of the components of the LNG terminal is in accordance with the applicable federal safety requirements. We did not identify any alternative configurations that would meet the regulations, codes, and guidelines while avoiding or reducing impacts when compared to those of the proposed LNG terminal configuration.

Therefore, we conclude that the proposed action, as modified by our recommended mitigation measures, is the preferred alternative to meet the Project objectives.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission authorizes the 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 the construction and operation of the Project. We have included some recommendations that require Venture Global to provide updated information and/or documents prior to the end of the draft EIS comment period. We do not expect that Venture Global's responses would materially change any of the conclusions presented in this draft EIS; instead, the information requested is primarily related to ensuring that our final EIS provides up-to-date information on Venture Global's ongoing efforts to minimize the impacts of the Project in compliance with FERC regulations. Unless otherwise noted within the condition, a recommendation made for Venture Global applies to both the LNG terminal and pipeline system.

1. Venture Global shall follow the construction procedures and mitigation measures described in their applications and supplements (including responses to staff data requests) and as identified in the EIS, unless modified by the Order. Venture Global 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 the LNG terminal, 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 life, health, property, and the environment during construction and operation of the Project. This authority shall allow:

   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 ensure continued compliance with the intent of the conditions of the Order as well as the avoidance or mitigation of unforeseen adverse environmental impact resulting from Project construction and operation.

3. For the 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 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 impact resulting from Project construction and operation.

4. **Prior to any construction**, Venture Global shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, EIs, and contractor personnel will be informed of the EI's 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**, Venture Global 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.

For the pipeline, Gator Express Pipeline's exercise of eminent domain authority granted under NGA section 7(h) in any condemnation proceedings related to the Order must be consistent with these authorized facilities and locations. Gator Express Pipeline's right of eminent domain granted under NGA section 7(h) does not authorize it to increase the size of its natural gas pipeline to accommodate future needs or to acquire a right-of-way for a pipeline to transport a commodity other than natural gas.

6. Venture Global shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations, and staging areas, pipe storage yards, 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. Each area 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 Plan and/or minor field realignments per landowner needs and requirements which do not affect other landowners or sensitive environmental areas such as wetlands.

   Examples of alterations requiring approval include all route realignments and 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 authorization and before construction begins**, Venture Global shall file an Implementation Plan with the Secretary for review and written approval by the Director of OEP. Venture Global must file revisions to the plan as schedules change. The plan(s) shall identify:

a. how Venture Global 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 Venture Global 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 how Venture Global 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 material;

e. the location and dates of the environmental compliance training and instructions Venture Global 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 and specific portion of Venture Global's organization having responsibility for compliance;

g. the procedures (including use of contract penalties) Venture Global 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. Venture Global shall employ at least one EI for the terminal and one EI per pipeline construction spread, or as may be required by the Director of OEP. The EIs shall be:

    a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or other authorizing documents;

    b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 6 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, Venture Global shall file updated status reports with the Secretary, on a **monthly** basis for the terminal and on a **biweekly** basis for the pipeline system, until all construction and restoration activities are complete. On request, these status reports will also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:

   a. an update on Venture Global's efforts to obtain the necessary federal authorizations;

   b. the construction status of the LNG terminal and each pipeline spread, work planned for the following reporting period, and any schedule changes for stream crossings or 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 EIs 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;

   e. the effectiveness of all corrective 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 Venture Global from other federal, state, or local permitting agencies concerning instances of noncompliance, and Venture Global's response.

10. Venture Global must receive written authorization from the Director of OEP **before commencing construction of any Project facilities**. To obtain such authorization, Venture Global must file with the Secretary documentation that it has received all applicable authorizations required under federal law (or evidence of waiver thereof).

11. Plaquemines LNG must receive written authorization from the Director of OEP **prior to introducing hazardous fluids into the terminal 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. Plaquemines LNG must receive written authorization from the Director of OEP **before placing each phase of the LNG terminal 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 right-of-way and other areas affected by the Project are proceeding satisfactorily.

13. Gator Express Pipeline must receive written authorization from the Director of OEP, **before placing each phase of the pipeline system into service** (i.e., the SW lateral TGP in Phase 1 and the SW lateral TETCO in Phase II). Such authorization will only be granted following a determination that rehabilitation and restoration of the right-of-way and other areas affected by the Project are proceeding satisfactorily.

14. **Within 30 days of placing each of the authorized facilities in service**, Venture Global 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. that identifies which of the conditions in the Order Venture Global 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. Gator Express Pipeline shall provide **72 hours' notice** to the owner(s) of producing oil and gas wells located within 0.25 mile from the pipeline workspace in order to allow the owner's representative to be on-site during construction activities. (See section 4.1.2)

16. **Prior to the close of the draft EIS comment period**, Plaquemines LNG shall provide its final proposed hydrostatic test water sources for piping and non-LNG tanks at the LNG terminal and for use during operation of the LNG terminal, including details on the depth and location of any new water wells to be installed. (See section 4.3.1.4)

17. **Prior to construction of the pipelines**, Gator Express Pipeline shall file with the Secretary written documentation of consultation with the LDWF expressly permitting the requested construction time windows for waterbody crossings or confirmation that it will adhere to the warmwater fishery crossing time windows in the FERC Procedures. (See section 4.3.2.2)

18. **Prior to construction of the Project**, Venture Global shall coordinate with the NRCS and LDWF to develop a Project-specific noxious weed control plan. Venture Global shall file its Project-specific noxious weed control plan with the Secretary, including documentation of its consultation with the NRCS and LDWF, for review and written approval by the Director of OEP. (See section 4.5.3)

19. **Prior to construction of the Project**, Venture Global shall conduct nesting bird colony surveys within the appropriate buffer area. Before the initiation of surveys, Venture Global shall consult with the LDWF and FWS for appropriate survey methods, timeframes, and locations. The survey reports, any LDWF or FWS comments on the surveys, and Venture Global's proposed mitigation measures shall be filed with the Secretary. Venture Global must receive written approval from the Director of OEP before construction or implementation of any mitigation measures may proceed. (See section 4.6.2.2)

20. **Prior to the end of the draft EIS comment period**, Venture Global shall file with the Secretary, a detailed description of the final proposed pile driving activity including:

    a. the number, diameter, and locations of all proposed piles at the metering facilities;

    b. the method of pile installation and the duration of pile driving activities at the metering facilities;

    c. a description of the measures developed in consultation with NMFS that it would implement to reduce noise impacts on aquatic resources in the vicinity of all in-water pile-driving activities; and

    d. an analysis of the expected noise levels with mitigation. (See section 4.6.3.2)

21. Venture Global shall **not begin construction of the Project until**:

    a. FERC staff receives comments from the NMFS regarding the proposed action;

    b. FERC staff completes formal consultation with the NMFS, if required; and

    c. Venture Global has received written notification from the Director of OEP that construction or use of mitigation may begin. (See section 4.7.1.4)

22. Venture Global shall **not begin** construction of the Project **until** it files with the Secretary a copy of the determination of consistency with the Coastal Zone Management Plan issued by the LDNR. (See section 4.8.7)

23. **Prior to construction of the pipelines**, Gator Express Pipeline shall file with the Secretary documentation that:

    a. LDWF and LDNR have confirmed the adequacy of the water bottom assessments; and

b. consultations with any affected oyster lease holders and the State of Louisiana regarding compensation are complete. (See section 4.9.3)

24. Gator Express Pipeline shall **not begin construction of facilities and/or use of (all) staging, storage, or temporary work areas and new or to-be improved access roads until**:

    a. Gator Express Pipeline files with the Secretary comments on reports and plans from the Louisiana SHPO;

    b. The ACHP is afforded an opportunity to comment if historic properties would be adversely affected; and

    c. FERC staff reviews and the Director of the OEP approves the cultural resources reports and plans, and notifies Gator Express Pipeline in writing that avoidance and/or treatment measures, as required, may be implemented and/or construction may proceed.

    All materials filed with the Commission containing **location, character, and ownership** information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: "**CUI//PRIV – DO NOT RELEASE**." (See section 4.10.5)

25. **Prior to beginning the HDD at Lake Hermitage,** Gator Express Pipeline shall file with the Secretary, for the review and written approval by the Director of OEP, an HDD noise mitigation plan for the crossing to reduce the projected noise level attributable to the proposed drilling operations at the nearby NSA. During drilling operations, Venture Global shall implement the approved plan, monitor noise levels, and make all reasonable efforts to restrict the noise attributable to the drilling operations to no more than an L_{dn} of 55 dBA at the NSA. (See section 4.11.2.3)

26. **No later than 60 days after placing Phase I into service,** Plaquemines LNG shall file a full power load noise survey with the Secretary for the LNG terminal. If the noise attributable to operation of the equipment at the LNG terminal exceeds an L_{dn} of 55 dBA at the nearest NSA, **within 60 days** Plaquemines 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. Plaquemines 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. (See section 4.11.2.4)

27. **No later than 60 days after placing the entire LNG terminal into service,** Plaquemines LNG shall file a noise survey with the Secretary. If a full load condition noise survey is not possible, Venture Global shall provide an interim survey at the maximum possible horsepower load **within 60 days** of placing the LNG terminal into service and provide the full load survey **within 6 months**. If the noise attributable to operation of the equipment at the LNG terminal exceeds an L_{dn} of 55 dBA at the nearest NSA under interim or full horsepower load conditions, Plaquemines 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. Plaquemines 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. (See section 4.11.2.4)

28. **Prior to the end of the draft EIS comment period**, Plaquemines LNG shall file with the Secretary clarification on the intended use for the water spray connection at the control building shown on the firewater drawings.

29. **Prior to the end of the draft EIS comment period**, Plaquemines LNG shall file with the Secretary the preliminary process hazard review referenced in the application as under development and would be submitted at a later date.

30. **Prior to initial site preparation,** Plaquemines LNG shall file with the Secretary a study that determines the presence or absence of growth faults extending across the site using geophysically logged borings that is stamped and sealed by the professional engineer-of-record, registered in Louisiana.

31. **Prior to construction of final design,** Plaquemines LNG shall file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in Louisiana:

    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, Plaquemines LNG shall file, in its Implementation Plan, the schedule for producing this information.

32. **Prior to commencement of service,** Plaquemines LNG shall file with the Secretary a monitoring and maintenance plan, stamped and sealed by the professional engineer-of-record registered in Louisiana, 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.

Conditions 33 through 121 shall apply to the LNG terminal. Information pertaining to these specific conditions 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 condition. 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 filed 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 offsite 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.

33. **Prior to initial site preparation**, Plaquemines LNG shall file an overall project schedule, which includes the proposed stages of the commissioning plan.

34. **Prior to initial site preparation**, Plaquemines LNG shall file quality assurance and quality control procedures for construction activities.

35. **Prior to initial site preparation**, Plaquemines LNG shall file procedures for controlling access during construction.

36. **Prior to initial site preparation**, Plaquemines LNG shall develop an ERP (including evacuation) and coordinate procedures with the Coast Guard; state, county, and local emergency planning groups; fire departments; state and local law enforcement; and appropriate federal agencies. This plan shall include at a minimum:

    a. designated contacts with state and local emergency response agencies;

    b. scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;

    c. procedures for notifying residents and recreational users within areas of potential hazard;

    d. evacuation routes/methods for residents and public use areas that are within any transient hazard areas along the route of the LNG marine transit;

    e. locations of permanent sirens and other warning devices; and

    f. an "emergency coordinator" on each LNG marine vessel to activate sirens and other warning devices.

    Plaquemines LNG shall notify the FERC staff of all planning meetings in advance and shall report progress on the development of its ERP at 3-month intervals.

37. **Prior to initial site preparation**, Plaquemines LNG shall file a 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. Plaquemines LNG shall notify FERC staff of all planning meetings in advance and shall report progress on the development of its Cost-Sharing Plan at 3-month intervals.

38. **Prior to construction of final design**, Plaquemines LNG shall include spill containment (e.g., a trough collection system) for the entire length of the pipe-in-pipe system between the LNG storage tanks and the marine berth area sized for a full guillotine rupture of the pipe-in-pipe line based on a 10-minute duration.

39. **Prior to construction of final design**, Plaquemines LNG shall file details of the pipe-in-pipe system design, including wall thicknesses, spacers, expansion bellows or loops, and transitions.

40. **Prior to construction of final design**, Plaquemines LNG shall file change logs that list and explain any changes made from the front end engineering design provided in Plaquemines 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.

41. **Prior to construction of final design**, Plaquemines LNG shall file information/revisions pertaining to the response numbers 14 of its October 11, 2018 filing, response numbers 8, 15, 24, 25, 27, 39, 40, and 43 of its October 16, 2018 filing, and response numbers 11, 31, and 38 of its October 30, 2018 filing, which indicated features to be included or considered in the final design.

42. **Prior to construction of final design**, Plaquemines LNG shall file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.

43. **Prior to construction of final design**, Plaquemines LNG shall file drawings of the storage tank piping support structure and support of horizontal piping at grade including pump columns, relief valves, pipe penetrations, instrumentation, and appurtenances.

44. **Prior to construction of final design**, Plaquemines LNG shall file an up-to-date equipment list, process and mechanical data sheets, and specifications. The specifications shall be in consistent units and 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, pressure vessel, other specialized equipment);

    c. Electrical and Instrumentation Specifications (e.g. power system specifications, control system specifications, SIS specifications, cable specifications, other electrical and instrumentation specifications);

    d. Security and Fire Safety Specifications (e.g., security, passive protection, hazard detection, hazard control, firewater).

45. **Prior to construction of final design**, Plaquemines LNG specify and design their control systems and human machine interfaces in accordance with the ISA Standards 5.3, 5.5, 60.1, 60.3, 60.4, and 60.6, or other equivalent standards and recommended practices for designing control buildings, displaying graphic symbols for human machine interfaces, and consideration of other human factors.

46. **Prior to construction of final design**, Plaquemines LNG shall file three-dimensional plant drawings, or other documentation, to confirm plant layout for maintenance, access, egress, and congestion.

47. **Prior to construction of final design**, Plaquemines LNG shall file up-to-date PFDs and P&IDs. The PFDs shall include heat and material balances. 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.

48. **Prior to construction of final design**, Plaquemines LNG shall include a means to remove mercury as part of the design to limit concentrations to less than 0.01 micrograms per normal cubic meter or alternatively provide monitoring for mercury by means of an analyzer or preventative maintenance inspections of the heat exchangers and connections for a mercury removal package.

49. **Prior to construction of final design**, Plaquemines LNG shall file layout and design specifications of the pig trap, inlet separation and liquid disposal, inlet/send-out meter station, filters, and pressure control.

50. **Prior to construction of final design**, Plaquemines LNG shall file a car seal philosophy and a list of all car-sealed and locked valves consistent with the P&IDs.

51. **Prior to construction of final design**, Plaquemines LNG shall file documentation demonstrating that the recommendations from the Front End Engineering Design

Hazard Identification are complete and consistent with the requirements of the final design as determined by the engineering, procurement, and construction contractor.

52. **Prior to construction of final design**, Plaquemines LNG shall file a hazard and operability 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.

53. **Prior to construction of final design**, Plaquemines 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).

54. **Prior to construction of final design**, Plaquemines LNG shall include LNG tank fill flow measurement with high flow alarm.

55. **Prior to construction of final design**, Plaquemines LNG shall include BOG flow, tank density profile and temperature profile measurement for each tank.

56. **Prior to construction of final design**, Plaquemines LNG shall file cause-and-effect matrices for the process instrumentation, fire and gas detection system, and emergency shutdown 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.

57. **Prior to construction of final design**, Plaquemines LNG shall specify that all ESD valves are to be equipped with open and closed position switches connected to the DCS/SIS.

58. **Prior to construction of final design**, Plaquemines LNG shall specify the minimum distance required for valve maintenance, between the LNG loading header and the first valve in the discharge piping to the loading arm.

59. **Prior to construction of final design**, Plaquemines 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.

60. **Prior to construction of final design**, Plaquemines LNG shall include any isolation valves necessary for startup, operation, shutdown, restart, and maintenance procedures.

61. **Prior to construction of final design**, Plaquemines 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.

62. **Prior to construction of final design**, Plaquemines LNG shall specify that all drains from high pressure hazardous fluid systems are to be equipped with double isolation and bleed valves or equivalent positive isolation.

63. **Prior to construction of final design**, Plaquemines 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.

64. **Prior to construction of final design**, Plaquemines LNG shall file pressure relieving protection for flammable liquid piping segments (i.e., refrigerants, liquid hydrocarbons, condensate products) that can be isolated by valves.

65. **Prior to construction of final design**, Plaquemines 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.

66. **Prior to construction of final design**, Plaquemines 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, as well as the sizing and design of the down-comer that would transfer spills from the tank top to the ground-level impoundment system.

67. **Prior to construction of final design**, Plaquemines LNG shall consult with DOT PHMSA on compliance with 49 CFR 193 for the water removal design using drains.

68. **Prior to construction of final design**, Plaquemines LNG shall file electrical area classification drawings. The drawings shall be updated with the latest design, including liquefaction blocks and full containment tanks, and demonstrate compliance with NFPA 59A, NFPA 70, NFPA 497, API 500, or equivalent, including but not limited to, illustrating Class 1 Division 1 and Division 2, as applicable, at all impoundment trenches, the LNG ship transfer connection, refrigerant truck transfer connection, diesel truck transfer connection, diesel and other combustible tank vents, power plant area, gas turbines, feed gas aftercoolers, MR coolers, and pig launchers.

69. **Prior to construction of final design**, Plaquemines 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.

70. **Prior to construction of final design**, Plaquemines 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 edition). Plaquemines LNG shall also provide the results of consultation with DOT PHMSA indicating that the proposed electrical process seal design would be considered to meet the design requirements of NFPA 59A (2001), as incorporated by 49 CFR 193.2101.

71. **Prior to construction of final design**, Plaquemines 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.

72. **Prior to construction of final design**, Plaquemines LNG shall file an analysis of the localized hazards to operators from a potential liquid nitrogen release and shall also provide spill containment and low oxygen detectors to mitigate liquid nitrogen releases.

73. **Prior to construction of final design**, Plaquemines LNG shall file a drawing showing the location of the emergency shutdown buttons. Emergency shutdown buttons shall be easily accessible, conspicuously labeled, and located in an area which would be accessible during an emergency.

74. **Prior to construction of the final design**, Plaquemines LNG shall install a plant-wide shutdown button or provide a human reliability analysis that demonstrates the multiple pushbutton approach does not significantly increase the risk compared to a plant-wide shutdown button.

75. **Prior to construction of final design**, Plaquemines 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. The list shall include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment. The hazard detection layout shall be supported by a performance based study that demonstrates releases that could results in an offsite hazard are detected by two or more gas detectors and flame detectors, including near the diesel and hot oil tanks, steam turbine power plant, flare KO drums, ethylene packages, peaking generator, essential diesel generator, acid gas removal area, hot oil furnaces, thermal oxidizer, combustion air intakes and HVAC intakes of buildings.

76. **Prior to construction of final design**, Plaquemines LNG shall account for the calibration gas of the hazard detectors when determining the lower flammable limit set points for methane, propane, butane, ethylene, and condensate.

77. **Prior to construction of final design**, Plaquemines LNG shall account for the calibration gas of hazard detectors when determining the set points for toxic components such as aqueous ammonia, natural gas liquids and hydrogen sulfide. Include a list of alarm and shutdown set points for each hazard detector.

78. **Prior to construction of final design**, Plaquemines 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.

79. **Prior to construction of final design**, Plaquemines LNG shall specify smoke detection in occupied buildings.

80. **Prior to construction of final design**, Plaquemines LNG shall specify hazard detection suitable to detect high temperatures and smoldering combustion products in electrical buildings and control room buildings.

81. **Prior to construction of final design**, Plaquemines 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 of all fixed, wheeled, and hand-held extinguishers. 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. The drawings shall illustrate portable extinguishers in accordance with NFPA 10 travel distances, including but not limited to, at the liquefaction blocks, near the metering station and pig launchers, on top of all tanks, and in all buildings.

82. **Prior to construction of final design**, Plaquemines LNG shall specify carbon dioxide systems installed in accordance with NFPA 12 or equivalent in gas turbine enclosures.

83. **Prior to construction of final design**, Plaquemines LNG shall specify clean agent systems installed in accordance with NFPA 2001 or equivalent in instrumentation buildings.

84. **Prior to construction of final design**, Plaquemines LNG shall file drawings and calculations for the structural passive protection systems to protect equipment and supports from cryogenic releases.

85. **Prior to construction of final design**, Plaquemines 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/ft^2-hr zone from an impoundment, or provide an analysis that assesses the consequence of pressure vessel bursts and boiling liquid expanding vapor explosions. Trucks at the truck transfer station shall be included in the analysis. Passive mitigation shall be supported by calculations for the thickness limiting temperature rise and active mitigation shall be justified with calculations demonstrating flow rates and durations of any cooling water will mitigate the heat absorbed by the vessel.

86. **Prior to construction of final design**, Plaquemines 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 also include piping and instrumentation diagrams of the firewater and foam

systems. The firewater coverage drawings shall illustrate firewater coverage by two or more hydrants or monitors accounting for obstructions (or deluge systems) for all process areas that contain flammable or combustible fluids, including all three docks, diesel generators and storage, hot oil storage, gas dehydration units, and LNG storage tanks.

87. **Prior to construction of final design**, Plaquemines LNG shall specify remotely operated or automatic firewater monitors in areas inaccessible or difficult to access in the event of an emergency.

88. **Prior to construction of final design**, Plaquemines LNG shall specify firewater capacities for the monitors and hydrants.

89. **Prior to construction of final design**, Plaquemines LNG shall design the firewater pump shelter for maintenance access to the firewater pumps.

90. **Prior to construction of final design**, Plaquemines LNG shall specify that a firewater flow test meter is installed and 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.

91. **Prior to construction of final design**, Plaquemines LNG shall specify the reducer on the suction side of the firewater pump to be eccentric or otherwise justify the use of an alternative reducer that will not cause air pockets to form and cause possible damage to the firewater pump.

92. **Prior to construction of final design**, Plaquemines LNG shall file an analysis of the structural integrity of the outer containment of the full containment storage tanks when exposed to a roof tank top fire or adjacent tank top fire.

93. **Prior to construction of final design**, Plaquemines LNG shall file drawings and specifications for protecting transfer piping, pumps, and compressors, etc. to ensure that they are located away from roadway or protected from inadvertent damage from vehicles.

94. **Prior to construction of final design**, Plaquemines LNG shall file specifications, drawings, and details of vehicle barriers at each facility entrance for access control.

95. **Prior to construction of final design**, Plaquemines LNG shall file specifications, drawings, and details of the vehicle collision protection at the SH 23 road crossing of the LNG transfer line that demonstrate it can withstand impact from the most severe loading, including potential explosion loads from any trucks carrying hazardous materials.

96. **Prior to construction of final design**, Plaquemines LNG shall file security camera drawings showing 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, including atop the LNG storage tanks, that would enable rapid monitoring of the LNG plant.

97. **Prior to construction of final design**, Plaquemines LNG shall file a photometric lighting simulation or other calculations that demonstrate lighting coverage adequately covers the interior and perimeter of the facility, including in liquefaction blocks, oily water treatment plant area, exterior of buildings, and along paths/roads of access and egress.

98. **Prior to construction of final design**, Plaquemines LNG shall file details of fencing with barbed or razor wire, or equivalent, at road crossing that would restrict and deter access.

99. **Prior to construction of final design**, Plaquemines LNG shall file drawings that clearly demonstrate fencing would be set back from exterior power lines and trees and from interior hazardous piping and equipment by at least 10 feet on either side of the fencing.

100. **Prior to commissioning**, Plaquemines LNG shall file a detailed schedule for commissioning through equipment startup. The schedule shall include milestones for all procedures and tests to be completed: prior to introduction of hazardous fluids and during commissioning and startup. Plaquemines LNG shall file with the Secretary documentation certifying that each of these milestones has been completed before authorization to commence the next phase of commissioning and startup will be issued.

101. **Prior to commissioning**, Plaquemines LNG shall file the 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.

102. **Prior to commissioning**, Plaquemines LNG shall provide procedures for removing the spent H_2S catalyst.

103. **Prior to commissioning**, Plaquemines LNG shall tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves.

104. **Prior to commissioning**, Plaquemines LNG shall file and maintain a detailed training log to demonstrate that operating, maintenance and emergency response staff has completed the required training.

105. **Prior to commissioning**, Plaquemines LNG shall file detailed plans and procedures for: testing the integrity of onsite mechanical installation; functional tests; introduction of hazardous fluids; operational tests; and placing the equipment into service.

106. **Prior to commissioning**, Plaquemines LNG shall file the procedures for pressure/leak tests which address the requirements of ASME VIII and ASME B31.3.

107. **Prior to commissioning**, Plaquemines 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.

108. **Prior to commissioning**, Plaquemines LNG shall equip the LNG storage tanks and adjacent piping and supports with permanent settlement monitors to allow personnel to observe and record the total and relative settlement between the LNG storage tank and adjacent piping. The settlement record shall be reported in the semi-annual operational reports.

109. **Prior to introduction of hazardous fluids**, Plaquemines LNG shall file settlement results from the hydrostatic tests of the LNG storage containers and shall file a plan to periodically verify settlement is as expected and does not exceed the applicable criteria set forth in API 620, API 625, API 653, and ACI 376.

110. **Prior to introduction of hazardous fluids**, Plaquemines LNG shall complete 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.

111. **Prior to introduction of hazardous fluids**, Plaquemines LNG shall develop and implement an alarm management program to ensure effectiveness of process alarms.

112. **Prior to introduction of hazardous fluids**, Plaquemines LNG shall complete 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).

113. **Prior to introduction of hazardous fluids**, Plaquemines LNG shall complete and document foam system and sprinkler system acceptance tests.

114. **Prior to introduction of hazardous fluids**, Plaquemines LNG shall complete and document a clean agent acceptance tests.

115. **Prior to introduction of hazardous fluids**, Plaquemines LNG shall complete and document a pre-startup safety review to ensure that installed equipment meets the design and operating intent of the facility. The pre-startup 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.

116. Plaquemines 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 first LNG, Plaquemines 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.

117. **Prior to commencement of service**, Plaquemines 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 edition).

118. **Prior to commencement of service**, Plaquemines LNG shall file any preventative and predictive maintenance program that performs periodic or continuous equipment condition monitoring to ensure mechanical integrity of equipment.

119. **Prior to commencement of service**, Plaquemines LNG shall file procedures for offsite contractors' responsibilities, restrictions, and limitations and for supervision of these contractors by Plaquemines LNG staff.

120. **Prior to commencement of service**, Plaquemines LNG shall notify the FERC staff of any proposed revisions to the security plan and physical security of the plant.

121. **Prior to commencement of service**, Plaquemines LNG shall file a request for written authorization from the Director of OEP. Such authorization would only be granted following a determination by the Coast Guard, under its authorities under the Ports and Waterways Safety Act, the Magnuson Act, the Maritime Transportation Security Act of 2002, and the Security 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 Plaquemines LNG or other appropriate parties.

In addition, conditions 122 through 125 shall apply throughout the life of the Plaquemines LNG terminal.

122. The facility 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**, Plaquemines 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.

123. Semi-annual operational reports shall be filed to identify changes in facility design and operating conditions; abnormal operating experiences; activities (e.g., LNG 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 offsite 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 LNG facilities.

124. 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.

125. Significant non-scheduled events, including safety-related incidents (e.g., LNG, condensate, 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 LNG facility's emergency 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 a facility that contains, controls, or processes hazardous fluids;

g. any crack or other material defect that impairs the structural integrity or reliability of a facility that contains, controls, or processes 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 LNG facility; 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 LNG terminal's 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 LNG facility 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.

APPENDIX A

DEIS DISTRIBUTION LIST

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DISTRIBUTION LIST

FEDERAL GOVERNMENT AGENCIES

Council on Environmental Quality, Associate Director for NEPA Oversight, Edward Boling, DC

Office of Federal Programs, Advisory Council on Historic Preservation, Assistant Director for Federal Program Development, Charlene D. Vaughn, DC

Senate Energy and Natural Resources Committee, Chairman, Lisa Murkowski, DC

Senate Energy and Natural Resources Committee, Chairman, Lisa Murkowski, DC

Senate Energy and Natural Resources Committee, Chairman, Lisa Murkowski, DC

U.S. Air Force, Office of the Deputy Assistant Secretary of the Air Force (Installations), SAF/IEI, Liaison, DoD Siting Clearinghouse, DC

U.S. Army Corps of Engineers, New Orleans District, CEMVN-OD-S, Western Evaluation Section Regulatory Branch, Chief, Mr. Darrell Barbara, LA

U.S. Army Corps of Engineers, New Orleans District, Chief Regulatory Branch, Mr. Martin Mayer, LA

U.S. Army Corps of Engineers, New Orleans District, Specialist Regulatory Branch, Environmental Research, Mr. James Little, LA

U.S. Army Corps of Engineers, Planning and Policy Division, Senior Policy Advisor, John Furry, DC

U.S. Army Corps of Engineers, Stephanie Castaing, LA

U.S. Army, Office of the Deputy Assistant Secretary of the Army (Energy & Sustainability), Liaison, DoD Siting Clearinghouse, DC

U.S. Coast Guard, Brian Porter, LA

U.S. Coast Guard, Facility Compliance Branch, MSTC Jason Spence, LA

U.S. Coast Guard, Commandant (CG-OES-4) Chief (Acting), Deepwater Ports Standards Division, Attorney/Advisor, Curtis E. Borland, DC

U.S. Coast Guard, Commanding Officer, Captain Randall Ogrydziak, TX

U.S. Coast Guard, Commanding Officer, Commander Monica Rochester, LA

U.S. Coast Guard, Executive Officer, Lieutenant Commander Jennifer Andrew, LA

U.S. Department of Agriculture, Conservation and Environmental Program Division, FSA, National Environmental Compliance Manager, Nell Fuller, DC

U.S. Department of Agriculture, Forest Service, Ecosystem Management Coordination, Assistant Director, NEPA, Joe Carbone, DC

FEDERAL GOVERNMENT AGENCIES (CONT'D)

U.S. Department of Agriculture, Natural Resources Conservation Service, State Conservationist, Mr. Kevin D. Norton, LA

U.S. Department of Agriculture, Natural Resources Conservation Service, National Environmental Coordinator, Andree DuVarney, DC

U.S. Department of Agriculture, Natural Resources Conservation Service, National Environmental Coordinator, Andree DuVarney, DC

U.S. Department of Commerce, National Oceanic and Atmospheric Administration National Marine Fisheries Service, Southwest Region, Regional Administrator, Dr. Roy Crabtree, FL

U.S. Department of Commerce, National Oceanic and Atmospheric Administration National Marine Fisheries Service, Protected Resources Division, Assistant Regional Administrator for Fishery Resources, Mr. Dave Bernhart, FL

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Habitat Conservation Division, Assistant Regional Administrator, Mr. Miles Croom, FL

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Habitat Conservation Division, Fishery Biologist/Team Leader, Mr. Richard Hartman, LA

U.S. Department of Commerce, National Oceanic and Atmospheric Administration NOAA NEPA Coordinator, MD

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Habitat Conservation Division, Fishery Biologist, Twyla Cheatwood, LA

U.S. Department of Commerce, National Oceanic and Atmospheric Administration National Marine Fisheries Service, Southwest Region, Regional Administrator, Dr. Roy Crabtree, FL

U.S. Department of Commerce, National Oceanic and Atmospheric Administration National Marine Fisheries Service, Protected Resources Division, Assistant Regional Administrator for Fishery Resources, Mr. Dave Bernhart, FL

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Habitat Conservation Division, Assistant Regional Administrator, Mr. Miles Croom, FL

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Habitat Conservation Division, Fishery Biologist/Team Leader, Mr. Richard Hartman, LA

U.S. Department of Commerce, National Oceanic and Atmospheric Administration NOAA NEPA Coordinator, MD

FEDERAL GOVERNMENT AGENCIES (CONT'D)

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Habitat Conservation Division, Fishery Biologist, Twyla Cheatwood, LA

U.S. Department of Defense, DOD Siting Clearinghouse, Steve Sample, DC

U.S. Department of Defense, DOD Siting Clearinghouse, Steve Sample, DC

U.S. Department of Defense, Office of the Deputy Under Secretary of Defense (Installations & Environment), Chief, Mission Evaluation Branch, DOD Siting Clearinghouse, DC

U.S. Department of Defense, Office of the Deputy Under Secretary of Defense (Installations & Environment), Chief, Mission Evaluation Branch, DOD Siting Clearinghouse, DC

U.S. Department of Energy, Division of Natural Gas Regulatory Activities, Director, John Anderson, DC

U.S. Department of Energy, Division of Natural Gas Regulatory Activities, Director, John Anderson, DC

U.S. Department of Energy, Office of Environmental Management, Principal Deputy Assistant Secretary, Mark Whitney, DC

U.S. Department of Energy, Office of Environmental Management, Principal Deputy Assistant Secretary, Mark Whitney, DC

U.S. Department of Energy, Office of Fossil Energy, Natural Gas Analyst, Kyle Moorman, DC

U.S. Department of Energy, Office of Fossil Energy, Natural Gas Analyst, Kyle Moorman, DC

U.S. Department of Energy, Office of NEPA Policy and Compliance, Acting Director, OGC, Brian Costner, DC

U.S. Department of Energy, Office of NEPA Policy and Compliance, Acting Director, OGC, Brian Costner, DC

U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Environmental Health, Division of Emergency and Environmental Health Services, Director, Sharunda Buchanan, GA

U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Environmental Health, Division of Emergency and Environmental Health Services, Director, Sharunda Buchanan, GA

U.S. Department of Health and Human Services, Chief Environmental Officer, Mr. Everett Bole, CHMM, DC

U.S. Department of Health and Human Services, Chief Environmental Officer, Mr. Everett Bole, CHMM, DC

U.S. Department of Homeland Security, U.S. Customs and Border Protection, Branch Chief, Christopher Oh, DC

U.S. Department of Homeland Security, U.S. Customs and Border Protection, Branch Chief, Christopher Oh, DC

FEDERAL GOVERNMENT AGENCIES (CONT'D)

U.S. Department of Housing and Urban Development, Office of Environment and Energy, Community Planner, Danielle Schopp, DC

U.S. Department of Housing and Urban Development, Office of Environment and Energy, Community Planner, Danielle Schopp, DC

U.S. Department of Justice, Environment and Natural Resources Division, NEPA Coordinator, DC

U.S. Department of State, Bureau of Oceans and International Environmental and Scientific Affairs, Foreign Affairs Officer, Alexander Yuan, DC

U.S. Department of the Army, Office of the Assistant Secretary of the Army for Civil Works, Assistant for Environment, Tribal and Regulatory Affairs, DC

U.S. Department of the Interior, Bureau of Indian Affairs, B.J. Howerton, VA

U.S. Department of the Interior, Bureau of Indian Affairs, NEPA Coordinator, Terry L McClung, DC

U.S. Department of the Interior, Bureau of Land Management, NEPA Specialist, DC

U.S. Department of the Interior, Bureau of Ocean Energy Management, Chief, , Division of Environmental Assessment, Dr. Jill Lewandowski, VA

U.S. Department of the Interior, Bureau of Safety and Environmental Enforcement, Chief, Environmental Compliance Division, David Fish, VA

U.S. Department of the Interior, National Park Service, Chief, Environmental Planning and Compliance, Branch, Patrick Walsh, CO

U.S. Department of the Interior, National Park Service, Oil and Gas Program Manager, Haigler "Dusty" Pate, TX

U.S. Department of the Navy, Office of the Assistant Secretary of the Navy (Energy, Installations and Environment), DC

U.S. Department of Transportation, Office of Assistant Secretary for Transportation Policy, Environmental Policy Team Coordinator, Camille Mittelholtz, DC

U.S. Department of Transportation, Office of Assistant Secretary for Transportation Policy, Senior Environmental Attorney Advisor, Helen Serassio, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, SW Region, Community Assistant and Technical Services, Mr. Bill Lowry, TX

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Attorney Advisor, Ahuva Battams, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Community Liaison Services Program Manager, Karen Lynch, DC

FEDERAL GOVERNMENT AGENCIES (CONT'D)

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Engineering and Research Division, Office of Pipeline Safety, Director, Kenneth Y Lee, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Attorney Advisor, Melanie Stevens, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Associate Administrator for Hazardous Materials Safety, William Schoonover, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Engineering and Research Division, Office of Pipeline Safety, Director, Kenneth Y Lee, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Attorney Advisor, Melanie Stevens, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Associate Administrator for Hazardous Materials Safety, William Schoonover, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Engineering and Research Division, Office of Pipeline Safety, Director, Kenneth Y Lee, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Attorney Advisor, Melanie Stevens, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Associate Administrator for Hazardous Materials Safety, William Schoonover, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Engineering and Research Division, Office of Pipeline Safety, Director, Kenneth Y Lee, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Attorney Advisor, Melanie Stevens, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Associate Administrator for Hazardous Materials Safety, William Schoonover, DC

U.S. Department of Transportation, Surface Transportation Board, Chief, Section of Environmental Analysis, Victoria Rutson, DC

U.S. Department of Transportation, Surface Transportation Board, Chief, Section of Environmental Analysis, Victoria Rutson, DC

U.S. Department of Transportation, Surface Transportation Board, Chief, Section of Environmental Analysis, Victoria Rutson, DC

FEDERAL GOVERNMENT AGENCIES (CONT'D)

U.S. Department of Transportation, Surface Transportation Board, Chief, Section of Environmental Analysis, Victoria Rutson, DC

U.S. Environmental Protection Agency-Region 6, Environmental Scientist, Keith Hayden, TX

U.S. Environmental Protection Agency-Region 6, Environmental Scientist, Keith Hayden, TX

U.S. Environmental Protection Agency, Air Permits Section Chief, Mr. Jeffrey Robinson, TX

U.S. Environmental Protection Agency, Air Permits Section Chief, Mr. Jeffrey Robinson, TX

U.S. Environmental Protection Agency, Air Permits Section Chief, Mr. Jeffrey Robinson, TX

U.S. Environmental Protection Agency, Air Permits Section Chief, Mr. Jeffrey Robinson, TX

U.S. Environmental Protection Agency, Natural Gas STAR, Jerome Blackman, DC

U.S. Environmental Protection Agency, Natural Gas STAR, Jerome Blackman, DC

U.S. Environmental Protection Agency, Natural Gas STAR, Jerome Blackman, DC

U.S. Environmental Protection Agency, Office of Enforcement and Compliance Assurance, Assistant Administrator, Lawrence Starfield, DC

U.S. Environmental Protection Agency, Office of Enforcement and Compliance Assurance, Assistant Administrator, Lawrence Starfield, DC

U.S. Environmental Protection Agency, Office of Enforcement and Compliance Assurance, Assistant Administrator, Lawrence Starfield, DC

U.S. Environmental Protection Agency, Office of Federal Activities, Director, Susan E Bromm, DC

U.S. Environmental Protection Agency, Office of Federal Activities, Director, Susan E Bromm, DC

U.S. Environmental Protection Agency, Office of Federal Activities, Director, Susan E Bromm, DC

U.S. Environmental Protection Agency, Region 6, Barbara Keeler, TX

U.S. Environmental Protection Agency, Region 6, Barbara Keeler, TX

U.S. Environmental Protection Agency, Region 6, Barbara Keeler, TX

U.S. Environmental Protection Agency, Region 6, Interstate Oil & Gas Commission Liaison, Rob Lawrence, TX

U.S. Environmental Protection Agency, Region 6, Interstate Oil & Gas Commission Liaison, Rob Lawrence, TX

U.S. Environmental Protection Agency, Region 6, Interstate Oil & Gas Commission Liaison, Rob Lawrence, TX

U.S. Environmental Protection Agency, Region 6, Jeff Riley, TX

U.S. Environmental Protection Agency, Region 6, Jeff Riley, TX

FEDERAL GOVERNMENT AGENCIES (CONT'D)

U.S. Environmental Protection Agency, Region 6, Jeff Riley, TX

U.S. Environmental Protection Agency, Region 6, Office of Planning and Coordination, Chief, Michael Jansky (6EN-XP), TX

U.S. Environmental Protection Agency, Region 6, Office of Planning and Coordination, Chief, Michael Jansky (6EN-XP), TX

U.S. Environmental Protection Agency, Region 6, Office of Planning and Coordination, Chief, Michael Jansky (6EN-XP), TX

U.S. Environmental Protection Agency, Regional Administrator, Mr. Ron Curry, TX

U.S. Environmental Protection Agency, Regional Administrator, Mr. Ron Curry, TX

U.S. Environmental Protection Agency, Regional Administrator, Mr. Ron Curry, TX

U.S. Environmental Protection Agency, Wetlands Section, Dr. Raul Gutierrez, TX

U.S. Environmental Protection Agency, Wetlands Section, Dr. Raul Gutierrez, TX

U.S. Environmental Protection Agency, Wetlands Section, Dr. Raul Gutierrez, TX

U.S. Fish and Wildlife Service, Fish and Wildlife Biologist, Mr. Joshua Marceaux, LA

U.S. Fish and Wildlife Service, Fish and Wildlife Biologist, Mr. Joshua Marceaux, LA

U.S. Fish and Wildlife Service, Fish and Wildlife Biologist, Mr. Joshua Marceaux, LA

U.S. Fish and Wildlife Service, Region 4, Southeast Louisiana Refuges Headquarters, Refuge Manager, Shelley Stiaes, LA

U.S. Fish and Wildlife Service, Region 4, Southeast Louisiana Refuges Headquarters, Refuge Manager, Shelley Stiaes, LA

U.S. Fish and Wildlife Service, Region 4, Southeast Louisiana Refuges Headquarters, Refuge Manager, Shelley Stiaes, LA

U.S. Fish and Wildlife Service, Regional Director, Ms. Cindy Dohner, GA

U.S. Fish and Wildlife Service, Regional Director, Ms. Cindy Dohner, GA

U.S. Fish and Wildlife Service, Regional Director, Ms. Cindy Dohner, GA

U.S. Fish and Wildlife Service, Regional Energy Coordinator, Barret Fortier, LA

U.S. Fish and Wildlife Service, Regional Energy Coordinator, Barret Fortier, LA

U.S. Fish and Wildlife Service, Regional Energy Coordinator, Barret Fortier, LA

U.S. Geological Survey, Environmental Management Branch, Chief, Esther Eng, VA

U.S. Geological Survey, Environmental Management Branch, Chief, Esther Eng, VA

FEDERAL GOVERNMENT AGENCIES (CONT'D)

U.S. Geological Survey, Environmental Management Branch, Chief, Esther Eng, VA

FEDERAL SENATORS AND REPRESENTATIVES

Mr. Charles W. Dalgleish, Staff to Representative Charles W. Boustany Jr., M.D., LA

U.S. House of Representatives, U.S. Representative, Representative Cedric Richmond, DC

U.S. House of Representatives, U.S. Representative, Representative Cedric Richmond, LA

U.S. House of Representatives, U.S. Representative, Representative Charles W. Boustany Jr., M.D., DC

U.S. House of Representatives, U.S. Representative, Representative Charles W. Boustany Jr., M.D., LA

U.S. House of Representatives, U.S. Representative, Representative Steve Scalise, DC

U.S. House of Representatives, U.S. Representative, Representative Steve Scalise, LA

U.S. Senate, U.S. Senator, Senator Bill Cassidy, DC

U.S. Senate, U.S. Senator, Senator Bill Cassidy, LA

U.S. Senate, U.S. Senator, Senator John Kennedy, DC

U.S. Senate, U.S. Senator, Senator John Kennedy, LA

STATE SENATORS AND REPRESENTATIVES

Louisiana House of Representatives, State Representative, District 103, Representative Raymond E. Garofalo, Jr., LA

Louisiana House of Representatives, State Representative, Representative Christopher J. Leopold, District 105, LA

Louisiana House of Representatives, State Representative, Representative Joseph Marino, District 85, LA

Louisiana House of Representatives, State Representative, Representative Patrick Connick, District 84, LA

Louisiana State Senate, State Senator, District 1, Senator Sharon Hewitt, LA

Louisiana State Senate, State Senator, District 7, Senator Troy Carter, LA

Louisiana State Senate, State Senator, District 8, Senator John Alario Jr., LA

STATE GOVERNMENT OFFICIALS AND AGENCIES

Coastal Protection and Restoration Authority of Louisiana, Chairman, Mr. Chip Kline, LA

Coastal Protection and Restoration Authority, Attorney, Duncan S. Kemp, IV, LA

Coastal Protection and Restoration Authority, General Counsel, David A. Peterson, LA

STATE GOVERNMENT OFFICIALS AND AGENCIES (CONT'D)

Louisiana Department of Agriculture and Forestry, Commissioner, Commissioner Mike Strain, LA

Louisiana Department of Culture, Recreation and Tourism, Division of Archaeology, State Archaeologist and Director, Dr. Charles (Chip) McGimsey, LA

Louisiana Department of Culture, Recreation, and Tourism, Division of Archaeology, Section 106 Review and Compliance, Rachel Watson, LA

Louisiana Department of Environmental Quality- Water Permits Division, Environmental Scientist, Elizabeth Hill, LA

Louisiana Department of Environmental Quality, Office of Environmental Services, Environmental Scientist, Bryan Johnston, LA

Louisiana Department of Environmental Quality, Office of Environmental Sciences, Assistant Secretary, Ms. Tegan Treadaway, LA

Louisiana Department of Environmental Quality, Secretary, Ms. Peggy Hatch, LA

Louisiana Department of Environmental Quality, Water Permits Division, Water Permits Administrator, Mr. Scott Guilliams, LA

Louisiana Department of Natural Resources OCM, Coastal Resources Scientist – Permits, Andi Zachary, LA

Louisiana Department of Natural Resources, Assistant Secretary, Mr. Keith Lovell, LA

Louisiana Department of Natural Resources, Coastal Resources Scientist Manager, Ms. Christine Charrier, LA

Louisiana Department of Natural Resources, Permits and Mitigation Division, Administrator, Mr. Karl Morgan, LA

Louisiana Department of Natural Resources, Secretary, Secretary Stephen Chustz, LA

Louisiana Department of Transportation and Development, Dr. Secretary, Shawn Wilson, LA

Louisiana Department of Transportation and Development, Environmental Engineer Administrator, Noel Ardoin, LA

Louisiana Department of Wildlife and Fisheries, Biologist Program Manager, Mr. Kyle Balkum, LA

Louisiana Department of Wildlife and Fisheries, Secretary, Mr. Robert Barham, LA

Louisiana Department of Wildlife and Fisheries, T&E Species, Biologist, Zach Chain, LA

Louisiana Economic Development, Secretary of Economic Development, Mr. Steven Grissom, LA

Louisiana Economic Development, Secretary, Mr. Stephen Moret, LA

Louisiana Economic Development, Senior Director of Business Development, Mr. Donald Pierson Jr., LA

Louisiana Economic Development, Small Business Development and Community Services, Director, Mr. Patrick Witty, LA

STATE GOVERNMENT OFFICIALS AND AGENCIES (CONT'D)

Louisiana Office of State, Fire Marshall's Office, State Fire Marshall, Chief, Mr. Butch Browning, LA

Louisiana State Police, Command Inspector, Region II, Major Bryson Williams, LA

Louisiana State Police, Troop B, Commander, Captain Donovan Archote, LA

Louisiana State University Center for Energy Studies, Executive Director, Dr. David Dismukes, LA

Louisiana Workforce Commission, Manager LMI & BLS Programs at Louisiana Workforce Commission, Mr. Sachin Chinatwar, LA

Louisiana Workforce Commission, Ms. Stephanie Moris, LA

Louisiana Workforce Commission/WIOA, Linda Galloway, LA

Regional Planning Commission, Executive Director, Mr. Walter R. Brooks, LA

SLouisiana Department of Environmental Quality, ec. 401 Water Quality Certification, Ms. Elizabeth Johnson, LA

State of Louisiana, Attorney General, Attorney General Jeff Landry, LA

State of Louisiana, Governor, Governor John Bel Edwards, LA

State of Louisiana, Lieutenant Governor, Lieutenant Billy Nungesser, LA

State of Louisiana, Secretary of State, Secretary Tom Schedler, LA

NATIVE AMERICAN GROUPS

Alabama Coushatta Tribe of Texas, Council Chairwoman, Chairwoman Nita Battise, TX

Alabama Coushatta Tribe of Texas, Historic Preservation Officer, Mr. Bryant Celestine, TX

Chitimacha Tribe of Louisiana, Chairman, Chairman John Paul Darden, LA

Chitimacha Tribe of Louisiana, Tribal Historic Preservation Officer, Kimberly S. Walden, LA

Choctaw Nation of Oklahoma, Chief, Chief Gary Batton, OK

Choctaw Nation of Oklahoma, Tribal Historic Preservation Officer, Dr. Ian Thompson, OK

Coushatta Tribe of Louisiana, Chairman, Chairman Lovelin Poncho, LA

Coushatta Tribe of Louisiana, Tribal Historic Preservation Officer, Dr. Linda Langley, LA

Jena Band of Choctaw Indians, Chief, Chief B. Cheryl Smith, LA

Jena Band of Choctaw Indians, Deputy THPO, Alina Shively, LA

Mississippi Band of Choctaw Indians, Chief, Chief Phyllis J. Anderson, MS

Mississippi Band of Choctaw Indians, Tribal Archaeologist, Mr. Ken Carleton, MS

Tunica-Biloxi Political Action Committee, Tribal Chairman, Tribal Chairman Joey P. Barbry, LA

NATIVE AMERICAN GROUPS (CONT'D)

Tunica-Biloxi Tribe of Louisiana, Tribal Historic Preservation Officer, Earl J. Barbry, Jr., LA

LOCAL GOVERNMENT AGENCIES

Belle Chasse Volunteer Fire Department, District 2, Fire Chief, Chief Roy Robichaux Jr., LA

City of Gretna Police Department, Chief of Police, Chief Arthur Lawson, LA

City of Gretna Police Department, Deputy Chief of Police, Deputy Chief Christiana Anthony, LA

City of Gretna Volunteer Fire Department, Fire Chief, Chief Michael Labruzza, LA

City of Gretna, City Clerk, Ms. Norma Cruz, LA

City of Gretna, District 1, Councilman, Councilman Milton Crosby, LA

City of Gretna, District 2, Councilman, Councilman Joseph Marino, LA

City of Gretna, District 3, Councilman, Councilman Mark Miller, LA

City of Gretna, District 4, Councilman, Councilman Jackie Berthelot, LA

City of Gretna, Mayor Pro-Tem, Councilman at Large, Councilman Wayne Rau, LA

City of Gretna, Mayor, Mayor Belinda Constant, LA

City of Gretna, Planning and Zoning Official, Ms. Azalea Roussell, LA

City of Gretna, Public Works, Director, Mr. Danny Lasyone, LA

Consolidated Recreation & Community Center and Playground District No. 2, LA

Gretna Economic Development Association, President, Mr. Anthony Buckley, LA

Jefferson Parish Drainage Department, Director, Mitchell T. Theriot, P.E., LA

Jefferson Parish Economic Development Commission, Executive Director, Mr. Jerry Bologna, LA

Jefferson Parish Environmental Department, Kathy Russo, LA

Jefferson Parish Public School Board, District I, Board Member, Mr. Mark D. Morgan, LA

Jefferson Parish Public School Board, District II, Board Member, Mr. Ricky Johnson, LA

Jefferson Parish Public School Board, District III, Vice President, Mr. Ray St. Pierre, LA

Jefferson Parish Public School Board, District IV, Board Member, Ms. Melinda Bourgeois, LA

Jefferson Parish Public School Board, District V, President, Mr. Cedric Floyd, LA

Jefferson Parish Public School Board, District VI, Board Member, Mr. Larry Dale, LA

Jefferson Parish Public School Board, District VII, Board Member, Ms. Melinda Doucet, LA

LOCAL GOVERNMENT AGENCIES (CONT'D)

Jefferson Parish Public School Board, District VIII, Board Member, Mr. Marion Bonura, LA

Jefferson Parish Public School Board, District XI, Board Member, Ms. Sandy Denapolis-Bosarge, LA

Jefferson Parish School Board, LA

Jefferson Parish Streets Department, Director, Randy Nicholson, LA

Jefferson Parish, Council Clerk, Ms. Eula Lopez, LA

Jefferson Parish, District 1, Councilman, Councilman Ricky Templet, LA

Jefferson Parish, District 2, Councilman Paul W. Johnston, Councilman, LA

Jefferson Parish, District 3, Councilman, Councilman Mark D. Spears, LA

Jefferson Parish, District 4, Councilman, Councilman E. "Ben" Zahn, LA

Jefferson Parish, District 5, Councilwoman, Councilwoman Cynthia Lee-Sheng, LA

Jefferson Parish, Division A, Councilman-at-Large, Council Chairman, Councilman Christopher L. Roberts, LA

Jefferson Parish, Division B, Councilman-at-Large, Councilman Elton M. Lagasse, LA

Jefferson Parish, Eastbank Consolidated Fire Department, Fire Department, Director, Mr. Joseph Greco Sr., LA

Jefferson Parish, Emergency Management, Director, Mr. Charles Hudson, LA

Jefferson Parish, Environmental Affairs, Director, Ms. Marnie Winter, LA

Jefferson Parish, Floodplain Management and Hazard Mitigation, Director, Ms. Michelle Gonzales, LA

Jefferson Parish, Parish Attorney, Ms. Deborah Cunningham Foshee, LA

Jefferson Parish, Parish President, Parish President John Young, LA

Jefferson Parish, Sheriff, Sheriff Newell Normand, LA

Lafitte, Barataria, Crown Point Volunteer Fire Department, Fire Chief, Chief Linton Duet, LA

Lake Hermitage Volunteer Fire Department, District 6, Fire Chief, Chief Donald Durr, LA

Marrero-Estelle Volunteer Fire Department, Fire Chief, Deputy Chief Blake Hunter, LA

New Orleans District Department of Transportation, LA

Plaquemines Department of Transportation, Land Superintendent, Blair Rittiner, LA

Plaquemines Parish Council, District 7, Council Member, Audrey Trufant-Salvant, LA

Plaquemines Parish Government, Blair Rittiner, LA

Plaquemines Parish Government, LA

Plaquemines Parish Government, LA

Plaquemines Parish School Board, District 1, Board Member, Ms. Jan Morgan, LA

LOCAL GOVERNMENT AGENCIES (CONT'D)

Plaquemines Parish School Board, District 2, Board Member, Mr. Daniel Morrill, LA

Plaquemines Parish School Board, District 3, Board Member, Mr. Corey Arbourgh, LA

Plaquemines Parish School Board, District 4, Board Member, Ms. Joyce Lamkin, LA

Plaquemines Parish School Board, District 5, Board Member, Ms. Shayne Meyers, LA

Plaquemines Parish School Board, District 6, Board Member, Ms. Fran Bayhi-Martinez, LA

Plaquemines Parish School Board, District 7, Board Member, Mr. Carlton LaFrance, LA

Plaquemines Parish School Board, District 8, Board Member, Mr. Paul W. Lemaire, LA

Plaquemines Parish School Board, District 9, Board Member, Mr. Chuck Soileau, LA

Plaquemines Parish School Board, LA

Plaquemines Parish School Board, Sharon Zilucca, LA

Plaquemines Parish, Clerk of Court, Ms. Dorothy Lundin, LA

Plaquemines Parish, Director of Coastal Restoration, Mr. Vincent W. Frelich, LA

Plaquemines Parish, Director of Economic Development and Tourism, Mr. Stan Mathes, LA

Plaquemines Parish, Director of Operations, Mr. Stanley Wallace, LA

Plaquemines Parish, District 1, Council Member, Councilman John Barthelemy, LA

Plaquemines Parish, District 2, Council Member, Councilman Beau Black, LA

Plaquemines Parish, District 3, Council Member, Councilman Kirk Lepine, LA

Plaquemines Parish, District 4, Council Member, Councilman Irvin Juneau, LA

Plaquemines Parish, District 5, Council Chairman, Chairman Benny Rousselle, LA

Plaquemines Parish, District 6, Council Member, Councilman Charlie Burt, LA

Plaquemines Parish, District 7, Council Member, Councilwoman Audrey Trufant-Salvant, LA

Plaquemines Parish, District 8, Council Member, Councilman Jeff Edgecombe, LA

Plaquemines Parish, District 9, Council Member, Councilwoman Nicole Smith Williams, LA

Plaquemines Parish, Homeland Security and Emergency Preparedness, Director, Mr. Guy Laigast, LA

Plaquemines Parish, Mr. District Attorney, Charles Ballay, LA

Plaquemines Parish, Parish President, Parish President Amos Cormier Jr., LA

Plaquemines Parish, Sheriff, Sheriff Lonnie Greco Sr., LA

Plaquemines Port Harbor & Terminal District, LA

LOCAL GOVERNMENT AGENCIES (CONT'D)

St. Charles Parish, District IV Councilman, Paul Hogan, LA

Town of Jean Lafitte, Chief of Police, Chief Marcell Rodriguez, LA

Town of Jean Lafitte, Councilman, Councilman, Calvin LeBeau, LA

Town of Jean Lafitte, Councilman, Mr. Barry Bartholomew, LA

Town of Jean Lafitte, Councilwoman, Councilman Verna Smith, LA

Town of Jean Lafitte, Councilwoman, Councilwoman Christy Creppel, LA

Town of Jean Lafitte, Councilwoman, Councilwoman Shirley Guillie, LA

Town of Lafitte, Mayor, Mayor Timothy Kerner, LA

LIBRARIES

Jefferson Parish Library, Library Director, Ms. Marilyn Haddican, LA

Lafitte Library, LA

Library Director, Gretna Public Library, LA

Plaquemines Parish Library, Assistant Director, Ms. Patricia Walker, LA

MEDIA

The Plaquemines Gazette, Public Notices, Shanice Mack, LA

COMPANIES AND ORGANIZATIONS

A/C Heating & Plumbing Inc Domino's, LA

America's Natural Gas Alliance, Mr. Charlie Riedl, DC

American Petroleum Institute, Senior Counsel, Mr. Ben Norris, DC

Apache Louisiana Minerals LLC, Timothy Allen, LA

Apache Louisiana Minerals LLC, TX

Associated Branch Pilots, President, Captain Mike Lorino, LA

Bear Associates Inc., LA

Belle Chasse Marine Transportation, LA

Belle Chasse Rotary Foundation, President, Mr. Corey Arbourgh, LA

BNB Partners LLC, LA

Bradish-Johnson Co Ltd, c/o Camilla Jones Strachan, Gen Manager, LA

Buras Levee District, LA

Co Ltd Bradish-Johnson, c/o Camilla Jones Strachan, Gen Manager, LA

Colmac Corp, LA

Crescent River Port Pilots Association, Captain, Captain Allen "A.J." Gibbs, LA

Defelice Land Co LLC, c/o Ronald Kilgen, LA

Defelice Land Co., LLC, c/o Ronald H. Kilgen, Ph.D., LA

Duckland LLC, LA

Entergy Louisiana Properties LLC, Mail Unit L-ENT-12B, LA

ESC Properties LLC, LA

COMPANIES AND ORGANIZATIONS (CONT'D)

Gene H. Koss LLC, LA

Go Do Your Business LLC, LA

Gulf South Pipeline, David F Hardesty, KY

Hero Lands Co, LA

Hero Wall Co, LA

Industrial Pipe Inc, LA

International Marine Terminals, LA

Jefferson Business Council, Executive Director, Mr. Tony Ligi, LA

Jefferson Chamber of Commerce, Mr. Todd Murphy, President, LA

Jefferson Homeowners Association, Mr. Lawrence Caillouet, LA

Jefferson Parish Farm Bureau, Parish President, Mr. Bruce Kennair, LA

Louisiana Land & Exploration Co, Ashley Golmon, LA

Louisiana Land & Exploration Co, c/o Conoco Phillips, TX

Louisiana Oil and Gas Association, Assistant to the President, Ms. CeCe Richter, LA

Louisiana Oil and Gas Association, Vice President, Mr. Gifford Briggs, LA

MCMK LLC, LA

New City Co, LA

New Orleans Baton Rouge Steamship Pilots Association, Captain, Captain Steve Hawthorne, LA

Phillips 66 Co, PTRRC, OK

Plaquemines Association of Business & Industry, Chair, Ms. Denise Buford, LA

Plaquemines Association of Business & Industry, Executive Director, Mr. Bobby Thomas, LA

Plaquemines Parish Canal Co, c/o Camilla Jones Strachan, Gen Manager, LA

Plaquemines Parish Farm Bureau, LA

Plaquemines Port, Deputy Port Director, Mr. Paul Matthews, LA

Plaquemines Port, Executive Director, Mr. Maynard Jackson (Sandy) Sanders, LA

Plaquemines Port, Port Security and Vessels, Director, Mr. Donald Durr, LA

Ridgeland Properties LLC, LA

River Rest LLC, LA

Rotary Club of West Bank/Gretna, President, Mr. Tony Sciacca, LA

Southwest Louisiana Association of Realtors, CEO, Ms. Lisa Verrette, LA

Springwood Estates Homeowners Association, President, Mr. Shawn Coco, LA

Stone Energy Corp, LA

Stonebridge Property Owners Association, President, Ms. Suzanne Farrar, LA

Tennessee Gas Pipeline Co, Property Tax Dept, TX

COMPANIES AND ORGANIZATIONS (CONT'D)

The Parks of Plaquemines Homeowners Association, LA

Toca Investments LLC, LA

United Bulk Terminals Davant LLC, c/o Tracy Ohmart, TX

Warves & Docks Co LLC, LA

William (Billy) Nungesser, Duckland LLC, LA

Woodland Borrow Pits LLC, LA

Woodland Borrow Pits, LLC, Phyllis Adams, LA

INDIVIDUALS

Adah J. Watt, c/o William G Christian Jr., TX

Alfred J. Rousselle, Jr., LA

Ann M. Jeanfreau, LA

Barbara E. Comeaux, LA

Benedict Rousselle, LA

Bernard J. Graf, LA

Betty A. Kuehne, LA

Beverly Palmisano, LA

Beverly S. Jarvis, LA

Bonnie T. Hinyup, LA

Bonnie Tonglet, LA

Brian H. Anderson, LA

Brian K. Falgout, LA

Bruce M. Comeaux, LA

Bryan A. Ragas, LA

Bryan S. Fisher, LA

Carey A. Borgeois, LA

Carol Gaudet, LA

Carol P. Riley, LA

Carolyn Willhoft, LA

Celeste D. Ancar, LA

Charles Iv Andres, LA

Charles Jones, TX

Charles R. Falcone, Jr., LA

Cheryl D. Entwisle, LA

Christie Nielsen, LA

Clayton P. Hinyup, Jr., LA

Clint E & Reine, c/o Craig A Reine, LA

Connely J. Wright, LA

Constance Meyer, LA

Cynthia C. Caster, LA

Cynthia L. Lawson, LA

Daniel E. Levasseur, LA

Daniel T Carroll, c/o Lisa Voisin Carroll, VA

Darrell J. Behre, LA

Darrella A. Jordan & Katherine Jordan Revocable Living Trust, LA

David A. Atkinson et al, LA

INDIVIDUALS (CONT'D)

David Cole Bostrom-Wilson, c/o Cindy Ann Loup, LA

David E. Banks III & Sandra G. Banks, LA

David M. Wooton, LA

Dian B. Campbell, LA

Dill Family Trust Dated December 4, 2009, LA

Don C. Adams, LA

Donna H. Comeaux, LA

Douglas M. Lanasa, Jr., LA

Edward Flanagan, Jr., c/o Clayton P. Hinyup, Jr. & Julie A. Hinyup, LA

Elaine P. Trapani, LA

Eleanor Coman, LA

Ellied P. Riley Jr., LA

Eric J. Paolini & Melissa A. M. Paolini, LA

Errance Plaisance, LA

Etole C. Furrow Estate, LA

Evelyn Edwards, LA

Frank A. Trapani, LA

Frank R. Penton, LA

Frederick G. Willhoft Jr., LA

Frederick H Jr Gondrella, LA

Gail D. Penton, LA

Genice R. Rivit, c/o Mary Ann Matherne, LA

Gerard J. Tonglet Jr., LA

Gills Parria, Sr, LA

Gladys B. Allen, LA

Gordon V. Rojas, LA

Grant M. Gaudet, LA

Gretchen L Lopez, c/o Janeth Gaile Lachmann, LA

Guy J. Allen, LA

H. H. Harvey, Et Al, Attn: Clarke J Gernon Sr, Harvey Heirs Family Representative, LA

Helena Bieber Mollo, LA

Henry J. McAnespy, LA

Henry McAnespy, LA

Iris Mae E. Rojas, LA

Jack W Sr & Lisa L & Comeaux, c/o Patricia C Jefferson, LA

James C. Holbrook Jr., LA

James D. Jarvis, LA

James L. Drachenberg, c/o Robert A. Pitre Jr., LA

James L. Toca, III Estate, Attn: Timothy M. Duncan, LA

James P. Rojas, LA

James W. Crawford, LA

James Wason, LA

Janeth Gaile Lachmann, LA

Jeffrey G. Kiefer, LA

INDIVIDUALS (CONT'D)

Joanne Daigle, LA

Joel Frederick, LA

John E & Kimberly Rauch

John E. Hourcade, Jr., LA

John N & Carolyn T Guidry, LA

John R. Coman, Jr., LA

John Rojas, Et Al, c/o Andrew Nolan, LA

John Thornton, LA

John Wisniewski, VA

Jonathan M. Hymel, LA

Judith B. Exsterstein, LA

Julie H. Hinyup, LA

Junius Plaisance, MS

Justin Casey, FL

Karen Bonvillian, LA

Karen S. Des Roches, LA

Katherine B. May, LA

Katie S. Daigle Et Al, GA

Kay L. Joyner, LA

Keith E. May, LA

Kelli S. Morris, LA

Kenneth J. Morrison, LA

Kenneth P Morrison, LA

Kevin M. Horner, LA

Laddis M. Hinyup, LA

Larry A. Pizani, c/o Annette Pizani, LA

Larry T. Ancar, LA

Lena L. B. R. Curol, Et Al, c/o Mrs John A. Rojas, Sr, LA

Lenora Levasseur, LA

Leon Rojas Est, Et Al, c/o Wayne J. Nolan, LA

Linda Johnson, LA

Linda Rousselle, LA

Louis E. Mcanespy, LA

Loycel A. Morvant, LA

Lucien A. Jeanfreau, LA

Lynn P. Perez, c/o United Bulk Terminal Devant LLC, TX

Madelyn M. O'Donohue, MS

Mark E. Comeaux, LA

Mary Nell B Poole, LA

Matthew Wall, LA

Maude L. Mann, c/o David M Hunter, Jones Walker, LA

Maunsel Hickey, Maunsel White Sr. Heirs et al, FL

May Nguyen, LA

Melanie C. Horner, LA

Michael A. Entwisle, LA

INDIVIDUALS (CONT'D)

Michael Boyle, VA

Michael C. Kuehne, LA

Michael R. Charron, LA

Michael W & Helms, c/o Stephen Helms, TX

Mike Gartman, FL

Mike Kuehne, LA

Mildred R. Collins Est, c/o Carl Navarre, Jr., LA

Miriam Blanchard Powers, c/o Kaia Schindler, LA

Morgan M. Perrin Jr., LA

Nancy K. Juge, LA

Numa C. Hero & Son, LA

Pamela A. Adams, LA

Pamela Plaisance, MS

Patricia S. Wright, LA

Paul J. Von Bodungen, LA

Peter R. Monrose et al, c/o Marcy Monrose, LA

Philip, Salvadore & Carolyn T St, LA

Rachel M. Jones, TX

Ray T. Johnson, LA

Richard A. Juge, LA

Richard C & Boni P Palazzo, LA

Richard E. Waldner, LA

Robert D. Wilson Jr., LA

Robert J. O'Donohue III, MS

Robert L. Seals, LA

Robert S. Campbell, LA

Roberta L. Beaver, LA

Rodney J. Barthelemy, LA

Rodney J. Bonvillian, LA

Roland J. Melancon, III, LA

Ross M. Easley, LA

Russell A. Easley, LA

Sandra B. Chauvin, LA

Sarah V. Levron, LA

Shawn E Townsend, LA

Sidney D Bieber Jr, LA

Stanley Hebert, LA

Stanley J Jr & Kimberly M Holliday, LA

Stephen C. Hourcade, LA

Sterling P. Chauvin, III, LA

Sterling P. Chauvin, Jr., LA

Steve C. Small, LA

Susan L. Murrell, LA

Tammy C. Graf, LA

The Estate of Isidore Antoine, c/o Mary Roth, LA

INDIVIDUALS (CONT'D)

The Living Trust of Hugh R & Evelyn Revocable Babylon, LA

Timothy P. Gaudet, Jr., LA

Tracy C. Orvis, LA

Trang T. Pham, TN

Troy D. Borgeois, LA

Tuan Q. Nguyen, LA

Verda A. Anderson, LA

Wade T. Des Roches, LA

Wayne P. Perrin, LA

Wilbert J. Levron, LA

William A & Kathy N Lutz, LA

William Caster Sr., LA

William E. Adam, c/o Adelaide Fabre, LA

William K. Bergeron, LA

Zane G. Elliott, LA

APPENDIX B

FIGURES

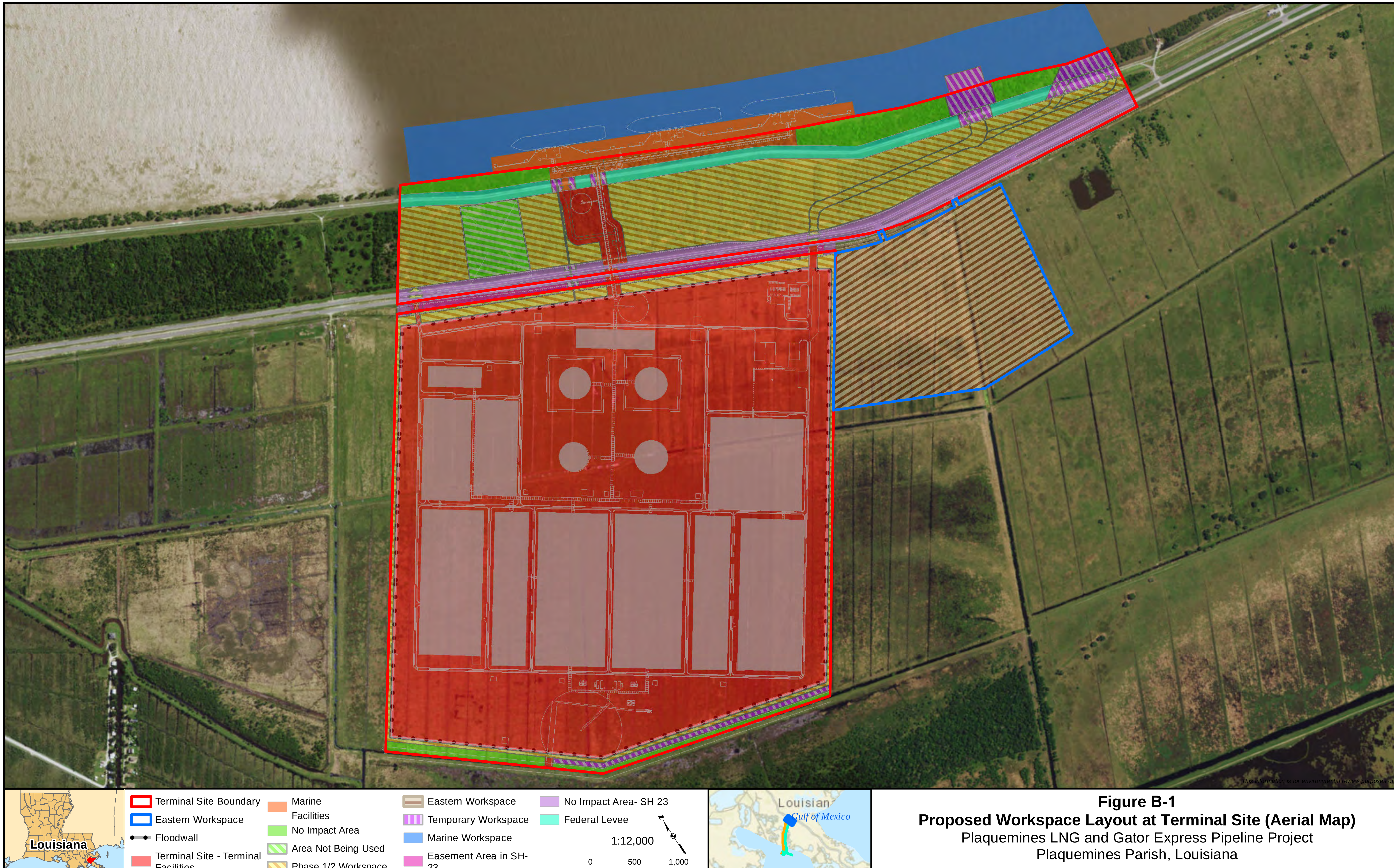

Figure B-1
Proposed Workspace Layout at Terminal Site (Aerial Map)
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR01_Plaquemines_RR01_1_3_13.mxd | REVISED: 02/14/2017 | SCALE: 1:12,000 when printed at 11x17

DRAWN BY: JSnyder

Alternative Sites

MS 55 = Mississippi River Mile 55 Site
MS 56 = Mississippi River Mile 56 Site

1:1,468,419

0 20 40 Miles

N

Figure B-2a
Terminal Site Alternatives
Overview
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR10_Plaquemines_RR10_5_1_1_Overview.mxd | REVISED: 02/17/2017 | SCALE: 1:1,468,419 when printed at 11x17

DRAWN BY: GIS

Figure B-2b
Terminal Site Alternatives
Mississippi River Mile 56 Site
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR10_Plaquemines_RR10_5_1_1.mxd | REVISED: 02/17/2017 | SCALE: 1:24,000 when printed at 11x17

DRAWN BY: GIS

1:24,000

0 1,000 2,000
Feet

Figure B-3c
Terminal Site Alternatives
Mississippi River Mile 55 Site - East Bank
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR10_Plaquemines_RR10_5_1_1.mxd | REVISED: 02/17/2017 | SCALE: 1:24,000 when printed at 11x17

DRAWN BY: GIS

1:24,000

0 1,000 2,000 Feet

N

Figure B-2d
Terminal Site Alternatives
Cutrone Property Site
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR10_Plaquemines_RR10_5_1_1.mxd | REVISED: 02/17/2017 | SCALE: 1:24,000 when printed at 11x17

DRAWN BY: GIS

1:24,000

0 1,000 2,000
Feet

Figure B-2e
Terminal Site Alternatives
Carlyss I Site
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR10_Plaquemines_RR10_5_1_1.mxd | REVISED: 02/17/2017 | SCALE: 1:24,000 when printed at 11x17

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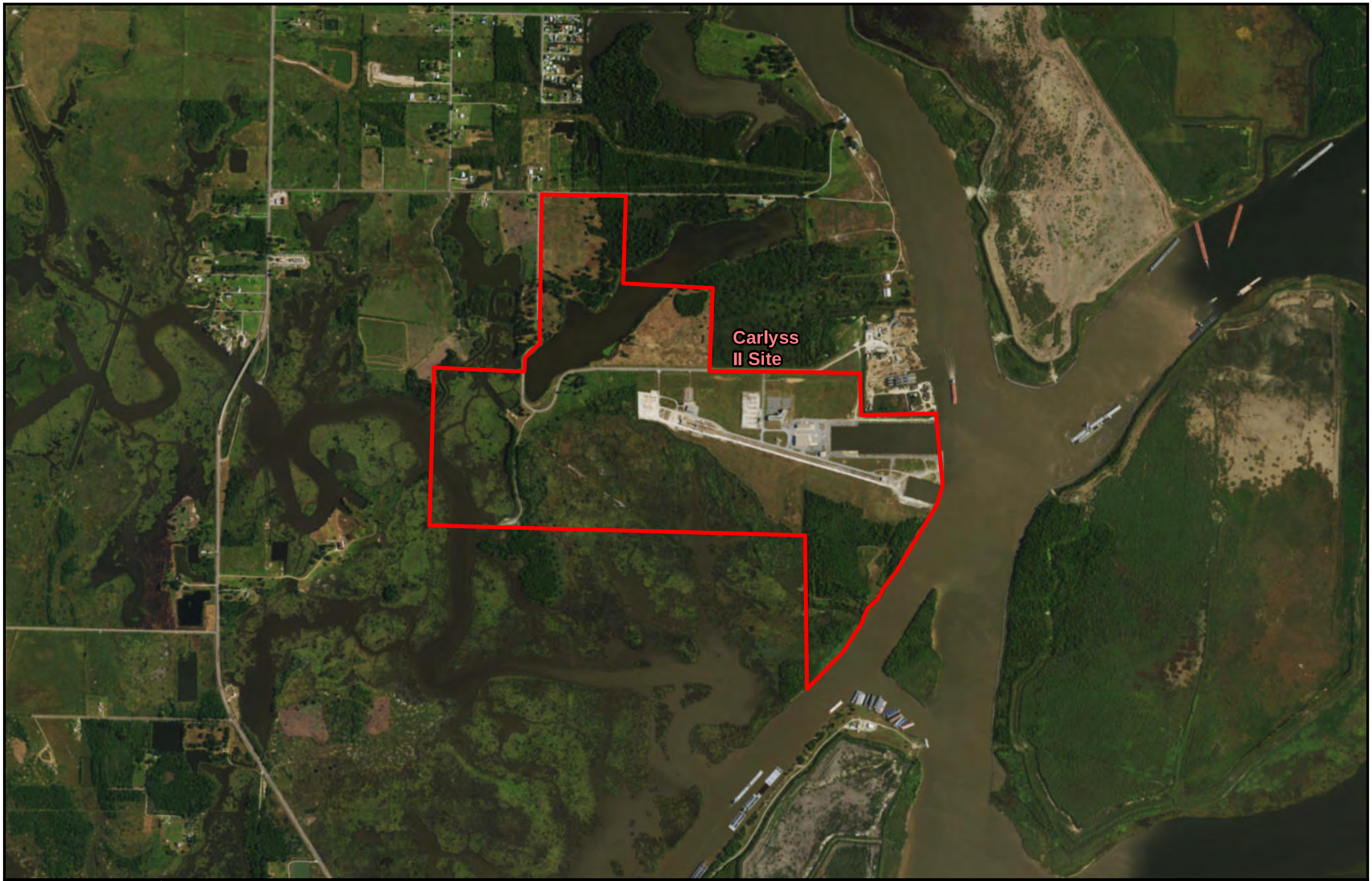

1:24,000

0 1,000 2,000 Feet

N

Figure B-2f
Terminal Site Alternatives
Carlyss II Site
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR10_Plaquemines_RR10_5_1_1.mxd | REVISED: 02/17/2017 | SCALE: 1:24,000 when printed at 11x17

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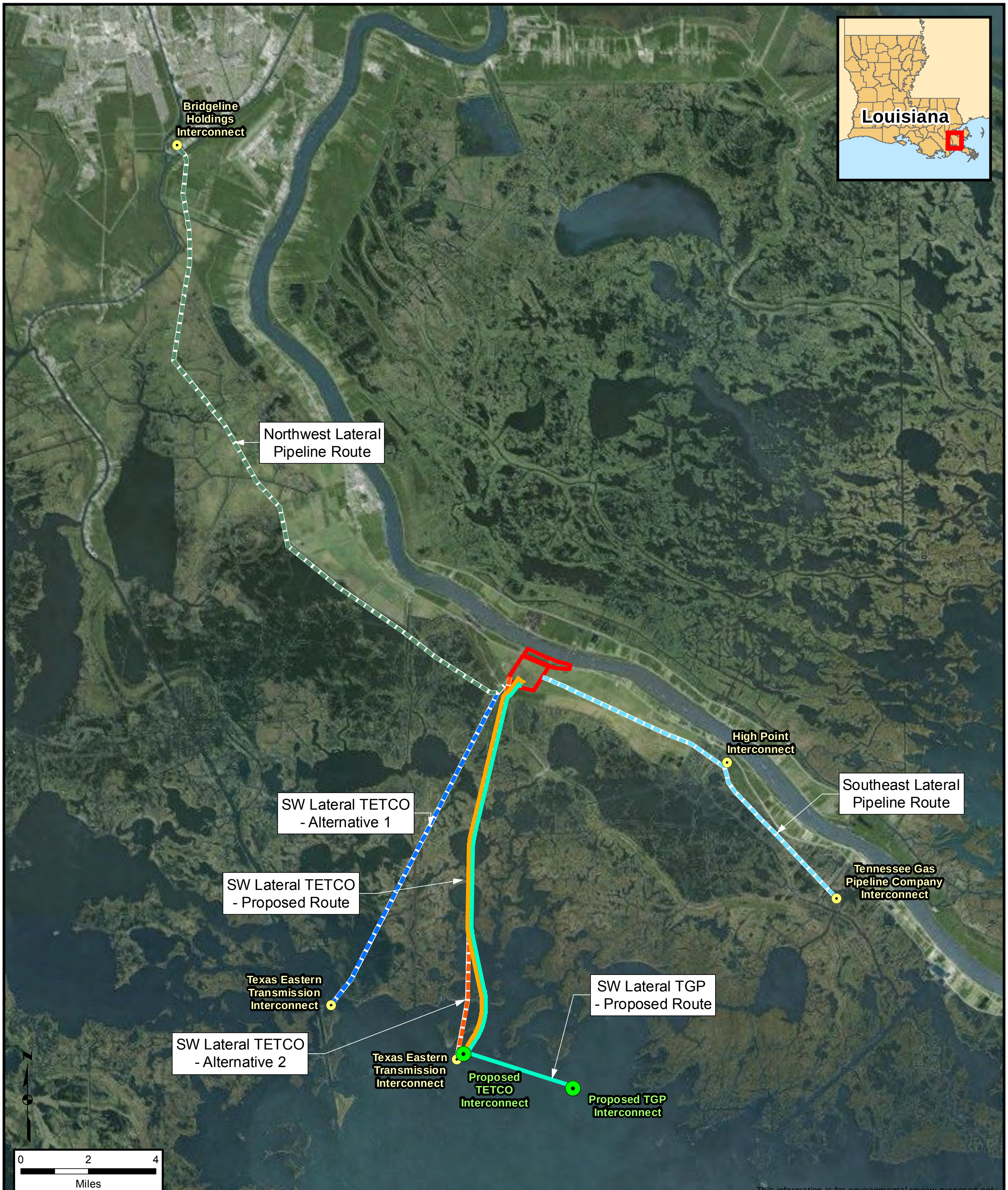


Terminal Site Boundary
SW Lateral TETCO – Proposed Route
SW Lateral TGP – Proposed Route
Northwest Lateral Pipeline Route
SW Lateral TETCO Alternative 1
SW Lateral TETCO Alternative 2
Southeast Lateral Pipeline Route
Proposed Interconnect and Meter Station
Alternative Interconnect and Meter Station

Figure B-3
Alternative Pipeline Routes
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR10_Plaquemines_RR10_5_3_1.mxd | REVISED: 02/17/2017 | SCALE: 1:253,440 DRAWN BY: GIS

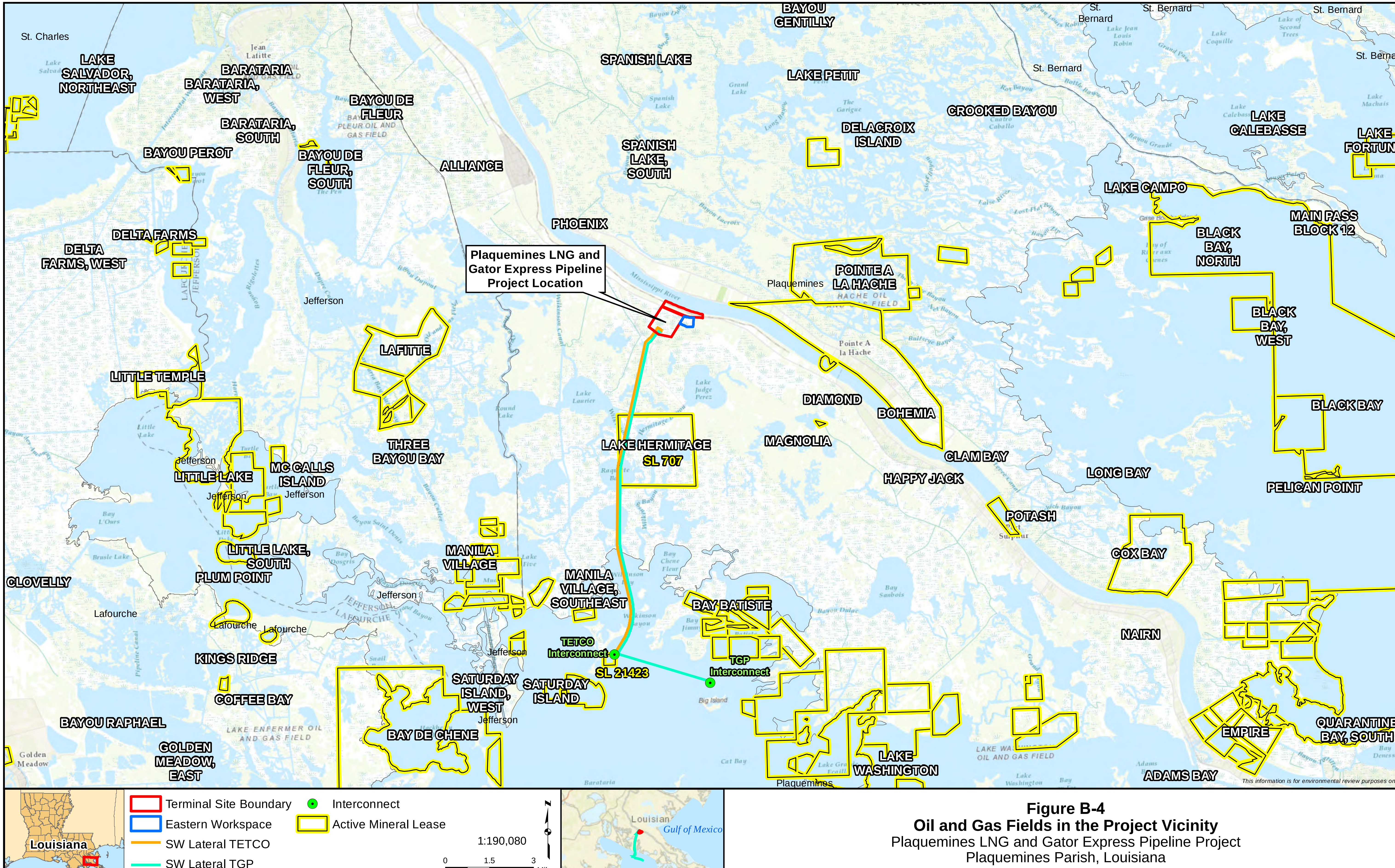
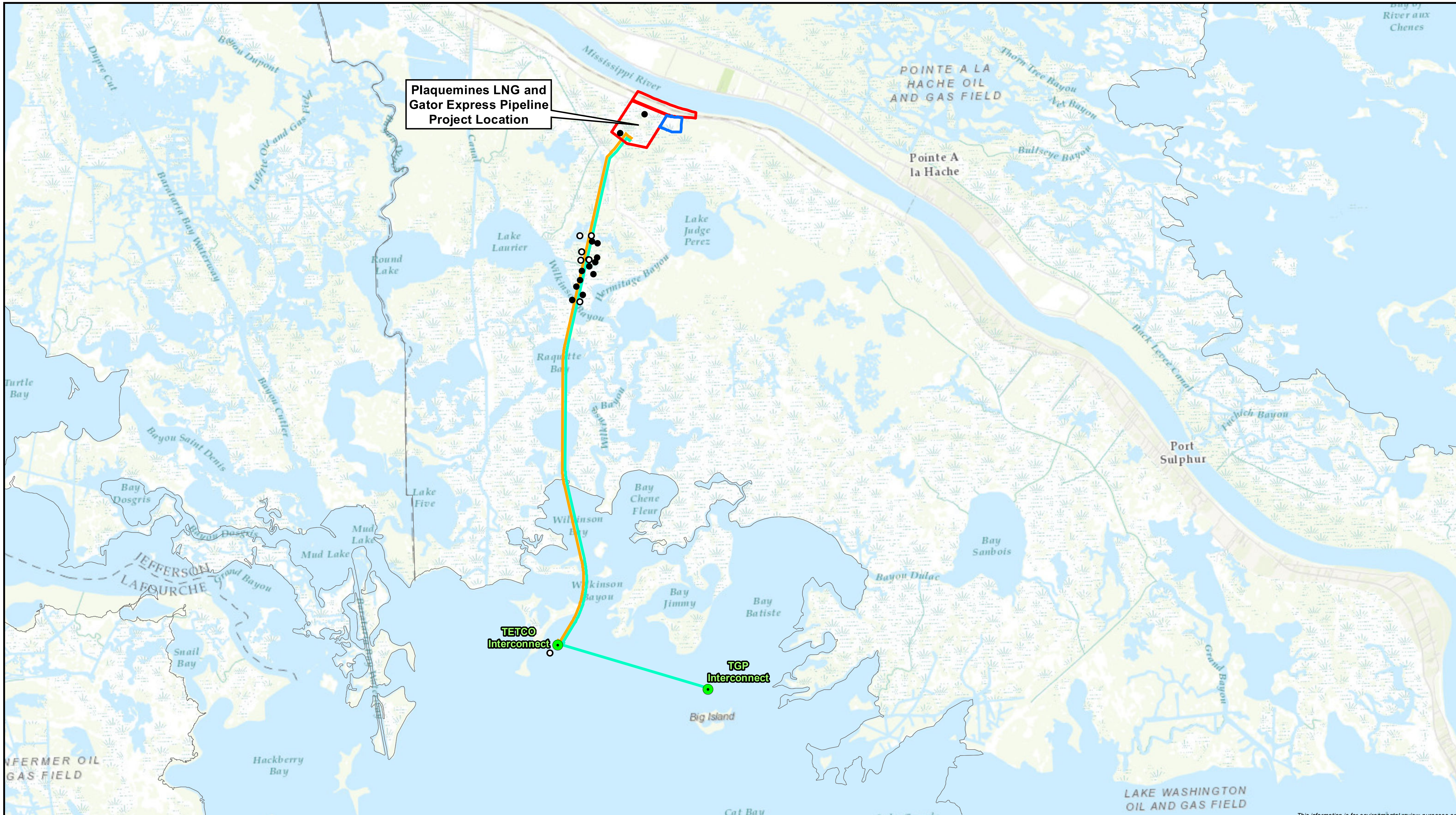


Figure B-4
Oil and Gas Fields in the Project Vicinity
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR06_Plaquemines_RR06_3_1.mxd | REVISED: 01/20/2017 | SCALE: 1:190,080 when printed at 11x17   DRAWN BY: JMS



Terminal Site Boundary
Eastern Workspace
SW Lateral TETCO
SW Lateral TGP
Interconnect
Oil and Gas Well
Oil and Gas Well with Well Pit

1:126,720

0 1 2 Miles

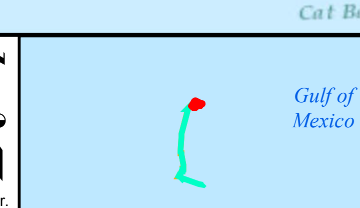


Figure B-5
Oil and Gas Wells Within 0.25 mile of the Project
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

Louisiana Department of Natural Resources. 2014. Strategic Online Natural Resources Information System Oil/Gas Wells Data Layer. Available online at: http://sonris-www.dnr.state.la.us/gis/agsweb/IE/JSViewer/index.html?TemplateID=181. Accessed December 2014.

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR06_Plaquemines_RR06_3_2.mxd | REVISED: 01/23/2017 | SCALE: 1:126,720 when printed at 11x17

DRAWN BY: JSnyder

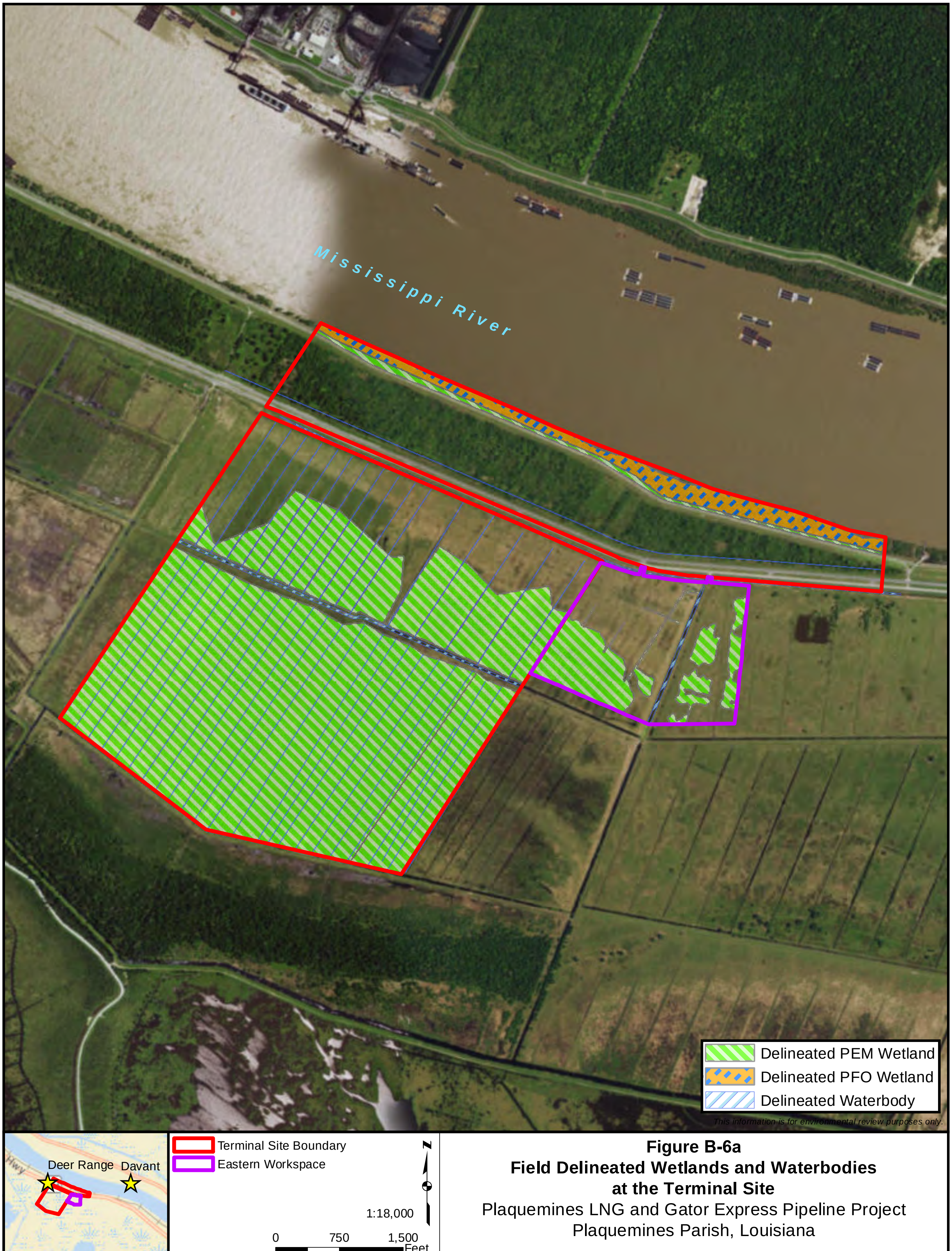
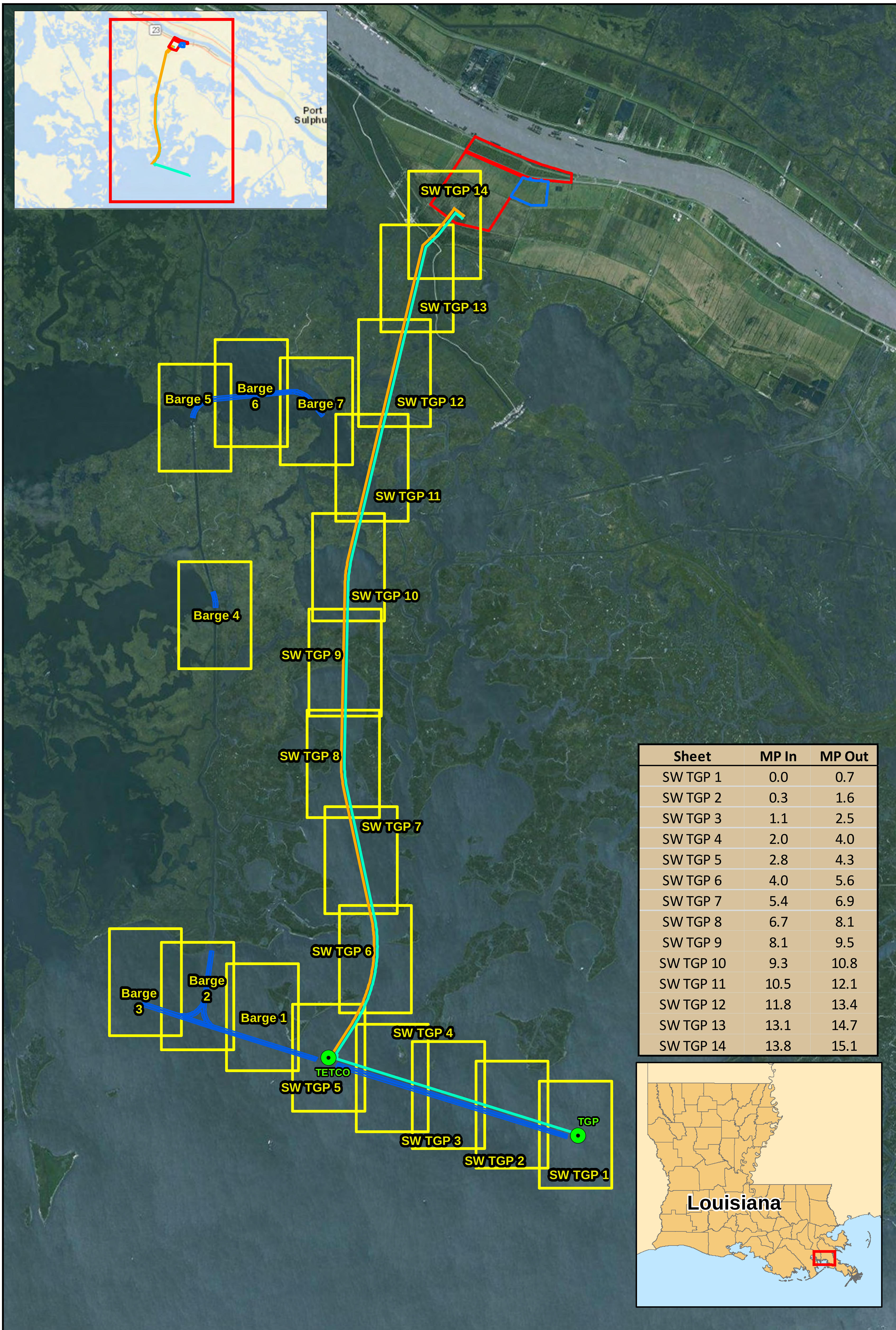


Figure B-6a
Field Delineated Wetlands and Waterbodies at the Terminal Site
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_3_Terminal.mxd | REVISED: 02/13/2017 | SCALE: 1:18,000 DRAWN BY: TG



Sheet	MP In	MP Out
SW TGP 1	0.0	0.7
SW TGP 2	0.3	1.6
SW TGP 3	1.1	2.5
SW TGP 4	2.0	4.0
SW TGP 5	2.8	4.3
SW TGP 6	4.0	5.6
SW TGP 7	5.4	6.9
SW TGP 8	6.7	8.1
SW TGP 9	8.1	9.5
SW TGP 10	9.3	10.8
SW TGP 11	10.5	12.1
SW TGP 12	11.8	13.4
SW TGP 13	13.1	14.7
SW TGP 14	13.8	15.1

Terminal Site Boundary
Eastern Workspace
SW Lateral TETCO
SW Lateral TGP
Interconnect and Meter Station
Sheet
Barge Access Channels

N

1:75,000

0 0.5 1 Miles

Figure B-6b

Overview of Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System Plaquemines LNG and Gator Express Pipeline Project Plaquemines Parish, Louisiana

Sheet Index

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW_Overview.mxd | REVISED: 02/17/2017 | SCALE: 1:75,000 when printed at 11x17

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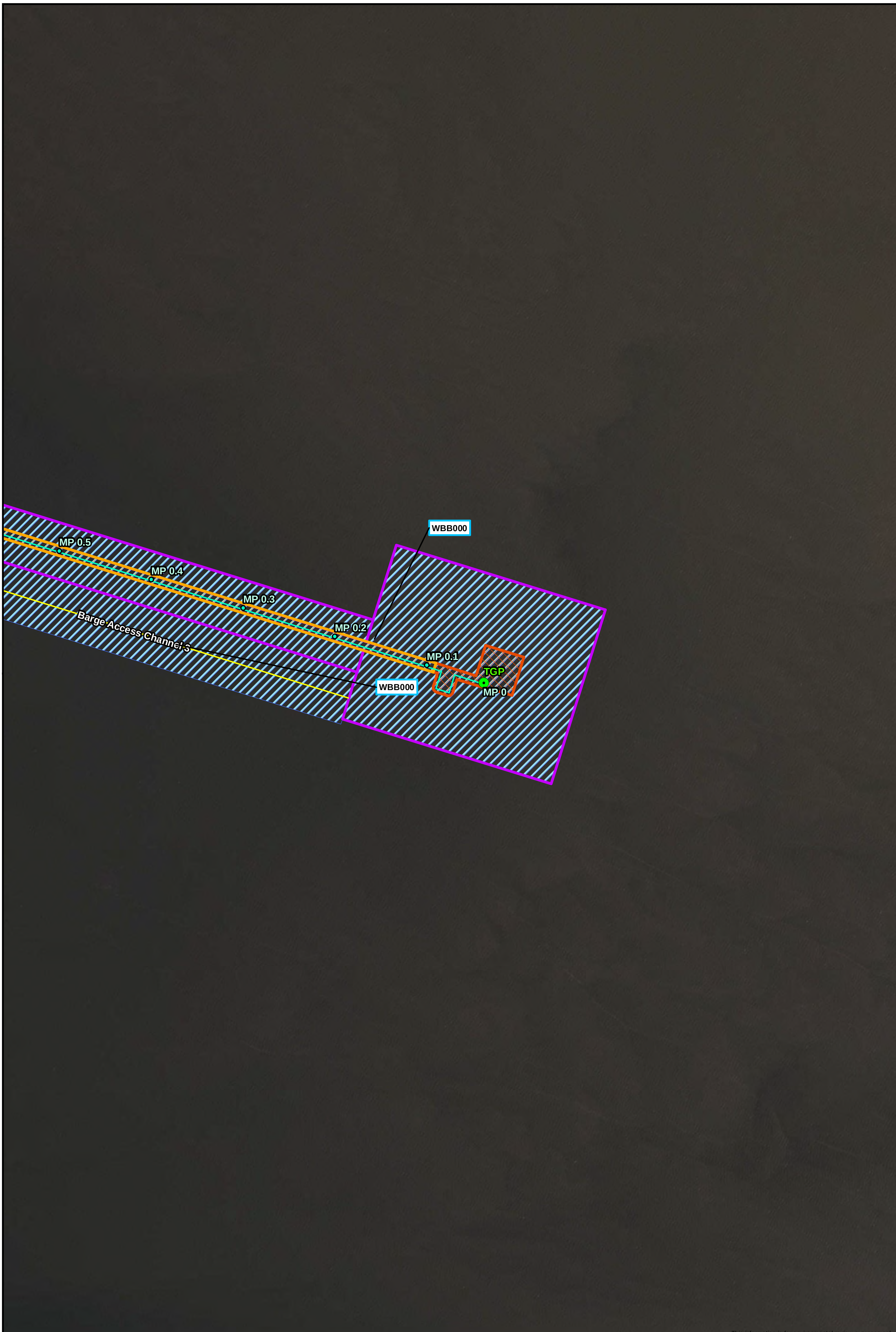

TGP Lateral Milepost
SW Lateral TGP
Barge Access Channel
Interconnect and Meter Station
Temporary Workspace
Permanent Easement
Meter Station
Delineated Waterbody

N

1:6,000

0 250 500 Feet

Figure B-6c

Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System

Plaquemines LNG and Gator Express Pipeline Project

Plaquemines Parish, Louisiana

Sheet 1 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17

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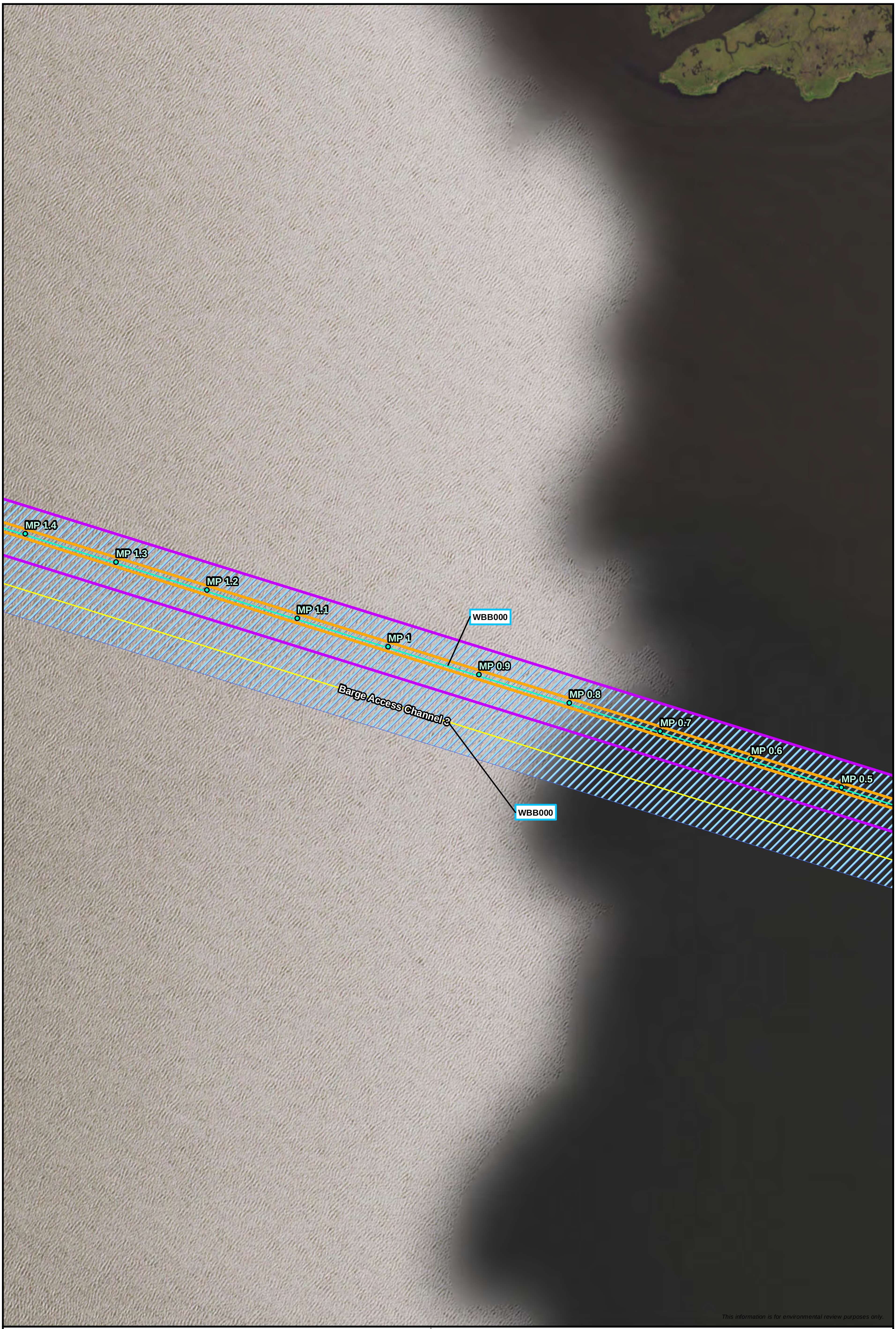


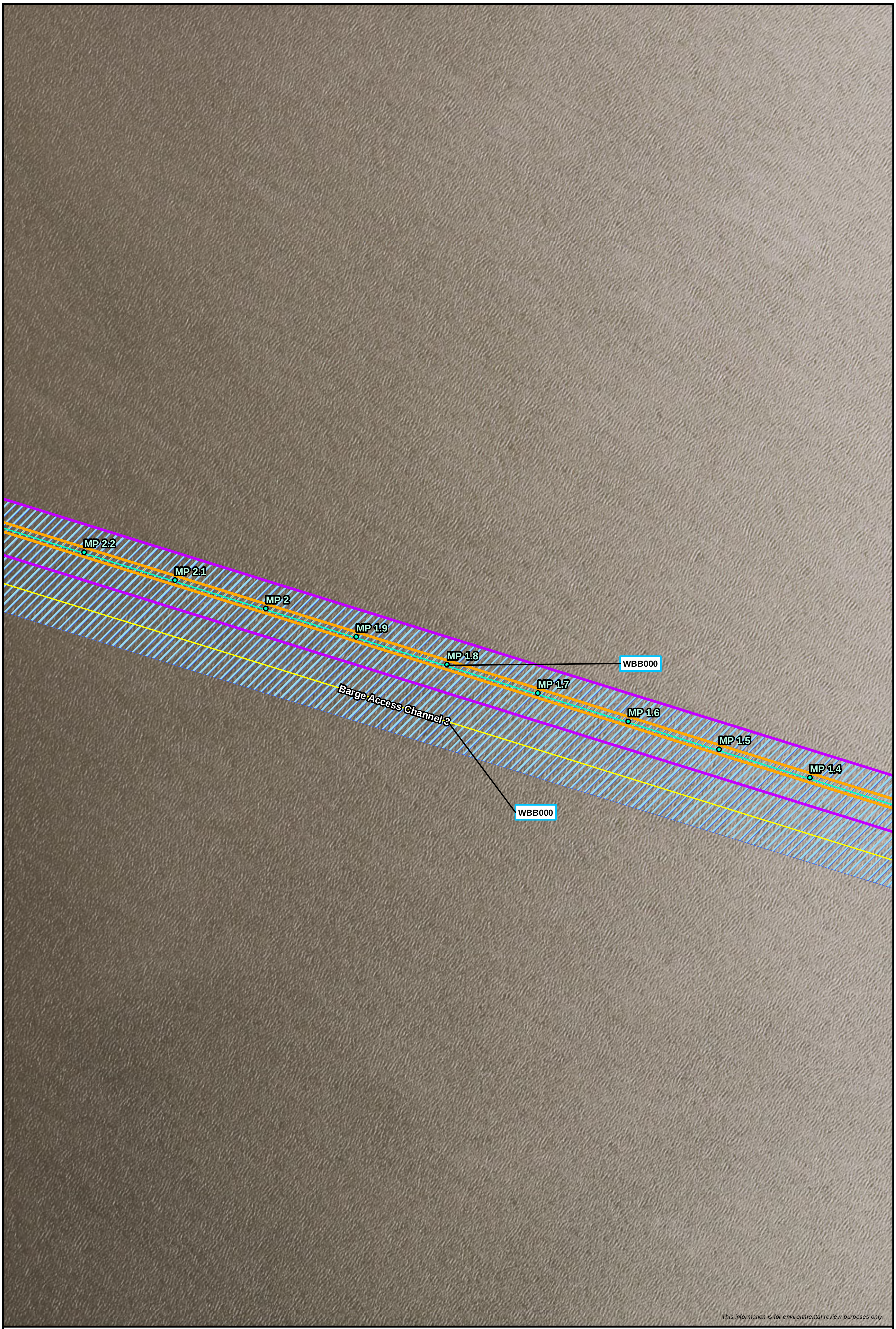
TGP Lateral Milepost
SW Lateral TGP
Barge Access Channel
Temporary Workspace
Permanent Easement
Delineated Waterbody

1:6,000
0 250 500 Feet

Figure B-6d

Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System

Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana
Sheet 2 of 21



TGP Lateral Milepost
SW Lateral TGP
Barge Access Channel
Temporary Workspace
Permanent Easement
Delineated Waterbody

N

1:6,000

0 250 500
Feet

Figure B-6e

Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System

Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana
Sheet 3 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17

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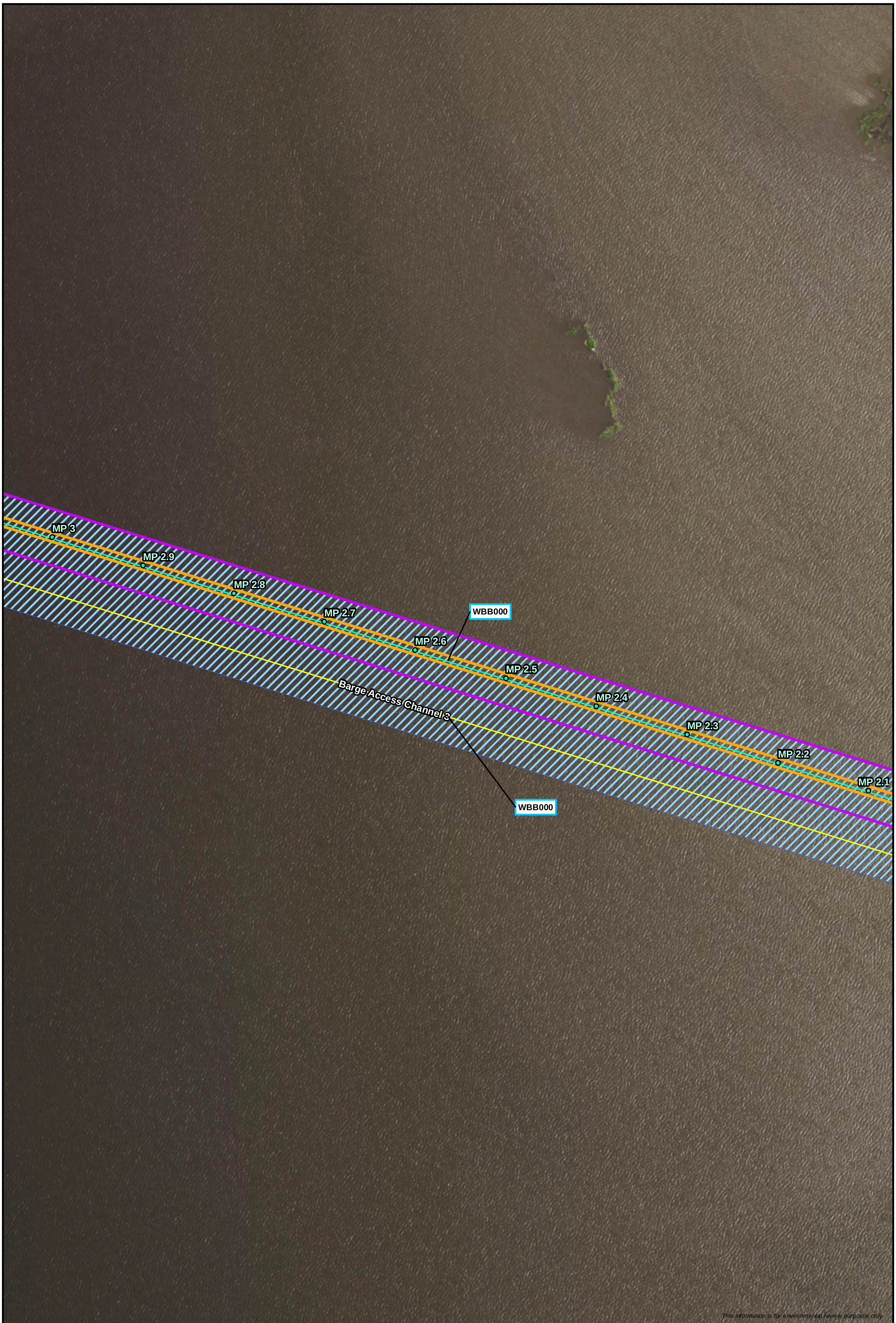


TGP Lateral Milepost
SW Lateral TGP
Barge Access Channel
Temporary Workspace
Permanent Easement
Delineated Waterbody

N

1:6,000

0 250 500 Feet

Figure B-6f

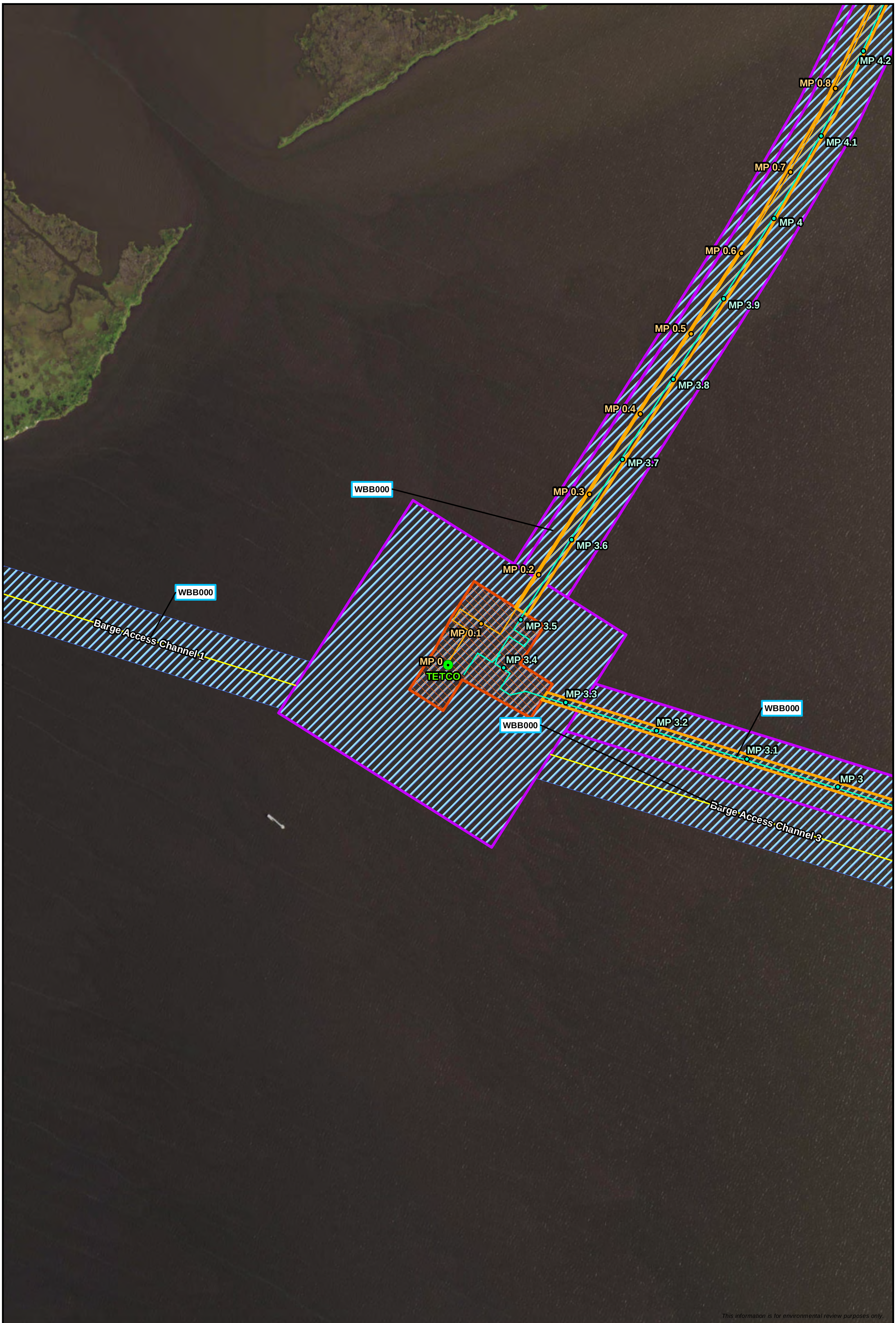
Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System

Plaquemines LNG and Gator Express Pipeline Project

Plaquemines Parish, Louisiana

Sheet 4 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17 DRAWN BY: GIS



TETCO Lateral Milepost
TGP Lateral Milepost
SW Lateral TETCO
SW Lateral TGP
Barge Access Channel
Interconnect and Meter Station
Temporary Workspace
Permanent Easement
Meter Station
Delineated Waterbody

1:6,000

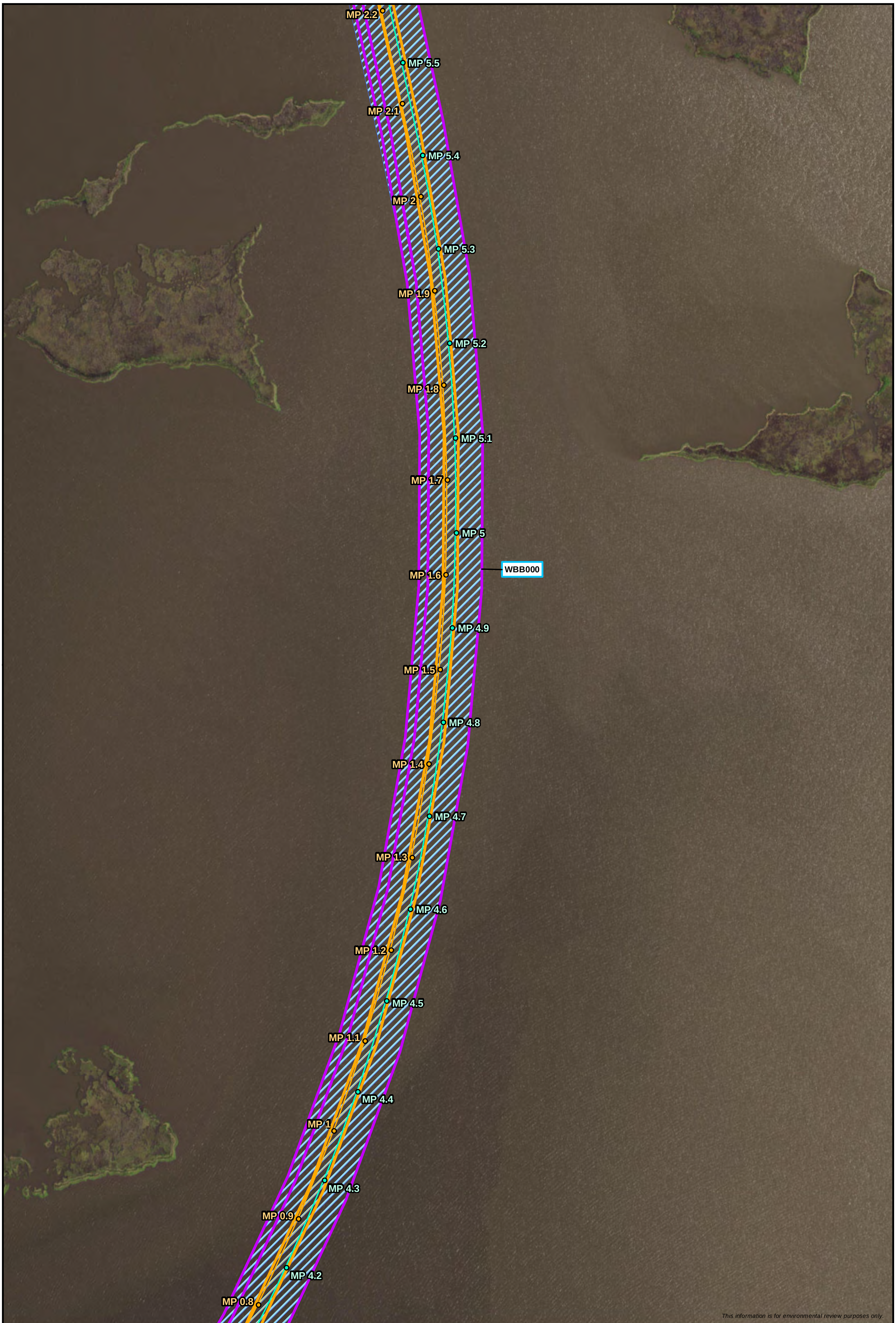
0 250 500 Feet

N

Figure B-6g
Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System

Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana
Sheet 5 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17 DRAWN BY: GIS



TETCO Lateral Milepost
TGP Lateral Milepost
SW Lateral TETCO
SW Lateral TGP
Temporary Workspace
Permanent Easement
Delineated Waterbody

N

1:6,000

0 250 500 Feet

Figure B-6h

Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System

Plaquemines LNG and Gator Express Pipeline Project

Plaquemines Parish, Louisiana

Sheet 6 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17 DRAWN BY: GIS

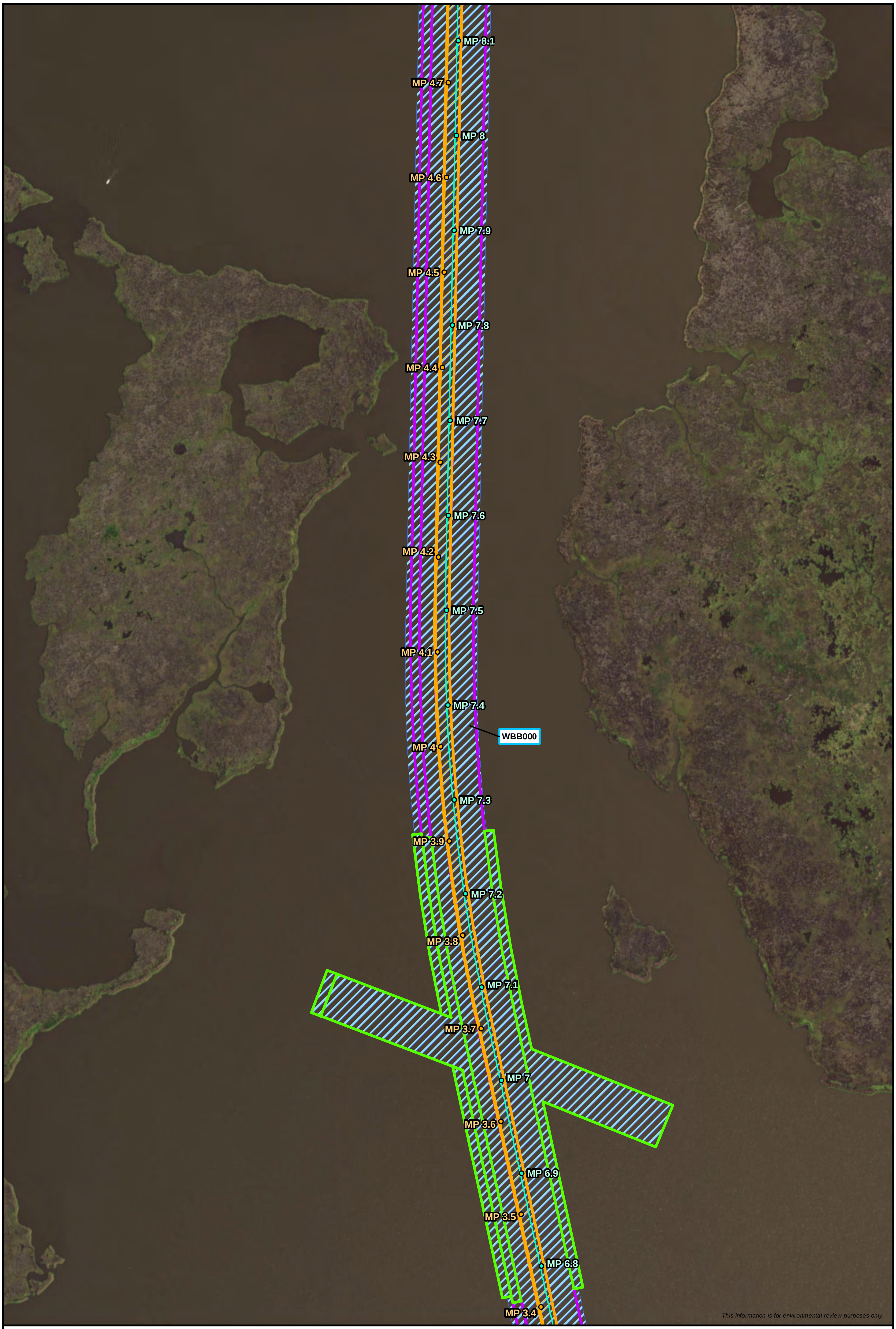
TETCO Lateral Milepost
TGP Lateral Milepost
SW Lateral TETCO
SW Lateral TGP
ATWS
Temporary Workspace
Permanent Easement
Delineated Waterbody

N

1:6,000

0 250 500 Feet

Figure B-6i
Field Delineated Wetlands and Waterbodies
Crossed by the Proposed Pipeline System
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana
Sheet 7 of 21



TETCO Lateral Milepost
TGP Lateral Milepost
SW Lateral TETCO
SW Lateral TGP
ATWS
Temporary Workspace
Permanent Easement
Delineated Waterbody

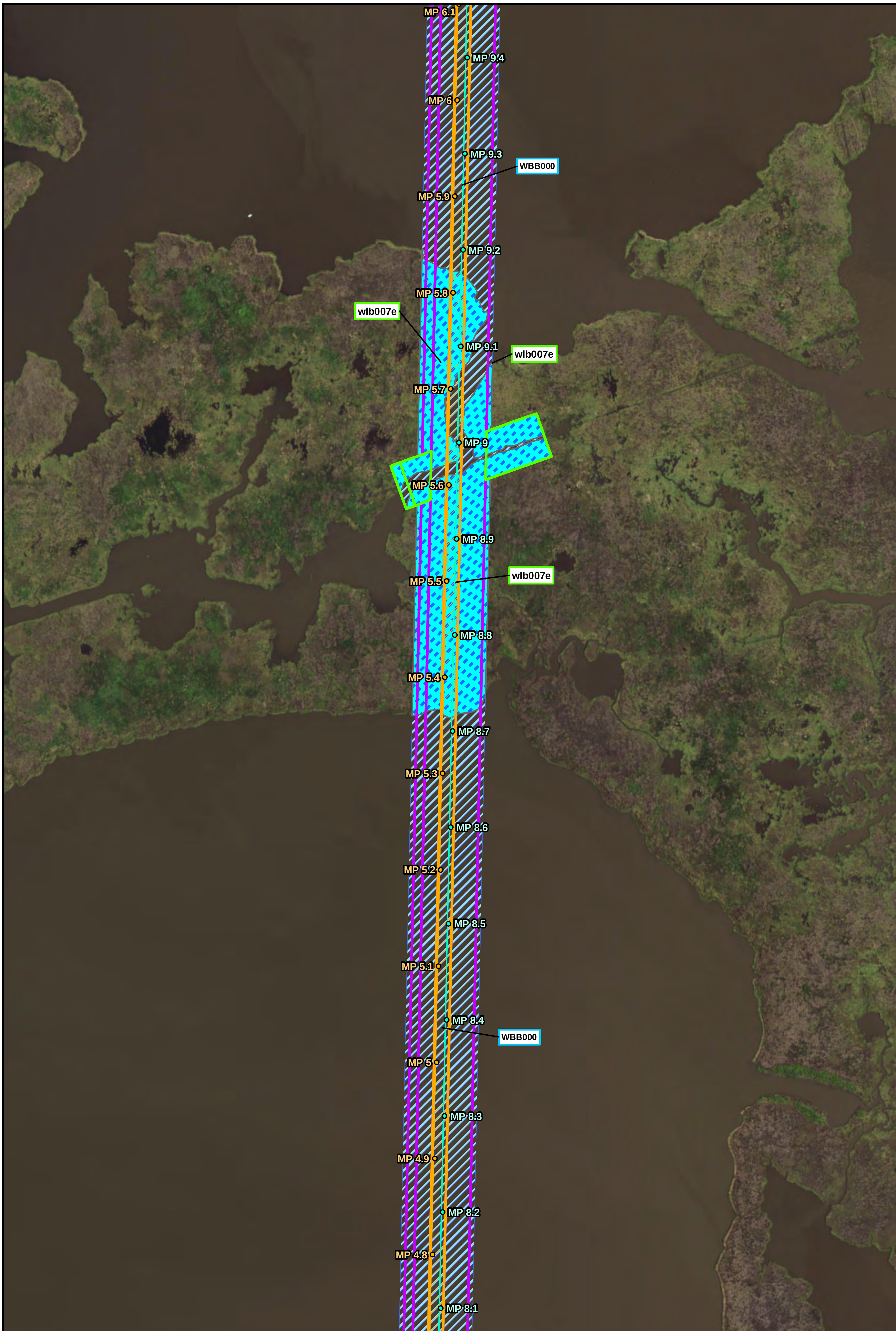
N

1:6,000

0 250 500 Feet

Figure B-6j
Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana
Sheet 8 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17 DRAWN BY: GIS



- TETCO Lateral Milepost
- TGP Lateral Milepost
- SW Lateral TETCO
- SW Lateral TGP
- ATWS
- Temporary Workspace
- Permanent Easement
- Delineated E2EM Wetland
- Delineated Waterbody

N

1:6,000

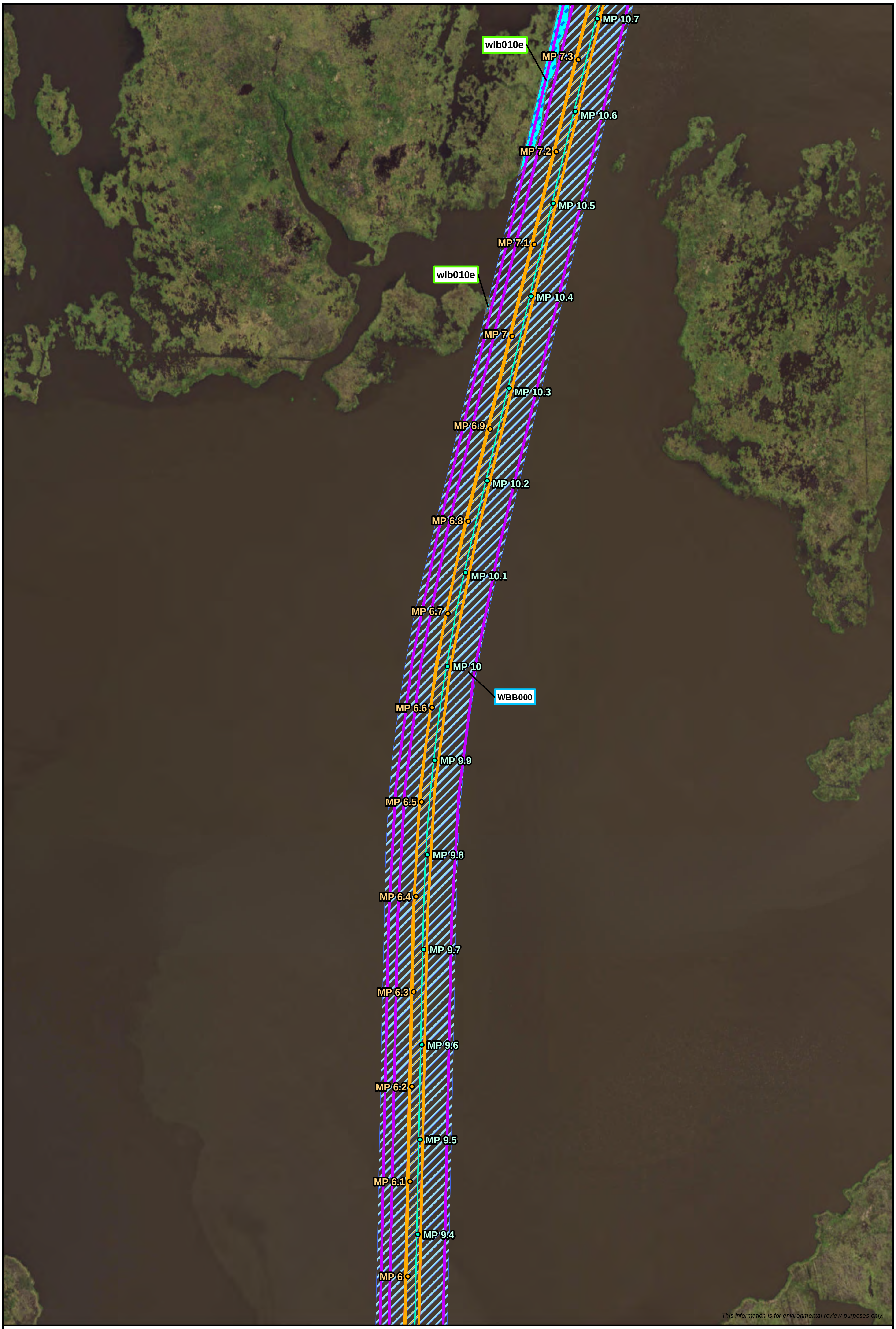
0 250 500 Feet

Figure B-6k

Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System

Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana
Sheet 9 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17 DRAWN BY: GIS



TETCO Lateral Milepost
TGP Lateral Milepost
SW Lateral TETCO
SW Lateral TGP
Temporary Workspace
Permanent Easement
Delineated E2EM Wetland
Delineated Waterbody

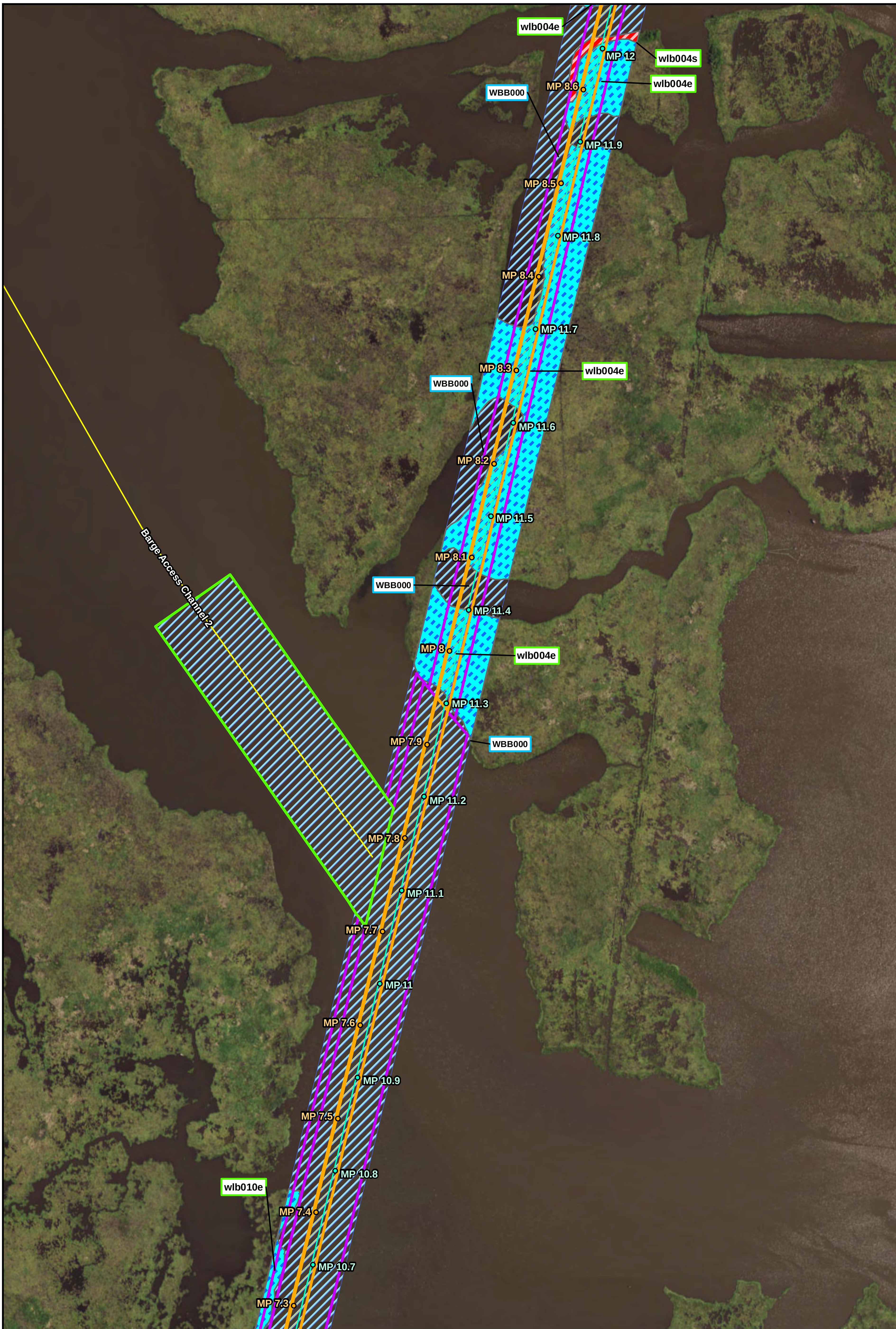
N

1:6,000

0 250 500 Feet

Figure B-6l
Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana
Sheet 10 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17 DRAWN BY: GIS



TETCO Lateral Milepost
TGP Lateral Milepost
SW Lateral TETCO
SW Lateral TGP
Barge Access Channel
ATWS
Temporary Workspace
Permanent Easement
Delineated E2SS Wetland
Delineated E2EM Wetland
Delineated Waterbody

N

1:6,000

0 250 500 Feet

Figure B-6m

Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System

Plaquemines LNG and Gator Express Pipeline Project Plaquemines Parish, Louisiana

Sheet 11 of 21

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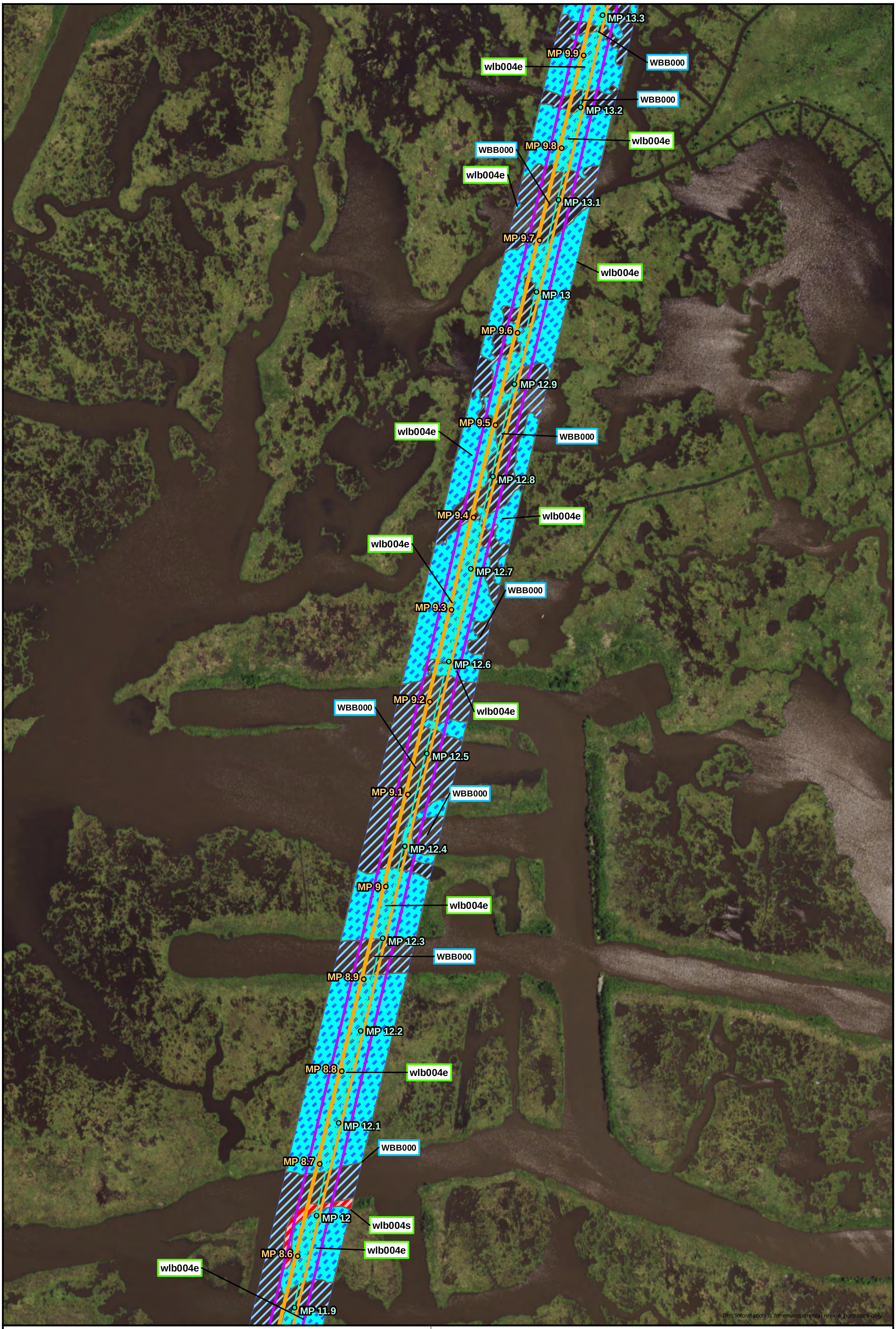

- TETCO Lateral Milepost
- TGP Lateral Milepost
- SW Lateral TETCO
- SW Lateral TGP
- Temporary Workspace
- Permanent Easement
- Delineated E2SS Wetland
- Delineated E2EM Wetland
- Delineated Waterbody

N

1:6,000

0 250 500 Feet

Figure B-6n

Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System

Plaquemines LNG and Gator Express Pipeline Project

Plaquemines Parish, Louisiana

Sheet 12 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17

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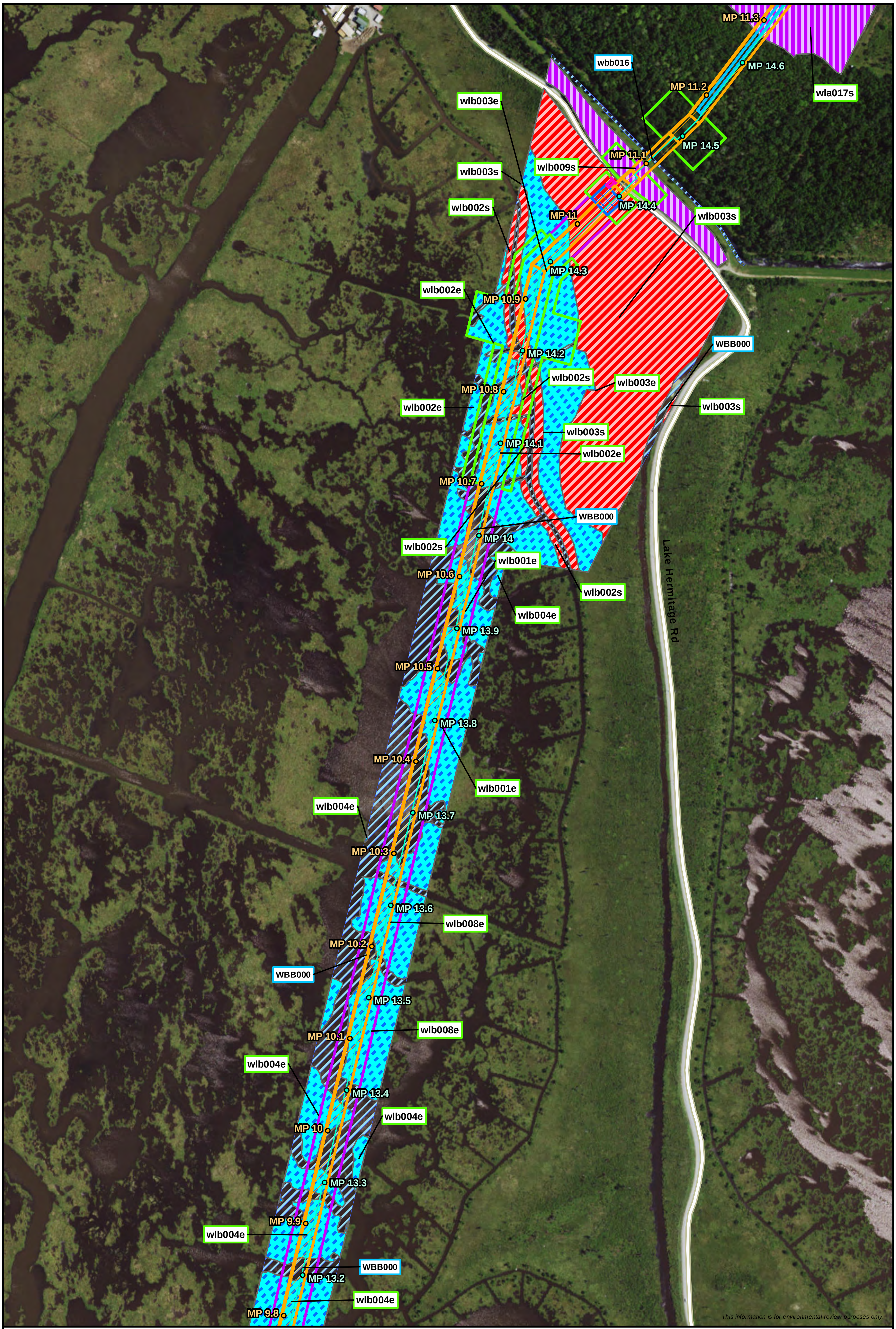

- TETCO Lateral Milepost
- TGP Lateral Milepost
- SW Lateral TETCO
- SW Lateral TGP
- ATWS
- Temporary Workspace
- Permanent Easement
- Main Line Block Valve Site
- Permanent Access Road
- Temporary Access Road
- Delineated E2SS Wetland
- Delineated PSS Wetland
- Delineated E2EM Wetland
- Delineated Waterbody

1:6,000

0 250 500 Feet

Figure B-6o
Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana
Sheet 13 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17

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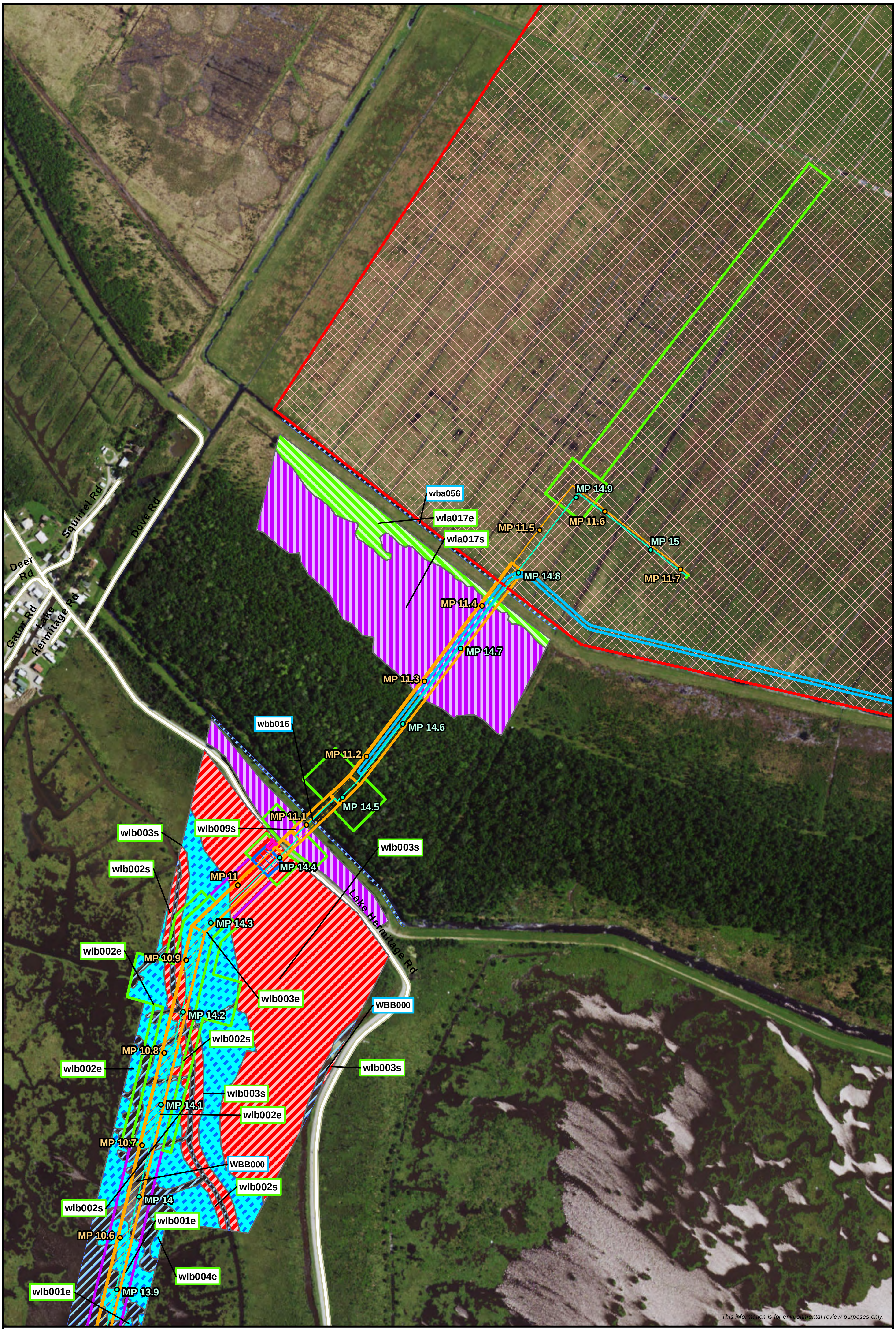


Terminal Site
TETCO Lateral Milepost
TGP Lateral Milepost
SW Lateral TETCO
SW Lateral TGP
ATWS
Temporary Workspace
Permanent Easement
Main Line Block Valve Site
Permanent Access Road
Temporary Access Road
Delineated E2SS Wetland
Delineated PEM Wetland
Delineated PSS Wetland
Delineated E2EM Wetland
Delineated Waterbody

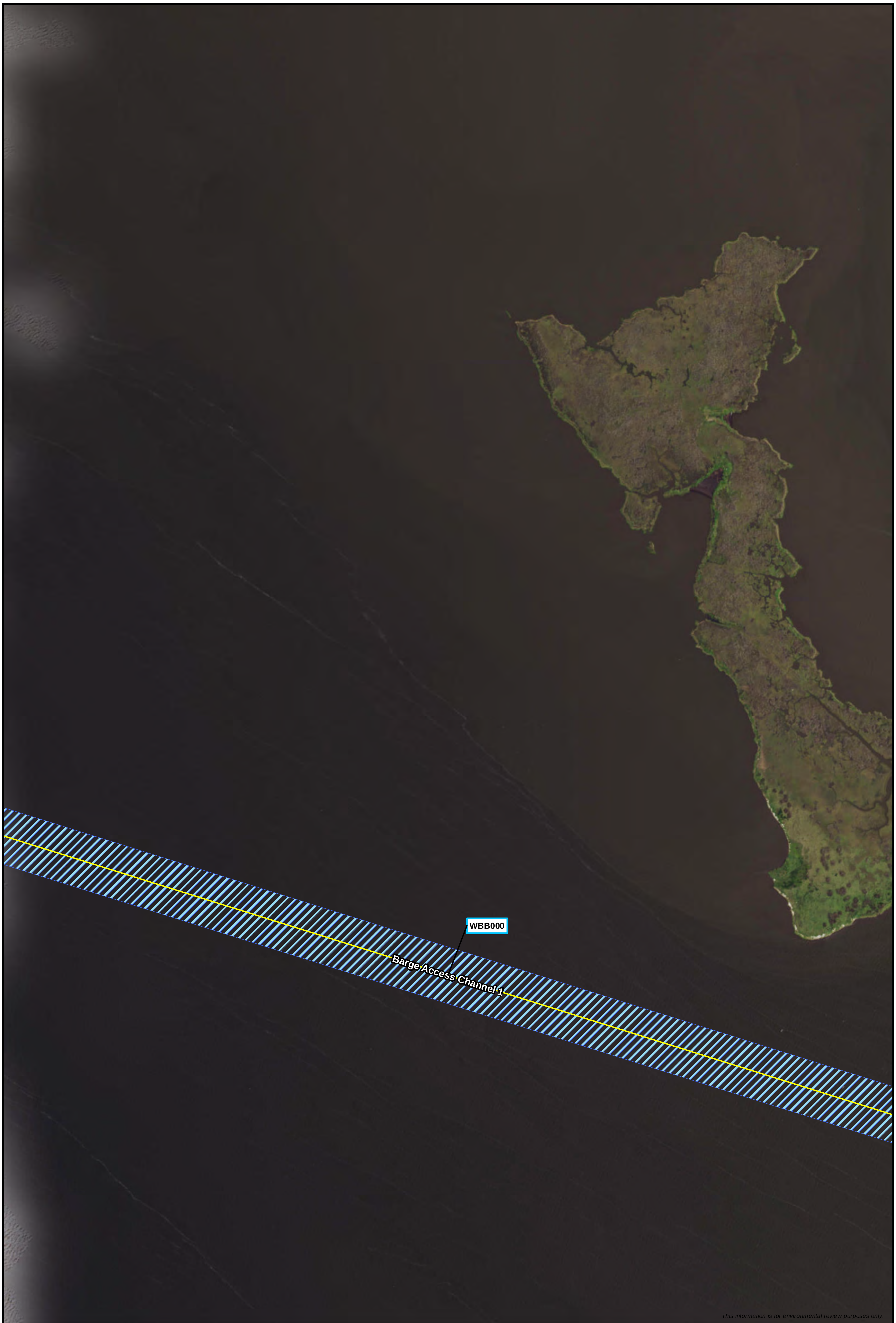
N

1:6,000

0 250 500
Feet

Figure B-6p
Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System
Plaquemines LNG and Gator Express Pipeline Project Plaquemines Parish, Louisiana
Sheet 14 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17 DRAWN BY: GIS



Barge Access Channel
Delineated Waterbody

N

1:6,000

0 250 500 Feet

Figure B-6q

Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System

Plaquemines LNG and Gator Express Pipeline Project

Plaquemines Parish, Louisiana

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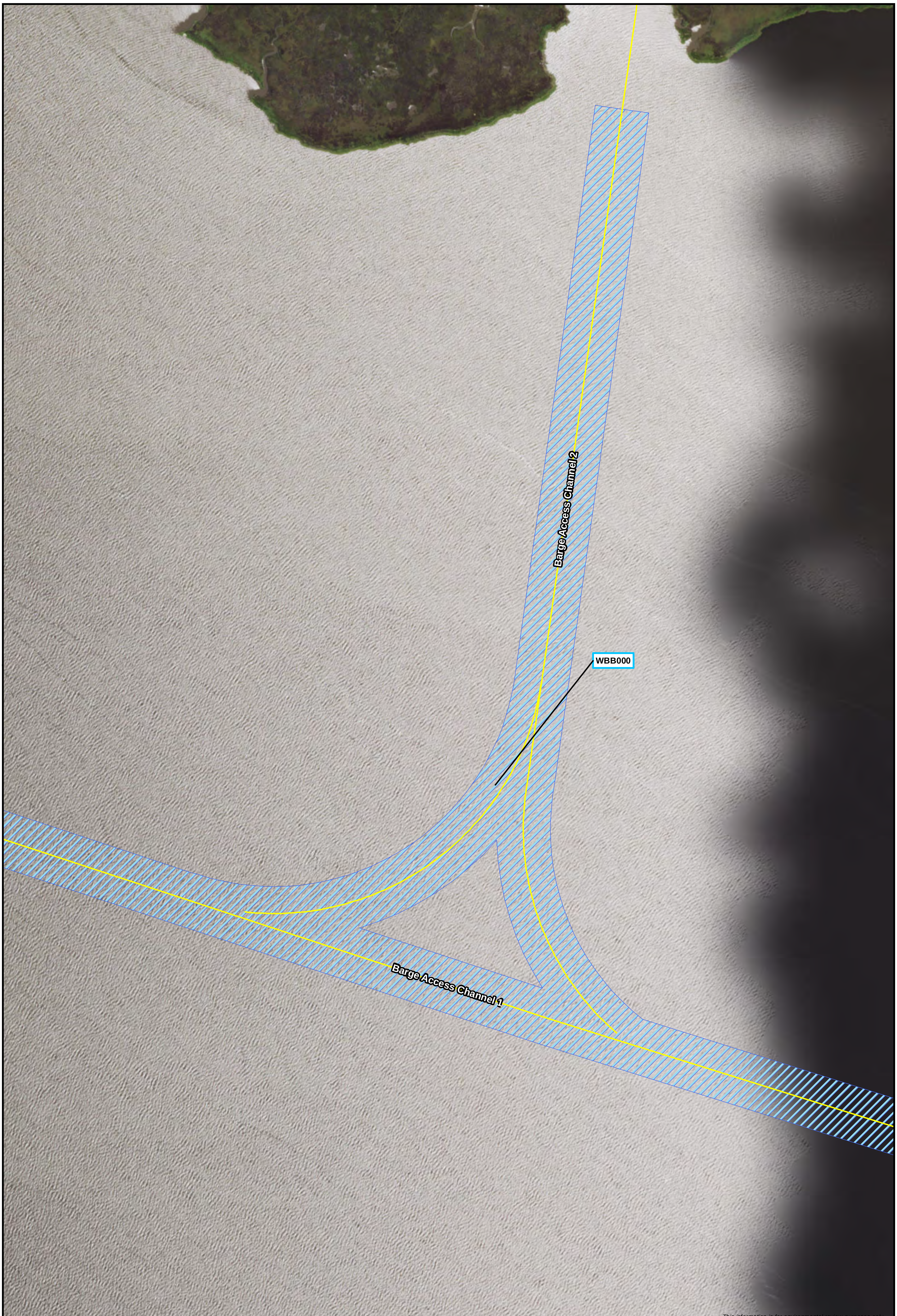
FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17 DRAWN BY: GIS

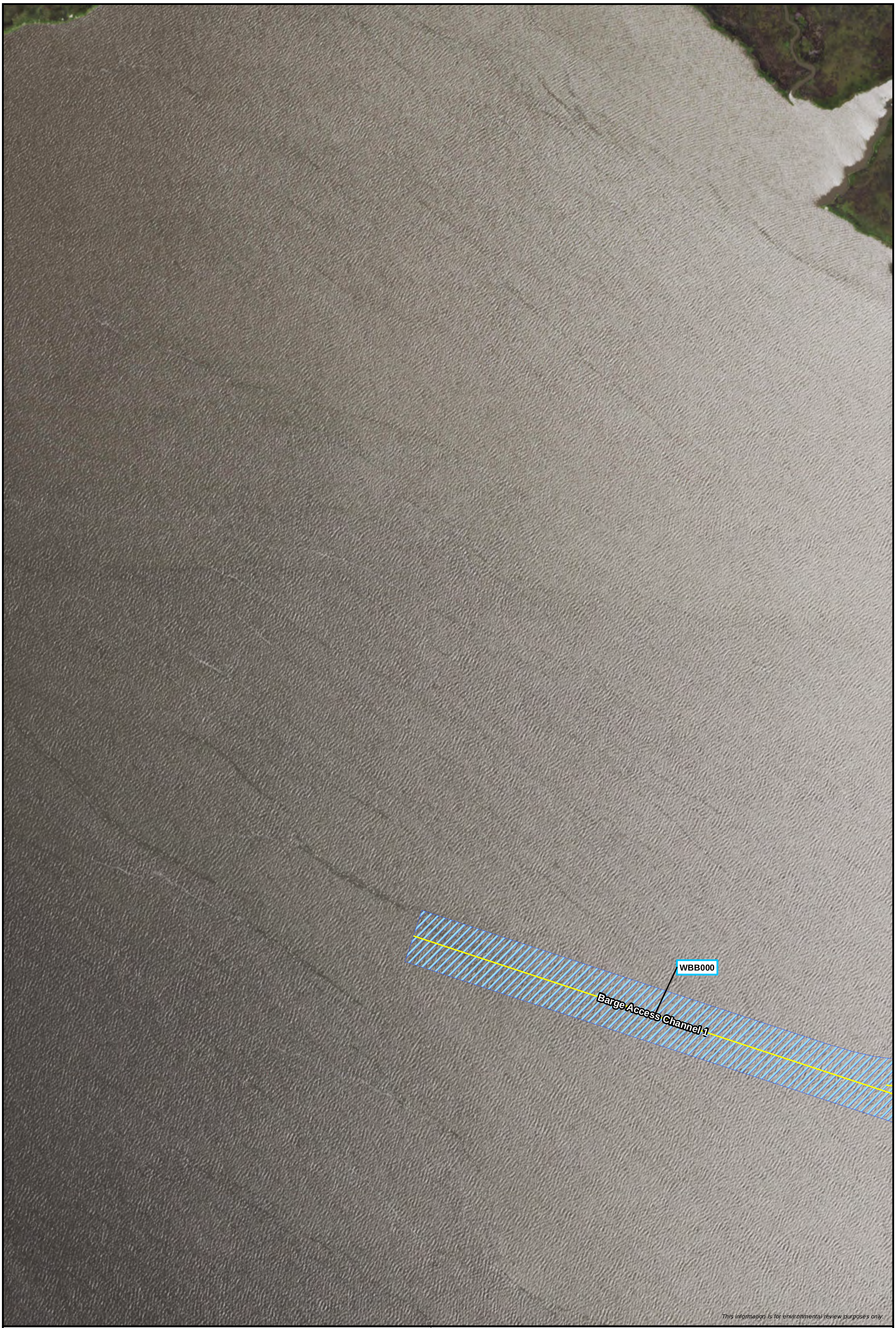


Barge Access Channel
Delineated Waterbody

1:6,000
0 250 500
Feet

Figure B-6r
Field Delineated Wetlands and Waterbodies
Crossed by the Proposed Pipeline System
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana
Sheet 16 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17 DRAWN BY: GIS



Barge Access Channel
Delineated Waterbody

N

1:6,000
0 250 500
Feet

Figure B-6s
Field Delineated Wetlands and Waterbodies
Crossed by the Proposed Pipeline System
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana
Sheet 17 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17 DRAWN BY: GIS

Barge Access Channel
Delineated Waterbody

N

1:6,000
0 250 500
Feet

Figure B-6t
Field Delineated Wetlands and Waterbodies
Crossed by the Proposed Pipeline System
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana
Sheet 18 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17 DRAWN BY: GIS

Barge Access Channel

Delineated Waterbody

N

1:6,000

0 250 500 Feet

Figure B-6u

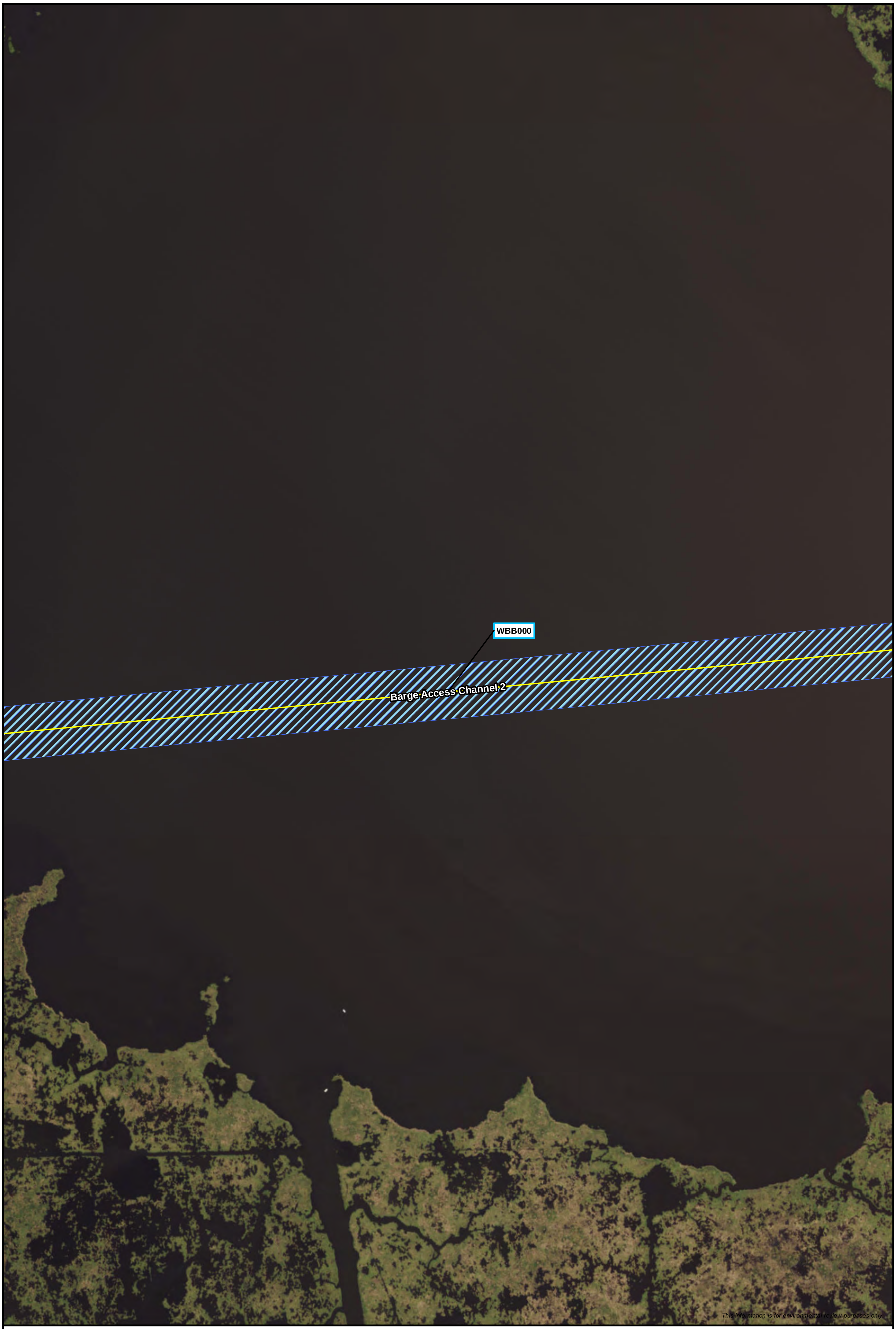
Field Delineated Wetlands and Waterbodies Crossed by the Proposed Pipeline System

Plaquemines LNG and Gator Express Pipeline Project

Plaquemines Parish, Louisiana

Sheet 19 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17 DRAWN BY: GIS



Barge Access Channel
Delineated Waterbody

N

1:6,000

0 250 500
Feet

Figure B-6v
Field Delineated Wetlands and Waterbodies
Crossed by the Proposed Pipeline System
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana
Sheet 20 of 21

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR02_Plaquemines_RR02_2_3_2_4_SW.mxd | REVISED: 02/17/2017 | SCALE: 1:6,000 when printed at 11x17 DRAWN BY: GIS

Barge Access Channel
ATWS
Delineated Waterbody

N

1:6,000
0 250 500
Feet

Figure B-6w
Field Delineated Wetlands and Waterbodies
Crossed by the Proposed Pipeline System
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana
Sheet 21 of 21

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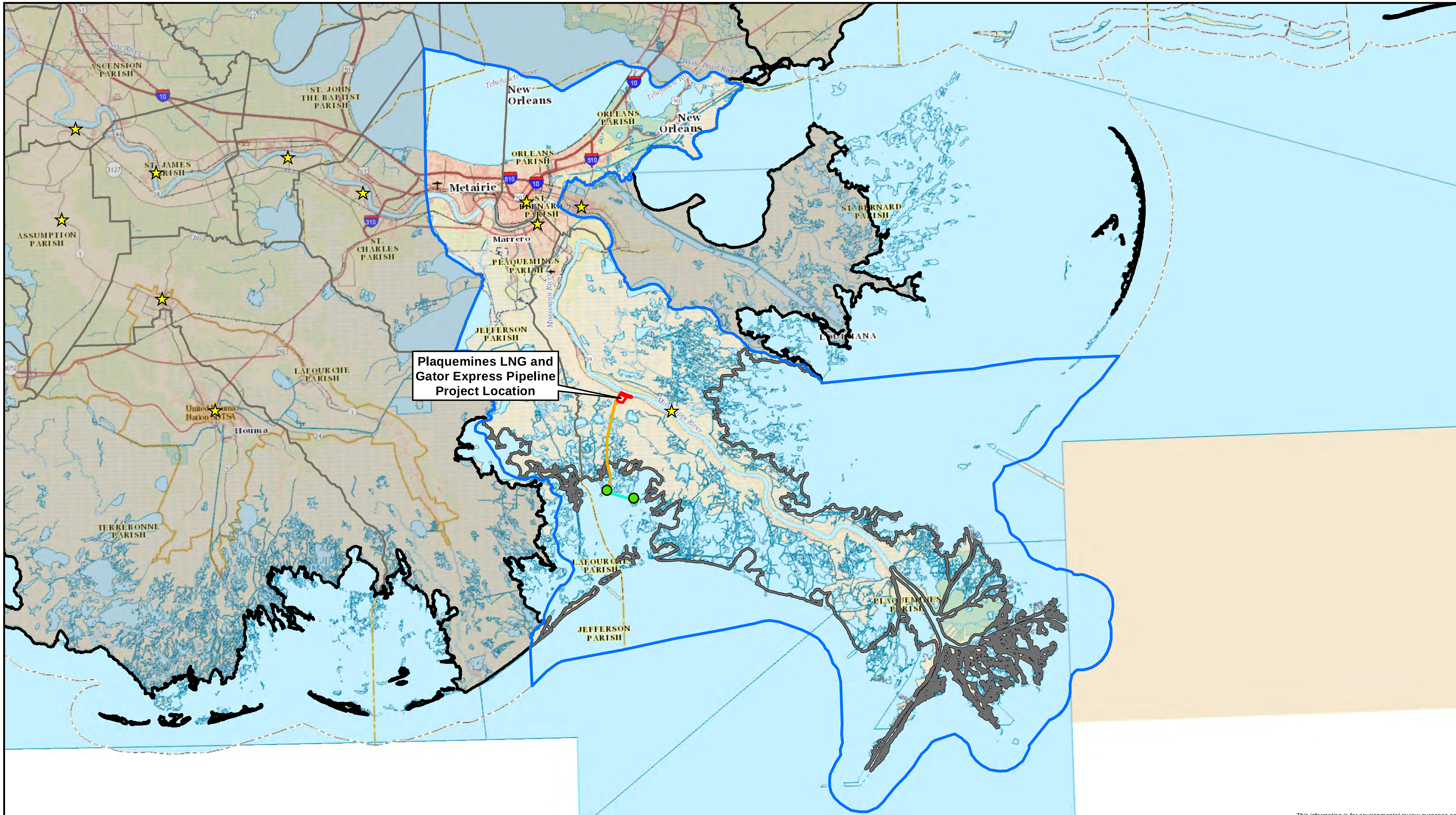


Louisiana

Economic Impact Area
Terminal Site Boundary
SW Lateral TETCO
SW Lateral TGP
Interconnect
Parish Seat

1:715,000

0 10 20 Miles

Figure B-7
Socioeconomic Study Area and Overview
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR05_Plaquemines_RR05_Socio.mxd | REVISED: 08/04/2016 | SCALE: 1:715,000 when printed at 11x17

DRAWN BY: JSnyder

Figure B-8
Plaquemines Parish Census Tracts
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

FILE: M:\Clients\V-X\VGL\Plaquemines_ArcGIS_ResourceReports\RR05_Plaquemines_RR05_Census.mxd | REVISED: 01/24/2017 | SCALE: 1:570,240 when printed at 11x17 DRAWN BY: JSnyder

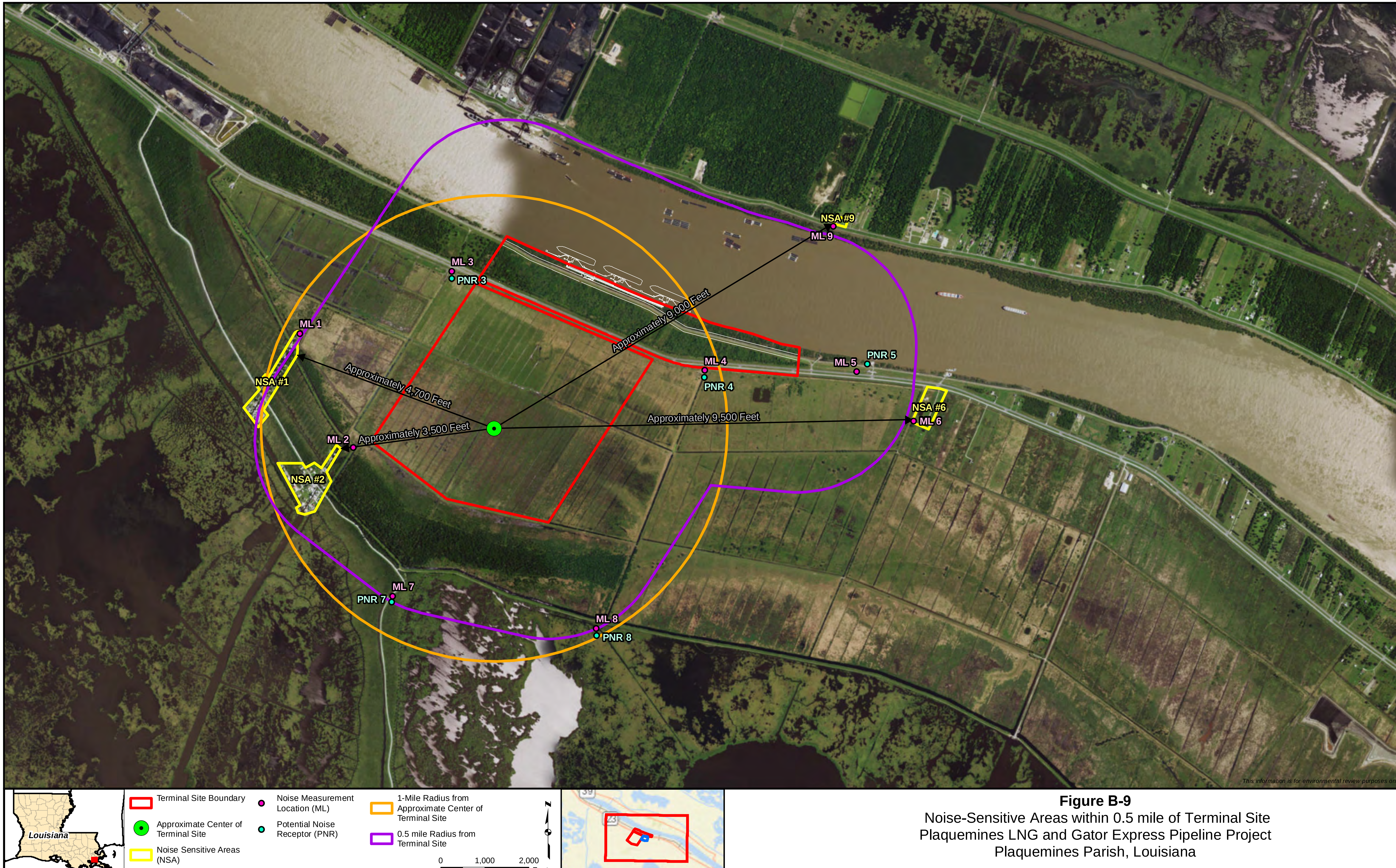
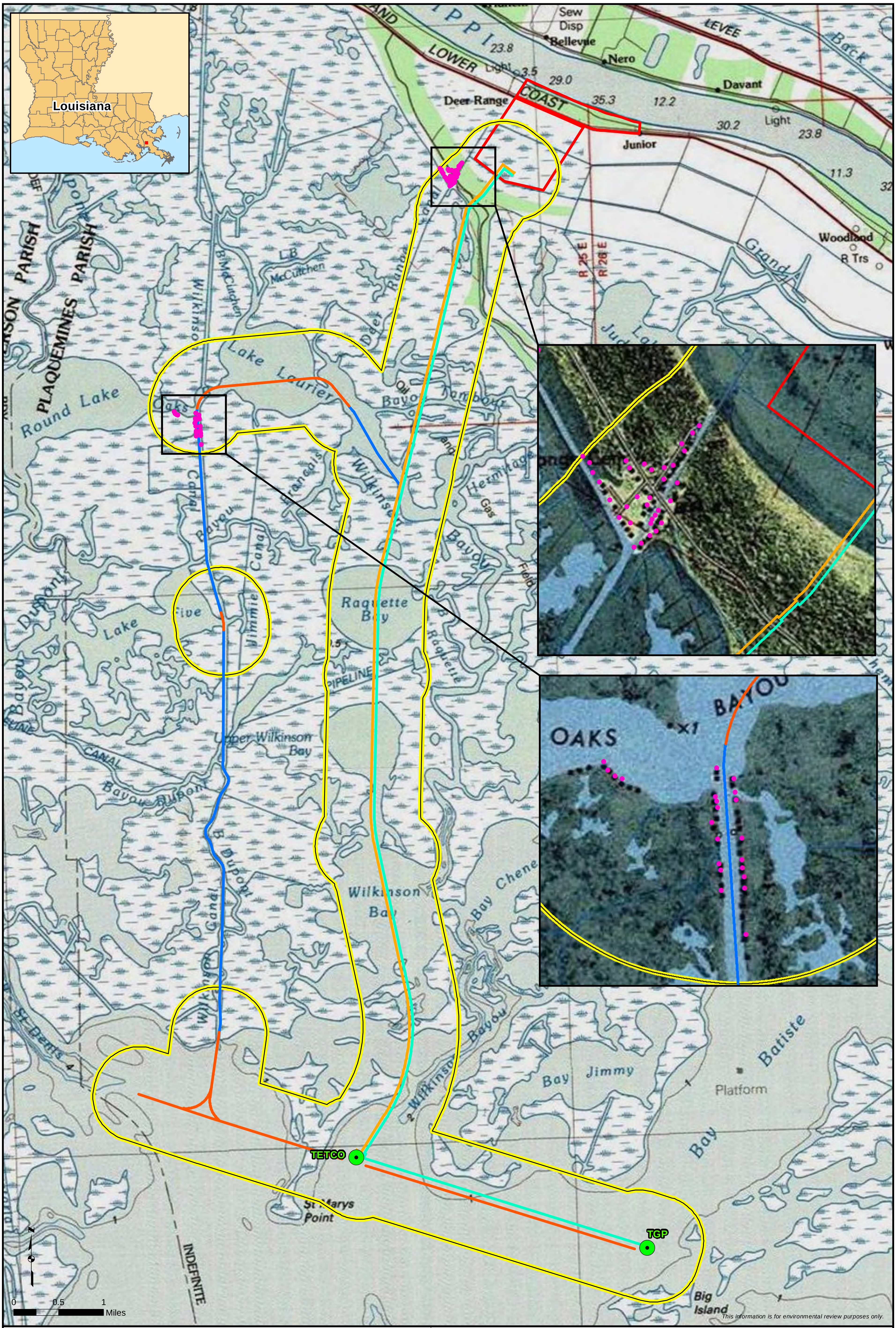


Figure B-9

Noise-Sensitive Areas within 0.5 mile of Terminal Site
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana



Terminal Site Boundary	Barge Access Channel - No Dredge Required
SW Lateral TETCO	Interconnect and Meter Station
SW Lateral TGP	Noise-Sensitive Area
Barge Access Channel - Dredge/Excavation Proposed	0.5-mile Radius Study Area

Figure B-10
Noise-Sensitive Areas within 0.5 mile of Proposed Pipline System (Topographic Map)
Plaquemines LNG and Gator Express Pipeline Project
Plaquemines Parish, Louisiana

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APPENDIX C

UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN; WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES; AND MODIFICATIONS TO THE PLAN AND PROCEDURES

Proposed Modifications to the Federal Energy Regulatory Commission's Plan

Venture Global's project-specific Plan includes proposed modifications to FERC's Plan (appendix C). FERC allows project sponsors to request modifications to its Plan. The FERC Plan directs applicants to specify in their application any individual measures that they consider unnecessary, technically infeasible, or unsuitable due to local conditions, and to describe the alternative measures they propose to use. They must also explain how their proposed alternative measures would achieve a comparable level of mitigation as the FERC measures.

The project-specific Plan includes numerous minor wording changes to specify the project sponsor and provide clarifications that do not require our specific approval. Those proposed modifications that are substantive and for which we have determined that Venture Global provided adequate justification are listed in table 1. The table includes the original text from FERC's Plan, the modified text in the project-specific Plan, and our determination regarding the proposed modification.

Appendix C, TABLE 1
Requested Modifications to the Federal Energy Regulatory Commission's Plan

Section Number	FERC Plan	Venture Global Plan	FERC Determination
II.A.1	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.	The number and experience of Environmental Inspectors (EIs) assigned the project shall be appropriate for the size of the construction area, the level of activity, and the number/significance of resources affected.	FERC accepts that the proposed alternative measure will achieve a comparable level of mitigation.
III.G	The project sponsor shall develop project-specific Spill Prevention and Response Procedures, as specified in section IV of the staff's Procedures.	The project sponsors will develop project-specific Spill Prevention and Response Procedures, as contained in a Spill Prevention, Control, and Countermeasure Plan or comparable document, as specified in section IV of the staff's Procedures.	FERC accepts that the proposed alternative measure will achieve a comparable level of mitigation.
IV.A.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.	The project will require a nominal 130-foot-wide right-of-way due to the parallel installation of two 42-inch-diameter pipelines.	This is not a necessary modification because the wording in the FERC Plan allows for and anticipates evaluating project-specific rights-of-way in the EIS.

IV.F.3.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.	The project terrain has limited elevation changes yielding few downslopes. However, the soils in upland areas, as well as wetland areas, are of types that will tend to slough when stacked as spoil. The workspace width (130 feet) will limit sediment migration laterally off the construction right-of-way. At upland and wetland/waterbody interfaces within the construction right-of-way, sediment barriers will be installed as practicable.	FERC accepts that this measure will achieve a comparable level of mitigation in areas sufficiently inundated to allow installation by the push method.

Proposed Modifications to the Federal Energy Regulatory Commission's Procedures

Venture Global's project-specific Procedures regarding wetland and waterbody crossings include certain proposed modifications to FERC's Procedures (appendix C). Just as with our Plan, FERC's Procedures directs applicants to specify in their application any individual measures that they consider unnecessary, technically infeasible, or unsuitable due to local conditions, and to describe the alternative measures they propose to use. They must also explain how their proposed alternative measures would achieve a level of mitigation comparable to the FERC measures.

The project-specific Procedures include numerous minor wording changes to specify the project sponsor and provide clarifications that do not require our specific approval. Those proposed modifications that are substantive and for which we have determined Venture Global provided adequate justification are listed in table 2. This table includes the original text from FERC's Procedures, the modified text in the project-specific Procedures, and our determination regarding the proposed modification. One modification that was proposed by Venture Global regarding the time-of-year for crossing waterbodies is already allowed by the FERC Procedures and is not included in the following table.

Appendix C, TABLE 2
Requested Modifications to the Federal Energy Regulatory Commission's Procedures

Section Number	FERC Procedure	Venture Global Procedure (Modified wording in bold)	FERC Determination
II.A.2	Site-specific justifications for the use of a construction right-of-way greater than 75-feet-wide in wetlands.	Site-specific justifications for the use of a construction right-of-way greater than 75-feet-wide in wetlands. The project requires a 130-foot-wide construction right-of-way for pipeline installation where the push method is used, due to the need for a relatively wide and deep trench to ensure the required depth of cover in the wet, poorly cohesive, and easily sloughed substrate, and the consequent need for increased space to sidecast relatively high spoil volumes. The project requires a 300-foot-wide construction right-of-way for pipeline installation in open waters, where the barge lay method is used, to accommodate an approximately 100-	FERC accepts that this proposed modification is necessary because the combination of pipe size, the inundated or saturated soil conditions, and the pervasiveness and extent of wetlands and open water in the project area make the 75-foot-wide right-of-way infeasible. The requirement to identify specific wetlands that require more than a 75-foot-wide right-of-way remains. See section 4.3.2.3 for further discussion

Appendix C, TABLE 2 Requested Modifications to the Federal Energy Regulatory Commission's Procedures			
Section Number	**FERC Procedure**	**Venture Global Procedure (Modified wording in bold)**	**FERC Determination**
		foot-wide floatation channel for lay barge and supply barge access, and up to approximately 100 feet on either side of the floatation channel for construction workspace to deposit sidecast trench material. The 300-foot-wide construction right-of-way allows safe and wholly waterborne construction.	
IV.A.1.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 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;	In construction locations where there is no reasonable alternative other than to locate upland refueling sites less than 100 feet from wetlands or waterbodies, the project will maintain at least a 10-foot setback. All refueling and equipment storage procedures, irrespective of proximity to wetlands or waterbodies, will be undertaken in accordance with the Spill Prevention, Control, and Countermeasure Plans to reduce the potential for spills during construction and to mitigate the environmental impacts if a spill should occur.	FERC accepts that this proposed modification is necessary because the pervasiveness and extent of wetlands and open water in the project area make this measure infeasible and the alternative measure would achieve a comparable level of mitigation.
IV.A.1.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;	Equipment used in wetlands and open water would often operate at long distances (up to several miles) from the nearest upland refueling station. To track the equipment out of the wetland or open water for refueling, possibly on multiple occasions, is logistically impractical and potentially more environmentally damaging than refueling in situ. To minimize the environmental damage caused by excessive tracking, towed fuel barges will accompany amphibious equipment as construction progresses. Equipment operators will be fully trained in refueling procedures and the Spill Prevention, Control, and Countermeasure Plans.	FERC accepts that this proposed modification is necessary because the pervasiveness and extent of wetlands and open water in the project area make this measure infeasible and the alternative measure would achieve a comparable level of mitigation.
VB.2.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.	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 indicated on alignment sheets as located in and within a waterbody. Selected additional temporary workspace (ATWS) in and within 50 feet of the waterbody are necessary due to the lack of cohesiveness in the saturated soil within the pipeline construction right-of-way, and the consequent need for adjacent areas in which the additional volumes of loosely aggregated spoil generated at foreign	FERC accepts that this proposed modification is necessary because the pervasiveness and extent of wetlands and open water in the project area make this measure infeasible. The project sponsors will provide FERC with copies of the wetland delineation report, wetland mitigation plans, and additional agency permits and approvals prior to project construction.

Appendix C, TABLE 2 Requested Modifications to the Federal Energy Regulatory Commission's Procedures			
Section Number	**FERC Procedure**	**Venture Global Procedure (Modified wording in bold)**	**FERC Determination**
		pipeline crossings can be temporarily stored. These ATWS will only be used for placement of spoil; any equipment used for this purpose will work from barges or other similar platforms and will be within a secondary containment structure to reduce the risk of spills of fuels or other pollutants from entering the waterbody. The same secondary containment provisions will apply for equipment operating within the ATWS located at the meter station platforms and the barge staging area.	
V.B.4.b	Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody.	Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody. For pipeline construction, the poor compaction of the native soil in marshland and open water is not conducive to the installation of sediment barriers. Due to the poor cohesiveness of the native spoil, as well as its low angle of repose after sidecasting, the use of sediment barriers, such as silt fences, to prevent the flow of spoil or to contain the spoil would require the barrier to withstand the pressure of the weight of the spoil against the barrier. It is anticipated that the native soil would not offer enough lateral support to withstand the pressure of unconsolidated spoil against the barrier. Therefore, at waterbody crossings during pipeline construction, spoil will be placed in the construction right-of-way and ATWS without lateral silt fencing, with the anticipation that the width of these areas will be sufficient to preclude spoil migration beyond their boundaries. During pipeline installation using the barge lay method, the dredge barge will cast the flotation canal and pipe trench spoil to either side of the right-of-way centerline, keeping the spoil below the water surface, where feasible, to minimize wave-generated turbidity. The spoil will be placed parallel to the trench in 500-foot-long piles, with 50-foot-wide openings to allow the passage of local watercraft.	FERC accepts that this proposed modification is necessary due to the pervasiveness and extent of wetlands and open water in the project area and the alternative measure achieving a comparable level of mitigation.
V.B.10	Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the waterbody or adjacent upland.	Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately prior to initial disturbance of the waterbody or adjacent upland. The	FERC accepts that this proposed modification is necessary due to the pervasiveness and extent of

Appendix C, TABLE 2 Requested Modifications to the Federal Energy Regulatory Commission's Procedures			
Section Number	**FERC Procedure**	**Venture Global Procedure (Modified wording in bold)**	**FERC Determination**
		project sponsors will install sediment barriers, as practicable.	wetlands and open water in the project area and the alternative measure achieving a comparable level of mitigation.
V.B.10.a, b, and c	{Specific measures related to installation of sediment barriers and trench plugs}	Venture Global will implement these measures "Except where the project's push and barge lay method is used on the construction right-of-way."	FERC accepts that this proposed modification is necessary due to the pervasiveness and extent of wetlands and open water in the project area.
VI.A.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.	The project will require a nominal 130-foot-wide right-of-way using the push method for the lateral pipelines in wetlands due to soil conditions along the proposed routes. The soils in the project area are characteristically poorly cohesive and prone to sloughing. This is exacerbated in the inundated or saturated soil conditions found in the marshland and open water areas that characterize the routes. It is anticipated that, to maintain side slopes with a sufficiently shallow angle to prevent collapse, the pipeline trenches will require relatively wide tops and bases. Consequently, a relatively high volume of trench spoil will be generated, necessitating storage piles on both sides of the trench line. Because of the excavated material's lack of cohesion, the storage piles will be relatively wide and low. The 130-foot-wide right-of- way is needed to accommodate the wide trench, the two wide-based storage piles, and equipment that must operate at some distance from the trench line to avoid edge cave-in. The use of the push method for pipeline installation, while reducing equipment-related disturbance, does not preclude the spoil storage issues associated with trench excavation. Installation of silt fences or other containment structures along the outer edges of the construction right-of-way in marshland and open water is technically infeasible, given the poorly compacted benthic substrate and average water depth of several feet. Compared to a narrower workspace, the 130-foot workspace width means that laterally migrating spoil is more likely to remain in an authorized area (the workspace),	FERC accepts that this proposed modification is necessary because of the inundated or saturated soil conditions found in the marshland and open water areas, which make constructing within a 75-foot-wide right-of-way infeasible. The alternative measures would achieve a comparable level of mitigation.

Appendix C, TABLE 2 Requested Modifications to the Federal Energy Regulatory Commission's Procedures			
Section Number	**FERC Procedure**	**Venture Global Procedure (Modified wording in bold)**	**FERC Determination**
		where any remedial measures can be readily and effectively deployed. The project will require a 300-foot-wide right-of-way using the barge lay method, used to install the pipelines in open water along the proposed routes. In water depths of less than 8 feet, it is anticipated that the dredge barge will first excavate the flotation canal. Afterwards the pipe trench will be excavated along the bottom of the flotation canal. The dredge barge will cast the flotation canal and pipe trench spoil to either side of the right-of-way centerline, keeping the spoil below the water surface, where feasible, to minimize wave-generated turbidity. The spoil will be placed parallel to the trench in 500-foot-long piles, with 50-foot-wide openings to allow the passage of local watercraft.	
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.	While avoidance and minimization of wetland impacts was integral to site selection, construction of the project's aboveground facilities will permanently impact some wetlands, as well as uplands. All wetlands impacted will be appropriately mitigated, and construction of the aboveground structures will result in no net loss of wetlands. The project sponsors will provide FERC with copies of the wetland delineation report, wetland mitigation plans, and additional agency permits and approvals prior to project construction.	FERC accepts that this proposed modification is necessary because the site and size of the LNG terminal make avoiding wetlands infeasible. The project sponsors will provide FERC with copies of the wetland delineation report, wetland mitigation plans, and additional agency permits and approvals prior to project construction.
VI.B.1.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.	Several ATWSs are necessarily located in wetlands and waterbodies due to their intended use and the limited availability of suitable upland sites. These include ATWSs required at the mainline valve sites and HDD exit and/or entry locations, set-up sites for push method operations, bore exit and/or entry locations, and crossing sites of multiple foreign pipelines. The project sponsors believe there are no feasible location alternatives for these ATWSs that would cause less significant environmental impacts. Moreover, most of the ATWSs are required for HDD, push method pipeline installation, and bore crossings, methods that have been selected to minimize or avoid greater environmental impacts elsewhere.	FERC accepts that this proposed modification is necessary because the pervasiveness and extent of wetlands and open water in the project area make this measure infeasible. The project sponsors will provide FERC with copies of the wetland delineation report, wetland mitigation plans, and additional agency permits and approvals prior to project construction.

Appendix C, TABLE 2 Requested Modifications to the Federal Energy Regulatory Commission's Procedures			
Section Number	**FERC Procedure**	**Venture Global Procedure (Modified wording in bold)**	**FERC Determination**
VI.B.1.c	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	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. Project construction is primarily located within wetlands and waterbodies, and certain work areas may require access via the construction right-of-way across wetland areas or waterbodies. The push method will be used to install portions of the lateral pipelines with limited equipment traffic crossing the wetlands. At certain locations, such as tie-ins or foreign line crossings, additional equipment will be required to complete the pipeline installation. To access these locations, multiple passes of construction equipment through the wetlands will be required using the construction right-of-way. Access channels through open water will be used to mobilize construction equipment to install the majority length of the lateral pipelines using the barge lay method. 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	FERC accepts that this proposed modification is necessary because the pervasiveness and extent of wetlands and open water in the project area make this measure infeasible. The project sponsors will provide FERC with copies of the wetland delineation report, wetland mitigation plans, and additional agency permits and approvals prior to project construction.
VI.B.1.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.	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. The project will require one new permanent access road to access two mainline valve sites during project operation; this road will also be used during construction. The project will require one new temporary access road to access pipe bridge and HDD sites during construction. Both roads cross some wetlands, but they represent the shortest travel distance to the sites and, given the extensive wetlands in their area, there are no practicable alternative routes with less wetland impacts. All impacts will be appropriately mitigated in accordance with applicable regulatory requirements.	FERC accepts that this proposed modification is necessary because the pervasiveness and extent of wetlands in the project area make avoiding them with all access roads infeasible. The project sponsors will provide FERC with copies of the wetland delineation report, wetland mitigation plans, and additional agency permits and approvals prior to project construction.
VI.B.2.d	Minimize the length of time that topsoil is segregated and the trench is open. Do not trench the wetland	Minimize the length of time that topsoil is segregated and the trench is open. The project will use the push method for	FERC accepts that the proposed alternative measure will achieve a

Appendix C, TABLE 2 Requested Modifications to the Federal Energy Regulatory Commission's Procedures			
Section Number	**FERC Procedure**	**Venture Global Procedure (Modified wording in bold)**	**FERC Determination**
	until the pipeline is assembled and ready for lowering in.	portions of the SW TETCO and TCP laterals, requiring the excavation of the pipe trench prior to pipeline assembly in order for the assembled pipeline segment to be floated and lowered into in the open trench. Do not trench the wetland until the pipeline is assembled and ready for lowering in.	comparable level of mitigation.
VI.B.3	Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the wetland or adjacent upland.	Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately prior to initial disturbance of the wetland or adjacent upland.	FERC accepts that the proposed alternative measure will achieve a comparable level of mitigation.
VI.B.3.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.	Except for the project's push method use on the construction right-of-way, 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	FERC accepts that this measure is unnecessary in areas sufficiently inundated to allow installation by the push method.
VI.B.3.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.	Except for the project's push method use on the construction right-of-way, 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	FERC accepts that this measure is unnecessary in areas sufficiently inundated to allow installation by the push method.
VI.B.3.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.	Except for the project's push method use on the construction right-of-way, 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.	FERC accepts that this measure is unnecessary in areas sufficiently inundated to allow installation by the push method.
VI.C.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).	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 or other species at a rate acceptable to the USACE and LDNR (unless standing water is present).	FERC accepts that the proposed alternative measure will achieve a comparable level of mitigation.

VENTURE GLOBAL LNG

PLAQUEMINES
GATOR EXPRESS

VENTURE GLOBAL PLAQUEMINES LNG, LLC

VENTURE GLOBAL GATOR EXPRESS, LLC

PLAQUEMINES LNG AND GATOR EXPRESS PIPELINE PROJECT

UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN

Docket No.

February 2017

VENTURE GLOBAL PLAQUEMINES LNG, LLC
VENTURE GLOBAL GATOR EXPRESS, LLC

PLAQUEMINES LNG AND GATOR EXPRESS PIPELINE PROJECT

UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN

Table 1.0 below identifies all changes proposed to the Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) for the Plaquemines LNG and Gator Express Pipeline Project (Project). Within the text of the Plan, the changes are ***bolded and italicized***.

TABLE 1.0

Plaquemines LNG and Gator Express Pipeline Project
Table of Changes

Section	Original Text	Proposed Text (Changes bolded and italicized)
II.A.1	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.	The number and experience of Environmental Inspectors assigned ***the Project shall be appropriate for the size of the construction area, the level of activity, and the number/significance of resources affected.***
III.A.1	The project sponsor must ensure that appropriate cultural resources and biological surveys are conducted, as determined necessary by the appropriate federal and state agencies.	***The Project sponsors will*** ensure that appropriate cultural resources and biological surveys are conducted, as determined necessary by the appropriate federal and state agencies.
III.A.2	Project sponsors are encouraged to consider expanding any required cultural resources and endangered species surveys in anticipation of the need for activities outside of authorized work areas.	***The Project sponsors will expand*** any required cultural resources and endangered species surveys in anticipation of the need for activities outside of authorized work areas.
III.B	Drain Tile and Irrigation Systems	***There are no known drain tile irrigation systems in use within the Project area; however, if the Project sponsors become aware of a drain tile system, they will:***
III.G	The project sponsor shall develop project-specific Spill Prevention and Response Procedures, as specified in section IV of the staff's Procedures.	***The Project sponsors will*** develop project-specific Spill Prevention and Response Procedures, ***as contained in a Spill Prevention, Control, and Countermeasure Plan or comparable document***, as specified in section IV of the staff's Procedures.
III.H	For all properties with residences located within 50 feet of construction work areas, project sponsors shall:	For all properties with residences located within 50 feet of construction work areas, ***the Project sponsors will***:
III.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.***
IV.A.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.	***The Project will require a nominal 130-foot-wide right-of-way due to the parallel installation of two 42-inch-diameter pipelines.***
IV.F.3.c	Where wetlands or waterbodies are adjacent to and	***The Project terrain has limited elevation changes***

	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.	***yielding few downslopes. However, the soils in upland areas, as well as wetland areas, are of types that will tend to slough when stacked as spoil. The workspace width (130 feet) will limit sediment migration laterally off the construction right-of-way. At upland and wetland/waterbody interfaces within the construction right-of-way, sediment barriers will be installed as practicable.***

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VENTURE GLOBAL PLAQUEMINES LNG, LLC
VENTURE GLOBAL GATOR EXPRESS, LLC

PLAQUEMINES LNG AND GATOR EXPRESS PIPELINE PROJECT

UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN

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Plaquemines LNG and Gator Express Pipeline Project Upland Erosion Control, Revegetation, and Maintenance Plan

I. APPLICABILITY

Venture Global Plaquemines LNG, LLC (Plaquemines LNG) and Venture Global Gator Express, LLC (Gator Express Pipeline)[1] are adopting the FERC Plan (May 2013 version) for the Plaquemines LNG and Gator Express Pipeline Project (or Project), with modifications. All modifications to the original wording are shown in ***bold italic font***. This Plan will apply to all non-wetland areas of the Project. Wetland and waterbody features are addressed in Plaquemines LNG's and Gator Express Pipeline's Project-specific *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures).

Deviations that involve measures different from those contained in this 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. The Project sponsors 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 for each construction spread 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 Plan, the Procedures, the environmental conditions of the FERC's Orders, the mitigation measures proposed by the project sponsor (as approved and/or modified by the Order), other environmental permits and approvals, and environmental requirements in landowner easement agreements.

[1] Venture Global Plaquemines LNG, LLC and Venture Global Gator Express, LLC are wholly owned subsidiaries of Venture Global LNG, Inc.

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 fields, defined as actively managed cropland, 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 project sponsor 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

The project sponsor 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. The ***Project sponsors will*** ensure that appropriate cultural resources and biological surveys are conducted, as determined necessary by the appropriate federal and state agencies.

2. The ***Project sponsors 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 the Project sponsors become aware of a drain tile system, they 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

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

The project sponsor must coordinate with the appropriate local, state, and federal agencies as outlined in this 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, CONTAINMENT, AND COUNTERMEASURES

The Project sponsors will develop project-specific Spill Prevention and Response Procedures, ***as contained in a Spill Prevention, Control, and Countermeasure Plan or comparable document***, 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, ***the Project sponsors 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 cleanup 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 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.

The Project will require a nominal 130-foot-wide right-of-way due to the parallel installation of two 42-inch-diameter pipelines.

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, the project sponsor 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 Plan. Leave adequate room between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition.

c. ***The Project terrain has limited elevation changes yielding few downslopes. However, the soils in upland areas, as well as wetland areas, are of types that will tend to slough when stacked as spoil. The workspace width (130 feet) will limit sediment migration laterally off the construction right-of-way. At upland and wetland/waterbody interfaces within the construction right-of-way, sediment barriers will be installed as practicable.***

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. RESTORATION

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:

1. Signs;
2. Fences with locking gates;
3. Slash and timber barriers, pipe barriers, or a line of boulders across the right-of-way; and
4. 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.
    a. 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.

PLAQUEMINES LNG AND GATOR EXPRESS PIPELINE PROJECT
Resource Report 1
APPENDIX 1D
Project-specific Wetland and Waterbody Construction and Mitigation Procedures

VENTURE GLOBAL LNG

PLAQUEMINES
GATOR EXPRESS

VENTURE GLOBAL PLAQUEMINES LNG, LLC

VENTURE GLOBAL GATOR EXPRESS, LLC

PLAQUEMINES LNG AND GATOR EXPRESS PIPELINE PROJECT

WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

Docket No.

February 2017

VENTURE GLOBAL PLAQUEMINES LNG, LLC
VENTURE GLOBAL GATOR EXPRESS, LLC

PLAQUEMINES LNG AND GATOR EXPRESS PIPELINE PROJECT

WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

Table 1.0 below identifies all changes proposed to the Wetland and Waterbody Construction and Mitigation Procedures for the Plaquemines LNG and Gator Express Pipeline Project (Project). Within the text of the Procedures, the changes are ***bolded and italicized***.

TABLE 1.0

Plaquemines LNG and Gator Express Pipeline Project
Table of Changes

Section	Original Text	Proposed Text (Changes bolded and italicized)
II.A.2	Site-specific justifications for the use of a construction right-of-way greater than 75-feet-wide in wetlands***.***	Site-specific justifications for the use of a construction right-of-way greater than 75-feet-wide in wetlands***. The Project requires a 130-foot-wide construction right-of-way for pipeline installation where the Push method is used, due to the need for a relatively wide and deep trench to ensure the required depth of cover in the wet, poorly cohesive, and easily sloughed substrate, and the consequent need for increased space to sidecast relatively high spoil volumes. The Project requires a 300-foot-wide construction right-of-way for pipeline installation in open waters, where the Barge Lay method is used, to accommodate an approximately 100-foot-wide floatation channel for lay barge and supply barge access, and up to approximately 100 feet on either side of the floatation channel for construction workspace to deposit sidecast trench material. The 300-foot-wide construction right-of-way allows safe and wholly waterborne construction.***
II.B.2	Project sponsor will revise the schedule as necessary to provide FERC staff at least 14 days advance notice.	The ***Project sponsors*** will revise the schedule as necessary to provide FERC staff at least 14 days advance notice.
III.B.	The Environmental Inspector's responsibilities are outlined in the Upland Erosion Control, Revegetation, and Maintenance Plan (Plan).	The Environmental Inspector's responsibilities are outlined in ***Plaquemines LNG's and Gator Express Pipeline's Project-specific Upland Erosion Control, Revegetation, and Maintenance Plan (Plan)***.
IV.A	The project sponsor shall develop project-specific Spill Prevention and Response Procedures that meet applicable requirements of state and federal agencies.	***The Project sponsors will*** develop project-specific Spill Prevention and Response Procedures that meet applicable requirements of state and federal agencies.
IV.A.1	It shall be the responsibility of the project sponsor and its 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. The project sponsor and its contractors must, at a minimum, ensure that:	It ***will be*** the responsibility of ***Project sponsors*** 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. The ***Project sponsors*** and **their** contractors must, at a minimum, ensure that:

TABLE 1.0

Plaquemines LNG and Gator Express Pipeline Project
Table of Changes

Section	Original Text	Proposed Text (Changes bolded and italicized)
IV.A.1.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 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;	***In construction locations where is no reasonable alternative other than to locate upland refueling sites less than 100 feet from wetlands or waterbodies, the Project will maintain at least a 10-foot setback. All refueling and equipment storage procedures, irrespective of proximity to wetlands or waterbodies, will be undertaken in accordance with Plaquemines LNG's and Gator Express Pipeline's Spill Prevention, Control, and Countermeasure Plans to reduce the potential for spills during construction and to mitigate the environmental impacts if a spill should occur.***
IV.A.1.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;	***Equipment used in wetlands and open water would often operate at long distances (up to several miles) from the nearest upland refueling station. To track the equipment out of the wetland or open water for refueling, possibly on multiple occasions, is logistically impractical and potentially more environmentally damaging than refueling in situ. To minimize the environmental damage caused by excessive tracking, towed fuel barges will accompany amphibious equipment as construction progresses. Equipment operators will be fully trained in refueling procedures and Plaquemines LNG's and Gator Express Pipeline's Spill Prevention, Control, and Countermeasure Plans;***
IV.A.2	The project sponsor and its contractors must 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, the project sponsor and its contractors must:	The ***Project sponsors*** 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, the ***Project sponsors*** and their contractors ***will***:
IV.B	The project sponsor must coordinate with the appropriate local, state, and federal agencies as outlined in these Procedures and in the FERC's Orders.	The ***Project sponsors will*** coordinate with the appropriate local, state, and federal agencies as outlined in these Procedures and in the FERC's Orders.
V.B.1.b	Coolwater and warmwater fisheries - June 1 through November 30.	Coolwater and warmwater fisheries - June 1 through November 30. ***The schedule for pipeline construction in open waters will necessarily be integrated with the overall Project schedule, such that certain Terminal facilities can receive gas supply at the appropriate time. As such, pipeline construction cannot be restricted to a specific seasonal timeframe. Use of the Push and Barge Lay installation methods will minimize impacts over reasonable alternative methods. Similarly, marine facility construction on the Mississippi River cannot be restricted to a specific seasonal timeframe, based on the anticipated length of the construction period and the need for an integrated schedule across the multiple Project facilities.***

TABLE 1.0

Plaquemines LNG and Gator Express Pipeline Project
Table of Changes

Section	Original Text	Proposed Text (Changes bolded and italicized)
V.B.4.b.	Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody.	Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody. ***For pipeline construction, the poor compaction of the native soil in marshland and open water is not conducive to the installation of sediment barriers. Due to the poor cohesiveness of the native spoil, as well as its low angle of repose after sidecasting, the use of sediment barriers, such as silt fences, to prevent the flow of spoil or to contain the spoil would require the barrier to withstand the pressure of the weight of the spoil against the barrier. It is anticipated that the native soil would not offer enough lateral support to withstand the pressure of unconsolidated spoil against the barrier. Therefore, at waterbody crossings during pipeline construction, spoil will be placed in the construction right-of-way and ATWS without lateral silt fencing, with the anticipation that the width of these areas will be sufficient to preclude spoil migration beyond their boundaries. During pipeline installation using the Barge Lay method, the dredge barge will cast the flotation canal and pipe trench spoil to either side of the right-of-way centerline, keeping the spoil below the water surface, where feasible, to minimize wave-generated turbidity. The spoil will be placed parallel to the trench in 500-foot-long piles, with 50-foot-wide openings to allow the passage of local watercraft.***
V.B.9	Crossings of Major Waterbodies	The Project involves the crossing of major waterbodies. The ***Project sponsors will comply with the following requirements:***
V.B.10	Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the waterbody or adjacent upland.	Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately ***prior to*** initial disturbance of the waterbody or adjacent upland. The ***Project sponsors will install sediment barriers as practicable.***
V.B.10.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 drivable 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;	***Except for the Project's Push and Barge Lay Method use on the construction right-of-way,*** 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 drivable 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;
V.B.10.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	***Except for the Project's Push and Barge Lay Method use on the construction right-of-way,*** 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
V.B.10.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.	***Except for the Project's Push and Barge Lay Method use on the construction right-of-way,*** 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.

TABLE 1.0

Plaquemines LNG and Gator Express Pipeline Project
Table of Changes

Section	Original Text	Proposed Text (Changes bolded and italicized)
V.C.8.	In addition, install sediment barriers as outlined in Plan.	In addition, install sediment barriers as outlined in ***Plaquemines LNG's and Gator Express Pipeline's Project-specific Upland Erosion Control, Revegetation, and Maintenance Plan***.
VI.A.1	The project sponsor shall conduct a wetland delineation using the current federal methodology and file a wetland delineation report with the Secretary before construction.	***The Project sponsors will*** conduct a wetland delineation using the current federal methodology and file a wetland delineation report with the Secretary before construction.
VI.A.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.	***The Project will require a nominal 130-foot-wide right-of-way using the Push method for the lateral pipelines in wetlands due to soil conditions along the proposed routes. The soils in the project area are characteristically poorly cohesive and prone to sloughing. This is exacerbated in the inundated or saturated soil conditions found in the marshland and open water areas that characterize the routes. Project anticipates that, to maintain side slopes with a sufficiently shallow angle to prevent collapse, the pipeline trenches will require relatively wide tops and bases. Consequently, a relatively high volume of trench spoil will be generated, necessitating storage piles on both sides of the trench line. Because of the excavated material's lack of cohesion, the storage piles will be relatively wide and low. The 130-foot wide right-of-way is needed to accommodate the wide trench, the two wide-based storage piles, and equipment that must operate at some distance from the trench line to avoid edge cave-in. The use of the Push Method for pipeline installation, while reducing equipment-related disturbance, does not preclude the spoil storage issues associated with trench excavation.*** ***Installation of silt fences or other containment structures along the outer edges of the construction right-of-way in marshland and open water is technically infeasible, given the poorly compacted benthic substrate and average water depth of several feet. Compared to a narrower workspace, the 130-foot workspace width means that laterally migrating spoil is more likely to remain in an authorized area (the workspace), where any remedial measures can be readily and effectively deployed.*** ***The Project will require a 300-foot-wide right-of-way using the Barge Lay Method, used to install the pipelines in open water along the proposed routes. In water depths of less than 8 feet, it is anticipated that the dredge barge will first excavate the flotation canal. Afterwards the pipe trench will be excavated along the bottom of the flotation canal. The dredge barge will cast the flotation canal and pipe trench spoil to either side of the right-of-way centerline, keeping the spoil below the water surface, where feasible, to minimize wave-generated turbidity. The spoil will be placed parallel to the trench in 500-foot-long piles, with 50-foot-wide openings to allow the passage of local watercraft.***

TABLE 1.0

Plaquemines LNG and Gator Express Pipeline Project
Table of Changes

Section	Original Text	Proposed Text (Changes bolded and italicized)
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.	***While avoidance and minimization of wetland impacts was integral to site selection, construction of the Project's aboveground facilities will permanently impact some wetlands, as well as uplands. All wetlands impacted will be appropriately mitigated, and construction of the aboveground structures will result in no net loss of wetlands. The Project sponsors will provide the FERC with copies of the wetland delineation report, wetland mitigation plans, and additional agency permits and approvals prior to Project construction.***
VI.B	Installation	***Project access roads may be constructed in delineated wetland areas. Project will provide appropriate mitigation for the unavoidable loss of wetlands due to Project construction. The Project sponsors will provide the FERC with copies of the wetland delineation report, wetland mitigation plans, and additional agency permits and approvals prior to Project construction.***
VI.B.1.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.	***Several ATWSs are necessarily located in wetlands and waterbodies due to their intended use and the limited availability of suitable upland sites. These include ATWSs required at the mainline valve sites and HDD exit and/or entry locations, set-up sites for Push Method operations, bore exit and/or entry locations, and crossing sites of multiple foreign pipelines. The Project sponsors believe there are no feasible location alternatives for these ATWSs that would cause less significant environmental impacts. Moreover, most of the ATWSs are required for HDD, Push Method pipeline installation, and bore crossings, methods that have been selected to minimize or avoid greater environmental impacts elsewhere.***
VI.B.1.b	The project sponsor 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.	The ***Project sponsors 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.

TABLE 1.0

Plaquemines LNG and Gator Express Pipeline Project
Table of Changes

Section	Original Text	Proposed Text (Changes bolded and italicized)
VI.B.1.c	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	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***. Project construction is primarily located within wetlands and waterbodies and certain work areas may require access via the construction right-of-way across wetland areas or waterbodies. The Push Method will be used to install portions of the lateral pipelines with limited equipment traffic crossing the wetlands. At certain locations, such as tie-ins or foreign line crossings, additional equipment will be required to complete the pipeline installation. To access these locations multiple passes of construction equipment through the wetlands will be required , using the construction right-of-way. Access channels through open water will be used to mobilize construction equipment to install the majority length of the lateral pipelines using the Barge Lay Method.*** 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
VI.B.1.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***.***	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***. The Project will require one new permanent access road, to access two mainline valve sites during Project operation; this road will also be used during construction. Project will require one new temporary access road to access pipe bridge and HDD sites during construction. Both roads cross some wetlands but they represent the shortest travel distance to the sites and given the extensive wetlands in their area, there are no practicable alternative routes with less wetland impacts. All impacts will be appropriately mitigated in accordance with applicable regulatory requirements.***
VI.B.2.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.	Minimize the length of time that topsoil is segregated and the trench is open. ***The Project will use the Push Method for portions of the SW Laterals, requiring the excavation of the pipe trench prior to pipeline assembly in order for the assembled pipeline segment to be floated and lowered into in the open trench.*** Do not trench the wetland until the pipeline is assembled and ready for lowering in.
VI.B.3	Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the wetland or adjacent upland.	Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately ***prior to*** initial disturbance of the wetland or adjacent upland.
VI.B.3.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	***Except for the Project's Push Method use on the construction right-of-way,*** 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
VI.B.3.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	***Except for the Project's Push Method use on the construction right-of-way,*** 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

TABLE 1.0

Plaquemines LNG and Gator Express Pipeline Project
Table of Changes

Section	Original Text	Proposed Text (Changes bolded and italicized)
VI.B.3.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	***Except for the Project's Push Method use on the construction right-of-way,*** 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
VI.C6.	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).	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 ***or other species at a rate acceptable to the USACE and LDNR*** (unless standing water is present).

VENTURE GLOBAL PLAQUEMINES LNG, LLC
VENTURE GLOBAL GATOR EXPRESS, LLC

PLAQUEMINES LNG AND GATOR EXPRESS PIPELINE PROJECT

WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

TABLE OF CONTENTS

Plaquemines LNG and Gator Express Pipeline Project

Wetland and Waterbody Construction and Mitigation Procedures

I. APPLICABILITY

A. Venture Global Plaquemines LNG, LLC (Plaquemines LNG) and Venture Global Gator Express, LLC (Gator Express Pipeline)[1] (hereinafter referred to as the Project sponsors) are adopting the FERC Procedures (May 2013 Version) for the Plaquemines LNG and Gator Express Pipeline Project, or Project, with requested modifications necessary to differentiate the Terminal Site, as a discrete facility, from the pipeline construction requirements. All modifications to the original wording are showing in ***bold italic font***. These Procedures will apply to Project construction in all wetlands and waterbodies.

Deviations that involve measures different from those contained in this Procedures document 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. The Project sponsors will file other agency requirements with the Secretary of the Commission (Secretary) prior to construction.

The Project sponsors have identified individual measures in these Procedures that are considered unnecessary, technically infeasible, or unsuitable due to local conditions and fully describes any alternative measures they would use. The Project sponsors also explain how these alternative measures would achieve a comparable level of mitigation.

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

[1] Venture Global Plaquemines LNG, LLC and Venture Global Gator Express, LLC are wholly owned subsidiaries of Venture Global LNG, Inc.

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***. The Project requires a 130-foot-wide construction right-of-way for pipeline installation where the Push method is used, due to the need for a relatively wide and deep trench to ensure the required depth of cover in the wet, poorly cohesive, and easily sloughed substrate, and the consequent need for increased space to sidecast relatively high spoil volumes. The Project requires a 300-foot-wide construction right-of-way for pipeline installation in open waters, where the Barge Lay method is used, to accommodate an approximately 100-foot-wide floatation channel for lay barge and supply barge access, and up to approximately 100 feet on either side of the floatation channel for construction workspace to deposit sidecast trench material. The 300-foot-wide construction right-of-way allows safe and wholly waterborne construction.***

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. The ***Project sponsors*** 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 ***Plaquemines LNG's and Gator Express Pipeline's Project-specific Upland Erosion Control, Revegetation, and Maintenance Plan (Plan)***.

IV. PRECONSTRUCTION PLANNING

A. The ***Project sponsors 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 ***will*** be the responsibility of the ***Project sponsors*** 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. The ***Project sponsors*** 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. In construction locations where is no reasonable alternative other than to locate upland refueling sites less than 100 feet from wetlands or waterbodies, the Project will maintain at least a 10-foot setback. All refueling and equipment storage procedures, irrespective of proximity to wetlands or waterbodies, will be undertaken in accordance with Plaquemine LNG's and Gator Express Pipeline's Spill Prevention, Control, and Countermeasure Plans to reduce the potential for spills during construction and to mitigate the environmental impacts if a spill should occur;

   e. ***Equipment used in wetlands and open water would often operate at long distances (up to several miles) from the nearest upland refueling station. To track the equipment out of the wetland or open water for refueling, possibly on multiple occasions, is logistically impractical and potentially more environmentally damaging than refueling in situ. To minimize***

the environmental damage caused by excessive tracking, towed fuel barges will accompany amphibious equipment as construction progresses. Equipment operators will be fully trained in refueling procedures and Plaquemines LNG's and Gator Express Pipeline's Spill Prevention, Control, and Countermeasure Plans;

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. The ***Project sponsors*** 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, the ***Project sponsors*** and ***their*** 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 material contaminated by a spill, and in collecting and disposing of waste generated during spill cleanup.

B. AGENCY COORDINATION

The ***Project sponsors will*** coordinate with the appropriate local, state, and federal agencies as outlined in these 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 (USACE), 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. ***The schedule for pipeline construction in open waters will necessarily be integrated with the overall Project schedule, such that certain Terminal facilities can receive gas supply at the appropriate time. As such, pipeline construction cannot be restricted to a specific seasonal timeframe. Use of the Push and Barge Lay installation methods will minimize impacts over reasonable alternative methods. Similarly, marine facility construction on the Mississippi River cannot be restricted to a specific seasonal timeframe, based on the anticipated length of the construction period and the need for an integrated schedule across the multiple Project facilities.***

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. The Project sponsors 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 USACE, 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. ***For pipeline construction, the poor compaction of the native soil in marshland and open water is not conducive to the installation of sediment barriers. Due to***

the poor cohesiveness of the native spoil, as well as its low angle of repose after sidecasting, the use of sediment barriers, such as silt fences, to prevent the flow of spoil or to contain the spoil would require the barrier to withstand the pressure of the weight of the spoil against the barrier. It is anticipated that the native soil would not offer enough lateral support to withstand the pressure of unconsolidated spoil against the barrier. Therefore, at waterbody crossings during pipeline construction, spoil will be placed in the construction right-of-way and ATWS without lateral silt fencing, with the anticipation that the width of these areas will be sufficient to preclude spoil migration beyond their boundaries. During pipeline installation using the Barge Lay method, the dredge barge will cast the flotation canal and pipe trench spoil to either side of the right-of-way centerline, keeping the spoil below the water surface, where feasible, to minimize wave-generated turbidity. The spoil will be placed parallel to the trench in 500-foot-long piles, with 50-foot-wide openings to allow the passage of local watercraft.

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

      (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 USACE, 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 involves the crossing of major waterbodies. The ***Project sponsors will comply with the following requirements:***

Before construction, the project sponsor shall 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 ***prior to*** initial disturbance of the waterbody or adjacent upland. The ***Project sponsors will install sediment barriers as practicable.***

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. ***Except for the Project's Push and Barge Lay Method use on the construction right-of-way,*** 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 drivable 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. ***Except for the Project's Push and Barge Lay Method use on the construction right-of-way,*** 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. ***Except for the Project's Push and Barge Lay Method use on the construction right-of-way,*** 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 USACE, 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 ***Plaquemines LNG's and Gator Express Pipeline's Project-specific Upland Erosion Control, Revegetation, and Maintenance 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-wide 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. The ***Project sponsors 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. The Project will require a nominal 130-foot-wide right-of-way using the Push method for the lateral pipelines in wetlands due to soil conditions along the proposed routes. The soils in the project area are characteristically poorly cohesive and prone to sloughing. This is exacerbated in the inundated or saturated soil conditions found in the marshland and open water areas that characterize the routes. Project anticipates that, to maintain side slopes with a sufficiently shallow angle to prevent collapse, the pipeline trenches will require relatively wide tops and bases. Consequently, a relatively high volume of trench spoil will be generated, necessitating storage piles on both sides of the trench line. Because of the excavated material's lack of cohesion, the storage piles will be relatively wide and low. The 130-foot wide right-of-way is needed to accommodate the wide trench, the two wide-based storage piles, and equipment that must operate at some distance from the trench line to avoid edge cave-in. The use of the Push Method for pipeline installation, while reducing equipment-related disturbance, does not preclude the spoil storage issues associated with trench excavation.

Installation of silt fences or other containment structures along the outer edges of the construction right-of-way in marshland and open water is technically infeasible, given the poorly compacted benthic substrate and average water depth of several feet. Compared to a narrower workspace, the 130-foot workspace width means that laterally migrating spoil is more likely to remain in an authorized area (the workspace), where any remedial measures can be readily and effectively deployed.

The Project will require a 300-foot-wide right-of-way for the Barge Lay Method, used to install the pipelines in open water along the proposed routes. In water depths of less than 8 feet, it is anticipated that the dredge barge will first excavate the flotation canal. Afterwards the pipe trench will be excavated along the bottom of the flotation canal. The dredge barge will cast the flotation canal and pipe trench spoil to either side of the right-of-way centerline, keeping the spoil below the water surface, where feasible, to minimize wave-generated turbidity. The spoil will be placed parallel to the trench in 500-foot-long piles, with 50-foot-wide openings to allow the passage of local watercraft.

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 and 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. While avoidance and minimization of wetland impacts was integral to site selection, construction of the Project's aboveground facilities will permanently impact some wetlands, as well as uplands. All wetlands impacted will be appropriately mitigated, and construction of the aboveground structures will result in no net loss of wetlands. The Project sponsors will provide the FERC with copies of the wetland delineation report, wetland mitigation plans, and additional agency permits and approvals prior to Project construction.

B. INSTALLATION

Project access roads may be constructed in delineated wetland areas. Project will provide appropriate mitigation for the unavoidable loss of wetlands due to Project construction. The Project sponsors will provide the FERC with copies of the wetland delineation report, wetland mitigation plans, and additional agency permits and approvals prior to Project construction.

1. Extra Work Areas and Access Roads

   a. Several ATWSs are necessarily located in wetlands and waterbodies due to their intended use and the limited availability of suitable upland sites. These include ATWSs required at the mainline valve sites and HDD exit and/or entry locations, set-up sites for Push Method operations, bore exit and/or entry locations, and crossing sites of multiple foreign pipelines. Project believes there are no feasible location alternatives for these ATWSs that would cause less significant environmental impacts. Moreover, most of the ATWSs are required for HDD, Push Method pipeline installation, and bore crossings, methods that have been selected to minimize or avoid greater environmental impacts elsewhere.

   b. The ***Project sponsors 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***. Project construction is primarily located within wetlands and waterbodies and certain work areas may require access via the construction right-of-way across wetland areas or waterbodies. The Push Method will be used to install portions of the lateral pipelines with limited equipment traffic crossing the wetlands. At certain locations, such as tie-ins or foreign line crossings, additional equipment will be required to complete the pipeline installation. To access these locations multiple passes of construction equipment through the wetlands will be required, using the construction right-of-way. Access channels through open water will be used to mobilize construction equipment to install the majority length of the lateral pipelines using the***

Barge Lay Method. 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***. The Project will require one new permanent access road, to access two mainline valve sites during Project operation; this road will also be used during construction. Project will require one new temporary access road to access pipe bridge and HDD sites during construction. Both roads cross some wetlands but they represent the shortest travel distance to the sites and given the extensive wetlands in their area, there are no practicable alternative routes with less wetland impacts. All impacts will be appropriately mitigated in accordance with applicable regulatory requirements.***

2. Crossing Procedures

a. Comply with USACE, 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 Method" 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. ***The Project will use the Push Method for portions of the SW Laterals, requiring the excavation of the pipe trench prior to pipeline assembly in order for the assembled pipeline segment to be floated and lowered into in the open trench.*** 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 USACE 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 ***prior to*** 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. ***Except for the Project's Push Method use on the construction right-of-way,*** 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. ***Except for the Project's Push Method use on the construction right-of-way,*** 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. ***Except for the Project's Push Method use on the construction right-of-way,*** 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 ***or other species at a rate acceptable to the USACE and LDNR*** (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.

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, will require secondary containment and refueling of these pumps in the project's Spill Prevention, Control, and Countermeasure plan.

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 D

HORIZONTAL DIRECTIONAL DRILLING CONTINGENCY PLAN

ENengineering

VENTURE GLOBAL LNG

Horizontal Directional Drilling Contingency Plan

Gator Express Pipeline Project

Submitted By:

EN Engineering

Warrenville, Illinois

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Prepared By: ENengineering

EN Engineering Project Number: 157407

Revision No.	Prepared By	Date	Checked By	Date	Approved By	Date	Client Approval By	Date	Revision Description
A	PT	11/11/16	ML	11/11/16	NP	11/11/16			Pipeline Lateral names update
B	ML	02/22/17	ML	02/22/17	NP	02/22/17	BF	02/22/17	Revised Per Client Comments

GATOR EXPRESS PIPELINE, LLC
GATOR EXPRESS PIPELINE PROJECT
HDD CONTINGENCY PLAN

1.0 PURPOSE AND NEED

As part of its Gator Express Pipeline Project (Project), Gator Express Pipeline, LLC (Gator Express Pipeline) proposes to use the Horizontal Directional Drilling (HDD) method to install pipe across various large spans of wetlands, waterbodies, roads, utilities and other obstacles obstructing the proposed pipeline alignment. The HDD method of installation reduces disturbances during pipeline construction by passing underneath sensitive features at the surface. The HDD method avoids disturbance to the bed and bank of a waterbody being crossed, keeps sensitive environmental resources and vegetation intact, and/or allows for a highway or other fixed feature to be crossed while avoiding open cut excavation between the drill entry and exit points. However, if a natural fracture or an unconsolidated area in the ground is encountered during drilling, an unexpected release of drilling mud could occur. For consistency within this HDD Contingency Plan, an unexpected release of drilling fluid will be referred to as an inadvertent return. Due to the potential of inadvertent returns, it is important to have a plan in place to establish the proper procedures and responsibilities of onsite personnel.

The objective of this HDD Contingency Plan is to:

- Provide procedures that will minimize the potential for release of drilling mud into sensitive resource areas such as wetlands and waterbodies, or onto adjacent upland surfaces;
- Provide for timely detection of inadvertent returns;
- Ensure the implementation of an organized, timely, and “minimum-impact” response in the event an inadvertent return of drilling fluid occurs;
- Ensure that all appropriate notifications are made in a timely manner;
- Provide for an alternative plan in case of drill failure; and,
- Establish the criteria by which Gator Express Pipeline will determine when a proposed HDD crossing is unsuccessful and must be abandoned.

2.0 HDD PROCESS

2.1 DRILLING BASICS

The HDD Method is a technically advanced process involving specialized equipment and skilled operators. The primary environmental risk associated with this construction method comes from the potential for inadvertent release of drilling mud. The supervision of inadvertent release monitoring is the responsibility of both the drilling Contractor and Gator Express Pipeline.

Minimal, consistent loss of drilling mud typically occurs during the HDD operation when layers of loose sand, gravel, or fractured rock are encountered and drilling mud fills voids in those sub-surface materials. However, a significant loss of returning drill mud and a reduction in drilling pressure indicates that excessive seepage is occurring outside of the drill hole.

2.2 DRILLING MUD AND DRILLING MUD SYSTEM

The HDD Method uses drilling mud consisting primarily of water and bentonite, a naturally occurring clay. Drilling mud removes the cuttings from the drill hole, stabilizes the walls of the drill hole, and acts as a coolant and lubricant to the drill bit during the drilling process. The drilling mud mixture consists of 1 to 5 percent bentonite clay and from 0 to 40 percent inert solids from the drill hole cuttings, with the remainder being water.

The drilling mud is prepared in a mixing tank using both new and clean recycled drilling mud. The mud is pumped at rates of 200 gallons per minute (gpm) to 1,000 gpm through the center of the drill pipe to the drilling tools. Return flow is through the annulus created between the wall of the drill hole and the drill pipe. During the pilot hole drilling operation, the cuttings are returned to a small excavation at the entry point called the entry pit. From the entry pit, the returned mud is pumped to the mud processing equipment. Typically, shaker screens, desanders, desilters, and centrifuges process and remove increasingly finer cuttings from the drilling mud. The clean mud is recycled to the mixing tank for reuse in the borehole. The cuttings removed by the cleaning process are disposed of at a site approved to accept this type of material.

Certain additives may be introduced into the drilling mud mix based on changing conditions during the drilling activities. Typical drilling fluid additives are listed below.

Additive	Description	Purpose or Use	Approximate and Typical Concentration (% by volume)
Pargel 220®	A naturally occurring Wyoming bentonite clay with low sand content	Lubrication, stabilization of the borehole walls, and the suspension and removal of soil cuttings from the bore	3.6
Polypac R®	100 percent carboxymethylcellulose sodium salt, a polyanionic cellulose polymer	To control fluid loss and increase the viscosity of the drilling fluid	0.02
Soda Ash	100 percent sodium carbonate	To Increase the pH of the drilling fluids to precipitate calcium	0.06
Ringfree®	60 to 100 percent acrylic polymer	To eliminate or cut mud bridging and free up borehole circulation; helps free stuck pipe because it dissolves sticky clays.	0.02 (as a single 60-gallon slug)
FSF Polyswell®	100 percent acrylamide polymer or copolymer	Primarily as a lost circulation material	0.02
My-Lo-Jal®	100 percent pre-gelantized starch	Fluid loss agent and viscosifier	0.02
Smooth Grout 20	Borehole plugging and grouting material	This product will be used to plug excessive losses	0.1
Smooth Bore/ Maxbore HDD	Premium grade, Wyoming sodium bentonite	Improves suspension properties and filtration control to freshwater fluids, as well as adds gel strength to compensate for low annular velocity.	As Required

Various brands of drilling fluid products may be used based on: functionality, economics, geographic-location to suppliers, and type of geological formation anticipated at the drill site. Equivalent brands of products may be supplied as an alternative.

3.0 DRILLING MUD RELEASE

3.1 PREVENTION

The HDD method is typically used to avoid congested areas and/or to avoid disturbance of sensitive surface features, including wetlands and waterbodies. HDD does, however, present potential for surface disturbance through inadvertent drilling mud releases. Drilling mud releases are typically caused by blockage of the return flow path around the drill pipe where pressurization of the drilling mud rises above the containment capability of the overburden soil material. Pressurized drilling mud follows the path of least resistance, which may result in the drilling mud flowing to the ground surface should the annulus around the drill pipe become plugged. Releases may follow fractures in bedrock or other voids in the strata that allow the mud to penetrate the surface.

3.1.1 Suitable Material and Adequate Overburden Criteria

Prevention of drilling mud seepage is a major consideration in determining the profile of the HDD crossing. The primary factors in selecting the pipeline crossing profile include the type of soil and rock, the physical condition of the geological materials, and the depth of adequate overburden cover material. Cohesive soils, such as clays, dense sands and competent rock are considered ideal materials for horizontal drilling.

The areas that present the highest potential for drilling mud seepage are the drill entry and exit points where the overburden depth is minimal. At both the entry and exit points, above ground containment containers will provide temporary storage for the inadvertently released drilling mud or seepage until it can be pumped back into the drilling system.

3.1.2 Pipeline Geometry

The geometry of the pipeline drilling profile can also affect the potential for drilling fluid seepage. In a profile which forces the pipe to make compound or excessively tight radii turns, downhole pressures can build up, thereby, increasing the potential for drilling fluid seepage. The profiles for the proposed crossings minimize this potential, with very smooth and gradual vertical curves. HDD design and planning minimizes the potential for pressure buildup caused by pipeline drilling geometry.

3.1.3 General Observations Regarding Inadvertent Returns

The risk of HDD inadvertent returns can also be reduced by evaluating those subsurface conditions prior to construction that could be conducive to inadvertent returns or drill failure, including:

- Highly permeable soil such as gravel;
- Soil test bore holes in close proximity to the drill path;
- Presence of rock joints or other subsurface fractures;
- Considerable differences in the elevations of HDD entry and exit points; and,
- Disturbed soil, such as fill.

3.1.4 Responsibility of Drilling Contractor

Project specifications will require that the drilling Contractor be fully qualified and experienced with HDD construction. The HDD Contractor will be responsible for monitoring down-hole drilling fluid pressures and drilling fluid flows and keeping these parameters within safe limits. The Contractor will also be responsible for complying with all permit requirements, technical specifications, and this HDD Contingency Plan. The HDD Contractor will be required to submit a detailed pre-construction contingency plan that supplements this plan. The plan should include measured design considerations that the Contractor made in its HDD design to mitigate inadvertent returns. General HDD activities will be conducted consistent with Gator Express Pipeline's Storm Water Pollution Prevention Plan (SWPPP).

3.1.5 Training

Prior to the start of construction, the Construction Manager and Environmental Inspector (EI) will verify that the construction field crew members receive the following site-specific training:

- Review provisions of this HDD Contingency Plan, equipment maintenance and site-specific permit and monitoring requirements;
- Review location of sensitive environmental resources at the site and relevant permit conditions; review inspection procedures for inadvertent return prevention and be familiar with containment equipment and materials;
- Review Contractor/crew obligation to temporarily suspend forward progress of the drilling upon first evidence of the occurrence of an inadvertent return and to report any inadvertent returns to the EI;
- Review operation of the control equipment and the location of control materials, as necessary and appropriate; and,
- Review protocols for reporting observed inadvertent returns and communication with appropriate regulatory agencies.

3.2 DETECTION AND MONITORING PROCEDURES

The Contractor, Construction Inspector and EI will perform continuous monitoring of the HDD operation to ensure adequate protection/controls have been installed. As noted, field personnel will be trained regarding their responsibility to promptly report inadvertent releases to the EI on site.

The Contractor will provide a trained operator with experience in HDD techniques to monitor drilling fluid returns at the drilling mud return pits. If the EI or operator identifies seepage of drilling fluid, the EI has the authority to halt construction until the seepage is controlled and corrective action taken. The EI will be responsible for reporting any drilling fluid seepage or spill in monitoring reports and notifying the appropriate agencies as discussed below.

3.2.1 Monitoring Procedures Will Include:

1. Inspection along the drill path;

2. Continuous examination of drilling mud pressure gauges and return flows to the surface pits; and

3. Monitoring of drilling status information regarding drilling conditions and drill profile alignments.

3.2.2 If a Release Occurs in a Wetland or Waterbody:

1. The drilling mud will be contained where practicable;

2. Continue inspection to determine any potential for movement of released drilling mud within the wetland or waterbody;

3. Collect drilling mud returns at the location for future analysis, if required; and

4. EI to provide photographic documentation and other documentation of the release (Gator Express Pipeline will keep photographs of release events on record).

Throughout the drilling and inspection effort, the Contractor, Construction Inspector, and EI will work together to avoid any drilling operation shut-downs. Avoiding shut-downs increases the likelihood of a successful drill and can limit the timeframe of potential inadvertent returns.

4.0 NOTIFICATION PROCEDURES

If monitoring indicates a release is occurring or has occurred, the Contractor will begin containment immediately while the Construction Inspector or EI will notify Gator Express Pipeline construction management personnel immediately.

Gator Express Pipeline will notify the appropriate agencies (see appendix for contact information) immediately upon discovery of an inadvertent wetland or waterbody release, detailing the location and nature of the release, corrective actions being taken, and whether the release poses any threat to public health and safety.

5.0 CORRECTIVE ACTION

In the event that an inadvertent return is observed or suspected during an HDD crossing, it will be assessed to determine the amount of drilling mud (or slurry) being returned and the potential for the inadvertent return to reach the ground, wetland, or waterbody. Response measures will vary based on the location of inadvertent return as described below. At a minimum, the following containment, response, and clean-up equipment will be available at each bored crossing location at the time such crossing occurs:

- sand bags
- silt fence;
- plastic sheeting;
- turbidity barriers;
- shovels, pails;
- push brooms;
- squeegees;

- pumps and sufficient hose;
- mud storage tanks; and
- vacuum truck on 24-hour call (a vacuum truck may be on site to haul return mud back to the recirculating tank.)

Gator Express Pipeline will address an inadvertent release immediately upon discovery. The following measures will be implemented to minimize or prevent further release, contain the release, and clean up the affected area.

5.1 HDD ENTRY AND EXIT LOCATIONS

There is a greater potential for drilling fluid seepage at the entry and exit locations than other areas along the HDD. In the contingency planning for the pipeline crossing, drilling fluid seepage at the entry and exit locations has been considered, and preventative actions have been developed. To contain and control drilling fluid seepage on the land area, there will be earth-moving equipment such as backhoes or small bulldozers, portable pumps, sandbags, and straw bales available at each of the drilling sites. Any drilling fluid seepage will first be contained and isolated using sandbag berms, straw bales, silt screens or other suitable structures. For larger returns, a sump may need to be excavated for containment purposes. Once the return is effectively contained, pumps or vacuum trucks will be used to remove accumulated drilling fluid and, if practical, return it to the active drilling fluid system.

If public health and safety are threatened by an inadvertent release, drilling operations will be shut down until the threat is eliminated.

5.2 WATERBODY OR WETLAND RELEASE

Straw bales and silt fences will also be on site readily available for upland and wetland containment situations. Sufficient spill-absorbent material will be on-site in the event of an inadvertent return. All inadvertent returns will be immediately contained and reported as required.

Should an inadvertent return occur within a waterway, the Contractor will notify appropriate parties and evaluate the potential impact of the return on a site-specific basis in order to determine an appropriate course of action. In general, Gator Express Pipeline considers that trying to contain and collect drilling fluid returns in a waterway is not environmentally beneficial. HDD drilling fluids are nontoxic and discharge of the amounts normally associated with inadvertent returns do not pose a threat to public health and safety. Placement of containment structures and attempting to collect drilling fluid within a waterway often result in greater environmental impact than allowing the drilling fluid returns to dissipate naturally.

The Contractor will be responsible for using a drilling fluid with the appropriate viscosity, maintaining the appropriate amount of pressure, and for establishing and maintaining containment measures at each drill endpoint. If an inadvertent return is observed or suspected within a wetland or waterbody, the following measures will be implemented:

5.2.1 Wetland Locations

- Temporarily suspend forward drilling and promptly notify the Construction Manager and EI.

- Notification of an inadvertent return to the appropriate Regulatory Agencies listed in the appendix of this HDD Contingency Plan. As long as such notification is possible (e.g., there is phone service) and it does not interfere with response activities, the Regulatory Agencies mentioned above shall be notified within two (2) hours of the inadvertent return event.

- The Construction Manager and EI will evaluate wetland inadvertent returns and, in consultation with Gator Express Pipeline and regulatory agencies, implement appropriate response and cleanup measures. Inadvertent return slurries in or adjacent to wetlands will be removed to the extent practical and the area restored to its previous condition. Efforts to contain and recover slurry in wetlands may result in further disturbance by equipment and personnel, and possibly offset the benefit gained in removing the slurry. Because it is difficult to predict the effect of an inadvertent return and attempts to recover the slurry, any inadvertent returns within a wetland will be evaluated on a case-by-case basis, and an appropriate level of response will be implemented with the intent to minimize any further impact to the area.

  - If the amount of the inadvertent return slurry is too small to allow the practical physical collection from the affected area, it will be diluted with fresh water and/or the fluid will be allowed to dry and dissipate naturally.

  - If the amount of the slurry exceeds that which can be contained with hand-placed barriers, small collection sumps (less than 5 cubic yards) may be used to remove the slurry.

  - If the amount of the slurry exceeds that which can be contained and collected using small sumps, drilling operations will be suspended until the inadvertent return can be brought under control. Suspending drilling operations immediately is not ideal because the loss of pressure in the borehole could result in a collapse of the borehole.

  - The slurry will be stored in a temporary holding tank or other suitable structure, for reuse or disposal.

Secondary containment will be used for portable equipment brought onto the project site (such as portable pumps). Secondary containment will consist of spill basins large enough to contain the equipment or earthen berms designed to encompass the equipment, lined with polyethylene sheeting. After the inadvertent release is stabilized and any required removal is completed, document post-cleanup conditions with photographs and prepare incident report describing time, place, actions taken to remediate inadvertent release, and measures implemented to prevent recurrence, in accordance with SWPPP. Incident reports will be provided to Gator Express Pipeline and distributed to appropriate regulatory agencies.

If public health and safety are threatened, drilling mud circulation pumps will be turned off. This measure will be taken as a last resort because of the potential for the drill hole to collapse resulting from loss of down-hole pressure. If monitoring indicates that the intake water quality at adjacent or downstream user locations is impacted to the extent that it is no longer suitable for treatment, alternative water sources (i.e., trucked or bottled water) will be provided to impacted users. Gator Express Pipeline will assist agencies with any sampling they may require.

5.2.2 Waterbody Locations

- Temporarily suspend forward progress and notify the Construction Manager and EI. The EI will monitor the extent of the slurry plume.
- Notification of an inadvertent return to the appropriate regulatory agencies listed in the appendix of this HDD Contingency Plan. As long as such notification is possible (e.g., there is phone service) and it does not interfere with response activities, the Regulatory Agencies mentioned above shall be notified within two (2) hours of the inadvertent return event.
- Initiate containment measures and recovery of the slurry as appropriate. Containment is not always feasible for waterway inadvertent returns. However, conditions will be assessed as to whether hand-placed containment, recovery or other measures, such as silt curtains and turbidity barriers, would be effective and beneficial at the specific inadvertent return location. Returns will be contained using sandbags and contained mud recovered by pumping or other means effectively removing the mud to the best extent practical.
- Evaluate the current drill profile (e.g., drill pressures, pump volume rates, drilling mud consistency) to identify means to prevent further inadvertent return events. Drilling operations will be suspended if the return poses a threat to human health and safety or the environment.
- Once the return is mitigated and controlled, forward progress of the drilling may resume.

5.3 UNCONTROLLABLE RELEASE

If an inadvertent release of drilling mud exceeds that which can be contained and controlled either because of volume or rate, HDD activities will cease. An evaluation will provide the probable cause of the release and the stage of the drill installation. Based on the evaluation, the measures described in the following paragraphs will be implemented.

Depending on the current stage of the installation, the HDD Contractor may choose to plug the hole near the fracture with heavyweight material (i.e., sawdust, nut shells, bentonite pellets, or other commercially available non-toxic product). If the inadvertent release of drilling mud occurs while drilling the pilot hole, the HDD Contractor may choose to back out of the hole by a predetermined distance and then create a new hole by drilling out of the original hole. Therefore, Procedures 1 or 2 listed below could occur in either order.

1. Plug the fissures/fracture, then:

   a) Pump sealers such as sawdust, nutshells, bentonite pellets, or other commercially available non-toxic products into the drill hole;

   b) Let set for an appropriate period of time (dependent upon sealant used); and

   c) Resume HDD activities.

2. If a fissure/fracture cannot be plugged, then, if practical:

   a) Remove drill pipe from the existing drill hole to a point where a new drill path can be attempted by drilling out of the existing hole and creating a new hole. The original hole will be abandoned and filled with bentonite and cuttings. The cuttings that are returned to the hole should only be equal to those removed from the hole. The return should not be under high pressure, therefore additional releases would not be anticipated.

   b) Resume HDD activities.

3. If the original drill path cannot be utilized:

   a) Abandon the original drill hole by pumping bentonite and cuttings downhole, then seal the top 5 vertical feet with grout. Grouting abandoned drill holes is an industry standard practice and serves to prevent the abandoned hole from disrupting groundwater flow.

   b) Move the drill rig to a new, adjacent location.

   c) Verify that the new, adjacent location meets the requirements of all applicable project permits and approvals. If the new, adjacent location does not meet the requirements of all applicable project permits and approvals, operations will cease until new permits and approvals are received.

   d) Design an alternative alignment for the re-drill.

   e) Begin HDD re-drill activities.

If all HDD attempts fail, then the crossing will be constructed using an alternative method after all necessary permits and approvals have been received. Failure is defined in Section 6.0.

6.0 HDD FAILURE AND ABANDONMENT CRITERIA

Gator Express Pipeline considers the failure criteria described below as sufficient reason to abandon the HDD process and install the crossing using an approved alternative method.

6.1 PILOT HOLE STEP FAILURE

The HDD installation method will be considered a failure if there are two unsuccessful attempts at completing the pilot hole. If this happens, the HDD Contractor will demobilize its equipment from the site after approval from Gator Express Pipeline.

6.2 HOLE OPENING STEP FAILURE

The HDD installation method will be considered a failure if there is one unsuccessful attempt at opening the hole to the required diameter, as long as the failure does not include losing parts of the hole opening tool or loss of the entire hole opening tool downhole. The HDD Contractor will then be allowed 7 working days to attempt to retrieve the missing tool or parts from the hole and continue the hole opening process. If failure occurs, the HDD Contractor will demobilize its equipment from the site after approval from Gator Express Pipeline.

6.3 PULLBACK STEP FAILURE

The HDD installation method will be considered a failure if there is one unsuccessful attempt at completing the pullback, unless the pipe can be removed from the hole. In the latter case, a second attempt will be made after the hole has been reopened and reconditioned with any necessary hole opening passes as determined jointly by the HDD Contractor and Gator Express Pipeline. If failure occurs, the HDD Contractor will demobilize its equipment from the site after approval from Gator Express Pipeline.

6.4 MECHANICAL BREAKDOWN FAILURE

The HDD installation method will be considered a failure if, at any point during the HDD, the HDD Contractor has a major mechanical breakdown and after either repairing or replacing the broken drilling rig or vital ancillary equipment, the drill pipe, hole opening tool, or pipeline cannot be rotated or pulled. If failure occurs, the HDD Contractor will demobilize its equipment from the site after approval from Gator Express Pipeline.

7.0 HDD ABANDONMENT APPROVALS

Gator Express Pipeline will provide on-site inspection during the HDD process to keep adequate documentation, daily progress reports, as-built information, etc., and will describe the events leading up to the HDD failure. Gator Express Pipeline will submit this documentation to the appropriate agencies notifying them of the HDD failure and the schedule for implementing the approved alternate crossing method as described in Section 8.0. The HDD Contractor will not demobilize until Gator Express Pipeline's approval has been received. The alternative crossing method will not be implemented until Gator Express Pipeline has received confirmation that the Federal Energy Regulatory Commission (FERC) and U.S. Army Corps of Engineers (USACE) have received the documentation of HDD failure.

8.0 HDD CONTINGENCY

If HDD failure occurs, Gator Express Pipeline will construct the proposed pipeline facilities across both wetland/ waterbody complexes using the open cut trenching method that is described in Gator Express Pipeline's Project-specific Wetland and Waterbody Construction and Mitigation Procedures and is the approved method for crossings outside of the designated HDD areas. Push-pull/float installation will be used where hydrological conditions and sufficient pipeline length make this approach feasible.

Gator Express Pipeline will ensure that the necessary authorizations have been obtained from the appropriate federal (FERC/USACE) and state agencies prior to the implementation of any alternative crossing methods.

9.0 REGULATORY CONTACTS

Agency Notification Requirements

1. U.S. Army Corps of Engineers –	
Safety, Security, and Occupational Health	Phone Number: 504-862-2207
Construction Division	Phone Number: 504-862-2235
2. Louisiana Department of Environmental Quality –	
Southeast Regional Office (Mike Algero)	Phone Number: 504-736-7701
3. Louisiana Department of Natural Resources –	
Pipeline Incidents Hotline	Phone Number: 225-342-5505
4. Federal Energy Regulatory Commission –	
Hotline:	Phone Number: 202-502-8390

APPENDIX E

TRAFFIC SIMULATION STUDY

VENTURE GLOBAL PLAQUEMINES LNG, LLC

KBR

PLAQUEMINES

TRAFFIC SIMULATION STUDY (CONSTRUCTION PEAK PERSONNEL PERIOD)

G314
LNG LIQUEFACTION AND EXPORT PROJECT

A	01-NOV-16	Issued For Information	GP	ML	AS
REV	**DATE**	**DESCRIPTION**	**ORIG.**	**CHECKED**	**APPR.**

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Change Log

REV	SECTION	CHANGE DESCRIPTION
A		Initial Issue

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1.0 EXECUTIVE SUMMARY

KBR performed a traffic simulation study for the VG Plaquemines LNG facility to assess and mitigate the impact of personnel traffic for the estimated construction peak period with a total of 3,300 craft and management personnel. This document summarizes the basis, methodology, and results of the study.

After the Base Case Scenario was defined and simulated, a Traffic Management Plan (TMP) was derived to address major issues observed. In fact, the Base Case Scenario results indicated potential heavy congestion as a result of undue queues from both construction entrances spilling back into SH-23. A number of alternative scenarios were run until the successful TMP could be formulated. The following is the list of specific TMP actions required during the personnel construction peak periods in order to minimize congestion problems:

- Eliminate traffic checkpoints along the proposed access roads between the designated personnel parking lots and SH-23 to allow free flow conditions
- Control construction personnel traffic demand by limiting the number of available passenger car parking permits on the designated parking lots.
- Designate the secondary site access (northern site access) to be used exclusively by the construction management personnel.
- Construct auxiliary turn lanes (southbound right and northbound left turn lanes) on SH-23 at the proposed intersection with the main site access point (southern site access).
- A police officer will be required to control the proposed intersection of SH-23 and main site access during the commuting rush hours (e.g. 6-7 AM and 5-6 PM).
- Provide a constant onsite bus shuttle service within the rush hours from designated parking lots to actual work locations to encourage uniform passenger car arrivals or departures within those rush hours.
- Restrict any project-generated truck traffic during the personnel commuting time windows at the labor peak period.

2.0 INTRODUCTION

KBR developed a Traffic Management Plan for the construction phase of the Venture Global (VG) Plaquemines LNG (PLNG) Project. The plan used a detailed microscopic road traffic simulation model built with Aimsun software by Transport Simulation systems (TSS) to mitigate the impact of the traffic generated during the peak construction personnel period. A base case model was created to represent likely projected conditions and assess traffic impacts for this period. Alternative scenario models were also developed in order to obtain effective congestion mitigation measures addressing specific traffic congestion issues from the base case model. The Traffic Management Plan is comprised of those successful measures.

3.0 STUDY BASIS

Based on initial estimates, this project would generate up to 3,300 craft and management personnel for peak period estimated to occur during the peak mechanical phase of construction.

One major construction shift is assumed with personnel arriving or departing within a one hour time window. The Base Case considered unrestricted traffic where everybody drives to the site construction.

Origin (housing) points of the personnel are assumed as follows:

- Craft personnel: 70% come from North SH-23 and 30% come from South SH-23
- Management personnel: 100% come from North SH-23

The following Figure 1 shows the proposed access points along SH-23 to the site. A transportation model was then created using the existing SH-23 configuration after overlaying the proposed intersections. Even though the actual site layout has changed (e.g. combi-walls as opposed to levee), access points shown from this model snapshot are still accurate for this study's purposes.

Figure 1 - Access Points (Traffic Model Snapshot)

Base Case Scenario also includes checkpoints at both entrances with average processing times of 10 seconds per vehicle.

Traffic volumes used were obtained from the following sources:

- Background traffic – obtained from the most recent traffic count data by the Louisiana Department of Transportation and Development (LADOTD) Database.
- Project traffic – Adds the construction peak project generated 3,300 personnel.

The model focuses in the morning peak operations (e.g. from 6:00 to 7:00AM) considered to be critical from the PLNG project construction productivity stand point and also from network impact perspective, once peak morning background traffic is added.

4.0 TRAFFIC MODEL RESULTS

4.1 Base Case Scenario

As stated before, the Base Case considered unrestricted traffic where everybody could drive to the construction site. Figure 2 shows a screen capture of the simulation model. Base Case Scenario results indicated potential heavy congestion as a result of undue queues from both construction entrances spilling back into SH-23. Such spillback would also create a major impact to background traffic along SH-23. The model also shows that about 44% of the PLNG construction personnel would report to work late (after 7:00AM) creating a direct hit in construction productivity and possibly compromising overall schedule. In summary, Base Case Scenario represented an unacceptable traffic operations impact and performance for both background and project generated traffic.

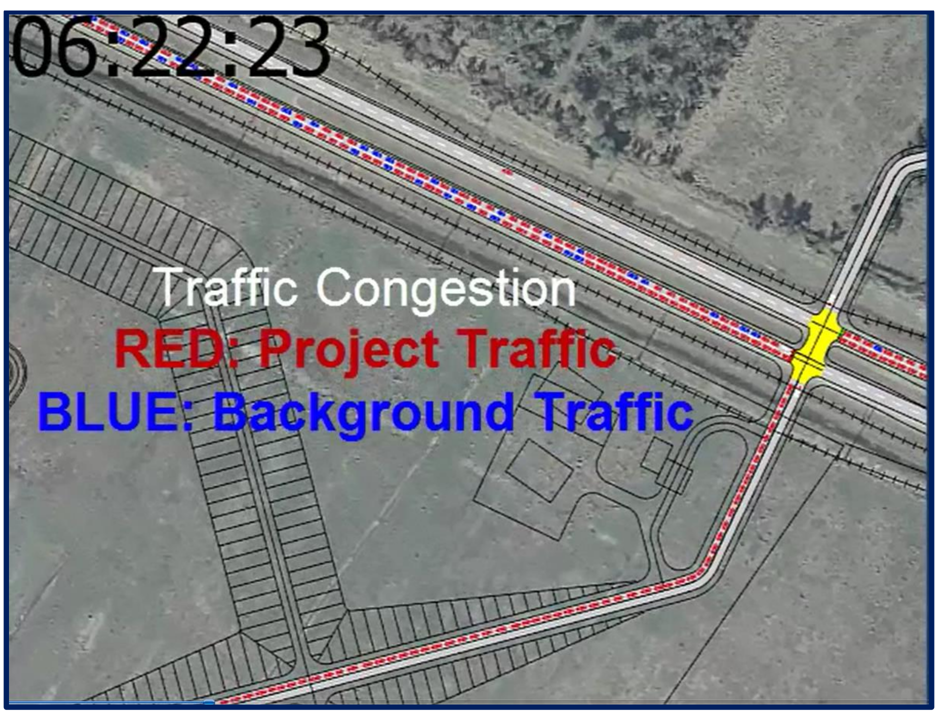

Figure 2 - Base Case Model Snapshot

4.2 Traffic Management Plan (TMP) Scenario

After running several alternatives, the following is a number of congestion mitigation measures found to effectively address issues of traffic congestion observed in the Base Case Scenario. The combined group of measures confirmed this scenario model referenced as the Traffic Management Plan. Results from this model confirm that these specific measures would effectively minimize traffic impacts during the labor construction peak period. Figure 3 shows a screen capture of the TMP model, where it can be seen that the red traffic is flowing stable with no queues along the entrances or SH-23. Furthermore, all PLNG construction personnel would report on time.

Note that a video clip of this simulation scenario is available for viewing.

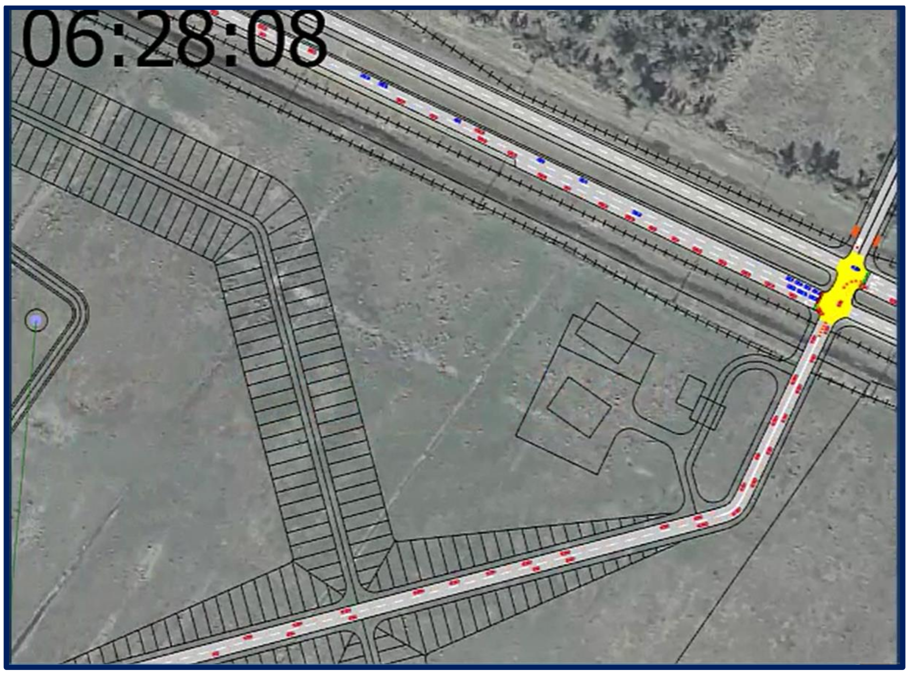

Figure 3– Traffic Management Plan Model Snapshot

5.0 TRAFFIC MANAGEMENT PLAN (STUDY RECOMMENDATIONS)

The following is a list of complete congestion mitigation measures that comprise the proposed traffic management plan. It is strongly recommended to implement all of them prior to the construction peak period.

a) Eliminate the need of having any personnel traffic checkpoints along the proposed access roads between the designated personnel parking lots and SH-23. Models clearly demonstrate that such checkpoints would cause traffic queuing to extend beyond the access roads into SH-23. Access control would be maintained at the entrances to the construction site from the parking lot.

b) Control construction personnel traffic demand by limiting the number of available passenger car parking permits on the designated parking lots. This measure is linked to achieve average passenger car occupancy targets of no less than 2.0 persons per car for craft personnel and 1.25 persons per car for management personnel during the manpower peak period.

c) Designate the secondary site access (northern site access) to be used exclusively by the construction management personnel.

d) Construct auxiliary turn lanes (southbound right and northbound left turn lanes) along SH-23 at the proposed intersection with the main site access point (southern site access).

e) A police officer will be required to control the proposed intersection of SH-23 and main site access during the commuting rush hours (e.g. 6-7 AM and 5-6 PM). They will also block the east leg of this intersection leading to the marine offsite facility (no truck traffic is allowed at those times). This will allow control for the temporary T-intersection with just two phases during the morning and afternoon rush hours: 1) northbound/southbound through (with permissive right turns); and, 2) concurrent southbound right turn and northbound left turn movements (for inbound traffic in the morning) or concurrent eastbound right and left turn movements (for outbound traffic in the evening). Operating this intersection with just two phases will significantly improve capacity and simplify the intersection control task. In addition, the construction project is calling for widening the main access road to 50 feet which directly supports multi-lane configuration as required by the concurrent maneuvers for each phase.

f) Provide a continuous onsite bus shuttle service from designated parking lots to actual work locations. Such onsite bus service should run in a constant schedule for no less than one hour before and after the workday in an effort to spread out arrivals/departures of passenger cars to the external network and to operate a reasonable onsite bus fleet size.

g) An integral part of the overall Traffic Management Plan is to minimize the use of external trucks by transporting most construction freight (material, equipment, and modules) via water. To that extend, the project will build two separate site preparation berths to be in operation for Early Works. In addition a dedicated Marine Off-site Facility (MOF) will also be available for the mechanical scope of the project and throughout the labor peak construction period. As a result, truck traffic will be largely stay within the site boundaries of the site and off the public roads.

h) Finally, the plan calls for restricting any project-generated truck traffic during the personnel commuting time windows at the labor peak period.

Note that a video clip illustrating the impact of implementing these suggestions is available for viewing.

PLAQUEMINES LNG AND GATOR EXPRESS PIPELINE PROJECT
Resource Report 5
APPENDIX 5C

Traffic Management Plan for Pipeline System Construction

Traffic Management Plan for Pipeline Construction

Gator Express Pipeline Project

Submitted by:

EN Engineering

Warrenville, Illinois

TABLE OF CONTENTS

Prepared By: ENengineering

EN Engineering Project Number: 157407

Revision No.	Prepared By	Date	Checked By	Date	Approved By	Date	Client Approval By	Date	Revision Description
A	ML	03/22/16	PT	03/24/16	NP	03/24/16			Issue for Client Review.
B	ML	06/02/16	PT	06/03/16	NP	12/05/16			Issue for Client Review.
C	ML	06/02/16	PT	1/11/17	NP	1/13/17			Revision to Table 1.1
D	ML	02/22/17	ML	02/22/17	NP	02/22/17	BF	02/22/17	Revised Per Client Comments

List of Tables

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List of Abbreviations and Acronyms

Gator Express Pipeline Project	Project
Louisiana State Highway 23	LA-23
Main Line Valve	MLV
Meter and Regulator	M&R
Permanent Access Road	PAR
Right-of-Way	ROW
Temporary Access Road	TAR
Transportation Plan Exhibit	Exhibit
Traffic Management Plan for Pipeline Construction	TMP
Venture Global Gator Express, LLC	Gator Express Pipeline

GATOR EXPRESS PIPELINE PROJECT
TRAFFIC MANAGEMENT PLAN FOR PIPELINE CONSTRUCTION

1. INTRODUCTION

The Gator Express Pipeline Project (Project) will include two natural gas pipeline laterals totaling approximately 26.8 miles in length. Proposed pipeline laterals comprise of two 42-inch-diameter lines (TGP Lateral – 15.1 miles and TETCO Lateral – 11.7 miles). The Project also includes the construction of meter and regulator (M&R) facilities associated with each proposed pipeline lateral. M&R facilities are to be located at proposed custody transfer locations, where natural gas will be received from existing pipelines. It is noteworthy that the TETCO Lateral will be constructed in parallel with the TGP Lateral and installed within a common ditch. See Table 1.1 for a summary of the details mentioned above.

The Project is located on the west side of the Mississippi River within the southern part of Plaquemines Parish, Louisiana. The proposed pipeline rights-of-way (ROW) will traverse varying terrain types including areas of upland, wetland, and open water. The differing types of terrain will dictate the construction methods used to install the proposed pipelines, resulting in various means of gaining access to the Project ROW for labor, equipment, and materials.

This document serves as a Traffic Management Plan (TMP) for Pipeline Construction for the proposed Project. The purpose of this TMP is to:

- Describe how Venture Global Gator Express, LLC (Gator Express Pipeline) will use, improve, and maintain roads for construction of the Project;
- Evaluate potential impacts of construction traffic on public roads and waterways near pipe delivery docks, contractor yards and storage/staging yards; and
- Describe how Gator Express Pipeline will execute equipment/employee access to and from the Project ROW.

Gator Express Pipeline will engage a competent contractor to carry out the construction stage of the Project. Gator Express Pipeline or the Contractor will obtain any permits necessary to use roads/cross roads described herein. The Contractor will adhere to the commitments outlined in this TMP.

Table 1.1
Gator Express Pipeline Project
Pipeline Lateral Summary

Pipeline Lateral	Outer Diameter (inches)	Total Length (miles)	Approximate Custody Transfer Location (Lat./long.)
TGP Lateral	42	15.05	N29.242958° / W89.534649°
TETCO Lateral	42	11.71	N29.255748° / W89.553040°

2. TRAFFIC MANAGEMENT

Construction activities will create short term impacts on the Louisiana transportation network. These impacts will be a result of construction activities crossing roads and waterways with the movement of construction personnel, equipment, and materials to Project locations such as the contractor yard, staging areas, designated parking locations, and the Project ROW. The Contractor will institute road signage alerting drivers to pipeline construction activities, as well as utilize flagman, where necessary, when equipment is crossing a road or traveling on a public road. The Contractor will be required to use appropriate signage in the vicinity of work areas and access road entrances, to clearly depict to the public where any potential traffic delays could occur.

Measures will be implemented to reduce impacts that the Project will have on the public transportation network. These measures will include, but are not limited to, utilizing minimally invasive pipeline installation techniques, as well as varying methods of equipment delivery for optimum efficiency. This TMP describes standards for which the Contractor shall follow in an effort to ensure that all federal, state, and local regulations are adhered to.

2.1 PUBLIC ROADS AND CONSTRUCTION ACCESS

2.1.1 Public Roads

As mentioned, the Project will have minimal impacts on the transportation network within a close proximity of where construction occurs. Walker Road and Louisiana State Highway 23 (LA-23) will experience increased traffic volume. Increased road traffic will be caused mainly by the construction of a pipe bridge over an existing levee and HDD operations for the 42” TGP and TETCO Laterals. A 16-mile stretch of LA-23, south of Walker road and north of the proposed LNG terminal, will be most impacted by construction activity. As may be expected, this activity will consist primarily of semi-trucks traversing to and from the pipe dock location to deliver pipe joints to their designated location. Walker Road will serve as a public road that would provide direct access to the proposed dock location. Limited use of Lake Hermitage Road will be required for the construction of the proposed pipeline laterals. See Figure A-1, in attachment A, for a Transportation Plan Exhibit (Exhibit) which illustrates the Project area and the public roads in the Project vicinity. Additional signage may be considered on Lake Hermitage Road where a variety of construction activities will occur including: a slick bore road crossing operation, construction related to the installation of a Main Line Valve (MLV), and above ground pipe bridge used to cross an existing non-federal levee.

To maintain safe conditions on roads that may be affected by pipeline construction, the Contractor will adhere to all state and county vehicle weight limit regulations and will remove excess soil that is left on the road surface from crossings of construction equipment. In addition, when it is necessary for equipment to cross paved roads, mats or other appropriate measures may be used to minimize damage to the road surface. In dry weather, necessary dust control measures will be taken by the Contractor, specifically on roads with unpaved surfaces such as Walker and Lake Hermitage Roads. If roadways are damaged during construction of the proposed Project, Gator Express Pipeline or its Contractor will repair or reconstruct the damaged roadway to the pre-construction condition.

2.1.2 Right-of-Way Access

2.1.2.1 Temporary Access

In order for construction crews to gain access to the Project ROW, Gator Express Pipeline will require the use of one temporary access road (TAR). More specifically, the TAR will provide access for the Contractor to deliver pipe and equipment to the proposed HDD entry and exit sites. This access road will experience both light-duty and heavy-duty traffic due to the delivery of pipe and other major equipment used for construction. Due to existing soil conditions, the TAR may require construction matting or clearing. Upon completion of the Project, Gator Express Pipeline or its Contractor will return the land impacted by the TAR to its pre-construction condition. For additional information on the proposed TAR see Table B-1 (Attachment B).

To ensure the public's awareness, the Contractor will install and maintain appropriate construction fencing in applicable areas where construction access roads are directly adjacent to public access.

2.1.2.2 Permanent Access

Gator Express Pipeline has proposed the construction of one road to be used as a permanent access road (PAR) for the Project. This PAR will be used throughout the lifetime of the pipeline for inspections and maintenance of the MLV facility located within the Project's proposed ROW. The traffic impact associated with these periodical site visits will be negligible and will typically consist of one worker in a pickup truck. VG will obtain the required permit(s) necessary to construct the PAR. Further details on this road are listed in Tables B-1 and B-2 (in Attachment B).

2.1.2.3 Barge Access

Considering that the majority, approximately 25.25 miles, of the proposed pipeline length will be installed within open water, it will be necessary for barges to have access to the construction ROW. It is anticipated that the Contractor will primarily utilize the pipeline construction ROW for barge access. However, the Contractor will have the option to utilize existing canals and open water areas as practicable and will abide by federal, state and local regulations set forth for marine vessels. Figure A-1 in Attachment A illustrates the location of the proposed barge access routes.

2.1.3 Road Crossings

Lake Hermitage Road will be the only public road crossed by the lateral pipelines. This road crossing will be accomplished by a slick bore installation method, which will avoid the need to open cut a pipe trench through the existing road. The pipeline will be buried to a depth required by applicable road crossing permits and will be designed to withstand anticipated external loadings. To identify approaching construction, additional signage and traffic control personnel will be required during the installation of the crossing. Should a temporary road closure be required, the Contractor will avoid closing Lake Hermitage Road during peak traffic hours and will coordinate construction activities with appropriate local and state officials to avoid or minimize potential traffic delays/impacts.

2.2 PIPE AND EQUIPMENT DELIVERY

2.2.1 Pipe Delivery

Semi-truck and barge traffic associated with transporting pipe to the project area could cause delays in traffic flow, but such impacts will be temporary and short term. Pipe will be stored and then barged in from a pipe coating plant, such as the Bayou Coating plant located in New Iberia, Louisiana. It is anticipated that pipe will be delivered by barge, as needed, directly from the pipe coating plant. Depending on the location where the proposed pipe is to be installed, pipe will either be left on the barge and taken directly to lay barges or offloaded at a dock location. The Bayou Coating plant is approximately 150 miles away from the Project area. To reduce impacts associated with semi-truck traffic, Gator Express Pipeline will use barges to transport the pipe on an as needed basis. The location of Bayou Coating, relative to the project vicinity, is illustrated in Figure A-1.

The following quantities are based on specifications allowing pipe to be stacked 3x high and pyramid loaded;

2.2.1.1 Pipe Delivered Directly to TGP/TETCO Lateral ROW

The majority of the pipe used for pipeline construction will arrive by barge and remain on the barge until it is installed through either a barge lay or push-pull type installation method. A rake-haul type barge will be used in conjunction with lay barges for immediate installation in open water areas. The rake-haul type barge is capable of handling an estimate of 45 concrete coated pipe segments which equates to approximately 1,800 linear feet of pipe. In order to maintain a consistent pipe supply, a single barge shipment containing 45 pipe segments will need to be delivered every other day, on average. The impact on marine traffic associated with this barge delivery rate will be minimal, with little effect on existing waterway capacities.

2.2.1.2 Pipe Delivered to Barge Dock Location

Approximately 8,000 feet of pipe for the TGP and TETCO Laterals, will arrive by barge and be unloaded onto semi-trucks at a designated barge dock location. Semi-trucks will deliver the pipe segments to their proper staging location along the pipeline route. Public roads, as well as the TAR and PAR, will be utilized for pipe delivery. Walker Road and LA-23 will serve as the primary routes to and from the barge dock location and the pipe staging area. A box-haul type barge will be used when delivering pipe segments to the barge unloading dock. A box-haul type barge is estimated to carry 80 concrete coated pipe segments or 200 non-concrete coated pipe segments which equates to approximately 3,200 feet and 8,000 feet in length, respectively. It is expected that a full barge shipment will require two 12-hour working days for unloading. The estimated time for pipe unloading applies regardless of concrete coated (1 pipe segment per truck) or non-concrete coated (3 pipe segments per truck) pipe. This will equate to approximately 40 semi-truck trips from the unloading dock to the staging area and back per day. Most pipe delivered to the barge unloading site will be non-concrete coated as the majority of pipe needing to be delivered by trucks will be used for HDD. This type of truck traffic would be expected to last for approximately 2 working days. The Contractor will most likely elect to get ahead of the pipe schedule and store extra pipe within the construction ROW to avoid potential delays. Semi-trucks used for pipe delivery will not utilize the shoulder of public roads at any time throughout construction. Semi-trucks will leave the barge docking location and drive directly to the appropriate pipe staging location.

2.2.2 Construction Equipment Delivery

Similar to the delivery of pipe segments via semi-trucks, LA-23 will serve as the main public road used to deliver major construction equipment for the land based portion of the Project. Most equipment, such as excavators, will be delivered by a low-boy type semi-truck trailer directly to either the contractor yard location or to the pipeline construction ROW. Specialty equipment like the Horizontal Directional Drilling (HDD) rig and the crane used to place the proposed pipe bridge will require additional attention and a written plan from the Contractor. As previously stated, Gator Express Pipeline will adhere to all state and county vehicle weight and width limit regulations.

2.3 WORKER COMMUTE AND PARKING

The Project will temporarily increase traffic on local road networks due to construction employees commuting to and from work and trucks transporting equipment. Construction workers will likely be located within a 50-mile radius of the Project and will commute to and from the contractor yard or designated employee parking location. It is expected that during peak construction, approximately 100 employee transporting vehicles per day will be mobilized to these locations. These vehicles will be used to transport operators, welders, foremen, inspectors and miscellaneous laborers. Some of these vehicles will travel to the contractor staging yard before proceeding to the ROW. However, many of them, will go directly to a designated parking area near Myrtle Grove Marina. Crew members would be transported, via crew boats, from Myrtle Grove Marina to the Contractor's lay barge(s). Boats transporting workers from land to the lay barges can hold approximately 25 people. Multiple boats, which remain with the crew throughout the work day, will be needed to transport the employees. An estimate of 175 vehicles total (including equipment delivery) will be expected to travel LA-23 on a daily basis during construction.

Vehicle movements will generally occur during the daylight hours, with primary movements occurring between 5:00 AM and 6:00 AM and at 6:00 PM. Typically, the work week is six days, sometimes extending to seven days as required by the workload and construction schedule. During boring, directional drilling, and hydrostatic testing, work will be conducted on a 24-hour basis until the drilling and testing is complete. Vehicles will also be entering and leaving the contractor yard throughout the day. This will include construction management personnel, supply trucks, and vendors. Further, due to the linear and progressive nature of pipeline construction, workers will be dispersed along the ROW, and disruptions to traffic on local roads will be limited to short durations at any given location.

3. CONSTRUCTION METHODS

The Contractor will utilize three construction methods to install the proposed TGP and TETCO Laterals. The following table illustrates the average construction site duration, truck traffic and the anticipated increase in barge traffic (for delivery of pipe) associate with each installation method. The daily truck and barge traffic values, shown in the table below, represent a per day average required to maintain the corresponding installation method with no excessive pipe storage or deficit. For instance, an HDD site will require an average of 7.5 pipe segments per day. Since a barge is estimated to ship 200 non-concrete coated pipe segment per load, the estimated barge delivery per day is 0.04.

Gator Express Pipeline Project Construction Related Traffic			
Pipeline Construction Operation	Average Site Duration (days)	Average Daily Semi-Truck Traffic (Trucks - Ea.)	Average Daily Barge Traffic (Barges - Ea.)
HDD	14	2.5	0.038
Push-Pull	27	0	0.67
Barge Lay	31.25	0	0.5

3.1 HDD SITES

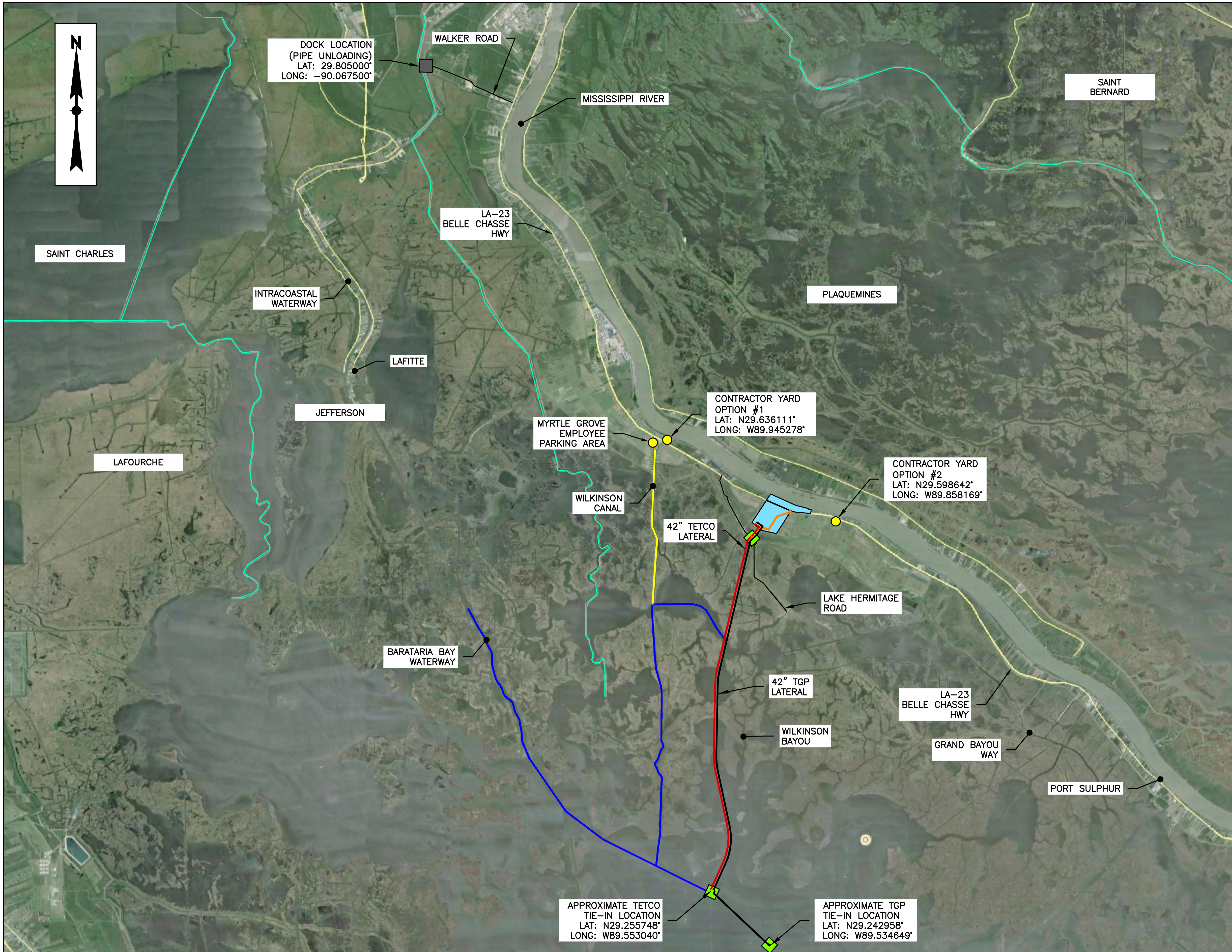
HDD equipment will be delivered on a low boy style semi-truck trailer and upon drill completion will be demobilized. Approximately 15-20 workers will be present onsite during HDD construction activities. It is anticipated that the Contractor will organize buses or car pool to the worksite and the increased traffic impact should not pose an issue as the workers will be arriving early in the morning and departing the work site during evening hours.

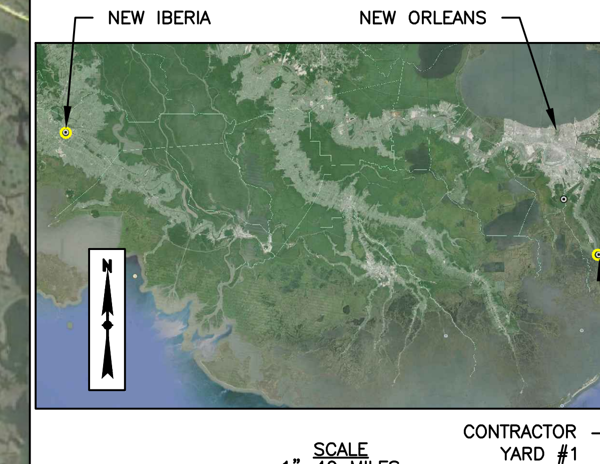
3.2 PUSH SITE LOCATIONS

The push site required to install the pipelines through approximately 3 miles of wetland terrain will operate from mechanically linked stationary barges. Necessary equipment will be delivered by barge and will remain on the barge until the push operation is completed. Approximately 40-50 workers will be present onsite during construction activities. It is anticipated that the Contractor will organize boats to get workers to the worksite, the increased traffic impact should not pose an issue as the workers will be arriving early in the morning and departing the work site during evening hours.

3.3 CONVENTIONAL/UPLAND LOCATIONS

Site clearing, trench excavating and site restoration is considered the bulk of the upland construction operation. Equipment will access the pipeline construction ROW from proposed a TAR and temporary work areas. Contractor will most likely utilize traditional open cut trenching methods to install the proposed pipeline in upland areas. Approximately 10-15 workers will be present onsite during upland construction activities, this includes all support personnel.





SCALE
1"=40 MILES

LEGEND

- DOCK
- CONTRACTOR YARD
- EMPLOYEE PARKING
- METER STATION
- TERMINAL BOUNDARY
- PROPOSED 42" TETCO LATERAL
- PROPOSED 42" TGP LATERAL
- PROPOSED EMPLOYEE TRANSPORT ROUTE
- BARGE ACCESS ROUTE
- PERMANENT/TEMPORARY ACCESS ROAD
- PARISH BOUNDARY
- PARISH — PARISH LOCATION

0 3 6
1" = 3 MILES

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REV. LEVEL	DATE	BY	DESCRIPTION	CK.	APP.
A	12/5/16	RJL	ISSUED FOR REVIEW	TB	

REVISIONS

GATOR EXPRESS PIPELINE PROJECT
TRANSPORTATION PLAN EXHIBIT
PLAQUEMINES PARISH, LA

COUNTY STATE

DATE:	SCALE:	DRAWN BY:	LOC. NO:	DRAWING NUMBER:	SHEET NO:	REV:
02/18/16	1"= 3 MILES	RJL	LOC	PLAPL-M-500	0	A

ATTACHMENT – B

ACCESS ROAD DATA

	Table B-1 TGP / TETCO Lateral Access Road Table								
	Approximate Location	Road Name	Access Road Length	Width	Access Road Class	Access Road Area	Area Disturbed	Perm. Fill	Temp. Fill
	Station # / TGP MP	Access #	ft	ft	Permanent / Temp.	Acre	Acre	Cubic ft	Cubic ft
PAR 1	760+00 / 14.4	Permanent Access Road 1	50	20	Permanent	0.02	0.02	511.00	0.00
TAR 1	767+19 / 14.53	Temporary Access Road 1	8,565	24	Temporary	4.72	0.73	0.00	26,333.33
					TOTALS =	4.74	0.75	511.00	26,333.33

Existing Conditions / Required Improvement

PAR 1 Currently undisturbed, construct 20' wide permanent access road.

TAR 1 Currently undisturbed. Existing conditions are suitable to support timber access road.
Majority of impacts associated with TAR 1 occur within LNG terminal property.

Table B-2: TGP / TETCO Lateral Road Crossing Data							
Approximate Location	Crossing Method	Road Name	Road Type	Access From -	Temporary Fill (see Typ. 1.3-15e)		Perm. Fill
Station # / TGP MP	HDD or Open Cut	Road, Street, Access	Paved/Unpaved/Access	Off Main Road	Aggregate Fill (cft)	Board Bridge (cft)	Aggregate (cft)
761+00 / 14.4	Slick Bore	Lake Hermitage Road	Public - Unpaved	HWY 23	0	0	0
				Total	0.0	0.0	0.0

Note that two slick bore crossing operations will occur at Lake Hermitage Road (TGP & TETCO Laterals)

APPENDIX F

AIR PERMIT BACT SUMMARY

Appendix F Table 1

BACT Summary from Air Permit Application
July 2017

Emissions Source	Pollutant	Proposed Emissions Controls	Proposed Emission Limits for Each Individual Source		
Gas-fired Combined Cycle Turbines and Associated Duct Burners (CCCT1, CCCT2, CCCT3, CCCT4, CCCT5, CCCT6, CCCT7, CCCT8, CCCT9, CCCT10)	NO_X	◦ Dry Low-NO_X Combustor Design will be Used on Each Turbine ◦ Low NO_X Burners will be Installed on the Turbine Duct Burners	2.5	ppmv at 15% O_2	Limit Based on 30 Day Rolling Average During Normal Operations
		◦ Selective Catalytic Reduction (SCR) will be Installed on the Turbine System	10.5	lb/hr	Limit Based on 30 Day Rolling Average Duct Burner and CC Turbine Operation
		◦ Good Combustion Practices	51.5	lb/hr	Limit Based on 2-Hour Average During Cold Start
			48.7	lb/hr	Limit Based on 1-Hour Average During Warm Start
			48.7	lb/hr	Limit Based on 1-Hour Average During Shutdown
	CO	◦ Catalytic Oxidation ◦ Proper Equipment Design	5	ppmv at 15% O_2	Limit Based on 30 Day Rolling Average During Normal Operations
		◦ Proper Operation	12.8	lb/hr	Limit Based on 30 Day Rolling Average Duct Burner and CC Turbine Operation
		◦ Good Combustion Practices	18.9	lb/hr	Limit Based on 2-Hour Average During Cold Start
			13.6	lb/hr	Limit Based on 1-Hour Average During Warm Start
			13.6	lb/hr	Limit Based on 1-Hour Average During Shutdown
	PM / PM_{10} / $PM_{2.5}$	◦ Exclusive Combustion of Gaseous Fuel	8.0	lb/hr	Limit Based on 3-Hour Average Duct Burner and CC Turbine Operation
		◦ Good Combustion Practices Including Proper Burner Design	6.3	lb/hr	Limit Based on 2-Hour Average During Cold Start
			6.3	lb/hr	Limit Based on 1-Hour Average During Warm Start
			6.3	lb/hr	Limit Based on 1-Hour Average During Shutdown
	SO_2	◦ Exclusive Combustion of Low Sulfur Fuels	4	ppmv H_2S	Based on Annual Average of H_2S Content in Fuel
		◦ Proper Equipment Design and Operation	0.7	lb/hr	Limit Based on Annual Average Duct Burner and CC Turbine Operation
			0.3	lb/hr	Limit Based on Annual Average During Cold Start
			0.3	lb/hr	Limit Based on Annual Average During Warm Start
			0.3	lb/hr	Limit Based on Annual Average During Shutdown
	VOC	◦ Catalytic Oxidation	1.1	ppmv @ 15% O_2	Limit Based on 3-Hour Average During Normal Operations
		◦ Combustion of Gaseous Fuel	2.2	lb/hr	Limit Based on 3-Hour Average Duct Burner and CC Turbine Operation
		◦ Good Combustion Practices	0.7	lb/hr	Limit Based on 2-Hour Average During Cold Start
		◦ Combustor Process Design with Proper Operation	0.6	lb/hr	Limit Based on 1-Hour Average During Warm Start
			0.6	lb/hr	Limit Based on 1-Hour Average During Shutdown
	CO_2e	◦ Exclusively Combust Low Carbon Fuel Gas ◦ Good Combustion Practices ◦ Proper O&M Practices ◦ Insulation will be Properly Implemented for Surfaces Above 120 °F	520,455	tpy	Based on Annual Total per Turbine
Gas-fired Simple Cycle Turbines (SCCT1, SCCT2, SCCT3, SCCT4)	NO_X	◦ Dry Low-NO_X Combustor Design will be Used on Each Turbine ◦ Good Combustion Practices	9	ppmv at 15% O_2	Limit Based on 30 Day Rolling Average During Normal Operations
		◦ Combustion of Natural Gas	31.21	lb/hr	Limit Based on 30 Day Rolling Average During Normal Operations
			54.6	lb/hr	Limit Based on 2-Hour Average During Cold Start
			54.6	lb/hr	Limit Based on 1-Hour Average During Warm Start
			54.6	lb/hr	Limit Based on 1-Hour Average During Shutdown
	CO	◦ Combustor Process Design ◦ Proper Operation	25	ppmv at 15% O_2	Limit Based on 30 Day Rolling Average During Normal Operations
		◦ Good Combustion Practices	52.78	lb/hr	Limit Based on 30 Day Rolling Average During Normal Operations
			24.3	lb/hr	Limit Based on 2-Hour Average During Cold Start
			24.3	lb/hr	Limit Based on 1-Hour Average During Warm Start
			24.3	lb/hr	Limit Based on 1-Hour Average During Shutdown
	PM / PM_{10} / $PM_{2.5}$	◦ Exclusive Combustion of Natural Gas	4.9	lb/hr	Limit Based on 3-Hour Average During Normal Operations
		◦ Good Combustion Practices Including Proper Burner Design	3.9	lb/hr	Limit Based on 2-Hour Average During Cold Start
			3.9	lb/hr	Limit Based on 1-Hour Average During Warm Start
			3.9	lb/hr	Limit Based on 1-Hour Average During Shutdown
	SO_2	◦ Exclusive Combustion of Low Sulfur Interstate Pipeline Quality Natural Gas	4	ppmv H_2S	Based on Annual Average of H_2S Content in Fuel
		◦ Proper Equipment Design and Operation	0.60	lb/hr	Limit Based on Annual Average During Normal Operations
			0.3	lb/hr	Limit Based on Annual Average During Cold Start
			0.3	lb/hr	Limit Based on Annual Average During Warm Start
			0.3	lb/hr	Limit Based on Annual Average During Shutdown
	VOC	◦ Combustor Process Design	1.4	ppmv @ 15% O_2	Limit Based on 3-Hour Average During Normal Operations
		◦ Proper Operation	1.7	lb/hr	Limit Based on 3-Hour Average During Normal Operations
		◦ Good Combustion Practices	0.7	lb/hr	Limit Based on 2-Hour Average During Cold Start
		◦ Combustion of Natural Gas	0.7	lb/hr	Limit Based on 1-Hour Average During Warm Start
			0.7	lb/hr	Limit Based on 1-Hour Average During Shutdown
	CO_2e	◦ Exclusively Combust Low Carbon Fuel Gas ◦ Good Combustion Practices ◦ Proper O&M Practices ◦ Insulation will be Properly Implemented for Surfaces Above 120 °F	475,382	tpy	Based on Annual Total per Turbine

Appendix F Table 1

BACT Summary from Air Permit Application
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Emissions Source	Pollutant	Proposed Emissions Controls	Proposed Emission Limits for Each Individual Source		
Smaller Aeroderivative Simple Cycle Combustion Turbines (ASCCT1 and ASCCT2)	NO_X	◦ Selective Catalytic Reduction (SCR) will be Installed on the Turbine System ◦ Good Combustion Practices	2.5	ppmv at 15% O_2	Limit Based on 30 Day Rolling Average During Normal Operations
			2.5	lb/hr	Limit Based on 30 Day Rolling Average During Normal Operation
			15.4	lb/hr	Limit Based on 2-Hour Average During Cold Start
			13.9	lb/hr	Limit Based on 1-Hour Average During Warm Start
			13.9	lb/hr	Limit Based on 1-Hour Average During Shutdown
	CO	◦ Proper Equipment Design ◦ Proper Operation	36	ppmv at 15% O_2	Limit Based on 30 Day Rolling Average During Normal Operations
		◦ Good Combustion Practices	21.6	lb/hr	Limit Based on 30 Day Rolling Average During Normal Operation
			9.0	lb/hr	Limit Based on 2-Hour Average During Cold Start
			9.0	lb/hr	Limit Based on 1-Hour Average During Warm Start
			9.0	lb/hr	Limit Based on 1-Hour Average During Shutdown
	PM / PM_{10} / $PM_{2.5}$	◦ Exclusive Combustion of Gaseous Fuel	4.5	lb/hr	Limit Based on 3-Hour Average During Normal Operations
		◦ Good Combustion Practices Including Proper Burner Design	1.8	lb/hr	Limit Based on 2-Hour Average During Cold Start
			1.8	lb/hr	Limit Based on 1-Hour Average During Warm Start
			1.8	lb/hr	Limit Based on 1-Hour Average During Shutdown
	SO_2	◦ Exclusive Combustion of Low Sulfur Fuels	4	ppmv H_2S	Based on Annual Average of H_2S Content in Fuel
		◦ Proper Equipment Design and Operation	0.17	lb/hr	Limit Based on Annual Average During Normal Operation
			0.09	lb/hr	Limit Based on Annual Average During Cold Start
			0.09	lb/hr	Limit Based on Annual Average During Warm Start
			0.09	lb/hr	Limit Based on Annual Average During Shutdown
	VOC	◦ Combustion of Gaseous Fuel	1.5	ppmv @ 15% O_2	Limit Based on 3-Hour Average During Normal Operations
		◦ Good Combustion Practices	0.51	lb/hr	Limit Based on 3-Hour Average During Normal Operation
			0.22	lb/hr	Limit Based on 2-Hour Average During Cold Start
			0.22	lb/hr	Limit Based on 1-Hour Average During Warm Start
			0.22	lb/hr	Limit Based on 1-Hour Average During Shutdown
	CO_2e	◦ Exclusively Combust Low Carbon Fuel Gas ◦ Good Combustion Practices ◦ Proper O&M Practices ◦ Insulation will be Properly Implemented for Surfaces Above 120 °F	134,901	tpy	Based on Annual Total per Turbine
Hot Oil Heaters (HOH1, HOH2, HOH3, HOH4, HOH5, HOH6)	NO_X	◦ Ultra Low NO_X Burners ◦ Good Combustion Practices	0.038	lb/MMBtu	Based on 3-Hour Average
	CO	◦ Exclusive Combustion of Fuel Gas ◦ Good Combustion Practices	0.08	lb/MMBtu	Based on 3-Hour Average
	PM / PM_{10} / $PM_{2.5}$	◦ Exclusive Combustion of Fuel Gas ◦ Good Combustion Practices Including Proper Burner Design	0.0075	lb/MMBtu	Based on 3-Hour Average
	SO_2	◦ Exclusive Combustion of Low Sulfur Fuel Gas ◦ Proper Engineering Practices	0.0006	lb/MMBtu	Based on 3-Hour Average
	VOC	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices ◦ Exclusive Combustion of Fuel Gas	0.0054	lb/MMBtu	Based on 3-Hour Average
	CO_2e	◦ Exclusive Combustion of Low-Carbon Fuel Gas ◦ Good Combustion Practices ◦ Good O&M Practices ◦ Insulation Will be Implemented for Surfaces above 120 °F.	104,114	tpy	Based on Annual Total
Acid Gas Thermal Oxidizers (AGTO1, AGTO2, AGTO3, AGTO4)	NO_X	◦ Low NOx Burners ◦ Good Combustion Practices	0.138	lb/MMBtu	Based on 3-Hour Average
	CO	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.082	lb/MMBtu	Based on 3-Hour Average
	PM / PM_{10} / $PM_{2.5}$	◦ Exclusive Combustion of Fuel Gas ◦ Good Combustion Practices	0.0075	lb/MMBtu	Based on 3-Hour Average
	SO_2	◦ Proper Equipment Design ◦ Proper Operation ◦ Monitoring the Sulfur Content at the Facility Inlet	27.17	ppm at 68°F	Based on 3-Hour Average
	VOC	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices ◦ Exclusive Combustion of Fuel Gas	0.009	lb/MMBtu	Based on 3-Hour Average
	CO_2e	◦ Exclusive Combustion of Low-Carbon Fuel Gas ◦ Good Combustion Practices ◦ Good O&M Practices ◦ Insulation Will be Implemented for Surfaces above 120 °F.	384,350	tpy	Based on Annual Total

Appendix F Table 1

BACT Summary from Air Permit Application
July 2017

Emissions Source	Pollutant	Proposed Emissions Controls	Proposed Emission Limits for Each Individual Source		
Large (>560kW) Essential Emergency Generators (EGEN1-EGEN12)	NOx	◦ Good Combustion and Operating Practices ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 100 Hours per Year ◦ An Ignition Timing Retard will be Installed on Each Engine	5.61	g/kW-hr	
	CO	◦ Good Combustion and Operating Practices ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 100 Hours per Year	3.5	g/kW-hr	
	PM / PM_{10} / $PM_{2.5}$	◦ Good Combustion and Operating Practices ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 100 Hours per Year	0.20	g/kW-hr	
	SO_2	◦ Ultra-low Sulfur Diesel Fuel with Sulfur Content of 15 ppmv not to be Exceeded (40 CFR 60 Subpart IIII) ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 100 Hours per Year	1.2E-05	lb/hp-hr	
	VOC	◦ Good Combustion and Operating Practices ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 100 Hours per Year	0.79	g/kW-hr	
	CO_2e	◦ Good Combustion Practices ◦ Good O&M Practices ◦ Insulation Will be Implemented for Surfaces above 120 °F. ◦ Limiting Normal Operations to 100 Hours per Year	2,411	tpy	Based on Annual Total
500 kW Essential Emergency Generators(EGEN13/MJ001G Admin and EGEN14/MJ002H Jetty)	NOx	◦ Good Combustion and Operating Practices ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 100 Hours per Year ◦ An Ignition Timing Retard will be Installed on Each Engine	3.50	g/kW-hr	
	CO	◦ Good Combustion and Operating Practices ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 100 Hours per Year	3.5	g/kW-hr	
	PM / PM_{10} / $PM_{2.5}$	◦ Good Combustion and Operating Practices ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 100 Hours per Year	0.20	g/kW-hr	
	SO_2	◦ Ultra-low Sulfur Diesel Fuel with Sulfur Content of 15 ppmv not to be Exceeded (40 CFR 60 Subpart IIII) ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 100 Hours per Year	1.2E-05	lb/hp-hr	
	VOC	◦ Good Combustion and Operating Practices ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 100 Hours per Year	0.50	g/kW-hr	
	CO_2e	◦ Good Combustion Practices ◦ Good O&M Practices ◦ Insulation Will be Implemented for Surfaces above 120 °F. ◦ Limiting Normal Operations to 100 Hours per Year	81	tpy	Based on Annual Total
Firewater Pumps (FRPMP1 and FRPMP2)	NOx	◦ Good Combustion and Operating Practices ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 52 Hours per Year ◦ An Ignition Timing Retard will be Installed on Each Pump	2.62	g/hp-hr	
	CO	◦ Good Combustion and Operating Practices ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 52 Hours per Year	3.50	g/hp-hr	
	PM / PM_{10} / $PM_{2.5}$	◦ Good Combustion and Operating Practices ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 52 Hours per Year	0.15	g/hp-hr	
	SO_2	◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 52 Hours per Year	0.04	lb/gal	
	VOC	◦ Good Combustion and Operating Practices ◦ Compliance with 40 CFR Part 60 Subpart IIII ◦ Limiting Normal Operations to 52 Hours per Year	0.38	g/hp-hr	
	CO_2e	◦ Good Combustion Practices ◦ Good O&M Practices ◦ Insulation Will be Implemented for Surfaces above 120 °F. ◦ Limiting Normal Operations to 52 Hours per Year	28.18	tpy	Based on Annual Total

Appendix F Table 1

BACT Summary from Air Permit Application
July 2017

Emissions Source	Pollutant	Proposed Emissions Controls	Proposed Emission Limits for Each Individual Source		
Equipment Leaks (FUG)	VOC	◦ Proper Piping Design ◦ The Provisions of LAC 33:III.2111 will be Followed	2.3	tpy	Based on Annual Total
	CO_2e	◦ Proper Piping Design	6,500	tpy	Based on Annual Total
Cold Flare Pilot (CLDFLR Pilot)	NO_X	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.068	lb/MMBtu	When Flare is Operating
	CO	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.310	lb/MMBtu	When Flare is Operating
	PM / PM10 / PM2.5	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.0070	lb/MMBtu	When Flare is Operating
	SO_2	◦ Proper Equipment Design and Operation ◦ Combustion of Low Sulfur Gas in Pilot ◦ Good Combustion Practices	4	ppmv H_2S	When Flare is Operating
	VOC	◦ Good Combustion Practices	0.218	lb/hr	When Flare is Operating
	CO_2e	◦ Good Management Practices and Proper Flare Design	979	tpy	Based on Annual Total
Warm Flare Pilot (WRMFLR Pilot)	NO_X	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.068	lb/MMBtu	When Flare is Operating
	CO	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.310	lb/MMBtu	When Flare is Operating
	PM / PM10 / PM2.5	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.0070	lb/MMBtu	When Flare is Operating
	SO_2	◦ Proper Equipment Design and Operation ◦ Combustion of Low Sulfur Gas in Pilot ◦ Good Combustion Practices	4	ppmv H_2S	When Flare is Operating
	VOC	◦ Good Combustion Practices	0.218	lb/hr	When Flare is Operating
	CO_2e	◦ Good Management Practices and Proper Flare Design	979	tpy	Based on Annual Total
LP Vent Pilot (LPFLR Pilot)	NO_X	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.068	lb/MMBtu	When Flare is Operating
	CO	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.310	lb/MMBtu	When Flare is Operating
	PM / PM10 / PM2.5	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.0070	lb/MMBtu	When Flare is Operating
	SO_2	◦ Proper Equipment Design and Operation ◦ Combustion of Low Sulfur Gas in Pilot ◦ Good Combustion Practices	4	ppmv H_2S	When Flare is Operating
	VOC	◦ Good Combustion Practices	0.218	lb/hr	When Flare is Operating
	CO_2e	◦ Good Management Practices and Proper Flare Design	979	tpy	Based on Annual Total
Marine Flare Pilot (MFLR Pilot)	NO_X	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.068	lb/MMBtu	When Flare is Operating
	CO	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.310	lb/MMBtu	When Flare is Operating
	PM / PM10 / PM2.5	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.0070	lb/MMBtu	When Flare is Operating
	SO_2	◦ Proper Equipment Design and Operation ◦ Combustion of Low Sulfur Gas in Pilot ◦ Good Combustion Practices	4	ppmv H_2S	When Flare is Operating
	VOC	◦ Good Combustion Practices	0.218	lb/hr	When Flare is Operating
	CO_2e	◦ Good Management Practices and Proper Flare Design	979	tpy	Based on Annual Total

Appendix F Table 1

BACT Summary from Air Permit Application
July 2017

Emissions Source	Pollutant	Proposed Emissions Controls	Proposed Emission Limits for Each Individual Source		
Cold Flare MSS (includes Purge) (CLDFLR MSS)	NO_X	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	139.6	lb/hr	Maintenance/Start up/Shutdown Operations
	CO	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	636.3	lb/hr	Maintenance/Start up/Shutdown Operations
	PM / PM10 / PM2.5	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	15.2	lb/hr	Maintenance/Start up/Shutdown Operations
	SO_2	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	1.4	lb/hr	Maintenance/Start up/Shutdown Operations
	VOC	◦ Good Combustion Practices	42.2	lb/hr	Maintenance/Start up/Shutdown Operations
	CO_2e	◦ Good Management Practices and Proper Flare Design	14,441	tpy	Based on Annual Total
Warm Flare MSS (includes Purge) (WRMFLR MSS)	NO_X	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	232.5	lb/hr	Maintenance/Start up/Shutdown Operations
	CO	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	1,060.0	lb/hr	Maintenance/Start up/Shutdown Operations
	PM / PM10 / PM2.5	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	25.3	lb/hr	Maintenance/Start up/Shutdown Operations
	SO_2	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	2.3	lb/hr	Maintenance/Start up/Shutdown Operations
	VOC	◦ Good Combustion Practices	70.2	lb/hr	Maintenance/Start up/Shutdown Operations
	CO_2e	◦ Good Management Practices and Proper Flare Design	14,836	tpy	Based on Annual Total
LP Flare MSS (includes Purge) (LPFLR MSS)	NO_X	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	24.9	lb/hr	Maintenance/Start up/Shutdown Operations
	CO	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	113.6	lb/hr	Maintenance/Start up/Shutdown Operations
	PM / PM10 / PM2.5	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	2.7	lb/hr	Maintenance/Start up/Shutdown Operations
	SO_2	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices	0.3	lb/hr	Maintenance/Start up/Shutdown Operations
	VOC	◦ Good Combustion Practices	7.7	lb/hr	Maintenance/Start up/Shutdown Operations
	CO_2e	◦ Good Management Practices and Proper Flare Design	13,980	tpy	Based on Annual Total
Marine Loading Flare Gassing Up Operations (MFGU)	NO_X	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices ◦ Marine Gas Recovery for Loading Return Gas with Methane Content of 80% or Greater	19.6	lb/hr	Gassing Up Operations
	CO	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices ◦ Marine Gas Recovery for Loading Return Gas with Methane Content of 80% or Greater	89.1	lb/hr	Gassing Up Operations
	PM / PM10 / PM2.5	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices ◦ Marine Gas Recovery for Loading Return Gas with Methane Content of 80% or Greater	2.2	lb/hr	Gassing Up Operations
	SO_2	◦ Proper Equipment Design ◦ Proper Operation ◦ Good Combustion Practices ◦ Marine Gas Recovery for Loading Return Gas with Methane Content of 80% or Greater	0.2	lb/hr	Gassing Up Operations
	VOC	◦ Good Combustion Practices ◦ Marine Gas Recovery for Loading Return Gas with Methane Content of 80% or Greater	0.4	lb/hr	Gassing Up Operations
	CO_2e	◦ Good Management Practices and Proper Flare Design ◦ Marine Gas Recovery for Loading Return Gas with Methane Content of 80% or Greater	4,045	tpy	Based on Annual Total

Appendix F Table 1

BACT Summary from Air Permit Application
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Emissions Source	Pollutant	Proposed Emissions Controls	Proposed Emission Limits for Each Individual Source		
Pipeline Pigging	VOC	◦ Limit number of pipeline pigging activities to six per year ◦ Flare	0.00142	tpy	Based on Annual Total
	CO_2e	◦ Limit number of pipeline pigging activities to six per year	0.39	tpy	Based on Annual Total
Concete Bin Vents (CBV1, CBV2, CBV3)	PM / PM_{10}	◦ Any present storage silos or/and weigh hoppers will use cartridge filters	0.01	gr/dscf	Applicable to Point Source (Storage Silos and Weigh Hoppers with Cartridge Filters)
Batch Concrete Operations	PM / PM_{10}	◦ Aggregate supplier to provide on-site delivery of aggregate that is pre-washed	4	tpy PM	Based on Annual Total
		◦ Water sprays on all aggregate and sand storage and handling operations	3	tpy PM_{10}	Based on Annual Total
Batch Concrete Non-Emergency Engines (CBGEN1, CBGEN2, CBGEN3)	NOx	◦ Good Combustion and Operating Practices ◦ Selective Catalytic Reduction in Compliance with Tier 4 Standards	0.40	g/kW-hr	
	CO	◦ Proper Engine Design and Operation with Good Combustion Practices ◦ Exclusively Combust Diesel for Improved Combustion Efficiency ◦ Oxidation Catalyst in Compliance with Tier 4 Standards	3.5	g/kW-hr	
	PM / PM_{10} / $PM_{2.5}$	◦ Exclusively Combust Diesel for Improved Combustion Efficiency ◦ Proper Engine Design and Operation ◦ Each Generator will be Equipped with a Diesel Particulate Filter	0.20	g/kW-hr	
	SO_2	◦ Ultra-low Sulfur Diesel Fuel with Sulfur Content of 15 ppmv not to be Exceeded ◦ Proper Engine Design and Operation with Good Combustion Practices	3.7E-04	lb/hp-hr	
	VOC	◦ Oxidation Catalyst in Compliance with Tier 4 Standards ◦ Proper Engine Design and Operation with Good Combustion Practices	0.19	g/kW-hr	
	CO_2e	◦ Good Combustion Practices ◦ Good O&M Practices ◦ Insulation Will be Implemented for Surfaces above 120 °F.	1,226	tpy	Based on Annual Total
Diesel Fuel Storage Tank 1 and 2 (DFST1, DFST2)	VOC	◦ Follow the best practical house keeping and maintenance practices as specified in LAC 33:III.2113	1.83E-01	tpy per tank	Based on Annual Total
Amine (DEA) Solvent Surge Storage Tank 1 and 2 (SSST1, SSST2)	VOC	◦ Follow the best practical house keeping and maintenance practices as specified in LAC 33:III.2113	1.81E-03	tpy per tank	Based on Annual Total
Amine Flash Drums (AFD1, AFD2, AFD3, AFD4, AFD5, AFD6)	VOC	◦ Route emissions to the Acid Gas Thermal Oxidizer System	See Acid Gas Thermal Oxidizer Limits		
Iso-pentane Tanks (PESD1 (previously 128-V0004), PESD2)	VOC	◦ Route emissions to the Warm Flare	See Warm Flare Limits		

APPENDIX G

REFERENCES

APPENDIX G
REFERENCES

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APPENDIX H

LIST OF PREPARERS

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Ecology and Environment, Inc. is a third party contractor assisting the Commission staff in reviewing the environmental aspects of the project application and preparing the environmental documents required by NEPA. Third party contractors are selected by Commission staff and funded by project applicants. Per the procedures in 40 CFR 1506.5(c), third party contractors execute a disclosure statement specifying that they have no financial or other conflicting interest in the outcome of the project. Third party contractors are required to self-report any changes in financial situation and to refresh their disclosure statements annually. The Commission staff solely directs the scope, content, quality, and schedule of the contractor's work. The Commission staff independently evaluates the results of the third-party contractor's work and the Commission, through its staff, bears ultimate responsibility for full compliance with the requirements of NEPA.