Federal Energy Regulatory Commission

Office of Energy Projects

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FINAL ENVIRONMENTAL IMPACT STATEMENT for the COMMONWEALTH LNG PROJECT

Volume I

Commonwealth LNG, LLC

Docket Nos. CP19-502-000
CP19-502-001

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

Cooperating Agencies:

U.S. Army Corps of Engineers

U.S. Coast Guard

U.S. Department of Energy

U.S. Department of Transportation

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

National Oceanic Atmospheric Administration - National Marine Fisheries Service

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

<u>In Reply Refer To</u>:
OEP/DG2E/Gas Branch 1
Commonwealth LNG, LLC
Commonwealth LNG Project
Docket Nos. CP19-502-000,
CP19-502-001

TO THE INTERESTED PARTY:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared a final environmental impact statement (EIS) for the Commonwealth LNG Project, proposed by Commonwealth LNG, LLC (Commonwealth) in the above-referenced docket. Commonwealth requests authorization to site, construct, and operate a natural gas liquefaction and export terminal and an integrated Natural Gas Act Section 3 natural gas pipeline, in Cameron Parish, Louisiana.

The final EIS assesses the potential environmental effects of the construction and operation of the Commonwealth LNG Project in accordance with the requirements of the National Environmental Policy Act (NEPA). FERC staff concludes that approval of the proposed project, with the mitigation measures recommended in the EIS, would result in some adverse environmental impacts. Most of these impacts on the environment would be reduced to less than significant levels; however, FERC staff conclude there would be significant impacts on visual resources and impacts on environmental justice communities would be disproportionately high and adverse. Regarding climate change impacts, this EIS is not characterizing the proposed project's greenhouse gas emissions as significant or insignificant because the Commission is conducting a generic proceeding to determine whether and how the Commission will conduct significance determinations going forward.[1]

The U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Department of Energy, U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and National Oceanic and Atmospheric Administration's National Marine Fisheries

1 Consideration of Greenhouse Gas Emissions in Natural Gas Infrastructure Project Reviews, 178 FERC ¶ 61,108 (2022); 178 FERC ¶ 61,197 (2022).

Service participated as cooperating agencies in the preparation of the final 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. Although the cooperating agencies provided input to the conclusions and recommendations presented in the final EIS, the agencies will present their own conclusions and recommendations in their respective Records of Decision for the project.

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

- six liquefaction trains;
- six gas pre-treatment trains;
- two flare systems (containing a total of four flares);
- six liquefied natural gas (LNG) storage tanks;
- one marine facility consisting of an LNG carrier berth and barge dock;
- utilities (e.g., electricity generation, water, plant air, nitrogen, hot oil system);
- operation and safety systems (e.g., access and haul roads, storm protection structures, stormwater drainage systems, spill containment system, fire suppression facilities, facility lighting and security, emergency shutdown systems);
- appurtenant facilities (e.g., administrative facilities, maintenance and warehouse buildings, marine facility operator buildings, equipment enclosures and electrical rooms);
- 3.0 miles of 42-inch-diameter pipeline;
- two interconnection facilities with existing pipelines; and
- one metering 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 final EIS is only available in electronic format. It may be viewed and downloaded from the FERC's website (www.ferc.gov), on the natural gas environmental documents page (https://www.ferc.gov/industries-data/natural-gas/environment/environmental-documents). In addition, the final EIS may be accessed by using the eLibrary link on the FERC's website. Click on the eLibrary link (https://elibrary.ferc.gov/eLibrary/search) select "General Search" and enter the docket number in the "Docket Number" field (i.e. CP19-502). 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.

The final EIS is not a decision document. It presents Commission staff's independent analysis of the environmental issues for the Commission to consider when addressing the merits of all issues in this proceeding.

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 https://www.ferc.gov/ferc-online/overview to register for eSubscription.

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TECHNICAL ACRONYMS AND ABBREVIATIONS

ACHE	air cooled heat exchanger
ACI	American Concrete Institute
ACS	American Community Survey
AEGL	Acute Exposure Guideline Level
AERMOD	American Meteorological Society/EPA Regulatory Model
AIChE	American Institute of Chemical Engineers
ALPEMA	Aluminum Plate-Fin Heat Exchanger Manufacturer’s Association
ANSI	American National Standards Institute
AQCRs	Air Quality Control Regions
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	additional temporary workspace
BA	Biological Assessment
Bcf/d	billion cubic feet per day
BGEPA	Bald and Golden Eagle Protection Act
BLEVE	boiling liquid expanding vapor explosion
BMP	best management practice
BO	Biological Opinion
BOG	boil-off gas
BPVC	Boiler and Pressure Vessel Code
Bridgeline	EnLink Bridgeline Holdings
Btu/ft^2-hr	British thermal units per square foot per hour
BUDM	beneficial use of dredged materials
CAA	Clean Air Act
CCS	carbon capture and sequestration
CCPS	Center for Chemical Process Safety
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
Cl-	chloride ion
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COE	United States Army Corps of Engineers
Commonwealth	Commonwealth LNG, LLC
COTP	Captain of the Port
CPRA	Louisiana Coastal Protection Restoration Authority

CPT	cone penetration test
cSEL	cumulative sound exposure level
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
dB	decibel
dBA	A-weighted decibel
DCS	distributed control system
DOD	Department of Defense
DOE	United States Department of Energy
DOT	United States Department of Transportation
DMMP	Dredged Material Management Plan
dBpeak	peak sound pressure level
EEM	estuarine emergent wetland
EFH	essential fish habitat
EFO	estuarine forested wetland
EI	Environmental Inspector
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPAct	Energy Policy Act
EO	Executive Order
ERP	Emergency Response Plan
ERPG	Emergency Response Planning Guidelines
ESA	Endangered Species Act
ESD	emergency shutdown
ESS	estuarine scrub-shrub wetland
FEED	front-end-engineering-design
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FMP	Fisheries Management Plan
FRA	Federal Rail Administration
FSA	Facility Security Assessment
FSP	Facility Security Plan
FTA	Free Trade Agreement
FWS	Fish and Wildlife Service
GHG	greenhouse gases
GMFMC	Gulf of Mexico Fishery Management Council
GT	gas turbine

GWP	Global Warming Potential
H_2S	hydrogen sulfide
HAP	hazardous air pollutants
HAZID	hazard identification
HAZOP	Hazard and Operability Review
HDD	horizontal directional drill
HEI	Heat Exchanger Institute
HIPPS	high integrity pressure protection system
HMB	heat and material balances
HUC	hydrological unit code
IBA	Important Bird Area
IBC	International Building Code
IHA	Incidental Harassment Authorization
IMO	International Marine Organization
ISO	International Organization for Standardization
ITS	Incidental Take Statement
IWG	Interagency Working Group
JPA	Joint Permit Application
kW/m^2	kilowatts per square meter
Kinetica	LP Kinetica Partners, LLC
KMLP	Kinder Morgan Louisiana Pipeline
L_{dn}	day-night sound level
L_{eq}	total noise impacts
$L_{eq(24)}$	24-hour equivalent sound level
L_{max}	maximum noise impacts
LAC	Louisiana Administrative Code
LDEQ	Louisiana Department of Environmental Quality
LDNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries
LFL	lower flammable limit
LNG	liquefied natural gas
LOD	Letter of Determination
LOR	Letter of Recommendation
LPDES	Louisiana Pollutant Discharge Elimination System
LPG	liquefied petroleum gas
m^3	cubic meters
MAOP	maximum allowable operating pressure
MBTA	Migratory Bird Treaty Act

MCC	motor control center
MERPS	modeled emission rates for precursors
MEOW	maximum envelope of water
Mg/L	milligrams per liter
MLs	monitoring locations
MMBtu/hr	million British thermal units per hour
MMPA	Marine Mammal Protection Act
MOU	memorandum of understanding
MP	milepost
mph	miles per hour
MSA	Magnuson-Stevens Fishery Conservation and Management Act of 1976
MTPA	million metric tonnes per annum
MTSA	Maritime Transportation Security Act
MW	megawatt
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAVD	North America Vertical Datum of 1988
NBSIR	National Bureau of Standards Information Report
NEHRP	National Earthquake Hazards Reduction Program
NEPA	National Environmental Policy
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NGA	Natural Gas Act
NGO	non-governmental organization
NHD	National Hydrographic Dataset
NHPA	National Historic Preservation Act
NHTSA	National Highway Traffic Safety Administration
NM	nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	noise sensitive areas
NSPS	New Source Performance Standards

NVIC	Coast Guard's Navigation and Vessel Inspection Circulars
NWR	National Wildlife Refuge
O_3	ozone
OBE	operating basis earthquake
OCM	Louisiana Department of Natural Resources Office of Coastal Management
P&IDs	piping and instrumentation drawings
Pb	lead
PFD	process flow diagram
PHMSA	Pipeline and Hazardous Materials Safety Administration
PIPA	Pipelines and Informed Planning Alliance
Plan	FERC's Upland Erosion Control, Revegetation, and Maintenance Plan
Procedures	FERC's Wetland and Waterbody Construction and Mitigation Procedures
PM	particulate matter
PM_{10}	PM less than 10 microns in diameter
$PM_{2.5}$	PM less than 2.5 microns in diameter
ppe	personal protective equipment
ppt	parts per thousand
PSD	Prevention of Significant Deterioration
psi	pound per square inch
PTE	potential to emit
PVBs	pressure vessel bursts
RHA	Rivers and Harbors Act
RICE	reciprocating internal combustion engines
RIE	remove instrument enclosure
RMP	Risk Management Plan
RPT	rapid phase transition
SER	Significant Emission Rate
SIL	Significant Impact Levels
SIP	State Implementation Plans
SIS	safety instrumented system
SLAMS	State and Local Air Monitoring Stations
SO_2	sulfur dioxide
SOLAS	International Convention for the Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
SPAR	Spill Prevention and Response Plan
SSE	safe shutdown earthquake
SWEL	stillwater flood elevation

TEMA	Tubular Exchanger Manufacturers Association
Terminal	Commonwealth LNG Export Terminal
tpy	tons per year
TSS	total suspended solids
TWIC	Transportation Worker Identification Credential
UFL	upper flammable limit
UL	Underwriters Laboratories
USC	United States Code
USCG	United States Coast Guard
USGS	U.S. Geological Survey
VOC	volatile organic compounds
Vs	velocity
WSA	Waterway Suitability Assessment

EXECUTIVE SUMMARY

INTRODUCTION

On August 20, 2019, Commonwealth LNG, LLC (Commonwealth) filed an application with the Federal Energy Regulatory Commission (Commission or FERC). Pursuant to Section 3(a) of the Natural Gas Act (NGA), Commonwealth requested authorization to site, construct, and operate a natural gas liquefaction and liquefied natural gas (LNG) export terminal, including an integrated NGA Section 3 natural gas pipeline, in Cameron Parish, Louisiana. The proposed project was designated as Docket No. CP19-502-000 by the Commission and is referred to as the "Commonwealth LNG Project" or "Project" in this Environmental Impact Statement (EIS).

This is not a decision document. The purpose of the EIS is to inform FERC decision-makers, the public, and the permitting agencies about the potential adverse and beneficial environmental impacts of the proposed Project and its alternatives and recommend mitigation measures that would reduce adverse impacts to the extent practicable. We[2] prepared this EIS to assess the environmental impacts associated with construction and operation of the Project as required under the National Environmental Policy Act (NEPA) of 1969, as amended. Our analysis is based on information provided by Commonwealth, 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 EIS. The U.S. Army Corps of Engineers (COE), U.S. Coast Guard (USCG), U.S. Department of Energy (DOE), U.S. Department of Transportation (DOT), Pipeline and Hazardous Materials Safety Administration (PHMSA), U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (FWS), and National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) are participating in the NEPA review as cooperating agencies.[3]

Proposed Action

The Commonwealth LNG Project consists of two main components: 1) construction and operation of the LNG export terminal (Terminal), which includes six LNG plant facilities to liquefy natural gas,[4] six tanks to store the LNG, an LNG carrier loading/berthing facility (marine facility), and other appurtenant facilities; and 2) construction and operation of 3.0 miles of 42-inch diameter pipeline (Pipeline) and one new meter station to deliver natural gas to the Terminal. The Project would produce 8.4 million metric tonnes per annum (MTPA) of LNG for export on an average of 156 LNG carriers per year.

Subject to the receipt of FERC authorization and all other applicable state and federal permits and approvals, Commonwealth anticipates beginning construction of the liquefaction facility in 2023 and beginning construction of the Pipeline in 2024. Commonwealth proposes to use modular techniques to construct the liquefaction plants and portions of the LNG storage tanks off-site in combination with traditional on-site construction practices for other Terminal and Pipeline components. Commonwealth

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

3 A cooperating agency is an agency that has jurisdiction over all or part of a project area and must make a decision on a project, and/or an agency that provides special expertise with regard to environmental or other resources.

4 A liquefaction plant (or train) is a facility that converts natural gas from its gaseous form (as it is transported in pipelines) into its liquefied form, known as LNG. In its liquefied form, natural gas occupies about 1/600th of the volume it does in its gaseous form, which makes it possible to transport large volumes of natural gas by LNG carriers.

asserts this approach would shorten the overall duration of on-site construction such that commercial operations could begin by the second quarter of 2026.

Public Involvement

On August 15, 2017, FERC accepted Commonwealth's request to begin pre-filing and Docket No. PF17-8-000 was established to place information related to the Project 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 the FERC.

We have received comments from the public requesting public hearings regarding the Project during the pre-filing process. Commonwealth held an initial open house meeting on October 23, 2017, in Johnson Bayou, Louisiana, to introduce the Project to the local community. FERC staff participated in the meeting to describe the Commission's process and provide those attending with information on how to file comments with the Commission.

On February 22, 2018, FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Commonwealth LNG Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Session* (NOI). The NOI was sent during the pre-filing process to about 300 interested parties, including property owners; elected officials; tribal governments; local, state, and federal regulatory agencies; libraries; local emergency responders; and local newspapers in the Project area. Publication of the NOI established a 30-day public scoping period.

We conducted a public scoping session to provide an opportunity for the public to learn more about the Project and provide oral and written comments on environmental issues to be addressed in the EIS. The scoping session was held in Johnson Bayou, Louisiana, on March 13, 2018. During the meeting, we received oral comments from one individual, which were transcribed by a court reporter, and written comments from other members of the public. Additional comments were submitted either by letter or electronically. All comments we received were posted to the Commission's public record through the FERC's online eLibrary system.

The pre- filing process ended on August 20, 2019, when Commonwealth filed its application with the FERC. On March 16, 2020, the Commission suspended the environmental review schedule for the Project pending adequate responses from Commonwealth to Commission staff data requests and an official interpretation from PHMSA pertaining to Commonwealth's proposed LNG storage tank design. On July 8, 2021, Commonwealth filed an amendment to its Natural Gas Act Section 3 Application to modify the proposed LNG storage tank designs and capacities so as not to require an interpretation from PHMSA. On July 13, 2021, the Commission issued an additional *Notice of Application for Amendment and Establishing Intervention Deadline*, which established a 21-day comment period for the submission of comments, concerns, and issues related to the environmental aspects of the proposed Project. On September 24, 2021, the Commission issued a *Notice of Intent to Prepare an Environmental Impact Statement, Request for Comments on Environmental Issues, and Revised Schedule for Environmental Review for the Project*. The notice established another 30-day scoping period.

During the scoping and comment periods, we received a total of 7 comments from two individuals that own land adjacent to the proposed Terminal site; 206 comments from individuals that do not own land adjacent to the proposed Project footprint; 11 comments from federal, state, and local agencies; 2 comments from Native American tribes; and 13 comments from companies and other non-governmental organizations (NGOs). The primary issues raised by the commenters related to potential Project impacts on water quality and wetlands, biological resources, recreational activities, local infrastructure, and air quality. We issued a *Notice of Availability of the Draft Environmental Impact Statement* on March 31, 2022. The draft EIS was filed with the EPA and a formal notice of availability was issued in the Federal Register on April 6, 2022, which established a 45-day comment period on the draft EIS that ended on May 23, 2022. All substantive environmental issues identified through this public review process were addressed in the draft EIS.[5]

We held two virtual public comment sessions to solicit and receive comments on the draft EIS. The sessions were held on April 25, 2022 and April 26, 2022 and provided the public an opportunity to present oral comments to a court reporter on the analysis of environmental impacts described in the draft EIS. Ten individuals provided oral comments.[6] We received written comments from 3 federal agencies, 1 state agency, 5 non-governmental organizations, and 15 individuals. We also received 1,792 copies of one form letter and 579 copies of a second form letter.

All comments received in response to the draft EIS are included in our comment responses in appendix M. Substantive environmental issues identified through this public review process are addressed in this EIS.[7]

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 and environmental justice communities; cultural resources; air quality and noise; reliability and safety; and cumulative impacts, including climate change. In addition to the no-action alternative, we identified potential system, site, configuration, power source, and pipeline route alternatives. Where necessary, we recommend additional mitigation measures to minimize or avoid these impacts. Sections 5.1 and 5.2 of the EIS contain our conclusions and a compilation of our recommended mitigation measures, respectively.

Construction of the Terminal facilities would disturb 118.8 acres of land and 47.0 acres of open water. Of this total, 105.7 acres of land and 47.0 acres of open water would be impacted by operation and maintenance of the Terminal facilities. The remaining 13.1 acres of land would be temporarily affected during construction. Afterward, Commonwealth would restore this area to preconstruction conditions. An additional 274.2 acres would be leased by Commonwealth at the Terminal site but would not be affected by construction. Construction of the 3.0-mile-long Pipeline would disturb 48.4 acres of land, including temporary workspaces, one temporary access road, and aboveground facilities (one meter station and a pig launching facility[8]). Approximately 0.3 acre of land, associated with Pipeline's aboveground facilities, would be affected by operation of the Pipeline. Commonwealth would maintain a 3.5-foot-wide permanent

5 The transcripts of the public scoping session and all written comments are part of the FERC's public record for the Project and are available for viewing in eLibrary under docket number CP19-502-000.

6 The transcripts of the virtual public comment sessions are available for viewing in eLibrary under accession no. 20220826-4001.

7 The transcripts of the public scoping and draft EIS comment meetings and all written comments are part of the FERC's public record for the Project and are available for viewing in eLibrary under the pre-filing docket number (PF17-8-000) and the certificate proceeding docket numbers (CP19-502-000, CP19-502-001).

8 A "pig" is a device that travels within a pipeline and is used to clean and dry the pipeline and/or to inspect it for damage or corrosion.

right-of-way[9] but would restore the entire right-of-way to its pre-construction state, which consists of herbaceous estuarine emergent wetland vegetation.

Based on our analysis, Project scoping, agency consultations, and public comments, the primary Project construction and operational impacts would be on geology, waterbodies and wetlands; vegetation; wildlife and aquatic resources; federally listed species; land use, recreation, and visual resources; socioeconomics; environmental justice, air quality and noise; reliability and safety; and cumulative impacts, including climate change.

Geology

The Project exists within a limited range of geologic conditions and resources. We conclude that construction and operation of the Project facilities in accordance with Commonwealth's proposed contingency measures related to mineral and paleontological resources, would not result in a significant impact on surface mines, mineral resources, or paleontological resources. Commonwealth would reduce the potential for impacts on the Project from natural hazards such as subsidence, coastal erosion, and flooding through its proposed engineering design.

Commonwealth proposes to use the horizontal directional drill (HDD) method to cross Highway 27/82, a 10-inch-diameter waterline, and two roadside ditches between and MPs 2.7 and 2.99. The total crossing length of the HDD would be approximately 1,940 feet. Commonwealth completed an analysis to assess the risk of hydrofracture releases and inadvertent returns of drilling fluid during the HDD process. Commonwealth's risk assessment indicates there is a "moderate" risk of an inadvertent release under Highway 27/82 and subsequent highway settlement on the order of one inch. For the remainder of the HDD alignment, including the roadside ditch waterbody adjacent to Highway 27/82, Commonwealth's assessment indicates the risk of an inadvertent release is "high" to "very high." Commonwealth would follow FERC's *Guidance for Horizontal Directional Drill Monitoring, Inadvertent Return Response, and Contingency Plans*. Commonwealth is consulting with the Louisiana Department of Transportation and Development to develop an alternative plan for crossing Highway 27/82 if, despite mitigation methods, an LDOTD inspector determines during construction that the amount of settlement beneath Highway 27/82 is unacceptable. To avoid environmental impacts in such a situation, we recommend in section 4.1.5.6 that Commonwealth complete an alternative plan for crossing Highway 27/82 that has been approved by the Louisiana Department of Transportation and Development and that Commonwealth should successfully complete the HDD or alternative plan for crossing Highway 27/82 prior to the start of construction of the remainder of the Pipeline right-of-way. With implementation of Commonwealth's mitigation methods and our recommendations, we conclude that Project impacts on geological resources would be adequately minimized and would not be significant.

Water Resources

The primary impacts on water resources from constructing the Terminal would include the filling of two unnamed waterbodies at the Terminal site and resuspension of sediments in the water column during construction and maintenance dredging of the marine facility. The filling of the waterbodies at the Terminal site would result in 2.8 acres of permanent impacts. Impacts on surface waters related to dredging would be temporary and would not substantially increase turbidity levels above general ambient conditions within the Calcasieu Ship Channel. Commonwealth evaluated the sediments to be dredged in accordance with the

9 Commonwealth states its permanent easement with the Pipeline right-of-way landowners would include the right to access the right-of-way for activities necessary to protect, inspect, maintain, operate, and repair the Pipeline in accordance with 49 CFR 192 for the duration of Pipeline operation.

EPA/COE *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual* and did not identify any evidence of contaminants.

Construction of the Pipeline would cross three major and two intermediate waterbodies. Commonwealth would use open-cut methods to install the Pipeline across the three major waterbodies and the horizontal directional drilling (HDD) method for the two intermediate waterbody crossings. Commonwealth would restore the open-cut waterbody crossings in accordance with its *Wetland and Waterbody Construction and Mitigation Procedures (Procedures)* and *Workspace Restoration Plan*.[10] Commonwealth would follow the protocols in its revised *HDD Contingency Plan*, which includes a detailed approach for responding to inadvertent surface releases of drilling fluids in the waterbodies under which the HDD would pass.

With implementation of the HDD method, revised *HDD Contingency Plan*, the FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan (Plan)*, Commonwealth's *Procedures* (which incorporate the FERC's *Procedures*)[11], we conclude that impacts on water resources would be adequately minimized or avoided and would not be significant.

Wetlands

Construction of the Terminal would affect about 95.9 acres of wetlands and result in the permanent loss of 89.6 acres of wetlands. Over 70 percent of this permanent impact would affect estuarine emergent wetlands, followed by estuarine forested, and estuarine scrub-shrub wetlands. To mitigate unavoidable wetland impacts at the Terminal, Commonwealth would purchase wetland mitigation bank credits at a quantity specified by the COE and Louisiana Department of Natural Resources Office of Coastal Management (OCM) to comply with the Clean Water Act.

Construction of the Pipeline facilities would affect a total of 43.6 acres of estuarine emergent wetlands, including construction impacts of the additional temporary workspace (ATWS) areas and a temporary access road. Approximately 0.3 acre of this impact would result in permanent wetland loss resulting from construction of the aboveground facilities. Following construction, the remaining disturbed areas, including the permanent right-of-way, would be restored in accordance with Commonwealth's *Procedures* and *Workspace Restoration Plan*. Part of Commonwealth's *Procedures* and *Workspace Restoration Plan* includes the potential to import fill to offset any loss of backfill volume when restoring the right-of-way.

With the implementation of Commonwealth's *Procedures* to restore wetlands within the temporary workspace (and permanent workspace for the Pipeline) and compliance with the COE's and OCM's mitigation requirements, we conclude that the impacts on wetlands would be adequately minimized.

Vegetation

Construction and operation of the Terminal facilities would permanently impact approximately 98.5 acres of vegetation habitat, resulting in the loss or conversion of 89.8 acres of wetlands and forested chenier habitat, 1.6 acres of tidal slough, and 0.8 acre of open land habitat into industrial land. All impacts

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10 Commonwealth's Workspace Restoration Plan Rev. 2 was filed on May 23, 2022 as appendix A under accession number 20220523-5182.

11 The FERC Plan and Procedures are a set of baseline construction and mitigation measures developed to minimize the potential environmental impacts of construction on upland areas, wetlands, and waterbodies. The Plan and Procedures can be viewed on the FERC website at: https://www.ferc.gov/sites/default/files/2020-04/upland-erosion-control-revegetation-maintenance-plan.pdf and https://www.ferc.gov/sites/default/files/2020-04/wetland-waterbody-construction-mitigation-procedures.pdf.

on vegetation related to the Pipeline would occur in estuarine emergent wetland vegetation, as described above.

One vegetation community of special concern (Coastal Live Oak-Hackberry Forest natural community; also known as a chenier habitat) was identified by the FWS and Louisiana Department of Wildlife and Fisheries (LDWF) as present within the Terminal footprint. Permanent impacts from the Terminal would total 13.3 acres of chenier habitat (23.6 acres of chenier habitat at the Terminal site would not be affected by construction). Based on suggestions by LDWF, Commonwealth has proposed mitigation that includes fencing the chenier habitat that would not be affected by construction of the Terminal, eradicating the feral hogs that are present in the chenier habitat from the fenced areas, and preserving the fenced areas from development for the life of the Project.

With the implementation of the Commonwealth's *Workspace Restoration Plan* and its proposed mitigation measures, we conclude that Project impacts on vegetation resources would be mostly short-term and minor or adequately mitigated (with the purchase of mitigation credits as required by the COE and OCM to comply with the Clean Water Act).

Wildlife and Aquatic Resources

Wildlife Resources

The primary impact on wildlife from construction of the Terminal and Pipeline would be the loss of estuarine emergent, scrub shrub, and forested wetland habitats and chenier habitat, which provide nutrients, cover, shelter, and water for a variety of terrestrial and aquatic wildlife species, including waterfowl, wading birds, nesting birds, raptors, mammals, reptiles, and amphibians. Construction of the Terminal and Pipeline could cause displacement, stress, and direct mortality of individual wildlife species that use these types of habitats. Operation of the Terminal would result in increased noise, lighting, and human activity that could disturb wildlife in the area and a reduction of usable habitat for most wildlife species currently inhabiting the area. However, much of the wildlife known to be present at the site (e.g., racoons, nutria, waterfowl) are common species that are habitat generalists (with the notable exception of the eastern black rail, discussed in section 4.7.1.2) and are generally tolerant of anthropogenic activities. Operation of the Pipeline would require minimal lighting, activities, or other disturbances that would affect wildlife.

The wetland and chenier habitats in the Project area are especially important as potential habitat for migratory bird species, including songbirds, colonial nesting waterbirds, and raptors. The Project is within the Gulf Coast Prairie Bird Conservation Region and the Chenier Plain Important Bird area. Chenier habitat provides critical in-transit habitat for migrating birds prior to and after crossing the Gulf of Mexico. Commonwealth consulted with the FWS and LDWF to determine measures Commonwealth would implement to avoid and minimize impacts on migratory birds. Measures include attempting to adhere to a vegetation clearing-restriction window of March 1 through July 31, adhering to FWS-recommended conservation measures related to minimizing impacts from flares and lighting, conducting pre-construction field surveys for evidence of colonial nesting waterbird rookeries and consulting FWS and LDWF if any are found, and protecting chenier habitat present in the Project area that would not be affected by construction.

We conclude that constructing and operating the Project would not significantly affect wildlife populations and wildlife habitat. Commonwealth would minimize impacts on wildlife and habitat by implementing its mitigation and avoidance plans for impacts on wetlands and chenier habitat, by following the measures outlined in the FERC's *Plan* and Commonwealth's *Procedures* and *Workspace Restoration Plan*, and by adhering to avoidance and minimization methods recommended by the FWS and LDWF related to facility lighting, flare stack design and usage, and conducting nest surveys, as needed.

Aquatic Resources

Construction of the Terminal's marine facility would require dredging/excavation of 55.0 acres (mostly in tidal estuarine habitat) and driving concrete and steel pilings in water with vibratory and impact pile drivers. Potential impacts from these activities include increased sedimentation, turbidity, and noise levels, which could adversely affect aquatic resources. The aquatic species within the Project area are accustomed to regular fluctuations in turbidity levels from industrial activity and strong tidal currents within the Calcasieu Ship Channel. Commonwealth would use a hydraulic dredge with a suction cutter head, which would minimize the resuspension of sediments and associated turbidity during dredging. Further, the soft, unconsolidated sediments in the Project area experience frequent cycles of tidal-related scour and deposition, which favors organisms that are adapted to a frequently changing substrate environment. These organisms would therefore recover quickly after construction. We conclude that sedimentation and turbidity impacts on aquatic resources from dredging would be localized, temporary to short-term, and not significant.

Underwater noise impacts from pile driving may result in injury or trauma to fish, sea turtles, and marine mammals if measures are not implemented to avoid and minimize these potential impacts. Commonwealth would use NMFS-recommended best management practices during pile driving to confirm protected species are not in the construction area (i.e., using biological monitors), allow mobile aquatic species to depart from the construction area, and reduce the extent of estimated underwater sound pressure levels produced by pile driving (e.g., using vibratory pile drivers when possible and using cushion blocks and bubble curtains when impact pile drivers are necessary) and reduce the potential for injury or behavioral level effects on aquatic species. Therefore, we conclude that underwater noise impacts on aquatic resources from pile driving would be localized, temporary, and not significant.

Terminal construction would permanently impact approximately 24.0 acres of brackish marsh, tidal intermediate marsh, estuarine soft bottom and estuarine water column habitat, and oyster reef habitat characterized as essential fish habitat (EFH). Dredging of the marine facility and subsequently placing the dredge spoils at a non-jurisdictional beneficial use of dredged materials (BUDM) site would temporarily affect 47.0 acres of estuarine mud bottom and estuarine water column at the marine facility and 666.2 acres of tidal intermediate marsh and estuarine soft bottom and estuarine water column through placement of the dredge slurry transport pipeline and deposition of dredged sediment at the BUDM site. The FWS would use the dredged sediment at the BUDM site for restoration of estuarine shallow subtidal habitat, mudflat habitat, and as substrate for restoration of estuarine emergent marsh. Commonwealth currently has not proposed to use the placement of the dredged sediment at the BUDM site as wetland mitigation under Section 404 of the CWA. Construction of the Pipeline would temporarily impact 43.6 acres of estuarine emergent wetlands characterized as EFH and permanently impact approximately 0.3 acre of estuarine emergent wetland that is considered EFH. The temporary construction impacts are expected to be of short duration and any affected populations of EFH species and their food sources would be expected to recover quickly following construction. Commonwealth would minimize the impacts on EFH by implementing its Project-specific *Procedures*, *Spill Prevention and Response Plan*, *HDD Contingency Plan*, *Workspace Restoration Plan,* and by using NMFS-recommended impact minimization methods such as bubble curtains and cushion blocks during pile driving. We conclude that the Project would adversely affect EFH, but these adverse effects would be minor and temporary to short-term in duration or appropriately mitigated through Commonwealth's compliance with CWA permitting and FERC's compliance with MSA consultation requirements. We requested in the draft EIS that NMFS consider the EIS as our EFH Assessment. On May 23, 2022, NMFS provided comments stating that the EFH Assessment was incomplete. We are responding to NMFS comments in section 4.6.3 and have included the EFH Assessment in appendix D of this EIS.

Threatened, Endangered, and Other Special Status Species

A total of 20 federally protected species, 1 proposed species, and 1 species that is under federal review have the potential to occur in the vicinity of the Project. We conclude the Project would have *no effect* or would be *not likely to adversely affect* 19 federally listed species, would have *no effect* on the species proposed as threatened, would *not contribute to a trend toward federal listing* for the 1 species under federal review, and *is likely to adversely affect* the threatened eastern black rail.

On October 19, 2020, the NMFS provided concurrence that the Project would be *not likely to adversely affect* the species under NMFS jurisdiction that could be affected by the Project. This notification concluded consultation responsibilities under the Endangered Species Act (ESA) for species under NMFS's purview.

On May 4, 2021, the FERC submitted a biological assessment (BA) to the FWS and requested to initiate formal consultation regarding the potential impacts of the Project on the eastern black rail. On September 16, 2021, the FWS published a Biological Opinion (BO), which stated the FWS concurred with the findings of the BA that the Project would have *no effect*, was *not likely to adversely affect*, or *would not contribute to a trend toward federal listing* for all species potentially affected by the Project, except for the eastern black rail. The FWS concurrence fulfilled the FERC's responsibilities for the Project under section 7 of the ESA for all federally listed species in the BA other than the eastern black rail. In the BO, the FWS determined that the Project is *not likely to jeopardize the continued existence* of the eastern black rail. In conjunction with the determination, the FWS issued a list of Terms and Conditions, Monitoring and Reporting Requirements, and conservation recommendations for the Project. Commonwealth formally accepted the Terms and Conditions of the BO, thereby concluding formal consultation under the ESA for the Project.

Land Use, Recreation, and Visual Resources

The Project site is 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 LDNR. To ensure compliance with this federal requirement, we recommend in section 4.8.5 of the EIS that Commonwealth file the consistency determination with FERC prior to any Project construction.

Several recreational and special interest sites are near the proposed Project site. While the Calcasieu River would be the only one directly impacted by the Project, some of the recreational sites may experience indirect impacts such as change in viewshed and/or increases in traffic in the area. Cameron Parish is home to vital fishery resources and serves as a conduit for access to such resources in the Calcasieu Ship Channel and the Gulf of Mexico. Construction associated with the Project may temporarily impact local recreational fishing, bird watching, trapping, hunting, and boating activities as a result of increased vessel traffic within the Calcasieu Ship Channel. This increase in vessel traffic related to construction of the Project would be short-term. During operations, up to 156 LNG carriers would call at the Terminal per year. Delays related to the LNG carriers arriving or departing the Terminal would be minor and localized. Therefore, we have determined the Project would not have any significant adverse impacts on recreational or commercial boating or fishing along the Calcasieu Ship Channel and Gulf of Mexico.

The proposed Terminal would be visible to varying degrees to users of the Calcasieu Ship Channel, nearby beaches and towns, motorists along the Creole Nature Trail All-American Road, and a Recreational Vehicle (RV) residence adjacent to the site. Although the addition of the facility would be consistent with the general character of the Calcasieu Ship Channel, the addition of the Terminal at this location would represent a significant impact on the viewshed of boaters, beachgoers, and local residents, including the RV residence adjacent to the site, as it would detract from the overall quality of the scenic views of this portion of the region.

The Pipeline would be constructed through generally flat wetlands but would not alter the landscape of the region, as the pipeline would be buried during operation. Construction of the Pipeline could result in a temporary visual impact within the viewshed of the Creole Nature Trail National Scenic Byway; however, Commonwealth would restore areas disturbed during construction to their prior condition. The closest aboveground facilities associated with the Pipeline would be about 0.9 mile west of Highway 27/82 and would likely be unnoticeable to drivers traveling along the road. Therefore, the visual impact of the aboveground facilities would not have a significant impact on the aesthetics of the landscape along the Pipeline route.

Socioeconomics

Construction of the Project would result in minor positive economic impacts due to increases in construction jobs, payroll taxes, purchases made by the workforce, and expenses associated with the acquisition of material goods and equipment. Operation of the Project would have a minor positive effect on the local governments' tax revenues due to the increase in property taxes that would be collected. Construction of the Project would not have a significant adverse impact on local populations, employment, provision of community services, housing, or property values.

Environmental Justice

As described throughout this EIS, the proposed Project would have a range of impacts on the environment and on individuals living in the vicinity of the Project facilities, including environmental justice populations. The closest environmental justice block groups are Census Tract 9702.01, Block Group 3 approximately 0.1 mile from the LNG Terminal (with the closest residence [pilot's temporary housing] approximately 3,300 feet away) and Census Tract 9701, Block Group 1 approximately 2.7 miles from the Pipeline. The closest town within an environmental justice community is Cameron (within Census Tract 9702.01, Block Group 3) over 2 miles away. Based on the scope of the Project and our analysis of the Project's impacts on the environment, we have determined Project-related impacts on wetlands, surface water, aquatic resources, visual resources, recreation, socioeconomics, traffic, noise, and air quality may adversely and disproportionately affect the identified environmental justice communities. In general, the magnitude and intensity of the impacts would be greater for individuals and residences closest to the Project's facilities and would diminish with distance. Visual impacts on environmental justice communities near the Terminal would be significant. As outlined in section 4.9.12.4, Commonwealth has committed to implementing a Facility Lighting Plan, which would reduce visual impacts on the environmental justice communities. Environmental justice communities in the area could also experience cumulative impacts due to the addition of other projects within the geographic scope (see section 4.13). Due to the presence of significant visual impacts on an environmental justice community and overall cumulative impacts in the project area, we conclude that impacts on environmental justice communities would be disproportionately high and adverse.

Air Quality and Noise

Air quality would be affected by construction and operation of the Project; however, most air emissions associated with the Project would result from the long-term operation of the Terminal. Emissions during Terminal and Pipeline construction would generally be associated with onshore construction activities conducted using on-road and off-road mobile equipment and offshore construction activities conducted using marine vessels such as tugboats or barges and a dredging vessel. Vehicular and/or marine vessel emissions from gasoline and diesel engines would comply with applicable EPA mobile source emission regulations (40 CFR 85) by using equipment manufactured to meet these specifications. The combustion and fugitive dust emissions that would occur during construction would be largely limited to the immediate vicinity of the Terminal site and to a lesser extent in the areas where the Pipeline would be constructed. These emissions would represent a small portion of Cameron Parish's yearly emissions inventories and would subside once construction has been completed. Therefore, we conclude the construction-related impact on local air quality during construction of the Terminal and Pipeline would not be significant.

Impacts on air quality during operation of the Project would primarily result from emissions related to the Terminal facilities; mobile emissions sources such as cars and trucks associated with the Terminal facility; LNG carriers and associated escort tugs calling on the Terminal; and fugitive emissions related to the aboveground facilities of the Pipeline. Commonwealth conducted an air quality dispersion modeling analysis, which indicates that the ambient pollutant concentrations that would result from these emissions would not lead to a violation of any ambient air quality standard or exceedance of any other air quality impact criterion. Commonwealth would use a site-specific program to identify leaking equipment and minimize fugitive emissions and Commonwealth Pipeline operations would comply with all applicable PHMSA codes and advisories regarding leak detection and repair and Louisiana Department of Environmental Quality (LDEQ) air quality regulations. Based on the dispersion modeling analysis, we conclude the impact on local air quality during operation of the Terminal and Pipeline would not be significant

Noise would affect the local environment and nearby noise sensitive areas (NSA) during both construction and operation of the Project facilities. Construction noise sources include pile driving and heavy construction machinery. Commonwealth proposes to conduct pile driving and general construction activities during daylight hours; however, dredging activities would be conducted on a 24-hour basis. Commonwealth would follow the measures in its *Nighttime Noise Monitoring Plan* to reduce projected nighttime dredging noise levels to at or below FERC's 55 decibels on the A-weighted scale (dBA) noise criterion to ensure noise impacts are not significant. We recommend in section 4.11.2.4 that Commonwealth monitor construction noise at the Terminal site between 7:00 p.m. and 7:00 a.m. and restrict the noise attributable to construction activities to no more than 55 dBA L_{dn} (48.6 dBA L_{eq}) at NSAs 1 and 2 during these hours.

Operation of the Terminal site would produce noise on a continuous basis. Modeled values indicate the sound level of Terminal operations would remain below the FERC's 55 dBA threshold at nearby NSAs. However, the modeled 55 dBA contour was very close to one NSA. Therefore, in section 4.11.2.4, we recommend Commonwealth file noise surveys within 60 days of beginning operations to confirm that Terminal noise levels do not exceed the 55 dBA threshold or modify operation of the Terminal to achieve noise levels less than the prescribed threshold. Normal operation of the Pipeline would not emit noise perceptible to nearby NSAs.

We conclude that with implementation of the recommended noise mitigation plans for construction and operation of the Terminal, construction and operation of the Project 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 whether the proposed facilities would operate safely, reliably, and securely.

As a cooperating agency, the DOT assists the FERC by determining whether Commonwealth LNG Project's proposed design would be capable of complying with location criteria and design standards contained in DOT's 49 CFR 193 Subpart B siting requirements. The DOT PHMSA provided a Letter of Determination (LOD) on the Project's compliance with 49 CFR 193 Subpart B on August 2, 2022. This determination is provided to the Commission as further consideration on its decision to authorize or deny the Project. If the Project is authorized, constructed, and operated, the facility would be subject to the DOT's inspection and enforcement program and final determination of whether a facility follows the requirements of 49 CFR 193 would be made by the DOT staff.

As a cooperating agency, the Coast Guard also assisted the FERC staff by reviewing the proposed LNG terminal and the associated LNG marine vessel traffic. The Coast Guard reviewed a Waterway Suitability Assessment (WSA) submitted by Commonwealth that focused on the navigation safety and maritime security aspects of LNG marine vessel transits along the affected waterway. On March 7, 2019, the Coast Guard issued a Letter of Recommendation (LOR) that recommended the Calcasieu River Ship Channel 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 Coast Guard's Navigation and Vessel Inspection Circulars (NVIC) 01-11. If the Project is authorized, constructed, and operated, the facilities would be subject to the Coast Guard's inspection and enforcement program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

FERC staff conducted a preliminary engineering and technical review of the Commonwealth LNG Project design, including potential external impacts based on the site location. Based on this review, we recommend a number of mitigation measures, which would ensure continuous oversight prior to initial site preparation, prior to construction of final design, prior to commissioning, prior to introduction of hazardous fluids, prior to commencement of service, and throughout the life of the facility to enhance the reliability and safety of the facility to mitigate the risk of impact on the public. With the incorporation of these mitigation measures and oversight, FERC staff concluded that the Commonwealth LNG 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.

The Pipeline System and associated aboveground facilities would be constructed, operated, and maintained in compliance with DOT standards published in 49 CFR 192. These regulations are intended to minimize the potential for natural gas facility accidents and protect the public and environment. The DOT specifies material selection and qualifications; minimum design requirements; and protection from internal, external, and atmospheric corrosion. Because the Pipeline would be constructed according to the DOT regulations, we conclude that the Pipeline System would not have a significant impact on public safety.

Cumulative Impacts

Our analysis of cumulative impacts includes other projects in the vicinity of the proposed Commonwealth Project that could affect the same resources as the Project in the same approximate timeframe. We generally conclude that the potential impacts of the Project, when combined with the impacts from the other projects considered in the geographic scopes, would not result in a significant impact on resources. Commonwealth's proposed mitigation measures would minimize or offset Project impacts on local resources. Additionally, concurrent construction and operation of the Project and the other projects in the area would have a beneficial cumulative effect on revenues for the state and the local parishes resulting from increased expenditures from the workforce and their families and increased property taxes.

The exceptions to this conclusion are the Project's impacts on visual resources and environmental justice populations. Construction of the Project and other planned area LNG projects and port facilities would contribute to cumulative visual impacts on users of the Calcasieu Ship Channel, users of Holly and Broussard Beaches, residents in the town of Cameron, and motorists along the Creole Nature Trail All-American Road. The Creole Nature Trail is a 180-mile road that runs from Sulphur to Holly Beach and from Lake Charles down to Cameron. Construction of Commonwealth Project, authorized Calcasieu Pass LNG Project, and the proposed CP2 LNG Project would result in several industrial sites in a concentrated area and the additional sites, including flares, lighting, and storage tanks, may be visible for several miles. Visual changes in this area would be significant compared to the conditions prior to construction of LNG projects along this portion of the Calcasieu Ship Channel.

Regarding environmental justice communities, we have determined environmental justice communities in the study area would experience cumulative impacts on wetlands, surface water, aquatic resources, socioeconomics, traffic, noise, air quality, greenhouse gas (GHG) and significant visual cumulative impacts related to the Project and the additional projects within the respective geographic scopes of the Project. Cumulative impacts on environmental justice communities related to wetlands, surface water, aquatic resources, socioeconomics, traffic, noise, and air quality would be less than significant. However, general cumulative impacts related to visual resources would be significant.

Finally, Commonwealth's filings indicate the Project would increase the atmospheric concentration of GHG in combination with past and future emissions from all other sources and would contribute to climate change. Construction of the Project would result in emission of an estimated 496,515 metric tons per year (tpy) of CO_2e over approximately 3 years. Operation of the Project would result in emission of an estimated 3,228,754 metric tpy over the lifetime of the project. This EIS is not characterizing the Project's GHG emissions as significant or insignificant because the Commission is conducting a generic proceeding to determine whether and how the Commission will conduct significance determinations going forward.[12]

ALTERNATIVES CONSIDERED

We evaluated several alternatives to the proposed Project, including the No-Action Alternative; system alternatives for the Terminal; alternative Terminal sites and alternative Pipeline routes. 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.

System alternatives evaluated for the Terminal included 7 existing LNG import 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 Commonwealth's purpose and need. Consequently, we must conclude that the proposed export capacity at any other existing or proposed LNG facility would require an expansion or new facilities similar to the facilities proposed for the Terminal, resulting in environmental impacts similar to the Project. These systems alternatives, therefore, offer no significant environmental advantage over the proposed Project and are not considered to be preferable.

The alternative sites we evaluated in addition to the Project site included six locations in southwest Louisiana along the Calcasieu Ship Channel, one location along the Sabine Pass Ship Channel, and one location in Plaquemines Parish along the Mississippi River. In general, these sites did not provide clear evidence of a significant environmental advantage to Commonwealth's proposed site.

We evaluated four alternative pipeline routes, in addition to the proposed route to assess whether an alternate Pipeline route would significantly reduce the environmental impacts of the Pipeline. Ultimately, none of the four route alternatives assessed provided a significant environmental advantage and/or reduction in impacts on the properties of landowners relative to the proposed Pipeline route.

12 See Consideration of Greenhouse Gas Emissions in Natural Gas Infrastructure Project Reviews, 178 FERC ¶ 61,108 (2022); 178 FERC ¶ 61,197 (2022).

Therefore, we conclude that Commonwealth's proposed Pipeline route would be the preferred alternative to meet the Project objectives.

CONCLUSIONS

We determined that construction and operation of the Project would result in adverse environmental impacts; however, for most resources, impacts on the environment would be reduced to less than significant levels with the implementation of Commonwealth's proposed impact avoidance, minimization, and mitigation measures and the additional measures recommended by FERC staff. The exceptions to these findings are related to visual resources and environmental justice communities. Through our analyses, we determined construction and operation of the Project would have significant adverse effects on the visual resources of the surrounding areas and environmental justice communities in the region.

Additionally, construction and operation of the Project would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources and would contribute to climate change. This EIS is not characterizing the Project's GHG emissions as significant or insignificant because the Commission is conducting a generic proceeding to determine whether and how the Commission will conduct significance determinations going forward. We based our conclusions upon information provided by Commonwealth and through data requests; field investigations; literature research; alternatives analysis; public comments and scoping sessions; and coordination with federal, state, and local agencies and Indian Tribes.

Although many factors were considered in these determinations, the principal reasons are:

- Commonwealth would mitigate wetland impacts associated with the construction and operation of the proposed Terminal and Pipeline in accordance with COE and OCM requirements to comply with the Clean Water Act.
- FERC staff has completed the process of complying with section 7 of the ESA and determined that the Project would have no effect, would be not likely to adversely affect, or would not contribute to a trend toward federal listing for 21 of the 22 species that could potentially be impacted by the Project and the FWS determined the Project is not likely to jeopardize the continued existence of the eastern black rail. Commonwealth has agreed to adhere to terms and conditions provided by the FWS to minimize the adverse effects the Project would have on the eastern black rail.
- FERC staff has completed consultation under section 106 of the National Historic Preservation Act and implementing regulations at 36 CFR 800 and determined that no historic properties would be affected by the Project.
- Commonwealth would comply with all applicable air and noise regulatory requirements during construction and operation of the Project.
- Commonwealth would minimize impacts on environmental resources during construction and operation of the Project by implementing, as applicable, FERC's *Plan*, and Commonwealth's *Procedures*, revised *Workspace Restoration Plan*, *Spill Prevention and Response Plan*, and revised *HDD Contingency Plan*.
- Commonwealth would construct a storm surge wall around the perimeter of the Terminal that would be 26 feet high on the south and east (windward) sides of the site and 21 feet high on the north and west (leeward) sides, which would be of sufficient height to withstand projected storm surge heights of 100-year and 500-year storms.

- The design spill methodology reviewed by DOT for the Terminal, the LOR issued by the USCG for the LNG marine traffic in the Calcasieu River Ship Channel, and the regulatory requirements for the Pipeline and Terminal would avoid a significant increase in public safety risks.
- Commonwealth would include acceptable layers of protection in the facility design that would reduce the risk of a potentially hazardous scenario from developing into an event that could impact the offsite public.
- An environmental inspection program would be implemented to ensure compliance with the mitigation measures that become conditions of the FERC authorization.

In addition, we developed recommendations that Commonwealth 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. These recommended mitigation measures are presented in section 5.2 of the final EIS.

1.0 INTRODUCTION

On August 20, 2019, Commonwealth LNG, LLC (Commonwealth) filed an application with the Federal Energy Regulatory Commission (Commission or FERC) pursuant to Section 3(a) of the *Natural Gas Act* (NGA). Commonwealth requested authorization to site, construct, and operate a natural gas liquefaction and export terminal and an integrated NGA Section 3 natural gas pipeline, in Cameron Parish, Louisiana. The proposed project was designated as Docket No. CP19-502-000 by the Commission and is referred to as the "Commonwealth LNG Project" or "Project" in this Environmental Impact Statement (EIS).

As part of the Commission's consideration of this application, we[1] prepared this final EIS to assess the potential environmental impacts resulting from construction and operation of the proposed Project in accordance with the requirements of the *National Environmental Policy Act of 1969*, as amended (NEPA).

Vertical lines in the margins of this document identify text that is new or modified in the final EIS and differs materially from corresponding text in the draft EIS. Changes were made to address comments from cooperating agencies and other stakeholders on the draft EIS, incorporate applicant-proposed modifications to the Project after publication of the draft EIS, update information included in the draft EIS, and incorporate information filed by Commonwealth in response to our recommendations in the draft EIS.

Herein, we refer to all of the facilities that comprise the Project, except for the pipeline (e.g., the liquefaction facilities, storage facilities, liquefied natural gas [LNG] carrier berth), as the "Terminal" and refer to the pipeline and all of its associated facilities (e.g., the interconnection facilities, pig[2] launcher and receiver, meter station, and pipe storage yards) as the "Pipeline." The Terminal would operate on 118.8 acres of a 393-acre property in south-central Cameron Parish, Louisiana, near the mouth of the Calcasieu River. The 42-inch-diameter Pipeline would extend 3.0 miles, in an approximate north-south orientation, from interconnections with two existing natural gas pipelines (EnLink Bridgeline Holdings [Bridgeline] and LP Kinetica Partners, LLC [Kinetica]) at its northern end and would connect to the Terminal at its southern end. The Pipeline would deliver a maximum of 1.44 billion cubic feet per day (Bcf/d) of natural gas to the Terminal. The Terminal would have a production capacity of 8.4 million metric tonnes per annum (MTPA) of LNG.[3] The natural gas would be liquefied using six liquefaction trains, each with a production capacity of 1.4 MTPA, and stored on-site in six aboveground, full-containment 50,000 cubic meter (m^3) LNG storage tanks. The Terminal would include a dredged turning basin and one LNG carrier berth capable of loading LNG carriers with capacities ranging between 10,000 m^3 and 216,000 m^3. During operation, Commonwealth anticipates that an average of 156 LNG carriers would call on the Terminal each year. Figure 1.0-1 provides the general vicinity of the Commonwealth Project. Section 2.0 provides more detailed information regarding specific components of the Terminal and Pipeline.

Subject to the receipt of FERC authorization and all other applicable permits, authorizations, and approvals, Commonwealth anticipates mobilizing for construction of the Terminal during the second quarter of 2023 and beginning commercial operations by the second quarter of 2026. Commonwealth estimates construction of the Pipeline would begin approximately one year after receiving the FERC Order and require about 12 months to complete.

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

2 A "pig" is a device that travels within a pipeline and is used to clean and dry the pipeline and/or to inspect it for damage or corrosion.

3 8.4 MTPA of LNG would be the production capacity of the Terminal when operating under design conditions; the maximum production capacity of the Terminal when operating under optimal conditions is anticipated to be 9.5 MTPA.

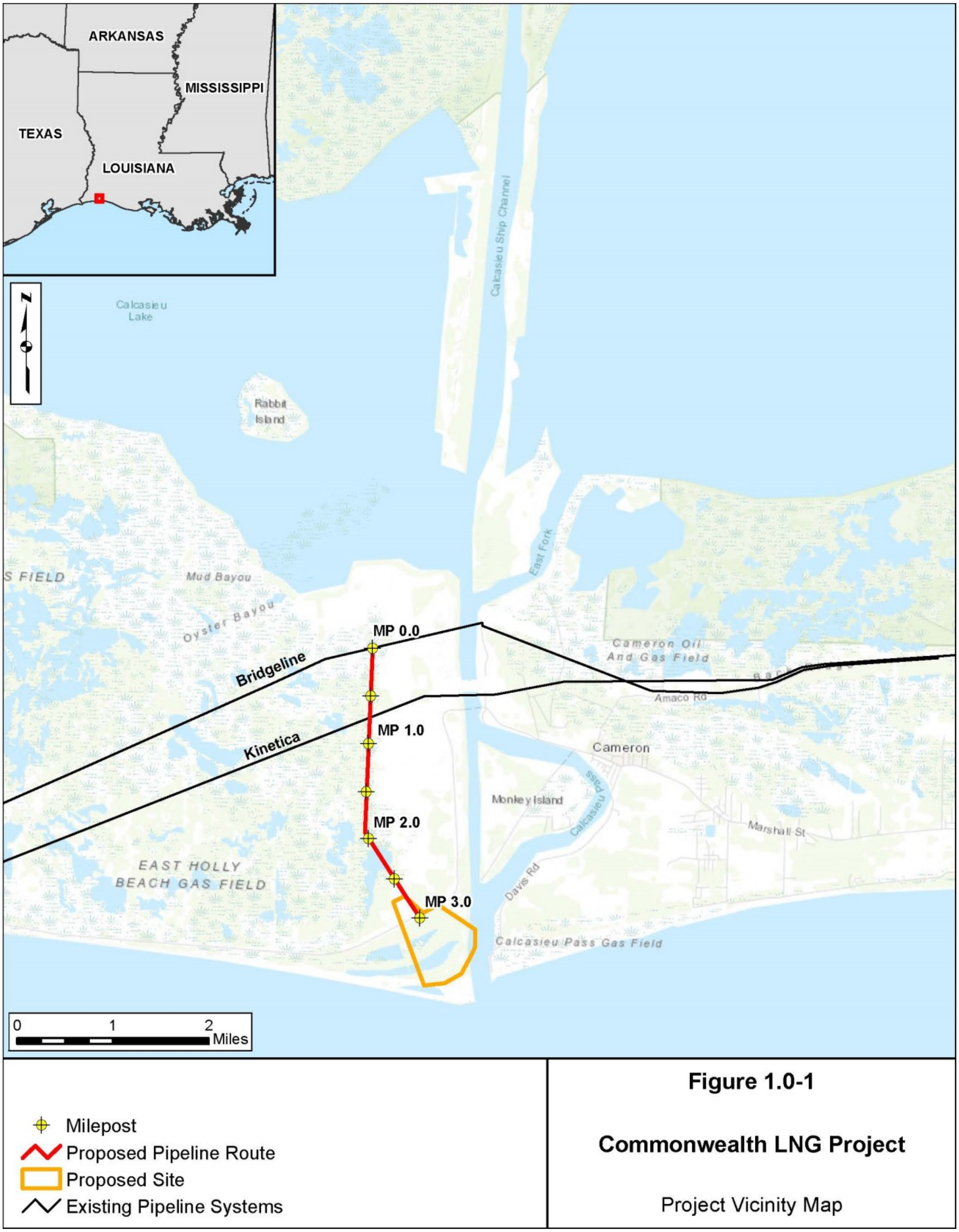

Figure 1.0-1

Commonwealth LNG Project

Project Vicinity Map

1.1 PROJECT PURPOSE AND NEED

Commonwealth states that the purpose of the proposed Project is to liquefy and export to foreign markets, domestically produced natural gas sourced from the existing interstate and intrastate pipeline systems of Kinetica and Bridgeline, respectively, in southwest Louisiana.[4]

We received multiple comments from the public stating that the Commission should not approve the Project due to the high number of other LNG export terminals either currently operating, under construction, or proposed for construction in the United States; due to society's need to reduce its dependency on natural gas as an energy source; and due to the lack of local or national benefit provided by the Project, as perceived by the commenters. The Commission's purpose for reviewing the Project is based on its obligations under Section 3 of the NGA, which requires the Commission to consider 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 used for exportation, the Commission would authorize the proposal unless it finds that the proposed facilities would not be consistent with the public interest.

The FERC does not plan, design, build, or operate natural gas transmission infrastructure. As an independent regulatory commission, the FERC reviews proposals to construct and operate such facilities. Accordingly, the project proponent is the source for identifying the purpose for developing, constructing, and operating a project. Commonwealth's purpose and objective in proposing the Project were defined in its application with the Commission.

1.2 PURPOSE AND SCOPE OF THIS EIS

This is not a decision document. The principal purposes of preparing an EIS are to:

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

This EIS focuses on the facilities that are under the FERC's jurisdiction (i.e., the Terminal and Pipeline). The topics addressed in this EIS include geology; soils and sediments; water use and quality; wetlands; vegetation; wildlife; aquatic resources and essential fish habitat (EFH); threatened, endangered, and special-status species; land use, recreation, and visual resources; socioeconomics (including environmental justice); cultural resources; air quality; noise; reliability and safety; cumulative impacts (including climate change); and alternatives. This EIS describes the affected environment as it currently exists based on a combination of data sources such as scientific literature, regulatory agency reports, and field data collected by Commonwealth; discusses the potential environmental consequences of the Project; compares the Project's potential impacts to those of alternatives; and presents our conclusions and recommended mitigation measures.

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4 Note that the Commission will consider as part of its decision to authorize natural gas facilities, all factors bearing on the public interest including the project's purpose and need. Specifically, regarding whether to authorize import or export natural gas facilities, the FERC shall authorize the proposal unless it finds that the proposed facilities would not be consistent with the public interest. Additional information regarding the Commission's process and considerations regarding the project's purpose and need are provided in section 1.2.1.

The *Energy Policy Act* (EPAct) of 2005, as amended states that the FERC shall act as the lead federal agency for coordinating all applicable authorizations related to jurisdictional natural gas facilities and for purposes of complying with NEPA. The FERC, as the "lead federal agency," is responsible for preparation of this EIS. This effort was undertaken with the participation and assistance of seven "cooperating agencies" as defined by NEPA. Cooperating agencies have jurisdiction by law or special expertise with respect to environmental impacts involved with a proposal. The cooperating agencies for this Project include: the U.S. Army Corps of Engineers (COE); U.S. Coast Guard (USCG); U.S. Department of Energy (DOE); U.S. Department of Transportation's (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA); U.S. Fish and Wildlife Service (FWS); National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS); and U.S. Environmental Protection Agency (EPA). The roles of FERC and the cooperating agencies in the Project review process are described below.

This EIS provides a basis for coordinated federal decision making in a single document, avoiding duplication among federal agencies in the NEPA environmental review processes. In addition to the lead and cooperating agencies, other federal, state, and local agencies may use this EIS in approving or issuing permits for all or parts of the proposed Project. Federal, state, and local permits, approvals, and consultations for the Project are addressed in section 1.4.

In accordance with the Council on Environmental Quality's (CEQ) regulations implementing NEPA, no agency decision on a proposed action may be made until 30 days after the U.S. Environmental Protection Agency publishes a notice of availability of the final EIS in the federal register. However, the CEQ regulations provide an exception to this rule when an agency decision is subject to a formal internal appeal process that allows other agencies or the public to make their views known. In such cases, the agency decision may be made at the same time the notice of the final EIS is published, allowing both periods to run concurrently. The Commission decision for this proposed action is subject to a 30-day rehearing period.

1.2.1 Federal Energy Regulatory Commission

The Commission has authority over the siting, construction, and operation of onshore LNG terminals under Section 3 of the NGA. In the case of the Project, the FERC also has jurisdiction over the Pipeline. As the lead federal agency (based on its authority under the NGA and EPAct of 2005), the FERC has prepared this document in compliance with the requirements of NEPA; the CEQ's regulations implementing procedural provisions of NEPA in 40 CFR 1500−1508; and the FERC's regulations implementing NEPA in 18 CFR 380.[5]

The Commission will consider the findings in this EIS during its review of Commonwealth's application. The identification of environmental impacts related to Project construction and operation and the mitigation of those impacts, as disclosed in this EIS, will be components of the Commission's decision-making process, which will be described in its Order. If the Project is approved, the Order would specify that the LNG terminal and related facilities can be constructed and operated under the authority of Section 3 of the NGA. The Commission may accept the application in whole or in part and can attach engineering

5 On July 16, 2020, CEQ issued a final rule; Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act (Final Rule, 85 Fed. Reg. 43,304), which was effective as of September 14, 2020; however, the NEPA review of this project was in process at that time and was prepared pursuant to the 1978 regulations. On April 20, 2022, CEQ issued a final rule to amend three provisions of its regulations implementing NEPA, addressing the purpose and need of a proposed action, agency NEPA procedures for implementing CEQ's NEPA regulations, and the definition of "effects," which became effective on May 20, 2022 (Final Rule, 87 Federal Register 23,453). The April 2022 final rule generally restores provisions of the 1978 regulations that were in effect before being modified in 2020. Therefore, this EIS is consistent with the April 2022 final rule.

and environmental conditions to the Order that would be enforceable actions to assure that the proper mitigation measures are implemented.

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

In accordance with Section 3A(e) of the NGA (added by Section 311 of the *EPAct of 2005*), the act stipulates that in any order authorizing an LNG terminal, the Commission must require the LNG terminal operator to develop an *Emergency Response Plan* (ERP) in consultation with the USCG and state and local agencies. 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 of 2005,* also requires that the ERP include a Cost-Sharing Plan that contains a description of any direct cost reimbursements the applicant agrees to provide to any state and local agencies with responsibility for security and safety at the LNG terminal and in proximity to LNG marine carriers that serve the facility.

1.2.2 U.S. Army Corps of Engineers

The COE has jurisdictional authority pursuant to Section 404 of the *Clean Water Act of 1972,* as amended (CWA) (Title 33 of the United States Code [USC], Section 1344 [33 USC 1344]); Section 10 of the *Rivers and Harbors* Act of 1899, as amended (RHA) (33 USC 403); Section 408 policy (Section 14 of the RHA; 33 USC 408); and Section 103 of the Marine Protection Research and Sanctuaries Act of 1972. The COE must comply with the requirements of NEPA before issuing permits under these statutes. The COE would adopt the EIS per 40 CFR 1506.3(c) if, after an independent review of the document, it concludes that the EIS sufficiently provides information to support decision making under its statutory authorities. Regulations implementing Section 404 of the CWA and Section 10 of the RHA are defined in 33 CFR Parts 320–332.

In its regulatory capacity, the COE is neither a proponent nor an opponent of projects seeking COE authorization. As stated in 33 CFR 320.19, the COE conducts a public interest review that seeks to balance a proposed action’s favorable impacts against its detrimental impacts. Additionally, as part of the public interest review, and in accordance with 33 CFR 320.4(b)(4), the COE is also required to review actions in accordance with regulations developed by the EPA under the CWA Section 404(b)(1) guidelines, including a determination of the least environmentally damaging practicable alternative. The CWA Section 404(b)(1) guidelines restrict the COE from issuing a permit for any alternative other than the least environmentally damaging practicable alternative. The term practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics, considering the overall purpose of the Project.

Although this EIS addresses environmental impacts associated with the Project as they relate to the COE’s jurisdictional permitting authority, it does not serve as a public notice for any COE permits or take the place of the COE’s permit review process. The COE will issue a Record of Decision to formally document its decisions on the proposed action, including Section 404(b)(1) analyses and required environmental mitigation commitments, if permits are issued for the Project.

1.2.3 U.S. Coast Guard

The USCG 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 *Magnuson Act of 1950* (50 USC 191); the *Ports and Waterways Safety Act of 1972*, as amended (33 USC 1221, et seq.), and the *Maritime Transportation Security Act of 2002* (46 USC 701). The USCG is responsible for matters related to navigation safety, vessel engineering and safety standards, and all matters pertaining to the safety of facilities or equipment in or adjacent to navigable waters up to the last valve immediately before the receiving tanks. The USCG also has authority over LNG facility security plan reviews, approvals, and compliance verifications as provided in 33 CFR 105, and siting as it pertains to the management of vessel traffic in and around LNG facilities to a point 12 nautical miles seaward from the coastline (i.e., within the territorial seas).

As required by its regulations, the USCG is responsible for issuing a Letter of Recommendation (LOR) and an LOR Analysis regarding the suitability of the waterway for LNG marine traffic following a Waterway Suitability Assessment (WSA) submitted by Commonwealth. Following submittal to the USCG of its initial Letter of Intent, Commonwealth performed both a Preliminary and Follow-On WSA as required by 33 CFR 127.007 and the USCG's Navigation and Vessel Inspection Circular – *Guidance Related to Waterfront Liquefied Natural Gas (LNG) Facilities* (NVIC 01-11). After reviewing the information in the Letter of Intent and WSA and completing an evaluation of the waterway in consultation with a variety of state and local port stakeholders, the USCG issued its LOR on March 7, 2019, recommending that the Calcasieu Ship Channel be considered suitable for LNG marine traffic associated with the proposed Project.

1.2.4 U.S. Department of Energy

Section 3(c) of the NGA requires that applications to DOE's Office of Fossil Energy and Carbon Management (DOE), formerly the office of Fossil Energy, requesting authorization of imports and/or exports of natural gas, including LNG, from and/or to nations with which there are free trade agreements (FTA) in effect, requiring national treatment for trade in natural gas (FTA nations), be deemed consistent with the public interest and granted without modification or delay. In the case of applications to export LNG to non-FTA nations, NGA Section 3(a) requires DOE to conduct a public interest review and grant authority to export unless DOE finds that the proposed exports would not be consistent with the public interest. Additionally, NEPA requires DOE to consider the environmental effects of its decisions regarding applications to export natural gas to non-FTA nations.

On October 16, 2019, Commonwealth submitted an application, in DOE/FE Docket No. 19-134-LNG, requesting authorization to export up to approximately 441.4 billion cubic feet per year of natural gas, as LNG, to FTA nations for a 25-year term and to non-FTA nations for a 20-year term. DOE approved Commonwealth's application to export to FTA nations on April 17, 2020 and noted it would address Commonwealth's application to export to non-FTA nations in a separate order. On September 11, 2020, Commonwealth amended its application to export LNG to non-FTA nations to request an export term through December 31, 2050 instead of the 20-year term Commonwealth initially requested.[6] Commonwealth's application to export to non-FTA nations is pending with DOE.

6 On August 25, 2020, DOE announced in the Federal Register (85 Fed Reg. 52237) that it had established a new policy extending the standard term for authorizations to export natural gas from the lower-48 states to non-FTA nations through December 31, 2050, discontinuing its practice of issuing standard 20-year export terms.

1.2.5 U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration

The DOT's PHMSA has prescribed the minimum federal safety standards for natural gas pipelines and LNG facilities in compliance with 49 USC 1671 et seq. and 49 USC 60101, respectively. Those standards are codified in 49 CFR Parts 192 and 193 and apply to safety regulations and standards related to the design, construction, operation, and maintenance of natural gas pipelines and the siting, design, construction, operation, maintenance, and security of LNG facilities, respectively. The 2001 edition of National Fire Protection Association (NFPA) Standard 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas*, is incorporated into 49 CFR Part 193 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, PHMSA participates as a cooperating agency and assists in assessing any mitigation measures that may become conditions of approval for any project. In addition, the August 31, 2018 MOU between FERC and PHMSA provides guidance and policy on each agency's respective statutory responsibility to ensure that each agency works in a coordinated and comprehensive manner.[7] In the 2018 MOU, PHMSA agreed to issue a Letter of Determination (LOD) stating whether LNG facilities would be capable of complying with location criteria and design standards contained in Subpart B of Part 193. The LOD will serve as one of the considerations in the Commission's decision-making process. DOT PHMSA issued the LOD for the Project on August 2, 2022.

The pipeline facilities would be designed, constructed, operated, and maintained in accordance with PHMSA regulations found in *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards* (49 CFR 192). Among other design standards, these regulations specify pipeline material selection; minimum design requirements; protection from internal, external, and atmospheric corrosion; and qualification procedures for welders and operations personnel. Any modifications to the provisions of the 49 CFR 192 regulations would be addressed through PHMSA special permits in accordance with 49 CFR 190.341, *Pipeline Safety Enforcement and Regulatory Procedures*.

1.2.6 U.S. Environmental Protection Agency

The EPA is the federal agency responsible for protecting human health and safeguarding the natural environment. It establishes and enforces national standards under a variety of environmental laws and regulations in consultation with state, tribal, and local governments. The EPA has responsibilities under NEPA as well as the Clean Water Act of 1972 (CWA) (33 USC 1251 et seq.); Clean Air Act of 1963 (CAA) (42 USC 7401 et seq.); Marine Protection, Research, and Sanctuaries Act of 1972 (16 USC 1431 et seq.); and the Safe Drinking Water Act of 1974 (42 USC 300), as well as other federal environmental laws.

In addition to its authority under the CWA, the EPA has authority under the CAA (42 USC 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. State and local agencies are given the authority to implement these regulations through EPA delegation or through EPA-approval of state air operating permit programs and State Implementation Plans (SIP). State and local agencies also can develop and implement their own regulations for non-major sources of air pollutants through an EPA-approved SIP. The EPA maintains oversight authority of the state's programs. The EPA also establishes general conformity applicability thresholds that a federal agency can use to

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7 The MOU can be viewed online at https://cms.ferc.gov/sites/default/files/2020-05/FERC-PHMSA-MOU.pdf

determine whether a specific action requires a general conformity assessment to ensure actions taken by federal agencies do not interfere with a state plan to maintain national air quality standards.

In addition to its permitting responsibilities, the EPA is required under section 309 of the CAA 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 responsible for implementing certain procedural provisions of the NEPA (e.g., publishing the Notices of Availability of the draft and final EISs in the Federal Record) to establish statutory timeframes for the environmental review process.

1.2.7 U.S. Fish and Wildlife Service

The FWS is responsible for ensuring compliance with the ESA. Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by any federal agency should not "…jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined…to be critical…" (16 USC 1536(a)(2)). The FWS also reviews project plans and provides comments regarding protection of fish and wildlife resources under the provisions of the Fish and Wildlife Coordination Act of 1934 (16 USC 661 et seq.). The FWS is responsible for the implementation of the provisions of the Migratory Bird Treaty Act of 1918 (MBTA) (16 USC 703), the Bald and Golden Eagle Protection Act of 1940 (BGEPA) (16 USC 688), and the Marine Mammal Protection Act of 1972 (MMPA). As such, the FERC is coordinating with the FWS regarding Section 7 of the ESA, MBTA, the BGEPA, the MMPA, and NEPA. The FWS elected to cooperate in preparing this EIS because it has special expertise with respect to environmental impacts associated with the Project.

1.2.8 National Marine Fisheries Service

NMFS is serving as a cooperating agency pursuant to 40 CFR 1501.6 because the scope of the proposed action and alternatives involve activities that have the potential to affect marine resources under their jurisdiction by law and special expertise. As applicable, permits and authorizations are issued pursuant to the ESA (16 USC 1531 et seq.) and the regulations governing the taking, importing, and exporting of threatened and endangered species (50 CFR Parts 222 to 226), as well as the MMPA (16 USC 1361 et seq.) and the regulations governing the taking and importing of marine mammals (50 CFR 216). NMFS has additional responsibilities to conserve and manage fishery resources of the United States, which includes the authority to engage in consultations with other federal agencies pursuant to the MSA and 50 CFR 600 when proposed actions may adversely affect EFH.

1.3 PUBLIC REVIEW AND COMMENT

1.3.1 Pre-filing Process and Scoping

On July 28, 2017, Commonwealth filed a request with FERC to use our pre-filing review process. We approved Commonwealth's request on August 15, 2017 and established pre-filing docket number PF17-8-000 for the Terminal and Pipeline. Information and documents filed by Commonwealth for the Project, as well as related documents, were placed 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 early resolution of issues, prior to a formal application being filed with the FERC.

During the pre-filing process, we conducted biweekly conference calls with Commonwealth to discuss Project progress and identify and address issues and concerns that had been raised by FERC staff or other agencies. Interested agencies were invited to participate on a monthly basis. Project information and documents and summaries of the conference calls are available for viewing on the FERC elibrary system. [8]

We received comments from the public requesting Project public meetings. Commonwealth held an initial open house meeting on October 23, 2017, in Johnson Bayou, Louisiana, to introduce the Project to the local community. FERC staff participated in the meeting to describe the Commission's process and provide those attending with information on how to file comments with the Commission.

On February 22, 2018, the Commission issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Commonwealth LNG Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Sessions* (NOI). This NOI was sent to about 300 interested parties, including property owners; elected officials; tribal governments; local, state, and federal regulatory agencies; libraries; local emergency responders; and local newspapers in the Project area. Publication of the NOI established a 30-day public scoping period for the submission of comments, concerns, and issues related to the environmental aspects of the proposed Project.

We conducted a public scoping session to provide an opportunity for the public to learn more about the Project and provide oral and written comments on environmental issues to be addressed in the EIS. The scoping session was held in Johnson Bayou, Louisiana, on March 13, 2018. During the meeting, we received oral comments from one individual that was transcribed by a court reporter, as well as written comments. Additional comments were submitted either by letter or electronically. All comments we received were posted to the Commission's public record through the FERC's online eLibrary system. The FERC staff also visited the Terminal site on March 13, 2018, along with representatives from USCG, NMFS, and the Louisiana Department of Natural Resources (LDNR).

On March 16, 2020, the Commission suspended the environmental review schedule for the Project pending adequate responses from Commonwealth to Commission staff data requests and an official interpretation from PHMSA pertaining to Commonwealth LNG's proposed LNG storage tank design. On June 8, 2021, Commonwealth filed an amendment to its Natural Gas Act Section 3 Application to modify the proposed LNG storage tank designs and capacities so as not to require an interpretation from PHMSA. On July 13, 2021, the Commission issued a Notice of Application for Amendment and Establishing Intervention Deadline, which established a 21-day comment period for the submission of comments, concerns, and issues related to the environmental aspects of the proposed Project. On September 24, 2021, the Commission issued a *Notice of Intent to Prepare an Environmental Impact Statement, Request for Comments on Environmental Issues, and Revised Schedule for Environmental Review for the Project*. The notice established another 30-day scoping period.

During the scoping periods, we received a total of 12 comments from two individuals that own land adjacent to the proposed Terminal site; 207 comments from individuals that do not own land adjacent to the proposed Project footprint; 11 comments from federal, state, and local agencies; 2 comments from Native American tribes; and 13 comments from companies and other non-governmental organizations (NGOs). Table 1.2-1 lists the environmental issues identified during the scoping process described above. Table 1.2-1 also indicates the section of this EIS in which each issue is addressed. Primary issues raised by the commenters related to potential Project impacts on water quality and wetlands, wildlife, aquatic resources, threatened and endangered species, recreational activities, local infrastructure, and air quality. All substantive environmental comments received prior to issuance of the draft EIS were addressed within the draft EIS.

8 To access the public record for this Project, go to FERC's website (http://www.ferc.gov), click on "Documents & Filings," and select the "eLibrary" feature. Click on "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the field (i.e., PF17-8). Select an appropriate date range.

TABLE 1.2-1

Issues Identified and Comments Received during the Public Scoping Process and from Comments on the draft EIS

Issue/Specific Comment	EIS Section Addressing Comment
General	
Purpose of and need for proposed projects; natural gas markets; local and national benefits	1.1
Alternatives	
Identify whether the global demand for natural gas outweighs the local benefits of the No-Action alternative.	3.1
Identify alternative locations for the Project that would reduce impacts on wetlands.	3.3
Identify alternative locations for the Project that would reduce the vulnerability of the Terminal to the effects of tropical storms and shoreline erosion.	3.3
Geology	
Potential for the Project to exacerbate flooding in surrounding areas.	4.1, 4.3
Vulnerability of the Project to flooding and shoreline erosion caused by rising sea levels.	4.1, 4.12
Soils and Sediments	
Contaminants within the dredged sediments that are proposed for beneficial use projects.	4.2
Potential for Project to cause shoreline erosion in the Calcasieu Ship Channel.	4.2
Water Resources	
Impacts on water quality of the surrounding waterways.	4.3
Wetlands	
Impacts on wetlands including their hydrologic functions.	4.4
Provide a sufficient Compensatory Wetland Mitigation Plan.	4.4
Wildlife and Aquatic Resources	
Impacts on important coastal wildlife habitats such as chenier, saltmarsh, mudflats, and sandy beach habitat.	4.5
Impacts on migratory bird populations, including colonial bird rookeries.	4.6
Impacts on essential fish habitat.	4.6
Threatened and Endangered Species	
Impacts on federally and state-listed threatened and endangered species, species of special concern, and critical habitat affected.	4.7
Land Use and Recreation	
Compliance of the Project with the LDNR Office of Coastal Management Coastal Zone Management Program and Coastal Use Guidelines.	4.8

TABLE 1.2-1 **Issues Identified and Comments Received during the Public Scoping Process and from Comments on the draft EIS**	
Issue/Specific Comment	**EIS Section Addressing Comment**
Impacts on recreational fishing, swimming, and boating along the shore of the Calcasieu River.	4.8
Socioeconomics	
Whether existing local public infrastructure is sufficient to support the Project.	4.9
Impacts on roadway and marine vessel traffic.	4.9
Economic benefits of the Project for the surrounding communities.	4.9
Cultural Resources	
Impacts on cultural resources.	4.10
Air Quality and Noise	
Greenhouse gas emissions from Project operation.	4.11.1
Impacts of increased noise levels in the vicinity of the Project.	4.11.2
Reliability and Safety	
Vulnerability of the Terminal to sea level rise, flooding, tropical storm winds, and storm surge.	4.1, 4.12
Cumulative Impacts	
Consider reasonably foreseeable cumulative impacts.	4.13
Climate change-related impacts of upstream and downstream greenhouse gas emissions caused by production and combustion of fossil fuel and other life cycle emissions from the Project's production and transportation of LNG	4.13.2.11
Feasibility of Carbon Capture and Sequestration to reduce greenhouse gas emissions that would be emitted during operation of the Project.	4.13.2.11

1.3.2 Public Review of the Draft EIS

On March 31, 2022, we issued a *Notice of Availability of the Draft Environmental Impact Statement for the Commonwealth LNG Project.* This notice, which was published in the Federal Register on April 6, 2022,[9] listed the dates of two virtual public comment sessions and established a closing date of May 23, 2022, for receiving comments on the draft EIS. Copies of the notice were mailed to 413 stakeholders.

We held two virtual public sessions to solicit and receive comments on the draft EIS. These sessions were held on April 25 and 26, 2022. The sessions provided the public an opportunity to present oral comments to a court reporter on the environmental analysis described in the draft EIS. A total of 10 individuals provided oral comments. During the public comment period for the draft EIS, we received comments from 3 federal agencies, 1 state agency, 4 non-governmental organizations, and 33 individuals. We also received 1,792 copies of one form letter and 579 copies of a second form letter. All unique

9 87 FR 19918

comments received and a representative copy of the form letters are included in our comment responses contained in appendix M. Transcripts from the public sessions, as well as written comment letters, were entered into the public record and are available for viewing on FERC's eLibrary website (www.ferc.gov).[10]

This EIS addresses all substantive environmental comments submitted to the FERC or made at open houses, scoping sessions, interagency meetings, and public comment sessions on the draft EIS. Issues identified are summarized in table 1.2-1, along with the EIS section that addresses each topic. Primary issues raised by the commenters relate to potential Project impacts on wetlands, wildlife, aquatic resources, threatened and endangered species, air quality, Terminal safety related to flooding and tropical storm systems, and greenhouse gases and climate change.

1.3.3 Final EIS

The Commission mailed a copy of the *Notice of Availability of the Final Environmental Impact Statement for the Proposed Commonwealth LNG Project* to agencies, individuals, companies/organizations, and other parties identified in the distribution list provided as appendix A. Additionally, the final EIS was filed with the EPA for issuance of a Notice of Availability in the Federal Register.

1.4 NON-JURISDICTIONAL FACILITIES

Under the NGA, the FERC is required to consider, as part of a decision to authorize jurisdictional facilities, all facilities that are directly related to a proposed project where there is sufficient federal control and responsibility to warrant environmental analysis as part of the NEPA environmental review for the proposed Project. Some proposed projects have associated facilities that do not come under the jurisdiction of the Commission. These "non-jurisdictional" facilities may be integral to the need for the proposed facilities, or they may be merely associated as minor components of the jurisdictional facilities that would be constructed and operated as a result of authorization of the proposed facilities. Two components of Project construction and operation would be considered non-jurisdictional: truck transport of commodities associated with the liquefaction process; and relocation of an aid to navigation (i.e., channel marker) in the Calcasieu Ship Channel.

Project operations would require daily truck travel to and from the Terminal to remove or provide absorbent, condensate, refrigerants, and other commodities required for operation of the Terminal (an average of approximately six trucks per day or 2,300 trucks per year); therefore, Commonwealth would construct a truck loading/unloading facility as part of the Terminal. Construction and operation of the truck facility at the Terminal is jurisdictional and is analyzed within this EIS. However, the tanker trucks traveling to and from the Terminal would be non-jurisdictional when not at the Terminal site. Truck-based transport of the absorbent, condensate, refrigerants, and other commodities needed for the Terminal is regulated by DOT's Federal Motor Carrier Safety Administration. Commonwealth would contract licensed carriers with appropriate hazardous materials credentials and equipment, as required. The impacts of the non-jurisdictional trucking are encompassed in the cumulative impacts section (EIS section 4.13).

As currently positioned, a channel marker on the Calcasieu Ship Channel adjacent to the proposed Project location would directly impede the approach of LNG carriers attempting to berth at the marine facility. Construction of the LNG carrier berth would therefore require the channel marker to be moved from its current location. Commonwealth has coordinated with the USCG Sector Houston/Galveston Aids to Navigation Officer to select a new location for the channel marker approximately 500 feet south of its current location. The channel marker would be relocated prior to or during dredging activities at the

10 See accession no. 20220826-4001.

Terminal. The non-jurisdictional channel marker relocation would have no new impacts on the environment, as it would simply be moved from one location in the channel to a different location.

As further described in section 4.4.2.2, Commonwealth proposes to dredge up to about 1.73 million cubic yards of sediment from the Calcasieu River during construction. Commonwealth proposes to transport the sediments dredged during construction and the first two maintenance dredges to a beneficial use of dredged materials (BUDM) site within the wetlands on the south shore of Calcasieu Lake within the East Cove Unit of the FWS Cameron Prairie National Wildlife Refuge (NWR) approximately 6 miles northeast of the Project site. Commonwealth would install a temporary slurry pipeline extending from the marine facility across the bottom of the Calcasieu Ship Channel, northeast through the Cameron Loop Channel, out of the Cameron Loop Channel just west of Rex Street in the Town of Cameron and under Highway 27/82, and then northeast aboveground along existing roadbeds, levees, and wetlands to the BUDM site at approximately 29.830º latitude and -93.274º longitude (figure 4.4-1). The BUDM site, and associated disposal pipeline are non-jurisdictional to the Commission. However, because they are so closely related to the project, we have included them in our analysis within the applicable resource sections.

There are no other non-jurisdictional facilities proposed as part of the Project.

1.5 PERMITS, APPROVALS, AND REGULATORY REVIEWS

As the lead federal agency, the FERC is required to comply with a number of regulatory statutes including, but not limited to NEPA, Section 7 of the ESA, the MSA, Section 106 of the NHPA, and Section 307 of the CZMA. Each of these statutes has been considered in the preparation of this document.

Major permits, approvals, and consultations for the Project are identified in table 1.4-1 and discussed below. Commonwealth would be responsible for obtaining all permits and approvals required to construct and operate the Project, regardless of whether they appear in this table. The FERC encourages cooperation between applicants and state and local authorities, but this does not mean that state and local laws may prohibit or unreasonably delay the construction or operation of facilities approved by the FERC. Any state or local permits issued with respect to jurisdictional facilities must be consistent with the conditions of any authorization issued by the FERC.

1.5.1 Clean Water Act

The CWA, as amended, regulates the discharges of pollutants into waters of the United States and regulates quality standards for surface waters. Both the EPA and the COE have regulatory authority under 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. Section 401 of the CWA requires that an applicant for a federal permit who conducts any activity that may result in a discharge to waters of the United States must provide the federal regulatory agency with a Section 401 certification, which declares that the discharge would comply with applicable provisions of the act, including state water quality standards. Section 402 of the CWA authorizes the EPA to operate the National Pollutant Discharge Elimination System (NPDES) permit program, which regulates point source discharges by industrial, municipal, and other facilities that directly enter surface waters. The EPA delegates the Section 401 certification and NPDES permitting to the jurisdiction of the state in which the discharge occurs (e.g., the Louisiana Department of Environmental Quality [LDEQ]) but may assume authority if the state program is not functioning adequately or at the request of the state. Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States and is under the jurisdiction of the COE; however, the EPA has the authority to review and veto the COE decisions on Section 404 permits. The status of the Section 401, 402, and 404 permitting requirements are further addressed in sections 4.3 and 4.4.

1.5.2 Rivers and Harbors Act

The RHA pertains to activities in navigable waters, as well as harbor and river improvements. Section 10 of the RHA prohibits the unauthorized obstruction or alteration of any navigable water of the United States. 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 COE. Section 14 of the RHA authorizes the Secretary of the Army to grant permission to any private, public, tribal, or other federal entity to temporarily or permanently alter or use a COE Civil Works project (e.g., federally maintained navigation channel) if the alteration or use will not be injurious to the public interest and will not impair the usefulness of the Civil Works project (see section 4.3 for the status of compliance with the RHA).

1.5.3 U.S. Department of Defense

The *EPAct of 2005* and Section 3 of the NGA require us to consult with the Department of Defense (DOD) Siting Clearinghouse to determine whether there would be any impacts associated with the Project on military training or activities on any military installations. The DOD responded to our request for consultation on April 5, 2018 concluding the Project would have minimal impact on military operations conducted in this area.

1.5.4 Endangered Species Act

Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by any federal agency (e.g., the FERC) should not "…jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined…to be critical…" (16 USC 1536(a)(2)(1988)). The FERC, or Commonwealth as FERC's non-federal representative, is required to consult with the FWS and NMFS to determine whether any federally listed or proposed endangered or threatened species or their designated critical habitat occur in the vicinity of the Project. If the FERC determines that these species or habitats may be impacted by the Project, the FERC is required to prepare a Biological Assessment (BA) to identify the nature and extent of adverse impact, and to recommend measures to avoid or reduce potential impacts on the habitat and/or species.

October 19, 2020, NMFS provided concurrence that the Project was not likely to adversely affect species under NMFS jurisdiction. In the spring of 2021, the FERC prepared a BA and, on May 4, 2021, initiated formal ESA Section 7 consultation with the FWS related to the likelihood that the Project would adversely affect eastern black rails. The FWS issued a Biological Opinion on September 16, 2021, which provided the conclusion of the FWS regarding whether the Project would jeopardize the continued existence of eastern black rails; included an Incidental Take Statement (ITS) that requires the FERC to implement reasonable and prudent measures that the FWS considers necessary or appropriate to minimize the impacts of anticipated taking on eastern black rails; and provided conservation recommendations relevant to the conservation of eastern black rails and consistent with the authorities of the FERC. The issuance of the Biological Opinion concluded the formal ESA Section 7 consultation process. Section 4.7 details this process.

1.5.5 Magnuson-Stevens Fishery Conservation and Management Act

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104–267), establishes procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal fisheries management plan. Section 305(b)(2) of the MSA requires federal agencies to consult with NMFS on any action authorized, funded, or undertaken that may adversely affect EFH. The EFH consultation process begins with a determination of adverse effect by the action or authorizing (lead) agency. If an action may adversely affect EFH, an EFH assessment is required per 50 CFR 600.920(e). EFH has been designated within the proposed footprint of the Project. An EFH Assessment for the Project is provided as appendix D and summarized in section 4.6.3.

1.5.6 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 they would meet their obligations and responsibilities in managing their coastal areas. In the state of Louisiana, the LDNR's Office of Coastal Management (OCM) is the agency responsible for administering its Coastal Zone Management Program (CZMP). Section 307 of the CZMA requires federal agency activities to be consistent to the maximum extent practicable with the enforceable policies of a CZMP. Commonwealth has applied for a Coastal Use Permit from the LDNR-OCM and would construct the Project following conditions stipulated in the permit to ensure compliance with the CZMP. Sections 4.8.1.5 and 4.8.2.5 summarize the Project's compliance with the CZMA.

1.5.7 Clean Air Act

The CAA, as amended, regulates air emissions from stationary and mobile sources, and defines the EPA's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone (O_3) layer. Among other things, the law authorizes the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and welfare, sets limits on certain air pollutants, and limits emissions of air pollutants coming from sources, such as industrial facilities. The EPA has delegated the authority to implement these regulations to the LDEQ, Air Permits Division in Louisiana.

LDEQ is responsible for issuing Title V operating permits in accordance with 40 CFR 70 and as incorporated into Louisiana Administrative Code (LAC) 33:III.507. On November 8, 2010, the EPA signed a rule that finalized reporting requirements for the petroleum and natural gas industry under 40 CFR 98. Air quality is further addressed in section 4.11.1.

1.5.8 National Historic Preservation Act

Section 106 of the NHPA (54 USC 3001 et seq.), as amended, requires the FERC to consider the effects of its undertakings on historic properties and afford the Advisory Council on Historic Preservation an opportunity to comment. Historic properties include precontact or historic sites, districts, buildings, structures, objects, or properties of traditional religious or cultural importance listed in or eligible for listing in the National Register of Historic Places (NRHP). In accordance with the regulations for implementing Section 106, at 36 CFR 800.2(a)(3), the FERC staff is using the services of the applicant to prepare information, analyses, and recommendations. However, we remain responsible for all findings and determinations. Section 4.10 summarizes the status of our compliance with the NHPA.

TABLE 1.4-1

Permits, Approvals, Clearances, and Consultations for the Commonwealth LNG Project

Agency	Permit, Approval, or Consultation	Submittal/approval Date
FEDERAL		
Federal Energy Regulatory Commission (FERC)	NGA Section 3	Application filed August 20, 2019 Amendment filed June 8, 2021
U.S. Department of Energy (DOE)	NGA Section 3, FTA and Non-FTA Authorizations	FTA Authorization granted April 17, 2020; Non-FTA application filed October 16, 2019; Amended application for Non-FTA Authorization filed September 11, 2020; Non-FTA Application is pending.
U.S. Army Corps of Engineers (COE)	Clean Water Act Section 404/Rivers & Harbors Act Section 10	Pending; Joint Permit Application with LADNR-OCM and LDEQ submitted August 30, 2019
	Section 408 (Section 14 Rivers & Harbors Act)	Pending; application submitted September 30, 2019
COE	Programmatic General Permit – Category 1 for Geotechnical Investigation	Approved June 27, 2018
U.S. Coast Guard (USCG)	33 CFR 105; 33 CFR 127 Waterfront Facilities Handling Liquefied Natural Gas and Liquefied Hazardous Gas (33 CFR 127), which includes Letter of Intent submission (33 CFR 127.007), Waterway Suitability Assessment consultation, and Letter of Recommendation from the USCG (18 CFR 157.21)	Letter of Recommendation issued March 7, 2019
	Notification to Mariners of Dredging Activities	To be filed prior to beginning of dredging activities
	Approval of Facility Security Plan	To be filed 60 days prior to beginning operations per 33 CFR §105.410
	Approval of Manual of Operations	To be filed prior to introduction of natural gas to the LNG facility
	Approval of Emergency Manual	To be filed prior to introduction of natural gas to the LNG facility
U.S. Department of Defense (DOD)	EPAct of 2005 Consultation Confirming No Impact of Project Construction on Any Active Military Installation	Completed April 5, 2018
U.S. Fish & Wildlife Service (FWS)	Section 7 of ESA, Migratory Bird Treaty Act, and Bald and Golden Eagle Protection Act	Consultation completed; Biological Opinion issued by FWS on September 16, 2021
National Oceanic and Atmospheric Administration (NOAA) Fisheries Protected Resources Division	Section 7 of ESA	Consultation completed October 19, 2020
NOAA Fisheries Habitat Conservation Division	Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation	Pending; consultation initiated May 13, 2019

TABLE 1.4-1 **Permits, Approvals, Clearances, and Consultations for the Commonwealth LNG Project**		
Agency	**Permit, Approval, or Consultation**	**Submittal/approval Date**
NOAA Fisheries Office of Protected Resources	Marine Mammal Protection Act	Pending
Federal Aviation Administration	Notice of Proposed Construction	Completed September 24, 2019
U.S. Department of Transportation (DOT)	Pre-construction Notice	Pending
Pipeline Hazardous Materials Safety Administration (PHMSA)	Letter of Determination	Provided August 2, 2022
	Pre-construction Notice	Pending
STATE OF LOUISIANA		
Louisiana Department of Natural Resources Office of Coastal Management (LDNR-OCM)	Coastal Use Permit Coastal Zone Management Act Consistency Determination	Pending; Joint Permit Application with COE and LDEQ submitted August 30, 2019
Louisiana Department of Environmental Quality (LDEQ) – Air Quality Division	Air Emissions Permit (Title V and Prevention of Significant Deterioration)	Pending
LDEQ – Water Quality Division	Section 401 Clean Water Act Water Quality Certification	Completed July 23, 2020
	Louisiana Pollutant Discharge Elimination System (LPDES) General Permit LAG6670000 – Hydrostatic Test and Vessel Testing Wastewater	Pending
	LPDES General Permit LAR050000 – Multi-Sector General Stormwater Permit	Pending
Louisiana Department of Wildlife and Fisheries (LDWF)	Threatened and Endangered Species Consultation	Completed June 4, 2020
	License to Dredge	Pending
	Oyster Lease Consultation	Completed December 7, 2021
Louisiana Office of State Lands	State Water Bottom Lease	Pending
Louisiana Department of Culture, Recreation and Tourism – State Historic Preservation Office	Section 106 National Historic Preservation Act Consultation	Completed January 9, 2022
Louisiana Department of Transportation and Development	Review of road easements, modifications to state highways, traffic safety	Pending

TABLE 1.4-1

Permits, Approvals, Clearances, and Consultations for the Commonwealth LNG Project

Agency	Permit, Approval, or Consultation	Submittal/approval Date
CAMERON PARISH		
Cameron Parish Police Jury	Floodplain Development Permit	Pending
	Coastal Use Permit Letter of No Objection	Provided July 6, 2020

2.0 PROPOSED ACTION

2.1 PROPOSED FACILITIES

Commonwealth proposes to construct and operate the Project in south-central Cameron Parish, Louisiana. The Project would consist of two main components: (a) a new LNG export Terminal adjacent to the mouth of the Calcasieu Ship Channel; and (b) a new natural gas Pipeline extending northward from the Terminal to interconnections at existing pipelines. The Terminal would produce approximately 8.4 MTPA of LNG for export. The primary components of the Terminal facilities are summarized here and detailed in the following sections:

- six liquefaction trains;
- six gas pre-treatment trains;
- two flare systems (containing a total of four flares);
- six LNG storage tanks;
- one marine facility consisting of an LNG carrier berth, barge dock, and vessel maneuvering area;
- utilities (e.g., electricity generation, water, plant air, nitrogen, hot oil system);
- operation and safety systems (e.g., access and haul roads, storm protection structures, stormwater drainage systems, spill containment system, fire suppression facilities, facility lighting and security, emergency shutdown systems); and
- appurtenant facilities (e.g., administrative facilities, maintenance and warehouse buildings, marine facility operator buildings, equipment enclosures and electrical rooms).

The Pipeline facilities would provide approximately 1.44 Bcf/d of natural gas to the Terminal. The primary components of the Pipeline facilities are summarized here and detailed in the following sections:

- 3.0 miles of 42-inch-diameter pipeline;
- two interconnection facilities with existing pipelines; and
- one metering station.

Figure 1.0-1 depicts the general location of the Project. Figure 2.1-1 depicts the location of the key components of the Terminal, and figure 2.1-2 depicts the location of the Pipeline and its key components.

2.1.1 Terminal

The Terminal would be constructed on 118.8 acres of a 393-acre parcel of land on the western shoreline of the Calcasieu Ship Channel, less than 1 mile from the Gulf of Mexico (see figure 2.1-1). Commonwealth has secured long-term commercial leases for the 393-acre site. The leases are structured in three phases: the development period, which extends until the start of construction; the construction period, which extends from the start of construction to the start of commercial operations; and the operations period, which begins at the start of commercial operations and lasts for 20 years with three 10-year extensions for a total of 50 years. The Terminal would receive natural gas from the newly constructed Pipeline (see section 2.1.2). The natural gas would be liquefied and stored at the Terminal prior to being loaded onto LNG carriers docked at the proposed LNG carrier berth for export. Additional information regarding the LNG Terminal components is provided below.

2.1.1.1 Liquefaction Trains

The Terminal would include six liquefaction trains, each with average operating liquefaction capacities of 1.4 MTPA (figure 2.1-1). Feed gas would be delivered by the proposed Pipeline to an on-site metering station (see section 2.1.2). Prior to entering a liquefaction train, the feed gas would pass through a pre-treatment unit to remove mercury, hydrogen sulfide (H_2S), carbon dioxide (CO_2), water, and heavy hydrocarbons (such as pentanes). The product of the heavy hydrocarbon removal would be sent to a condensate storage tank and removed from the Project site by truck by a licensed carrier. After the feed gas is treated to remove the contaminants and heavy hydrocarbon components, it would enter the liquefaction train and become condensed as it passes through a three-part heat exchanger system and is exposed to a progressively cooler mixed refrigerant consisting of nitrogen, methane, ethylene, propane, and iso-pentane. Boil-off gas (BOG) would be generated from stored LNG and vapors returned during LNG marine vessel filling. BOG would be diverted to BOG compressors and returned to the liquefaction process upstream of the liquefaction trains or used as supplemental fuel gas for the facility. Refrigerant for the liquefaction process would be stored on-site.

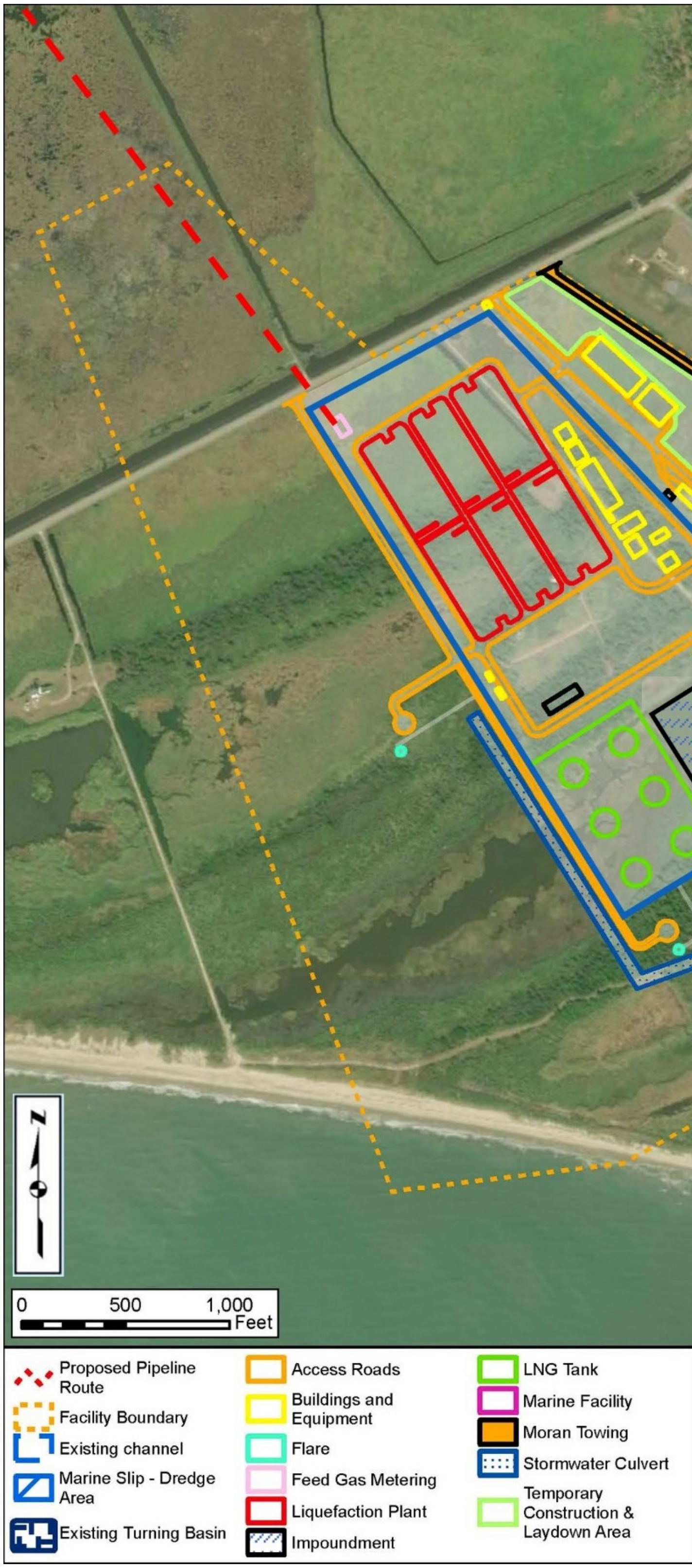

Figure 2.1-1

Commonwealth LNG Project

Terminal Facilities Overview

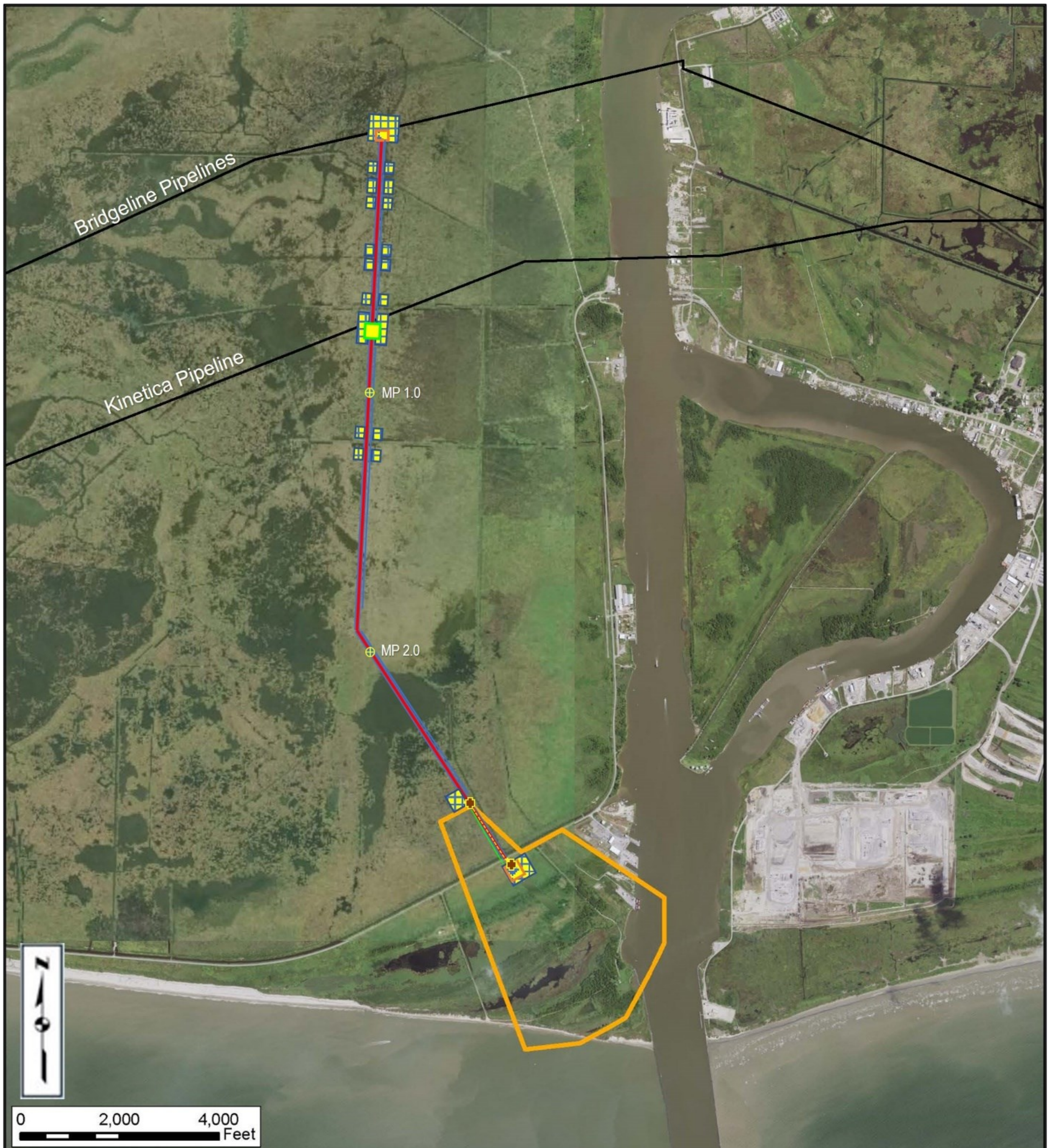

Figure 2.1-2

Commonwealth LNG Project

Pipeline Facilities Overview

2.1.1.2 LNG Storage Tanks

Commonwealth would store the LNG produced by the liquefaction trains in six storage tanks. The LNG storage tanks would be full-containment tanks (i.e., containing inner and outer walls), each with a capacity of 50,000 m^3. The storage tanks would be 167 feet tall, 149 feet in diameter, and designed and constructed to meet the requirements of PHMSA (49 CFR Part 193), the NFPA Standard 59A, and other applicable standards. Commonwealth would construct the inner tank walls and dome roofs using 9 percent nickel stainless steel. The outer tank walls would be constructed of pre-stressed concrete with a carbon steel liner. A reinforced concrete slab and steel support frame would support each tank. The support frame would in turn be supported by foundation pile caps with concrete pedestals that would allow an air gap between the ground and the tank. Commonwealth would insulate the bottoms of the tanks with load bearing cellular glass block insulation; the annular space between the inner and outer tank walls would contain loose fill expanded perlite and resilient glass wool blanket insulation. Commonwealth would insulate the suspended deck at the top of the inner tank with fiberglass blanket insulation.

2.1.1.3 Marine Facility

The marine facility would include an existing ship turning basin in the Calcasieu Ship Channel; construction and operation of a recessed, single-vessel LNG carrier berth capable of supporting LNG carriers with capacities ranging from 10,000 m^3 to 216,000 m^3; and construction and operation of a barge dock and off-loading platform capable of receiving heavy loads necessary for construction activities and supplies. Commonwealth proposes that up to 156 LNG carriers would visit the Project annually.

Turning Basin

LNG carriers calling on the Terminal would use an existing 1,500-foot by 3,000-foot turning basin excavated immediately upriver of the proposed marine facility to turn the vessel to a downstream-facing direction prior to docking at the LNG carrier berth. The turning basin has been constructed independent of the Project as part of the Calcasieu Pass LNG project on the east side of the Calcasieu Ship Channel, across from the Project (see FERC docket number CP15-550-000). In its LOR for the Project, the USCG (2019) notes that marine simulation studies conducted by the Lake Charles Pilots concluded that the proposed LNG carrier berth for the Commonwealth LNG Project would be easily accessible from the turning basin, which would facilitate safe navigation of LNG carriers. Given that the turning basin is existing, Commonwealth does not need to construct the turning basin, and environmental impacts related to the turning basin were addressed by the Calcasieu Pass LNG project,[23] we are not evaluating impacts from construction and operation of the turning basin within this EIS (other than within the cumulative impacts section in section 4.13.2). The location of the turning basin is indicated in figure 2.1-1.

LNG Carrier Berth and Barge Dock

The LNG carrier berth would consist of a single-ship slip recessed along the western shoreline of the Calcasieu Ship Channel. The berth platform would measure 100 feet in length by 90 feet in width. Its long axis would extend parallel to moored vessels and contain four 16-inch-diameter marine loading arms (three would be used for LNG transfer and one would be used for BOG return), a gangway and mooring system, a loadout control and operator building, and a berth-specific LNG spill containment system. The berth would not include an overwater trestle. At the north end of the berth, Commonwealth would construct an overwater barge dock, measuring approximately 400 feet by 100 feet with its long axis perpendicular to the shoreline, and an adjacent over-land off-loading platform, measuring 140 feet by 100 feet. The barge dock and off-loading platform would be capable of supporting heavy loads and would receive general

23 FERC Docket No. CP15-550-000; accession no. 20181022-3001; Sections 2.1.6, 4.3.2, 4.6.2, 4.6.3, 4.7.2.

construction equipment and supplies in addition to the modular components of the Terminal during construction activities. During operations, Commonwealth would use the barge dock to moor tugboats and smaller vessels.

Construction of the marine facility would require excavation and dredging along the western shoreline of the Calcasieu Ship Channel to provide adequate space to berth LNG carriers and allow passage of commercial and recreational vessel traffic in the Calcasieu Ship Channel. Construction would require sheet piling within the berthing area and armoring of the adjacent shoreline (upstream and downstream) to prevent erosion.

2.1.1.4 Flare System

Commonwealth would install a flare system at the Terminal site for venting excess natural gas, if necessary, during maintenance, startup/shutdown, and upset activities. Two flare stacks (comprised of four flare systems) would be constructed, one associated with the liquefaction facilities and one associated with the marine facility. The liquefaction flare stack would rise to a height of 300 feet and would be the tallest structure at the site. It would contain one wet flare for warm relief streams, one dry flare for cold, cryogenic relief steams, and a spare flare capable of handling the load of either the wet or dry flares. The marine flare stack would rise to a height of 200 feet and would consist of one flare for low-pressure cryogenic vapor from the BOG and the vessel dock loading system. Outside of emergency situations, Commonwealth estimates flaring would be required for up to 30 days during startup of the Terminal (five days per liquefaction train) and then for no more than 12 hours during the first year of operation and 6 hours per year in subsequent years. A pilot flare at each stack would be lit at all times. The locations of the flare stacks are shown in figure 2.1-1.

2.1.1.5 Associated Infrastructure

Infrastructure associated with the Terminal would include establishment of a power supply and construction of access roads, storm protection and stormwater drainage systems, a spill containment system, and fire suppression facilities.

Power Generation

Commonwealth would construct an on-site, natural gas-fired simple cycle electric power generation plant. The generation plant would use three 75-mega volt amp natural gas turbine generators to produce the approximately 120 megawatts required for operation of the Terminal. Electrical power would be distributed throughout the Terminal infrastructure through common industrial electrical distribution systems (e.g., transformers, circuit breakers, motor control centers).

Commonwealth would also install two diesel stand-by generators with battery backup systems at the Project site to provide a source of essential backup power generation for critical equipment and plant shutdown if the electrical power system were to fail. Each generator would provide one megawatt of power. Diesel for the generators would be stored on-site in a 16,900-gallon capacity storage tank with secondary containment. The tank would store enough fuel for seven days of backup power generation.

Storm Protection and Stormwater Drainage Systems

Commonwealth would construct a storm protection system to encompass the majority of the Terminal including the liquefaction trains and LNG storage tanks. The marine facility, flare stacks, and maintenance and administrative buildings would not be within the storm protection system (see figure 2.1-1). The storm protection system would consist of a new concrete wall that would be 26 feet high on the south and east (windward) sides of the site, and 21 feet high on the north and west (leeward) sides. The system would have three gates—two on the east side of the facility to allow access from the administrative buildings and barge dock and one to serve as a west side exit near the proposed flare location.

Commonwealth would grade the Terminal site to between +8 and +5 feet (North American Vertical Datum of 1988 [NAVD88]) to generally allow rainwater runoff to flow from north to south into a proposed stormwater retention and settling pond at the south end of the facility. Commonwealth would divert runoff from process equipment areas into drainage piping leading to oil-water separators to remove hydrocarbons from the runoff prior to pumping it into the retention and settling pond. Commonwealth would pump stormwater from the retention pond over the storm protection wall and into the Calcasieu Ship Channel in compliance with LPDES permit conditions.

Access Roads

Commonwealth would construct 25-foot-wide access roads within and outside of the storm protection wall. Outside of the storm protection wall, one road would extend along the west side of the Terminal from Highway 27/82 to each of the two flare stacks and another would extend along the east side of the Terminal from Highway 27/82 to the barge dock and off-loading platform of the marine facility. The roads to the flare stacks would contain culverts at 500-foot intervals to maintain surface water flow. The east-side road would provide access to the Terminal administrative and maintenance buildings, the temporary construction and laydown area, and two of the three gates within the storm protection wall (see figure 2.1-1). Roadways within the storm protection wall would extend around the interior perimeter of the storm protection wall extending from the barge dock to the liquefaction trains and the LNG storage tanks.

Spill Containment System

Commonwealth would construct separate systems for refrigerant and LNG to contain the materials in the event of an accidental release. See section 2.6.1.4 for additional details.

Fire Suppression Facilities

The Terminal would use water from a proposed 1,136,500-gallon service water storage tank that would, in part, provide water for initial firefighting and periodic firewater system testing, and to maintain the firewater system under pressure. Commonwealth would use water from the Calcasieu Ship Channel as a backup source for firewater if the primary service water storage tank is exhausted. The expanded firewater system would be designed in accordance with the requirements of the NFPA Standard 59A.

Administration and Maintenance Buildings

Commonwealth would construct administrative facilities, maintenance and warehouse buildings, marine facility operator buildings, equipment enclosures, and electrical rooms to support operations at the LNG facility (see figure 2.1-1).

Stormwater Culvert

Commonwealth would construct an earthen channel along the west and south sides of the Terminal perimeter to gather stormwater and drainage from the wetlands west of the Terminal and allow it to flow eastward to the Calcasieu River following the current hydrological flow of the site (see figure 2.1-1). The channel would extend about 2,500 feet from the approximate midpoint of the western side of the Terminal to the Calcasieu River. Commonwealth would construct the channel to a depth of -3.0 feet (NAVD) and a bottom width of 45 feet. The outflow end of the culvert at the Calcasieu River would contain a water control structure that would allow for control of water ingress volumes and salinity levels in the culvert waters but also permit ingress and egress of marsh fauna. Specific details of the culvert and water control structure design would be determined during the final design of the Terminal. Commonwealth has committed to coordinating with the regulatory community, including NMFS, for design features that would minimize impacts of the culvert on aquatic species, wetlands, and EFH.

Construction Staging Areas

Commonwealth would use one temporary construction and laydown area for construction of the Terminal. The 13.1-acre laydown area would be adjacent to the administrative and maintenance buildings and extend between Highway 27/82 and the northern extent of the marine facility (see figure 2.1-1).

Moran Towing Relocation

Moran Towing of Lake Charles, LLC has a tugboat facility on the Calcasieu Ship Channel that is currently within the proposed footprint of the Terminal. Commonwealth and Moran Towing have agreed to relocate the tugboat facility to the eastern edge of the Terminal footprint, adjacent to the marine facility (see figure 2.1-1).

Park and Ride Facilities

Commonwealth would use two existing gravel parking lots adjacent to Highway 27 in Carlyss, Louisiana (approximately 40 miles north of the Terminal site) as Park and Ride facilities for workers to park off-site and be shuttled to the Project site during construction. Commonwealth would use an existing parking lot at the Southland Airport (Southland Airport Lot) for the duration of the expected 36- to 38-month construction period. The Southland Airport Lot is a 6.7-acre lot with a 600-vehicle capacity. Commonwealth would use at least part of the existing parking lot near the corner of Highway 27 and State Road 1256 (Circle K Lot) on an as-needed basis during peak construction periods. The Circle K Lot is a 9.9-acre lot with a 1,300-vehicle capacity.

2.1.2 Pipeline

Commonwealth proposes to construct a 3.0-mile-long, 42-inch-diameter natural gas pipeline to transport 1.44 Bcf/d of natural gas from three existing pipelines in Cameron Parish (dual 20-inch- and 12-inch-diameter Bridgeline pipelines and one 16-inch-diameter Kinetica pipeline) to the Terminal (figure 2.1-2). The interconnections with the Bridgeline and Kinetica pipelines are north-northwest of the proposed Terminal location. The Bridgeline interconnection would occur at the northern-most point of the Pipeline at milepost (MP) 0.0, and the Kinetica interconnection would occur at approximately MP 0.8. Commonwealth would construct aboveground facilities, elevated on pilings, at each interconnection point. The Bridgeline interconnection would contain a pig launcher and the Kinetica interconnection would contain a meter station.

As noted in section 2.1.1.1, the southern end of the Pipeline (MP 3.0) would terminate at a metering station within the Terminal site. The metering station would consist of a gas separator, a liquid storage and loadout facility, custody transfer meters, pressure regulators, emergency shutdown valves, gas analyzers, and a pig receiver.

2.2 LAND REQUIREMENTS

Commonwealth would disturb 230.5 acres of land and open water for construction of the Project and 153.1 acres during its operation. Of this, 152.8 acres would be permanently disturbed at the Terminal site (including the 55.0 acres for the marine facility during both construction and operation) and 0.3 acre would be permanently disturbed due to the aboveground facilities associated with the Pipeline. The operational right-of-way for the Pipeline would measure 1.1 acres. Land requirements for the Project are summarized in table 2.2-1.

2.2.1 Terminal

Construction of the Terminal would require a combined area of about 118.8 acres of land and 47.0 acres of open water for the marine facility. Operation of the Terminal would require 105.7 acres of land in addition to the 47.0 acres of open water required for the marine facility. Commonwealth would maintain all onshore areas with concrete or gravel cover and permanently convert them to industrial use. The open water associated with the marine facility would require initial dredging to construct the facility and subsequent maintenance dredges approximately every two years after construction.

2.2.2 Pipeline

Commonwealth has requested approval to construct the Pipeline within a 110-foot-wide right-of-way. Commonwealth has requested the larger construction right-of-way (a 75-foot-wide construction right-of-way is required by our *Wetland and Waterbody Construction and Mitigation Procedures*) to accommodate a deeper and wider pipeline ditch than is typically used in construction. The deeper trench would accommodate lining the full length of the pipeline with concrete coating or sack weights and still maintain adequate backfill cover. The wider trench would allow it to be excavated with shallower trench-wall-angle, which is safer in saturated soils. Construction would also result in impacts on land associated with additional temporary workspace (ATWS), and temporary access roads. During operations, Commonwealth would retain access to a 3.5-foot-wide permanent right-of-way. Commonwealth states its permanent easement with landowners would include the right to access the Pipeline right-of-way for activities necessary to protect, inspect, maintain, operate and repair the Pipeline in accordance with 49 CFR 192 for the duration of Pipeline operation. Commonwealth would use airboats, low-ground-pressure vehicles, or timber equipment mats to access the right-of-way as needed. Commonwealth notes that, based on the conditions of its permanent easement with the right-of-way landowners, it would retain the right to negotiate compensation with the landowners to secure necessary additional access or workspace to the right-of-way in circumstances where additional access or workspace is required to conduct maintenance on or repairs of the Pipeline and subsequently restore and monitor vegetation in the affected area. Commonwealth would construct the aboveground facilities on elevated platforms supported by pilings. Aside from the footprints of the aboveground facility pilings, Commonwealth would stabilize and restore all areas affected by construction of the Pipeline, including the Pipeline right-of-way, and allow these areas to revert to pre-construction land use and vegetative cover. No permanent roadways are proposed for operation.

TABLE 2.2-1 **Land Requirements for the Commonwealth LNG Project**		
Facility	**Land Affected During Construction (acres) a/, b/**	**Land Affected During Operation (acres) a/, b/**
Terminal		
Liquefaction Facility	84.5	84.5
Marine Facility (excavated upland)	8.0	8.0
Marine Facility (dredged open water)	47.0	47.0
Stormwater Culvert	3.5	3.5
Administrative and Maintenance Buildings	1.5	1.5
Access Roads (outside of storm protection wall)	5.9	5.9
Moran Towing (relocation)	2.3	2.3
Construction and Laydown Area	13.1	0.0
Terminal Subtotal	***165.8***	***152.7***
Pipeline c/		
Right-of-way	1.0	0.0 c/
Temporary Workspace	33.5	0.0
Additional Temporary Workspace	12.7	0.0
Access Road (temporary)	0.9	0.0
Aboveground Pipeline Facilities		
Interconnection Facility and Pig Launcher (MP 0.0)	0.1	0.1
Interconnection Facility and Meter Station (MP 0.8)	0.2	0.2
Combined Pipeline and Aboveground Facilities Subtotal	**48.4**	***0.3***
Park and Ride Facilities		
Southland Airport Lot	6.7	0.0
Circle K Lot	9.9	0.0
Park and Ride Subtotal	**16.6**	
Commonwealth LNG Project Grand Total	**230.8**	**153.0**

a/ The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.
b/ Construction acreage totals include the corresponding operation acreages.
c/ Land requirements for the pipeline are based on a 110-foot-wide construction right-of-way and 3.5-foot-wide operational right-of-way. Commonwealth would restore the operational right-of-way to pre-construction land use and vegetative cover.

2.3 CONSTRUCTION SCHEDULE AND WORKFORCE

Commonwealth anticipates beginning construction in the third quarter of 2023 and initiating commercial operation by the second quarter of 2026 (assuming receipt of all required certifications, authorizations, and permits). Commonwealth anticipates construction of the Terminal to be completed in approximately 36 to 38 months through use of off-site modular construction of the liquefaction trains and parts of the LNG storage tanks. Commonwealth proposes a 12-month construction schedule for the Pipeline, which would occur concurrent with construction of the Terminal. Commonwealth would initiate construction of the Pipeline in the first quarter of 2024 and expect to complete it during the first quarter of 2025. Commonwealth anticipates commissioning of the Terminal to last 9 months. The construction workforce is expected to require approximately 800 individuals during the first 12 months of the Project, peak at about 2,000 individuals over the ensuing 14 months, and then rapidly decrease as construction activities are completed. The final 6-month commissioning stage of construction is expected to require approximately 400 individuals.

2.4 ENVIRONMENTAL COMPLIANCE

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

Commonwealth would also be required to implement the measures and procedures identified in the FERC *Upland Erosion Control, Revegetation, and Maintenance Plan* (*Plan*), which it has adopted without modification, and its Project-specific *Wetland and Waterbody Construction and Mitigation Procedures* (*Procedures*),[24] which incorporates the FERC's *Procedures* with proposed modifications. The FERC *Plan* and *Procedures* (FERC, 2013a, b) are a set of construction and mitigation measures developed to minimize the potential environmental impacts of the construction of pipeline projects in general. Commonwealth has requested minor modifications to the FERC *Procedures* involving locating extra work areas, equipment, hazardous materials, and concrete coating activities in the vicinity of wetlands (Commonwealth would locate these items and activities within wetlands given that the majority of the Project's footprint would be within wetlands). We discuss Commonwealth's requested modifications further in sections 4.4.3. Commonwealth would also implement its revised *Workspace Restoration Plan*, which includes measures to address workspace cleanup, soil compaction mitigation, revegetation of areas disturbed by construction activities, and the monitoring and maintenance of the revegetated areas.[25]

Should Commonwealth receive Commission approval for the Project, any changes to the authorized Project that Commonwealth may request would require approval from FERC staff. Examples of Project changes could include route realignments, shifting or adding new ATWS, adding additional access roads, modifying construction methods, or implementing adaptive management strategies in the event originally proposed minimization or mitigation measures are ineffective due to site-specific field conditions. We have developed a variance process for evaluating and approving or denying such requested changes.

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24 Commonwealth's proposed modifications to the FERC's *Procedures* are provided in appendix 1E of Commonwealth's application to the FERC, which can be viewed on FERC's eLibrary (https://elibrary.ferc.gov/eLibrary/search) under accession number 20190820-5125.

25 Commonwealth's Workspace Restoration Plan can be viewed on FERC's eLibrary under appendix A of accession number 20191022-5165.

Commonwealth would employ at least one environmental inspector (EI) for the Project in accordance with the FERC's *Plan*. The EI's duties would include ensuring compliance with environmental conditions, construction procedures, techniques and plans, landowner agreements, and permit conditions and requirements. The EI would also verify construction workspaces prior to use, confirm that all sensitive resources are properly marked, and ensure proper installation and maintenance of all erosion control devices. The EI would have peer status with all other inspectors and would have the authority to enforce permit and FERC environmental conditions, issue stop-activity orders, and impose corrective actions to maintain environmental compliance. In addition to monitoring compliance, the EI would assist with environmental training for Project personnel regarding environmental conditions and Project-specific plans. The EI duties further include maintaining status reports and training records for the Project and its personnel.

In addition to the EI, we would conduct periodic compliance inspections during all phases of construction. Following the inspections, we would enter inspection reports into the Commission's public record. Other agencies may conduct inspections as well. Representatives of these agencies could require the implementation of additional and/or corrective environmental measures. These representatives could also issue work stoppages, impose fines, and recommend additional actions in response to environmental compliance failures.

After construction, we would continue to conduct oversight inspection and monitoring during operation of the Project to ensure successful restoration. Additionally, the FERC staff would conduct annual engineering safety inspections of the Terminal operations throughout the life of the project.

Commonwealth would require that its contractors be familiar with the requirements of all environmental permits and comply with all federal, state, and local environmental regulations and ordinances that apply to construction of the facilities, including restoration of areas temporarily disturbed during construction. This would be accomplished by implementation of a training program that would ensure the following:

- qualified environmental training personnel provide training sessions regarding the environmental requirements applicable to the trainees' activities;
- all individuals receive environmental training before beginning work;
- adequate records regarding the training program are kept; and
- refresher training is provided as needed to maintain a high awareness of environmental requirements.

As many of the components of the Terminal may be fabricated elsewhere and transported to the site, Commonwealth has committed to ensuring that all components would be designed, fabricated, transported, installed, tested, operated, and maintained in compliance with all applicable laws, regulations, and standards to protect the community and the environment.

2.5 CONSTRUCTION PROCEDURES

Commonwealth proposes the following construction methods, which it states include measures intended to avoid or minimize environmental impacts during construction.

2.5.1 Terminal

Many of the Terminal components would be designed and fabricated off-site and transported to the site for modular installation, including the gas pre-treatment units, liquefaction trains, and the inner portion of the LNG storage tanks. This modular construction would allow for the components to be largely constructed while the Terminal site is being prepared for installation.

2.5.1.1 Site Preparation

Commonwealth would clear all construction work areas of shrubs, trees, and other obstructions. In accordance with the FERC's *Plan*, Commonwealth would install temporary erosion controls immediately after initial disturbance of the soil to minimize erosion and maintain these controls throughout construction until permanent erosion control measures are installed. Commonwealth would burn on-site or transport the cleared vegetation by truck to an off-site disposal facility. Commonwealth would adhere to the conditional criteria provided in LAC Title 33, Part III, Chapter 11, Section 1109, Subsection C.8, which would exempt Commonwealth from the prohibition of outdoor burning in Louisiana.

Commonwealth would grade and fill the Terminal site where necessary to create a reasonably level working surface to allow safe passage of construction equipment and materials and to facilitate stormwater drainage. Commonwealth would raise the upland area to be developed within the Terminal to an elevation of 5 to 8 feet relative to the NAVD. The Terminal within the storm protection wall would slope from 8 feet NAVD at the northern end of the Terminal to 5 feet NAVD at the southern end. Commonwealth would raise the ground elevation of the Terminal facilities that would be outside of the storm protection wall, including the temporary construction and laydown areas on the east side of the Terminal site and the permanent access roads and flare facilities on the west side of the Terminal site, to 5 feet NAVD. Commonwealth would use general fill to raise the elevations of the process areas and engineered fill as a base for the roads. Up to approximately 1.1 million cubic yards of fill would be required. Commonwealth would procure the fill, comprising contaminant-free soil local to Louisiana, from borrow pits in Calcasieu Parish and transport the fill by truck to the site during the first six months of construction. Commonwealth would also assess whether soils excavated at the Project site (e.g., during construction of the stormwater culvert described in section 2.1.1.5) could be re-purposed as fill. If the soils are of suitable consistency, Commonwealth would use them as fill material. Commonwealth would excavate the upland area associated with the marine facility using a land-based excavator. Commonwealth would dredge the open water associated with the marine facility using a barge-mounted cutterhead suction dredge. Dredging would occur on a 24-hour schedule and conducted in accordance with COE and USCG regulations and FWS and NOAA guidelines to minimize potential impacts on protected species. Commonwealth would remove up to about 1.73 million cubic yards of dredged and excavated material. As noted in section 1.4, the dredged and excavated material comprised of sediment would be slurried and transported by pipeline to a BUDM site. Commonwealth is pursuing use of a BUDM site within wetland areas along the southern shore of Calcasieu Lake within the East Cove Unit of the Cameron Prairie National Wildlife Refuge (NWR; see section 4.4.2.2). Materials excavated from the upland portion of the marine facility footprint that could not be transported by pipeline (e.g., human-made materials such as the concrete parking lot and bulkhead of the Moran Towing location) would be trucked off-site for upland disposal at an appropriate solid waste facility. Commonwealth would relocate riprap present in the intertidal area of the marine facility footprint to other portions of the existing riprap jetties at the mouth of the Calcasieu River. The locations on the jetties where the riprap would be placed would be determined at the time of relocation by the COE based on which jetty areas would benefit most from additional rock.

As an adequate working surface is prepared for the Terminal, Commonwealth would install construction roads, including heavy-haul roads capable of supporting the self-propelled modular component transporters, along with construction offices, parking lots, warehouses, security fencing, and utility systems. In addition, a stormwater management system, including a retention pond at the southern end of the Terminal site, would be installed.

2.5.1.2 Storm Protection System

As noted in section 2.1.1.5, Commonwealth would construct a concrete stormwater protection wall with a height of 26 feet on the south and east sides of the Terminal and 21 feet on the north and west sides of the Terminal. The wall would be approximately 7,800 feet long and encompass a majority of the Terminal, including the liquefaction trains and LNG storage tanks. The marine facility, flare stacks, and maintenance and administrative buildings would not be within the wall (see figure 2.1-1). The wall would be constructed on pairs of 80- to 100-foot-long, 18- to 24-inch-diameter piles placed every 15 feet. Stormwater runoff from inside the wall would be diverted to the stormwater retention pond and subsequently pumped over the wall and into the Calcasieu Ship Channel through a permitted stormwater outfall pipe.

2.5.1.3 Facility Foundations

Once the site is prepared and the storm protection system installed, Commonwealth would install foundation piles to support concrete pads on which the modular components of the Terminal would be placed. The specific number and design of the piles are dependent on pending geotechnical investigations, but Commonwealth anticipates about 6,000 cast in place or precast, pre-stressed concrete piles would be required. Once the piles are installed and capped, concrete pads would be poured on top of the piles.

The foundations for each of the LNG pre-treatment and liquefaction trains would consist of approximately 300 24-inch-diameter piles and 110 18-inch-diameter piles. The 24-inch-diameter piles would be driven to a depth of 108 feet. The 18-inch-diameter piles would be driven to a depth of 80 feet. The foundations for each of the LNG storage tanks would consist of approximately 1,422 24-inch-diameter piles driven to a depth of 130 feet. Commonwealth would drive an additional approximately 1,900 18-inch-diameter piles to provide the foundations for associated pipe racks, buildings, utilities, and the off-loading platform adjacent to the marine facility. Pile driving for the stormwater protection wall and the facility foundations would take 6 months to complete. Commonwealth would only conduct pile driving operations during daylight hours.

2.5.1.4 Installation of Modular Facilities

Once the foundations are constructed, the gas pre-treatment, liquefaction (including the main cryogenic heat exchangers), and LNG storage tank components or modules would be transported to the site by general cargo carrier transport vessels or barges and moved to the appropriate foundation by self-propelled transporters and heavy-lift cranes. Once in the appropriate location and inspected for damage or defect, the modules would be connected to each other on-site, including electrical, piping, and instrumentation tie-ins.

The pre-treatment and liquefaction modules would likely be manufactured outside of the United States and would require transport by general cargo carrier vessels. Each vessel would likely transport one pre-treatment module and one liquefaction module. Commonwealth expects that two vessels would be used to transport the 12 modules (i.e., 6 total vessel trips) to the Terminal site over a 10-month period. The six main cryogenic heat exchange units would be fabricated in Florida and transported to the Terminal site by barge. The interiors of the LNG storage tanks would be manufactured in Louisiana or Texas and transported to the Terminal site by barges. Each barge would likely transport two storage tanks, thereby requiring three sailings to transport the storage tanks to the site. The exterior walls of the LNG storage tanks would be constructed on-site and made of pre-cast, reinforced concrete panels provided by regional ready-mix suppliers.

Other Terminal components, such as piles and pipe racks, would be sourced from or manufactured in Louisiana and Texas and transported to the Terminal site by barge.

Commonwealth would ensure that the pre-treatment and liquefaction modules fabricated off-site would be tested and certified in accordance with applicable industry codes (e.g., American Petroleum Institute 620 storage tank standards, American Society of Mechanical Engineers B31.3 process piping standards) prior to being delivered to the Terminal site.

Commonwealth would test all modular and process equipment shortly after installation. Once the Terminal equipment is installed and electrical, mechanical, and other instrumentation work completed, key pre-commissioning activities would commence, including the following:

- conformity checks on each part or piece of equipment to ensure proper installation;
- flushing and cleaning of equipment;
- pressure testing of piping, including interconnection and process piping within the Terminal facility; and
- leak testing of storage tanks.

Commonwealth would hydrostatically test the LNG storage tanks using approximately 9.9 million gallons of water from the Calcasieu Ship Channel. This volume would constitute approximately 75 percent of the capacity of a single LNG tank. The test water would be reused to sequentially test each LNG tank. The test water intakes would be screened, and Commonwealth would likely treat the test water with biocides to eliminate fouling, though adding chemical corrosion inhibitors would likely not be necessary. The test water would be gradually discharged into the Terminal stormwater retention pond prior to its ultimate discharge back into the Calcasieu Ship Channel. The test water would be chemically tested in accordance with LPDES General Permit LAG670000 authorization requirements prior to discharge back into the river (see sections 4.3.1.2 and 4.3.2.2 for further information on hydrostatic test water).

Commonwealth would hydrostatically test the other Terminal components constructed on-site using fresh water brought to the site by truck or using the local water pipeline tie-in in coordination with the local water district. Commonwealth would conduct the testing and flushing procedures using water storage tanks and would either pump the used water to the Terminal retention pond or haul it off-site for disposal. Components constructed of stainless-steel piping would likely require chemical cleaning and flushing. The water from this cleaning would be trucked off-site to an approved disposal facility.

2.5.1.5 Marine Facility

LNG Carrier Berth and Barge Dock

To construct the LNG carrier berth and barge dock, Commonwealth would drive piles comprising the facility bulkhead and the barge dock off-loading platform; excavate the upland that would be transformed into open water as part of the marine facility; dredge the open water along the shoreline of the Calcasieu Ship Channel; and subsequently install the piles that would support the infrastructure of the marine berth and barge dock. Commonwealth would stabilize the marine facility shoreline by constructing a combination-wall bulkhead consisting of sheet piles supported by king piles (i.e., steel I-beams). Commonwealth would install the bulkhead piles prior to excavation in the upland using vibratory and impact pile drivers. Commonwealth would also use vibratory and impact pile drivers to install approximately 114 48-inch-diameter steel piles in the upland to serve as the foundation for the barge dock off-loading platform. Once the bulkhead and barge dock off-loading platform piles are in place, Commonwealth would then excavate the upland waterward of the installed bulkhead to a sufficient depth to allow it to be dredged along with the open water portion of the marine facility. Figure 2.1-1 illustrates the location of the marine facility relative to the existing upland and shoreline. Commonwealth would construct the bulkhead and barge dock off-loading platform along the landward edge of the marine facility illustration in the figure.

Commonwealth would dredge the marine facility to a depth of 40 feet below mean low tide to accommodate the drafts of the LNG carriers and the general cargo carrier vessels that would deliver the pre-treatment and liquefaction modules during construction. As noted in section 2.5.1.1, excavating and dredging the entire 47-acre marine facility area would require removal of approximately 1.73 million cubic yards of sediment (1.5 million cubic yards for the LNG carrier berth area and 230,000 cubic yards for the barge dock area).

Once the marine facility area is dredged, Commonwealth would install the foundation piles for the different components of the LNG carrier berth and the barge dock itself. Piles would be driven using both impact hammers and vibratory hammers. Commonwealth would install a total of 62 piles within the water. The following types of piles would be required:

- five 42-inch-diameter steel piles for the LNG carrier berth fender system;
- twelve 96-inch-diameter steel piles for breasting and mooring dolphins;
- two 48-inch-diameter steel piles for the berthing and mooring walkway;
- six 18-inch square concrete piles for the LNG carrier berth access bridge; and
- thirty-seven 54-inch-diameter steel piles for the barge dock.

2.5.1.6 Traffic

Construction of the Terminal would increase roadway traffic to and from the facility. Bulk construction supplies and consumable supplies would be delivered to the Terminal by truck using Highway 27/82. Examples of bulk construction and consumable supplies include bulk fill material, building materials and paint for the administrative and maintenance buildings, geotextile fabrics and drains, fencing, formwork and batched concrete, hot mix asphalt, welding consumables, refrigerant make-up, nitrogen, and food supplies. Commonwealth expects transport of the bulk fill material alone would require an average of 384 trucks per day to transit between borrow pits in Calcasieu Parish and the Terminal site. Commonwealth plans for construction workforce personnel to be shuttled by bus to the Terminal from two remote parking sites.

Construction of the Terminal would also increase waterway traffic to and from the facility. Commonwealth would deliver construction supplies, such as precast concrete pilings and the Terminal modules, to the Terminal using barges and general cargo carrier vessels. Commonwealth expects the Terminal site preparation and construction of the facility foundations, barge dock, off-loading platform, and LNG carrier berth to require approximately 14 months, during which time most of the concrete materials and pilings would be delivered. Commonwealth anticipates materials delivery would require an average of 11 barge trips per month. Commonwealth would initially use a temporary dock constructed at the Project site for barge deliveries. Once the facility foundations are in place and the permanent barge dock and off-loading platform are constructed, the pre-treatment and liquefaction train modules, pipe rack modules, and LNG storage tanks would be delivered throughout the following 14 months. Additional construction-related materials would also be transported by barge to the Project site throughout construction of the Terminal. Consequently, marine traffic in the Calcasieu Ship Channel would be affected throughout the 36- to 38-month construction schedule.

Section 4.9.11 provides a more detailed assessment of the potential impacts resulting from increased roadway and marine traffic.

Site Restoration

The entire area within the storm protection system, marine facility, and associated access roads would be used during operation of the Terminal. Commonwealth would maintain all onshore areas with concrete or gravel cover and permanently convert them to industrial use. Therefore, the site restoration at these locations would consist of cleaning the site to eliminate any remaining construction equipment, supplies, and waste prior to operation. Commonwealth would restore the 13.1 acres comprising the temporary construction facilities and laydown area adjacent to the Terminal by planting a mixture of saltmarsh grass seedlings on 36-inch grid spacing, as described in its *Workspace Restoration Plan*.

2.5.1.7 Construction Waste Management

A waste disposal contractor would collect general construction waste, such as non-hazardous refuse, wood, and metal in dumpsters and transport it off-site to a state-approved facility. Sewage from the temporary construction offices and portable toilets and water from hand wash stations would be collected in holding tanks and regularly pumped out by a sewage waste disposal contractor for appropriate disposal.

2.5.2 Pipeline

Commonwealth would construct the Pipeline in accordance with the FERC's *Plan* and its Project-specific *Procedures* and in compliance with the requirements of 49 CFR 192 (Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards) and other applicable federal and state regulations. Commonwealth has obtained the approval of all landowners along the entire length of the proposed right-of-way to construct the Pipeline (including the associated aboveground facilities).

The entirety of the Pipeline right-of-way (excluding Highway 27/82, which would be crossed using horizontal direction drilling [HDD]; see sections 2.5.3.1 and 2.5.3.2) would be constructed within estuarine emergent wetland habitat. Commonwealth proposes a 110-foot-wide construction right-of-way. All Pipeline construction would be performed using low-ground-pressure amphibious equipment and equipment mats. The construction methods used by Commonwealth to install the Pipeline would likely vary based on the level of soil stability and saturation encountered at the time of construction. If the right-of-way comprises unsaturated "dry" soils, Commonwealth would use conventional open-cut construction procedures similar to standard pipeline construction methods used in dry, upland areas. Where the right-of-way comprises standing water or saturated soils, Commonwealth would use the push-pull construction method, which is specific to crossing waterbodies and wetlands.

Commonwealth's proposed methods are described in sections 2.5.2.1 through 2.5.2.8. Specialized construction procedures, such as those used for crossing waterbodies and Highway 27/82, are described in section 2.5.3. Typical construction right-of-way configurations are provided in appendix B.

Marking the Right-of-Way

Prior to clearing the right-of-way, a civil survey crew would stake the centerline of the Pipeline route and the boundaries of the construction right-of-way. Commonwealth would contact the "Call before You Dig" or "One Call" system to verify and flag utilities along the construction right-of-way and any other construction work areas, and would flag environmentally sensitive areas (e.g., wetlands).

Clearing and Grading

Commonwealth would clear and grade the construction right-of-way and ATWS where necessary to provide a relatively level surface for trench-excavating equipment and movement of other construction equipment. This would include clearing brush and roots either mechanically or by hand. Commonwealth would grub (i.e., remove root structures in addition to aboveground vegetation) the trench line as needed. Commonwealth would preserve natural drainage patterns to the extent practical and would install temporary erosion controls immediately after initial disturbance of the soils where necessary to minimize erosion. The temporary erosion control measures would be maintained throughout construction. Commonwealth would dispose of the removed vegetation in the same manner as discussed for the Terminal in section 2.5.1.1 (i.e., either burning it on-site or transporting it by truck to an off-site disposal facility).

Where fences cross the right-of-way, Commonwealth would cut, brace, and temporarily fit them with gates, to permit passage of construction equipment while maintaining current livestock barriers and limit public access to the right-of-way.

Trenching

The trench would be excavated to a depth that would allow a minimum of 3 feet of soil cover over the Pipeline in accordance with 49 CFR 192.327. Typically, the trench would be about 8 feet deep (to allow for about 3 feet of cover), about 12.5 feet wide in stable soils, and up to 25 feet wide at the top in unstable soils (e.g., soils with high water content). Additional trench width may be required to maintain the stability of trench walls for the safety of Pipeline workers and equipment. Where possible (i.e., if soils are not saturated) Commonwealth would segregate the top 1 foot of topsoil, and excavated material would be stored on the right-of-way next to the trench, on the opposite side of the working area (see appendix B). No blasting is anticipated for Pipeline installation. Where soils are saturated, Commonwealth would segregate the trench spoils on the opposite side of the working area and allow the trench to fill with water.

The trench would be kept open for the minimum time necessary, subject to weather and the duration of weld testing. To deter wildlife from becoming stranded in the open trench, Commonwealth would install temporary wildlife exclusion fencing along sections of the trench that have been excavated but where active construction is not occurring (e.g., overnight or during non-working days). The fencing would be removed once the trench has been backfilled. The EI would direct the placement of the exclusion fencing and determine the duration of its use. Commonwealth would not install wildlife escape ramps due to the likelihood that the side walls of the trench would not be stable enough to support escape ramps. The EI would be responsible for inspecting the trenches for trapped wildlife before construction begins each day.

Pipe Stringing, Bending, and Welding

Commonwealth would transport pipe segments from ATWS to the construction right-of-way using low-ground-pressure equipment. Where soils are not saturated, Commonwealth would string the pipe segments by positioning pipe sections end-to-end along the prepared right-of-way parallel to the centerline of the trench using side-boom tractors. Pipe sections would be strung along the right-of-way for bending, welding, coating, and lowering-in operations and the associated inspection activities. If soils are saturated, Commonwealth would pre-assemble the pipe outside of the saturated area, attach floats to the pipe, and push or pull (e.g., using a wench) the pipe into place along the trench.

Field bends of the pipe would follow the natural grade and direction changes of the right-of-way and would be accomplished using a hydraulic pipe bending machine. Following stringing and bending, the ends of the pipe sections would be aligned and welded together. All welding would be conducted by qualified welders as specified in 49 CFR 192. Commonwealth would inspect and test the welds to ensure structural integrity using non-destructive examination methods such as radiography (x-ray) or ultrasonic testing. Commonwealth would repair or replace any welds that do not meet PHMSA's safety standards in 49 CFR 192.

A factory-applied, epoxy external coating would cover and protect the delivered pipe sections from corrosion. After welding, Commonwealth would coat all joints with a material compatible with the factory-applied coating in preparation for installation. Commonwealth would then inspect the coating, both visually and electronically, and repair any damaged coating prior to lowering the pipe into the trench.

2.5.2.1 Lowering-in and Backfilling

Prior to lowering the pipe into the trench, Commonwealth would remove debris and foreign material and dewater the trench as necessary. Commonwealth would pump accumulated groundwater or rainwater from the trench for the minimum time necessary to install the pipe segment. As much as 600-1,000 gallons per hour of dewater could be required for each 1,000-foot segment of trench. Commonwealth would install well points[26] along the construction right-of-way and pump the water through dewatering structures away from the trench. Given that there is no upland in the vicinity of the construction right-of-way, the dewatering outflow would occur in wetland habitat; however, the dewatering structures would consist of sediment filters and energy-dissipating devices to minimize sediment deposition and scour in the wetland.

Commonwealth would lower the pipe into the trench using side boom tractors working in unison to avoid buckling of the pipe. After longer sections of pipe are lowered into the trench, final tie-in welds would be made within the trench using the welding methods described above. Where soils are saturated and the pipeline was floated into place, Commonwealth would remove the floats and allow the pipeline to sink into the trench. Commonwealth would add set-on weights or a concrete coating to the pipeline to ensure that it maintains negative buoyancy and remains in place at the bottom of the trench.

After the pipe is lowered into the trench, final tie-in welds completed, and the pipe adequately protected, backfilling would begin. Commonwealth would use previously excavated materials to backfill the trench. If the excavated material was saturated at the time of excavation, loss of pore water during stockpiling would likely result in a loss of backfill volume that Commonwealth would offset with imported fill to return the trench to its pre-excavation grade. Commonwealth would use locally sourced fill as discussed in section 2.5.1.1. In areas where topsoil has been segregated, Commonwealth would place the excavated subsoil into the trench first and top it with the topsoil. Commonwealth would backfill the trench to its original grade.

Hydrostatic Testing

Once installation and backfilling are completed, Commonwealth would clean the inside of the Pipeline using pigs to remove debris or liquid. Commonwealth would hydrostatically test the Pipeline in accordance with DOT safety standards (49 CFR 192) to verify its integrity and ensure its ability to withstand the maximum allowable operating pressure (MAOP). Hydrostatic testing consists of installing a hydrostatic test cap and manifold, filling the Pipeline with water, pressurizing the Pipeline to 125 percent of its MAOP, and maintaining that test pressure for a minimum of 8 hours. Commonwealth would use approximately 1.2 million gallons of municipal water to fill the pipeline. Commonwealth would test the Pipeline in two segments, separated by the meter station at MP 0.8, and reuse the test water from the first, shorter segment as part of the test water volume for the second segment. Upon completing the hydrostatic testing, Commonwealth would discharge the hydrostatic water into the Terminal stormwater retention pond and subsequently into the Calcasieu Ship Channel. Prior to discharge, Commonwealth would test the hydrostatic water in accordance with the LDEQ's Hydrostatic Test Water Discharge Permit, which requires testing for oil, grease, and pH, and monitoring of the discharge water for visible sheen. However, this test water would only contact the newly installed pipe.

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26 Well points are a series of temporary, small-diameter, vertical well pipes inserted adjacent to the excavated area being dewatered. The well pipes are connected by a header pipe to a pump. The well points pump groundwater from the immediate vicinity of the excavated area and function to lower the water table in that area.

If either leaks or loss of pressure are detected during the test, Commonwealth would excavate, remove, replace, and re-test the flawed segment. Section 4.3.2.2 provides additional information on hydrostatic testing.

Pre-Commissioning

After completion of hydrostatic testing, Commonwealth would clean and dry the Pipeline with pigs, which would be propelled through the Pipeline using compressed air. The Pipeline would then be packed with nitrogen or other appropriate inert gas that would remain in place until the Pipeline is put into service.

Cleanup and Restoration

After the trench is backfilled, Commonwealth would remove all remaining construction debris, surplus materials, and temporary structures from the construction work areas and dispose of them in accordance with applicable federal, state, and local regulations. Commonwealth proposes to finish grading and restoring all temporarily disturbed areas (including the construction right-of-way, temporary access roads, and ATWS) as closely as practicable to pre-construction contours within 20 days after backfill, as specified in the FERC's *Plan*, depending on weather and soil conditions. During this phase, Commonwealth would also install permanent erosion control measures in accordance with the FERC's *Plan* and Commonwealth's Project-specific *Procedures*. Fences disturbed during construction would be repaired.

Commonwealth would revegetate the right-of-way in accordance with the FERC's *Plan*, Commonwealth's Project-specific *Procedures* and *Workspace Restoration Plan*, recommendations of the Natural Resources Conservation Service (NRCS), and landowner agreements, as applicable. Commonwealth would plant a mixture of saltmarsh seedling species along the right-of-way within 6 days of final grading if weather and soil conditions allow. Commonwealth would inspect the right-of-way after the first and second growing seasons to determine the success of revegetation and would implement additional restoration measures in accordance with the FERC Plan and Project-Specific *Procedures*, or if deemed necessary by federal, state, or local agencies.

Finally, Commonwealth would install pipeline markers and/or warning signs along the Pipeline centerline at line-of-sight intervals to identify the Pipeline location, identify Commonwealth as the Pipeline operator, and provide telephone numbers for emergencies and inquiries. In accordance with 49 CFR 192, Commonwealth would install a cathodic protection system within the permanent right-of-way to prevent or minimize corrosion of the buried Pipeline and aboveground facilities. The cathodic protection system impresses a low-voltage current on the Pipeline to offset natural soil and groundwater corrosion potential.

2.5.3 Waterbody and Horizontal Direction Drilling Crossings

The Pipeline right-of-way would span three major waterbodies and three intermediate waterbodies. Commonwealth would cross the three major waterbodies (at MPs 0.0, 0.2, and 2.1) using open cut crossing methods. The pipeline would cross under the intermediate waterbodies (at MPs 2.7 and 2.9) as part of the HDD crossing of Highway 27/82.

2.5.3.1 Open-cut Crossing Method

The open-cut crossing method is intended to minimize impacts on waterbodies by limiting in-water activities and the time necessary to complete the crossing. To cross the waterbodies at MPs 0.0 and 0.2, Commonwealth would excavate the trench using backhoes along the banks and stockpile the trench spoils on the banks in accordance with its Project-specific *Procedures*. The pipe would be assembled outside of the waterbody prior to commencing trenching activities within the waterbody. Commonwealth would dig the trench within the waterbody and install the pipe in the trench. The pipe would be weighted to create negative buoyancy. Commonwealth would then return the stockpiled spoils to the trench and stabilize and restore the banks of the waterbody within 24 hours. Commonwealth would adhere to its *Procedures* and the guidance of LDNR's OCM for all waterbody crossing methods.

Crossing the waterbody at MP 2.1, a 1,170-foot-wide shallow pond, would require additional methods. Commonwealth would float an excavator on a construction barge across the pond. As the barge advances along the right-of-way route, the excavator would dig the trench from the aft, or trailing, side of the barge, storing the trench spoils in the shallow water adjacent to the trench. After the trench is excavated, the pipeline, with floats attached, would be pushed into the trench from one end and pulled by the construction barge from the other end. Workers on flat-bottomed boats would guide the advancing pipeline and remove the floats from the pipeline once it is in place and allow the pipeline to settle into the trench. The excavator would then cross the pond on the construction barge again and backfill the trench.

2.5.3.2 Horizontal Directional Drilling Method

Commonwealth proposes to use the HDD method to cross Highway 27/82 and two intermediate waterbodies (which are roadside ditches) between and MPs 2.7 and 2.99. A 10-inch-diameter waterline would also be crossed by this HDD.

The HDD method is a trenchless crossing method used to avoid direct impacts on sensitive resources (such as high-traffic roadways, waterbodies, or wetlands). 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 extending about 30 feet beneath the sensitive resource; (3) enlarging the pilot hole to 54 inches with a series of reamers to accommodate the pipe; and (4) pulling a pre-fabricated section of pipe through the hole. The HDD method involves an entry pit measuring approximately 8 feet by 20 feet (within a 218-foot by 402-foot workspace) at the start of the crossing and an exit pit measuring approximately 8 feet by 10 feet (within a 230-foot by 200-foot workspace) at the end of the crossing. The initial step of placing HDD guide wires over the path of the drill may require minor hand clearing of vegetation. Commonwealth would drill a pilot hole along the path of the HDD route (i.e., under the waterbodies and highway). 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 toward the surface. Throughout the process of drilling and enlarging the hole, a 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 a commercial name for a non-toxic mixture of clays and rock particles consisting of about 85 percent montmorillonite clay, 10 percent quartz and feldspars, and 5 percent accessory materials such as calcite and gypsum. When combined with water, 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 follows the path of least resistance, and near the drill entry or exit pits, where the drilled hole is at its shallowest depths. For example, if the drill path passes through fine-grained soils with low shear strength (such as those found in marsh habitats), an inadvertent release could occur.

2.5.4 Road and Foreign Pipeline Crossings

As noted above, the Pipeline would cross Highway 27/82 (Gulf Beach Highway) immediately adjacent to the Terminal site. The Pipeline would not cross any other roadways. The only foreign pipelines that the Pipeline would intersect would be the interconnections with the Bridgeline and Kinetica pipelines.

The Pipeline would also cross a 10-inch-diameter municipal waterline that runs parallel with and immediately adjacent to the north side of Highway 27/82.

As described in section 2.5.3.2, Commonwealth would use the HDD method to cross Highway 27/82 and the 10-inch-diameter municipal waterline.

2.5.5 Aboveground Facilities

As noted in section 2.4, Commonwealth proposes a modification to section VI.A.6 of the FERC's *Procedures*, which prohibits constructing aboveground facilities in wetlands. Commonwealth proposes to construct the interconnection facility at MP 0.0 and interconnection facility/meter station at MP 0.8 within wetlands. We discuss potential alternative locations for the pipeline route and aboveground facilities in sections 3.8 and 3.9. Site preparation and restoration at the aboveground facility sites would generally be conducted as described in section 2.5.2. The facilities would be pile-supported (i.e., elevated) to minimize their footprint within the wetland. The facilities would consist of piping, valves, fittings, and electrical systems and would be permanent for the operational duration of the Project.

2.5.6 Construction Support Areas

Commonwealth proposes 26 ATWS at regular locations along the Pipeline right-of-way. As with the aboveground facilities, Commonwealth requests an additional modification to section VI.B.1.a of the FERC's *Procedures*, which mandates extra work areas be placed at least 50 feet away from wetland boundaries. Commonwealth would use the ATWS to stage equipment and pipe, stockpile spoil, and serve as the HDD entry and exit locations. Commonwealth's proposed modifications to the FERC *Procedures* are discussed further in section 4.4.3.

2.5.7 Access Roads

Commonwealth would not construct permanent access roads for the Pipeline. Commonwealth would instead access the Pipeline during construction and operation using low-ground-pressure equipment over the proposed permanent right-of-way. Commonwealth would construct a 25-foot-wide, 1,650-foot-long temporary access road extending from Highway 27/82 to the HDD exit workspace (see figure 2.1-2). Commonwealth previously planned for the temporary access road to cross a culvert over the drainage ditch adjacent and parallel to Highway 27/82. Because of hurricane damage to the culvert in 2020, Commonwealth would repair the culvert prior to use of the road in accordance with guidance from the Cameron Parish Gravity Drainage District 7 and the Louisiana Department of Transportation and Development (LDOTD). Commonwealth would use land-based equipment to remove the damaged culvert materials and place new crossing materials. Resource acreage impacts to replace the culvert would be equivalent to those previously estimated as part of the temporary access road acreage impacts.

2.6 OPERATION AND MAINTENANCE

2.6.1 Terminal

2.6.1.1 Summary of Operation

Commonwealth would operate its Terminal consistent with federal requirements for LNG facilities, which include operation, emergency, and security procedures. All operational systems of the Terminal, including operations of the liquefaction trains, LNG storage tanks, and LNG carrier loading, would be controlled through the Terminal control room. The control room would also monitor systems for hazard detection and control, fire detection, and emergency shutdowns. Commonwealth would design, construct, operate, and maintain safety controls in accordance with DOT federal safety standards for LNG facilities at 49 CFR 193. The Terminal would also meet NFPA Standard 59A.

Maintenance of the Terminal would be conducted according to 49 CFR 193, Subpart G. Commonwealth would employ the necessary maintenance staff and craftsmen (e.g., mechanics, millwrights, electricians, instrument technicians, etc.) as required to properly maintain the Terminal. Full-time maintenance staff would conduct routine maintenance and minor overhauls. Overhauls and similar major maintenance would be handled by authorized factory service representatives and trained contract personnel. Scheduled maintenance would be performed on safety and environmental equipment, instrumentation, and other equipment. All scheduled and unscheduled maintenance would be part of a systematic approach to maintenance, using industry accepted practices for scheduling and tracking maintenance activities.

2.6.1.2 LNG Carrier Traffic

Commonwealth anticipates an average of three LNG carriers per week (156 LNG carriers per year) would call on the Terminal. The marine facility would be sized to accommodate one LNG carrier at a time. Therefore, while an LNG carrier is berthed at the Terminal, any other LNG carrier attempting to call on the Terminal would be required to anchor offshore (i.e., in the Gulf of Mexico) until the marine facility is clear. This is the normal operating procedure for the Calcasieu Ship Channel.

LNG carriers would be piloted through the mouth of the Calcasieu River to the turning basin and maneuvered from the turning basin into the LNG carrier berth. Simulations conducted by the Lake Charles Pilots concluded that four 75-ton bollard pull tractor tugs would be adequate to safely maneuver the LNG carriers that would call on the Terminal with no additional risk than posed by other deep-draft vessels (e.g., oil tankers, chemical ships, freighters) that currently navigate the Calcasieu Ship Channel (USCG, 2019).

2.6.1.3 Vehicle Traffic

The Project would require daily truck travel to and from the Terminal to remove or provide absorbent, condensate, refrigerants, and other commodities required for operation of the Terminal. Spent absorbent required to remove mercury from the feed gas and condensate from the liquefaction process would be trucked off-site for disposal. The spent absorbent would only require periodic removal while the condensate would be trucked off-site daily. Commonwealth expects an average of between six and nine trucks per day would be required to transport the produced condensate to an off-site customer. Commonwealth expects an average of about two trucks per week would be required to provide refrigerants and other commodities (e.g., diesel) to the Terminal throughout the life of the Project. Vehicle traffic is discussed further in section 4.9.11.

2.6.1.4 Spill Containment System

Commonwealth would construct separate containment systems for refrigerant and LNG to contain the materials in the event of an accidental release. The refrigerant containment system would be sited, sized, and designed in accordance with the requirements of American Petroleum Institute Standard 2510 (API 2510) and NFPA Standard 30, and the LNG containment system would be sited, designed, and constructed in accordance with the requirements of 49 CFR 193.2155 through 193.2181. Spill containment system operation, maintenance, and safety information is presented in section 4.12.

2.6.2 Pipeline

Commonwealth would operate and maintain its Pipeline in accordance with the DOT regulations in 49 CFR 192, other applicable federal and state regulations, and industry standard procedures designed to ensure the integrity of the Pipeline and minimize the potential for pipe failure. Commonwealth would maintain a 3.5-foot-wide permanent easement along the Pipeline route. As noted above, we recommend in section 4.12.4 that Commonwealth identify how it would adequately maintain and repair the pipeline with this size of a permanent right-of-way. Commonwealth would conduct periodic vegetation maintenance of the Pipeline right-of-way, if needed, at a frequency of no more than every three years. Commonwealth would not conduct routine vegetation maintenance between April 15 and August 1 of any year, unless such maintenance were approved by the FWS, and no vegetation maintenance activities would be conducted between the HDD entry and exit points.

Commonwealth would inspect the Pipeline as part of scheduled maintenance conducted in accordance with 49 CFR 192. Besides vegetation maintenance, other operational activities on the pipeline right-of-way would include inspections and repairs. Periodic aerial and ground inspections may identify pipeline leaks, erosion, or loss of vegetation cover on the right-of-way, and unauthorized encroachment. The cathodic protection system would also be inspected periodically to ensure that it is functioning properly. In addition, pigs would be regularly sent through the pipeline to check for corrosion and irregularities in the pipe in accordance with DOT requirements.

3.0 ALTERNATIVES

As required by NEPA and FERC policy, we evaluated reasonable alternatives to the Project and its various components to determine whether any such alternatives would be preferable to the proposed action. A reasonable alternative would meet the Project's purpose and would be technically and economically feasible and practical. The range of alternatives analyzed included the No-Action Alternative; system alternatives for the proposed Terminal; Terminal site location and layout design alternatives; alternative pipeline routes; and dredge spoil disposal location alternatives.

As part of the No-Action Alternative, we considered the effects and actions that could conceivably result if the proposed Project was not constructed. Under the analysis of system alternatives, we evaluated the ability of other existing, planned, or proposed (new or expanded) facilities to meet the Project objectives of Commonwealth. Our evaluation of alternative sites for the Terminal focused on several locations in the project region. Our evaluation of Terminal layout design alternatives focused on different Terminal configurations and our evaluation of alternative pipeline routes assessed different alignments of the Project pipeline. Finally, we also assessed onshore and offshore disposal alternatives of Commonwealth's dredge spoils.

The principal criteria for considering and weighing the alternatives for the Project were:

- the ability of each alternative to reasonably meet Commonwealth's primary objective of liquefying and exporting to foreign markets 8.4 MTPA of domestically produced natural gas sourced from existing interstate and intrastate pipeline systems in southwest Louisiana;
- the technical and economic feasibility and practicality of each alternative; and
- whether each alternative would provide a significant environmental advantage relative to the proposed undertaking.

Through environmental comparison and application of our professional judgement, each alternative is considered to a point where it becomes clear if the alternative could or could not meet the three evaluation criteria. Our environmental analysis and this evaluation consider quantitative data (e.g., acreage or mileage) and use common comparative factors such as total length, amount of collocation, and land requirements. In recognition of the competing interests and the different nature of impacts resulting from an alternative that sometimes exist (i.e., impacts on the natural environment versus impacts on the human environment), we also consider other factors that are relevant to a particular alternative and discount or eliminate factors that are not relevant or may have less weight or significance.

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

The second evaluation criteria is feasibility and practicality. Many alternatives are technically and economically feasible. Technically practical alternatives, with exceptions, would generally require the use of common construction methods. Economically practical alternatives would result in an action that generally maintains the price competitive nature of the proposed action. Generally, we do not consider the cost of an alternative as a critical factor unless the added cost to design, permit, and construct the alternative would render the project economically impractical.

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

Commonwealth participated in our pre-filing process during the preliminary design stage of the Project (see section 1.0). This process emphasized identification of stakeholder issues, as well as identification and evaluation of alternatives that could reduce environmental impacts. Our analysis of alternatives is based on Project-specific information provided by the applicant, affected stakeholders, those comments received during Project scoping, publicly available information, our consultations with federal and state agencies, and our own research regarding the siting, construction, and operation of the proposed pipeline, LNG facilities, and dredge disposal location and their impacts on the environment (i.e., our alternatives analysis are comment and resource driven). Unless otherwise noted, we used the same desktop sources of information to standardize comparisons between the Project and each alternative (e.g., aerial photographs, U.S. Geological Survey [USGS] topographic maps, National Wetland Inventory [NWI] maps, agency consultations, and other publicly available information). As a result, some of the information presented in this section relative to the Project may differ from information presented in section 4.0, which is based on Project specific data derived from field surveys and engineered drawings.

3.1 NO-ACTION ALTERNATIVE

NEPA requires the Commission to consider and evaluate the no-action alternative. According to CEQ guidance, in instances involving federal decisions on proposals for projects, no-action would mean the proposed activity would not take place and the resulting environmental effects from taking no-action would be compared with the effects of permitting the proposed activity. Further, the no action alternative provides a benchmark for decisionmakers to compare the magnitude of environmental effects of the proposed activity and alternatives.

Thus, under the No-Action Alternative, the Project would not be developed and Commonwealth's objective of liquefying and exporting natural gas to foreign markets would not be realized. In addition, the potential environmental impacts discussed in section 4.0 of this EIS would not occur.

During scoping, we received a comment regarding whether apparently unsubscribed LNG capacity at several existing, proposed, or planned LNG Terminals could be contracted and combined to meet the projected demand for LNG. While we recognize that liquefaction capacity may not be fully subscribed at other Terminals based on contracts executed as of the writing of this EIS, the DOE's export approval is a determination that the export is in the public interest. Therefore, we will not speculate that any portion of the liquefaction capacity of other LNG terminals is in "excess" or available as an alternative for use by Commonwealth to meet its Project objectives.

The No-Action Alternative might result in end users of LNG making different arrangements to meet their needs. Although it is speculative to predict what actions might be taken by policymakers or end users if the No-Action Alternative is selected, it is possible that renewable energy sources (e.g., solar power), traditional energy sources (e.g., coal or fuel oil), or traditional long-term energy sources (e.g., nuclear power) could be used in lieu of the Project. But the location of the facility and use of the fuel (e.g., electricity, heating, industrial feed stock, etc.) would also be speculative. In addition, alternative energy sources would not meet the Project objective of liquefying natural gas for export and are beyond the scope of this EIS.

We have prepared this EIS to inform the Commission and stakeholders about the expected impacts that would occur if the Project were constructed and operated. The Commission will determine the Project need and could choose the no-action alternative.

3.2 SYSTEM ALTERNATIVES

We received comments from the public expressing concern that there may be system alternatives that would cause fewer land impacts and that these alternatives may be better suited to provide the LNG capacity that Commonwealth is proposing. The purpose of the Project is to liquefy and export 8.4 MTPA of natural gas to FTA and non-FTA countries. We reviewed system alternatives in the Gulf Coast region to evaluate the ability of other existing, modified, approved, planned, or proposed facilities to meet the Project purpose and to determine if a system alternative exists that would be technically and economically feasible and have a significant environmental advantage over those impacts associated with the Project. In the case of the Project, it must also be compatible with project parameters stated in Commonwealth's DOE applications for LNG export to FTA and non-FTA countries. The status identified for each system alternative (e.g., planned, proposed, or approved[27]) is current as of the time this EIS being written, and is subject to change over time. By definition, implementation of a system alternative would make construction of all or some of the proposed facilities unnecessary; conversely, infrastructure additions or other modifications to the system alternative may be required to increase capacity or provide receipt and delivery capability consistent with that of the proposed facilities. Such modifications may result in environmental impacts that are less than, comparable to, or greater than those associated with construction and operation of the proposed facilities. It should also be noted that any future expansion plans do not need to be addressed in this document as expansion of the terminal would require an additional NEPA document. For this reason, and because the impacts of hypothetical expansion are not reasonably foreseeable, they are not addressed here.

The system alternatives identified include both existing LNG terminals with planned, proposed, or authorized expansions, as well as new LNG terminals planned, proposed, or authorized on greenfield sites. We received a comment from the public requesting that the comparison of the Project with potential system alternatives be conducted as a comparison of the total liquefaction capacities of both the Terminal and the system alternatives. These potential system alternatives, and their total MTPA capacities, are identified in table 3.2-1 below. Our analysis was predicated on the assumption that each project has an equal chance of being constructed and would therefore be available as a potential alternative. However, market forces will ultimately decide which and how many of these facilities are built.

27 Proposed projects are projects for which the proponent has submitted a formal application to the FERC; planned projects are projects that are either in pre-filing or have been announced but have not been proposed. Approved projects are projects that have received FERC authorization.

TABLE 3.2-1

Liquefied Natural Gas Export Terminals with Planned, Proposed, or Approved Liquefaction Projects Along the Gulf Coast – Summary Profile of System Alternatives

Project	MTPA	FERC Status a/	In-Service Target Date
EXISTING LNG TERMINAL EXPANSIONS			
Approved Projects			
Cameron LNG Trains 1-3	14.95	In-Service	2020
Freeport LNG Trains 1-3	15.3	In-Service	2020
Corpus Christi LNG Trains 1-3	16.9	In-Service	2021
Sabine Pass LNG Trains 1-6	32.1	In-Service	2022
Golden Pass LNG	15.6	Under construction	2024
Cameron LNG Expansion Train 4	6.75	Approval received 5/5/16	2026
Lake Charles/Trunkline LNG	16.45	Approval received 12/17/15	2028
Freeport LNG Expansion Train 4	5.1	Approval received 5/16/19	2026
Gulf LNG Liquefaction Company	10.85	Approval received 7/16/19	2024
Corpus Christi LNG Stage 3	11.45	Approval received 11/22/19	2024
NEW LNG TERMINALS			
Approved Projects			
Driftwood LNG	27.6	Under construction	2026
Venture Global Calcasieu Pass	12.0	In-Service	2022
Magnolia LNG	8.0	Approval received 4/15/16	2023
Delfin LNG Deepwater Port	9.2	Approval received 9/28/17	2024
Port Arthur LNG Phase 1	13.5	Approval received 4/18/19	2023
Venture Global Plaquemines LNG	20.0	Under construction	2024
Texas LNG	4.0	Approval received 11/22/19	pending b/
Rio Grande LNG	27.0	Approval received 11/22/19	2026
Magnolia LNG Amendment	0.8	Approval received 10/7/2020	2026
Proposed Projects			
Port Arthur LNG Phase 2	13.5	Application filed 2/19/20	2028
Venture Global CP2 LNG	20.0	Application filed 12/2/2021	2026
Planned Projects			
Port Fourchon LNG	5.0	Pre-filing initiated 8/21/17	pending
Venture Global Delta LNG	24.0	Pre-filing initiated 4/17/19	pending

a/ Approved indicates the project has been certificated by the Commission.
b/ Construction for the Texas LNG project has not begun; no estimated start of construction is available

As identified in table 3.2-1, there are seven existing LNG terminal sites along the Gulf Coast in the southeastern United States with approved, proposed, and/or planned expansion(s) to export to FTA countries. We also identified 11 new LNG terminal projects approved, proposed, or planned on greenfield sites. Each of the seven expansion projects and 11 new LNG projects was evaluated as a potential system alternative to the Project.

Each proposed project is authorized from or has applied to DOE to export to FTA countries. The NGA, as amended, has deemed FTA exports to be in the public interest; therefore, we cannot speculate or conclude that excess capacity is available from the listed proposed projects to accommodate the purpose and need of the Commonwealth LNG Project. Consequently, we must conclude Commonwealth's proposed export capacity at any other existing or proposed LNG facility would require an expansion or new facilities. Some of the facilities, such as Freeport LNG, are unlikely to have the available acreage to expand its facilities to accommodate the purpose and need of the Project. For those remaining LNG facilities, there may be available acreage to expand the existing or proposed facilities. However, expansion would require similar structures as the facilities proposed for the Terminal, resulting in environmental impacts similar to the Project. These systems alternatives, therefore, offer no significant environmental advantage over the proposed Project and are not considered to be preferable.

3.3 ALTERNATIVE TERMINAL SITES

To minimize the potential environmental impacts from the proposed action, we evaluated potential alternative sites for the Project within the Gulf Coast region that meet the following criteria related to site size and zoning, marine operations, and infrastructure.

Site size and availability:

- site has sufficient acreage for the current Project design (at least 200 acres); and
- the surrounding land use is compatible for construction of an LNG Terminal.

Marine Operations:

- site has waterfront access sufficient to construct a berth for LNG carriers with capacities of up to 216,000 m^3 (at least 1,500 feet of shoreline);
- site is adjacent to a navigational channel deep enough to accommodate LNG carriers with capacities of up to 216,000 m^3 (depth of at least 40 feet); and
- navigational channel within proximity of the site is wide enough to accommodate a turning basin.

Infrastructure:

- site has reasonably close access to a natural gas supply that can provide sufficient volumes of natural gas to the Project;
- site has reasonable proximity to utilities (water and electricity); and
- site has suitable road and highway access.

We received multiple comments from the public requesting Commonwealth to consider specific alternative locations for the Terminal site. The alternative sites included the parcel of privately owned land north of the Cameron Ferry landing on Highway 27/82, and south of St. John's Island; the land adjacent to the Omega Protein, Inc. fish-processing plant approximately 0.75 mile north of the proposed Terminal location; on Monkey Island; and along the lower Mississippi River in Plaquemines Parish, Louisiana. These suggestions are included in our assessment as Alternative sites 1, 2, 3A, and 5, respectively.

We identified three additional alternative sites and the proposed site for assessment based on the above criteria during the Project's initial development. However, based on the lack of availability of several of those sites over time, at our request Commonwealth identified three additional alternatives (Alternative Sites 6-8). The locations of the sites are provided in figures 3.3-1a-e and their attributes are summarized in table 3.3-1. We have received comments from the public expressing concern that including the alternative sites that are no longer commercially available in the EIS presents a false appearance of considering a wide range of alternatives despite some of the alternatives not being available. We are including here the sites that are no longer commercially available to identify that the sites were previously considered as they are sites recommended as alternatives in the public comments. However, we do not provide in-depth descriptions of the potential environmental advantages of these sites given that under section 3 of the Natural Gas Act these alternatives are no longer feasible.

We also received a comment that the proposed Project site is the only site that would directly impact protected wildlife species and that typical wetland mitigation plans would not resolve impacts on the eastern black rail, a bird species federally classified as threatened and likely present at the Project site, because of the limited habitat in the region where they can be found. Threatened and endangered species consultation with the FWS has not been conducted for the alternative sites; therefore, we do not have an official accounting of the potential presence of protected species at the alternative sites. However, an unofficial inquiry of the FWS' Information for Planning and Consultation online system[28] indicates protected species may be present at all eight of the alternative sites, including the potential for presence of the eastern black rail at six of the eight alternative sites. Project impacts on the eastern black rail are addressed in section 4.7.1. In short, the FWS issued a Biological Opinion that the Project is not likely to jeopardize the continued existence of the eastern black rail. The FWS provided mandatory Reasonable and Prudent Measures that were deemed necessary and appropriate by the FWS for Commonwealth to follow to monitor and minimize impacts on eastern black rails. Further, the FWS provided a suite of Terms and Conditions and Monitoring and Reporting Requirements for Commonwealth to abide by in association with the Reasonable and Prudent Measures. Commonwealth accepted the terms and conditions of the BO on October 6, 2021.

During the public comment period for the draft EIS, we received a comment from the public suggesting the alternatives analysis was not conducted in a quantitative manner and recommended that FERC use tools such as the CPRA Coastal Master Plan Viewer or the National Fish and Wildlife Foundation's Coastal Resilience Evaluation and Siting Tool. The commenter noted that the CPRA Coastal Master Plan Viewer showed the Terminal site as falling within the tool's highest flood risk category (16-feet-plus). Table 3.3.1 provides a quantitative comparison of each of the proposed Alternative Sites and while the National Fish and Wildlife Foundation's Coastal Resilience Evaluation and Siting Tool provides quantitative values for a suite of resource parameters, they are not able to integrate many of the parameters in table 3.3.1, such as dredging volumes and acreage impacts from feed gas pipelines, that must also be weighed. We also note that the CPRA Coastal Master Plan Viewer shows approximately two-thirds of the Terminal site to be in the 7 to 9 feet flood risk and even the 1 to 3 feet flood risk in some scenarios. Additionally, Alternative Sites 1, 2, 4, 6, and 7 all contain large portions, if not the entirety of the sites, within the 16-foot-plus range and Alternative Sites 3A and 5 contain portions of the site within the next range of flood risk at 13 to 15 feet. Alternative site 8 is in Texas and therefore does not have CPRA data associated with it; however, much of the site is wetland habitat and would therefore be expected to have comparable flood risk as Alternative Sites 1, 2, 4, 6, and 7.

28 See https://ipac.ecosphere.fws.gov/.

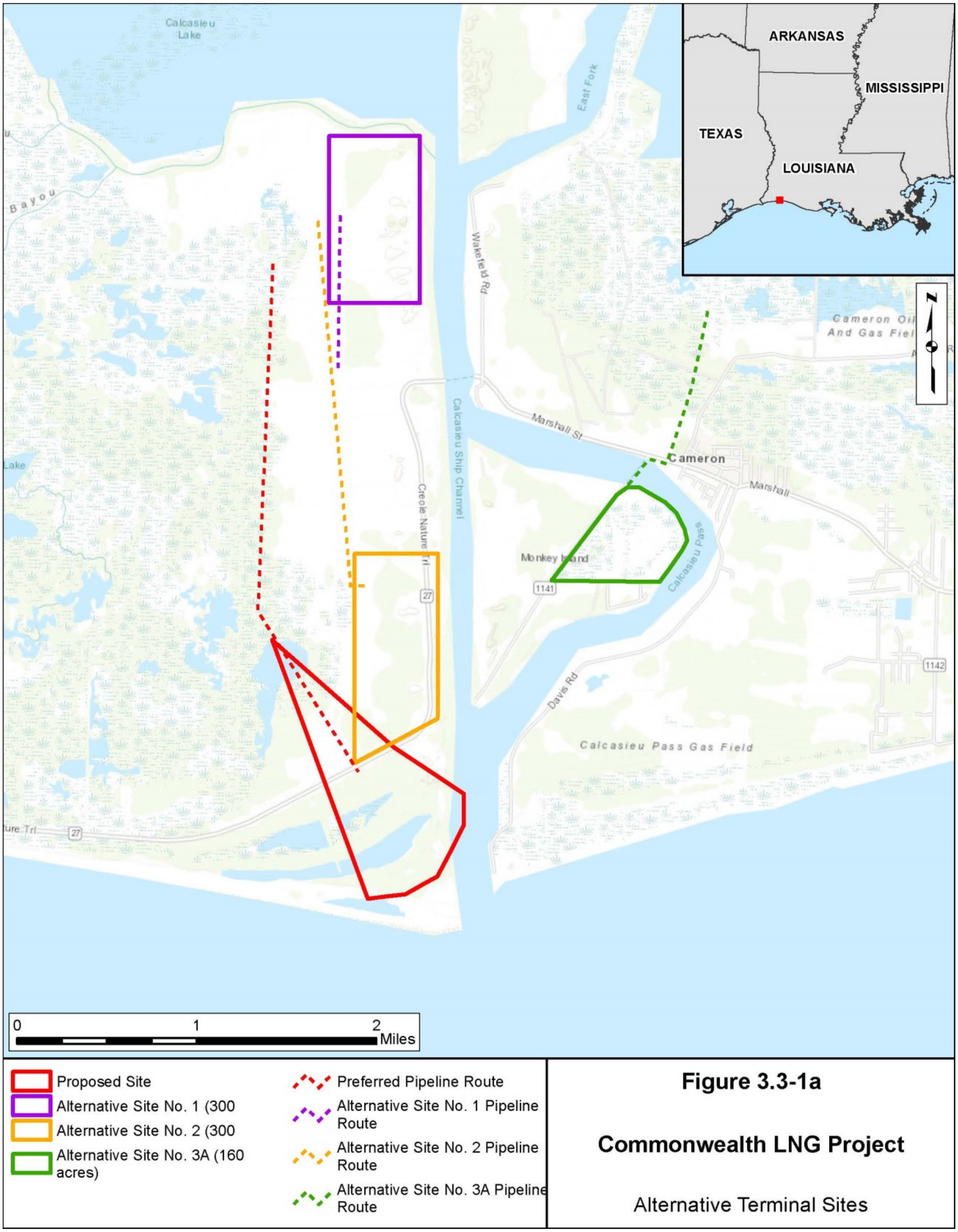
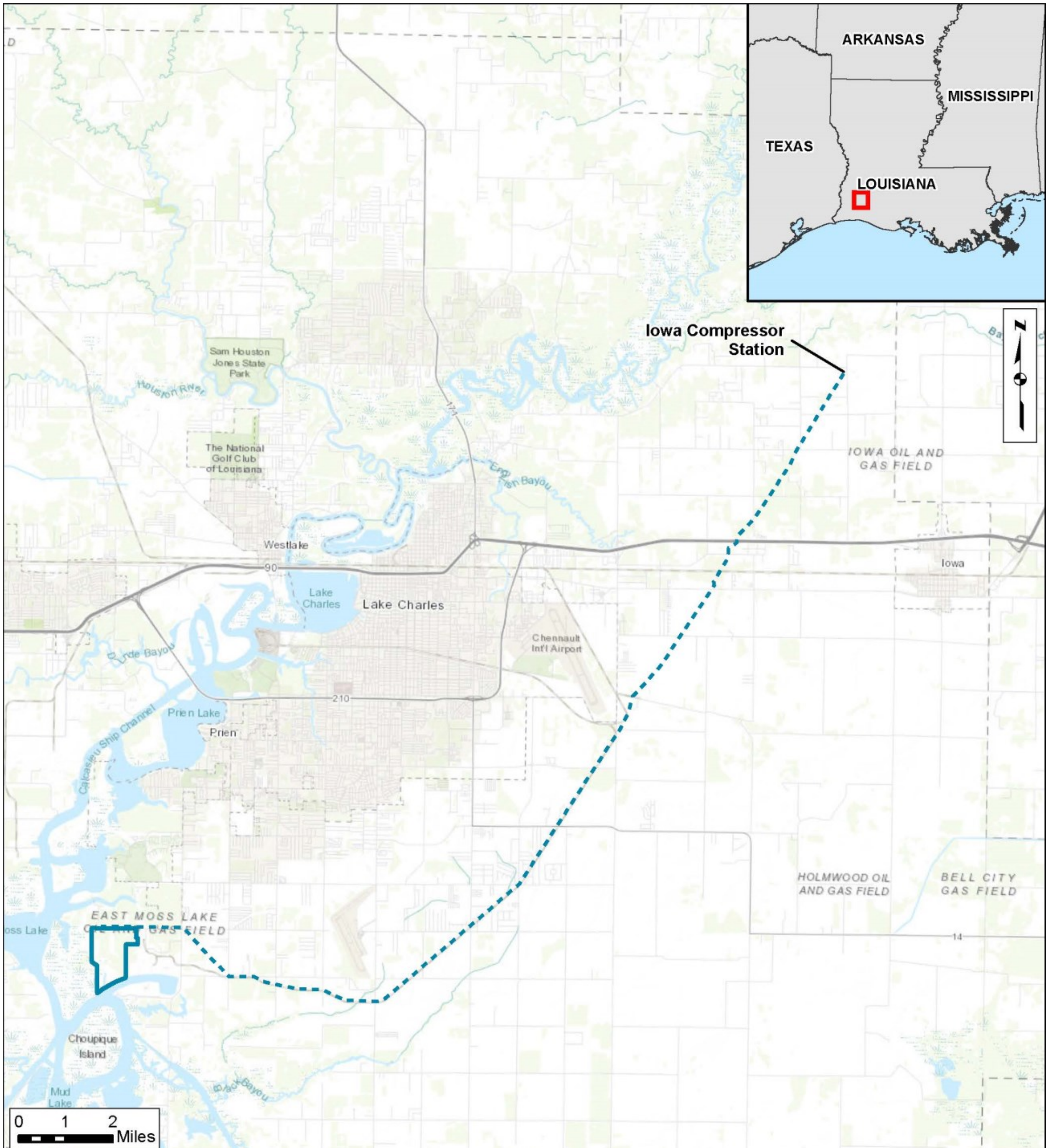


Figure 3.3-1a

Commonwealth LNG Project

Alternative Terminal Sites

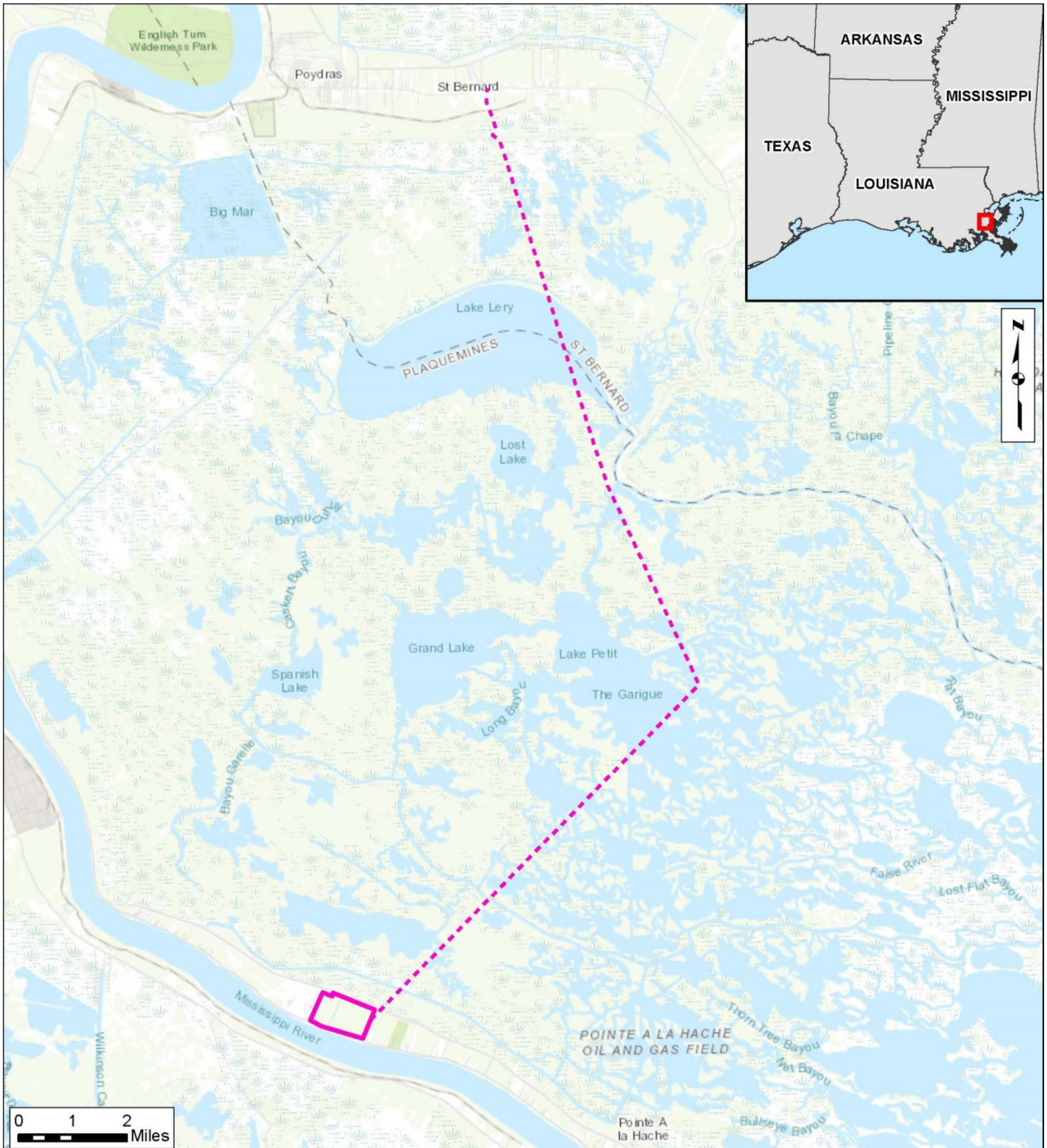


Alternative Site No. 4 (568 acres)
Alternative Site No. 4 Pipeline Route

Figure 3.3-1b

Commonwealth LNG Project

Alternative Terminal Sites

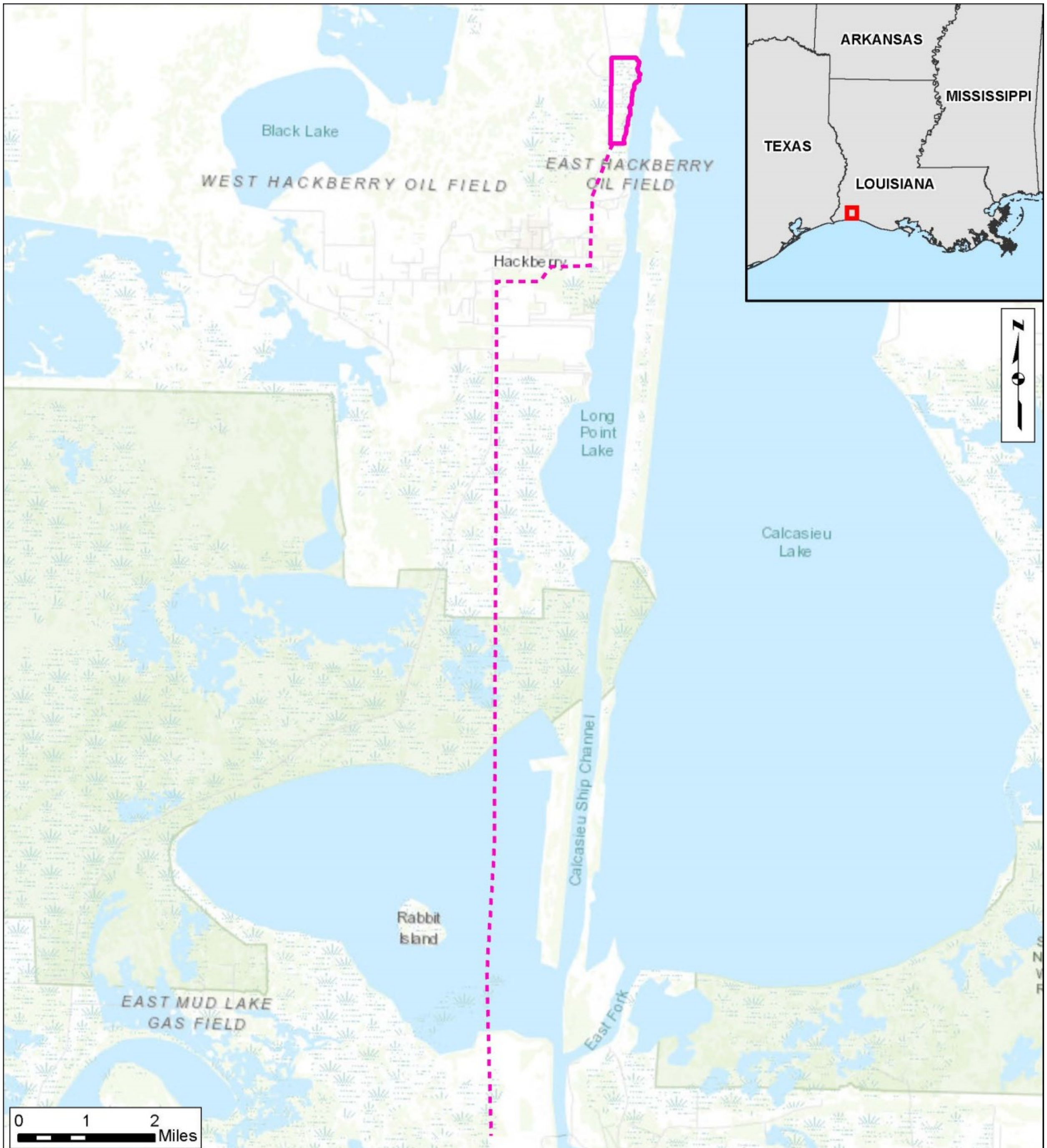


Alternative Site No. 5 (462 acres)
Alternative Site No. 5 Pipeline Route

Figure 3.3-1c

Commonwealth LNG Project

Alternative Terminal Sites

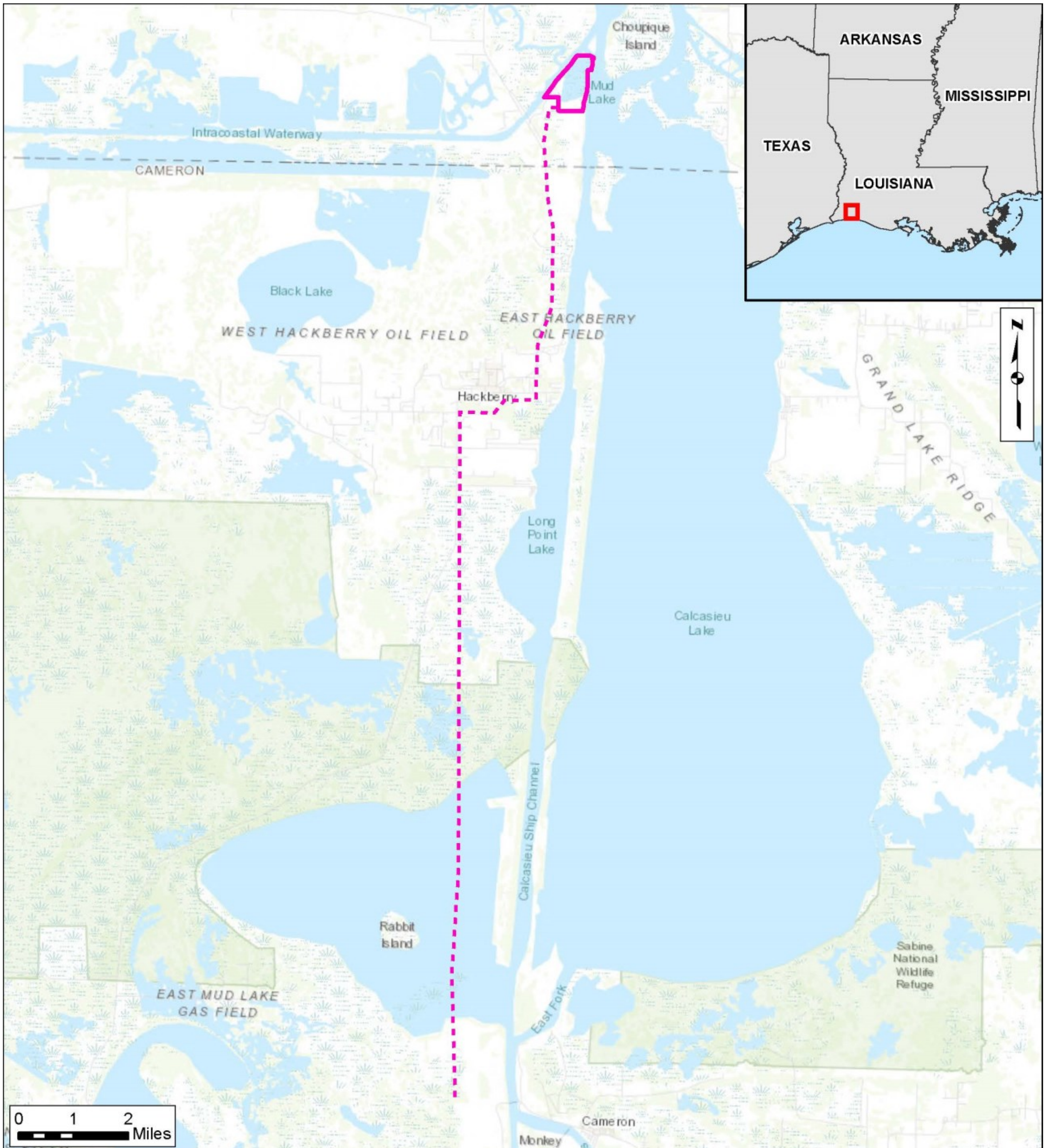


Alternative Site No. 6 (251 acres)
Alternative Site No. 6 Pipeline Route

Figure 3.3-1d

Commonwealth LNG Project

Alternative Terminal Sites



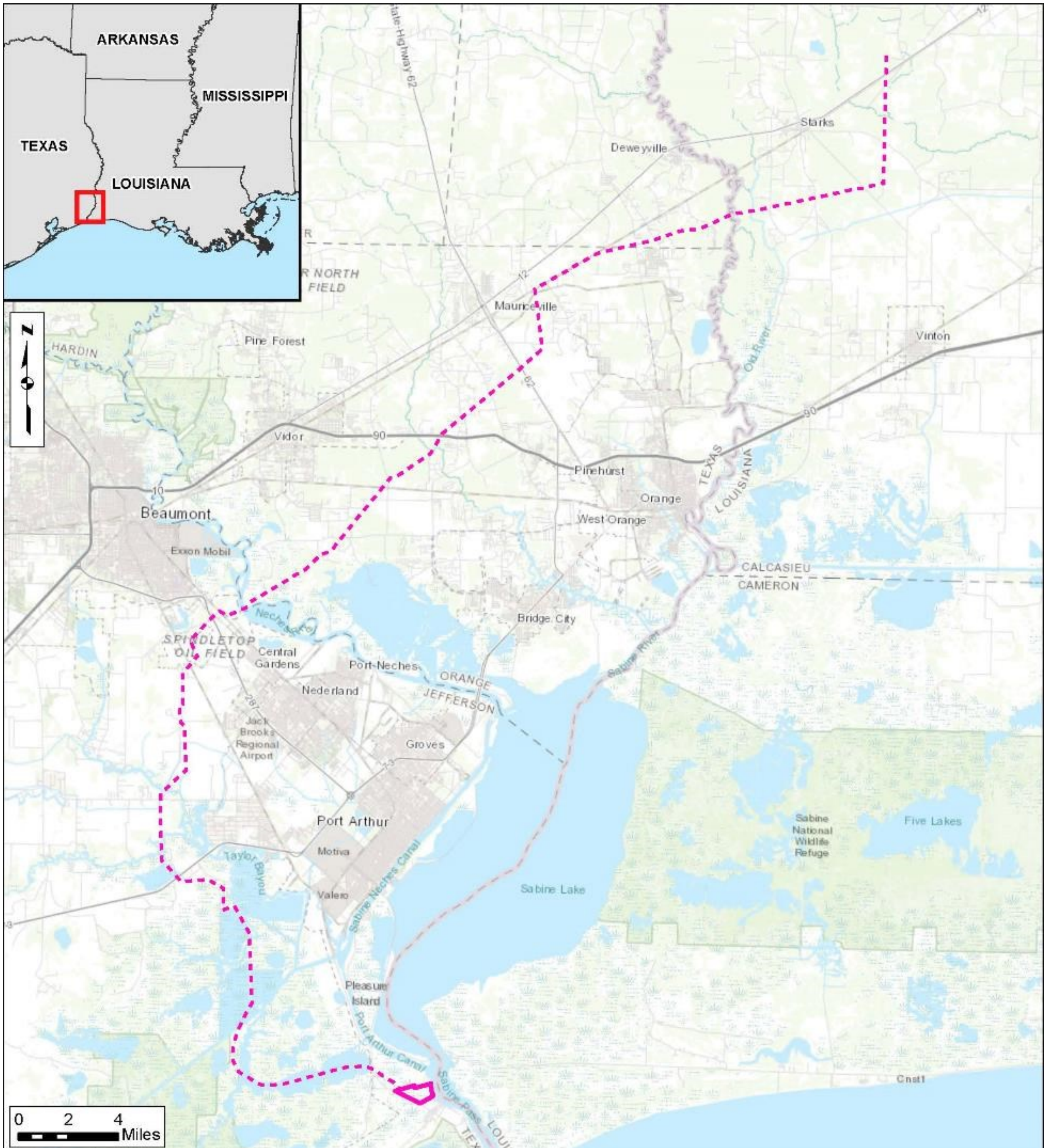
Alternative Site No. 7 (317 acres)

Alternative Site No. 7 Pipeline Route

Figure 3.3-1e

Commonwealth LNG Project

Alternative Terminal Sites



Alternative Site No. 8 (421 acres)
Alternative Site No. 8 Pipeline Route

Figure 3.3-1f

Commonwealth LNG Project

Alternative Terminal Sites

TABLE 3.3-1

Commonwealth LNG Terminal Alternative Sites 1-8 Location Comparison

Criteria	Proposed Site	Alternative Site 1	Alternative Site 2 a/	Alternative Site 3A a/	Alternative Site 4	Alternative Site 5	Alternative Site 6	Alternative Site 7	Alternative Site 8
Site Size and Availability									
Acres available for construction of Project (200 acres needed)	393	300	189	161.9	568	462	251	317	421
Availability of site for purchase or lease	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Marine Operations									
Linear feet of waterfront available (1,500 needed)	2,700	4,900	5,400	0 b/	3,650	5,624	7,328	4,064	2,451
Turning basin construction required	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dredging Volume (cubic yards)	1,730,000	4,800,000	6,010,000	NA c/	1,340,000	0 d/	5,675,000	5,675,000	4,570,000
Approximate distance from Bar Channel Entrance (miles)	32.5	35.9	33.6	33.1	56	76 e/	49.4	53.8	91.1 e/
Infrastructure									
Approximate distance to natural gas feed pipelines (miles)	3.04	0.7	2	1.2	23.2	20.2	15.6	19.2	69.4
Distance to utilities (miles)	0	0.7	0	0	1.5	0	0	0.6	0
Distance to road and/or highway (miles)	Adjacent	Adjacent	Adjacent	0.3	Adjacent	Adjacent	Adjacent	Adjacent	Adjacent
Site Environmental Factors									

TABLE 3.3-1

Commonwealth LNG Terminal Alternative Sites 1-8 Location Comparison

Criteria	Proposed Site	Alternative Site 1	Alternative Site 2 a/	Alternative Site 3A a/	Alternative Site 4	Alternative Site 5	Alternative Site 6	Alternative Site 7	Alternative Site 8
NWI wetlands mapped (acres) f/	184	132	73	159.7	249 g/	13	155	31.3	402.3
NWI wetlands mapped (percent of site)	46.8	44.0	24.3	98.6	43.8 g/	2.8	61.8	9.9	95.6
USGS National Hydrography Dataset Streams (feet) requiring filling	1,060	0	0	0	2,813 g/	0	0	0	0
Approximate Distance to Residences (miles)	2.5 h/	2.5	2.0	1.0	1.25	0.03 – 0.1	0.7	0.6	0.3
Feed Gas Pipeline Environmental Factors									
NWI wetlands crossed (acres) i/	24	4	17	7.5	17	178	113.7	142.4	80.9
Roads crossed	1	0	0	1	26	1	6	8	33
Co-location with existing right-of-way (miles)	0	0	0	0.1	23	12	0.6	4.2	69.4
Residences Within 50 feet	0	0	0	0	2	0	1	1	4
Environmental Justice Communities									
Site parcel crosses an environmental justice community (yes/no)	N	N	N	Y	N	N	Y	N	N
Feed gas pipeline crosses an environmental justice community (yes/no)	N	N	N	Y	Y	Y	Y	Y	Y

TABLE 3.3-1

Commonwealth LNG Terminal Alternative Sites 1-8 Location Comparison

Criteria	Proposed Site	Alternative Site 1	Alternative Site 2 a/	Alternative Site 3A a/	Alternative Site 4	Alternative Site 5	Alternative Site 6	Alternative Site 7	Alternative Site 8

a/ Alternatives 2 and 3A include only the parcels available at the time the analysis was completed.

b/ Linear feet of waterfront at this site noted as zero because the site's location on the Cameron Loop Channel precludes LNG carriers from begin able to access the site.

c/ Dredge volume not provided because dredging any sized turning basin at this location was deemed infeasible.

d/ Dredge volume at this site is noted as zero because the Mississippi River at this location is wide and deep enough such that no turning basin would need to be required.

e/ Alternative sites 5 and 8 are not accessed through the Bar Channel; therefore, the Alternative 5 measurement is the distance from Alternative 5 to Southwest Pass, where the Mississippi River meets the Gulf of Mexico; the Alternative 8 measurement is the distance from the entrance to the Sabine Pass Channel, which access the Sabine Pass Channel on which Alternative 8 is located.. Alternative 8 is approximately 7 miles from the Gulf of Mexico.

f/ Acreages for all of the alternative Terminal sites represent National Wetlands Inventory (NWI) wetlands mapped by the U.S. Fish and Wildlife Service. Because the boundaries of jurisdictional wetlands may differ from NWI wetlands, the wetland acreage numbers provided in this table are different than those reported elsewhere in this EIS for the proposed Terminal.

g/ The Alternative Site 4 parcel contains an approximate 125-acre upland area that fronts the Calcasieu Industrial Canal with approximately 2,600 feet of shoreline. If Commonwealth restricted the location of the Terminal to this block of upland the impacts on NWI wetlands and USGS National Hydrography Dataset Streams would be much lower than the values presented in this table.

h/ There is also an RV pad that serves as a secondary residence site for the landowner approximately 0.3 mile west of the proposed Terminal footprint.

i/ Acreage based on a standard 110-foot-wide construction right-of-way.

j/ The distance assessed for environmental justice block groups is discussed in section 4.9.12.2.

All site alternatives are zoned for heavy industrial use or have no zoning limitations and are in industrial areas. With respect to air permitting, the proposed Terminal site and all eight alternative sites are within attainment air quality zones. Screening criteria used to evaluate the feasibility and potential environmental advantage of each site to select it for further consideration included the availability of land for purchase or long-term lease and a significant reduction in impacts on environmental resources.

3.3.1 Proposed Terminal Site – Commonwealth, Cameron Parish, Louisiana

The proposed Terminal site is on 393 acres of property approximately 2.5 miles southwest of the Town of Cameron in Cameron Parish, Louisiana. The southern border of the site is approximately 900 feet north of the Gulf of Mexico and the site has about 2,700 feet of frontage on the Calcasieu Ship Channel. It is in a remote, industrial region over 2.5 miles from the nearest residential neighborhood.[29] The site is not in an environmental justice community. There is a concrete pad about 0.15 mile west of the Terminal site that is used as an RV parking site by the owner. The proposed Pipeline route would be 3.0 miles long, crossing approximately 24 acres of wetlands and one road.

This site is made up of developed land, open land, open water, cheniers, and wetlands. NWI mapping indicates that approximately 47 percent (184 acres) of the property contains mapped wetlands, and 1,060 feet of National Hydrographic Dataset (NHD)-mapped streams would be impacted. Commonwealth has sited the Terminal to avoid about 48 percent of the wetlands at the site. The chenier habitat, although generally degraded, is rare and important habitat for migratory birds and is not present at any of the alternative sites. Commonwealth is working with federal and state agencies to avoid and minimize the Project effects on wetland and chenier habitat and to provide sufficient mitigation for the unavoidable impacts (see sections 4.4 and 4.6).

Dredging and/or construction at the proposed Terminal site and each of the alternative sites would impact EFH. Each site would require some amount of mitigation for impacts on wetlands and EFH. The channel configuration at the proposed Terminal site would require less dredging for development and maintenance compared to five of the seven other alternatives, for which dredging volumes were considered, due to its location and the ability to use an existing turning basin.[30] The number of vessels transiting to the Terminal would remain the same for each alternative; however, the transit distance in the Calcasieu Ship Channel would be shortest to the proposed Terminal site. The proposed site also would have the shortest approach through the Bar Channel from the Gulf and has sufficient existing road/highway access.

3.3.2 Alternative Site 1 – North of Cameron Ferry Landing, Cameron Parish, Louisiana

Alternative Site 1 is a 300-acre parcel of privately owned land north of the Cameron Ferry landing on Highway 27/82, and south of St. John's Island. This site was available at the time that alternatives were first considered; however, it has since become unavailable. Therefore, under section 3 of the Natural Gas Act, this alternative is no longer feasible and was not carried forward for additional consideration.

3.3.3 Alternative Site 2 – South of Cameron Ferry Landing, Cameron Parish, Louisiana

Alternative Site 2 is a 300-acre parcel of privately owned land south of the Cameron Ferry landing in Cameron Parish, Louisiana. Evaluation of this site as an alternative was requested by a local landowner.

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29 There is one residential camp site and a commercial property within the Project boundary; both would be removed or relocated according to negotiated terms. There is also an RV pad that serves as a secondary residence site for the landowner about 0.3 mile west of the Terminal.

30 Only 7 alternatives have dredging volumes for comparison because the location of Alternative Site 3A on the Cameron Loop Channel precludes the possibility of LNG carriers transiting to the site. Commonwealth intends to use the Calcasieu Pass LNG turning basin on the east side of the Calcasieu Ship Channel, across from the Project (see FERC docket number CP15-550-000).

The area is zoned for heavy industrial use. It is also on the west bank of the Calcasieu Ship Channel, with a channel frontage of approximately 5,400 feet, and is 0.7 mile north of the Gulf of Mexico shoreline. Highway 27/82 passes from north to south through the eastern quarter of the site. This site was available at the time that alternatives were first considered; however, it has since become unavailable. A portion of the site (26 percent) is no longer commercially available, and it is unlikely that the remaining land would be of sufficient size to support the proposed Project. Highway 27/82 runs through the center of the site and would need to be relocated from its current location to accommodate the footprint of an LNG terminal and avoid having the highway pass among the terminal facilities. Under section 3 of the Natural Gas Act, this alternative is no longer feasible and was not carried forward for additional consideration.

3.3.4 Alternative Site 3A – Monkey Island, Cameron Parish, Louisiana

Alternative Site 3A is a 161.9-acre parcel of privately owned land on Monkey Island in Cameron Parish, Louisiana. While Monkey Island is a 450-acre area of land, Monkey Island LNG and CP2 LNG hold lease options for the majority of the site. Therefore, only the unleased area was assessed as part of this alternative. The site is across from the proposed Terminal site on the Calcasieu Ship Channel, approximately 1.2 miles north of the Gulf of Mexico shoreline. The area is zoned for heavy industrial use, and the closest residences are about 0.2 mile from the site; however, no road/bridge access to the island is present. A heavy haul bridge/road would have to be constructed to access the site. The site is also part of an environmental justice community (Census tract 9702.01 block group 3). Approximately 98.6 percent (159.7 acres) of the site is mapped as NWI wetland. The site would require approximately 1.2 miles of pipeline to reach the Kinetica and Bridgeline feed gas pipeline systems. The pipeline would cross the Calcasieu Ship Channel (requiring horizontal directional drilling) and impact approximately 7.5 acres of NWI-mapped wetlands.

The only waterfront available is along the barge channel and would not support construction of a turning basin. Construction of a turning basin would require additional dredging north or south of the island. Navigation of LNG carriers to the site could pose safety hazards due to the narrow channel between Monkey Island and the town of Cameron. The site has no road access to the mainland and development of a heavy-haul bridge and access road to support the facility would cause additional impacts on aquatic, EFH, and water resources (e.g., increases in turbidity and construction noise), as well as impacts on businesses and or residences in Cameron where the bridge would connect to the mainland. The bridge would also limit the size and types of vessels that could traverse through the channel between Cameron and Monkey Island, including LNG carriers. Given the lack of existing infrastructure, its location being part of an environmental justice community, the potential environmental disadvantages, and the feasibility limitations (especially the lack of turning basin and navigation of LNG carriers), Alternative 3A was not carried forward for additional consideration.

3.3.5 Alternative Site 4 – Industrial Canal West of ALCOA Plant, Calcasieu Parish, Louisiana

Alternative Site 4 is a 568-acre parcel situated on the north side of the Calcasieu River Industrial Canal, approximately 9 miles southwest of the City of Lake Charles and 24 miles north of the Gulf of Mexico shoreline. The site has a shoreline frontage of about 3,650 feet. Two authorized LNG projects are immediately east of the site on opposite sides of the Industrial Canal: Lake Charles LNG on the north side of the canal and Magnolia LNG on the south side of the canal. The site is not within an environmental justice community. The site has no existing roads or utilities and approximately 49 percent (282 acres) of the site is mapped as NWI wetland. The site is commercially available for purchase or long-term lease. The site would require approximately 23.2 miles of pipeline, extending northeast of the site, to reach a feasible feed gas pipeline system (connecting to the Kinetica and Bridgeline systems at the same location as the proposed Pipeline would not be feasible). The pipeline would cross 26 roads and approximately 17 acres of NWI-mapped wetlands.

LNG carriers calling at Alternative Site 4 would have to transit an additional 24 miles up the Calcasieu Ship Channel, increasing encounters with ship traffic en route. There could be delays due to anchorage times to wait for other LNG tankers transiting in the opposite direction, which would result in an increase in air emissions from the LNG carriers and tugboats. Alternative Site 4 is adjacent to an existing public road; however, there are no existing utility lines that could provide service. A 1.5-mile utility line route would need to be constructed to the site, crossing about 4.3 acres of NWI wetlands. NWI information indicates that Alternative Site 4 would also impact an additional 65 acres of wetlands compared to the proposed Terminal site.

We received a comment during the draft EIS public comment period suggesting that, given the large size of the parcel, it may be possible to at least partially avoid wetland impacts at the site and thereby increase the environmental advantage of the site. Upon review, the site appears to have an approximately 125-acre block of near-contiguous upland forested land with approximately 2,600 feet of the shoreline frontage. There appears to only be an approximately 2.9-acre, permanently flooded palustrine unconsolidated bottom wetland in the northwest portion of this upland block. There also appears to be a corridor of upland forested land connecting this upland block to the public road (West Tank Farm Road) that parallels the northern boundary of the full parcel. This corridor runs adjacent to and then crosses an apparent drainage ditch but otherwise extends, at a width upwards of 260 feet, approximately 1.5 mile from the contiguous upland forested block to West Tank Farm Road. Although the entire parcel is comprised of about 43 percent wetland habitat, it does appear, as the commenter notes, that there would be enough acreage within the parcel to site a terminal of an equivalent size as the proposed Terminal on the waterfront of the Calcasieu Industrial Canal, and avoid direct Terminal impacts on wetlands aside from the noted approximately 2.9-acre palustrine wetland.

As noted in table 3.3-1, dredging for a turning basin at Alternative Site 4 would require removal of approximately 390,000 fewer cubic yards than would be required at the proposed marine facility. Additionally, the dredged area for this alternative would be at the terminus of the Calcasieu Industrial Canal, which is surrounded by industrial buildings on all sides. As noted above, constructing the Project on the Alternative Site 4 parcel would require construction of a 23.2-mile feed gas pipeline. The presence of existing rights-of-way between the alternative site and the closest feasible natural gas pipeline interconnection indicate the feed gas pipeline would have the potential to be co-located with existing rights-of-way for 23 of the 23.2 miles.

However, as noted above, the additional 24 miles that LNG carriers would be required to transit to reach the Terminal would result in increased air emissions and potential impacts on aquatic resources, including marine mammals, associated with the Project. Furthermore, the substantially extended pipeline length could require additional aboveground facilities, such as a compressor station, which could result in permanent land use or vegetation resource impacts and increased air emissions. Although the pipeline would cross fewer acres of mapped NWI wetlands than the Project's Pipeline (17 acres for Alternative Site 4 versus 24 acres for the proposed Project), the route would require crossings of 26 roads (versus 1 for the Proposed Pipeline) and would pass through or be adjacent to numerous houses and neighborhoods (2 of which would be within 50 feet of the pipeline). Approximately 17 of the 23 miles of feed gas pipeline right-of-way would pass through environmental justice communities (Census Tract 17 Block Group 4 and Census Tract 20 Block Group 4), whereas the proposed Project would not cross or be constructed within any environmental justice communities.

Given the increased air impacts related to the longer vessel transits that would be required to reach the site; the associated addition to vessel traffic congestion within the Calcasieu Ship Channel that would occur due to having to transit the approximately 24 miles farther than what would be required for the proposed Project site; and the potential resource impacts related to the 20 additional miles of feed gas pipeline that would be necessary (including road crossings and the potential necessity for a compressor station); and that almost 75 percent of the pipeline route would be within environmental justice communities, we conclude that Alternative site 4 does not provide a significant environmental advantage over the proposed Project location and was therefore not carried forward for additional consideration.

3.3.6 Alternative Site 5 – Mississippi River, Plaquemines Parish

Alternative Site 5 is a 462-acre site on the lower Mississippi River in Plaquemines Parish, Louisiana, within an industrially zoned area. It contains 5,624 feet of waterfront, and the site was commercially available at the time of this assessment. The land cover at the site is primarily forested or shrubland habitat, with a smaller portion of developed and wetland areas. Connection to the closest feed-gas supply would require approximately 20 miles of pipeline. Although the pipeline could be co-located with an existing right-of-way for over 11 miles, the route would pass almost entirely through wetlands and open water habitat classified as EFH (figure 3.3-1c). Given the location of the site, Commonwealth has determined that no additional turning basin would be needed. Any dredging would be limited to construction of the berth slip.

LNG carriers calling at the Terminal would need to transit approximately 76 river miles upstream using the Southwest Pass. This represents the greatest distance for LNG carrier transit from the Gulf of Mexico compared to the other alternative locations sited on the Calcasieu Ship Channel. The increased travel distance would likely result in a minor increase in air emissions as compared to the proposed Terminal site. According to NWI mapping, Alternative Site 5 would impact the least wetland acreage for construction of the Terminal. The natural gas feed pipeline would disturb the greatest amount of wetland acreage of all alternatives (approximately 176 acres). Although these impacts would be temporary, the longer pipeline would likely require construction of additional permanent upstream facilities (e.g., pipeline looping and compression stations) resulting in further potential environmental impacts. The pipeline would also cross an environmental justice community. Construction and operation would require clearing of about 240 acres of forested vegetation.

Alternative Site 5 would be adjacent to existing utilities and public roads. However, there are six residences along the waterfront between 150 and 750 feet from the site. There is also a community center and local park about 0.5 mile from Alternative Site 5. Overall, Alternative Site 5 would result in the fewest acres of permanently filled wetlands. However, it would require the permanent removal over almost 250 acres of trees and would likely require wetland/EFH fill for pipeline aboveground facilities. We received comments that this forest is heavily disturbed. However, utilizing this site could also have adverse effects on neighboring residents and the community center. Given its potential effects on the local community, pipeline impacts on an environmental justice community and the environmental disadvantages associated with the site's distance from natural gas supply, loss of forest habitat due to clearing at the site (even though it may be low quality forest), and the extended transit distance required for LNG carriers, Alternative 5 would not provide a significant environmental advantage to the proposed Project location and was not carried forward for additional analysis.

3.3.7 Alternative Site 6 – South of Cameron LNG

Alternative Site 6 is a 251-acre site on the west side of the Calcasieu Ship Channel, south and adjacent to the existing Cameron LNG Terminal near Hackberry, Louisiana. This site is within an environmental justice community (Census tract 9702.01 block group 1). It contains 7,328 feet of waterfront and the site was commercially available at the time of this assessment. The land cover at the site is primarily emergent herbaceous wetlands, with a smaller portion of developed and upland herbaceous lands. Given the presence of Cameron LNG facilities, Commonwealth would need to create a turning basin to accommodate the LNG carriers. Creation of the turning basin would require about 5.6 million cubic yards of dredging, plus continued maintenance dredging throughout the life of the Project. LNG carriers calling at the Terminal would need to transit an additional 18 miles upstream from the proposed site using the

Southwest Pass. The increased travel distance would likely result in a minor increase in air emissions as compared to the proposed Terminal site.

According to NWI mapping, Alternative Site 6 includes about 155 acres of wetlands. Feed-gas supply would be obtained from the same point as the proposed pipeline, resulting in the need for a 15.6-mile-long pipeline to the Terminal Site (figure 3.3-1d). The pipeline would cross mainly emergent wetlands and would include crossing the town of Hackberry, Louisiana. The extension of the natural gas feed pipeline would disturb 113.7 acres of wetlands. Although the right-of-way impacts would be temporary, the approximately five-fold increase in the pipeline length may require construction of aboveground facilities such as a compressor station, which would result in permanent impacts and increased air emissions. Additionally, the Pipeline would also traverse an environmental justice community. Likewise, the approximately three-fold increase in dredging volume would have a substantially greater impact on EFH than the proposed site, and the Calcasieu Ship Channel adjacent to this site is classified by LDWF as Public Seed Grounds for oysters (LDWF, 2022a). Additionally, this area of the Calcasieu Ship Channel does not experience the same velocity of current flow as the proposed site (COE, 2010). Therefore, post-dredge recovery of water bottom organisms would likely be slower, as the transport of recolonizing benthic fauna to the area would not occur as quickly, thereby creating longer term effects at the site (see section 4.6.2.2 regarding expected post-dredge recovery at the proposed site). We received a public comment suggesting the large difference in dredging requirements could be offset by beneficially using the dredge materials for wetland creation. Commonwealth has proposed to transport the dredge materials removed from the proposed site to wetland habitat south of Calcasieu Lake in the Cameron Prairie National Wildlife Refuge, a location listed in the Louisiana Coastal Management Plan as a marsh restoration area (see section 4.4.2). Given that the alternative site and a portion of the pipeline would be within an environmental justice community, the environmental disadvantages associated with the site's distance from natural gas supply and the substantial increase in impacts on aquatic habitat and EFH related to the creation of a turning basin, Alternative 6 would not provide a significant environmental advantage to the proposed Project location and was not carried forward for additional analysis.

3.3.8 Alternative Site 7 – North of Cameron LNG

Alternative Site 7 is a 317-acre site on the west side of the Calcasieu Ship Channel, north of the existing Cameron LNG Terminal. It contains 4,064 feet of waterfront and the site was commercially available at the time of this assessment. The land cover at the site is primarily emergent herbaceous wetlands and upland grassland/herbaceous, with a smaller portion of developed and cultivated crops. Commonwealth would need to create a turning basin to accommodate the LNG carriers. Creation of the turning basin would require about 5.6 million cubic yards of dredging, plus continued maintenance dredging throughout the life of the Project. LNG carriers calling at the Terminal would need to transit an additional 21 miles upstream from the proposed site using the Southwest Pass. The increased travel distance would likely result in a minor increase in air emissions as compared to the proposed Terminal site.

According to NWI mapping, Alternative Site 7 includes about 31.3 acres of wetlands. Feed-gas supply would require a 69.4-mile pipeline to the Terminal Site (figure 3.3-1e). The pipeline would cross mainly emergent wetlands and would also include crossing the town of Hackberry, Louisiana. The extension of the natural gas feed pipeline would disturb 142.4 acres of wetlands. As with previous alternatives, the impacts on wetlands within the right-of-way would be temporary; however, the increase in the pipeline length may require construction of aboveground facilities such as a compressor station, which would result in permanent impacts and increased air emissions. Also, about one-half of the pipeline route would pass through the Census tract 9702.01 block group 1 environmental justice community. Additionally, there is no direct utility or road service to this site; about 0.6 mile of additional utility line and right-of-way would be required for Alternative 7. As with Alternative 6, the approximately three-fold increase in dredging volume would have a substantially greater impact on EFH than the proposed site and increasing the volume of dredging necessary by 3.9 million cubic yards (plus regular maintenance dredging). Furthermore, this area of the Calcasieu Ship Channel also does not experience the same velocity of current flow as the proposed site (COE, 2010). Therefore, post-dredge recovery of the water bottom would likely be slower, as the transport of recolonizing benthic fauna to the area would not occur as quickly, thereby creating longer term effects at the site Given the environmental disadvantages associated with the site's distance from natural gas supply, that approximately one-half of the pipeline route would pass through an environmental justice community, the increased air emissions related to longer ship transits to reach the site and the potentially needed compressor station, and the substantially greater impacts on aquatic habitat and EFH related to creation of a turning basin, Alternative 7 would not provide a significant environmental advantage to the proposed Project location and was not carried forward for additional analysis.

3.3.9 Alternative Site 8 – South of Golden Pass LNG

Alternative Site 8 is a 421-acre site on the west side of the Sabine Pass Ship Channel, south of the existing Golden Pass LNG Terminal. It contains 2,451 feet of waterfront and the site was commercially available at the time of this assessment. The land cover at the site is almost entirely emergent herbaceous wetlands, with a minimal portion of developed land. Commonwealth would need to create a turning basin to accommodate the LNG carriers. Creation of the turning basin would require about 4.6 million cubic yards of dredging, plus continued maintenance dredging throughout the life of the Project. LNG carriers calling at the Terminal would need to transit seven miles upstream on the Sabine Pass Channel from the Channel entrance at the Gulf of Mexico, whereas the Commonwealth Terminal is less than 0.5 mile from the Gulf of Mexico. The increased travel distance would likely result in a minor increase in air emissions as compared to the proposed Terminal site.

According to NWI mapping, Alternative Site 8 includes about 402.3 acres of wetlands. Feed-gas supply would be obtained from the same point as the proposed pipeline, resulting in the need for a 69.4-mile pipeline to the Terminal Site (figure 3.3-1f). The pipeline would cross mainly emergent wetlands, pastureland, and woody wetlands. The extension of the natural gas feed pipeline would disturb 80.9 acres of wetlands. As with previous alternatives, the impacts on wetlands within the right-of-way would be temporary; however, the increase in the pipeline length may require construction of aboveground facilities such as a compressor station, which would result in permanent impacts and increased air emissions. Furthermore, the approximately two-fold increase in dredging volume would have a substantially greater impact on EFH as compared to the proposed site and increase the volume of dredging necessary by 3.9 million cubic yards (plus regular maintenance dredging). Given its environmental disadvantages associated with the site's distance from natural gas supply relative to the proposed site and the increase in impacts on aquatic habitat and EFH related to creation of a turning basin, Alternative 8 would not provide a significant environmental advantage to the proposed Project location and was not carried forward for additional analysis.

3.3.10 Conclusion

We evaluated the proposed Terminal site and eight possible alternative sites to assess whether any of the alternatives would be reasonable and have a significant environmental advantage as compared to the proposed Terminal site. The proposed Terminal site contains the largest percentage of wetland habitat relative to the size of the location and would cause impacts on chenier habitat. However, Commonwealth is working with federal and state agencies to mitigate for the Project effects on wetland and chenier habitat where such impacts would be unavoidable (see sections 4.4.2 and 4.5.3). The proposed Terminal site has the advantage of being commercially available and requiring the shortest transit from the Gulf of Mexico, thus reducing impacts from vessel traffic and neither the Terminal site nor the Pipeline route would be in an environmental justice community. The Project would require substantially less dredging than five of the alternatives, thus broadly minimizing impacts on surface water and aquatic resources. Based on the site-specific analyses of the alternative sites' size and availability, potential for marine operations, infrastructure, and environmental and environmental justice factors, we conclude that alternatives 1-8 would not provide significant environmental advantages to the proposed Project location.

3.4 ALTERNATIVE TERMINAL CONFIGURATIONS

Facility design and configuration within the Terminal site is subject to the siting requirements of 49 CFR 193 and other industry or engineering standards. Regulatory requirements stipulate that potential thermal exclusion and vapor dispersion zones remain on site, limiting the potential locations for specific terminal components (e.g., LNG storage tanks). Similarly, thermal radiation zones for flares require that the flare be set back a minimum distance from other equipment and property lines. Commonwealth's selected locations for each of the components of the Terminal was based on the relevant regulations, codes, and guidelines.

COE requested that Commonwealth address the feasibility of confining the proposed Project to non-wetland portions of the proposed Terminal site, to the greatest extent practicable. Based on NWI wetland data, the proposed Terminal site is comprised of almost 48.6 percent wetlands. Commonwealth made minor adjustments to its proposed Terminal configuration during the pre-filing process as it acquired additional land parcels surrounding the Project site and as a result of changes to its LNG storage tank containment designs. Commonwealth was able to adjust the Terminal configuration to reduce impacts on wetland habitat from 79.1 acres to 68.5 acres (based on NWI wetlands data) and reduce impacts on chenier habitat from approximately 17.0 acres to 13.3 acres. Actual surveyed wetland impacts are slightly higher, with construction of the Terminal disturbing 95.9 acres and the permanent fill of 89.6 acres.

We received a comment from the public noting that in Commonwealth's August 2019 application to the FERC, the design of the Terminal included 6 LNG storage tanks with capacities of 40,000 m^3 per tank for a total storage capacity of 240,000 m^3. In Commonwealth's July 2021 application amendment,[31] Commonwealth adjusted the proposed design of the LNG storage tanks to enable capacities of 50,000 m^3 per tank for total storage capacity of 300,000 m^3. Despite the increase in proposed storage capabilities, Commonwealth did not propose an increase in LNG production capacity. The commenter requested that Commonwealth alter the configuration of the Terminal to include 5 LNG storage tanks with capacities of 50,000 m^3 per tank for a total storage capacity of 250,000 m^3, which would be greater than the storage capacity that Commonwealth originally proposed and, with the removal of an LNG storage tank from the Terminal design, potentially reduce the Terminal footprint and have a smaller acreage impact on wetlands. Commonwealth noted in reply that the proposed increase in LNG storage capacity did not increase the proposed Terminal footprint from that which was proposed in the August 2019 application. Commonwealth also stated that the increase in proposed storage capacity is intended to improve the operational flexibility of the Terminal during inclement weather events, such as fog or high winds, that frequently require the Calcasieu Ship Channel to be closed to vessel traffic. Commonwealth determined that increased storage capacity would reduce the likelihood that the Terminal would need to shut down in circumstances where an LNG carrier would not be able to berth at the Terminal and offload LNG from the Terminal in a timely fashion. Removing one LNG storage tank would result in a maximum decrease of approximately 2.3 acres. Given this modest change in acreage, we conclude the possible benefits of the increased storage capacity, with no increase in the Terminal footprint from the original application, would be preferable to the potential adverse air impacts due to increased flaring events of Commonwealth having to shut down and restart the Terminal at a higher annual frequency than would otherwise occur.

31 Commonwealth's amended application to the FERC can be viewed on FERC's eLibrary (https://elibrary.ferc.gov/eLibrary/search) under accession no. 20210708-5004.

We have not identified any other changes to the Terminal configuration that would meet the required regulations, codes, and guidelines and at the same time further avoid or reduce environmental impacts associated with the proposed Terminal configuration.

3.5 ALTERNATIVE LIQUEFACTION DESIGNS

Commonwealth's liquefaction design is described in section 2.1.1. We received a comment from the public suggesting that Commonwealth could use fewer larger liquefaction trains that would employ a more efficient liquefaction process (Air Products and Chemicals' C3MR process vs. Commonwealth's proposed AP-SMR process by Air Products and Chemicals), as stated by the manufacturer of the liquefaction trains. The commenter stated the larger, more efficient liquefaction trains would have fewer environmental impacts during operation due to the general tenet that being less efficient increases environmental impacts. However, the facilities required for the C3MR process require a substantially larger footprint as the process includes more heat exchanging equipment and additional refrigerant compressors. Comparing a recent FERC jurisdictional C3MR facility to Commonwealth's proposed SMR, the footprint of liquefaction and pretreatment area per unit of LNG is nearly 70 percent greater for the C3MR technology than for the SMR technology. For the Commonwealth project, this would equate to about a 12-acre increase in the area required by the pretreatment and liquefaction process equipment. Public comments point out a large area between the LNG storage tanks and the liquefaction units with only a small impoundment. This impoundment basin is the largest spill containment for the facility, collecting spills from both the process area, and the ship loading area. The area around the impoundment basin is not suited for additional process equipment because it presents a safety concern. The Commonwealth layout has the impoundment located such that a fire at the impoundment would not expose process vessels to high heat fluxes which could result in cascading damage and safety impacts to the public. Therefore, if the C3MR process were pursued, Commonwealth would need to increase the footprint of the Terminal (i.e., 12 acres) into eastern black rail habitat and/or wetlands, which would offer no significant environmental advantage to the proposed Project.

3.6 ALTERNATIVE TERMINAL POWER SOURCES

3.6.1 Grid-Based Electricity vs. Natural Gas-Powered Generators

We received a comment from the public suggesting that Commonwealth should use commercial, grid-sourced electricity in place of the natural gas-fired simple cycle electric power generators Commonwealth has proposed to power the Terminal. The commentor posits that using electricity would reduce overall Project emissions based on the assumption that the commercial electric grid will increasingly source more power from renewable energy sources, whereas the Terminal would use natural gas for the duration of the expected Project life span. The commenter also requested FERC to compare the power sources of nearby LNG terminals to Commonwealth's proposed approach. Commonwealth consulted the Jefferson Davis Electric Cooperative to assess the feasibility of using grid-sourced electricity to power the Terminal. Powering the Terminal using grid-sourced electricity would require Commonwealth to construct a 29.3-mile transmission line to reach the nearest available electrical substation (Mud Lake substation on the northern side of Calcasieu Lake) given that the existing transmission lines in the Project area do not have the sufficient 500-megawatt (MW) capacity necessary to provide power to the Project. Commonwealth would also be required to fund upgrades to the existing grid and increased generating capacity at the Nelson power station, which would be the primary source for the electricity that Commonwealth would use.

Commonwealth contends the cost of funding the upgrades and constructing a transmission line of that length would be prohibitive for the Project. Additionally, Commonwealth states that relying on the transmission line and substation framework would be too unreliable, noting that severe tropical storm systems are expected to increase in frequency and size and past hurricanes in the Project area have disrupted power supplies for extended periods.

Regarding grid-based electricity likely being increasingly powered by renewable sources, comparison between the emissions associated with the natural gas-driven turbines of the refrigeration compressors and the emissions associated with imported power from the grid can be complicated. Generally, grid power can be obtained from a variety of power sources (such as fossil fuel and renewable fuels). Further, there are likely differences in the contributing fossil fuel-fired generating stations: they may use gas, oil, or coal for fuel; they would have different plant configurations (simple cycle or combined cycle power generation); and the plants would likely have different emission control systems. However, the Nelson power station, which would be the primary source for the electricity that Commonwealth would access, is currently a coal-powered plant. Considering Commonwealth's assertions that constructing a new transmission line and funding upgrades to the Nelson power station would be cost prohibitive, combined with its design considerations for power reliability during severe storms, and the uncertainty of whether the Nelson power station would use an energy source other than coal, we conclude this alternative would not provide a significant environmental advantage to Commonwealth's proposed method of using an on-site source to power the Terminal.

3.6.2 On-site Electrical Generation vs. Gas-Powered Generators

We received comments from the public suggesting that, if Commonwealth could not source its power from the commercial grid, Commonwealth should construct electrical generation plants at the Terminal to use a combined cycle plant to power the Terminal instead of simple cycle gas-powered system. However, the required footprint of such a plant would be much larger than Commonwealth's proposed simple cycle approach. Commonwealth would require a 500 MW plant to power the liquefaction facilities and the general auxiliary load of the Terminal in general. A combined cycle power plant capable of converting natural gas to that volume of electricity would require an approximately 100-acre footprint. Public comments cite a report which states a liquefaction facility with combined cycle drives instead of simple cycle drives may reduce emissions by approximately 25 percent. However, any reduction in emissions impacts related to converting the natural gas to electricity would be offset by the physical impacts of constructing the power plant. Public comments suggest that if combined cycle is not utilized to produce all the power required by the liquefaction facilities, then a combined cycle should be considered for the 120 MW of on-site power instead of the proposed simple cycle electrical generators. A combined cycle power plant converts more energy from fuel gas to electricity than simple cycle generators. However, the refrigerant compressor gas turbine drives consume more fuel than the simple cycle electric generators. If the 120 MW of on-site simple cycle power generation was switched to combined cycle, the overall site fuel consumption, and thereby emissions, would be reduced by less than 10 percent. Additionally, a 120 MW combined cycle would have a land usage between the proposed simple cycle electrical generators and the 100-acre 500 MW combined cycle power plant. Even a 120 MW combined cycle power plant would have a significant land use compared to the simple cycle to accommodate the waste heat recovery equipment, steam turbine, air-cooled condenser, and water treatment facilities. The additional space of a combined cycle, either 120 MW or 500 MW, would require an expansion of the Terminal into eastern black rail habitat and wetlands. Therefore, we conclude that this alternative would not provide a significant environmental advantage to Commonwealth's proposal to construct the smaller simple cycle gas-powered system.

3.6.3 On-site vs. Off-site Facility Locations

We received comments from the public suggesting that Commonwealth should construct the gas-powered or electrical generators off-site in an upland area to reduce the Terminal footprint and thereby reduce impacts on wetlands. Placing the power generators off-site would result in the same vulnerabilities to storms as described above for the grid-based power. Commonwealth would need to construct a transmission line from the power generators to the Terminal, which would be vulnerable to severe storms. Additionally, the generators would require a feed gas source in the form of a lateral pipeline from Commonwealth's proposed Pipeline. This lateral would result in additional environmental impacts, much of which would be in wetland habitat based on the proposed location of the Pipeline. Siting the power generators within the Terminal storm protection wall would alleviate most storm-related vulnerabilities and minimize the infrastructure necessary to connect the power source to the Terminal. Therefore, we conclude this alternative would not provide a significant environmental advantage to Commonwealth's proposal to place the electrical generators within the Terminal footprint.

3.7 ALTERNATIVE USES FOR METHANE

We received a comment from the public suggesting that FERC should not promote the use of LNG as a fuel but should instead promote the use of methane for fertilizer production. Doing so would be counter to Commonwealth's stated purpose and need for the Project; therefore, this alternative was not considered further.

3.8 ALTERNATIVE PIPELINE ROUTES

Commonwealth proposes to construct a 3.0-mile-long, 42-inch-diamater natural gas pipeline with interconnections at the existing 12- and 20-inch-diameter Bridgeline pipeline system and an interconnection at the 16-inch-diameter Kinetica pipeline system. Commonwealth updated the pipeline route in March 2021 in response to landowner requests. The Pipeline would deliver 1.44 Bcf/d of natural gas to the Terminal to allow Commonwealth to liquefy and export approximately 8.4 MPTA of LNG. Given the relatively short length of the proposed Pipeline, the range of alternative pipeline routes is limited to locations where the Pipeline could connect to existing natural gas pipelines within 5 miles of the Terminal.

We reviewed four major alternatives and the proposed Pipeline route to assess whether an alternate Pipeline route would significantly reduce the environmental impacts of the Pipeline (figure 3.8-1). These major route alternatives begin at the Terminal and follow different alignments to reach the Kinetica and Bridgeline pipelines at different points along the pipelines relative to the proposed Pipeline alignment. The analysis was based on comparable information (i.e., NWI data for wetlands (FWS, 2018); National Land Cover Database data for land use (National Land Cover Database [NLCD, 2016); and NHD for waterbodies (USGS, 2019a)); therefore, impacts for the proposed route may differ from analyses in other sections of this EIS that incorporate survey data. The results of this evaluation for Major Route Alternatives 1 through 4 are summarized in table 3.8-1 and are discussed in the following sections. Commonwealth would construct the Pipeline pursuant to section 3 of the NGA, which does not grant the applicant eminent domain. Therefore, there is limited ability to ensure that a recommended alternative site would be available unless the landowner would make it available for purchase or lease.

3.8.1 Proposed Pipeline Route – Commonwealth, Cameron Parish, Louisiana

The proposed Pipeline route would be 3.0 miles long, with the permanent right-of-way crossing 3.0 miles of NWI wetlands and one road (table 3.8-1). Commonwealth would use the HDD crossing method to avoid direct impacts on the road and minimize impacts on a drainage ditch adjacent to the roadway. The pipeline route would not permanently affect any wetlands. Aboveground facilities associated with the Pipeline would permanently impact 0.3 acre of wetlands.

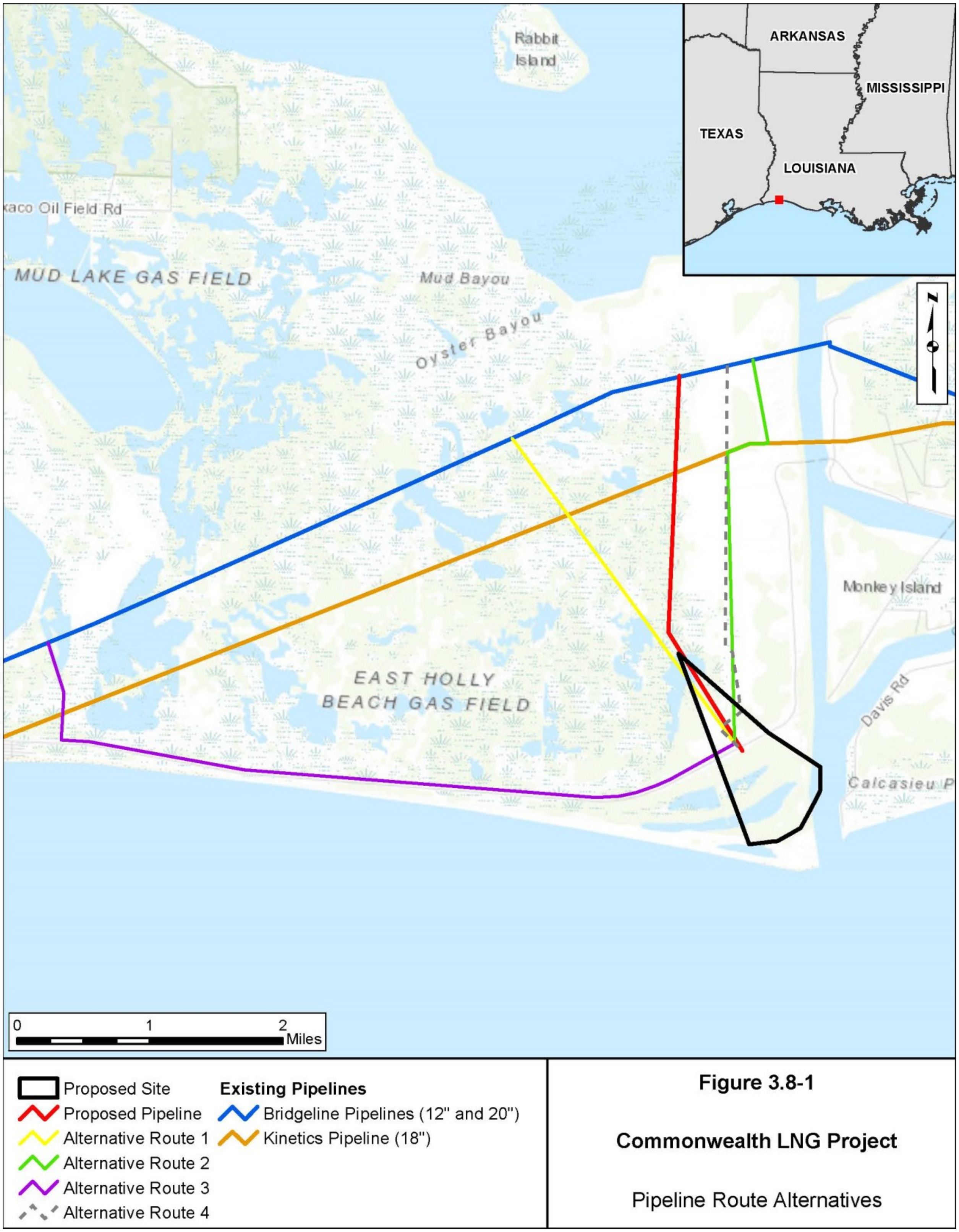

Figure 3.8-1

Commonwealth LNG Project

Pipeline Route Alternatives

TABLE 3.8-1 **Comparison of the Pipeline Route Alternatives**						
Criteria	**Units a/**	**Proposed Route**	**Route Alternative 1**	**Route Alternative 2**	**Route Alternative 3**	**Route Alternative 4**
Route Length	Miles	3.0	2.9	3.2	5.9	3.1
Parallel/Adjacent to Existing Right-of-Way	Miles	0.0	0.0	0.3	5.1	2.6
Land Use (NLCD):						
Barren Land	Miles	0.0	0.0	0.0	0.1	0.0
Developed	Miles	0.06	0.0	0.0	0.1	0.0
Emergent Herbaceous Wetlands (temporary impacts)	Miles	2.7	2.6	2.8	5.7	3.0
Emergent Herbaceous Wetlands (permanent impacts)	Acres	0.3	0.3	0.2	0.3	0.3
Herbaceous	Miles	0.0	0.0	0.3	0.0	0.0
Open Water	Miles	0.2	0.2	0.0	0.0	0.0
Wetlands (NWI)	Miles	3.0	2.9	2.9	5.9	3.1
National Hydrography Dataset Features						
Lake/Pond	Miles	0.0	0.3	0.0	0.2	0.0
Swamp/Marsh	Miles	1.9	2.2	0.2	4.6	0.3
Roads Crossed (Highway 27/82)	Number	1	1	1	1	1
Property Holders	Number	53	54	53	70	53
a/ Length and area based on Geographic Information System (GIS) analysis and rounded; total may not equal sum of addends.						

3.8.2 Route Alternative 1

Route Alternative 1 is 0.1 mile shorter than the proposed route and crosses 0.1 mile fewer emergent herbaceous wetlands. However, this route would cross 0.2 mile of habitat identified as land/pond in the NHD, whereas the proposed route would not cross any habitat identified in the NHD as lake/pond and would result in the same acreage of permanent emergent herbaceous wetland impacts. Route Alternative 1 would affect one more landowner than the proposed route. In total, Route Alternative 1 would not provide a significant environmental advantage or minimize impacts on landowners compared to the proposed route; therefore, we did not evaluate this route alternative any further.

3.8.3 Route Alternative 2

Route Alternative 2 is 0.2 mile longer than the proposed route, would cross 0.1 mile more emergent herbaceous wetlands, but cross 0.2 mile fewer open water, would be co-located with an existing right-of-way for 0.3 mile, and would result in 0.1 acre less of permanent emergent herbaceous wetland impacts. All other criteria are similar between the Proposed Route and Route Alternative 2. Route Alternative 2 offers a slight reduction in wetland impacts and makes some use of an existing right-of-way; however, a segment of this route between the Kinetica and Bridgeline pipelines is not available for Commonwealth to obtain an easement through. Therefore, under section 3 of the Natural Gas Act, this alternative is not feasible, and we did not evaluate this route alternative any further.

3.8.4 Route Alternative 3

Route Alternative 3 would be co-located with an existing right-of-way (Highway 27/82) for approximately 5.1 miles. However, it would be almost 3.0 miles longer than the proposed route, would cross 2.7 more miles of emergent herbaceous wetlands habitat, and would result in the same acreage of permanent emergent herbaceous wetland impacts. Route Alternative 3 would not provide a significant environmental advantage relative to the proposed route; therefore, we did not evaluate this route alternative any further.

3.8.5 Route Alternative 4

Route Alternative 4 was recommended to Commonwealth by LDWF during a Project status meeting in October 2019 as a way to increase collocation of the Pipeline with an existing right-of-way. We also received a comment during the public comment period for the draft EIS asking us to consider more strongly the LDWF-recommended route. The route is 0.1 mile longer than the proposed route. The route would cross 3.04 miles of emergent herbaceous wetlands, 0.03 mile more than the proposed route, and would result in the same acreage of permanent emergent herbaceous wetland impacts. Otherwise, the route would cross the same land use types, roads, and property holders as the proposed route. Route Alternative 4 would increase co-location along an existing right-of-way by 2.6 miles, primarily through emergent herbaceous wetlands. Although co-location would be increased, emergent herbaceous wetlands are generally not strongly affected by habitat fragmentation and Commonwealth would restore the Pipeline right-of-way and the emergent vegetation present would be expected to return to pre-construction conditions within a short-term period. Most significant to our assessment, the proposed route takes into account requests relayed to Commonwealth from affected landowners during landowner approval negotiations to route the Pipeline along a different alignment across their properties. Given that Commonwealth would construct the Pipeline pursuant to section 3 of the NGA, which does not grant the applicant eminent domain , and the short-term impacts anticipated on wetlands that would be impacted by the proposed route, we conclude Route Alternative 4 would not provide a significant environmental advantage relative to the proposed route. We did not evaluate this route alternative further.

3.8.6 Conclusion

None of the four route alternatives assessed herein would provide a significant environmental advantage and/or reduction in impacts on the properties of landowners relative to the proposed Pipeline route. Aside from the LDWF recommendation, we did not receive any comments during scoping regarding alternatives to the Pipeline route. Therefore, we conclude that Commonwealth's proposed Pipeline route would be the preferred route for the Project.

3.9 ALTERNATIVE ABOVEGROUND FACILTY SITES

We received comments from the public inquiring about the alternatives analysis of aboveground facilities for the Pipeline. Proposed aboveground facilities for the Pipeline would include the two interconnection facilities at the Kinetica and Bridgeline pipelines, one pig launcher, and one meter station. The interconnection facilities would be within the Pipeline permanent right-of-way and the pig launcher and meter station would be contiguous with the Pipeline permanent right-of-way. The interconnections, pig launcher, and meter station would permanently impact approximately 0.3 acre of emergent wetlands on properties with willing landowners. Wetlands are by far the dominant land cover within the general region of the Project and the locations of the aboveground facilities are tied to the locations of the required interconnection facilities; therefore, we did not identify or evaluate alternative sites for the aboveground facilities (i.e., all of the alternative pipeline routes would result in comparable wetland impacts). Additionally, no specific aboveground facility site alternatives were suggested during the public scoping period or as part of the comments received during draft EIS comment period. Given that we have not identified any other sites for the aboveground facilities that would provide a significant environmental advantage, we conclude that the sites proposed by Commonwealth would be the preferred alternative.

4.0 ENVIRONMENTAL ANALYSIS

This section describes the affected environment as it currently exists and discusses the environmental consequences of the Project. The discussion is organized by the following major resource topics: geology; soils; water resources; wetlands; vegetation; wildlife; aquatic resources; special-status species; land use, recreation, and visual resources; socioeconomics (including transportation, traffic, and environmental justice); cultural resources; air quality and noise; reliability and safety; and cumulative impacts (including climate change).

The environmental consequences of constructing and operating the Project would vary in duration and significance. Four levels of impact duration were considered: temporary, short-term, long-term, and permanent. Temporary impacts generally occur during construction, with the resource returning to preconstruction 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 but would return to preexisting conditions within the life of the Project. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the Project. When determining the significance of an impact, the geographic, biological, and/or social context in which the effects would occur, as well as the intensity (e.g., severity), were also considered. In the following sections, we address direct and indirect effects collectively by resource. Section 4.13 analyzes the Project's contribution to cumulative impacts.

As part of its proposal, Commonwealth developed mitigation measures to reduce most impacts associated with the Project to less than a significant level. We evaluated Commonwealth's proposed mitigation measures to determine whether additional measures would be necessary to reduce impacts; if we deemed additional measures to be appropriate, we have included them as bulleted, boldfaced paragraphs in the text and included them in section 5.2. We will recommend to the Commission that these measures be included as specific conditions in any order the Commission may issue authorizing this Project. The conclusions in this EIS are based on our analysis of the environmental impacts and the following assumptions:

- The proposed facilities would be constructed and operated as described in section 2.0 of the EIS;
- Commonwealth would implement the mitigation measures included in its application and supplemental submittals to the FERC; and
- Commonwealth would comply with our recommended mitigation measures, listed in section 5.2.

If a project is approved and proceeds to the construction phase, it is not uncommon for the project proponent to require minor modifications (e.g., minor realignments, changes in workspace configurations). These changes are often identified by the applicant once on-the-ground implementation is initiated. Any Project modifications would be subject to review and approval from the FERC's Director of the Office of Energy Projects, or their designee, and any other applicable permitting/authorizing agencies.

4.1 GEOLOGICAL RESOURCES

4.1.1 Geologic Setting

4.1.1.1 Terminal

The Project would be constructed in the portion of the West Gulf Coastal Plain's Louisiana Chenier Plain. The Louisiana Chenier Plain is characterized by flat topography with historical beach ridges (cheniers), mudflats, and marsh and swamp deposits. The surface geology consists of Holocene clay and silt over a thick sequence of sedimentary deposits. Bedrock is generally greater than 2,000 feet below ground surface.

The topography at the Terminal site is primarily flat, ranging from 0 to 8 feet NAVD. Topographical relief throughout the site is limited to chenier ridges and shallow wetland ponds. To construct the Terminal in accordance with federal safety regulations, Commonwealth would raise site topographic elevations to between 5 and 8 feet NAVD using general and engineered fill sourced off-site from state-approved locations free of contamination. Commonwealth anticipates it would need about 1.6 million cubic yards of fill material to bring the Terminal to the design grades.

Commonwealth conducted onshore and nearshore geophysical investigations at the Terminal site (Geoengineers, 2019). The results indicate the top 30 feet of surficial geologic deposits primarily contain unconsolidated materials, including: clay, sand, silty sand, silty/sandy clay, and clayey sand. At depth, the general site conditions are stratified dense clayey sand, silty/sandy clay, and clay. Unconsolidated material was observed to at least 250 feet below the surface (Geoengineers, 2019). Commonwealth would install up to 7,000 cast-in-place or precast, pre-stressed concrete piles to support the stormwater protection wall and concrete pads on which the Terminal facilities would be constructed or placed. The piles would be driven to depths of 80 to 130 feet below ground level of the raised terminal elevation.

Commonwealth conducted nearshore geophysical and geotechnical investigations. Bottom sediments of the Calcasieu Ship Channel consist of a mixture of sand, silty sand, silty/sandy clay, and clay (Geoengineers, 2019). Commonwealth would modify the shoreline by dredging 1.73 million cubic yards of material to create the marine facility, consisting of the LNG carrier berth and the barge dock. Commonwealth intends to contour the sides of the carrier berth to a stable slope of about 3:1 and armor them with quarry stone that would be placed with an underlayer of cushion stone (i.e., 1 to 6-inch diameter stone) and geotextile filter fabric. In addition, a stone toe apron would be installed at the base of the slope for buttressing upper quarry stones and to protect against scour and erosion. The bulkhead for the marine facility would be constructed using a combination-wall bulkhead consisting of king piles (i.e., steel I-beams) and sheet piles.

4.1.1.2 Pipeline

The Pipeline and associated aboveground facilities would be constructed in land with the same topography and geologic characteristics as the Terminal (though no chenier ridges are present along the Pipeline right-of-way). The topography of the Pipeline right-of-way is flat, with topographical relief limited to shallow wetland ponds and ditches, consisting of Holocene clay and silt that are underlain by Pleistocene-age soils encountered 25 feet to 35 feet below ground surface.

4.1.2 Mineral Resources

According to the USGS, non-fuel mineral resources produced in Louisiana include salt, construction and industrial sand and gravel, common clays, crushed stone, gypsum, lime, and natural gemstones (USGS, 2013a). No non-fuel mines or mineral resources are present within 0.25 mile of the proposed Terminal site or the Pipeline (USGS, 2019b).

Oil and natural gas resources are prevalent in Louisiana and offshore of its coastline. According to the LDNR Strategic Online Natural Resources Information System (SONRIS) database, 17 natural gas or unspecified product wells are within 0.25 mile of the Terminal or the Pipeline right-of-way (LDNR, 2019). However, all of the wells are dry and plugged, plugged and abandoned, or inactive. Commonwealth would contact the LDNR if an undocumented abandoned, dry, or inactive oil or natural gas well were discovered on the Project property to determine appropriate cutoff depths for well casings on a case-by-case basis. If orphaned wells are identified during construction, Commonwealth would stop work within a 30-foot area of the unidentified well and contact LDNR to discuss the location and implementation of proposed mitigation measures.

Because no active mining or oil and natural gas extraction is within the Project area, we conclude that construction and operation of the Terminal site and Pipeline would not affect these activities.

4.1.3 Paleontological Resources

A majority of surface exposures in Louisiana (and the Project area) are Tertiary and Quaternary in age (less than 65 million years) with many of the surficial sediments being less than 10,000 years in age. These sediments were formed from erosional deposition and are underlain by Holocene-age clay/mud deposits, representing recent erosion and deposition. These environments are not as conducive to preserving fossils as the marine environment. The geological composition of Louisiana causes marine fossils to be relatively uncommon in surface exposures (Louisiana Geological Survey, 2002). Therefore, the Holocene geologic units that underlie the Project area are not considered fossil-bearing. The nearest paleontological resource of significance is in the Cane River formation approximately 130 miles north of the Terminal site (Louisiana Geological Survey, 2002). No sensitive paleontological resources have been identified within the Terminal site or Pipeline workspaces.

Therefore, we conclude no significant impacts on paleontological resources would occur from constructing or operating the Terminal and Pipeline facilities.

4.1.4 Blasting

Blasting would not be required during construction. The Project areas at the Terminal site and Pipeline are underlain by unconsolidated sediments to depths greater than the excavation depth of the proposed facilities.

4.1.5 Natural Hazards

Geologic hazards that can potentially affect the Terminal and Pipeline include earthquake-induced ground motions, faulting, soil liquefaction, subsidence, and slope stability. Other natural hazards of concern, as expressed by several scoping commenters, primarily in relation to the Terminal, include tropical storm-related winds, flooding, and long-term sea level rise and, generally, how climate change resiliency has been incorporated into the design of the Project. The Pipeline would be designed to withstand natural hazards as generally discussed below. The Terminal designs to withstand natural hazards and resiliency to future impacts are generally discussed in section 4.12.1.5.

4.1.5.1 Seismic Ground Shaking Hazards

The east coast of the United States is a passive tectonic plate boundary on the “trailing edge” of the North American continental plate, which is seismically quiet when compared with active plate boundaries, such as the San Andreas fault, a transformative plate boundary, and the Juan de Fuca convergent (subduction) plate boundary, both along the western coast of the United States. Earthquakes, however, do occur in the southern United States, primarily due to stress within post-rift sequence causing extension of normal faults.

Louisiana is within the Gulf Coast Basin tectonic province. The province’s sedimentary strata thicken toward the south, with salt domes and relatively shallow listric growth faults that run parallel to the Gulf of Mexico coastline and extend outside of Louisiana. Movement within the fault system has been classified as a general creep as opposed to the breaking of rocks, the latter of which is often associated with earthquake events (Stevenson and McCulloh, 2001). In addition to tectonic activity or natural events, seismicity can also be potentially induced by man-made actions such as groundwater extraction, oil extraction, and underground fluid injection. Induced earthquakes tend to differ from naturally occurring earthquakes based on their lower maximum magnitudes and tendencies to exhibit or occur in swarms with shallower average rupture depths (USGS, 2016a).

The modified Mercalli scale (Modified Mercalli Intensity) measures the intensity of an earthquake at a particular location while the Richter scale measures the size of the earthquake at its source (USGS, 2016b). In general, modern pipeline systems have not sustained damage during seismic events except due to permanent ground deformation or traveling ground-wave propagation greater than or equal to a Modified Mercalli Intensity of VIII (similar to a Richter scale magnitude around 6.8 to 7.0; O'Rourke and Palmer, 1994). The largest recorded earthquake within 50 miles of the Project area had a magnitude of 3.8 on the Richter scale with an epicenter approximately 29 miles north from the Pipeline in Louisiana (USGS, 2019b).

A low risk of seismic activity and faulting effects can be reasonably anticipated for the Pipeline area. No recorded earthquake has been attributed to any specific mapped fault system in the vicinity of the Pipeline. The only earthquake recorded within 50 miles of the Pipeline measured 3.8 on the Richter scale, the effects of which could include "shaking of indoor items, rattling noises," with "significant damage unlikely" (USGS, 2013b).

Given that the Pipeline right-of-way is not along a tectonic plate boundary where frequent, high-energy earthquakes would typically be common, the Pipeline would be constructed in accordance with DOT's 49 CFR 192 (which would minimize the likelihood of damage from seismic events), and the only earthquake recorded within 50 miles would not be expected to affect pipeline systems, we conclude that earthquakes and related seismic hazards would not have an impact on the Pipeline.

4.1.5.2 Soil Liquefaction

Soil liquefaction is a phenomenon often associated with seismic activity in which saturated, non-cohesive soils temporarily lose their strength and liquefy (i.e., behave like viscous liquid) when subjected to forces such as intense and prolonged ground shaking. The result is a transformation of soil to a liquid state. Typically, three general circumstances are necessary for liquefaction to occur and can be used as a liquefaction hazard screening (USGS, 2014b). These circumstances are:

- presence of young (Pleistocene) sands and silts with very low or no clay content, naturally deposited (beach or river deposits), or human-made land (e.g., hydraulic fill, backfill);
- saturated soils where the space between individual particles is completely filled with water. This is most commonly observed near waterbodies such as rivers, lakes, bays, and oceans, and associated wetlands; and
- severe shaking, which is most commonly caused by a large earthquake.

A peak ground acceleration (PGA) of at least 10 percent g with a 10 percent probability of being exceeded in 50 years is considered the minimum threshold for soil liquefaction to occur (California Geological Survey, 2004). The low seismic risk in the Project area renders the likelihood of this geologic hazard occurring during construction and operation of the Pipeline as low. Although certain soils within the Project area (e.g., naturally deposited sand and silt, beach deposits, and areas of hydraulic fill from dredging) may be susceptible to liquefaction if there were large ground motions, the low seismic ground motions in the Gulf of Mexico would not cause soil liquefaction. Therefore, we conclude soil liquefaction would be unlikely to present a significant hazard to the Pipeline.

4.1.5.3 Subsidence

Subsidence is the sudden sinking or gradual downward settling of land, with little or no horizontal motion. It is typically caused by movements on surface faults or by subsurface mining or pumping of oil, natural gas, or groundwater. Subsidence in southern Louisiana is typically caused through sub-surface water extraction for agriculture, flood protection, or development. Subsidence also occurs naturally through fault movements and compaction/consolidation of Holocene deposits. In a study of published subsidence rates at locations along the Louisiana coast, Nienhuis et al. (2017) calculated that coastal Louisiana is subsiding at an average rate of approximately 0.36 inch per year.

Commonwealth assessed the extent of subsidence that would be expected to occur at the Terminal site after construction of the Project. Based on geotechnical analyses, Commonwealth calculated the local subsidence rate to be 0.12 to 0.16 inch per year, or 3.5 to 6.3 inches over 30 years. Commonwealth estimates that overall settlement of the Terminal site during the same period would range from 8 to 12 inches at the center of the facility to 5 to 7 inches along the perimeter of the facility. A similar amount of subsidence would be anticipated along the Pipeline. Subsidence to this extent is unlikely to present a hazard because pipelines are inherently flexible.

Fault-induced subsidence in coastal Louisiana occurs along deep, east-west-trending growth faults. Subsidence along growth faults results in vertical displacement, and the rate of movement is relatively slow. Typically, subsidence occurs as 3- to 5-mile-long linear or arc-shaped segments that are evident by associated areas of rapid land loss or wetland deterioration and are readily mapped (Coastal Environments, Inc., 2003). Geotechnical analyses conducted by Commonwealth did not show evidence of faulting in the vicinity of the Terminal and reviews of recent aerial photography do not show any indication of a growth fault in the vicinity of the Pipeline right-of-way. Given the slow-developing nature of growth faults, Commonwealth would be able to detect any growth fault-related subsidence that could contribute to Pipeline damage through routine monitoring of the Pipeline right-of-way. Commonwealth would then respond accordingly to protect the integrity of the Pipeline in accordance with 49 CFR 192. Therefore, we conclude that growth fault-related subsidence would not present a significant hazard to the Pipeline.

4.1.5.4 Coastal Erosion

We received numerous scoping comments regarding the potential susceptibility of the Project to coastal erosion due to its proximity to the Gulf of Mexico and the vulnerability of Louisiana's shorelines to rising sea levels. Increased storm activities, shortage of sediment supply, and sea level rise have made shoreline erosion a major concern in southern Louisiana. The average shoreline erosion rate in Cameron Parish was 15 feet per year between 1998 and 2009 (Shepis et al., 2010). The Project could potentially be affected by erosion of the Gulf of Mexico coast immediately south of the Project and erosion of the western shoreline of the Calcasieu Ship Channel on which the Project would be constructed.

The Louisiana Coastal Protection Restoration Authority (CPRA) estimated that the Gulf of Mexico shoreline between the western Calcasieu River Jetty, immediately south of the Terminal site, and Holly Beach, approximately 7 miles west of the Terminal site, was eroding at a rate of 5 to 30 feet per year, which threatened the existence of Highway 27/82 along this stretch. To offset this erosion, the COE placed approximately two million cubic yards of sand along this stretch of shoreline between 2008 and 2014 (CPRA, 2017). The proposed southern terminus of the Pipeline would be more than 0.5 mile inland. Therefore, even at the erosion rate of 30 feet per year, the Pipeline would not be affected by erosion of the Gulf of Mexico shoreline within the 30-year design lifespan of the Project.

As noted, the Project would be constructed on the western shoreline of the Calcasieu Ship Channel. Vessel wakes and propeller thrust from the large commercial vessels that transit the Calcasieu Ship Channel daily can exacerbate the shoreline erosion of unprotected portions of the riverbank, which occurs naturally due to winds and tides. However, stabilizing and armoring the shoreline with seawalls and riprap can moderate such impacts (Fitzgerald et al., 2011). The northern extent of the Terminal site shoreline is currently protected by a concrete bulkhead, and the southern extent is protected by an existing riprap revetment that extends to the mouth of the Calcasieu River and connects to the western Calcasieu River Jetty. Commonwealth would stabilize the shoreline of the marine facility, the only area that currently has exposed shoreline, with a sheet pile bulkhead and riprap. Consequently, the full extent of the Terminal site shoreline on the Calcasieu Ship Channel would be protected from erosion. The portion of the Pipeline closest to both the Gulf of Mexico and Calcasieu Ship Channel shoreline is where the Pipeline would enter the Terminal. This portion of the Pipeline would be no closer than approximately 0.5 mile from either shoreline and therefore would not be susceptible to impacts from coastal erosion during the lifespan of the Project.

4.1.5.5 Flooding

The proposed Project location is within the FEMA National Flood Insurance Program flood zones AE and VE (FEMA, 2019) and the Louisiana designated Coastal Zone. Zone AE is designated as a special flood hazard area subject to a 1-percent annual chance flood event (i.e., 100-year floodplain). Zone VE is designated as a special flood hazard area subject to a 1-percent annual chance flood event (i.e., 100-year floodplain) with additional hazards due to storm-induced wave action. Base flood elevations range up to 14 feet above mean sea level along the Pipeline route. The buried pipeline would not displace floodwaters. Nor would it be susceptible to direct physical forces related to waves, wind, and floodwaters. In areas of open water or where the right-of-way is generally inundated, the Pipeline would be fitted with a concrete coating as a buoyancy countermeasure, which would further protect the Pipeline from the effects of floodwaters. Proposed construction, ATWS, and temporary access roads would result in 12.4 acres of temporary fill being placed within the floodplain. This, in addition to the 0.3 acre of piling footprint at the Pipeline aboveground facilities, would not result in any significant displacement of floodplain capacity.

We received comments from FEMA requesting that the Community Flood Plain Administrator be contacted for review and possible permit requirements for the Project so that the Project would maintain compliance with Presidential Executive Orders (EO) 11988 and 11990. EOs 11988 and 11990 require that all federal actions in or affecting the floodplain or wetlands be reviewed for opportunities to relocate, and evaluated for social, economic, historical, environmental, legal and safety considerations. Commonwealth contacted the Cameron Parish Flood Plain Administrator in May 2017 to introduce the Project. Commonwealth anticipates requesting a Flood Plain Development Permit from Cameron Parish in the fourth quarter of 2022.

4.1.5.6 HDD Feasibility and Geotechnical Investigations

Commonwealth has proposed to use the HDD method to cross Highway 27/82 and a roadside ditch immediately adjacent to the highway. The length of an HDD alignment, pipeline diameter, and subsurface material are factors in the technical feasibility of an HDD installation. As discussed in section 2.5.3.2, during HDD operations, drilling fluid is pumped under pressure through the inside of the drill pipe and flows back (returns) to the drill entry point along an annular space between the outside of the drill pipe and the drilled hole. Because the drilling fluid is pressurized, inadvertent releases of drilling fluid can occur if the shear strength of the soil column above the HDD pathway is too low to resist drilling fluid migrating to the ground surface. Chances for an inadvertent release to occur are greatest near the drill entry and exit points where the drill path has the least amount of ground cover. A summary of geotechnical investigations and feasibility assessments completed for the proposed crossing follows.

Highway 27/82

The total crossing length of Commonwealth's proposed Highway 27/82 HDD would be approximately 1,940 feet. As part of the geotechnical assessment of the Terminal site, Commonwealth completed a boring approximately 220 feet offset from the proposed entry point of the HDD to a depth of 100 feet below ground surface. Overburden material consisted of predominately very soft to very stiff low plasticity and high plasticity clays. Groundwater was encountered at approximately 0.3 foot below ground surface. Commonwealth stated the borehole data from the existing boring is representative of the soil data and horizon of the HDD alignment and therefore completed a preliminary risk analysis of the hydraulic fracture and drilling fluid surface release potential for the Highway 27/82 HDD based on these data.[32] We recommended in the draft EIS that Commonwealth complete at least one additional geotechnical survey borehole on the proposed HDD alignment to better define the soil profile. Commonwealth completed a second boring to a depth of 120 feet below ground surface approximately 1,250 feet north of the proposed HDD entry point. The results of the second boring were consistent with the first boring, indicating the presence of very soft to very stiff low plasticity and high plasticity clays.

The currently proposed depth of cover for the HDD alignment is 34 feet below Highway 27/82. The maximum depth of the alignment would reach 100 feet below ground surface and the final reamed hole for the 42-inch-diameter pipe would be approximately 54 inches. We received a comment stating that the HDD exit and/or entry point should be relocated into open water areas. As noted in section 4.4.2.2, Commonwealth would restore the entire construction right-of-way following their Procedures, which incorporate the FERC Procedures. Relocating the exit workspace to open water would require a longer HDD route, which would require additional drilling fluid pressure, exacerbating the potential for drilling fluid surface release. Additionally, exiting an HDD in open water increases the potential for a release of drilling fluid into the waterbody when the drill head reaches the water.

Commonwealth completed an analysis that utilized both borings to assess the risk of hydrofracture releases and inadvertent returns of drilling fluid.[33] Commonwealth's updated risk assessment indicates that, based on the proposed depth of cover, the diameter of the final reamed hole, and the low shear-strength fine-grained soils, typical of coastal marsh environments that are expected to be present along the HDD alignment, there is a "moderate" risk of an inadvertent release under Highway 27/82 and subsequent highway settlement on the order of one inch. For the remainder of the HDD alignment, including the roadside ditch waterbody adjacent to Highway 27/82, Commonwealth's assessment indicates the risk of an inadvertent release is "high" to "very high."

HDD General Impacts and Mitigation

Drilling fluids associated with HDD operations would consist primarily of water and bentonite clay. Commonwealth would require approval from FERC staff for the use of any additional proposed additives, and all additives would comply with applicable permit requirements. Commonwealth would follow FERC's *Guidance for Horizontal Directional Drill Monitoring, Inadvertent Return Response, and Contingency Plans* (FERC, 2019a). Commonwealth's *Horizontal Directional Drill Monitoring, Indadvertent Return Response, and Contingency Plan (HDD Contingency Plan)*[34] describes specific procedures it would use to monitor drilling conditions and progress and the notifications and corrective actions that Commonwealth would make in the case of an inadvertent release.

In response to our recommendation in the draft EIS, Commonwealth filed a revised *HDD Contingency Plan*, which includes proposed monitoring and sampling procedures Commonwealth would implement during the HDD operations, including:

- visual inspections along the drill path, including the monitoring of sensitive areas (i.e., waterbodies and wetlands) to identify signs of drilling fluid inadvertent returns, surface heaving, and settlement; land-based portions of the drill path would be surveyed on foot; inspections of waterbodies would entail surveying from the banks for signs of drilling fluid plumes;

32 This report is provided on FERC's eLibrary (https://elibrary.ferc.gov/eLibrary/search) under accession number 20211217-5016.

33 See appendix E of accession number 20220624-5166.

34 Commonwealth's revised plan can be viewed on FERC's eLibrary in appendix B of accession number20220728-5187.

- monitoring of down-hole annular pressure during the HDD pilot hole drilling phase, which allows detection of decreases, spikes, or losses in drilling fluid pressure, which in turn aids in identifying potential hydraulic fractures or inadvertent returns;
- a drilling fluid specialist would review, assess, and provide recommendations regarding changes to drilling mud properties during the HDD; the specialist would be responsible for testing, sampling, and documenting fluid properties of the returning and raw drilling fluid during drilling operations; fluid properties typically monitored during HDD activities include viscosity, fluid density (or mud weight), and sand content;
- documentation of status information regarding drilling progress, returns, pressures, and drill conditions; data collected during monitoring would be compiled to create a drill summary report to be provided to FERC upon successful completion of the drill;
- periodic monitoring for the presence of drilling fluid returns at the HDD entry/exit points;
- instrumentation that identifies the location of the pilot hole, measures drill string axial and torsional loads, and measures the rates and pressure of drilling fluid during circulation; and
- documentation of all drilling fluids present at the jobsite.

Precautionary steps Commonwealth would employ as countermeasures for an inadvertent release include storing containment equipment (including portable pumps, hay bales, silt fencing, lumber, and earth moving equipment) at the drilling site for immediate use and constructing sediment barriers around the drill entry and exit pits. Commonwealth would implement the following procedures and protocols if drilling fluid circulation to the HDD entry/exit points were notably lost or diminished:

- the EI would be notified of lost or diminished drilling fluid and HDD operations would be halted;
- the EI, Commonwealth's construction management team, and the drilling contractor would immediately perform a walk-through inspection for inadvertent returns along the drill alignment; and
- the drilling contractor would implement the following options if drilling fluid circulation was dissipating:
  - decrease pump pressure;
  - retract the drill string back to the entry point to restore circulation (i.e., "swab" the hole);
  - introduce additional drilling fluid flow along the horizontal hole alignment; and
  - introduce additives to the drilled hole that aid in lost circulation.

The steps taken by the drilling contractor to restore circulation would be documented by the EI. If circulation is regained, the EI, Commonwealth's construction management team, and the drilling contractor would resume the sampling and monitoring procedures. If circulation is not re-established, the EI would increase the visual inspection frequency along the drilled path alignment as appropriate. The EI would also document the drilling fluid pumping rate and downtime (during which no drilling fluid is pumped) should it become necessary to determine lost circulation volumes. If circulation is not re-established, the contractor may use the option to decrease pump pressures and increase the penetration rate to "out run" the drilling fluid.

Commonwealth would implement the following grouting plan to address the potential of settlement of 1 inch associated with the drilling of the HDD crossing under Highway 27/82. The grouting plan, as identified on the HDD design drawings, requires the drilling contractor to grout the annulus between the installed pipeline (42 inches) and the reamed hole (54 inches) from the point of entry to an elevation of minus 35 feet (or past the western boundary of Highway 27/82, whichever is greater). Additionally, post construction grouting the annulus until it reaches the surface at the entry point may be necessary.

The annulus grouting would be in accordance with the LDEQ and LDOTD's *Geotechnical Boreholes and Groundwater Monitoring Systems* dated December 2020. The grout would consist of a cement bentonite mix and be designed to avoid shrinkage of the grout plug to effectively seal off the annular space between the reamed hole and installed pipeline. This would be done by grouting the annular gap between the reamed soil hole and the installed pipeline.

LDOTD has advised Commonwealth that it would prefer Commonwealth cross Highway 27/82 using the proposed HDD method. In accordance with FERC guidance (FERC, 2019a), Commonwealth is consulting with LDOTD to develop an alternative plan for crossing Highway 27/82 if, despite the above mitigation methods, an LDOTD inspector determines during construction that the amount of settlement beneath Highway 27/82 is unacceptable. To avoid environmental impacts in the event LDOTD requires Commonwealth to cross Highway 27/82 at a different location if settlement beneath the highway is deemed unacceptable, **we recommend that:**

- **<u>Prior to construction of the Pipeline</u>, Commonwealth should file with the Secretary of the Commission (Secretary) for review and written approval by the Director of OEP, or the Director's designee, an alternative contingency plan for crossing Highway 27/82 in the event that Commonwealth is unable to successfully complete the proposed HDD of Highway 27/82. Commonwealth should develop the contingency plan in consultation with the LDOTD**; and
- **Commonwealth should successfully complete the Highway 27/82 crossing prior to the start of construction of the remainder of the Pipeline**.

4.1.6 Geology Conclusions

The Project exists within a limited range of geologic conditions and resources. We conclude that construction and operation of the Project facilities in accordance with Commonwealth's proposed contingency measures, as described in sections 4.1.2 and 4.1.3, would not result in a significant impact on surface mines, mineral resources, or paleontological resources. In addition, with the implementation of the measures outlined above, we conclude that impacts on geological resources would be adequately minimized and would not be significant.

Commonwealth would reduce the potential for impacts on the Project from natural hazards such as subsidence, coastal erosion, and flooding through its proposed engineering design (see section 4.12).

4.2 SOIL AND SEDIMENTS

4.2.1 Soil Types and Limitations

Soil types and characteristics at the Terminal site and along the Pipeline were identified and assessed using the U.S. Department of Agriculture NRCS Soil Survey Geographic database and NRCS official soil series descriptions (USDA NRCS, 2019a, 2019b). Commonwealth obtained additional information about soil descriptions from the Soil Conservation Service's Cameron Parish Soil Survey (USDA SCS, 1995). The soils of the Project site are relatively uniform. All soils at the Project site are classified as hydric soils with high compaction potential and low to moderate potential to be eroded by water (surface K factor values less than 0.3) or wind (wind erodibility groups values range from 3 to 8).[35]

35 Surface K factor provides the basis for the potential of soil to be eroded by water; soil types are grouped into water erosion classes of "Low," "Moderate," and "High." Low K values range from 0.02 to 0.20, moderate K valuesrange from 0.20 to 0.40, and high K values range from 0.40 to 0.69; Wind erodibility groups range from 1 to 8; 1 indicates

None of the soils at the Terminal site or along the Pipeline right-of-way are prime farmlands, unique farmlands, or farmland of statewide importance; or classified as stony/rocky (as noted in section 4.1.1, bedrock is greater than 2,000 feet below ground surface throughout the Project area).

4.2.1.1 Terminal

Construction of the Terminal would affect five soil types (plus "water") mapped by the NRCS. Approximately 106 acres would be permanently disturbed due to construction of the Terminal, including service roads and the marine facility. Table 4.2.1-1 summarizes the permanent and temporary acreage impacts for each soil mapping unit identified at the Terminal site, as well as the temporary acreage impacts associated with the support facilities.

We reviewed publicly available information to identify and evaluate the soils that would be most susceptible to impacts from construction of the Terminal. Major soil limitations within the Terminal site are discussed below.

the highest potential for wind erosion and 8 indicates the lowest. Highly wind-erodible-soils include those in groups 1 or 2 (USDA NRCS, 2019a, 2019b).

TABLE 4.2.1-1 **Soil Series Impacted at the Terminal Site and Support Facilities**		
Map Unit Name	**Temporary Impact (acres) a/, b/**	**Permanent Impact (acres) a/, b/**
Liquefaction Facilities		
Aquents, frequently flooded (AN)	0.3	0.3
Creole mucky clay (CR)	19.5	19.5
Hackberry-Mermentau complex, gently undulating (Hm)	44.1	44.1
Mermentau Clay (ME)	16.1	16.1
Udifluvents, 1 to 20 percent slopes (UD)	4.5	4.5
Subtotal	**84.5**	**84.5**
Construction and Laydown Area		
Aquents, frequently flooded (AN)	3.7	0.0
Udifluvents, 1 to 20 percent slopes (UD)	9.0	0.0
Water	0.4	0.0
Subtotal	**13.1**	**0.0**
Marine Facility		
Creole mucky clay (CR)	0.8	0.8
Hackberry-Mermentau complex, gently undulating (Hm)	3.8	3.8
Udifluvents, 1 to 20 percent slopes (UD)	2.7	2.7
Water	0.7	0.7
Subtotal	**8.0**	**8.0**
Stormwater Culvert		
Creole mucky clay (CR)	0.8	0.8
Hackberry-Mermentau complex, gently undulating (Hm)	2.5	2.5
Water	0.2	0.2
Subtotal	**3.5**	**3.5**
Administration and Maintenance Buildings		
Aquents, frequently flooded (AN)	1.0	1.0
Udifluvents, 1 to 20 percent slopes (UD)	0.5	0.5
Subtotal	**1.5**	**1.5**
Access Roads		
Aquents, frequently flooded (AN)	1.1	1.1
Creole mucky clay (CR)	1.1	1.1
Hackberry-Mermentau complex, gently undulating (Hm)	1.7	1.7
Mermentau Clay (ME)	0.7	0.7
Udifluvents, 1 to 20 percent slopes (UD)	1.3	1.3
Subtotal	**5.9**	**5.9**
Moran Towing		
Aquents, frequently flooded (AN)	0.6	0.6

TABLE 4.2.1-1 **Soil Series Impacted at the Terminal Site and Support Facilities**		
Map Unit Name	**Temporary Impact (acres) a/, b/**	**Permanent Impact (acres) a/, b/**
Udifluvents, 1 to 20 percent slopes (UD)	1.0	1.0
Water	0.7	0.7
Subtotal	**2.3**	**2.3**
Total	**118.8**	**105.7**

a/ Temporary impact acreages include the temporary and permanent acreages.
b/ The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.

Compaction Potential

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils; the degree of potential compaction is evaluated based on soil texture and drainage class. Compaction is typically of concern when the moisture content of the soils is high such as in hydric soils or during precipitation events. Construction equipment traveling over wet soils can disrupt soil structure, reduce pore space, increase runoff potential, and cause rutting.

Construction of the Terminal would impact about 117 acres of soils classified as compaction-prone (Aquents [frequently flooded], Banker muck, Creole mucky clay, Hackberry-Mermentau complex gently undulating, Mermentau and Udifluvents 1 to 20 percent slopes). Vegetation clearing and grading would only be conducted to provide adequate access to the Project area and for operational staging and safe construction purposes. Commonwealth would implement the FERC's *Plan* and Commonwealth's *Procedures* to mitigate permanent soil impacts. Additionally, Commonwealth would restore the temporary construction and laydown areas to preconstruction grades and conditions after completing construction activities. Commonwealth would deep plow areas temporarily impacted to reduce compaction. Further, Commonwealth would replant the wetlands in this area and conduct revegetation monitoring in accordance with its *Procedures*.

Erosion Potential

Erosion is a continuing natural process that can be accelerated by human disturbance. Factors such as soil texture, structure, slope, vegetation cover, rainfall intensity, and wind intensity can influence the erosion process. Soils most susceptible to erosion by water are typified by bare or sparse vegetation cover, non-cohesive soil particles with low infiltration rates, and moderate to steep slopes. Soils typically more resistant to erosion by water include those that occupy low relief areas, are well vegetated, and have high infiltration capacity and internal permeability. Wind erosion processes are less affected by slope angles than water erosion processes. Wind-induced erosion often occurs on dry soil where vegetation cover is sparse and strong winds are prevalent.

There are no soils within the Terminal site that are classified as highly erodible by water or wind. However, construction activities, such as backfilling, clearing, grading, and trenching and vehicular traffic, can cause soils in affected areas to be more susceptible to erosion potential. Prior to initiating construction at the Terminal, Commonwealth would implement best management practices (BMPs) that include the use of sediment filtration devices (e.g., silt fences) to minimize soil transport away from the Terminal site. Constructing gravel and paved roads throughout the facility would further minimize wind and water erosion during operation of the Project. Revegetation of temporary workspaces would be implemented during operation of the facilities in addition to dust suppression activities to further reduce water and wind erosion onsite.

Contaminated Soils and Sediments and Spills

We received comments from the public expressing concern regarding negative environmental impacts of potentially contaminated soils and sediments being unearthed during dredging at the Project site. Commonwealth conducted assessments to identify the potential contaminated sediments present at the Project site in accordance with the EPA's and COE's *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual*, commonly referred to as the Inland Testing Manual, issued in February 1998. Commonwealth's Phase I Environmental Site Assessment identified fill and dredged material near the north end of the proposed marine facility. This location has not been identified by the LDEQ as an area of concern regarding soil/sediment contamination. However, due to the unknown origin of this material, Commonwealth conducted an Inland Testing Manual Tier I Evaluation, which consists of a comprehensive analysis of existing information and data from field evaluations conducted in the Project area, to assess whether there are known instances of contaminated soils in the Project area. The results of the evaluation indicate there are no contaminated soils present. However, as these results are incomplete, Commonwealth would analyze dredged sediments from this area of the marine facility prior to transporting them off-site.

Commonwealth did not identify any hazardous waste sites or evidence of spills, leaks, or releases at the Terminal site. Additionally, federal and state database searches did not reveal any known releases of petroleum products, hazardous materials, or hazardous waste on the Terminal site. Four locations (13 individual sites) of potential contamination were identified within 0.125 mile of the Terminal; however, none of the sites are within the proposed construction work area and the regulatory status of the sites is such that no further action is required to remediate the locations. Therefore, we conclude the Project would not be affected by any of the identified sites. Consequently, the Terminal site would not impact contaminated soils and sediments.

If construction activities were to uncover any type of contamination, Commonwealth would coordinate with the appropriate agencies, and follow the procedures in its *Unanticipated Contaminated Sediment and Soils Discovery Plan.*[36] We have reviewed this plan and found it acceptable. The plan provides discovery and response procedures that Commonwealth would follow if contamination were discovered during construction, including the following steps:

- Step 1 – immediately notify the EI if unanticipated potentially contaminated material is encountered;
- Step 2 – suspend all work activities within 10 feet of the potentially contaminated area and flag or fence the estimated extent of the potentially contaminated area;
- Step 3 – identify immediate threats; if human health, environmental, or safety risks are present, implement monitoring and management measures to minimize risk to on-site personnel;
- Step 4 – implement the Spill Prevention and Response (SPAR) Plan and appropriate BMPs if the contamination presents a potential risk of spreading to Waters of the U.S. or Waters of the State;
- Step 5 – notify the LDEQ, Cameron Parish Office of Emergency Preparedness, and FERC within 7 days, if warranted;

36 Commonwealth's Unanticipated Contaminated Sediment and Soils Discovery Plan is provided in appendix 7C of Commonwealth's application to the FERC, which can be viewed on eLibrary under Accession Number 20190820-5125.

- Step 6 – engage an environmental response provider to isolate, treat, or remove and dispose of contamination, if warranted; and
- Step 7 – only resume work within the potentially contaminated area and 10-foot buffer after the appropriate course of action is determined and personnel are informed work may continue.

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 construction workspaces could carry unconfined debris or other materials. Commonwealth would adhere to its *SPAR Plan* for construction activities to minimize the potential for spills and provide measures to clean up any inadvertent spills. During operation, the Terminal's spill impoundment systems would be designed to retain leaks or spills of LNG, refrigerant, condensate, or other hazardous materials such as hydraulic fluid, diesel fuel, and oil from vehicles and equipment, in accordance with NFPA 59A and 49 CFR Part 193 requirements.

4.2.1.2 Pipeline

Three soil types mapped by the NRCS—aquents, frequently flooded; bancker muck, 0 to 0.2 percent slopes, very frequently flooded; and creole mucky clay—would be affected by construction of the Pipeline. Construction would temporarily disturb 48.4 acres of soils, 1.0 acre of soils would be within the permanent right-of-way, and 0.3 acre would be permanently impacted by aboveground facilities. Table 4.2.1-2 summarizes the temporary and permanent acreage of impacts for each soil type that would be disturbed by construction of the Pipeline. During backfilling, Commonwealth would restore the natural ground contours and restore surface drainage patterns as close to preconstruction conditions as practicable.

We reviewed publicly available information to identify and evaluate the soils that would be most susceptible to impacts from construction of the Pipeline. In addition to the soil limitations discussed in section 4.2.1.1, soil limitations relevant to construction of the Pipeline are discussed below.

TABLE 4.2.1-2 **Soils Series Impacted by the Commonwealth LNG Pipeline**		
Map Unit Name	**Construction Workspace (acres) a/, b/**	**Permanent Impacts (acres) a/, b/**
Right-of-Way		
Aquents, frequently flooded (AN)	0.2	0.0
Creole mucky clay (CR)	0.4	0.0
Bancker muck, 0 to 0.2 percent slopes, very frequently flooded (BA)	0.4	0.0
Water	0.1	0.0
Temporary Workspace		
Aquents, frequently flooded (AN)	7.6	0.0
Creole mucky clay (CR)	12.5	0.0
Bancker muck, 0 to 0.2 percent slopes, very frequently flooded (BA)	11.3	0.0
Water	2.1	0.0
Additional Temporary Workspace		
Aquents, frequently flooded (AN)	3.5	0.0
Creole mucky clay (CR)	5.1	0.0
Bancker muck, 0 to 0.2 percent slopes, very frequently flooded (BA)	4.0	0.0
Access Roads (Temporary)		
Creole mucky clay (CR)	0.9	0.0
Aboveground Facilities		
Aquents, frequently flooded (AN)	0.2	0.2
Bancker muck, 0 to 0.2 percent slopes, very frequently flooded (BA)	0.1	0.1
Pipeline Total	**48.4**	**0.3**
a/ Temporary impact acreages include the temporary and permanent impact acreages. b/ The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.		

Compaction Potential

All 48.4 acres of soils that the Pipeline would cross are classified as compaction prone. Commonwealth would use low-ground pressure construction equipment and geo-textile fabric or construction mats during construction to reduce potential rutting and compaction, where appropriate. Commonwealth would implement the FERC's *Plan* and Commonwealth's *Procedures* during construction and restoration of the Pipeline construction right-of-way. Accordingly, the right-of-way would be graded and restored to natural site contours. Restoration would include deep tilling in areas of compaction, and Commonwealth would repair rutted areas prior to seeding, mulching, and final revegetation.

Erosion Potential

None of the soils that would be crossed by the Pipeline right-of-way are classified as highly erodible by water or wind. As stated above, construction activities, such as backfilling, clearing, grading, and trenching, and vehicular traffic, can cause soils in affected areas to be more susceptible to erosion potential. Prior to the initialization of construction activities along the Pipeline, Commonwealth would implement BMPs that include the use of sediment filtration devices (e.g., silt fence) to minimize soil transport away from the Pipeline right-of-way. Upon completion of Pipeline construction, Commonwealth would reestablish preconstruction contours and use stockpiled topsoil to cap the backfilled areas. To reduce erosion, areas disturbed by construction activities would be revegetated. Commonwealth would plant Gulf cordgrass and saltgrass seedlings during the right-of-way restoration at 36-inch spacing, as recommended by NRCS guidance, unless an alternative seed mix is requested by the landowner Commonwealth would remove temporary erosion control devices once stabilization is achieved. Commonwealth would inspect revegetated areas throughout the first three growing seasons to assess revegetation success and to address any concerns from landowners and continue revegetation efforts until revegetation is successful.

Contaminated Soils and Sediments

A search of the EPA Envirofacts database (EPA, 2019a) did not identify any recorded contaminated or hazardous waste sites within 0.25 mile of the Pipeline. If construction activities along the Pipeline right-of-way were to uncover contamination, Commonwealth would notify the affected landowner, coordinate with the appropriate agencies, and follow the procedures put forth in its *Unanticipated Contaminated Sediment and Soils Discovery Plan* as described in section 4.2.1.1.

During construction and, to a lesser extent, operation, some potential exists for spills of hazardous materials, such as hydraulic fluid and diesel fuel for vehicles and equipment; in addition, stormwater runoff from construction workspaces could carry unconfined debris or other materials. Commonwealth's approach to inadvertent spills would be the same for the Pipeline as the Terminal. These measures are discussed in section 4.2.1.1.

4.2.2 Soils Conclusions

Construction and operation of the Project would convert about 106 acres of hydric and compaction-prone soils to industrial/commercial use. This constitutes a permanent, but minor, impact due to the abundance of similar soil types in the vicinity of the Project.

Commonwealth would implement the FERC's *Plan* and Commonwealth's *Procedures*, SPAR, and *Unanticipated Contaminated Sediment and Soils Discovery* Plans to minimize Project impacts on soils.

Based on the overall soil conditions present in the Project area and the Project's proposed construction and restoration methods, we conclude that construction and operation of the Project would not significantly alter the soils of the region.

4.3 WATER RESOURCES

Water resources include groundwater and surface waters that could be affected by construction and operation of the Project.

4.3.1 Groundwater

4.3.1.1 Groundwater Resources

The proposed Project is within the saltwater portion of the Chicot aquifer. According to the LDEQ (LDEQ, 2003), the Chicot aquifer system consists of confining upward sequences of gravels, sands, silts, and clays of the Pleistocene Prairie and the intermediate and high terrace deposits of southwestern Louisiana.

In the Lake Charles area, the Chicot aquifer is divided into shallow alluvial sand, the "200-foot" sand, the "500-foot" sand, and the "700-foot" sand. Fresh water in the Chicot and other southwestern Louisiana aquifers is separated from fresh water in southeast Louisiana by a saltwater ridge along the western edge of the Mississippi River valley. Fresh groundwater depth within Cameron Parish ranges from 300 to 800 feet below ground surface; however, no fresh groundwater is present in the Chicot aquifer system along the southern coastline (i.e., in the vicinity of the Project area).

Recharge to the Chicot aquifer in Cameron Parish generally comes from precipitation infiltration, vertical leakage, and lateral groundwater flow from the north. Recharge flows historically came from northern areas and flowed south to the coast, but increased water withdrawals for industrial and agricultural use have shifted flows from south to north and increased saltwater encroachment. The hydraulic conductivity varies between 40 feet to 220 feet per day.

Sole-Source Aquifers

Sole-source aquifers are 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, 2019b). The Chicot aquifer in Louisiana has been designated as a sole-source aquifer by the EPA. The dominant use of the water drawn from the aquifer is rice irrigation, with public drinking water supply being the second most extensive use (USGS, 2019c). In 2010, groundwater withdrawals from the Chicot aquifer system in Cameron Parish totaled about 7.74 million gallons per day.

Although the Project is within the Chicot aquifer system, its location is within a coastal area that does not provide recharge to any major Louisiana freshwater aquifers (Louisiana Geological Survey, 1988); therefore, we conclude the Project would not affect the availability or quality of water within the sole-source aquifer.

Groundwater Quality

The LDEQ Aquifer Sampling and Assessment Program monitors approximately 200 water wells throughout the state, including 24 wells in the Chicot aquifer. These wells are at least 17 miles from the Terminal site. Commonwealth has conducted several Phase I Environmental Site Assessments assessing the potential for groundwater contamination in the vicinity of the Project. The results of these extensive database searches indicate no evidence of groundwater contamination at or within the vicinity of the Project location.

Water Supply Wells

Although all fresh groundwater withdrawals in Cameron Parish come from the Chicot aquifer system, the aquifer produces only saltwater along the coast and in isolated bodies north of the coast (USGS, 2014c). The salinity of the groundwater near the Terminal exceeds LDEQ drinking water standards but fresh groundwater is present in the vicinity of the Pipeline (LDEQ, 2009).

State well-registration records listed 354 active water wells screened in the Chicot aquifer system in Cameron Parish in 2010, including 204 domestic, 67 public supply, 46 irrigation, and 37 industrial wells (LDNR, 2019). Depths of these wells ranged from 80 feet to 968 feet below land surface, with a median depth of 252 feet. According to publicly available LDNR data, no active public or private drinking water supply wells are registered within 150 feet of the Project (LDNR, 2019). The nearest active water supply well is over 500 feet northeast of the Terminal site. Based on review of the USGS topographic maps and field survey data, there are no springs within 150 feet of the Project.

The LDEQ operates a Wellhead Protection Program designed under the federal Safe Drinking Water Act Amendments of 1986 to protect the quality of public drinking water supplies obtained from community water wells (LDEQ, 2011). The LDEQ also operates a Source Water Assessment Program as required by the federal Safe Drinking Water Act Amendments of 1996 to determine the potential susceptibility of public water supply systems to contamination. A source water protection area defines the zone through which contaminants, if present, are likely to migrate and reach either a well or surface water intake supplying drinking water to the public. A wellhead protection area defines the same zone, but for groundwater wells only, and are therefore subsumed by source water protection areas. These drinking water protection areas vary from a 1,000-foot to 1-mile buffers from the water supply, depending on the characteristics of the supply source (e.g., screen depth of a well, construction date, or aquifer).

Based on LDEQ information (2015), there are no source water protection areas in Cameron Parish or within 5 miles of Project activities.

4.3.1.2 Groundwater Impacts and Mitigation

Terminal

Impacts on groundwater could occur during construction and operation activities at the Terminal site. The activities with the greatest potential to affect groundwater include excavation, pile installation, potential spills of hazardous materials, and groundwater withdrawals.

Excavations for construction have the potential to intercept groundwater, thereby affecting groundwater quality and/or quantity. Although these excavations would generally be shallow (e.g., facility foundation piles driven to approximately 120 feet below ground level), groundwater throughout much of the Terminal site is expected to be at or near the ground surface. Therefore, dewatering may be required during excavation and would occur in accordance with the FERC *Plan* and Commonwealth's *Procedures*.

Hammer- and vibratory-driven piles would be used as the foundation for the Terminal facilities. A potential impact associated with driven piles is the cross contamination of lower permeable aquifer zones through downward vertical seepage from one layer to another. The proposed piles are 80 to 120 feet long and would not penetrate the confining unit, which is greater than 200 feet under the Terminal site. Due to the proposed depth of pile foundations and the characteristics of the material above the Chicot aquifer (mostly clays), we conclude the potential for cross-contamination of groundwater is low.

Most of the Terminal footprint would be permanently converted from porous vegetative habitat to paved, impervious surfaces. This could result in a reduction in groundwater recharge area in the vicinity of the Terminal site. The paved areas would encompass approximately 84.5 acres. However, the Terminal is within three watersheds (Mud Lake-Frontal Gulf of Mexico: hydrologic unit code [HUC]-12: 080802060605, Mesquite Ridge – Frontal Gulf of Mexico: HUC-12: 08080206060501, and Monkey Island/Calcasieu Lake-Calcasieu Pass: HUC-12: 080802060700). The paved area within the Terminal would represent approximately 0.15 percent of the total acres in the watersheds directly around the Terminal. Therefore, we conclude Impacts on groundwater recharge due to impervious surfaces at the Terminal would be minor.

An accidental release of hazardous substances, such as fuels, lubricants, and coolants while constructing or operating the Terminal could potentially impact groundwater. Commonwealth would construct and operate the Terminal in accordance with its *SPAR Plan*. The *SPAR Plan* includes planning and measures for spill avoidance; general BMPs, including refueling procedures, lists of required spill response equipment to be kept on-site, and proper management of typical fuels, lubricants, and hazardous materials management; general spill response procedures; reportable spill response procedures; cleanup requirements; and waste storage and disposal requirements. We have reviewed the *SPAR Plan* and found it to be acceptable.

Commonwealth would use surface water from the Calcasieu Ship Channel for LNG storage tank hydrostatic testing and would return the water to the Calcasieu Ship Channel after a period of resting in an on-site stormwater retention pond and water quality testing to ensure compliance with the Louisiana Pollutant Discharge Elimination System General Permit LAG670000 – Hydrostatic Test and Vessel Testing Wastewater authorization permit limits. Therefore, hydrostatic testing at the Terminal would not affect groundwater at the site.

Commonwealth would use a municipal water source to wet problem areas as a dust control measure during construction, if needed. Additionally, the Terminal would require approximately 860,000 gallons per month of fresh water for Project operations (approximately 200 gallons per minute). Commonwealth proposes a tie-in to the existing 10-inch-diameter water line located parallel to Highway 27/82. This water line is associated with Water District 10. Water District 10 has more than three million gallons of surplus water per month and has notified Commonwealth that it can provide water to the Project site without affecting other users. Overall, we conclude that significant impacts on the groundwater resources underlying the Terminal would not occur due to a lack of active public or private drinking water supply wells within 150 feet of the site's construction work area; construction of the proposed pilings within the permeable zone of the Chicot aquifer at a sufficiently shallow depth, which would avoid crossing aquifer confining layers; and surficial mitigation measures that Commonwealth would implement in the event of a hazardous material spill. Further, the Terminal site is underlain by multiple strata of dense clay content, which provide a restrictive layer to slow or prevent the downward migration of surface and near-surface waters or contaminants, thereby providing a natural protective barrier to groundwater quality.

Pipeline

Impacts on groundwater could occur during construction activities associated with the Pipeline. The activities with the greatest potential to affect groundwater include excavation, potential spills of hazardous materials, and groundwater withdrawals. Groundwater would likely enter the Pipeline trench during excavation, making dewatering of the trench necessary. As a result of the soil types through which the route is proposed, anticipated dewatering is 600 to 1,000 gallons per hour for each 1,000-foot segment of open trench. Generally, dewatering can cause groundwater from the surrounding area to migrate toward the trench site, potentially causing localized drawdown of the water table. However, Commonwealth would remove wellpoints (see section 2.5.2.5) and dewatering structures after completing dewatering activities in accordance with the FERC's *Plan*. Given that the proposed Pipeline right-of-way is within wetland soils where saturated subsurface conditions are likely prevalent and the absence of water wells within 150 feet of construction, perceptible impacts of localized drawdown of the water table is unlikely.

A second potential for impacts on groundwater would be an accidental release of a hazardous substance, such as fuels, lubricants, and coolants, while constructing the Pipeline. Commonwealth would implement the measures contained in the FERC *Plan* and Commonwealth's *Procedures*, as well as its *SPAR Plan*, which provides measures to minimize the potential impacts associated with spills of hazardous materials including storing hazardous liquids in containment vessels of compatible materials, storing fuel tanks on pallets within temporary containment vessels capable of containing 110 percent of the volume of the tank, and inspecting fuel tanks and storage vessels daily for leaks or deterioration.

Commonwealth would require about 80,000 gallons of water during construction for HDD drilling operations and an additional 1.2 million gallons of water for hydrostatic testing of the Pipeline. Commonwealth would obtain the hydrostatic test water and HDD drilling water via truck from its Water District 10 tie-in. As noted above, Water District 10 has sufficient surplus water supply to accommodate Commonwealth's construction and operation needs. As with the Terminal, water used for Pipeline hydrostatic testing would be transferred to the on-site stormwater pond at the Terminal and then tested for compliance with permits prior to release back into the Calcasieu Ship Channel. No new groundwater wells would be required for these water uses and no groundwater impacts are anticipated.

No dust control is expected during pipeline construction due to the wetland condition of the entire pipeline route.

4.3.1.3 Groundwater Conclusions

Overall, we conclude substantial impacts on the groundwater resources underlying the Project facilities would not occur due to the absence of active public and private drinking water supply wells within 150 feet of construction work areas; surficial mitigation measures that would be implemented by Commonwealth in the event of a hazardous material spill; and post-construction contour restoration and revegetation of the Pipeline right-of-way and temporary workspaces at the Terminal to ensure the restoration of overland flow and recharge patterns (see section 2.5.2.8). Further, the Project area is underlain by multiple strata of dense clay content, which provide a restrictive layer to slow or prevent the downward migration of surface and near-surface waters or contaminants, thereby providing a natural protective barrier to groundwater quality. Finally, Water District 10 has more than a 3-million-gallon surplus of water per month and the volumetric flow of the Calcasieu Ship Channel is far greater than the volume of water required to perform hydrostatic testing of the Project components. With the implementation of the measures described above (including implementation of the FERC *Plan* and Commonwealth's *Procedures* and *SPAR Plan*), we conclude that impacts on groundwater and wells would not be significant and would be minimal and temporary in nature.

4.3.2 Surface Water

4.3.2.1 Surface Water Resources

Terminal

The Terminal would be constructed on the west side of the Calcasieu Ship Channel at the mouth of the Calcasieu River. The channel is maintained by the COE at a depth of 40 feet and a width of 400 feet; in the vicinity of the Terminal, maintenance dredging is not required due to strong currents that prevent the settling of sediments within the channel (COE, 2010).

In addition to the Calcasieu Ship Channel, surface water resources associated with the Terminal include two unnamed waterbodies within the 118.8-acre Terminal site workspace. Further, one unnamed waterbody and a portion of the Calcasieu Ship Channel would be within the area of the marine facility. These surface water resources are part of the 1,080-square-mile lower Calcasieu River Subbasin (HUC 08080206). None of the waterbodies that would be affected by the Terminal, including the Calcasieu Ship

Channel, are listed as Wild and Scenic Rivers. There are also no state-designated Natural and Scenic Rivers that would be affected by the Terminal. Based on the LDEQ 2020 *Water Quality Integrated Report*, two waterbody segments within the Project area, both associated with the Calcasieu River, are listed as impaired in the current 305(b)/303(d) list (LDEQ, 2020):

- Sub-segment No. LA030401_00 – the Calcasieu River from below Moss Lake to the Gulf of Mexico including the Calcasieu Ship Channel and the Cameron Loop; and
- Sub-segment No. LA031201_00 – The Calcasieu River Basin Coastal Bays and Gulf Waters to the State 3-mile limit.

Impairments for sub-segment No. LA031201 are enterococcus from waterfowl. Impairments for sub-segment No. LA031401 include dioxin, furan compounds, fecal coliform, and enterococcus. Construction would take place in sub-segment No. LA030401_00 (the Calcasieu River from below Moss Lake to the Gulf of Mexico including the Calcasieu Ship Channel and the Cameron Loop). Activities within this sub-segment would include ship movements, dredging with a hydraulic dredge and in-water pile driving with a vibratory hammer. No mitigation measures are proposed for these activities related to the impairments.

Commonwealth has conducted an Inland Testing Manual Tier 1 Evaluation (EPA, 1998), to determine whether the proposed actions of dredging and pile driving would result in the resuspension of contaminants or the spread of contaminated water. A Tier 1 evaluation relies on a review and analysis of existing readily available physical, chemical, and biological monitoring data from previous efforts within the Project Area. Based on the results of the Tier 1 evaluation, it is unlikely that contaminated sediment is present. In addition, Commonwealth's proposed use of hydraulic cutter head dredge equipment, which would minimize resuspension of sediment during dredging activities; therefore, we do not anticipate that large volumes of sediments would be re-suspended as a result of the Project. Should contaminated sediments be discovered during dredging activities, Commonwealth would implement the measures outlined in the *Unanticipated Contaminated Sediment and Soils Discovery Plan*.

Pipeline

Commonwealth's Pipeline would cross three major waterbodies (ranging between 114 and 1,170 feet wide) and two intermediate waterbodies (40 and 66 feet wide). The three major waterbody crossings would use open-cut crossing methods (see section 2.5.3). The two intermediate waterbody crossings would be HDD crossings. Commonwealth would also place approximately 1.2 acres of temporary fill in the major waterbodies at MPs 0.0 and 0.2 to create temporary workspaces during construction.

4.3.2.2 Surface Water Impacts and Mitigation

Terminal

As described below, construction and operation of the Terminal would permanently impact two waterbodies within the Project area and would both temporarily and permanently impact portions of the adjacent Calcasieu Ship Channel. Construction and operation of the Terminal would require a combined area of about 116.0 acres of land and 49.8 acres of open water for the Terminal and marine facility. These impacts would result from dredging activities, site construction, marine traffic, stormwater runoff, water use, hydrostatic testing, and could occur from accidental spills or other releases of hazardous substances.

Commonwealth would attempt to minimize waterbody impacts by minimizing the Project footprint to the extent possible and using the turning basin that was dredged for the Calcasieu Pass LNG Project, thus minimizing the amount of dredging needed within the Calcasieu Ship Channel. Table 4.3.2-1 provides a summary of waterbody impacts that would result from construction of the Terminal. All impacts on waterbodies within the Terminal site property boundary would be permanent.

TABLE 4.3.2-1 **Summary of Waterbody Impacts at the Terminal Site**							
Project Component	**Water-body**	**Width (feet)**	**Impact Method**	**Construction Impact (acres)**	**Operation Impact (acres)**	**FERC Class**	**LDEQ Water Use Designation**
Liquefaction facility	Ditch	23	Fill	0.4	0.4	Intermediate	PCR, SCR, FWP
	Slough	20	Fill	1.1	1.1	Intermediate	PCR, SCR, FWP
Marine Facility	Calcasieu River	1,600	Excavation	0.7	0.7	Major	PCR, SCR, FWP, OYS
	Slough	20	Excavation	0.1	0.1	Intermediate	PCR, SCR, FWP
Marine Facility LNG Carrier Berth	Calcasieu River	1,600	Dredge	47.0	47.0	Major	PCR, SCR, FWP, OYS
Stormwater Culvert	Calcasieu River	1,600	Excavation	0.1	0.1	Major	PCR, SCR, FWP, OYS
	Slough	20	Excavation	0.3	0.3	Intermediate	PCR, SCR, FWP
Access Roads	Slough	20	Fill	0.1	0.1	Intermediate	PCR, SCR, FWP
Moran Towing	Calcasieu River	1,600	Fill	<0.1	<0.1	Major	PCR, SCR, FWP, OYS
PCR – Primary Contact Recreation SCR – Secondary Contact Recreation FWP – Fish and Wildlife Propagation OYS – Oyster Propagation							

Dredging

We received public comments expressing concern about potential negative effects resulting from sediment resuspension due to dredging in the Calcasieu Ship Channel. To create a recessed berthing area for the marine facility, Commonwealth would need to excavate and dredge the Calcasieu Ship Channel at the Terminal location. Commonwealth would excavate the upland area associated with the marine facility using a land-based excavator. Commonwealth would dredge the open water associated with the marine facility using a barge-mounted cutterhead suction dredge. Commonwealth would conduct dredging in accordance with COE and USCG regulations and FWS and NOAA guidelines to minimize potential impacts on protected species. Commonwealth would dredge up to about 1.73 million cubic yards during construction and about 152,000 cubic yards from a 47-acre area during biennial maintenance dredging. During construction and the subsequent maintenance dredges, the dredged material would be primarily transported via a non-jurisdictional pipeline to an approved BUDM site. The construction-related dredging and excavating activities would require approximately 5 months to complete.

Use of a cutterhead suction dredge would minimize turbidity caused by resuspension of sediments in the water column as compared to a clamshell-type dredge, which would more readily disperse sediment during dredging. Nonetheless, in-water dredging would increase the rates of turbidity and sedimentation in the Calcasieu Ship Channel and the BUDM site. Guidance from NMFS regarding how to assess the effects of turbidity on endangered species notes that cutterhead dredging generally creates total suspended solids (TSS) concentrations above background levels throughout the bottom six feet of the water column out to a radius of about 985 to 1,640 feet of the cutterhead (NMFS, 2020a). NMFS (2020a) further states that TSS concentrations throughout sediment plumes associated with cutterhead dredging typically range from 11.5 to 282.0 milligrams per liter (mg/L) but may be as high as 550.0 mg/L adjacent to the cutterhead. TSS concentrations decrease with greater distance from the dredge. The COE (2014) reports that the effects of temporarily increased levels of suspended sediments due to dredging are comparable to the common passage of a storm front with high winds and heavy wave action. Increased turbidity due to dredging is typically confined to the time during dredging and about 2 to 3 hours after dredging ceases, after which suspended solids settle to background levels over time (COE, 2014).

In April 2021, Commonwealth conducted Project site-specific turbidity modeling, using COE-supported modeling methods (DREDGE)[37], to provide more refined estimates of the potential levels of water column turbidity that could occur during construction and maintenance dredging at the Project location. The modeling report indicates maximum turbidity concentrations associated with dredging would range, depending on the velocity of the tidal flow during dredging, from approximately 122 to 128 mg/L adjacent to the cutter head; 3 to 51 mg/L at 1 meter above the cutter head; and 0.1 to 10 mg/L at 2 meters above the cutter head. Background turbidity concentrations in the Calcasieu River are estimated to range between 10 and 45 mg/L.

Based on the literature estimates published by NMFS and Commonwealth's site-specific modeling, we conclude the proposed dredging at the Terminal site would increase suspended sediment and turbidity levels at the Terminal site in the immediate vicinity of the dredging activity; however, sediment and turbidity levels would be indistinguishable from ambient water conditions outside of a small radius (2 meter or less) surrounding the dredge cutterhead. Therefore, we conclude that dredging impacts on surface waters at the Project site would be temporary and not significant.

Furthermore, Commonwealth is required to obtain several permits that would address dredging and dredged material management. These include permits from the COE under Section 404 of the CWA and Sections 10 and 14 of the RHA of 1899 and a Coastal Use Permit from LDNR under LAC 43:I.Ch.7. Commonwealth would also be required to obtain a permit for water discharges from the Terminal from the LDEQ under Section 401 of the CWA and an NPDES and LPDES permit under Section 402 of the CWA issued by LDEQ to regulate return water flowing from the dredged material placement area. Commonwealth submitted a Joint Permit Application (JPA) to the COE and LDNR in September 2019. The JPA was submitted under Sections 404 and 401 of the CWA, Sections 10 and 14 of the RHA, and the Coastal Use Permit regulations and is currently under review.

Construction of Marine Facility

The Project would require marine facilities to enable the export of LNG on ocean-going LNG carriers. The LNG carriers would require suitable moorings and loading platforms to facilitate the transfer of LNG (i.e., the LNG carrier berth), and support vessels during operations would require suitable dockage (i.e., the barge dock). A description of the marine facility is provided in section 2.1.1.3.

As noted above, construction of the marine facility would require excavation and dredging along the western shoreline of the Calcasieu Ship Channel to provide adequate space to berth LNG carriers and allow passage of commercial and recreational vessel traffic in the Calcasieu Ship Channel. Commonwealth expects the Terminal site preparation and construction of the facility foundations, barge dock, off-loading platform, and LNG carrier berth to require approximately 14 months, during which time most of the concrete materials and pilings would be delivered. Once the facility foundations are in place and the barge dock and off-loading platform are constructed, the pre-treatment and liquefaction train modules, pipe rack modules, and LNG storage tanks would be delivered throughout the following 14 months. Commonwealth

37 See appendix F of accession no. 20210604-5170.

would install sheet piling within the berthing area on dry land prior to excavation and armor the adjacent shoreline (upstream and downstream) with rip rap to prevent erosion.

The activities associated with the construction of the marine terminal facilities would result in temporary and minor increases in turbidity and sediment levels in the immediate vicinity of construction activities. As noted above, minor turbidity increases within the Calcasieu Ship Channel would be temporary and comparable to ambient turbidity levels within the channel. The operational impacts of maintenance dredging would also be temporary and localized to the dredging operation. As noted in section 4.2.1.1, there are no known contaminated sediments in the Project area. Therefore, we conclude that construction of the marine facility would cause no significant, or long-term water quality impacts.

Marine Traffic

Marine traffic associated with construction and operation of the Terminal could impact surface water resources as a result of ship movements, including propeller use, wave action, and ballast and other water exchanges.

Throughout construction of the Project, general cargo carrier vessels, barges, and support vessels would deliver heavy equipment and materials to the Terminal. The marine construction fleet would likely include vessels such as dredge barges, heavy lift cranes, derrick crane barges, deck barges, tugs, and support vessels. The support vessels anticipated include booster pump barges, tender boats, work barges, material barges, fuel barges, personnel shuttles, and survey vessels.

Commonwealth estimates an average of seven supply barges per week would call at the Terminal site during construction. Commonwealth anticipates an average of three LNG carriers per week (156 LNG carriers per year) would call on the Terminal during operations. The marine facility would be sized to accommodate one LNG carrier at a time. Therefore, while an LNG carrier is berthed at the Terminal, any other LNG carrier attempting to call on the Terminal would be required to anchor offshore (i.e., in the Gulf of Mexico) until the marine facility is clear. This is the normal operating procedure for the Calcasieu Ship Channel.

LNG carriers would be piloted through the mouth of the Calcasieu River to the turning basin and maneuvered from the turning basin into the LNG carrier berth. Simulations conducted by the Lake Charles Pilots concluded that four 75-ton bollard pull tractor tugs would be adequate to safely maneuver the LNG carriers that would call on the Terminal with no additional risk compared with that posed by other deep-draft vessels (e.g., oil tankers, chemical ships, freighters) that currently navigate the Calcasieu Ship Channel (USCG, 2019). Shoreline stabilization to prevent erosion related to vessel wakes would be achieved using a combination of sheet piles and rip rap along the entire Calcasieu Ship Channel-facing shoreline within the LNG Facility. Areas adjacent to the proposed Terminal are already armored for erosion. As such, use of the channel by barges and support vessels to deliver materials during construction of the Terminal facilities would be consistent with the use of this active shipping channel, and associated impacts on water quality would be minor.

The LNG carriers would discharge ballast water into the Calcasieu Ship Channel during LNG loading in accordance with federal regulations. Although FERC does not have jurisdiction over LNG vessels, 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 151.2025). Under these requirements, vessels must implement one of the following ballast management methods to prevent the spread of aquatic nuisance species in U.S. waters: 1) install a ballast water management system (as described in 33 CFR 151.2025(a)(3)); 2) use only water from a U.S. public water system; 3) do not discharge ballast; or 4) discharge ballast to a facility onshore or to another vessel for treatment.

The ballast water discharged at the LNG carrier berth would be composed mainly of Gulf of Mexico ocean water. Potential impacts on water quality due to ballast water discharge would be a temporary increase in salinity level, a temporary decrease in dissolved oxygen levels, and potential change in pH level in the immediate vicinity of the LNG berthing area. Because the proposed Terminal site and turning basin/berthing area are within the lower Calcasieu River Ship Channel (about 0.2 mile from the Gulf of Mexico), these differences are expected to be minor and may not be measurable under normal tidal cycles. Ballast water would be discharged near the bottom of the LNG carrier berth, where relatively dense saltwater from the Gulf of Mexico characteristically underlies fresh water from inland sources. Furthermore, the volume of ballast water discharged during each LNG carrier visit to the Terminal would represent a negligible influence on the overall system. Ballast water is stored in the ship's hull below the waterline; as a result, discharged water temperatures are not expected to deviate significantly from ambient water temperatures.

Impacts on water resources resulting from ballast water would be temporary and minor, only affecting a relatively small area. Further, to ensure compliance with U.S. laws and regulations governing ballast water discharges, Commonwealth would ensure that any visiting vessels possess documentation to demonstrate compliance with ballast water regulations and implement BMPs prior to allowing any ballast water to be discharged at the LNG carrier berth. Therefore, we conclude that significant impacts on surface waters would not occur as a result of ballast water discharge.

Vessels berthed at the marine facility would also withdraw water from the Calcasieu Ship Channel in order to cool their engines, generators, condensers, and other shipboard equipment. An average of 3 vessels per week or 156 vessels per year would be anticipated to call on the LNG Facility. Each vessel is anticipated to withdraw and discharge up to 10 million gallons of cooling water during a 20-hour loading period. Cooling water return temperatures vary widely, depending on the type of LNG carrier and mode of operation, but are generally in the range of 5.4 to 7.2 degrees Fahrenheit greater than the ambient temperature of surrounding waters. The withdrawal and discharge of water for vessel cooling may moderately increase water temperatures in the vicinity of the moored vessels. However, due to the limited temperature differences, the relatively small volume of discharged water compared to the total volume of the Calcasieu Ship Channel (approximately 86 million cubic meters), and the typically strong tidal currents present in the vicinity of the marine facilities, we anticipate that any increases in water temperature would diminish quickly with distance from the vessel and shortly after discharge. Therefore, we conclude cooling water discharges, while occurring with each LNG vessel, would have temporary and minor impacts on water quality.

Site Construction

Construction and operation of the Terminal would permanently impact 49.8 acres of waterbodies identified on the site, including the Calcasieu Ship Channel and two unnamed waterbodies. Impacts on waterbodies associated with the Terminal are provided in table 4.3.2-1. Commonwealth would mitigate for the loss of the waterbodies through purchases of wetland mitigation bank credits (see section 4.4.2).

We received comments from the public expressing concern that the Terminal would displace floodwaters and exacerbate flooding in the surrounding area. As noted in section 4.3.1.2, the Terminal is in a FEMA floodplain and the area inside the storm surge wall would encompass 84.5 acres and 1.4 million cubic meters within the floodplain. The area within the storm surge wall would represent 0.15 percent of the total acres in the watersheds in which the Project is located. In an average storm surge, the volume displaced by the area within the storm surge walls would represent 0.13 percent of the overall floodplain capacity. Both impacts are very small in relation to the overall floodplain and would not be expected to impact flooding.

We also received comments requesting that we address the impacts of a 1-foot increase in sea level by the year 2050 on the Project, as presented in the NOAA 2022 Sea Level Rise Technical Report (Sweet et al., 2022), and how the Terminal may displace floodwaters associated with sea level rise into the adjacent wetlands and sensitive habitat. NOAA provides a Sea Level Rise Viewer (NOAA, 2022a) that allows map-based visualizations of the expected water depths at a given site due to the 1-foot increase in sea level and the shallow coastal flooding areas that would be at risk for flooding in this scenario. For both metrics, it appears the risk to the Terminal site would consist of coastal high tide flooding near the west side of the Terminal through the existing low-lying areas comprising the wetlands to the west of the Terminal site. The risk of flooding from sea level rise of 1 foot would not appear to originate from the shoreline due south of the Terminal or from the Calcasieu River to the east. Thus, in this scenario, flooding in the wetlands and sensitive habitat west of the Terminal site would occur independent of whether the Terminal is present and the Terminal stormwater culvert, described in section 2.1.1.5, would route floodwaters from the wetlands westward into the Calcasieu River. Additional impacts on the Terminal due to flooding and natural hazards as well as additional mitigation measures are detailed in section 4.12.1.5.

Commonwealth would apply for a floodplain permit through Cameron Parish and a Conditional Letter of Map Revision from FEMA. Because the proposed Terminal location is within a Coastal Zone, Commonwealth would also apply for a Coastal Use Permit through the State of Louisiana. The Terminal would be designed and built to comply with conditions in the LDNR OCM's Coastal Use Permit program. Further discussion of flood zones and Commonwealth's Coastal Zone Permit is provided in sections 4.1.5 and 4.8.5.

Stormwater Runoff

We received a comment concerning the construction of the stormwater system at the terminal site. Commonwealth would grade the Terminal site such that rainwater runoff would flow from north to south into a constructed stormwater retention and settling pond at the south end of the Terminal. Commonwealth would divert runoff from process equipment areas into drainage piping leading to oil-water separators to remove hydrocarbons from the runoff prior to pumping it into the retention and settling pond. The design of the stormwater removal system within the LNG storage tank dike is required to conform to 49 CFR 193.2173, which requires adequate pump capacity to remove water at a rate equal to 25 percent of the maximum predictable collection rate of a storm of 10-year frequency and 1-hour duration. Commonwealth would subsequently pump stormwater from the retention pond over the Terminal's storm protection wall and into the Calcasieu Ship Channel. Given that the stormwater retention system is designed to accommodate significant storm events and minimize erosion, we conclude impacts from stormwater runoff at the Terminal would be minor. Further, Commonwealth would construct its stormwater system to be in compliance with LPDES permit conditions.

Hydrostatic Testing

Commonwealth would use surface water from the Calcasieu Ship Channel for LNG storage tank hydrostatic testing. Hydrostatic testing of the LNG storage tanks would require about 9.9 million gallons of water. The tanks would be tested one at a time. When testing of one tank is complete, the water used for the test would be transferred to the adjacent tank to be used for its testing, thereby reducing the volume of water needed for hydrostatic testing of the tanks. After testing, the water used would be returned to the Calcasieu Ship Channel after a period of resting in an on-site stormwater retention pond and water quality testing to ensure compliance with the Louisiana Pollutant Discharge Elimination System General Permit LAG670000 – Hydrostatic Test and Vessel Testing Wastewater authorization permit limits. The volumetric flow of the Calcasieu Ship Channel, at approximately 115 cubic meters per second (COE, 2010), is far greater than the volume of water required to perform hydrostatic testing of Project components (the 9.9 million gallons would be withdrawn at a rate of less than 0.23 m^3 per second). The anticipated water withdrawal is therefore estimated at about 0.2 percent of the volumetric flow of the Calcasieu River. Withdrawals would be only as needed, on an infrequent basis and only during construction. Therefore, we conclude the withdrawal of water from the Calcasieu Ship Channel for hydrostatic testing would have minimal impacts on surface water.

Hydrostatic test water is not anticipated to be treated with any chemical additives but would be treated with biocides to prevent marine growth inside tanks. The potential impacts of hydrostatic test water withdrawal on aquatic life are discussed in section 4.6.2.2.

Spills and Hazardous Materials

Construction and operation of the Terminal, as well as marine traffic to and from the Terminal, have the potential to adversely impact water quality in the event of an accidental release of a hazardous substance such as fuel, lubricants, coolants, or other material. Commonwealth would implement the measures outlined in the FERC's *Plan* and Commonwealth's *Procedures* to minimize the likelihood of a spill and would implement its *SPAR Plan* in the event of a spill. Additionally, LNG carriers are required to develop and implement a Shipboard Oil Pollution Emergency Plan (SOPEP), which includes measures to be taken when an oil pollution incident has occurred, or a ship is at risk of one. Commonwealth would further minimize the risk of a spill by implementing general preventative BMPs, including personnel training, equipment inspection, secondary and spill containment structures for fuels, vehicles, or equipment, and refueling procedures.

Pipeline

Waterbody Crossings

As depicted in table 4.3.2-2, the Pipeline, and associated temporary workspaces, would affect three major waterbodies (ranging between 114 and 1,170 feet wide) and two intermediate waterbodies (ranging between 40 and 66 feet wide). Commonwealth would use open cut crossing methods to install the Pipeline across the three major waterbodies (see section 2.5.3). The open-cut crossing method is intended to minimize impacts on waterbodies with by limiting in-water activities to equipment necessary to conduct the crossing and the time necessary to complete the crossing. After placing the pipe in the cut, Commonwealth would return stockpiled spoils to the trench and stabilize and restore the banks of the waterbody within 24 hours.

Crossing the waterbodies in this fashion would cause temporary increases in sediment and turbidity and risk spills of hazardous liquids within the waterbodies. Hazardous liquids could include lubricant, hydraulic fluid, and fuel spills from refueling construction equipment, fuel storage, or equipment failure. Commonwealth would implement measures outlined in its *SPAR Plan* and *Procedures* to minimize the potential impacts of spills and hazardous materials in waterbodies (e.g., conducting refueling and storing equipment greater than 100 feet from waterbodies unless an EI determines that there is no reasonable alternative and storing fuel greater than 100 feet from a waterbody).

Commonwealth would cross the intermediate waterbodies using the HDD method, which would reduce potential impacts. However, use of the HDD method could result in an inadvertent return of drilling mud to the surface. Drilling mud primarily consists of water and bentonite clay (a non-toxic clay that is naturally occurring in some parts of the country). If an inadvertent release were to occur, it could temporarily impact water quality (i.e., increasing turbidity and sedimentation). We recommended in the draft EIS that Commonwealth provide a revised *HDD Contingency Plan* detailing the procedures it would follow to minimize the potential for an inadvertent release of drilling mud and to undertake effective cleanup should a release occur. Section 4.1.5.6 details Commonwealth's revised *HDD Contingency Plan*. Based on Commonwealth's revised *HDD Contingency Plan*, we conclude Pipeline construction impacts on waterbodies would not be significant.

TABLE 4.3.2-2 **Summary of Waterbody Impacts associated with the Pipeline**							
FERC Waterbody Classification	**MP**	**Project Component**	**Waterbody Width (feet)**	**Impact Method**	**Construction Impact (acres)**	**Operation Impact (acres)**	**LDEQ Water Use Designation**
Major	0.0	Right-of-way	198	Open cut	< 0.1	< 0.1 a/	PCR, SCR, FWP
		Temporary Workspace		Open cut	0.2	0.0	
		ATWS		Temporary Fill a/	1.2	0.0	
Major	0.2	Right-of-way	114	Open cut	< 0.1	< 0.1 a/	PCR, SCR, FWP
		Temporary Workspace		Open cut	0.2	0.0	
		ATWS		Temporary Fill a/	< 0.1	0.0	
Major	2.1	Right-of-way	1,170	Open cut	0.1	0.1 b/	PCR, SCR, FWP
		Temporary Workspace		Open cut	3.1	0.0	
Intermediate	2.9	HDD	40		0.0	0.0	PCR, SCR, FWP
Intermediate	2.9	HDD	66		0.0	0.0	PCR, SCR, FWP
Intermediate	2.9	Temporary Access Road	66	Temporary Fill c/	< 0.1	0.0	PCR, SCR, FWP

For all waterbodies, flow regime is perennial, fishery type is warmwater. FWP – fish and wildlife propagation
HDD = horizontal directional drill
OYS = oyster propagation
PCR = primary contact recreation SCR = secondary contact recreation
a/ Temporary fill impacts on waterbodies would consist of timber mats being placed in portions of shallow ponds during construction. No water flow would be inhibited. After construction the mats would be removed and the contours of the waterbody restored.
b/ The waterbodies within the permanent easement of the Pipeline would not be affected during operation.
c/ Commonwealth would repair the existing hurricane-damaged culvert in accordance with permit requirements of the Cameron Parish Gravity Drainage District 7 and the LDOTD.

We received a comment from the public indicating that the bridge over the intermediate waterbody at MP 2.9 that Commonwealth has proposed to cross as part of its temporary access road to the HDD exit location was damaged by hurricanes in 2020 and is no longer intact. As described in section 2.5.7, and in response to our recommendation in the draft EIS, Commonwealth states it would repair the culverted crossing (not more than 25 feet wide) sufficient for access by pipeline construction equipment.

Water Use

Information concerning water use during pipeline construction is provided in section 4.3.1.2.

4.3.2.3 Surface Water Conclusions

Construction and operation of the Terminal would permanently fill or excavate 2.8 acres of waterbodies at the Terminal, including a portion of the Calcasieu River and two unnamed waterbodies. The

COE does not require mitigation for impacts on open water under section 404 of the CWA. Commonwealth has therefore not proposed to mitigate for the loss of the surface waterbody acreages through purchases of wetland mitigation bank credits. Construction and operation of the Terminal would also impact water quality within the vicinity of the Project resulting from dredging, maintenance dredging, marine traffic, and stormwater runoff. However, through implementation of the FERC's *Plan* and Commonwealth's *Procedures*, *SPAR Plan*, and BMPs, potential construction and operation impacts resulting from stormwater runoff, or the discharge of hydrostatic test water, would be adequately minimized, and temporary, or avoided and would not be significant.

Construction of the Pipeline would temporarily affect 4.8 acres of waterbodies. Waterbodies crossed by the Pipeline via the open-cut methods would experience temporary decreases in water quality resulting from increased turbidity, sedimentation, and overall bed and bank disturbance. Commonwealth would restore the banks of the waterbodies within 24 hours and turbidity and sedimentation would settle to pre-construction conditions within the same timeframe. Crossing the waterbodies would risk spills of hazardous liquids and inadvertent returns of HDD drilling mud within the waterbodies. However, implementation of Commonwealth's *SPAR Plan*, revised *HDD Contingency Plan*, and Project-specific *Procedures* would adequately minimize impacts on surface water resources to less than significant levels.

4.4 WETLANDS

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, under normal conditions, a prevalence of hydrophytic vegetation (COE, 1987). Hydrophytic vegetation comprises plant species typically adapted for life in saturated soil conditions. Wetlands can be a source of substantial biodiversity and serve a variety of functions that include providing wildlife habitat, recreational opportunities, flood control, and naturally improving water quality. Generally, wetlands in coastal areas are both salt-water and fresh water and include a range of salinity levels. LDNR-OCM characterizes the wetlands in the Project area as fresh/intermediate and brackish. During scoping for the Project, the LDWF and members of the public expressed concern about Project wetland impacts and the avoidance, minimization, and mitigation measures. Commonwealth would use to address these impacts.

Wetlands are protected on a federal basis under Section 404 of the CWA. Section 404 establishes standards under the regulatory jurisdiction of the COE that require avoidance, where possible, and minimization of disturbance, to the degree practicable, where impacts are unavoidable. Section 404(b)(1) includes guidelines that restrict discharges of dredged or fill material where a less environmentally damaging and practicable alternative exists. The COE New Orleans District has authority under Section 404 to review and issue permits for Project-related activities that would result in the discharge of dredged or fill material into waters of the United States, including wetlands.

Wetland impacts authorized under Section 404 of the CWA also require state water quality certification under Section 401 of the CWA and a state-issued Coastal Use Permit for impacts on coastal wetlands. For the proposed Project, state water quality certification would be issued by the LDEQ.

The State of Louisiana defines coastal wetlands as wetlands less than 5 feet above mean sea level that occur within the designated Coastal Zone (Louisiana Revised Statute 49:214.2). According to the revised June 7, 2012 Coastal Zone Inland Boundary, all Project components are within the state-designated Coastal Zone. Coastal wetlands are under the jurisdiction of the LDNR-OCM and the COE. Additional details on Coastal Zone Management designations, and the Coastal Use Permit, can be found in section 4.8.5.

4.4.1 Affected Wetlands

Commonwealth conducted wetland delineations for the Terminal in accordance with the COE's Wetlands Delineation Manual (COE, 1987) and the COE's Atlantic and Gulf Coast Plain Regional Supplement, Version 2.0 (COE, 2010). In accordance with the COE's methodology, an area is a wetland if positive indicators for the three mandatory wetland criteria are identified in a given area, with special exceptions. These criteria include the presence of hydrophytic vegetation, wetland hydrology, and hydric soils.[38]

Wetlands delineated in the Project area were grouped into categories using the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al., 1979). The wetland categories used included estuarine emergent (EEM), estuarine scrub-shrub (ESS), and estuarine forested (EFO). Categories were differentiated by vegetation cover. Estuarine wetlands occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent.

EEM wetlands are tidal wetlands dominated by herbaceous hydrophytic vegetation in areas where salinity is less than 5 parts per thousand (ppt). EEM wetlands within the Project area are typically dominated by perennial plants and showed signs of disturbance within the Project area. Disturbance included altered hydrology from sloughs acting as ditches, cattle grazing activity, and feral hog activity. Common species observed during surveys included native species, such as multiflora rose, , bushy bluestem, gulf cordgrass, roseau cane, and peppervine; and invasive species, such as Japanese honeysuckle.

ESS wetlands are tidal wetlands dominated by low woody hydrophytic vegetation, typically shorter than 16 feet, where salinity is less than 5 ppt. ESS wetlands showed signs of feral hog activity and vehicular traffic disturbance within the Project area. Common species observed during surveys included native species, such as Eastern baccharis, multiflora rose, roseau cane, gulf cordgrass, bushy bluestem, seaside goldenrod, and smartweed, and invasive species, such as Chinese tallow and Japanese honeysuckle.

EFO wetlands are tidal wetlands dominated by trees, typically over 16 feet, in areas where salinity is less than 5 ppt. EFO wetlands showed signs of feral hog disturbance, vehicular traffic, and altered hydrology. Common species observed during surveys included native species, such as sugarberry and multiflora rose, and invasive species, such as Chinese tallow and Japanese honeysuckle.

Further descriptions of the wetland communities identified in the Project area are discussed for the Terminal and Pipeline facilities below. Wetlands that would be affected by the Project, including wetland identification number, wetland types, and nature and acreage of impact, are provided in appendix C for the Terminal and Pipeline.

4.4.1.1 Terminal

A total of 95.9 acres of wetlands would be impacted by construction of the Terminal, of which 89.6 acres would be permanently impacted for operations and 6.3 acres would be temporarily impacted during construction for a construction and laydown area. The 6.3 acres that would be temporarily impacted for the construction and laydown area and 65.8 acres of the permanently impacted area are EEM wetlands. The remaining permanent impact area consists of ESS (9.5 acres) and EFO (14.3 acres) wetlands. The majority (about 81 percent) of the Terminal site is comprised of wetlands.

We received multiple comments expressing concern that construction of the Terminal would negatively alter surface water flow of the wetlands surrounding the Project site. The Terminal would not

38 The LDNR-OCM does not adopt the same three-parameter approach for defining jurisdictional wetlands and their permitting guidelines indicate that wetlands do not need to meet hydric soil criteria to be regulated under the Coastal Use Permit program.

remove surface water connections or otherwise alter the existing hydrology of the surrounding wetlands. As part of its application to the FERC, Commonwealth conducted a Hydraulic Impact Analysis study to determine how best to maintain water flow through the wetlands.[39] Based on the findings of this study, Commonwealth proposes to construct a culvert extending from the west side of the Terminal, along its southern edge, and into the Calcasieu River, as described in section 2.1.1.5. Generally, Commonwealth would use the pre-construction conditions of the wetlands west of the Terminal site, as characterized in its Hydraulic Impact Analysis study, as the standard for the conditions that Commonwealth's culvert designs would seek to maintain. The preliminary design of the structure includes a variable crest weir at its outlet at the Calcasieu River that would allow it to maintain the natural drainage patterns of the existing wetlands. Further, Commonwealth would design the outlet structure to allow tidal inflow into the culvert and surrounding wetlands (i.e., the structure would not contain a backflow prevention device at the outlet) and would contain continuously open fish bays/slots that would allow aquatic fauna to access the culvert and surrounding wetlands. Commonwealth would consult with state and federal agencies, including OCM,NMFS and the COE, to confirm the final design of the structure would be appropriate to maintain the existing drainage patterns of the wetlands west of the Terminal and ingress and egress of aquatic fauna. A weir is a fixed structure and would therefore be self-functioning (i.e., it would not require operation by Commonwealth staff to maintain the appropriate water levels in the surrounding wetlands). However, maintenance and upkeep of the structure (e.g., ensuring it is not blocked by debris) would be incorporated into Commonwealth's Terminal maintenance program and overseen by Commonwealth's Director of Health, Safety, Security, and Environment during operation of the Terminal.

In addition to wetland impacts within the Terminal footprint, the COE has determined that 2.8 acres of intertidal mudflats along the western shoreline of the Calcasieu River that would be removed as part of the dredging activities associated with the marine facility are classified as "special aquatic sites" under section 404 of the CWA.[40] Special aquatic sites are a subset of the waters of the U.S. consisting of areas possessing special ecological characteristics of productivity, habitat, wildlife protection or other important and easily disrupted ecological values. These sites are generally recognized as significantly influencing or positively contributing to the overall environmental health of the entire ecosystem (40 CFR § 230.3).

4.4.1.2 Pipeline

Construction of the Pipeline would disturb 43.6 acres of wetlands, all EEM communities, of which 0.3 acre would be permanently impacted by aboveground facility pilings. About 91 percent of the Pipeline right-of-way would cross wetlands and the other 9 percent of the right-of-way would cross open water (drainage ditches and ponds).

4.4.2 Wetland Impacts and Mitigation

Construction and operation of the Terminal and the Pipeline would permanently and temporarily impact wetlands. Wetland impacts associated with the Project are summarized in table 4.4.2-1.

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39 See appendix 13.J.4 of accession no. 20190820-5125.

40 The 2.8 acres of intertidal mudflats within the dredge footprint of the marine facility that are classified as "special aquatic sites" are predominantly separate from the 2.8 acres of waterbodies that would be filled or excavated within the footprint of the Terminal as discussed in section 4.3.2. The 2.8 acres of intertidal mudflats would include 0.8 acre of the waterbody impacts discussed in section 4.3.2. In addition, they are not considered Project wetland impacts as they are within the footprint of the dredging required for the marine facility.

TABLE 4.4.2-1 **Wetlands Affected by Construction and Operation of the Project (Acres)**								
Facility	**EEM**		**ESS**		**EFO**		**Total**	
	Con a/	**Op b/**	**Con a/**	**Op b/**	**Con a/**	**Op b/**	**Con a/**	**Op b/**
Terminal								
Liquefaction Facility	56.9	56.9	7.7	7.7	12.6	12.6	77.2	77.2
Construction and Laydown Area	6.3	0.0	0.0	0.0	0.0	0.0	6.3	0.0
Marine Facility	2.1	2.1	0.2	0.2	0.2	0.2	2.5	2.5
Stormwater Culvert	1.0	1.0	0.5	0.5	1.1	1.1	2.6	2.6
Appurtenant Structures	1.4	1.4	0.0	0.0	0.0	0.0	1.4	1.4
Access Roads	3.5	3.5	1.0	1.0	0.4	0.4	4.9	4.9
Moran Towing Relocation	0.9	0.9	0.0	0.0	0.0	0.0	0.9	0.9
Facility Total c/	72.1	65.8	9.5	9.5	14.3	14.3	95.9	89.6
Pipeline								
Pipeline Right-of-Way d/	0.9	0.0	0	0	0	0	0.9	0
Temporary Workspace	30.0	0	0	0	0	0	30.0	0
ATWS	11.5	0	0	0	0	0	11.5	0
Aboveground Facilities (Meter Station and pig launcher)	0.3	0.3	0	0	0	0	0.3	0.3
Access Roads	0.9	0	0	0	0	0	0.9	0
Pipeline Total c/	43.6	0.3	0.0	0.0	0.0	0.0	43.6	0.3
Project Total c/	115.7	66.1	9.5	9.5	14.3 e/	14.3 e/	139.5	89.9

a/ Construction impacts: Includes temporary and permanent impacts from construction
b/ Operation impacts: Portion of construction impacts that would be permanently maintained following construction.
c/ Total area values have been rounded and may not total the individual sums in each column.
d/ Pipeline right-of-way does not create permanent impacts because the right-of-way would be restored to native vegetation and result in no permanent impacts at the ground surface.
e/ EFO totals in prior tables within this document contain 0.2 acre of forested upland habitat due to the similarity in vegetation species and habitat provided; the EFO totals in this table only include EFO habitat as determined by wetland delineation.

4.4.2.1 Terminal

We received multiple comments from the public and state and federal agencies expressing concern regarding the potential impacts of the Project on biologically valuable resources and protective coastal habitats, such as wetlands. The LDWF commented that Commonwealth should implement adequate erosion and sediment control measures during construction to minimize impacts on adjacent wetlands and water. Construction of the liquefaction facility would result in the majority (80.5 percent) of construction impacts on wetlands. The construction laydown area (6.7percent), marine facility (2.6 percent), appurtenant structures (1.5 percent), access roads (5.1 percent), stormwater culvert (2.7 percent), and relocation of the Moran Towing facility (0.9 percent) would result in the remaining wetlands impacts. Permanently impacted areas would be expected to remain in a non-vegetated industrial state throughout operation of the Project. A portion of the marine facility area would be converted to open water.

The construction and laydown area would temporarily disturb 6.3 acres of EEM wetlands, which Commonwealth would restore to native vegetation after construction following Commonwealth's *Procedures* and *Workplace Restoration Plan*.[41] These EEM areas would be expected to be restored within one to two growing seasons. Commonwealth would minimize impacts on wetland habitat and open water areas adjacent to the Terminal by installing temporary sediment and erosion control devices during construction and restoration of the construction and laydown area, as prescribed in Commonwealth's *Procedures*.

Commonwealth states it has minimized impacts by using a site configuration that reduces the overall footprint of the Terminal facility while also meeting regulated safety requirements and design considerations. Commonwealth has also reduced temporary workspace impacts by using a modular approach to construction that involves fabricating modules off-site in existing facilities. By constructing the Terminal facility using modules, the Project reduces the need for large construction and laydown areas.

Wetland mitigation for Terminal impacts would follow guidance established by the COE in accordance with the Louisiana Rapid Assessment Method and in coordination with the LDNR-OCM in accordance with the Wetland Value Assessment Method. Commonwealth has completed a pre-application meeting with COE and LDNR-OCM and continues to coordinate with additional stakeholders including the FWS, NMFS Habitat Conservation Division, LDWF, and the Louisiana Coastal Protection and Restoration Authority. Final wetland mitigation would be established during the joint COE and LDNR-OCM permitting process.

Construction of the Terminal would have substantial and permanent impacts on EEM wetlands; however, impacts would be reduced to less-than-significant levels based on Commonwealth's proposed mitigation. Commonwealth has proposed to address wetland mitigation through purchase of wetland mitigation bank credits. The totals of mitigation bank credits would be determined based on COE Louisiana Wetland Rapid Assessment Method and OCM Wetland Value Assessment calculations as approved by the COE and OCM in accordance with the Louisiana Coastal Resources Program. In part for the purpose of determining the appropriate mitigation bank from which to purchase mitigation bank credits, EEM wetlands in the Louisiana Coastal Zone may be further classified according to their salinities and tidal influence. The EEM wetlands at the Terminal site consist of tidally influenced brackish (i.e., higher salinity) marsh, tidally influenced intermediate (i.e., lower salinity) marsh, and non-tidally influenced intermediate marsh. Table 4.4.2-2 provides an accounting of the wetland types and acreages that would be permanently filled through construction of the Terminal and the mitigation banks and credits Commonwealth has proposed.

41 See appendix A of accession no. 20220523-5182.

TABLE 4.4.2-2

Summary of Permanent Wetland Impacts and Proposed Compensatory Mitigation

Wetland Type	Impacts (acres)	Mitigation Credits (acres)	Mitigation Credit Habitat Type	Mitigation Bank
Brackish Marsh, Tidal	11.9 a/	20.8	Brackish Marsh	Rockefeller Refuge
Intermediate Marsh, Tidal	9.2	20.6	Freshwater Marsh	Bull Island
Intermediate Marsh, Non-tidal	44.7	90.0	Freshwater Marsh	South Fork
Estuarine Scrub-Shrub	9.5			
Estuarine Forested	14.3	24.8	Bottomland Hardwood	Bull Island
Totals b/	**89.6**	**156.2**		

a/ Project impacts on tidal brackish marsh are 12.2 acres; however, the 0.3 acre associated with the Pipeline aboveground facilities does not require mitigation by the COE because the impacts are from pilings, which the COE does not consider as fill in waterbodies of the U.S.

b/ Total area values have been rounded and may not total the individual sums in each column.

We received a comment from a local landowner suggesting that portions of the EEM wetlands along the northern boundary of the Terminal site, adjacent to Highway 27/82, that were previously categorized as non-tidal, were in fact tidally connected to the Calcasieu River by culverts extending under the highway to the drainage ditch on the north side of the highway that connects to the river. The tidally influenced intermediate marsh acreage in table 4.4.2-2 includes these wetlands.

We received a comment questioning how Commonwealth's proposed stormwater culvert would maintain hydrologic flow through the wetlands surrounding the terminal site and also maintain subsurface flow. Commonwealth's geotechnical survey of the LNG Facility site indicates that the subsurface soil profile is typically clay with some silty clay and sandy clay layers. All clay layers are expected to be highly resistant to subsurface flow and essentially impermeable for the purposes of surface water migration. The existing surface sand ridges (cheniers) comprise sandy soils, which are permeable to sub-surface flows. Where these features lie outside the LNG Facility, i.e., to the west and south of the LNG Facility, Commonwealth does not propose structures that would affect this sub-surface flow.

Commonwealth's proposed wetland mitigation calculations were still under review by the COE at the time of writing of this final EIS.. However, the COE and OCM would require wetland mitigation to sufficiently offset permanent impacts on wetlands of the United States. Given that Commonwealth would implement its *Workspace Restoration Plan*[42] and *Procedures* to mitigate for temporary impacts on wetlands, and comply with the COE's and OCM's mitigation requirements for permanent impacts on wetlands, we conclude that impacts on wetlands due to construction of the Terminal would not be significant.

42 Commonwealth's revised *Workspace Restoration Plan* was filed by Commonwealth on May 23, 2022 (appendix A of accession number 20220523-5182).

4.4.2.2 Beneficial Use of Dredged Materials Site

As described in section 1.4, Commonwealth proposes to dredge up to about 1.73 million cubic yards of sediment from the Calcasieu River during construction to achieve an appropriate depth for the marine facility and subsequently dredge about 152,000 cubic yards every two years to maintain the marine facility depths. Commonwealth proposes to transport the sediments dredged during construction and the first two maintenance dredges to a BUDM site within the wetlands on the south shore of Calcasieu Lake in the East Cove Unit of the FWS Cameron Prairie NWR approximately 6 miles northeast of the Project site. The East Cove Unit was originally established as part of the Sabine NWR but was transferred to the Cameron Prairie NWR in 2001. Commonwealth would install a temporary slurry pipeline extending from the marine facility across the bottom of the Calcasieu Ship Channel, northeast through the Cameron Loop Channel, out of the Cameron Loop Channel just west of Rex Street in the Town of Cameron and under Highway 27/82, and then northeast aboveground along existing roadbeds, levees, and wetlands to the BUDM site at approximately 29.830º latitude and -93.274º longitude (figure 4.4-1). As mentioned in section 1.4, the BUDM site, and associated disposal pipeline are non-jurisdictional to the Commission but are addressed in the resource sections of this final EIS given they are integrative to the Project. Commonwealth would anchor the slurry pipeline along the bottom of the Calcasieu Ship Channel to prevent the pipeline from interfering with navigation. Commonwealth would coordinate with LDOTD regarding appropriate methods and permits to bore under Highway 27/82 at Rex Street in Cameron. Where the slurry pipeline would cross wetlands, Commonwealth would use temporary timber matting to minimize impacts. The slurry pipeline would extend about 6.9 miles and would require seven booster pumps to transport the slurry to the site. Table 4.4.2-3 provides the acreage impacts of the proposed slurry transport pipeline and BUDM site.

The FWS would use the dredge sediments for emergent wetlands creation, thus satisfying Louisiana coastal use regulations for BUDM (LAC 43:I Ch. 7 § 724). The location within the Cameron Prairie NWR that Commonwealth has proposed is listed in the state of Louisiana's *Comprehensive Master Plan for a Sustainable Coast* as a marsh restoration site (CPRA, 2017). The FWS has informed Commonwealth they would accept the dredge sediments at elevations appropriate for shallow waters, mudflats, wetlands, or as existing wetland nourishment.[43] Commonwealth is not proposing to use this BUDM as compensatory mitigation for the wetland impacts of the Project. However, the COE has informed Commonwealth that it would consider the provision of dredged sediment to the FWS for its beneficial use (without further involvement from Commonwealth, such as long-term monitoring or restoration success criteria) as sufficient mitigation for the impacts of the Project on the 2.8 acres of marine facility mudflats, considered by the COE as a Special Aquatic Site, and for the impacts on wetlands of the dredge slurry pipeline and BUDM site.[44] Likewise, we conclude that the permanent impacts on the Special Aquatic Site mudflats associated with construction of the marine facility and the temporary impacts on wetlands associated with Commonwealth's proposed BUDM site would be accounted for through Commonwealth's compliance with the Clean Water Act and therefore are not significant.

43 See Correspondence 942 on May 24, 2022 from appendix C of accession no. 20220624-5165.

44 See Correspondence 977 on June 14, 2022 from appendix C of accession no. 20220624-5165.

TABLE 4.4.2-3

Impacts Associated with Commonwealth's Proposed Beneficial Use of Dredged Materials (BUDM) Site

BUDM Component	Habitat Type	Length (linear ft)	Area (acres)
Slurry pipeline (with booster pumps)	Estuarine water bottom/water column (open water)	21,173	24.3
Slurry pipeline (with booster pumps)	Upland	13,781	-- a/
Slurry pipeline (with booster pumps)	EEM (intermediate marsh)	1,690	1.9
Dredge material placement area	EEM (intermediate marsh)	--	217
Dredge material placement area	Estuarine water bottom/water column (open water)	--	423

a/ Upland acreages are not presented in this table

Commonwealth filed a Dredged Material Management Plan (DMMP) for its currently proposed BUDM site on July 28, 2022.[45] In accordance with requests from NMFS, this plan includes figures indicating the location and acreages of the BUDM site; the preliminary target construction and settlement elevations of the BUDM site; a description of the methods Commonwealth would employ to transport the dredge slurry to the BUDM site, and the associated resource impacts of these methods; and an analysis of potential alternatives to its proposed BUDM site location including a no-action alternative, upland disposal, nearshore BUDM site, and alternative BUDM sites. NMFS provided cooperating agency comments on the DMMP as it pertains to EFH, expressing concern that Commonwealth's proposed site plans would create temporal loss of habitat functions at the site. NMFS recommended that Commonwealth perform a geotechnical analysis on the proposed BUDM site to inform selection of an appropriate target construction elevation and a target settled elevation; provide a settlement curve, adjusted for sea level rise over the Project life, to ensure the site's target construction elevation would fall within the percent inundation range, within three to five years maximum, of the specific marsh species to be restored at the site; and to refer to nearby CPRA marsh creation areas for appropriate target construction areas and thereby ensure temporal loss of intertidal habitats would not occur. As previously mentioned, and further described below, EFH consultation is currently ongoing with NMFS.

As noted above, the BUDM site would be non-jurisdictional to the Commission and, accordingly, we would not recommend specifications for the BUDM site. As of publication of this document, Commonwealth is continuing consultation with OCM regarding details of the site, such as specifications of the location and design of the site containment dikes, and dike borrow areas, to ensure the hydraulic connections of adjacent marsh areas would be maintained. Commonwealth would require a different placement area for the dredge materials after its first two maintenance dredges, as the FWS's need for sediment at the currently proposed BUDM site would be unknown beyond provision of the 1.73 million cubic yards of sediment from the initial dredging and the 304,000 cubic yards of sediment from the first two maintenance dredges. Commonwealth states that it would develop an updated DMMP prior to the third round of maintenance dredging. This plan would include formal figures indicating the location(s) and acreages of the new dredged material placement area; a description of the methods Commonwealth would employ to transport the dredge slurry to the new site and the associated resource impacts of these methods; an updated list of permits or approvals necessary to complete the dredge disposal process; and an alternatives analysis of potential disposal locations including a no-action alternative, upland disposal, nearshore dredge material placement area, and alternative beneficial use areas.

45 See appendix C of accession no. 20220728-5187.

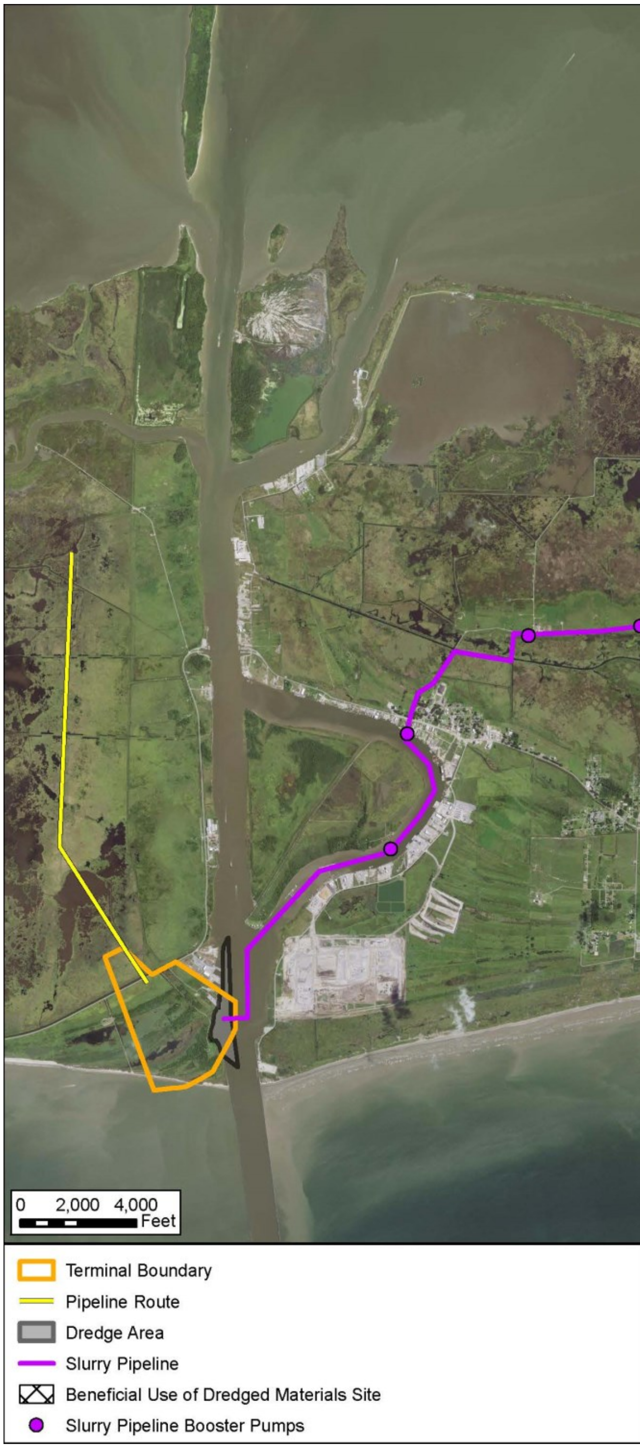

Figure 4.4-1

Commonwealth LNG Project

Beneficial Use of Dredged Materials Site

4.4.2.3 Pipeline

Commonwealth would disturb 43.6 acres of EEM wetlands during construction of the Pipeline, including aboveground facilities, ATWS areas, and a temporary access road. As mentioned above, the majority (91 percent) of Pipeline construction would occur in wetlands and the remaining 9 percent would occur in open water (drainage ditches and ponds).

Pipeline construction in wetlands would use a push-pull method when soils are saturated or inundated. The push-pull method uses low-ground-pressure equipment or equipment mats to excavate a trench and string pipeline. The pipeline is floated into place using attached floats suspended on water, which seeps into the trench. Once the pipeline is in place, the floats are removed, and the trench is backfilled. Additional details of the push-pull construction method are included in section 2.5.3. Pipeline construction would be limited to a 110-foot-wide right-of-way, and methods would include excavation of the Pipeline trench, stockpiling of trench spoil, where possible, and backfilling of the trench. Trenching would disturb soils and temporarily affect the rate and direction of water movement within disturbed wetlands. Unrestored contours could modify wetland hydrology and revegetation through creation of soil conditions that no longer support wetland communities. Improperly installed soils during trench backfilling could create mixed soil layers, altering reestablishment of native wetland vegetation and biological components of the wetland. Heavy machinery travel and temporary soil stockpiling in wetland areas could create compaction and furrowing of soils, which could alter natural hydrology and reduce vegetation regrowth. Construction equipment could introduce non-native and invasive species into the disturbed areas. Wetland regeneration could be impacted by altered surface drainage patterns, runoff from the trench during construction, and accidental spills from construction equipment.

Construction impacts would be largest during trench excavation and backfilling. The FERC's *Plan* and Commonwealth's *Procedures* require that disturbed areas along the Pipeline be restored to preconstruction contours following construction. Construction equipment in wetland areas would be limited to items necessary to construct in those areas. Commonwealth would minimize impacts on wetland habitat and open water areas outside of the construction right-of-way by installing temporary sediment and erosion control devices, as prescribed in Commonwealth's *Procedures*. During excavation, Commonwealth would segregate the upper 1 foot of topsoil when soils remain dry enough during the construction period. In saturated soil conditions, topsoil segregation would not be feasible. We received comments expressing concern that there would not be enough native material to fill the excavated ditch to pre-construction conditions or that the bankline at the marsh/open water interface could be compromised by work activities. For example, if material excavated from the trench was saturated at the time of excavation, loss of pore water during stockpiling could result in a loss of backfill volume. As noted in section 2.5.2.5 and Commonwealth's revised *Workspace Restoration Plan*, Commonwealth would assess areas overlying the backfilled trenchline to determine whether additional fill should be imported to ensure that the trenchline is returned to original grade and contour after settling. Should importation of soils be necessary, Commonwealth has committed to offset any settling with locally sourced fill as described in section 2.5.1.1. Commonwealth would also comply with the measures in its *Procedures* which would help prevent spoil piles from impacting wetlands or waterbodies, including those in sections VI.B.2.h, VI.B.2.j, and V.B.4.

Other potential impacts on wetlands could occur as a result of inadvertent releases of drilling fluid during Commonwealth's HDD operations. While Commonwealth would generally use open cut methods to cross wetlands in the right-of-way, Commonwealth would use the HDD method to cross Highway 27/82 (see section 2.5.3). The HDD alignment to cross the highway would extend 1,940 feet from approximately MP 2.7 to MP 2.99. Commonwealth conducted a risk assessment of the hydraulic fracture and drilling fluid surface release potential that indicated the risk of an inadvertent release of drilling mud into the EEM wetlands along the HDD alignment is "high" to "very high." In the draft EIS, we recommended Commonwealth file a revised *HDD Contingency Plan* that, in part, provides a detailed approach for reducing the potential for an inadvertent release of drilling mud, a detailed contingency plan for responding to an inadvertent release of drilling mud in wetland habitat, and a plan to mitigate for any adverse impacts on wetlands.

As noted in section 4.1.5.6, Commonwealth filed a revised *HDD Contingency Plan* containing Commonwealth's proposed approach to responding to an inadvertent release of drilling mud in aquatic habitat or wetlands. If an inadvertent release of drilling mud occurred in a sensitive resource such as a wetland or waterbody, Commonwealth would suspend drilling operations to allow the EI to quantify the extent of the inadvertent release, document its location (including taking photographs), assess the potential impacts on the sensitive resource, and report the incident to Commonwealth's Construction Management Team. The HDD contractor would be advised to commence actions necessary to reduce, eliminate, or control the inadvertent return. Such actions would include the following:

- evaluating the release to assess whether containment structures would effectively contain the release or if placement of containment structures would cause additional resource impacts; the HDD contractor would obtain approval from state or federal agencies as appropriate, and the landowner(s) if necessary;
- collecting drilling mud returns at the drill entry location for future analysis, as required;
- determining and implementing modifications to the drilling technique or composition of the drilling fluid as appropriate to prevent or minimize further drilling mud releases;
- taking reasonable measures, within the limitation of the HDD technology and the contractor's capabilities, to re-establish drilling mud circulation; and
- resuming drilling operations only once the inadvertent return is contained and remediated.

HDD activities would only be implemented under close supervision by the EI. Commonwealth would continue to monitor the inadvertent return area during daily inspections. Upon completion of the HDD operations, Commonwealth would consult with applicable agencies (e.g., FERC, OCM) to determine whether any final clean-up requirements would be necessary. Commonwealth would monitor recovery of the release area and provide mitigation as necessary, as described in Commonwealth's Project-specific *Procedures*. We conclude these methods are sufficient to minimize impacts on wetland habitat due to an inadvertent return of HDD drilling mud.

Commonwealth would restore construction workspaces according to its *Procedures*, revised *Workspace Restoration Plan*, and revised *HDD Contingency Plan*. Commonwealth's *Procedures* also require it to monitor and record the success of wetland revegetation annually for the first three years following construction. If revegetation does not meet the prescribed restoration criteria specified in Commonwealth's *Procedures* within three years of construction, Commonwealth would be required to develop a remedial revegetation and monitoring plan, in consultation with a professional wetland ecologist, to continue revegetation efforts and file a report annually documenting progress until revegetation is successful. With implementation of these measures, we conclude that construction impacts from Pipeline installation on wetlands would be adequately minimized.

Approximately 0.9 acre of wetlands would be within the permanent easement area of the Pipeline, which includes wetlands within a 3.5-foot-wide permanent pipeline right-of-way. The permanent right-of-way would be periodically maintained to remove any woody vegetation, but because all vegetation communities in the right-of-way are dominated by non-woody vegetation, maintenance would be minimal.

Commonwealth would permanently impact approximately 0.3 acre of wetland by installing pilings supporting the aboveground facilities. These areas would be permanently converted to non-wetland. However, the COE does not consider the placement of pilings as a discharge of fill material within wetlands; therefore, the 0.3 acre of wetlands comprising the individual footprints of the aboveground facility support pilings would not require mitigation. Given that 99 percent of the wetland impacts associated with construction of the Pipeline would be restored to pre-construction conditions through implementation of the measures in Commonwealth's *Workspace Restoration Plan,* Project-specific *Procedures*, and revised *HDD Contingency Plan*, we conclude that impacts on wetlands from Pipeline construction and operation would be largely short-term (until revegetation is successful) and not significant.

4.4.3 Alternative Measures to FERC Procedures

Commonwealth proposes to use Project-specific *Procedures* to construct the Project. Commonwealth's *Procedures* provide justifications for conducting work in wetland habitat and/or modify the FERC's *Procedures* where Commonwealth deemed it unavoidable. These justifications and modifications are described below. We have reviewed the modifications and the site-specific justifications and have found them to be justified, particularly given the hydrology of the region, and adequately protective of the environment.

4.4.3.1 Extra Work Areas

Section II.A.1 of the FERC *Procedures* requires site-specific justifications for extra work areas that would be closer than 50 feet from a waterbody or wetland. Section VI.B.1.a of the FERC *Procedures* requires that extra work areas be at least 50 feet from wetland boundaries except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. Given that the majority of the Project area consists of wetlands and ATWS areas are required near or adjacent to construction activity, it is not logistically feasible to locate ATWS outside of wetland areas. Commonwealth has proposed to place all ATWS areas for pipeline construction within wetlands (table 4.4.3-1). ATWS areas would be used for equipment staging, fueling, hazardous materials storage, spoil material storage, and access roads. Impact minimization measures for ATWS area would include installation of timber mats in ATWS at high traffic workstations, such as push sites and HDD sites, and use of low-ground pressure, amphibious equipment in push workspaces and associated ATWS.

TABLE 4.4.3-1

Pipeline Construction ATWS Proposed for Placement Within Wetlands

Milepost	ATWS ID and Size (feet x feet)	Construction Impacts (acres)	Operation Impacts (acres)	Justification for Placing Within 50 Feet of a Wetland
0.00	ATWS #01 (410 x 407)	3.4	0.0	Aboveground facility workspace
0.16	ATWS #02 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
0.17	ATWS #03 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
0.22	ATWS #04 (310 x 50)	0.36	0.0	Temporary spoil stockpile for ditch crossing
0.22	ATWS #05 (200 x 50)	0.23	0.0	Temporary spoil stockpile for ditch crossing
0.26	ATWS #06 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
0.27	ATWS #07 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
0.47	ATWS #08 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
0.47	ATWS #09 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
0.51	ATWS #10 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
0.58	ATWS #11 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
0.60	ATWS #12 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
0.64	ATWS #13 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
0.64	ATWS #14 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
0.66	ATWS #15 (145 x 50)	0.17	0.0	Temporary spoil stockpile for ditch crossing
0.68	ATWS #16 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
0.70	ATWS #17 (50 x 50)	0.06	0.0	Temporary spoil stockpile for ditch crossing
0.70	ATWS #18 (50 x 50)	0.06	0.0	Temporary spoil stockpile for ditch crossing
0.72	ATWS #19 (409 x 144)	1.3	0.0	Aboveground facility workspace
0.72	ATWS #20 (409 x 155)	1.4	0.0	Aboveground facility workspace
1.16	ATWS #21 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
1.17	ATWS #22 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing

TABLE 4.4.3-1 **Pipeline Construction ATWS Proposed for Placement Within Wetlands**				
Milepost	**ATWS ID and Size (feet x feet)**	**Construction Impacts (acres)**	**Operation Impacts (acres)**	**Justification for Placing Within 50 Feet of a Wetland**
1.21	ATWS #23 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
1.23	ATWS #24 (100 x 50)	0.11	0.0	Temporary spoil stockpile for ditch crossing
2.57	ATWS #25 (400 x 300)	2.8	0.0	Push Pull workspace
2.63	ATWS #26 (230 x 200)	1.1	0.0	HDD Exit

Due to the prevalence of wetlands in the Project area, we concur that placing extra work areas in wetlands would be unavoidable and the proposed alternative measures are justified. The proposed mitigation measures, such as timber mats and low ground pressure equipment, would lessen the impact of the Project on wetlands.

4.4.3.2 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. Because the majority of the Project area consists of wetlands, fueling equipment outside of wetland areas is not logistically feasible. Commonwealth proposes to prepare equipment parking areas less than 100 feet from wetlands within secondary containment structures and spill containment kits. All refueling and equipment parking and storage procedures would be undertaken in accordance with Commonwealth's *SPAR Plan* to reduce the potential for spills during construction and to mitigate the environmental impacts if a spill should 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. Because the majority of the Project area consists of wetlands, it would be logistically impractical and potentially more environmentally damaging to divert construction equipment long distances to refuel than to temporarily store hazardous materials on-site. Commonwealth proposes to temporarily store hazardous materials used for maintenance at locations within 100 feet of a wetland. Temporary storage areas would be prepared with secondary containment structures and spill containment kits to prevent discharges of spills into wetlands. All hazardous material storage areas would be prepared in accordance with Commonwealth's *SPAR Plan* to reduce the potential for spills during construction and to mitigate the environmental impacts if a spill should occur.

Due to the prevalence of wetlands in the Project area, equipment staging and storage of hazardous materials in wetlands is unavoidable, and the proposed alternative measure is justified.

4.4.3.3 Concrete Coating Activities

Section IV.A.1.f of our *Procedures* requires that concrete activities not be performed within 100 feet of a wetland or waterbody boundary, unless the location is an existing industrial site designated for such use. Pipeline sections would arrive mostly pre-coated with concrete; however, pipeline end sections would require welding and coating on-site. Repairs of pipeline sections damaged in transport would also occur on-site. Since the majority of the Project area consists of wetlands and coating activities are required during final Pipeline installation, it is not logistically feasible to perform coating activities outside of wetland areas. Commonwealth proposes to perform concrete coating activities within wetland areas but would prepare all concrete coating areas with secondary containment structures and spill containment kits to prevent discharges of concrete material into wetlands. Due to the prevalence of wetlands in the Project area, performing concrete coating in wetlands is unavoidable and the proposed alternative justified.

4.4.3.4 Aboveground Facilities

Section VI.A.6 of our *Procedures* requires that aboveground facilities be located outside wetlands, except where the location of such facilities outside of wetlands would prohibit compliance with DOT regulations. Commonwealth has proposed an alternative measure to this requirement to allow the construction of the Terminal, pig launcher, and meter station within wetlands. The Terminal, pig launcher, and meter station footprint has been minimized, but cannot be sited to fully avoid wetlands due to the prevalence of wetlands across the Project area. The meter station must connect to the existing Kinetica meter station because that is the proposed receipt point of feed gas from the existing Kinetica pipeline. The existing Kinetica meter station is completely surrounded by wetlands. Therefore, we agree that construction of these facilities within wetlands is unavoidable and justified. We discuss potential alternative locations for the Pipeline and the associated aboveground facilities in sections 3.8 and 3.9.

4.4.3.5 Access Roads

Section VI.B.1.d of our *Procedures* requires 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 have no impact on wetlands. Commonwealth has requested a modification to this requirement to allow construction of an access road for construction access where there are no existing roads. The proposed temporary access road would connect the Pipeline route and HDD staging area to an existing roadway. Because the pipeline goes under the existing roadway and would be below ground across the HDD route, the access road is the only way to reach the HDD staging area from the existing roadway. No alternative route for the road exists because the majority of the Pipeline route is wetland.

We conclude this modification has been adequately justified, associated impacts have been minimized to the extent practicable, and these impacts would be temporary and not significant. In addition, Commonwealth would mitigate impacts through purchase of mitigation bank credits.

4.4.4 Wetlands Conclusions

Construction and operation of the Project would result in short-term, temporary, and permanent impacts on wetlands and would require Commonwealth to implement alternative measures to the FERC's *Procedures*. However, the total impacted wetland area for the Project represents about 0.3 percent of the approximately 27,000 acres of wetlands contained within the HUC 12 watershed, in which the Project resides. Through implementation of the measures in Commonwealth's *Workspace Restoration Plan* and Project-specific *Procedures* and Commonwealth's compliance with the Clean Water Act (e.g., proposed mitigation bank credits), we conclude that the impacts on wetlands would be adequately minimized and sufficiently mitigated for, in accordance with the requirements of the federal and state agencies.

4.5 VEGETATION

The Project is within the Texas-Louisiana Marshes Ecoregion (Level IV), within the larger Western Gulf Coastal Plain Ecoregion (Level III). The Texas-Louisiana Marshes Ecoregion is described as flat plains covered by standing water, including tidal marshes with bayous, lakes, canals, and cheniers.[46] The primary land use and land cover types include marshland, wildlife and waterfowl habitat, and oil and gas production (Daigle et al., 2006). The primary vegetation type surrounding the Project area is coastal marsh.

The most common vegetation communities in the Project area are EEM, ESS, and EFO wetlands with brackish or intermediate salinity. Common species are described in section 4.4.1 (Wetlands). The ESS areas of coastal Louisiana may be found in transition zones between marsh vegetation and areas of higher elevation, such as chenier vegetation (LDWF, 2009). The EFO wetlands include seven areas that are considered cheniers. One additional chenier area is considered non-wetland but is included with this vegetation group due to the similarity in vegetation with the chenier areas that are considered wetland. All of the vegetated Project areas are generally disturbed due to feral hog activity and altered hydrology. Detailed wetland area characteristics are described in section 4.4.1. Detailed chenier area characteristics are described in section 4.5.3.

The remaining vegetation communities include slough, open land, and developed land.[47] Sloughs within the Project area are perennial or intermittent ditches with altered hydrology that often drain the surrounding wetland communities. Sloughs typically contain similar vegetation as EEM areas. Open land areas are non-forested lands containing a mix of native and exotic species and dominated by grasses (e.g., Johnsongrass, Bermuda grass), forbs (e.g., white clover, annual ragweed), and shrubs (e.g., yaupon). Developed land is land that has experienced some amount of grading or surface manipulation and is partially unvegetated.

4.5.1 Construction and Operation Impacts and Mitigation

The Project would impact 142.0 acres of vegetation (not including open water) during construction, of which 92.4 acres would be permanently impacted during operation. The Terminal would impact 98.4 acres during construction, of which 92.1 acres would remain impacted during operation. The Pipeline would impact 43.6 acres during construction, of which 0.3 acre would remain impacted during operation. The majority of the construction impacts would occur in EEM wetlands (82 percent). The remaining vegetation types (EFO wetland and cheniers, ESS wetland, open, and slough) would each comprise 10 percent or less of the construction impacts. Operation would primarily impact EEM wetlands (72 percent), EFO wetlands and cheniers (16 percent), and ESS wetlands (10 percent). A summary of Project impacts on vegetation is included in table 4.5.1-1.

4.5.1.1 Terminal

Construction of the Terminal would result in 98.4 acres of impact on vegetation, of which 92.1 acres would be permanent. Types of vegetation impacted during operation would include EEM wetland (71 percent), EFO wetland and chenier (16 percent), ESS wetland (10 percent), and a small portion of other cover types. The additional 13.1 acres of temporary impacts would occur on developed land (52 percent) and EEM wetland (48 percent).

The majority of the Terminal impacts would result from the liquefaction facility (80 percent). The construction and laydown area (6 percent), access roads (5 percent), marine facility (3 percent), stormwater

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46 Cheniers are forested vegetation, formally known as coastal live-oak hackberry forest, that form on abandoned beach ridges and are considered vegetative communities of special concern in Louisiana (see section 4.5.3)

47 Open water within the Project area is dredged deep-water habitat that is not expected to contain aquatic vegetation.

culvert (3 percent), Moran Towing facilities (1 percent), and administration/maintenance buildings (1 percent) would compose the remaining impacts.

The majority of the impacts from the Terminal would be permanent and would not be restored. These areas would be converted to developed industrial land that is part of the facility, surrounding access roads, and auxiliary structures. Permanently impacted vegetation would be largely EEM, EFO, and ESS wetlands, which are currently disturbed due to feral hog activity and altered hydrology. A small portion of the permanently impacted area would include chenier areas. Approximately 2.5 million acres of coastal wetlands are currently present across Louisiana and about 27,000 acres of coastal wetlands are present within the HUC 12 watershed that encompasses the Project area. The loss of an approximately 90-acre area of wetlands represents a small fraction of the overall total wetland area in the state and would result in a minor overall impact within the HUC 12 watershed. Nonetheless, Commonwealth would mitigate for the loss of wetlands through purchase of wetland mitigation bank credits for the different types of wetland habitat affected (see section 4.4.2).

The temporary impact areas (13.1 acres) would be evenly split between developed land, which would not represent a loss of native vegetation, and EEM wetland, which Commonwealth would restore after construction. Commonwealth would follow the restoration measures in its *Workspace Restoration Plan,* which includes planting a mixture of gulf cordgrass, smooth cordgrass, saltmeadow cordgrass, and saltgrass seedlings at 36-inch spacing within the temporary construction and laydown area. Commonwealth would monitor the plantings over three growing seasons to assess the success of the restoration and confirm that invasive species and noxious weeds are not greater than the surrounding areas. The restoration would be considered successful once the area satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation criteria); vegetation cover in the right-of-way is at least 80 percent of the cover in the adjacent area; and no invasive species or noxious weeds are present in numbers greater than in the surrounding area. Restoration of developed and EEM vegetation is likely to occur within one to two growing seasons in the temporarily impacted areas.

4.5.1.2 Pipeline

Construction of the Pipeline would result in 43.6 acres of impacts, of which 0.3 acre would be permanent impacts on vegetation. All of the temporary vegetation impacts would occur in EEM wetlands. The Pipeline would also cross drainage ditches and ponds. All construction areas along the Pipeline right-of-way would be restored with native vegetation after pipe installation, and as a result, would be considered temporary impacts. All permanent impacts would result from construction of aboveground facilities in EEM wetlands.

During Pipeline construction, vegetation would be removed within the 110-foot-wide construction right-of-way. Additional areas would be cleared for staging, equipment laydown, and parking. Areas would be graded as needed. Commonwealth would follow the FERC's *Plan* and Commonwealth's Project-specific *Procedures*, which include temporary and permanent erosion control measures, testing and mitigation for soil compaction, and topsoil segregation above the trench in wetlands. Because all vegetation types disturbed by construction of the Pipeline are emergent, non-woody communities, temporary impacts would be expected to be restored within a one to two growing seasons.

Following construction, Commonwealth would maintain access to a 3.5-foot-wide right-of-way as a permanent easement. The permanent easement would be periodically maintained to remove any woody vegetation, but because all vegetation communities in the right-of-way are dominated by non-woody vegetation, maintenance would be minimal.

Permanent impacts from aboveground facilities (i.e., meter station and pig launcher) would total 0.3 acre in EEM wetlands. This disturbance to emergent wetland vegetation represents a small portion of the overall surrounding emergent wetland community. The relatively small permanent loss of EEM wetlands would result in a minor overall impact.

In comments filed to the public docket, LDWF expressed concern regarding the possibility of habitat fragmentation resulting from construction of the Pipeline. Generally, pipeline construction can result in vegetation fragmentation (Lester et al., 2005). However, vegetation fragmentation is not expected to result from this Project due to the high level of existing disturbance in the area around the Pipeline and Commonwealth's proposed restoration and revegetation efforts, which would include restoring the entire construction right-of-way. To minimize impacts on vegetation associated with the Pipeline, Commonwealth would implement restoration measures outlined in its revised *Workspace Restoration Plan* and the Project-specific *Procedures*. Restoration measures would include planting Gulf cordgrass and saltgrass seedlings throughout the Pipeline right-of-way. Commonwealth would monitor the plantings over three growing seasons to assess the success of the restoration and confirm that invasive species and noxious weeds are absent. The restoration would be considered successful once the area satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation criteria); vegetation cover in the right-of-way is at least 80 percent of the cover in the adjacent area; and invasive species or noxious weeds are not present in numbers greater than in the surrounding area. Should revegetation not be successful within three years, in accordance with Commonwealth's Project-specific Procedures, Commonwealth must consult with a professional wetland ecologist to develop a remedial revegetation plan to actively revegetate the wetlands.

4.5.1.3 Park and Ride Facilities

Commonwealth would use two existing gravel parking lots adjacent in Carlyss, Louisiana as Park and Ride facilities for workers to park off-site and be shuttled to the Project site during construction (see section 2.1.1.5). No vegetation would be impacted through Commonwealth's use of these sites.

TABLE 4.5.1-1

Vegetation Affected by Construction and Operation of the Project (Acres)

Terminal	Open Land		Emergent Wetland		Shrub Wetland		Forested Wetland & Chenier		Slough		Total	
	Con a/	**Op b/**	**Con a/**	**Op b/**	**Con a/**	**Op b/**	**Con a/**	**Op b/**	**Con a/**	**Op b/**	**Con a/**	**Op b/**
Facility												
Liquefaction Facility	0.2	0.2	56.9	56.9	7.7	7.7	12.6	12.6	1.1	1.1	78.5	78.5
Construction & Laydown Area	0	0	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0
Marine Facility	0.6	0.6	2.1	2.1	0.2	0.2	0.2	0.2	0.1	0.1	3.2	3.2
Stormwater Culvert	0	0	1.0	1.0	0.5	0.5	1.3	1.3	0.3	0.3	3.1	3.1
Appurtenant Structures	0	0	1.4	1.4	0.0	0.0	0.0	0.0	0.0	0.0	1.4	1.4
Access Roads (outside of stormwater protection wall)	0	0	3.5	3.5	1.0	1.0	0.4	0.4	0.1	0.1	5.0	5.0
Moran Towing	0	0	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.9
Facility Total c/	**0.8**	**0.8**	**72.1**	**65.8**	**9.5**	**9.5**	**14.5**	**14.5**	**1.6**	**1.6**	**98.4**	**92.1**
Pipeline												
Pipeline Right-of-Way d/	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0
Aboveground Facilities (Meter Stations and pig launcher)	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Temporary Workspace	0.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	0.0
ATWS	0.0	0.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5	0.0
Temporary Access Roads	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0
Pipeline Total c/	**0.0**	**0.0**	**43.6**	**0.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**43.6**	**0.3**
Park and Ride Facilities												
Southland Airport Lot	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Circle K Lot	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Project Total c/	**0.8**	**0.8**	**115.7**	**66.1**	**9.5**	**9.5**	**14.5**	**14.5**	**1.6**	**1.6**	**142.0**	**92.4**

a/ Construction impacts: Includes temporary and permanent impacts from construction.
b/ Operation impacts: Portion of construction impacts that would be permanently maintained following construction.
c/ Total area values have been rounded and may not total the individual sums in each column.
d/ Pipeline right-of-way does not create permanent impacts because Commonwealth would restore the right-of-way to preconstruction conditions with native vegetation, resulting in no permanent impacts at the ground surface.

4.5.1.4 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. The following invasive plants were identified by the LDWF as having the potential to occur in the Project area: giant salvinia, water hyacinth, and waterthyme. Commonwealth's field surveys did not identify any of these species in the Project area. Chinese tallow has been designated as a noxious weed by the State of Louisiana and was found in multiple ESS and EFO wetlands and chenier areas during Commonwealth's field surveys. Chinese tallow poses a substantial threat to vegetation communities in the area by rapidly replacing native plants and trees and radically altering wetland, forest, and coastal prairie ecosystems.

Commonwealth would use measures outlined in our Plan and Commonwealth's Project-specific *Procedures* and *Invasive Species Management Plan*[48] to minimize risk of invasive species and monitor disturbed areas for invasive species. Commonwealth has worked with the NRCS and LDWF to establish appropriate restoration seed mixes, weed and invasive plant treatment methods, and monitoring protocols. Commonwealth would incorporate agency recommendations into its *Invasive Species Management Plan*.

Invasive and/or exotic vegetation can also be introduced to an area by ballast water and ship hulls, anchors, and chains. To prevent this from occurring, ships using the Terminal would adhere to the guidelines listed in the USCG Office of Operation and Environmental Standards' *Mandatory Practices for All Vessels with Ballast Tanks on All Waters of the U.S*. and compliance with USCG ballast water regulations (33 CFR Part 151, subpart D and 46 CFR 162.060). These guidelines were developed to implement the provisions of the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 as amended by the National Invasive Species Act of 1996. The guidelines require vessel operators to:

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

The guidelines also include reporting and recordkeeping requirements regarding their implementation. Copies of the reports must be sent to the USCG and maintained on the vessel for at least 2 years (COE, 2015). Ballast water would be discharged using a USCG-approved ballast water management system, which are designed to kill, render harmless, or remove organisms to prevent the spread of invasive species by ballast water.

4.5.2 Vegetative Communities of Special Concern

Vegetative 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. The Project would largely impact coastal wetland areas. Vegetative communities of special concern in the Project area include coastal live oak-hackberry forest (cheniers). In communications with Commonwealth regarding potential impacts of the Project on federal and state

48 See appendix 3C of Commonwealth's application to the FERC (accession no. 20190820-5125).

protected resources, neither the FWS nor the LDWF expressed concern regarding potential presence of federal- or state-designated rare plant species at the Project site.

4.5.2.1 Chenier – Coastal Live Oak-Hackberry Forest

During scoping, the FWS (2018) and LDWF (2018) expressed concern for impacts on chenier communities, formally known as coastal live-oak hackberry forest, in the Project area. We also received comments from the public, including local landowners, expressing concern regarding potential Project impacts on chenier habitat. Chenier communities are considered communities of special concern in Louisiana. Chenier communities form on abandoned beach ridges primarily in coastal southwest Louisiana and are stranded via deltaic sedimentation by the constantly shifting Mississippi River. Cheniers provide storm barriers, limit saltwater intrusion, and provide stopover sites for migratory birds.

Eight chenier areas were identified within the Project area, all within the Terminal site. Seven of the chenier areas displayed wetland soil and hydrology characteristics and were also considered forested marsh. One chenier area was in an area identified as upland. Due to the similarities in vegetation composition between the wetland and upland chenier areas, all chenier areas were grouped together in the forested marsh/chenier vegetation class used for impact calculations. The chenier areas follow narrow, sandy beach ridges that run parallel to the overall shoreline in the area (i.e., east-west). Dominant species identified in field surveys include sugarberry, multiflora rose, and the invasive species Japanese honeysuckle and Chinese tallow.

Permanent impacts from the Terminal would total 13.3 acres of chenier and represent a small portion of the overall surrounding chenier community. A total of 23.6 acres of existing chenier would remain within the Terminal property. The LDNR reports over 2,000 acres of existing chenier habitat in coastal southwest Louisiana. LDWF (2019a) recommended that Commonwealth restore and preserve unaffected chenier habitat in the vicinity of the Project to mitigate for unavoidable permanent impacts on chenier habitat at the Project site. Accordingly, Commonwealth has committed to eradicating hogs from the Terminal property and installing a hog exclusion fence around the perimeter of the Terminal property and the 23.6 acres of chenier habitat that would not be affected by construction. We received comments from the public expressing concern that Commonwealth's proposed mitigation would not be sufficient. Removing feral hogs from the chenier and surrounding habitat would be likely to at least prevent continued degradation of the existing chenier habitat and would have the potential to substantially improve the quality of the habitat that would not be affected by construction. Feral hogs are invasive species that are extremely destructive in sensitive vegetative and wildlife habitats. They are referred to as ecosystem engineers. Through their rooting, wallowing, and trampling and their voracious feeding behaviors, they can change or destroy their local habitat by, for example, degrading water quality and increasing runoff in wetlands and shifting the composition and distribution of plant communities (USDA, 2020). Feral hogs uproot planted and naturally regenerated coniferous and hardwood seedlings, reduce natural forest regeneration through heavy consumption of hard mast, and prey on reptiles, amphibians, small mammals, and the eggs of ground-nesting birds such as the eastern black rail (LDWF, 2022b; FWS, 2018). Feral hogs have been linked to the decline of nearly 250 threatened or endangered plant and animal species (USDA 2020). Commonwealth would preserve the chenier areas on the Terminal property for the life of the Project (anticipated to be 30 years). The relatively small permanent loss of chenier, compared to total state acreages, and the anticipated mitigation would result in a minor overall reduction in acreage, but potentially higher value cheniers within the Project area would be preserved. Therefore, we conclude that Project impacts on cheniers would not be significant.

4.5.3 Vegetation Conclusions

The Project would result in short-term and permanent impacts on vegetation resources. The majority of impacts on vegetation in the Project area would occur in estuarine emergent wetlands or cheniers, which are vegetative communities of special concern. Commonwealth would implement restoration measures outlined in its revised *Workspace Restoration Plan* and Project-specific *Procedures* to minimize temporary and short-term impacts associated with construction of the Terminal and Pipeline right-of-way. Commonwealth would account for permanent impacts on wetlands through its wetland mitigation plan, as discussed in section 4.4.2. Commonwealth would account for impacts on chenier habitat by preserving and improving 23.6 acres of existing chenier habitat, in consultation with the LDWF and FWS. Therefore, we conclude that Project impacts on vegetation resources would be short-term and minor or, in the case of permanent wetland impacts, adequately mitigated to not be significant.

4.6 WILDLIFE AND AQUATIC RESOURCES

4.6.1 Wildlife Resources

Wildlife species inhabiting the Project area are characteristic of the habitats provided by the plant communities that occur in the Project region. Detailed information on vegetation types present within the Project area is included in section 4.5. Habitat types were identified based on Commonwealth's aerial photography and field surveys.

4.6.1.1 Existing Wildlife Habitat

Wildlife habitats associated with the Project site are dominated by coastal wetlands, scrub/shrub and forested wetlands, areas of open water, cheniers, open land, and beach. The Terminal site consists of each of these habitat types, whereas the proposed Pipeline right-of-way is entirely comprised of EEM wetlands.

Louisiana coastal wetlands dominate the landscape in this region, and include EEM, ESS, and EFO wetland communities. Generally, these wetland types support a diverse ecosystem that provides nutrients, cover, shelter, and water for a variety of terrestrial and aquatic wildlife species, including waterfowl, wading birds, nesting birds, raptors, mammals, reptiles, and amphibians. Approximately 735 species of birds, finfish, amphibians, shellfish, reptiles, and mammals use this type of habitat (Bartlett, 2015). As discussed in section 4.4.1, the wetlands present at the Project site are generally degraded due to altered hydrology from sloughs acting as ditches, cattle grazing, and feral hog activity.

Open water habitats associated with the Project include the Calcasieu Ship Channel, a tidal slough, and small and intermediate waterbodies. Typical wildlife associated with open water habitat includes wading birds, waterfowl, beavers, otters, nutria, snakes, and other wildlife species dependent on aquatic environments. Aquatic species are discussed further in section 4.6.2.

Eight chenier ridges are present within the Terminal site. Chenier habitat generally provides shelter, foraging, and nesting habitat for various bird species. Larger mammals, including white-tailed deer, striped skunk, shrews, voles, cotton rat, armadillo, raccoon, and mice may also use chenier habitat for shelter and foraging habitat. As with the wetlands and as discussed in section 4.5.3.1, the chenier habitat at the Terminal site is generally degraded due to feral hog activity.

Open land and beach habitats are important for migratory shorebirds as habitat for nesting and foraging and as stopover locations. Typical reptiles and amphibians associated with these habitats include chorus frog, box turtle, rat snake, and garter snake (Benyus, 1989; Martin et al., 1951).

4.6.1.2 Impacts and Mitigation

We received comments from the public and state and federal agencies expressing concern regarding potential Project impacts, including edge or indirect effects, such as increased noise and artificial lighting, on wildlife and, specifically, migratory birds and Birds of Conservation Concern (see section 4.6.1.3). Construction of the Terminal and Pipeline would disturb 213.9 acres of land and open water during construction and 153.0 acres during operation. Of this, 105.7 acres at the Terminal site and 0.3 acre constituting the aboveground facilities associated with the Pipeline would be permanently converted to industrial use.

Terminal

Construction

Permanent impacts on wildlife habitat from construction of the Terminal would include 0.8 acre of open land, 1.2 acres of open water, 1.5 acres of tidal slough, 14.5 acres of combined EFO wetland and chenier habitats, and 75.2 acres of combined EEM and ESS wetlands habitat. The impacts would consist of replacing the vegetated and open water habitat with surfacing materials such as concrete or gravel. The remaining Terminal site land that would be permanently impacted by construction (12.5 acres) consists of developed land, which does not currently provide significant wildlife habitat value. Terminal construction activities would temporarily impact 6.3 acres of EEM wetlands as part of the construction and laydown area. The temporarily disturbed area would be restored in accordance with Commonwealth's *Workspace Restoration Plan*. Impacts on aquatic wildlife as a result of the dredging and excavation that would be required to construct the marine facility are discussed in section 4.6.2.

Potentially suitable cover, nesting, and foraging habitat for some wildlife species would be reduced due to clearing and removal of vegetation. Individuals of smaller, less mobile wildlife, such as reptiles and amphibians, could be inadvertently killed by construction equipment. More mobile species, such as mature birds and larger mammals, may relocate to similar habitats nearby when construction activities commence. The permanent reduction in available habitat within the area as well as the influx of individuals to other nearby areas may increase population densities of certain species, resulting in increased inter- and intra-specific competition and reduced reproductive success of individuals. The greatest impact on wildlife habitat would result from the permanent loss of the 92.5 acres of wetland, chenier, slough, and open water habitat at the Terminal site. In comments on the public docket, LDWF requested that Commonwealth provide mitigation to offset impacts on wildlife resources. Subject to final review and approval by the COE, LDNR-OCM, FWS, and LDWF, Commonwealth would provide different types of compensatory mitigation for permanent impacts on the wetlands and chenier habitat, respectively. Commonwealth's proposed wetland mitigation is described in section 4.4.2. Commonwealth's proposed chenier habitat mitigation is described in section 4.5.3. The compensatory mitigation plans must be finalized prior to construction.

We received a comment expressing concern regarding indirect effects of the Project on wildlife habitat, specifically chenier habitat, that would be adjacent to but not directly affected by construction and operation of the Project. Indirect effects on wildlife, in addition to potential increased inter- and intra-specific competition and reduced reproductive success of individuals as noted above, may include increased noise and light from the Terminal. Commonwealth expects construction to last 36 months. Noise generated during construction could cause short-term impacts on wildlife that may be present in the area. Sources of noise during construction would include clearing and grading of the Project site, placement of fill, operation of construction heavy machinery, dredging, and impact and vibratory pile driving. The intensity of noise would vary throughout the construction timeframe based on the phase of construction and types of equipment being used. Sections 4.11.2.3 and 4.11.2.4 detail ambient noise levels at the Project site and the ranges of noise levels expected to occur throughout construction relative to human perception. Extensive literature exists documenting the effects of anthropogenic noise on wildlife (Barber et al., 2011). Wildlife species exhibit different hearing ranges, as compared to humans, and all wildlife do not respond the same way to similar sound levels. Wildlife response to sound depends on many factors including, but not limited to, ambient noise levels; construction noise levels, frequency, distance, and duration; and weather and atmospheric conditions. Construction noise may not affect some wildlife species, but others may be sensitive to noise, forcing individuals to move out of the construction area and expend more energy finding replacement habitat. This disruption of normal behavioral patterns could lead to reduced feeding and competition for existing habitat, increased risk of predation, delayed reproduction, and increased juvenile mortality.

Increased lighting associated with Project construction could also result in animal displacement, including the avoidance or abandonment of an area. Construction of the Terminal would require adequate lighting for safety and security. Light pollution resulting in intermittently increased lighting, unexpected changes in lighting, or direct glare can impact wildlife. Animals can alternately be attracted to or avoid artificial lighting, which can adversely affect foraging behavior, reproduction, communication, and other critical behaviors. Generally, artificial light can disrupt species-specific behaviors that evolved in natural cycles of light and dark (Longcore and Rich, 2004). Commonwealth has committed to using the minimum amount of lighting necessary for safety and security during construction and would ensure artificial lighting is directed downward and toward the construction activity to minimize light pollution. The impacts of light pollution on birds are discussed 4.6.1.3. Artificial lighting impacts on aquatic species are discussed in section 4.6.2.2. Generally, the level of wildlife displacement due to noise or artificial lighting would be dependent on the sensitivity of the species. Most of these impacts would only last for the duration of construction; however, there would be some displacement resulting from permanent habitat loss.

An accidental spill or release of hazardous materials (e.g., fuels) during construction could potentially come into contact with wildlife, leading to injury or acute toxic effects. However, the potential impacts from accidental hazardous materials spills and releases would be avoided or minimized through Commonwealth's implementation of its Project-specific *Procedures* and *SPAR Plan*.

Operations

Operation of the Terminal would result in increased noise, lighting, and human activity that could disturb wildlife in the area. The potential disturbance to wildlife would be similar as those described for construction. Although heavy ship traffic and other industry are common along the Calcasieu Ship Channel, the existing vegetation at the Project site as it currently exists may provide a buffer from the industrial noise and artificial light that would be lost with construction of the Terminal. Nonetheless, much of the wildlife known to be present at the site (e.g., racoons, nutria, waterfowl) are common species that are habitat generalists (with the notable exception of the eastern black rail, discussed in section 4.7.1.2) and are generally tolerant of anthropogenic activity. Wildlife in the area is likely accustomed or would readily acclimate to the noise and artificial lighting associated with these activities. However, other species may leave the site and not return. Nonetheless, we anticipate that operational impacts on wildlife would be minimized to the extent practicable and would not have any population level effects on the wildlife.

To minimize Project-related impacts on wildlife habitat, Commonwealth would implement the FERC's *Plan* and Commonwealth's Project-specific *Procedures* and its *SPAR Plan* for materials regulated by the EPA. Therefore, while there would be permanent impacts associated with the removal of habitat and the area immediately surrounding the Terminal would be impacted by operational noise, lighting, and movement of operational personnel and vehicles, we conclude construction and operation of the proposed Terminal would not have significant long-term impacts on wildlife species due to the existence of similar habitats within the Project area and Commonwealth's proposed restoration and mitigation for Project impacts on chenier and wetland habitat.

Pipeline

Construction

Construction of the Pipeline would require approximately 48.4 acres of land. The Pipeline right-of-way, temporary access roads, and ATWS would temporarily impact 48.1 acres of wildlife habitat, including 4.8 acres of open water, and 43.3 acres of EEM wetland.

The aboveground facilities (pig launcher and meter station) associated with the Pipeline would permanently impact 0.3 acre of wildlife habitat, consisting of EEM wetlands (0.3 acre). All permanent habitat impacts would result from the conversion of wetland vegetation to industrial land through placement of pilings used to support the aboveground facilities.

Following construction, Commonwealth would restore the Pipeline right-of-way, temporary access roads, and ATWS in accordance with the FERC's *Plan* and Commonwealth's *Workspace Restoration Plan* and Project-specific *Procedures*. Commonwealth would maintain access to a permanent 3.5-foot-wide easement along the right-of-way during operation, which would equate to approximately 0.9 acre of EEM wetland habitat and 0.1 acre of open water habitat; however, the permanent easement would be restored and maintained as EEM wetlands and open water respectively, and wildlife habitat along the easement would thereby not be permanently affected by operations.

The duration of impacts on wildlife habitat would depend on the rate at which vegetation regenerates immediately following Pipeline construction. Herbaceous land and emergent wetland habitat generally revegetate within 1 to 4 years after construction is completed. Open water habitat would revert to preconstruction conditions shortly after the completion of in-water work (see section 4.6.2 for further discussion of impacts on aquatic resources). As a result, no long-term impacts on habitat and wildlife that use those habitats are anticipated along the Pipeline.

Impacts on wildlife during Pipeline construction would generally be similar to the impacts described for the Terminal. Construction noise, use of construction equipment, and other human activity could impact wildlife. While these impacts would be temporary, they could cause displacement, stress, and direct mortality of some individuals. However, given Commonwealth's commitment to follow the measures in the FERC *Plan* and Commonwealth's *Procedures*, *Workspace Restoration Plan,* and wetland mitigation plan, as well as the abundance of similar habitat adjacent to the Pipeline, we conclude these impacts on wildlife would not be significant.

Operations

Operations-related impacts on wildlife would primarily include periodic noise associated with maintenance vehicles and human activity near the aboveground facilities. These potential impacts on wildlife would be similar to what is described for construction (but at a much smaller scale) and could cause displacement, stress, and direct mortality of some individuals. However, these operational impacts would occur only periodically and on a much more localized basis. Therefore, we conclude that impacts on wildlife from operation of the Pipeline would not be significant.

4.6.1.3 Unique and Sensitive Wildlife Resources

Unique or sensitive wildlife resources, such as migratory birds, colonial waterbird nesting areas, and managed wildlife areas, may be present in the vicinity of the proposed Project and are discussed below. State and federally listed endangered, threatened, and other special-status species are discussed in section 4.7.

Migratory Birds

Migratory bird species nest in the United States and Canada during the summer months and then migrate south to the tropical regions of Mexico, Central and South America, and the Caribbean for the non-breeding season. Some species migrate from breeding areas in the north to the Gulf Coast for the non-breeding season. Migratory birds are protected under the MBTA, which prohibits the intentional take or killing of individual migratory birds, their eggs and chicks, and active nests. The MBTA provides that it is unlawful to pursue, hunt, take, capture, kill, possess, sell, purchase, barter, import, export, or transport any migratory bird, or any part, nest, or egg of any such bird. Executive Order 13186 (January 2001) directs federal agencies to consider the effects of agency actions on migratory birds and determine where unintentional take is likely to have a measurable negative effect on migratory bird populations, and to avoid or minimize adverse impacts on migratory birds through enhanced collaboration with the 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 MOU 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, BGEPA, ESA, Federal Power Act, NGA, or any other statute and does not authorize the take of migratory birds.

Birds of Conservation Concern are a subset of protected birds under the MBTA and include all species, subspecies, and populations of migratory nongame birds that are likely to become candidates for listing under the ESA without additional conservation actions. To accurately identify these sensitive bird species and stimulate action by federal/state agencies and private parties, the FWS Migratory Bird Office issued a report describing the Birds of Conservation Concern (FWS, 2008). The report identifies priority bird species at the national, regional, and Bird Conservation Region levels. The Project is within Bird Conservation Region 37 – Gulf Coastal Prairie. The Gulf Coastal Prairie is composed of flat grasslands and marshes that line the coast of the Gulf of Mexico from northern Mexico, across the mouth of the Río Grande, through the rice country of southeastern Texas and southwestern Louisiana, and across the great Louisiana marshlands at the mouth of the Mississippi River. This Bird Conservation Region features one of the greatest concentrations of colonial waterbirds in the world, with breeding reddish egret, roseate spoonbill, and large numbers of other species of herons, egrets, ibis, terns, and skimmers. The region also provides critical in-transit habitat for migrating shorebirds, including buffbreasted sandpipers and Hudsonian godwits, and most of the neotropical migrant forest birds of eastern North America. Waterfowl such as mottled ducks, fulvous whistling-ducks, and purple gallinule, and rails, such as the clapper rail and eastern black rail, also breed in wetlands, and numbers of overwintering waterfowl are among the highest on the continent. These include dabbling ducks (especially northern pintail and gadwall), redhead, lesser scaup, and white-fronted geese from two of the major migratory routes (i.e., flyways) in the northern hemisphere. The most important waterfowl habitats of the area are coastal marsh, shallow estuarine bays and lagoons, and wetlands on agricultural lands of the rice prairies. Loss and degradation of wetland habitats due to subsidence, sea-level rise, shoreline erosion, freshwater and sediment deprivation, saltwater intrusion, oil and gas canals, and navigation channels and associated maintenance dredging are the most important problems facing the area’s wetland wildlife.

Table 4.6.1-1, updated since the draft EIS as a result of public comments, identifies the 44 Birds of Conservation Concern species that have been documented in or are probable to occur in the vicinity of the proposed Project.

TABLE 4.6.1-1 **Birds of Conservation Concern within Bird Conservation Region 37**					
Common Name	**Scientific Name**	**Seasonal Occurrence**	**Colonial Waterbird**	**Breeds in Region**	**Nesting Habitat a/**
American bittern	*Botaurus lentiginosus*	Wintering	--	--	--
American oystercatcher	*Haematopus palliatus*	Year-round (sparse)	--	--	--
Audubon's shearwater	*Puffinus lherminieri*	Migrating	Yes	--	--
Bald eagle	*Haliaeetus leucocephalus*	Migrating	--	--	--
Band-rumped storm-petrel	*Oceanodroma castro*	Migrating	Yes	--	--
Black skimmer	*Rynchops niger*	Year-round	Yes	Yes	Sand
Botteri's sparrow	*Paucaea botterii*	Migrating	--	--	--
Buff-breasted sandpiper	*Calidris subruficollis*	Migrating	--	--	--
Dickcissel	*Spiza americana*	Migrating	--	--	--
Eastern black rail	*Laterallus jamaicensis*	Year-round	--	Probable	EEM vegetation
Grasshopper sparrow	*Ammodramus savannarum*	Wintering	--	--	--
Gull-billed tern	*Gelochelidon nilotica*	Year-round	Yes	--	--
Henslow's sparrow	*Ammodramus henslowii*	Wintering	--	--	--
Hudsonian godwit	*Limosa haemastica*	Migrating	--	--	--
Least bittern	*Ixobrychus exilis*	Summer	--s	Yes	EEM vegetation
Least tern	*Sternula antillarum*	Summer	Yes	Yes	Sand
LeConte's sparrow	*Ammodramus leconteii*	Wintering	--	--	--
Lesser yellowlegs	*Tringa flavipes*	Wintering	--	--	--
Loggerhead shrike	*Lanius ludovicianus*	Year-round	--	Yes	--Shrub/tree
Long-billed curlew	*Numenius americanus*	Wintering, Migrating	--	--	--
Marbled godwit	*Limosa fedoa*	Wintering	--	--	--
Mountain plover	*Charadrius montanus*	Migrating	--	--	--
Nelson's sharp-tailed sparrow	*Ammodramus nelsoni*	Wintering	--	--	--
Painted bunting	*Passerina ciris*	Summer	--	Yes	Shrub
Peregrine falcon	*Falco peregrinus*	Wintering	--	--	--

TABLE 4.6.1-1 **Birds of Conservation Concern within Bird Conservation Region 37**					
Common Name	**Scientific Name**	**Seasonal Occurrence**	**Colonial Waterbird**	**Breeds in Region**	**Nesting Habitat a/**
Prothonotary warbler	*Protonotaria citrea*	Migrating	--	--	--
Red knot	*Calidris canutus rufa*	Wintering	--	--	--
Reddish egret	*Egretta rufescens*	Year-round	Yes	--	--
Sandwich tern	*Thalasseus sandvicensis*	Wintering	Yes	--	--
Seaside sparrow	*Ammodramus maritimus*	Year-round	--	Yes	EEM vegetation
Sedge wren	*Cistothorus platensis*	Wintering	--	--	--
Short-billed dowitcher	*Limnodromus griseus*	Wintering	--	--	--
Short-eared owl	*Asio flammeus*	Wintering	--	--	--
Snowy plover	*Charadrius alexandrines*	Year-round	--	Yes	Sand
Solitary sandpiper	*Tringa solitaria*	Migrating	--	--	--
Sprague's pipit	*Anthus spragueii*	Wintering	--	--	--
Swainson's warbler	*Limnothlypis swainsonii*	Summer	--	Yes	Shrub
Swallow-tailed kite	*Elanoides forficatus*	Migrating	--	--	--
Upland sandpiper	*Bartramia longicauda*	Migrating	--	--	--
Whimbrel	*Numenius phaeopus*	Wintering	--	--	--
White-tailed hawk	*Geranoaetus albicaudatus*	Migrating	--	--	--
Wilson’s plover	*Charadrius wilsonia*	Year-round	--	Yes	Sand
Yellow rail	*Coturnicops noveboracensis*	Wintering	--	--	--
a/ Nesting habitat type is only provided for those species that breed in Bird Conservation Region 37. Sources: Cornell Lab of Ornithology, 2018; FWS, 2008.					

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 areas in the north to winter along the Gulf Coast and remain throughout the non-breeding season. The proposed Project is within the western portion of the Mississippi Flyway and near the eastern edge of the Central Flyway (the Louisiana-Texas border is the boundary between the two flyways). The Central and Mississippi Flyways both terminate at the Gulf Coast, making it one of the most important waterfowl areas in North America. Of the 650 species of birds known to occur in the United States, nearly 400 species occur along the Gulf Coast (Esslinger and Wilson, 2003). The Gulf Coast provides wintering and migration habitat for significant numbers of continental duck and goose populations.

The coastal marshes of Louisiana, Alabama, and Mississippi regularly hold half of the wintering duck population of the Mississippi Flyway (Esslinger and Wilson, 2003).

Important Bird Areas

The Important Bird Area (IBA) program is a global program managed by BirdLife International, with the National Audubon Society servicing as the lead partner in the United States, that identifies habitats that are essential in sustaining bird populations. Identification of a site as an IBA imposes no legal restrictions or management requirements on any property, public or private, and the program carries no regulatory authority. The intent of the IBA program is to recognize areas that are essential for bird populations. IBA sites include migratory staging areas, winter roost sites, and prime breeding areas for songbirds, wading birds, and other species. The Project location is entirely within the Chenier Plain IBA, one of Louisiana's largest IBAs at over 2.3 million acres. The extensive open water and marshes in this IBA are home to over 360 species of birds, including ducks, egrets, geese, rails, raptors, wading birds, and shorebirds. It also serves as a stopover area for many of the transient birds that overwinter in Central and South America (National Audubon Society, 2019).

Large portions of this IBA are treeless, consisting of nearly 50 percent open water and 50 percent emergent herbaceous wetlands, including salt, brackish, intermediate, and freshwater marsh. The marshland of this IBA is prime habitat for ducks, other waterfowl, wading birds, and shorebirds because of the emerged and submerged vegetation that the marsh produces. Northern harriers and red-tailed hawks are also abundant in the marshes through the winter (National Audubon Society, 2019).

A small but disproportionately important feature of this IBA is the Louisiana Chenier Plain. As noted in section 4.5.3, cheniers are beach ridges vegetated by coastal oak woodlands, which provide important stopover habitat for neotropical migratory birds. These are the first lands that migratory birds see after a journey of more than 500 miles across the Gulf of Mexico (National Audubon Society, 2013). Remnant forests present on cheniers – coastal live oak-hackberry forest – are ranked by the Louisiana Natural Heritage Program as imperiled or critically imperiled because they are vulnerable to extirpation. Cheniers are imperiled because they occur slightly above the level of the surrounding wetland and are the only inhabitable land for people in these areas. As a result, many of the cheniers have been cleared of vegetation for home sites, linear transportation projects, and commercial properties or have been drastically altered by livestock grazing or commercial mining operations (LDNR, 2009).

Migratory Bird Impacts and Mitigation

There are nine protected or special-status species of migratory birds that could potentially occur in the Project area. We discuss the potential impacts of the Project on the species that are listed, or proposed for listing, at the federal and state levels, and those that are considered species of concern, in section 4.7.

The vegetation communities in the Project area provide potential habitat for migratory bird species, including songbirds, waterbirds, and raptors. Construction of the Terminal and Pipeline would permanently and temporarily impact wildlife habitat areas as previously described. Much of the habitat associated with the Terminal site is EEM, ESS, and EFO wetlands and chenier. In general, these systems have been disturbed due to alterations in hydrology from anthropogenic activities and by feral hog habitation resulting in extensive cover in these habitats by Chinese tallow (designated a noxious weed). This poses a threat to overall habitat quality by displacing native plant species. These factors contribute to reducing the overall quality of habitat available to wildlife for foraging, nesting, and breeding.

Commonwealth has proposed a compensatory wetland mitigation plan that requires replanting temporarily disturbed wetlands and purchasing wetland bank mitigation credits (see section 4.4.2). Commonwealth has also proposed eradicating feral hogs from the chenier habitat at the Terminal site that would not be affected by construction (see section 4.5.3). The proposed wetland restoration would result in increased habitat quality for wildlife in the general Project vicinity and removing hogs from the cheniers would promote the recovery of an important habitat type. In addition, there are about 2.5 million acres of coastal wetlands, mostly salt marshes (i.e., EEM wetlands), in Louisiana. About 60 percent of Louisiana's coastal marshes are classified as either brackish or saline (FWS, 2009). Given the presence of these similar resources, the overall effect on migratory bird habitat in the vicinity of the Project would be minor.

Other impacts on migratory birds and their habitats due to construction and operation of the Project would be similar to impacts described above for wildlife resources. Additionally, birds could be injured by flaring and lighting at the Terminal. Two flare stacks would be constructed, one associated with the liquefaction facilities and one associated with the marine facility. The liquefaction flare stack would rise to a height of 300 feet and would be the tallest structure at the site. The marine flare would rise to a height of 200 feet. Outside of emergency situations, Commonwealth estimates flaring would be required for up to 30 days during startup of the Terminal and then for no more than 12 hours during the first year of operation and 6 hours per year in subsequent years. The FWS provides several conservation measures to avoid or reduce potential flare impacts on migratory birds during Terminal operations (FWS, 2018). We received a comment expressing concern that Commonwealth has not been clear on whether it would follow the measures recommended by the FWS. Commonwealth has committed to implement the conservation measures during normal operations[49], such as avoiding flaring at night, avoiding flaring during low visibility weather conditions, and avoiding flaring during the general spring and fall migration periods of mid-March through mid-April and September through October. Commonwealth would coordinate with the FWS on the use and type of migratory bird deterrent devices and for methods of measuring bird mortality, should mortality occur following flare events. Lighting on the flare stacks would be designed in accordance with federal regulatory requirements (e.g., FWS communication tower guidance [FWS, 2021] and Federal Aviation Administration lighting requirements [14 CFR 77; FAA, 2020]). We conclude that the temporary flaring during commissioning activities and Commonwealth's commitment to implementing conservation measures and working with the FWS to avoid and reduce flaring impacts during operation would not represent a significant impact on migratory birds.

Artificial lighting can hide natural light sources. Fatalities of avian species due to artificial lighting are well documented. 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 proposed Terminal would require adequate lighting for operations and safety. Commonwealth has developed a *Facility Lighting Plan*[50] that provides mitigation measures for light pollution, including using full cut-off or fully shielded lighting to reduce glare and light pollution; focusing light distribution on the LNG carrier berth and barge dock loading platforms and internally from the perimeter wall onto working areas inside the Terminal footprint; and using motion detection sensors and timers to minimize the duration that non-essential lights are kept on. Given the steps Commonwealth would implement these measures to minimize light pollution impacts on migratory birds and the extent of industrial lighting to the north and east on the Calcasieu Ship Channel, we conclude artificial lighting at the Terminal would not represent a significant impact on migratory birds.

The majority of the migratory bird habitat along the Pipeline (primarily EEM wetlands) would be temporarily impacted and restored after construction. In addition, Commonwealth would provide mitigation for permanently impacted wetlands along the Pipeline right-of-way through purchase of wetland

49 Normal operations would not include commissioning activities/startup of the Terminal during which flaring would be required for up to 30 days.

50 Commonwealth's *Facility Lighting Plan* can be viewed on FERC's eLibrary as appendix 3D of accession number 20190820-5125.

mitigation bank credits. Therefore, we conclude that impacts on migratory birds along the Pipeline right-of-way would be temporary and minor and impacts on habitat would be appropriately mitigated.

To further minimize impacts on migratory birds, Commonwealth would attempt to clear vegetation at the Terminal and Pipeline right-of-way to avoid the migratory bird nesting season (March 1 to July 31). If the construction schedule requires clearing during the migratory bird nesting season, Commonwealth would consult with the FWS regarding appropriate methods to minimize impacts on migratory birds.

Colonial Waterbird Nesting Areas

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 the nesting season, and (2) they obtain all or most of their food from the water (FWS, 2002). Rookeries are typically established in marshes or near the shores of ponds or streams, and colonial waterbirds return to the same rookery year after year. Although some colonial waterbirds will nest in developed areas (e.g., least terns), many waterbirds are wary of human activity (e.g., great blue heron and great egrets).

The LDWF informed Commonwealth that nesting colonies may occur within the Project area (LDWF, 2018). Potential impacts on colonial waterbirds and their habitats due to construction and operation of the Project would be similar to impacts described for wildlife resources in general. The LDWF prohibits entry into or disturbance of active breeding colonies, as well as work in proximity to active nesting colonies. The FWS (2018) recommends that a qualified biologist inspect the proposed work areas within jurisdictional wetlands during the nesting season for the presence of undocumented rookeries. Per LDWF and FWS guidance, Commonwealth would conduct field surveys using qualified biologists no more than 2 weeks prior to the commencement of construction, should construction occur during the colonial waterbird nesting season (February 15 to September 15). The FWS (2018) requires that any activity within 1,000 feet of a colony containing wading birds, anhingas, and/or cormorants be restricted to the non-nesting period (FWS, 2018). If an active rookery is identified, Commonwealth would comply with FWS and LDWF requirements and refrain from construction activities within 1,000 feet of colonies containing wading birds (i.e., herons, egrets, night-herons, ibis, roseate spoonbills, anhingas, or cormorants) during their nesting season (February 15 to August 31), and within 650 feet of colonies containing gulls, turns, or black skimmers during their nesting season (April 1 to September 15).

With Commonwealth's commitment to the implementation of the measures recommended by the LDWF and FWS, we conclude that impacts on colonial waterbirds would be minimized and not significant.

Managed Wildlife Areas

There are three NWRs in Cameron Parish, all of which are managed by the FWS:

- Sabine NWR: The Sabine NWR extends from Calcasieu Lake to Sabine Lake; its closest boundary is approximately 7 miles northwest of the Project.
- Cameron Prairie NWR: The Cameron Prairie NWR East Cove Unit (previously established as the eastern unit of the Sabine NWR) is approximately 2 miles east of the northern end of the Pipeline and approximately 4 miles northeast of the Terminal.
- Lacassine NWR: The Lacassine NWR is approximately 28 miles northeast of the Project.

The Sabine and Lacassine NWRs would not be directly affected by the Terminal or the Pipeline due to the distance between the Project facilities and these refuges. Project effects on the Cameron Prairie NWR are discussed in section 4.4.2.2. Impacts on the NWR would be temporary, and sufficient suitable habitat in the region is available for wildlife displaced during construction and maintenance dredging activities. Additionally, the Project would create long-term positive benefits for the NWR through the creation of new wetland habitat. Therefore, we conclude that adverse impacts on managed wildlife areas would not be significant.

4.6.1.4 Wildlife Conclusions

We conclude that constructing and operating the Project would not significantly affect wildlife populations and wildlife habitat. Commonwealth would minimize impacts on wildlife and habitat by implementing its mitigation plans for impacts on wetlands and chenier habitat, by following the measures outlined in the FERC's *Plan* and Commonwealth's *Workspace Restoration Plan* and Project-specific *Procedures*, and by adhering to avoidance and minimization methods recommended by the FWS and LDWF.

4.6.2 Aquatic Resources

4.6.2.1 Existing Aquatic Resources

Terminal

Construction and operation of the Terminal would impact the estuarine waters of the Calcasieu Ship Channel at the mouth of the Calcasieu River, a tidal slough that flows across the Project footprint from its west side and into the Calcasieu Ship Channel to the east, and tidally influenced wetlands present throughout the footprint of the Terminal. Each of these resources likely provides year-round habitat for various aquatic species.

The Calcasieu Ship Channel at the Project location is within the mixing zone of freshwater outflow from the Calcasieu River and its tributaries and tidal inflow of marine waters from the Gulf of Mexico. The bed of the Calcasieu Ship Channel is composed mainly of unconsolidated sand and silt. Unconsolidated sediment provides foraging habitat for demersal (i.e., bottom-dwelling) fish and benthic invertebrates (i.e., invertebrates living on and within the bottom substrate).

Approximately 80 percent of the Terminal site is comprised of wetlands. The wetlands in the southern half of the Terminal footprint consist predominantly of saline and brackish marsh (i.e., tidally influenced estuarine emergent wetlands) surrounding the tidal slough, which serves as a conduit for periodic inundation of the marsh by the estuarine waters of the Calcasieu Ship Channel during tidal events. Saline and brackish marsh provides nursery and foraging habitat supportive of a variety of economically important marine fishery species, including Atlantic croaker, Gulf menhaden, sand seatrout, southern flounder, spotted seatrout, striped mullet, and blue crab (LDWF, 2014a; LDWF, 2014b; NMFS, 2019a). Some of these species serve as prey for other fishes managed under the MSA by the Gulf of Mexico Fishery Management Council (GMFMC) and highly migratory species managed by the NMFS. Marsh habitat also produces and export nutrients and organic material, important components of the aquatic food web, which contribute to the overall productivity of the Calcasieu River estuary and nearshore Gulf of Mexico (EPA, 1999).

<u>Fisheries</u>

All fishery habitats in the Project area support warmwater fisheries; no coldwater fisheries occur in the Project area. The Calcasieu Ship Channel at the Project location is classified as estuarine habitat and the aquatic species commonly found in this area are typical of estuaries in the northern Gulf of Mexico (table 4.6.2-1).

TABLE 4.6.2-1 **Representative Fish Species Potentially Occurring in the Vicinity of the Project Area**	
Common Name	**Scientific Name**
Shellfish	
Blue crab	*Callinectes sapidus*
White shrimp	*Litopenaeus setiferus*
Brown shrimp	*Farfantepenaeus aztecus*
Common *rangia*	
Eastern oyster	*Crassostrea virginica*
Fish	
Atlantic croaker	*Micropogonias undulates*
Bay anchovy	*Anchoa mitchilli*
Hardhead catfish	*Arius felis*
Grouper	*Mycteroperca* spp.
Gulf menhaden	*Brevoortia patronus*
Sand seatrout	*Cyonoscion arenarius*
Sheepshead	*Archosargus probatocephalus*
Southern flounder	*Paralichthys lethostigma*
Spanish mackerel	*Scomberomorus maculatus*
Spotted seatrout	*Cynoscion nebulosis*
Striped bass	*Morone saxatilis*
Striped mullet	*Mugil cephalus*
Sunfish	*Lepomis microlophus*
Red drum	*Sciaenops ocellatus*
Red snapper	*Lutjanus campechanus*
Vermillion snapper	*Rhomboplites aurorubens*
Sources: LDWF, 2014b; LDWF, 2014c; NMFS, 2015.	

The MSA mandates the identification of EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 USC 1802(10)). In addition to their ecological significance, EFH areas are of high economic importance due to the dependence of recreational and commercial fisheries associated with them. EFH is further discussed in section 4.6.3.

Marine Mammals and Sea Turtles

As identified in table 4.6.2-2, the Gulf of Mexico is home to 29 species of marine mammals, which are protected by the federal government under MMPA. The MMPA prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S. Under the MMPA, a "take" is defined as "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture or kill any marine mammal" (16 USC 1362). State law extends additional protections to nine of these species. The majority of these marine mammal species are most commonly found in deep water habitats on the edge of the continental shelf and are unlikely to frequent the shallow coastal waters in the Project vicinity (table 4.6.2-2). There is potential for the bottlenose dolphin, Atlantic spotted dolphin, and West Indian manatee to occur in the Project vicinity. The West Indian manatee is also listed as a threatened species by the FWS and an endangered species by LDWF. It is addressed in section 4.7.1.

We received comments from the public expressing concern that construction of the Project would result in Level B harassment of marine mammals. The MMPA lists two levels of harassment: Level A, which means any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild; and Level B, which refers to acts that have the potential to disturb (but not injure) a marine mammal or marine mammal stock in the wild by disrupting behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (NMFS, 2022a). The MMPA allows, upon request, the incidental take of small numbers of marine mammals by U.S. citizens or entities that engage in a non-commercial fishing activity within a specified geographic region. Incidental take is unintentional, but not unexpected, take.

NMFS authorizes incidental take of marine mammals under the MMPA if the taking would be of small numbers, have not more than a "negligible impact" on the marine mammal species or stocks, and not have an "unmitigable adverse impact" on the availability of the species or stock for subsistence uses. Generally, incidental take authorizations are issued for activities that produce underwater sound such as: scientific research projects; construction projects; military sonar and training activities; oil and gas development, exploration, and production; and other energy activities such as renewables and LNG. There are two types of incidental take authorizations: an Incidental Harassment Authorization (IHA), which is for actions that may result in harassment (i.e., injury or disturbance) only and last for less than one year; and a Letter of Authorization, which may result in harassment and is planned for multiple years. Commonwealth is consulting with NMFS to submit an application for an IHA under the MMPA prior to the beginning of construction of the Terminal.

Five of the world's seven sea turtle species have been recorded in the Gulf of Mexico. They include the green, hawksbill, Kemp's ridley, leatherback, and loggerhead. All five species are listed as threatened or endangered and are managed jointly by the FWS and NMFS. These species are also listed as threatened or endangered by LDWF. Threatened and endangered species are addressed in section 4.7.1.

Pipeline

Commonwealth's Pipeline would consist of 3.0 miles of 42-inch-diameter pipeline, ATWS areas, one temporary access road, two interconnections and one meter station (see section 2.1.2). Section 4.3.2 lists the waterbodies that would be crossed or affected by the Pipeline, as well as the proposed crossing method and water quality classification for each feature. The waterbodies that would be affected by the Pipeline are ditches/canals and are classified as warmwater fisheries. However, ditches/canals typically provide limited value or marginal fishery habitat due to restricted water flow regimes and/or anthropogenic influences.

TABLE 4.6.2-2 **Marine Mammals of the Gulf of Mexico**		
Common Name	**Scientific Name**	**Likely to Occur in Project Vicinity?**
Atlantic spinner dolphin	*Stenella clymene*	No
Atlantic spotted dolphin	*Stenella frontalis*	Yes
Blue whale a/, b/	*Balaenoptera musculus*	No
Bottlenose dolphin	*Tursiops truncatus*	Yes
Cuvier's beaked whale	*Ziphius cavirostris*	No
Densebeak whale	*Mesoplodon densirostris*	No
Dwarf sperm whale	*Kogia sima*	No
Eden's whale	*Balaenoptera edeni*	No
False killer whale a/	*Pseudorca crassidens*	No
Finback whale a/, b/	*Balaenoptera physalus*	No
Fraser's dolphin	*Lagenodelphis hosei*	No
Gulf stream beaked whale	*Mesoplodon europaeus*	No
Humpback whale a/	*Megaptera novaeangliae*	No
Killer whale a/	*Orcinus orca*	No
Melon-headed whale	*Pepnocephala electra*	No
Minke whale	*Balaenoptera acutorostrata*	No
North Atlantic right whale a/	*Eubalaena glacialis*	No
Pantropical spotted dolphin	*Stenella attenuate*	No
Pygmy killer whale	*Feresa attenuate*	No
Pygmy sperm whale	*Kogia breviceps*	No
Risso's dolphin	*Grampus griseus*	No
Rough-toothed dolphin	*Steno bredanensis*	No
Sei whale a/, b/	*Balaenoptera borealis*	No
Short-finned pilot whale	*Globicephala macrorhynchus*	No
Sowerby's beaked whale	*Mesoplodon bidens*	No
Sperm whale a/	*Physeter microcephalus*	No
Spinner dolphin	*Stenella longirostris*	No
Striped dolphin	*Stenella coeruleoalba*	No
West Indian manatee b/, c/	*Trichechus manatus*	Yes
Source: Hammock and Schulz, 2015. a/ Federally endangered species. b/ State endangered species. c/ Federally threatened species.		

4.6.2.2 Aquatic Resources Impacts and Mitigation

Terminal

Potential impacts on aquatic resources during construction and operation of the Terminal include those associated with dredging and construction of the marine facility (including pile installation), the permanent loss of wetlands and waterbodies within the footprint of the Terminal, ballast water exchanges, inadvertent spills, ship traffic, and hydrostatic testing.

Construction and Operation of the Marine Facility

We received multiple comments from the public and from NMFS expressing concern about potential adverse impacts on the aquatic environment, aquatic species, and EFH resulting from constructing the Terminal and marine facility and, specifically, the impacts of dredging and pile driving. Construction of the onshore portion of the Terminal and the LNG carrier berth and barge dock at the Terminal site would require dredging/excavation of 57.0 acres, of which approximately 50.8 acres are tidal estuarine habitat (including 2.0 acres of tidal slough and ditch habitat in the onshore footprint of the Terminal). In addition to open water and tidal slough, this tidal estuarine habitat includes approximately 1.0 acre of tidal brackish marsh (EEM wetland) 2.8 acres of mudflat designated by the COE as a Special Aquatic Site (see section 4.4.1.1), and 0.05 acre of estuarine oyster reef habitat that would be permanently impacted through construction of the marine facility bulkhead. Dredging between the shoreline and the edge of the Calcasieu Ship Channel would permanently alter the depth profile of 47.0 acres of shallow to deepwater habitat between the shoreline and the edge of the navigation channel; the increased water depth would continue to provide deepwater habitat after dredging is completed. Commonwealth would maintain the depth of the dredged area through maintenance dredging that would be conducted every two years. Construction and maintenance dredging would produce a turbidity plume that extends beyond the construction footprint, with the direction and size of the plume depending on tidal currents at the time of disturbance.

The impacts of Project construction and operation on fish and other aquatic organisms would vary by species, depending on the mobility of the affected species or life stage to avoid affected habitats and the sensitivity of the species or life stage to each type of impact. For example, some fish species are highly mobile and would avoid areas affected by dredging, underwater noise, and elevated turbidity and would only be temporarily displaced. In contrast, other small or sedentary fish species and/or larval life stages may not avoid exposure to certain impacts like underwater noise. Fish larvae and benthic organisms, such as mollusks and crustaceans that are in the dredge footprint would likely be killed. Aquatic organisms present in the tidally connected wetlands habitat within the Terminal footprint, which can serve as nursery habitat for many juvenile fishes, would also likely be killed if these wetlands were filled.

Dredging would temporarily increase turbidity, and suspended solids within the water column, which can adversely affect fish eggs and juvenile survival, benthic community diversity and health, foraging success, and suitability of spawning habitat. Increases in turbidity and suspended solids can affect the physiology and behavior of marine organisms. Potential physiological effects include mechanical abrasion of surface membranes, delayed larval and embryonic development, reduced bivalve pumping rates, and interference with respiratory functions. Possible behavioral effects from increased turbidity include interference with feeding for sight-foraging fish and area-avoidance (Berry et al., 2003; COE, 2014; Wenger et al., 2017). Conversely, the reduced visibility of predatory fish could lower vulnerability to predation for prey species. Turbidity also interferes with light penetration and thus reduces photosynthetic activity by phytoplankton. Additionally, sediments in the water column may be deposited on nearby substrates, burying aquatic macroinvertebrates (an important food source for many species of fish). Another potential impact resulting from the re-suspension of solids in the water column due to dredging may be the mobilization of contaminated sediments. Contaminants generally adhere to fine-grained particles, which, when re-suspended, can be ingested by organisms and have potentially toxic effects (EPA, 1999; Schoellhamer, 2007).

We discuss the magnitude and duration of turbidity and sedimentation resulting from Project-related dredging in section 4.3.2.2. We received a comment requesting details of how Commonwealth would prevent displacement of material or debris outside of the dredging limits during dredging operations. Commonwealth would use a hydraulic dredge with a suction cutter head, which would minimize resuspension of sediments and the resulting increases in turbidity and suspended sediment levels. Commonwealth conducted suspended sediment deposition modeling using a COE-supported modeling method (STFATE).[51] The modeling indicated that under low water velocity conditions (e.g., near slack tide), up to 0.5 inch of sediment would be redeposited per 1 hour of dredging and redeposition would occur within 200 feet of the dredge. Under higher water velocities (i.e., normal tidal flow), the modeling indicated the sediments deposited during low water velocity conditions would be resuspended and carried with the tidal flow. Sediment suspended during dredging operations under higher water velocities would remain suspended in the water column.

Generally, sediment suspended during dredging using the suction cutter head would be of minimal volume and would be dispersed broadly by tidal flow and would be unlikely to cause adverse impacts on demersal aquatic fauna (e.g., through deposition-related smothering). Therefore, sediment deposition outside of the dredge footprint would be temporary and minor. Impacts on aquatic resources due to increased turbidity and suspended solids in the water column 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 strong tidal currents that prevent settling of sediments from the water column or shift sediments from one area to another as the tide direction changes (COE, 2010). Any reductions in primary production would be localized around the immediate vicinity of the area being actively dredged and would be limited to immediately following completion of the dredging activities (COE, 2014). The 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. This indicates that fish and benthic organisms within the impact area would likely recover quickly after construction and maintenance dredging related disturbances (MMS, 2004). As noted in section 4.2.1.1, it is unlikely that contaminated sediments are present at the Project site; therefore, the potential for toxic effects on aquatic species during and after dredging is low. On this basis, we conclude that impacts on aquatic resources from dredging-related turbidity and sediment resuspension would be localized, temporary, and minor.

Dredging would remove the estuarine bottom sediments used as habitat by some aquatic species. Benthic organisms, such as mollusks and crustaceans, may experience direct mortality during dredging, while other more mobile species, such as blue crab, may experience temporary displacement. Although the dredging-related impacts would be greatest on the benthic community within the dredging area, impacts on fish and shrimp species, such as red drum and brown and white shrimp, could also occur. However, these impacts are expected to be localized and temporary. Determining how to define when a disturbed site has recovered and quantifying the time required to reach that point remains a major challenge for the scientific community (De La Cruz, et. al., 2020). Part of this difficulty is that the functional recovery of the invertebrate population at site (i.e., the point at which the invertebrate population at a site is able to serve the same role in the food web as the population that was present prior to dredging) can occur prior to the structural recovery of the community (De La Cruz, et. al., 2020). The recovery timeframe of a dredged site is often site-specific and dependent on the physical and biological characteristics of that site (Wilber and Clarke, 2007). However, some generalizations can be made. Shallow habitats (less than 60 feet) that frequently experience disturbances from waves, wind, and/or currents typically contain early successional species assemblages that reestablish themselves relatively quickly after a disturbance (Newell et. al., 1998;

51 See appendix F of accession no. 20210604-5170.

Wilber and Clark, 2007). These types of species generally recolonize disturbed sites, often beginning within days of the disturbance, through adult and juvenile migration and/or larval settlement, which are facilitated in areas with high currents, such as the Calcasieu Ship Channel (MMS, 2004). Given that the dredged area would be expected to recover relatively quickly after the disturbance, the loss of benthic organisms due to dredging would be unlikely to have a prolonged adverse effect on the aquatic community at that site (MMS, 2004). Therefore, we conclude that the impacts on the benthic community due to the initial and maintenance dredging of the marine facility would be temporary and minor.

Commonwealth would transport dredge slurry through a non-jurisdictional 6.9-mile-long temporary pipeline to a BUDM site within a wetlands creation area on the southern shore of Calcasieu Lake within the Cameron Prairie NWR (see section 4.4.2.2). Initial dredging of the marine facility location would require placement of 1.73 million cubic yards of sediment at the BUDM site. Maintenance dredging every two years would require placement of approximately 152,000 cubic yards of sediment at the BUDM site. The COE has informed Commonwealth that the impacts on wetland habitat caused by the slurry pipeline and placement of the dredge slurry into the BUDM site would be offset by the beneficial use of the dredged sediments.

Construction of the marine facility would also require removal of riprap currently present along the shoreline of the Calcasieu River within the footprint of the Project. As a hard substrate in an estuarine environment, this riprap serves as estuarine oyster reef habitat. Commonwealth is in discussions with the COE to provide the riprap to the COE for use in repairing the jetties at the mouth of the Calcasieu River. Removal of the riprap would result in a permanent loss of 0.05 acre of estuarine oyster reef habitat. The COE would not require mitigation for loss of this habitat and Commonwealth has stated it would not provide mitigation beyond providing the riprap to the COE for use on the jetty. Commonwealth notes the riprap containing oyster reef would be placed in a subtidal environment that would allow the riprap to continue functioning as oyster reef habitat. However, the location on the jetty that the riprap would be used is currently unknown and anywhere on the jetty would expose the oysters to different environmental conditions than what currently exists in the protected environment inside the mouth of the Calcasieu River. Commonwealth would, however, create new potential estuarine oyster reef habitat in the form of the new riprap that Commonwealth would use to armor the shoreline of the marine facility (see section 4.1.5.4). Although, the new riprap would not immediately function as estuarine oyster reef habitat, as a hard substrate in an estuarine environment, oyster settlement on the riprap would be expected to occur in time in the same fashion that it has occurred with the existing riprap. Thus, we conclude the removal of 0.05 acre of estuarine oyster reef habitat at the marine facility would be considered a short- to long-term, but minor impact.

Project construction would also produce temporary impacts that extend beyond the permanent Project footprint. The piers, mooring dolphins, and other in- and overwater structures associated with the Terminal would require the placement of concrete and steel piles ranging from 18 to 96 inches in diameter. The piles would be placed using a combination of vibratory and impact pile driving. Non-mobile organisms or those with restricted mobility (e.g., benthic invertebrates or fish larvae) within the pile driving footprint would be killed or permanently displaced. Pile driving would also produce underwater noise sufficient to injure and/or alter the behavior of fish and other aquatic organisms a considerable distance from the point of disturbance.

Studies have shown that the sound waves from pile driving may result in injury or trauma to fish, sea turtles, and other animals with gas-filled cavities, such as swim bladders, lungs, sinuses, and hearing structures (Popper, 2014). Injurious effects can occur in two ways. First, immediate adverse effects can occur if a single noise event exceeds the threshold for direct physical injury. Second, effects can result from prolonged exposure to noise levels that exceed the daily cumulative exposure threshold for the animals, and these can constitute adverse effects if animals are exposed to the noise levels for sufficient periods. The intensity of the sound pressure levels produced during pile driving depends on a variety of factors such as type and size of the pile, the substrate into which the pile is being driven, the depth of water, and the type of pile-driving equipment being used (Mueller-Blenkle et al., 2010).

Underwater sound levels are commonly referred to as a ratio of the underwater sound pressure to a common reference pressure of 1 micropascal (μPa), which is expressed in decibels (dB) of sound intensity as dB referenced to 1 μPa (i.e., dB re: 1 μPa).[52] Three types of sound measurement are generally used to evaluate the effects of sound on aquatic species: peak sound pressure level (dBpeak), root mean square (dB RMS), and cumulative sound exposure level (cSEL).[53] A dBpeak value is the largest absolute value of instantaneous sound pressure. It is used as the measurement to evaluate injury effects from a single strike of an impact pile driver. The dB RMS value represents the effective pressure and intensity produced by a sound source and is used as the measurement for behavioral change thresholds. Cumulative SEL is the sound energy accumulated over a given period and is used as the measurement of cumulative injury.[54]

The NMFS Southeast Regional Office guidance states that fish exhibit behavioral effects in response to both vibratory and impact pile driving at a threshold sound level of 150 dB RMS (NMFS, 2021); sea turtles exhibit behavioral effects in response to vibratory and impact pile driving at a threshold sound level of 160 dB RMS (NMFS, 2021); and cetaceans and pinnipeds exhibit disturbance behaviors at 120 dB RMS in response to vibratory pile driving and 160 dB RMS in response to impact pile driving (NMFS, 2021). Noise levels in excess of these thresholds can cause temporary behavior changes (startle and stress) that can interfere with animals migrating, feeding, resting, or reproducing, for example.

Injury-level effects on fish and marine mammals can result from exposure to high-intensity sound from single pile strikes and cumulative exposure to extended vibratory pile driving or multiple, lower-intensity impact pile strikes. The cSEL is a function of a single pile strike or set-duration vibratory sound exposure level and the total number of pile strikes or the total duration of vibratory pile driving over the period of exposure. NMFS has defined a set of categorical injury thresholds for fish, sea turtles, and marine mammals by species group and the type of injury. In the case of marine mammals, two categories of injury are defined, temporary and permanent threshold shifts. Temporary threshold shifts refer to temporary loss of hearing ability and permanent threshold shifts refer to permanent loss of or reduction in hearing ability. Disturbance and injury thresholds as provided by NMFS are summarized in table 4.6.2-3, updated since the draft EIS based on the *NMFS Multi-Species Pile Driving Calculator Tool Version 1.0* (NMFS, 2021).

Commonwealth would construct the bulkhead portion of the marine facility from dry land, and thereby avoid in-water pile driving. However, in-water pile driving would be required to construct the overwater portion of the barge dock and the mooring and breasting dolphins, bridges, and walkways of the LNG carrier berth. Table 4.6.2-4 provides a summary of numbers and types of piles that would require installation and the methods and duration required to install them.

52 For comparison, air sounds have a reference pressure of 20 μPa, though the reference pressure for air measurements is not generally stated when presenting sound data.

53 The measurement unit for dBpeak is dB re: 1 μPa; the measurement unit for RMS is dB re: 1 μPa RMS; the measurement unit for SEL is dB re: 1 μPa2 per second (s)

54 NMFS assumes this accumulation occurs continuously unless there is a break of at least 12 hours (Stadler and Woodbury, 2009)

TABLE 4.6.2-3

Underwater Noise Disturbance and Injury Thresholds for Fish, Marine Mammals, and Marine Turtles Likely to Occur in the Project Vicinity

Functional Hearing Group	Vibratory Pile Behavioral Disturbance Threshold (dB)	Vibratory Pile Injury Threshold	Impact Pile Behavioral Disturbance Threshold (dBpeak)	Impact Pile Injury Threshold (dB peak; cumulative SEL)
Fish ≤ 2 grams	150 dB RMS	--	150 dB RMS	206 dB RMS 183 dB cSEL
Fish >2 grams	150 dB RMS	--	150 dB RMS	206 dB RMS 187 dB cSEL
Fish <102 grams	150 dB RMS	--	--	--
Fish ≥ 102 grams	150 dB RMS	--	--	--
Mid-frequency cetaceans (e.g., dolphins)	120 dB RMS	Temporary: 178 dB cSEL Permanent: 198 dB cSEL	160 dB RMS	Temporary: 224 dB RMS; 170 dB cSEL Permanent: 230 dB RMS; 185 dB cSEL
Marine turtles	175 dB RMS	220 cSEL	175 dB RMS	175 dB RMS 204 dB cSEL

Source: NMFS, 2021

TABLE 4.6.2-4

Summary of In-Water Pile Installation Required for the Marine Facility

Pile size / material	Number	Number per day	Length (feet)	Vibratory Driver (minutes)			Impact Hammer (strikes)		
				Per pile	Per day	Total	Per pile	Per day	Total
18-inch square concrete	6	3	60	--	--	--	3,120	9,360	18,720
42-inch diameter cylindrical steel	5	2	145	110	220	550	800	1,600	4,000
48-inch diameter cylindrical steel	2	1	80	70	70	140	800	800	1,600
54-inch diameter cylindrical steel	37	2	130-145	--	--	--	6,160	12,320	227,920
96-inch diameter cylindrical steel breasting dolphin	6	1	140	116	116	696	1,080	1,080	6,480
96-inch diameter cylindrical steel mooring dolphin	6	1	140	157	157	942	1,600	1,600	9,600

Ambient noise levels in the Calcasieu Ship Channel are generally high given the industrial nature of the ship channel and the frequent marine traffic and construction activity within the ship channel (CSRS, 2017). Nonetheless, in a letter discussing consultation for the Project, NMFS noted that based on the size of the piles that Commonwealth would be driving (e.g., 96-inch steel piles), the use of noise attenuation devices during pile driving would almost certainly be necessary to avoid adverse impacts on ESA-listed species (NMFS, 2019b). Commonwealth has committed to using cushion blocks (used with the impact hammer) and bubble curtains around the piles during in-water pile driving activities. Commonwealth would also implement the following NMFS-recommended measures to mitigate noise impacts on aquatic species in the vicinity of pile driving activities:

- employ a soft-start technique (i.e., gradual increase in pile-driving intensity at the start of each pile installation or when pile driving has been stopped for more than 15 minutes);
- deploy a trained wildlife observer to maintain a watch for protected species within 330 feet of the construction area during pile driving activities; and
- implement all measures included in the NMFS Sea Turtle and Smalltooth Sawfish Construction Conditions (NMFS, 2006) including the following:

- notify all construction personnel of the potential presence of protected species in the vicinity and the need to avoid collisions with the species;
- inform all construction personnel of their responsibility for observing water-related activities for the presence of protected species; and
- if a protected species is seen within 330 feet of active construction, operation, or vessel movement, implement all appropriate precautions to ensure its protection, including ceasing operation of any moving or mechanical construction equipment closer than 50 feet from the species and remaining on operational stand-down until it has departed the Project area of its own volition.

Reducing the source noise level (i.e., through use of the noted noise attenuation devices) would reduce the extent of potential behavioral and injury level effects on aquatic species. In combination with the noted monitoring and construction controls, these steps can minimize potential adverse effects on fish, sea turtles, and marine mammal species. We received a comment expressing concern that the draft EIS did not use updated NMFS guidance regarding noise impacts on aquatic species. NMFS has issued a revised tool for calculating the distance from a noise-generating source that is required to attenuate sound pressure below behavioral and injury level thresholds (NMFS, 2021). Calculations in this document were updated using the *NMFS Multi-Species Pile Driving Calculator Tool Version 1.0* (NMFS, 2021). Calculations using this guidance indicate that using an impact hammer would potentially impact aquatic species over a larger distance than using a vibratory hammer. We discuss here the effects of impact pile driving on aquatic species, as vibratory pile driving would produce lower levels (and smaller areas) of effects relative to the impact hammer. Impact pile driving during construction could cause fish, sea turtles, and marine mammals to experience behavioral changes and physical injury. However, use of the NMFS-recommended noise attenuation devices (i.e., bubble curtains and cushion blocks) as proposed by Commonwealth would minimize the area in which these aquatic species would be affected. As indicated in table 4.6.2-5, injury from a single, full-strength hammer strike would require fish to be within 28 feet of the pile being driven and sea turtles and marine mammals would need to be within 1 foot of the pile being driven. For fish to experience injury due to cumulative exposure to impact pile driving noise would require small (i.e., less than 2 grams) fish to remain within 0.5 mile of the pile driving location throughout a 12-hour period. Large (i.e., greater than or equal to 2 grams) fish would have to remain within 0.3 mile of the pile driving location throughout a 12-hour period. Sea turtles and marine mammals would have to remain within approximately 200 feet of the pile driving location throughout a 12-hour period. Given the mobility of these species (particularly larger fish, sea turtles and marine mammals), their natural tendency to avoid in-water construction activities, and Commonwealth's plan to use the soft-start technique when initiating pile driving, these injury scenarios would be extremely unlikely to occur.

Behavioral effects on aquatic species would likely occur over a broader area. As shown in table 4.6.2-5, pile driving of 96-inch steel pilings could cause behavioral changes in fish within about 3 miles of the pile driving location, in marine mammals within about 0.6 mile, and in sea turtles within about 330 feet. We note that the distances provide in table 4.6.2-5 do not account for the closely surrounding shorelines and stone jetties at the mouth of the Calcasieu River that would absorb much of the sound energy radiating from the pile driving. We received a comment expressing concern that pile driving noise could prevent aquatic species from exiting the Calcasieu River into the Gulf of Mexico because the noise impacts would extend across the river from the Terminal site to the opposite shoreline. In this hypothetical scenario, a fish or dolphin upriver of the Terminal would not be able to pass the Terminal to exit the river into the Gulf of Mexico due to behavioral changing noise impacts extending from shoreline to shoreline at the mouth of the river. However, behavioral effects in aquatic species can include a wide array of actions. Research shows pile driving sounds can elicit increases in swimming speeds, changes in ventilation and heart rate, and startle responses. However, these can be transient reflexes, after which the animal may rapidly return to their normal behavior (Molnar *et. al*., 2020). Thus, while it is possible pile driving could hinder passage of fish or marine mammals during construction due to behavioral changes, it is also possible that the noted behavioral change is simply an increase in swimming speed as the animal passes the source of the noise. Additionally, as provided in table 4.6.2-4, the duration (number of pile strikes per day) of pile driving on any given day would not be constant throughout the day. Although the behavioral response of fish or marine mammals could prevent the individuals from passing the Terminal during pile driving activities, lulls in pile driving throughout the day could allow the individuals to pass.

Based on the distances presented in table 4.6.2-5, in-water pile driving could result in injury and behavior disturbances to aquatic species that remain in the Project area. However, given the mitigation measures that Commonwealth would implement (e.g., soft starts, bubble curtains, and vibratory hammer) and the mobility of each of the species types, we conclude injury would be unlikely and behavioral disturbances would not be significant. If fish, sea turtles, or marine mammals are in the vicinity of the Project at the beginning of construction activities, we would expect them to move away from the noise disturbances, beginning with the soft start of the pile driver, and continue their normal behavior beyond the affected zone and return once construction activities are completed. Furthermore, the trained wildlife observer ceasing operations if any protected species is observed within 330 feet of active construction, operation, or vessel movement, would minimize impacts on these species.

Over-water activities associated with installation of the marine facility may cause avoidance of the area by mobile species due to noise and movement, but this impact would be minor and temporary. During operation of the Terminal, the marine facility pilings would create aquatic habitat in the form of additional hard substrate areas, allowing for the growth of attached organisms. Over-water dock structures may also provide a source of refuge for some aquatic species.

Artificial lighting associated with the marine facility may also impact aquatic species. Artificial lighting over coastal waters has been shown to attract both juvenile fishes and larger predators (Keenan et al., 2007; Becker et al., 2013). Illumination of waters adjacent to marine facility may be detrimental to juvenile fishes that may otherwise be able to avoid predation under natural circumstances. However, aquatic species in the area are likely acclimated to the current ambient light from the existing industrial nature of the Calcasieu Ship Channel. Therefore, adverse impacts species due to nighttime lighting would not be substantial. Although the juvenile fish species present in the area could be drawn to light that shines on waters outside the marine facility and may thereby be subject to increased predation, we conclude that there would not be substantial adverse impacts at the population level.

Overall, we conclude that impacts on aquatic wildlife from construction and operation of the marine facility would result in temporary impacts on aquatic organisms. In addition, we conclude that operation of the Terminal would result in minimal long-term impacts on aquatic organisms.

TABLE 4.6.2-5

Distances (feet) to the Indicated Noise Thresholds for Impact Hammer with Noise Attenuation Devices

Pile Size & Installation Method	Fish				Sea Turtles			Mid-frequency Marine Mammals		
	Behavioral Change	Onset of Physical Injury			Behavioral Change	Onset of Physical Injury		Behavioral Change	Onset of Physical Injury	
			Cumulative SEL				Cumulative SEL			Cumulative SEL
	RMS (150 dB)	Peak (206 dB)	Fish (≥2 g, 187 dB cSEL)	Fish (<2 g, 183 dB cSEL)	RMS (175 dB)	Peak (232 dB) a/	204 dB cSEL	RMS (160 dB)	Peak (230 dB) a/	185 dB cSEL
18-inch concrete	176	< 1	33	33	4	0	4	38	0	3
42-inch steel b/ Impact	4,460	21	283	523	96	< 1	21	961	< 1	19
48-inch steel Impact	4,460	21	178	330	96	< 1	13	961	< 1	12
54-inch steel Impact c/	7,068	13	1,523	1,523	152	< 1	204	1,523	< 1	182
96-inch steel breasting dolphins Impact	15,228	28	1,179	2,179	328	< 1	87	3,281	<1	77
96-inch steel mooring dolphins Impact	15,228	28	1,532	2,832	328	< 1	113	3,281	< 1	101

Source: NMFS 2021.
a/ 0 values indicate noise levels from driving the given sized pile would not reach the stated noise threshold
b/ Impact driver data for 42-inch diameter steel piles is unavailable in NMFS 2021. Source levels were estimated from data for 48-inch piles.
c/ Impact driver data for 54-inch diameter steel piles is unavailable in NMFS 2021. Source levels were estimated from data for 60-inch steel piles.

Ballast Water Discharge

The potential effects of ballast water on water quality are described in section 4.3.2.2. Resident species within the Calcasieu Ship Channel are euryhaline (able to live in waters with a wide range of salinity) and are well adapted to natural spatiotemporal variation in salinity and oxygen levels. This adaptability and the ability to move over a short distance to more suitable conditions minimizes adverse impacts on aquatic resources associated with ballast water discharges.

As noted in section 4.3.2.2, FERC does not have jurisdiction over LNG vessels; however, 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 151.2025). Under these requirements, vessels must implement one of the following ballast management methods to prevent the spread of aquatic nuisance species in U.S. waters: 1) install a ballast water management system (as described in 33 CFR 151.2025(a)(3)); 2) use only water from a U.S. public water system; 3) do not discharge ballast; or 4) discharge ballast to a facility onshore or to another vessel for treatment. LNG vessels operating at the Terminal would discharge all ballast water in accordance with federal regulations. With the implementation of the mandatory practices required by the USCG, we conclude that the impacts on aquatic resources from ballast water discharges associated with the Project would not be significant.

Entrainment and Impingement of Aquatic Species

As noted in section 4.3.2.2, vessels berthed at the marine facility would also withdraw water from the Calcasieu Ship Channel to cool their engines, generators, condensers, and other shipboard equipment. The temporary and minor effect of cooling water discharge on water temperature at the marine facility is discussed in section 4.3.2.2. Barges and modular component delivery vessels would require ballast water intake at the Project site during modular off-loading. Ballast and cooling water intake can cause aquatic organisms to become impinged (i.e., becoming trapped against an intake screen due to the velocity of the intake flow) or entrained (i.e., being pulled through an intake screen and into the cooling water system). Planktonic early life stages of brown and white shrimp, assorted fish species, and other small organisms (collectively referred to as ichthyoplankton) that use the estuarine waters of the Calcasieu Ship Channel as nursery habitat would be most susceptible to impingement and entrainment on and within the water intake systems of the vessels. LNG carriers calling on the marine facility during operation would likely have intake screens with 0.2-inch slots, which should generally prevent entrainment of larger larvae and fish. Some older LNG carriers could have intake screens with 0.4-inch slots, which may result in a higher entrainment rate. Other LNG projects along the Calcasieu Ship Channel have conducted studies to gain a general understanding of the potential impacts on ichthyoplankton resulting from LNG carrier cooling water intake (FERC, 2019b). These studies indicate each LNG carrier call at the marine facility would result in potential entrainment of less than one-tenth of one percent of the ichthyoplankton population in the Calcasieu Ship Channel. Given the generally high natural mortality rates of eggs and larvae in the water column (e.g., the daily natural mortality rate of red drum eggs and planktonic larvae is upwards of 56 percent; EPRI, 2012), we conclude that these impacts would not be significant.

Likewise, entrainment of fish eggs, larvae, and juveniles during dredging would be minor. Documented entrainment rates of mobile fish species are low (Wenger et al, 2017). Impacts would likely be highest on eggs and larvae present in the dredge footprint. However, given the area encompassed by dredging operations, the frequency in which dredging would occur, and the noted generally high natural mortality rates of eggs and larvae in the water column, we conclude entrainment impacts from dredging would not be significant.

Inadvertent Spills

Aquatic resources could be adversely affected by an accidental spill or leak of hazardous materials into or near a waterbody. To minimize impacts on aquatic resources, Commonwealth would implement its *SPAR Plan*. Implementation of the *SPAR Plan* would minimize the potential for releases to occur. Should a spill or leak occur, implementation of the response measures in the *SPAR Plan* would reduce response time and ensure appropriate cleanup, thereby minimizing impacts on aquatic resources. In addition, LNG carriers are required to develop and implement a SOPEP that include measures to be taken when an oil pollution incident has occurred or a ship is at risk of one.

Ship Traffic

Construction of the Terminal would require approximately 238 barge trips over the 36- to 38-month construction period. During operation of the Project, an average of 13 LNG carriers would call on the Terminal per month. Increases in ship traffic have the potential to increase shoreline erosion and suspended sediment concentrations due to increased wave activity. Because the barges and LNG carriers are typically slow-moving vessels and would transit an existing, industrial channel created and maintained for the purposes of ship traffic, Project-related increases in shoreline erosion or suspended sediment concentrations within the Calcasieu Ship Channel would not be significant.

Construction and operation of the Terminal, particularly the ship traffic, could impact marine mammals and sea turtles, resulting in an increase in stress, injury, and/or mortality. The measures that Commonwealth would implement to minimize ship traffic impacts on marine mammals and sea turtles are described in section 4.7.1. They include the measures recommended by the FWS to minimize impacts on the West Indian manatee and measures within the NMFS *Vessel Strike Avoidance Measures and Reporting for Mariners* (NMFS, 2008). Based on the modest increase in ship traffic over current conditions in the Calcasieu Ship Channel resulting from the construction and operation of the Terminal, the current commonality of such activities in the vicinity of the Terminal, and the NMFS-recommended vessel strike avoidance measures that would be communicated by Commonwealth to LNG carriers, we have determined that impacts on marine mammals and turtles would not be significant.

Hydrostatic Testing

LNG storage tanks require hydrostatic testing prior to being placed into service. Commonwealth would withdraw approximately 9.9 million gallons of hydrostatic test water from the Calcasieu Ship Channel for this purpose. The water withdrawal process could entrain fish eggs and juvenile fish near the intake hose. However, Commonwealth would screen intake hoses using wedgewire screens with 0.07-inch slots and would maintain an intake velocity of less than 0.5 feet per second, which is considered by the EPA to be protective of aquatic species. These measures would minimize the risk of entrainment and impingement of fingerling and small fish during water withdrawal.

Commonwealth does not anticipate adding chemicals such as corrosion inhibitors to the test water before or after testing but states it could use biocides to prevent biological growth inside the tanks. After testing is completed, the hydrostatic test water would be discharged into the Terminal's storm water retention pond and subsequently discharged back into the Calcasieu Ship Channel in accordance with any permit conditions within Commonwealth's Louisiana Pollutant Discharge Elimination System General Permit LAG670000 – Hydrostatic Test and Vessel Testing Wastewater authorization. Biocides in the test water could adversely impact aquatic organisms in the Calcasieu Ship Channel if not neutralized prior to discharge. According to General Permit LAG670000, Commonwealth would be required to obtain prior written approval from LDEQ to discharge water containing additives such as corrosion inhibitors or bactericides. Commonwealth would be required to provide aquatic toxicity (or lack thereof) data for the additive in its request or it would otherwise be denied the use of the additive. Therefore, impacts on aquatic resources due to hydrostatic testing would be temporary and negligible.

Pipeline

Impacts on aquatic resources resulting from construction and operation of the Pipeline could include loss or modification of habitat, increased sedimentation and turbidity levels, and alteration of vegetative cover resulting from waterbody crossings; entrainment of small organisms during withdrawal of hydrostatic test water; and introduction of pollutants as a result of inadvertent spills or leaks of hazardous materials. These impacts are discussed in the following sections.

<u>Waterbody Crossings</u>

Commonwealth would cross three major waterbodies using open cut methods and would use the HDD method at two intermediate waterbody crossings (see table 4.3.2-2). No meter stations or mainline valves are proposed within a waterbody.

The intermediate waterbodies that Commonwealth would cross using HDD connect to the Calcasieu Ship Channel via a culvert approximately 0.2 mile east of the proposed HDD crossing. Installing the proposed Pipeline 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 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. In the draft EIS, we recommended Commonwealth file with the Secretary a revised *HDD Contingency Plan* that, in part, provides a detailed approach for reducing the potential for an inadvertent release of drilling mud, a detailed contingency plan for responding to an inadvertent release of drilling mud in aquatic habitat, and a plan to mitigate for any adverse impacts on aquatic habitat, including EFH. Commonwealth's revised *HDD Contingency Plan* is described in section 4.4.2.3. We conclude these methods are sufficient to minimize impacts on aquatic habitat due to an inadvertent return of HDD drilling mud.

The use of open-cut methods would result in temporary loss or modification of aquatic habitat, increase in sedimentation and turbidity levels, and alteration of vegetative cover. The Pipeline would not cross any forested lands; therefore, impacts on vegetative cover would be temporary and would return to preconstruction conditions within one to four growing seasons upon Commonwealth's restoration of the right-of-way. Because much of the vegetation is already maintained in a low-growing, herbaceous state and does not provide shade over the waterbodies, changes in water temperature would be minimized. The majority of fish present within the waterbody at the time of construction activities would likely be displaced to similar adjacent habitats up or down stream; 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. This temporary increase in suspended solids would decrease rapidly following the completion of instream activities. Commonwealth would place timber mats within a portion of the shallow ponds present at MP 0 as part of an ATWS location. These mats would not block water flow or otherwise impact fish within the pond other than to reduce marginally the size of the ponds.

Commonwealth would implement the measures outlined in its Project-specific *Procedures* to minimize impacts on waterbodies and aquatic resources during pipeline construction. Once construction is complete, streambeds and banks would be restored to their preconstruction conditions and contours to the maximum extent practicable, which would aid in preventing erosion and minimize long-term impacts on aquatic resources. With implementation of the mitigation measures described above, we anticipate that the Project would have minimal and localized impacts on aquatic resources.

Hydrostatic Testing

Prior to placing the Pipeline into service, each component would be hydrostatically tested to ensure its integrity. Hydrostatic test water would be brought to the site via truck or using the local water pipeline tie-in. Hydrostatic test water would contact only new pipe and Commonwealth would not add chemicals to the water. After testing is completed, Commonwealth would discharge the hydrostatic test water to the Terminal's storm water retention pond and subsequently into the Calcasieu Ship Channel in accordance with any permit conditions within Commonwealth's Louisiana Pollutant Discharge Elimination System General Permit LAG670000 – Hydrostatic Test and Vessel Testing Wastewater authorization. Therefore, impacts on aquatic resources due to hydrostatic testing would be temporary and negligible.

Accidental Spill or Leak of Hazardous Materials

Aquatic resources could be adversely affected by an accidental spill or leak of hazardous materials into or near a waterbody. As described in section 4.3.2.2, Commonwealth would implement its Project-specific *SPAR Plan* to minimize the potential for releases to occur. Should a spill or leak occur, implementation of the response measures in the *SPAR Plan* would reduce response time and ensure appropriate cleanup, thereby minimizing impacts on aquatic resources.

4.6.2.3 Aquatic Resources Conclusions

The highest potential for Project impacts on aquatic resources would stem from activities associated with construction of the Terminal. Dredging and pile driving during construction of the marine facility could cause increased sedimentation, turbidity, and noise levels in the Calcasieu Ship Channel. However, given Commonwealth's intent to use a suction cutterhead dredge and adhere to NMFS-recommended measures to mitigate noise impacts on aquatic species in the vicinity of pile driving activities, we conclude impacts on aquatic resources from construction of the marine facility would not be significant. Aquatic species would be expected to populate the area shortly after construction. Species that prefer only shallow-water habitat would be displaced but given the abundance of similar shallow water habitat immediately upriver of the Project, we do not expect this to cause population-wide impacts on these species. Otherwise, Project impacts on aquatic resources would be temporary to short-term in duration.

4.6.3 Essential Fish Habitat

In comments filed during the Project scoping periods, NMFS emphasized that the aquatic resources potentially affected by the Project, comprising the estuarine mud bottom and water column of the Calcasieu River adjacent to the Calcasieu Ship Channel, oyster reef covering the riprap present along the shoreline of the Calcasieu River within the proposed marine facility footprint, and the adjacent estuarine emergent wetlands present within the proposed Terminal footprint are areas designated as EFH for various life stages of federally managed species, including post larval and juvenile stages of brown shrimp, white shrimp, red drum, red snapper, gray snapper, lane snapper, gray triggerfish, cobia, greater amberjack, king mackerel, Spanish mackerel, scalloped hammerhead shark, blacktip shark, and Atlantic sharpnose shark (NMFS, 2018a).

In 1996, the U.S. Congress made amendments to the MSA that mandated the identification of EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (16 USC 1802(10)). In addition to their ecological significance, EFH areas are of high economic importance due to the dependence of recreational and commercial fisheries associated with them. The MSA granted NMFS legislative authority for fisheries regulation in the U.S. within a jurisdictional area between 3 and 200 miles offshore, depending on the geographical location. NMFS in turn established eight regional fishery management councils, each responsible for the proper management and harvest of finfish and shellfish resources within their respective geographic regions. These fishery management councils have developed region-specific fisheries management plans (FMP), which outline measures to ensure the proper management and harvest of finfish and shellfish species within federal waters. The Project area lies within the management jurisdiction of the GMFMC, which has prepared FMPs for seven marine groups within the Gulf of Mexico: reef fish, migratory pelagic fish, red drum, shrimp, spiny lobster, and corals. Each FMP has undergone several amendments, including an amendment in 1998 that defined EFH for each fisheries group.

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

- **Notification** – The action agency (i.e., FERC in this instance) should clearly state the process being used for EFH consultations (e.g., incorporating EFH consultation into the EIS).
- **EFH Assessment** – The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH Assessment should include: 1) a description of the proposed action; 2) an analysis of the effects (including cumulative effects) of the proposed action on EFH, the managed fish species, and major prey species; 3) the federal agency's views regarding the effects of the action on EFH; and 4) proposed mitigation, if applicable.
- **EFH Conservation Recommendations** – After reviewing the EFH Assessment, NMFS will provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.
- **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 will 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 any conservation recommendation that is not adopted, the action agency must explain its reason to NMFS for not following the recommendation.

On May 13, 2019, Commonwealth, serving as a non-federal party assisting FERC in meeting its obligations under the MSA, submitted to NMFS a Project introduction letter, an associated Project description, and a summary of Commonwealth's proposed minimization and mitigation approaches for potential Project impacts on EFH. NMFS responded, in a letter dated May 31, 2019, that the Project would likely adversely impact EFH and associated marine fishery resources. In an email dated July 2, 2019, Commonwealth provided NMFS with additional information regarding avoidance, minimization, and mitigation approaches the Project would implement for impacts on EFH. NMFS responded again, in a letter dated August 12, 2019, that the Project would likely adversely impact EFH and associated marine fishery resources despite Commonwealth's mitigation proposals and therefore the FERC would be required to conduct an EFH consultation with NMFS. As such, we requested that NMFS consider the draft EIS as our initiation of EFH consultation. NMFS determined that the EFH Assessment was incomplete based on inconsistencies between the EFH Assessment and information Commonwealth had provided to NMFS related to Commonwealth's evolving proposal for dredge materials management and the unresolved nature of the COE's quantification of tidal versus non-tidal wetlands, which impacts the EFH acreages.[55] Since issuance of the draft EIS, Commonwealth has revised its plans for dredge material management; therefore, NMFS's prior comments regarding the impacts on EFH of the nearshore dredged material placement area

55 See accession number 20220523-5181.

are no longer applicable. Commonwealth has consulted with the COE to determine the appropriate elevation to use as mean high water and thereby determine what proportion of intermediate marsh EEM should be considered tidally influenced and therefore EFH. FERC has updated the EFH Assessment based on Commonwealth's revised proposal for dredge material management and wetland mitigation and incorporated the revised EFH acreages. Our EFH Assessment is provided for reference as appendix D. We are now reinitating EFH consultation with NFMS with this final EIS and appendix D.

4.6.3.1 Essential Fish Habitat in the Project Area

GMFMS characterizes EFH as occurring within three zones: estuarine (inside barrier islands and estuaries), nearshore (60 feet or less in depth), and offshore (greater than 60 feet in depth). The GMFMC defines 12 standard habitat types in the Gulf of Mexico: submerged aquatic vegetation (e.g., seagrasses, benthic algae); mangroves; drifting algae; estuarine emergent marshes (EEM wetlands; e.g., tidal wetlands, salt marshes, tidal creeks, rivers/streams); soft bottoms (e.g., mud, clay bottoms, silt); sand/shell bottoms; hard bottoms (e.g., live hard bottoms, low-relief irregular bottoms, high-relief irregular bottoms); oyster reefs; banks/shoals; reefs (e.g., reef halos, patch reefs, deep reefs); shelf edge/slope; and pelagic (e.g., estuarine and nearshore water column; GMFMC, 2004).

Impacts associated with the Project would occur in the estuarine zone. The habitat types that would be affected are listed below.

- Estuarine emergent marsh: EEM wetlands present at the Terminal site, along the Pipeline right-of-way, and at the BUDM site (see section 4.4.2.2) that are hydrologically connected to the Calcasieu River and Calcasieu Lake. Includes tidal brackish marsh and tidal intermediate marsh.
- Soft bottom: the estuarine mud bottom of the Calcasieu River where construction and operation of the marine facility would occur and on which the dredge slurry pipeline would be placed (see section 4.4.2.2).
- Pelagic: the estuarine water column of the Calcasieu Ship Channel where construction and operation of the marine facility would occur.
- Estuarine oyster reef: present on shoreline armoring riprap in the intertidal and subtidal zones of the Calcasieu River shoreline within the proposed footprint of the marine facility.

Generally, estuarine water column habitat serves as EFH for several species and their prey at various life stages by providing habitat for spawning, breeding, and foraging. Fish communities within the water column are influenced by factors such as salinity, temperature, dissolved oxygen, and turbidity. The affected estuarine mud bottom habitat consists of intertidal and subtidal consolidated and unconsolidated, mixed sediments devoid of submerged aquatic vegetation. This EFH type serves as important nursery and feeding areas for many fish and invertebrates, including bottom-dwelling (demersal) fish that prey upon aquatic species living on and in the sediments. Estuarine emergent marsh provides important nursery and feeding areas and a source of protection from predation for many fish and invertebrate species. Estuarine emergent marsh also produces nutrients and detritus, which are important components of the aquatic food web and contribute to the overall productivity of an estuarine environment (NMFS, 2019a). Estuarine oyster reef habitat serves as a substrate for additional oyster growth and provides structure that many recreationally and commercially valuable fish and invertebrates use as a foraging location and to hide from predators. Oysters also function as natural water filters that can dramatically improve water quality where they are present in high concentrations (Coen et. al., 1999).

4.6.3.2 Federally Managed Species with Essential Fish Habitat in the Project Area

Based on our review of the Project and correspondence from NMFS, we have concluded that construction and operation of the Project could affect EFH for species of shrimp, reef fish, red drum, coastal migratory pelagic fishes, and Atlantic highly migratory species in the Gulf of Mexico. The general characteristics of these fisheries groups and the specific species that may be affected are provided below. Table 4.6.3-1, updated based on NFMS' comments as a cooperating agency, provides an overview of which life stages of the species occur in the different EFH zones and habitat types that would be affected by the Project.

In addition to the federally managed species with EFH in the Project area, the estuarine water column, estuarine softbottom, estuarine oyster reef, and EEM wetlands of the Project area provide nursery, foraging, and refuge habitats for various recreationally and economically important marine fishery species such as blue crab, Atlantic croaker, gulf menhaden, spotted and sand sea trout, striped mullet, and southern flounder. Estuarine-dependent species such as these serve as prey for other fish species managed under the MSA by the GMFMC (e.g., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks).

Shrimp Fishery of the Gulf of Mexico

Shrimp species within the Gulf of Mexico use a variety of habitats including estuarine and open ocean habitats as they grow from planktonic larvae to spawning adults. Larvae are primarily found in the open ocean. As larvae progress into the post-larval life stage, they begin to move into the benthic estuarine habitats. Adult habitat use varies between species and season but typically ranges from nearshore to offshore (GMFMC, 1981). Shrimp species with EFH in the Project area include brown shrimp and white shrimp.

Reef Fishery of the Gulf of Mexico

Throughout all life stages, estuarine-dependent and nearshore reef fish and snapper-grouper species are found inshore of the 100-foot contour in habitats such as attached macroalgae; submerged rooted vascular plants (seagrasses); estuarine emergent vegetated wetlands (salt marshes, brackish marsh); tidal creeks; estuarine scrub/shrub (mangrove fringe); oyster reefs and shell banks; unconsolidated bottom (soft sediments); artificial and coral reefs; and live/hard bottom. Snappers are common in all warm marine waters. Although most are inshore dwellers, some occur in open water. Some species enter estuaries and mangroves, with the latter functioning as nursery grounds (GMFMC, 2004). Reef fishes with EFH in the Project area include gray snapper, lane snapper, red snapper, and greater amberjack.

Red Drum Fishery of the Gulf of Mexico

Red drum occur in a variety of habitats in the Gulf of Mexico, ranging from water depths of about 130 feet offshore to very shallow estuarine waters. Red drum can tolerate salinities ranging from freshwater to highly saline water. They commonly occur in nearly all estuaries of the Gulf of Mexico year-round where they are present over a variety of substrates, including sand, mud, and oyster reefs. Estuarine wetlands are especially important as nursery habitat for larval, juvenile, and sub-adult red drum, and are also important habitat for the prey species of all life stages. Larval and post-larval red drum prey on mysids, amphipods, and shrimp. As they develop into juveniles their diet shifts to primarily crabs and fish. Crustaceans, including shrimp and crab, and fish are the most important prey items in the adult red drum diet (GMFMC, 1998).

Coastal Migratory Pelagic Species of the Gulf of Mexico

Generally, the coastal migratory pelagic species are commonly distributed throughout the Gulf of Mexico from estuaries to marine waters. The distribution of these species is dictated by water temperature and salinity. The coastal migratory pelagic species infrequently occur in water less than 20 degrees Celsius and generally prefer high salinities. However, cobia and Spanish mackerel tolerate brackish waters and may often inhabit estuaries as nursery habitat (GMFMC, 1998). Coastal migratory pelagic species with EFH in the Project area include cobia, king mackerel, and Spanish mackerel.

Atlantic Highly Migratory Species in the Gulf of Mexico

Highly migratory species may utilize a variety of coastal and ocean habitats. Sharks are the only highly migratory species pertinent to the Project. Shark habitat can be described in four broad categories: coastal, pelagic, coastal-pelagic, and deep-dwelling. Coastal species inhabit estuaries, nearshore areas, the continental shelf, and the continental slope. Adult sharks are broadly distributed as adults, but often utilize estuaries as pupping and nursery areas during pupping season and through their neonate and young-of-year life stages (NMFS, 2009; 1999). Sharks with EFH in the Project area include Atlantic sharpnose, blacktip, and scalloped hammerhead sharks.

TABLE 4.6.3-1

Species with Essential Fish Habitat Present at the Commonwealth LNG Project

EFH Zone and Habitat Type	Species	Life Stage
Estuarine Emergent Marsh		
	Brown shrimp	Late post-larvae, juveniles
	White shrimp	Late post-larvae, juveniles
	Gray snapper	Adults, juveniles
	Red drum	Post-larvae, early juveniles, late juveniles, adults
Estuarine Soft Bottom		
	Brown shrimp	Late post-larvae, juveniles, sub-adults
	White shrimp	Late post-larvae, juveniles, sub-adults, adults
	Gray snapper	Adults
	Lane snapper	Early juveniles, late juveniles
	Red drum	Larvae, post-larvae, early juveniles, late juveniles, adults
Estuarine Pelagic		
	White shrimp	Larvae
	Red snapper	Larvae
	Red drum	Larvae
	Cobia	Eggs, larvae
	Greater amberjack	Adults
	King mackerel	Early juveniles, late juveniles
Estuarine Pelagic - Highly Migratory Species		
	Atlantic sharpnose shark	Neonates, juveniles, adults
	Blacktip shark	Neonates, juveniles, adults
	Scalloped hammerhead shark	Neonates
Estuarine Oyster Reef		
	Brown shrimp	Early juveniles
Sources: GMFMC, 2016; NMFS, 2017		

4.6.3.3 Essential Fish Habitat Impacts and Mitigation

EFH within the Project area includes habitats within the estuarine zone. The Project would directly impact estuarine emergent marsh (i.e., tidal brackish marsh, tidal intermediate marsh, and non-tidal intermediate marsh), estuarine mud bottoms (e.g., tidal channels or sloughs within the marsh habitat and open water benthic habitat), estuarine water column, and estuarine oyster reef. In the Calcasieu Ship Channel, the benthic substrate and estuarine water column provide EFH for spawning, breeding, feeding, growth, and shelter for various life stages of several managed species and their prey. Estuarine emergent marsh, mud bottoms, and estuarine oyster reef provide nursery areas, foraging, and growth opportunities for various stages of shrimp, reef fish, and red drum. Estuarine tidal channels may also provide travel corridors for managed species between habitats. Temporary and permanent Project impacts on EFH are summarized below for the Terminal and the Pipeline.

Terminal

As discussed in section 4.6.3.1, EFH is present in the Calcasieu River and the tidal wetlands and tidal sloughs within the Terminal site and at the BUDM site. Impacts on EFH would result from filling the tidally influenced EEM wetlands for construction of the Terminal; dredging and excavating the Calcasieu River and shoreline wetlands for the creation of the marine facility; biennial maintenance dredging of the marine facility; depositing dredge slurry on estuarine mud/soft bottom and EEM habitat during initial and biennial maintenance dredging; construction of marine facility, including pile driving activities; construction vessel ballast water discharges; hydrostatic test water withdrawal; LNG carrier cooling water withdrawal; and hazardous materials spills. These activities may impact EFH in the following ways.

Habitat modification

Filling of the tidal brackish and tidal intermediate marsh within the Terminal footprint would permanently convert EFH to industrial land use; therefore, all the benefits that these marsh types would otherwise provide to EFH species and their prey would be lost. Construction of the Terminal and associated marine facility would require dredging/excavation of 71.0 acres of EFH. This would consist of 11.9 acres of tidally influenced brackish marsh, 9.2 acres of tidally influenced intermediate marsh, 49.8 acres of estuarine mud/soft bottom and estuarine water column, and 0.05 acre of oyster reef habitat (table 4.6.3-1). Dredging between the shoreline and the edge of the Calcasieu Ship Channel would impact approximately 47.0 acres of existing estuarine water column and estuarine soft bottom EFH. We received comments from NMFS emphasizing dredging this area would change the water depth in this area from generally less than 10 feet to 40 feet. Maintenance dredging of the marine facility every two years would result in the 47-acre area being permanently converted from relatively shallow water estuarine mud/soft bottom to deep water mud/soft bottom habitat. We also received comments from NMFS requesting that we include impacts on oyster reef habitat in this assessment. Construction of the marine facility would result in the removal of 0.05 acre of riprap that currently armors the shoreline within a portion of the marine facility footprint. This riprap contains oysters and provides a hard substrate for oyster reef habitat. We note in section 4.6.2.2 that Commonwealth would create new potential estuarine oyster reef habitat in the form of the new riprap that Commonwealth would use to armor the shoreline of the marine facility (see section 4.1.5.4). Although, the new riprap would not immediately function as estuarine oyster reef habitat, as a hard substrate in an estuarine environment, oyster settlement on the riprap could occur in time in the same fashion that it has occurred on the existing riprap. Thus, impacts on oyster reef EFH would be short- to long-term but would not be significant given the small area of habitat that currently exists at the site.

As described in section 4.4.2.2, Commonwealth would transport dredge slurry through a non-jurisdictional anchored pipeline across the bottom of the Calcasieu Ship Channel, north through the Cameron Loop Channel, and across uplands and tidally influenced intermediate marsh to a 640-acre BUDM site within the wetlands on the south shore of Calcasieu Lake in the FWS Cameron Prairie NWR. The existing BUDM site consists of a mix of open water and tidally influenced intermediate marsh. Placement of dredge slurry pipeline from the marine facility to the BUDM site and deposition of the dredged sediment at the BUDM site for the initial construction dredge and biennial maintenance dredges would temporarily affect 24.3 acres of estuarine mud/softbottom and estuarine water column EFH and 1.9 acres of estuarine emergent marsh EFH (table 4.6.3-2). FWS would use the dredged sediment from the initial construction dredge (1.73 million cubic yards) and at least two maintenance dredges (304,000 cubic yards) to bolster the shallow estuarine mud/soft bottom, mudflat, and EEM wetland habitat at the BUDM site.

Filling of the brackish and intermediate wetlands within the terminal footprint would cause permanent impacts on estuarine emergent marsh EFH. The loss of wetlands, tidal slough, and open water would likely result in direct loss of larvae, juvenile, and adult life stages of species that use the emergent marsh habitat as nursery and foraging areas (e.g., brown and white shrimp, gray snapper, and red drum) as well as the loss of eggs, larvae, and adult life stages of FMP species prey. Deepening of the marine facility site would cause permanent adverse impacts on estuarine mud/soft bottom EFH, as the change in depth would remove available habitat for life stages of species such as early juvenile red fish and late post-larvae and juvenile brown and white shrimp (GMFMC, 2004). Transporting and depositing the dredge materials at the BUDM site would cause temporary impacts on estuarine mud/soft bottom and estuarine emergent marsh EFH, due to placement of the dredge slurry pipeline, and temporary impacts on estuarine mud/soft bottom and estuarine emergent marsh EFH due to deposition of the dredge slurry at the BUDM site. As described in section 4.4.2, Commonwealth would mitigate for the loss of the estuarine emergent marsh wetlands within the Terminal footprint through purchase of mitigation bank credits from COE-approved mitigation banks. Therefore, although the impacts on EFH within the Terminal footprint would be permanent, Commonwealth's compliance with the CWA and FERC's compliance with the MSA consultation requirements would ensure that the impacts would be appropriately mitigated.

The COE would not require mitigation for Commonwealth's impacts on estuarine mud/soft bottom or oyster reef EFH. As such, Commonwealth has not proposed to purchase mitigation bank credits for these impacts. Although non-jurisdictional to FERC, the COE has informed Commonwealth that it considers the impacts on wetlands that would be associated with transport and placement of the dredged materials at the BUDM site would be offset by the FWS' beneficial use of the dredged materials. Given Commonwealth would comply with the CWA permit, and FERC would comply with the MSA consultation requirements, impacts would be appropriately mitigated.

TABLE 4.6.3-1

Essential Fish Habitat Impacts for the Terminal (acres) a/

Facility Name	Tidal Brackish Marsh		Tidal Intermediate Marsh		Estuarine Soft Bottom / Estuarine Water Column		Estuarine Osyter Reef		Total	
	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent
Liquefaction Facility	-	9.9	-	8.6	-	1.5	-	-	-	**20.0**
Marine Facility (excavated)	-	1.0	-	-	-	0.8	-	0.05	-	**1.9**
Marine Facility (dredge)	-	-	-	-	-	47.0 b/	-	-	-	**47.0 a/**
Storm Water Culvert	-	0.7	-	0.1	-	0.4	-	-	-	**1.2**
Administration and Maintenance Buildings	-	-	-	-	-	-	-	-	-	**-**
Access Roads (outside surge wall)	-	0.3	-	0.5	-	0.1	-	-	-	**0.9**
Construction & Laydown Area	-	-	-	-	-	-	-	-	-	**-**
Total	**-**	**11.9**	**-**	**9.2**	**-**	**2.8**	**-**	**0.05**	**-**	**24.0**

a/ Note: EFH acreages include tidal wetlands only; acreages in table 4.4.2-1 and appendix C include tidal and non-tidal wetlands and therefore may not match the acreages in this table.
b/ The 47.0 acres dredged for the marine facility would remain the same habitat type but would be permanently converted from shallow water to deep water habitat.

TABLE 4.6.3-2

Essential Fish Habitat Impacts for the BUDM (acres)

Facility Name	Tidal Brackish Marsh		Tidal Intermediate Marsh		Estuarine Soft Bottom / Estuarine Water Column		Estuarine Oyster Reef		Total	
	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent
BUDM Site	-	-	-	217.0	-	423.0	-	-	-	640.0
BUDM Slurry Pipeline	-	-	-	1.9	-	24.3	-	-	-	26.2
Total	**-**	**-**	**-**	**218.9**	**-**	**447.3**	**-**	**-**	**-**	**666.2**

Displacement and mortality

The Project would require dredging to construct and operate the marine facility. Initial dredging would require about 5 months to complete and maintenance dredging would require about 7 days every two years. We anticipate that most juveniles and adults of FMP species would avoid construction areas, and that potential direct impacts from dredging would be temporary and insignificant resulting in the displacement of, followed by rapid post-construction recolonization by, these species. Dredging may result in direct loss of eggs and larvae of those FMP species that may occur in the Calcasieu Ship Channel; however, the impacts would not be significant, and would not result in any population level effects, because mortality would be primarily limited to the dredge footprint and spawning occurs over broad areas.

The proposed dredging activities would also result in direct mortality of benthic invertebrates within the dredge footprint. Benthic invertebrates are an important food source for many species of fish. However, this loss of benthic food resources within the EFH would be short-term (until species recolonize), as we would expect the benthic community to quickly rebound after dredging (Wilber and Clarke, 2007; MMS, 2004; also see section 4.6.2.2). Shallow habitats (less than 65 feet) that experience strong currents that continuously shift the sediments along the benthic surface, such as the Calcasieu Ship Channel, typically contain early successional species assemblages that reestablish relatively quickly after a disturbance (Newell et. al., 1998; Wilber and Clark, 2007). The strong currents that cause the disturbances (i.e., shifting sediments) are also the forces that assist with rapid recolonization of the site (often beginning within days of the disturbance) by transporting adults, juveniles, and larvae of the displaced species from adjacent areas to the recently disturbed location. Consequently, the resulting loss of benthic organisms due to dredging would be unlikely to have a prolonged adverse effect on the aquatic community at the site (MMS, 2004). Given that the construction dredging effects would be short-term and limited to the dredge footprint, we conclude that this would not cause a significant adverse impact on EFH.

Underwater noise and vibration

Fishes within the nearshore habitat area would also be exposed to potential injury and disturbance level impacts resulting from impact and vibratory hammer pile driving to construct the marine facility. Although Commonwealth would use noise attenuation devices during pile driving, the highest intensity impact pile driving could produce hydro-acoustic impacts sufficient to alter fish behavior or induce injury. Impact pile driving could produce underwater noise of sufficient intensity to impede migration through the mouth of the Calcasieu River and adjacent to the marine facility and could injure larval and adult fish within about 28 feet of the construction area.

An assessment of the Project's impacts on fish from pile driving is provided in section 4.6.2.2. Commonwealth would follow the guidance NMFS has provided to date for appropriate impact avoidance and minimization measures to limit potential noise/vibration-related effects on EFH. In-water pile driving would require up to about 37 days to complete and physical injury to aquatic species would unlikely and limited to a radius of approximately 0.5 mile from the construction site. Therefore, we conclude that the effects of pile driving noise on EFH would be temporary and would not produce population level effects.

Temporary water quality impacts

Dredging and pile driving activities would temporarily increase turbidity and suspended solids within the water column, which could adversely affect fish eggs and juvenile survival, benthic community diversity and health, foraging success, and suitability of spawning habitat. Additionally, sediments in the water column could be deposited on nearby substrates, burying demersal eggs and larvae and aquatic macroinvertebrates, an important food source for many species of fish. In-water work may cause localized increases in nutrient levels in the water column and decreases in dissolved oxygen. Additionally, ballast water discharges may have a localized effect on salinity levels. Impacts on aquatic species and water quality related to increased turbidity during construction are discussed further in sections 4.3.2.2 and 4.6.2.2. The waters of the lower Calcasieu River are subject to significant fluctuations in water physicochemical components (including turbidity, salinity, and nutrient levels) due to tidal action, significant weather events, ship traffic, maintenance dredging, and the confluence of the Calcasieu Ship Channel and Calcasieu Pass. The FMP species that occur in this area are adapted to water quality fluctuations. Further, Commonwealth would minimize impacts on EFH by utilizing a hydraulic dredge with a suction cutter head, which would minimize resuspension of sediments and the resulting increases in turbidity and suspended sediment levels; by requiring that ballast water discharges be undertaken in accordance with federal regulations; and by adhering to water quality thresholds specified in CWA permits and certifications. We have therefore determined that impacts on water quality would have temporary, non-significant impacts on EFH.

Introduction of pollutants

As noted in section 4.2.1.1, Commonwealth conducted an Inland Testing Manual Tier I Evaluation of the Terminal site, which indicated there are no contaminated soils present at the marine facility. If construction activities were to uncover any type of contamination, Commonwealth would coordinate with the appropriate agencies, and follow the procedures in its *Unanticipated Contaminated Sediment and Soils Discovery Plan.* EFH could be adversely affected by an accidental spill or leak of hazardous materials into or near a waterbody. To minimize impacts on EFH, Commonwealth would implement its *SPAR Plan* (see section 4.3.2.2). Implementation of the *SPAR Plan* would minimize the potential for releases to occur. Should a spill or leak occur, implementation of the response measures in the *SPAR Plan* and LNG carriers' SOPEP would reduce response time and ensure appropriate cleanup, thereby minimizing impacts on EFH.

Entrainment/impingement

Hydrostatic test water would be withdrawn from the Calcasieu Ship Channel. The water withdrawal process could entrain fish eggs, juvenile fish, and food resources near the water intakes. Commonwealth would use screen intakes using wedgewire screens with 0.07-inch slots and would maintain an intake velocity of less than 0.5 feet per second, which is considered by the EPA to be protective of aquatic species (EPA, 2014). These measures would minimize the risk of entrainment and impingement of fingerling and small fish during water withdrawal and regulate intake velocity to eliminate or minimize the entrainment of FMP species and their food resources during water withdrawal. Therefore, we have determined that impacts on EFH resulting from entrainment/impingement during hydrostatic test water withdrawals would be temporary and negligible.

LNG carriers calling on the marine facility during operation would also withdraw water from the Calcasieu Ship Channel in order to cool their engines, generators, condensers, and other shipboard equipment. Barges and modular component delivery vessels would require ballast water intake at the Project site during modular off-loading. The LNG carriers would likely have intake screens with 0.2-inch slots, which should generally prevent entrainment of larger larvae and fish. Some older LNG carriers could have intake screens 0.4-inch slots, which may result in a higher entrainment rate. Other LNG projects along the Calcasieu Ship Channel have conducted studies to gain a general understanding of the potential impacts on ichthyoplankton resulting from LNG carrier cooling water intake (FERC, 2019b). These studies indicate each LNG carrier call at the marine facility would result in potential entrainment of less than one-tenth of one percent of the ichthyoplankton population in the Calcasieu Ship Channel at the time of intake. Given the generally high natural mortality rates of eggs and larvae in the water column (e.g., the daily natural mortality rate of red drum eggs and planktonic larvae is upwards of 56 percent; EPRI, 2012), we conclude that these impacts would not be significant.

Likewise, entrainment of fish eggs, larvae, and juveniles during dredging would be minor. Documented entrainment rates of mobile fish species are low (Wenger et al, 2017). Impacts would likely be highest on eggs and larvae present in the dredge footprint. However, given the area encompassed by dredging operations, the frequency in which dredging would occur, and the noted generally high natural mortality rates of eggs and larvae in the water column, we conclude entrainment impacts from dredging would not be significant.

Pipeline

Construction of the aboveground facilities would permanently impact approximately 0.3 acre of estuarine emergent wetland and estuarine mud bottom that is considered EFH. Installation of the Pipeline would result in temporary impacts on 43.3 acres of tidal brackish marsh EFH and 4.8 acres of estuarine mud bottom and estuarine water column EFH associated with waterbodies that would be crossed by the Pipeline. These impacts on EFH are considered temporary because the tidal brackish marsh and waterbodies would be returned to preconstruction conditions in accordance with Commonwealth's *Procedures* and revised *Workspace Restoration Plan*. These activities may impact EFH in the following ways.

<u>Displacement and mortality</u>

We anticipate that most juveniles and adults of FMP species would avoid construction areas, and that potential direct impacts from pipeline construction would be temporary and non-significant resulting in the displacement of, followed by rapid post-construction recolonization by these species. As shown in table 4.6.3-1, the emergent marsh associated with the Pipeline may provide EFH for larvae of brown and white shrimp and red drum. Excavation of the pipeline could result in direct mortality of these less mobile life stages. The loss of these larvae would not be expected to have population level effects given that construction would only affect one year's spawning cohort (construction of the Pipeline is expected to last 12 months) and the natural mortality rates of these species are relatively high (EPRI, 2012). At the population level, the potential loss of larvae during construction would be temporary, as larvae losses would be recouped during the spawning cycle of the following year. Therefore, we conclude this would be a non-significant adverse impact on EFH.

The proposed activities could result in direct mortality of aquatic invertebrates, an important food source for many species of fish, within the Project footprint. This loss of food resources would be temporary and would be expected to rebound within a few seasons. Because the effects would be temporary and limited to the Project footprint, we conclude that this would be a minor adverse impact on EFH.

<u>Habitat loss</u>

Construction of the aboveground facilities would result in the permanent loss of 0.3 acres of estuarine emergent wetland that provides EFH. The footprints of the aboveground facilities have been minimized to limit habitat fragmentation and potential loss of EFH. Given the limited area of impact and abundant suitable habitat in the Pipeline area, we conclude that this loss of habitat would not be significant.

<u>Temporary water quality impacts</u>

Commonwealth would cross 5 waterbodies via the open-cut or HDD method. Pipeline construction could result in a temporary increase in turbidity and suspended solids, which could impact EFH. These impacts would be temporary and localized and would be minimized through the implementation of Commonwealth's Procedures and Project permit conditions. See section 4.3.2 for further information on surface water resources.

Introduction of pollutants

As noted in section 4.2.1.2, the EPA Envirofacts database did not identify any potentially contaminated soils or hazardous waste sites within 0.25 mile of the Pipeline. EFH could be adversely affected by an accidental spill or leak of hazardous materials (e.g., release of petrochemicals during construction) into or near a wetland or waterbody. To minimize impacts on EFH, Commonwealth would implement its SPAR Plan (see section 4.3.2.2). Implementation of the SPAR Plan would minimize the potential for releases to occur. Should a spill or leak occur, implementation of the response measures in the SPAR Plan would reduce response time and ensure appropriate cleanup. Therefore, we conclude the likelihood of adverse impacts on EFH would not be significant.

Entrainment/impingement

Water for hydrostatic testing and HDD activities would be withdrawn from municipal sources; therefore, impacts on EFH resulting from entrainment/impingement during hydrostatic test water withdrawals would not occur.

Inadvertent return

Installing the proposed Pipeline using the HDD method across intermediate waterbodies with direct connections to the Calcasieu Ship Channel via a culvert, would avoid or minimize impacts on EFH within the waterbodies and surrounding wetlands. However, an inadvertent release of drilling mud into a wetland or waterbody could affect water quality and could impede the movement of FMP species, potentially resulting in stress, injury, and/or direct mortality of individuals in the vicinity of a release. As described in section 4.4.2.3, Commonwealth has revised its *HDD Contingency Plan* to include procedures it would implement to reduce the potential for an inadvertent release of drilling mud, a detailed contingency plan for responding to an inadvertent release of drilling mud in aquatic habitat, and a plan to mitigate for any adverse impacts on aquatic habitat, including EFH. If an inadvertent release occurs Commonwealth would implement the corrective action and cleanup measures outlined in its *HDD Contingency Plan* to minimize potential impacts on EFH. Therefore, we conclude the likelihood of adverse impacts on EFH from an inadvertent return would not be significant.

4.6.3.4 Essential Fish Habitat Conclusions

The Project would result in the permanent loss of 21.4 acres of estuarine emergent marsh EFH associated with the construction of the Terminal and the Pipeline's aboveground facilities. The permanent impacts on wetlands associated with the Terminal (21.1 acres) would be mitigated through Commonwealth's purchase of COE-approved wetland mitigation bank credits. The Project would also result in the permanent loss of 2.0 acres of estuarine mud/soft bottom EFH in the form of open water/tidal slough habitat within the Terminal footprint and 0.05 acre of oyster reef EFH. It would permanently convert 47.0 acres of shallow estuarine mud/soft bottom EFH (including the 2.8 acres of shoreline mudflat designated as a special aquatic site by the COE), to deep estuarine mud/soft bottom EFH. These impacts would be offset by Commonwealth's provision of dredged sediments to the FWS' Cameron Prairie NWR, which would use the sediment to create shallow water estuarine mud/soft bottom and mudflat habitat and to assist with emergent marsh restoration. The Project is also expected to cause temporary impacts associated with in-water construction (i.e., dredging), turbidity, and pile driving-related underwater noise affecting estuarine and nearshore habitat. Dredging would account for the majority of this impact area. These impacts are expected to be of short duration, as populations of FMP species and their food sources would be expected to recover quickly following construction and maintenance dredges. These impacts would also be minimized through implementation of Commonwealth's *Procedures*, the *SPAR Plan*, use of bubble curtains and cushion blocks during pile driving, and the revised *HDD Contingency Plan*. Therefore, we conclude that the Project would adversely affect EFH, but these adverse effects would be appropriately offset through purchase of wetland mitigation bank credits and compliance with the MSA and CWA permit or would be temporary to short-term in duration and not significant.

4.7 THREATENED, ENDANGERED AND OTHER SPECIAL STATUS SPECIES

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

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

For actions involving major construction activities with the potential to affect listed species or critical habitats, the federal agency must prepare a BA for those species that may be affected. As the lead agency, the FERC must submit its BA to the FWS and/or the NMFS and, if it is determined that the action may adversely affect a federally listed species, the FERC must submit a request for formal consultation to comply with Section 7 of the ESA. In response, the FWS and/or the NMFS would issue a Biological Opinion (BO) as to whether the federal action would likely adversely affect or jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

To assist in compliance with Section 7 of the ESA, Commonwealth, acting as the FERC's non-federal representative, initiated informal consultation with the FWS (Louisiana Ecological Services Field Office) and NMFS, regarding federally listed and other special status species. Commonwealth also consulted with the LDWF regarding state listed or other special status species or habitat with the potential to be affected by construction and operation of the Project.

These consultations, along with information collected by Commonwealth during literature reviews and field surveys of the Project area, were used to create a list of 25 federal or state-protected, listed, candidate, or special status species with the potential to occur within the vicinity of the Project, including parts of the Gulf of Mexico that would be traversed by Project shipping traffic (see table 4.7-1). No federal or state listed threatened, endangered, candidate, or special status species were observed during field surveys.

On June 21, 2019, the FWS (2019a) notified Commonwealth that the FWS concurred with findings that the Project is ***not likely to adversely affect*** all listed species and critical habitat under the jurisdiction of the FWS that may be found in the vicinity of the Project (as noted in table 4.7-1), *except* the eastern black rail. However, at the time of the FWS notification, the eastern black rail was still only proposed for listing (as of October 9, 2018) and the FWS determined that Project implementation was not likely to jeopardize the continued existence of the species. The FWS provided conservation measures for Commonwealth to consider to minimize impacts on the eastern black rail and noted that additional consultation may be required if the status of the eastern black rail changes from proposed to threatened.

On October 19, 2020, the NMFS (2020) notified Commonwealth that because all potential project effects to listed species and critical habitat under the jurisdiction of NMFS were found to be extremely unlikely to occur, insignificant, or beneficial, NMFS concludes that the proposed action is ***not likely to adversely affect*** listed species and critical habitat under NMFS's purview. NMFS continued that their notification concluded consultation responsibilities under the ESA for species under NMFS's purview.

The FWS formally listed the eastern black rail as threatened on October 8, 2020, effective November 9, 2020. On May 4, 2021, as required by section 7 of the ESA, the FERC submitted a BA to the FWS and requested to initiate formal consultation regarding the potential impacts of the Project on the eastern black rail (*Laterallus jamaicensis* subspecies).[56] In requesting formal consultation, the FERC stated that based on our review of potentially affected federally-listed threatened and endangered species (and proposed species) and associated critical habitats subject to the jurisdiction of the FWS, we have concluded that constructing and operating the Project would result in a determination of ***likely to adversely affect*** for the eastern black rail. The BA addressed a total of five species under the sole jurisdiction of the FWS, including four threatened species (eastern black rail, piping plover [and its critical habitat], red knot, and West Indian manatee) and one species that is currently under review (golden-winged warbler). The BA also addressed five species of sea turtle, three listed as endangered (hawksbill, Kemp's ridley, and leatherback) and two listed as threatened (green and loggerhead), that are within the joint jurisdictions of NMFS and the FWS.

On September 16, 2021, the FWS published its BO, which stated the FWS concurred with the findings of the BA that the Project would have ***no effect***, was ***not likely to adversely affect***, or ***would not contribute to a trend toward federal listing*** for all species listed in table 4.7-1, except for the eastern black rail.[57] The FWS concurred that the Project is ***likely to adversely affect*** the eastern black rail. The FWS concurrence fulfilled the FERC's responsibilities for the Project under section 7 of the ESA for all federally listed species in the BA other than the eastern black rail.

With regard to the eastern black rail, the FWS noted that the BO evaluates the consequences to listed species and designated critical habitat caused by a federal action, activities that would not occur but for the federal action, and non-federal actions unrelated to the proposed Action that are reasonably certain to occur (cumulative effects), relative to the status of listed species and the status of designated critical habitat. A Service opinion that concludes a proposed federal action is not likely to jeopardize species and is not likely to destroy or adversely modify critical habitat fulfills the federal agency's responsibilities under section 7 of the ESA.

"*Jeopardize the continued existence*" means to engage in an Action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR section 402.02). "*Destruction or adverse modification*" means a direct or indirect alteration that appreciably diminishes the value of designated critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 CFR section 402.02).

The FWS concluded in the BO that individual activities from the Project that cause direct or indirect effects could result in harm to a maximum of 30 eastern black rails utilizing the Project area. The FWS noted the status of the eastern black rail population within Cameron Parish is uncertain but that, based on estimates of potential breeding pairs and recent survey efforts in Louisiana, Cameron Parish may currently

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56 See accession no. 20210504-3050.

57 See accession no. 20210920-5077

support sporadic populations during the breeding and overwintering seasons. The FWS's analysis indicates that while the Project would have a negative effect on 30 eastern black rails, such effects to a small portion of the Louisiana population would not be appreciable for the survival and recovery of the eastern black rail.

Therefore, after reviewing the status of the species, the environmental baseline for the Project area, and the effects of the Project and the cumulative effects, the FWS states that the Project is not likely to jeopardize the continued existence of the eastern black rail. Additionally, the FWS issued an incidental take statement, noting that the maximum number of birds over the three-year construction period that is anticipated to be affected to the level of harm is approximately 30 eastern black rails due to permanent alteration of suitable habitat (i.e., adequate overhead cover, vegetation communities conductive to nesting and foraging sites, and preferred inundation levels) resulting from clearing and siting of the proposed Commonwealth LNG facility. The FWS included in the incidental take statement a listing of Terms and Conditions that are mandatory for Commonwealth to follow during construction of the Project, accompanying Monitoring and Reporting Requirements necessary to monitor the impacts of the allowed incidental take, and conservation recommendations for the Project. On October 6, 2021, Commonwealth formally accepted the Terms and Conditions of the BO,[58] thereby concluding formal consultation for the Project. These Terms and Conditions are summarized in section 4.7.1.2.

The BA for the Project is available on the FERC docket under accession no. 20210504-3050. The sections below provide a summary of the findings of the BA and our conclusions regarding the impacts of the Project on threatened and endangered species.

58 See accession no. 20211006-5079.

TABLE 4.7-1

Federal, Candidate, and State Listed Species with the Potential to Occur Within the Vicinity of the Project

Common Name	Scientific Name	Federal Status	State Status	Jurisdiction (Agency)	Determination and Comments
Marine Mammals					
Blue whale	*Balaenoptera musculus*	E	E	NMFS	*May Affect, Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is transient and vessel strike avoidance measures would be implemented.
False killer whale	*Pseudorca crasidens*	E	NL	NMFS	*May Affect, Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is transient and vessel strike avoidance measures would be implemented.
Fin whale	*Balaenoptera physalus*	E	E	NMFS	*May Affect, Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is transient and vessel strike avoidance measures would be implemented.
Rice’s Whale (previously designated as Gulf of Mexico’s Bryde’s whale)	*Balaenoptera ricei* (previously *Balaenoptera edeni*)	E	NL	NMFS	*May affect, Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is transient and vessel strike avoidance measures would be implemented.
Humpback whale	*Megaptera novaeangliae*	E	NL	NMFS	*May Affect, Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is transient and vessel strike avoidance measures would be implemented.
Killer whale	*Orcinus orca*	E	NL	NMFS	*May Affect, Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is transient and vessel strike avoidance measures would be implemented.

TABLE 4.7-1

Federal, Candidate, and State Listed Species with the Potential to Occur Within the Vicinity of the Project

Common Name	Scientific Name	Federal Status	State Status	Jurisdiction (Agency)	Determination and Comments
Sei whale	*Balaenoptera borealis*	E	E	NMFS	*May affect, Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is transient and vessel strike avoidance measures would be implemented.
Sperm whale	*Physeter macrocephalus*	E	E	NMFS	*May affect, Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is transient and vessel strike avoidance measures would be implemented.
West Indian Manatee	*Trichechus manatus*	T	E	FWS, LDWF	*May affect, Not Likely to Adversely Affect.* Suitable habitat is present within the Project area, but this species could occur as a transient and vessel strike avoidance measures would be implemented.
Birds					
Eastern black rail	*Laterallus jamaicensis ssp.*	T	NL	FWS	May affect, likely to adversely affect. Suitable habitat is present within the Project area; impact avoidance, minimization, and mitigation approaches would be implemented but species take is likely.
Golden-winged warbler	*Vermivora chrysoptera*	UR	NL	FWS	Project would not contribute to a trend toward federal listing. Suitable habitat is present within the Project area. If the species is listed, the FERC would re-consult with the FWS regarding the golden-winged warbler.
Interior least tern	*Sternula antillarum athalassos*	NL	E	LDWF	No Impact. Interior least terns do not occur in the region of the state containing the Project.

TABLE 4.7-1 **Federal, Candidate, and State Listed Species with the Potential to Occur Within the Vicinity of the Project**					
Common Name	**Scientific Name**	**Federal Status**	**State Status**	**Jurisdiction (Agency)**	**Determination and Comments**
Piping plover	*Charadrius melodus*	T, CH	T/E	FWS, LDWF	May Affect, Not Likely to Adversely Affect. Suitable foraging habitat is present within the Project area. Critical habitat would be avoided. Abundance of suitable foraging and roosting habitat present in nearby areas.
Red knot	*Calidris canutus rufa*	T	NL	FWS	May Affect, Not Likely to Adversely Affect. Suitable foraging habitat is present at the Terminal site. Optimal foraging habitat avoided. Abundance of suitable foraging and roosting habitat present in nearby areas. No individuals were observed during surveys.
Reptiles					
Alligator snapping turtle	*Macrochelys temminckii*	PT	S3	FWS, LDWF	*No Effect.* Species Status Assessment Report indicates the Project is not within the geographic range of the species and species habitat is not present at the Terminal or Pipeline sites.
Diamondback terrapin	*Malaclemys terrapin*	NA	S3/RH	LDWF	*Not Likely to Significantly Impact.* State records do not show this species as potentially present at the Project site.
Green sea turtle	*Chelonia mydas*	T	T	FWS, LDWF	*No Effect.* Suitable nesting habitat is not present within the Project area.
				NMFS	*May Affect, Not Likely to Adversely Affect.* Suitable foraging habitat is present within the Project area. There is no known nesting habitat in the vicinity of the Project site.
Hawksbill sea turtle	*Eretmechelys imbricata*	E	E	FWS, LDWF	*No Effect.* Suitable nesting habitat is not present within the Project area.

TABLE 4.7-1

Federal, Candidate, and State Listed Species with the Potential to Occur Within the Vicinity of the Project

Common Name	Scientific Name	Federal Status	State Status	Jurisdiction (Agency)	Determination and Comments
				NMFS	*Not Likely to Adversely Affect.* Suitable foraging habitat is present within the Project area. The Project would not affect potential nesting habitat in the vicinity of the Project site.
Kemp's Ridley sea turtle	*Lepidochelys kempii*	E	E	FWS, LDWF	*No Effect.* Suitable nesting habitat is not present within the Project area.
				NMFS	*Not Likely to Adversely Affect.* Suitable foraging habitat is present within the Project area. The Project would not affect potential nesting habitat in the vicinity of the Project site.
Leatherback sea turtle	*Dermochelys coriacea*	E	E	FWS, LDWF	*May Affect, Not Likely to Adversely Affect.* Suitable foraging habitat is present within the Project area. There is no known nesting habitat in the vicinity of the Project site. *No Effect.* Suitable nesting habitat is not present within the Project area.
				NMFS	*Not Likely to Adversely Affect.* Suitable foraging habitat is present within the Project area. The Project would not affect potential nesting habitat in the vicinity of the Project site.
Loggerhead sea turtle	*Caretta caretta*	T	T	FWS, LDWF	*No Effect.* Suitable nesting habitat is not present within the Project area.
				NMFS	*May Affect, Not Likely to Adversely Affect.* Suitable foraging habitat is present within the Project area. The Project would not affect potential nesting habitat in the vicinity of the Project site.
Ornate box turtle	*Terrapene ornata*	NL	S1/RH	LDWF	*No Effect.* Suitable habitat is not present within the Project area.

TABLE 4.7-1

Federal, Candidate, and State Listed Species with the Potential to Occur Within the Vicinity of the Project

Common Name	Scientific Name	Federal Status	State Status	Jurisdiction (Agency)	Determination and Comments
Fish					
Gulf sturgeon	*Acipenser oxyrhynchus desotoi*	T	T	FWS, NMFS LDWF	*May Affect, Not Likely to Adversely Affect.* Suitable foraging habitat is present within the Project area.
Giant manta ray	*Manta birostris*	T	NL	NMFS	*May Affect, Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is unlikely to occur within the Project area.
Oceanic whitetip shark	*Carcharhinus longimanus*	T	NL	NMFS	*May Affect, Not Likely to Adversely Affect.* Suitable habitat may be present within the Project area, but this species is unlikely to occur within the Project area.

S1 = Critically imperiled in Louisiana because of extreme rarity (5 or fewer known extant populations) or because of some factor(s) making it especially vulnerable to extirpation.

S2 = Imperiled in Louisiana because of rarity (6 to 20 known extant populations) or because of some factor(s) making it very vulnerable to extirpation

S3 = Rare and local throughout the State or found locally (even abundantly at some of its locations) in a restricted region of the state, or because of other factors making it vulnerable to extirpation (21 to 100 known extant populations).

RH = Restricted harvest = There are restrictions regarding the taking and possession of these species.

E = Endangered

T = Threatened

PT = Proposed for Listing as Threatened.

UR = Under review for Federal listing

CH = Critical Habitat

NL = Not Listed

4.7.1 Federally Listed Threatened and Endangered Species

We received multiple comments from the public and federal and state agencies expressing concern regarding potential Project impacts on threatened and endangered species. A total of 20 federally protected species, 1 proposed species, and 1 species that is under federal review have the potential to occur in the vicinity of the Project. Of these species, 6 are under the jurisdiction of the FWS, 10 are under the jurisdiction of NMFS, and 6 live in habitats that fall within an area where both services manage the species. The information below outlines life history information, and potential Project impacts on the species, and conservation measures that Commonwealth would implement to avoid and/or minimize such impacts. Given the limited amount of available habitat in the area, the temporary or short-term nature of construction impacts potentially caused by the Project, and the avoidance, minimization, and mitigation measures Commonwealth has proposed, we conclude the Project would have *no effect* or would be *not likely to adversely affect* 19 federally listed species, would have *no effect* on the species proposed as threatened, would *not contribute to a trend toward federal listing* for the 1 species under federal review, and *is likely to adversely affect* the threatened eastern black rail.

4.7.1.1 Marine Mammals

West Indian Manatee

The West Indian manatee is a federally listed threatened and state listed endangered species that is protected under MMPA. Manatees are found in rivers, estuaries, and coastal areas of the tropical and subtropical New World. They may be found from the southeastern United States coast along Central America and the West Indies to the northern coastline of South America. They occur mainly in larger rivers and brackish bays. In Louisiana, the West Indian manatee is known to regularly occur in Lakes Pontchartrain and Maurepas and their associated coastal areas. They have also been regularly reported in the Amite, Blind, Tchefuncte, and Tickfaw Rivers, and in canals within the adjacent coastal marshes of southeastern Louisiana. They are infrequently observed in the coastal areas of southwestern Louisiana. The initial decline of manatee populations was a result of over-hunting; however, today population declines may be attributed to collisions with power boats, entrapment in floodgates, navigation locks, fishing nets, and water pipes. Loss of warmwater habitat along with ingestion of marine debris is also a threat to the continued survival of the West Indian manatee.

While extremely rare, manatees have been sighted within the Calcasieu River. They would most likely be present, if at all, during the warmer summer months. Manatees would not be expected to be encountered during Pipeline construction. The potential impacts on manatees resulting from the Project would be disturbance or injury from pile driving noise and collision with vessels. Impacts and proposed mitigation measures for these activities are discussed below.

<u>Pile Driving</u>

In-water pile driving would be required to construct the overwater portion of the barge dock and the mooring and breasting dolphins, bridges, and walkways of the LNG carrier berth. Commonwealth proposes a total of 62 piles for construction of the marine berthing facility, including 5 42-inch-diameter steel piles, 12 96-inch-diameter steel piles, 2 48-inch-diameter steel piles, 6 18-inch diameter steel piles, and 37 54-inch -diameter steel piles. Piles would be driven using both impact hammers and vibratory hammers.

An analysis of potential pile driving-related underwater noise impacts on marine mammals and other aquatic species is provided in section 4.6.2.2. That analysis was used to determine the extent of potential injury-level noise impacts for mid-frequency cetaceans using recently revised underwater noise impact assessment guidance developed by the NMFS (NMFS, 2018). This guidance is specifically intended to apply to marine mammal species under NMFS jurisdiction and does not cover manatees and other Sirenians because current understanding of the hearing sensitivity of these species is limited. Manatees are believed to be most similar to mid- frequency cetaceans, but generally less sensitive overall (NMFS, 2016).

As detailed in section 4.6.2.2, the distances to the behavioral and injury thresholds for each type of pile for fish, sea turtles, and marine mammals have been calculated using NMFS guidance. These calculations indicate that using an impact hammer would potentially impact aquatic species over a larger distance than using a vibratory hammer. In-water pile driving could result in injury and behavior disturbances to aquatic species that remain in the Project area.

NMFS has noted that based on the size of the piles that Commonwealth would be driving (e.g., 96-inch steel piles), the use of noise attenuation devices during pile driving would almost certainly be necessary to avoid adverse impacts on ESA-listed species (NMFS, 2019b). Commonwealth has therefore committed to using cushion blocks (used with the impact hammer) and bubble curtains around the piles during in-water pile driving activities. Commonwealth would also implement additional NMFS-recommended measures to mitigate noise impacts on aquatic species in the vicinity of pile driving activities as described in section 4.6.2.2. Reducing the source noise level (i.e., through use of the noted noise attenuation devices) would substantially reduce the extent of potential behavioral and injury level effects on aquatic species. In combination with the noted monitoring and construction controls, these steps can effectively avoid or minimize potential adverse effects on fish, sea turtles, and marine mammal species. In addition, as part of the ESA section 7 consultation process, Commonwealth has committed to implementing all measures in the FWS' *Standard Manatee Conditions for In-Water Work* guidance to avoid and minimize impacts on manatees. Prior to construction, Commonwealth would train an EI in the techniques and distances required for marine mammal monitoring. The trained EI would scan the channel waters for marine mammals for 20 minutes prior to the onset of, and continuously during, pile driving activities. Commonwealth stated that a buffer zone of 50 feet around pile-driving areas would be monitored prior to and during pile driving. If a manatee is spotted in the buffer zone, work would not begin or would be halted until the manatee has left the area or has not been observed in the buffer for 30 minutes.

<u>Vessel Collision</u>

Construction of the Project would also increase turbidity and sedimentation and remove shallow water habitat in the Project area. In addition, operation of the Project would increase lighting and ship traffic in the Project area. These impacts would also affect manatees in the area. As stated above, Commonwealth would minimize impacts on the West Indian manatee by implementing all conservation measures recommended by the FWS, including providing training to all personnel associated with the Project during in-water work in areas that potentially support the manatee. Personnel would be instructed about the potential presence of manatees, manatee speed zones, and the need to avoid collisions with and injury to manatees and other marine mammals. Training information would advise contractors and staff that there are civil and criminal penalties for harming, harassing, or killing manatees due to their protection under the MMPA and the ESA. Additionally, personnel would be instructed not to attempt to feed or otherwise interact with the animals. Should a manatee be observed within a 50-foot minimum radius (buffer zone) of the active work area, all work, equipment, and vessel operation would cease until the manatee has left the buffer zone of its own accord or after 30 minutes have passed without additional sightings of the manatee(s) within the buffer zone. If a manatee is sighted in or near the Project area, all construction vessels associated with the Project would operate at "no wake/idle" speeds within the construction area and at all times while in waters where the draft of the vessel provides less than a 4-foot clearance from the bottom; vessels would follow routes of deep water whenever possible. When used, siltation or turbidity barriers would be properly secured, made of material in which manatees cannot become entangled, and monitored to avoid manatee entrapment or impeding their movement. Temporary signs concerning manatees and other marine mammals would be posted prior to and during all in-water Project activities and removed upon completion, in accordance with the FWS guidelines. Finally, personnel would be instructed to call the FWS Louisiana Ecological Services Field Office and the LDWF to report any sightings of or injury to manatees.

Based on the manatee's potential presence in the Calcasieu River and Commonwealth's commitment to follow all FWS-recommended mitigation, we conclude that the Project is *not likely to adversely affect* the West Indian manatee.

Whale Species

We received multiple comments from the public during scoping and the public comment period for the draft EIS regarding potential impacts on the newly named Rice's whale (formerly Bryde's whale)[59] from construction of the Project and the resulting increase in LNG traffic and consequent marine pollution during operation of the Project. Eight federally listed whale species may potentially occur in the Gulf of Mexico waters off Louisiana (blue, false killer, fin, humpback, killer, sei, sperm, and Rice's whales). Whales are long-lived marine mammals that occur throughout the world's oceans. They can be divided into two main groups: toothed whales and baleen whales. Feeding morphology and prey are the major differences between these groups. Many species of whales migrate extremely long distances to take advantage of seasonal food resources or calm wintering grounds for rearing young. Whales generally utilize warm tropical waters during winter months when the polar seas are cold, ice covered, and food-poor, though some species will stay in these regions year-round. The sperm whale and Rice's whale are the only federally listed species known to commonly occur in the Gulf of Mexico (NMFS, 2012).

The sperm whale is a toothed whale that inhabits the deeper waters of the world's oceans throughout the year, where they feed primarily on squid and other deep-sea creatures. Migrations are not as distinct as other species and are thought to primarily follow food resources (NMFS, 2010a). Sperm whales are present in the northern Gulf of Mexico in all seasons but are more common during the summer months (NMFS, 2014a). The Rice's whale is a baleen whale that was previously classified as a distinct stock of the Bryde's whale, which occurs worldwide in tropical and subtropical waters. The Rice's whale is now considered a distinct species that has been almost exclusively sighted in the northeastern Gulf of Mexico at depths between 328 and 1,312 feet. The eastern Gulf of Mexico (along the continental shelf) is identified as a biologically important area for the Rice's whale (NMFS, 2020b). The best estimate for this stock is 33 whales. This species has a high risk of extinction due to its small population size, life history characteristics, extremely limited distribution, and vulnerability to existing threats (NOAA, 2020b).

Other baleen whales, including the fin, sei, and blue whales are listed by NMFS as occurring in offshore Atlantic Ocean waters of the southeast United States, the Gulf of Mexico, and the Caribbean. These whales are not commonly found in the Gulf of Mexico but could occur within the Gulf of Mexico LNG vessel transit area during migrations or other movements (NMFS, 2012). Feeding is not expected in or around the Gulf of Mexico as these species usually feed on zooplankton and small fish aggregations during summer months in the northern Atlantic Ocean (NMFS, 1998, 2010b, and 2011). Calving and breeding grounds have not been identified for these species in the Gulf of Mexico.

Sperm whales and Rice's whales also inhabit offshore waters and therefore would not be found in the nearshore or estuarine waters in which Project construction activities would occur. Given the offshore habitat in which these species are found, the noise and vessel traffic associated with construction of the LNG terminal would not affect these species. Suitable habitat for these species is present along the vessel transit routes of LNG carriers and whales could be vulnerable to vessel strikes by in-transit LNG carriers during operation of the facility. Vulnerability to collision with LNG carriers would be greatest while these

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59 Rice's whales were previously identified as Gulf of Mexico Bryde's whales. On August 23, 2021 the NMFS announced the revised taxonomy and common name for the Gulf of Mexico Bryde's whale, revising the species name to Rice's whale (*Balaenoptera ricei*). See 86 FR 160.

animals feed, swim, and rest near the surface of the water. In areas of intense ship traffic, whales can experience propeller or collision injuries.

However, the LNG carriers would use established and well-traveled shipping lanes and are slower moving than typical large vessels, thus making them more readily avoidable by mobile whale species. Although LNG carriers are outside of our jurisdiction, Commonwealth would advocate for LNG carrier captains calling on the Terminal to adhere to the measures outlined in the NMFS' *Vessel Strike Avoidance Measures and Reporting for Mariners* (NMFS, 2008), which provides standard measures for vessel captains to implement to reduce the risk associated with vessel strikes or disturbance of marine mammals. Additionally, to address the potential impacts associated with offshore spills of fuel, lubricants, or other hazardous materials, LNG carriers are required to develop and implement a SOPEP, which includes measures to be taken if an oil pollution incident occurs or a ship is at risk of one.

In its ESA Section 7 consultation concurrence, NMFS (2020b) provides statistics and calculations indicating the very low likelihood of the LNG carrier transits associated with operation of the Project (approximately 156 LNG carrier round trips per year) resulting in a vessel strike. NMFS notes sperm whales are by far the most abundant whale occurring in the Gulf of Mexico and an average of 2 sperm whales are struck by vessels per year. The last documented vessel strike of a Rice's whale was in 2009. Annual transits of all ships in the entire Gulf of Mexico total approximately 964,316 trips. The increase in LNG carriers related to operation of the Project would result in a 0.03 percent increase in vessel traffic per year. Furthermore, the noted primary shipping routes that LNG carriers follow do not overlap with the biologically important area where Rice's whales are known to be concentrated (see section 3.2.1 of the BA for additional information).

We received a comment during the draft EIS comment period expressing concern that the EIS did not address the common presence of Rice's whales along the 100-meter to 500-meter isobaths and within the core distribution area established for Rice's by NMFS in 2019. As described by NMFS (2022b), Rice's whales in the Gulf of Mexico are consistently found in the northeastern Gulf of Mexico along the continental shelf between roughly 100 meters and 400 meters depth. The Rice's whale biologically important area referenced in the NMFS consultation is in the northeastern Gulf of Mexico near the De Soto Canyon area, along the continental shelf break between 100 meters and 300 meters depth (NOAA, 2019a). Biologically important areas are reproductive areas, feeding areas, migratory corridors, or areas in which small and resident populations are concentrated. Rice's whales have been observed in deeper waters, thus the core area inhabited by the species is described out to the 400-meter depth contour west to approximately Mobile Bay (NOAA, 2019a). The core distribution area encompasses the biologically important area but neither overlap or approach the primary shipping routes likely to be followed by LNG carriers (NMFS, 2022b).

We also received a comment expressing concern that the draft EIS did not address the impacts vessel noise from LNG carriers could have on whales during operation of the Project. As with the possibility of increased vessel strikes, the very small increase in vessel traffic per year that would be associated with operation of the Project would not lead to a significant increase in vessel noise impacts on whales.

Based on the characteristics and habitat requirements of the listed whales, Commonwealth's planned provision to the operators of LNG carriers of NMFS' recommended strike avoidance measures, and the low likelihood of the Project-related increase in LNG carrier traffic resulting in whale strikes, we have determined that the Project is *not likely to adversely affect* federally listed whales.

4.7.1.2 Birds

As described in section 4.6.1.3, Commonwealth would implement measures recommended by LDWF and FWS to minimize Project impacts on migratory birds. Implementing the described conservation measures, such as following FWS guidance related to flaring operations, minimizing lighting at the Terminal, and attempting to avoid the migratory bird nesting season when clearing vegetation at the Terminal prior to construction, would reduce potential Project impacts on the federal and state listed birds discussed in the following sections.

Red Knot

We received comments from the public expressing concern about potential project impacts on red knots and red knot critical habitat. The red knot is a federally threatened shorebird that breeds in the central Canadian arctic but is found in Louisiana during spring and fall migrations and during the winter months (generally September through March). During migration and on their wintering grounds, red knots forage along sandy beaches, tidal mudflats, salt marshes, and peat banks with sparse emergent vegetation. They roost on high sand flats, reefs, and other sites protected from high tides. In wintering and migration habitats, red knots commonly feed on bivalves, gastropods, and crustaceans. Major threats to this species along the Gulf of Mexico include the loss and degradation of habitat due to erosion, shoreline stabilization, and development; disturbance by humans and pets; and predation (FWS, 2019a). Louisiana does not currently contain red knot critical habitat.

Given that the red knot does not breed in the Gulf region, construction-related impacts on this species would primarily be limited to temporary displacement from areas of active construction. This species is mobile and would likely avoid areas of ongoing construction activity during migration and wintering. Construction and operation would not affect beach habitat, which is the optimal foraging habitat for the red knot. Construction and operation related impacts would primarily result from the permanent loss of coastal wetlands at the Terminal site; however, Commonwealth would provide compensation for wetland loss through purchase of wetland mitigation bank credits. Wetland impacts from Pipeline construction would be temporary and wetlands would be restored following pipeline installation in accordance with Commonwealth's *Procedures* and *Workspace Restoration Plan*.

Given the lack of quality foraging habitat at the Terminal site, the abundance of suitable wetland habitat in the immediate vicinity for foraging during construction, and the ability of the species to avoid the Project area, we conclude that the Project is *not likely to adversely affect* the red knot.

Piping Plover

We also received comments from the public expressing concern about potential Project impacts on piping plovers and piping plover critical habitat. The piping plover is a federally and state listed threatened species that occurs in the vicinity of the Project. Critical habitat for this species has been designated along the Louisiana coast. Piping plovers winter in Louisiana and feed at intertidal beaches, mudflats, and sand flats with little or no emergent vegetation. The primary threats to this species are destruction and degradation of wintering habitat, habitat alteration through shoreline erosion, woody species encroachment of lake shorelines and riverbanks, and human disturbance of foraging birds.

Designated critical habitat, including critical foraging and wintering habitat, for the piping plover occurs along the beach shoreline of the Gulf of Mexico south of the Terminal site. The Project would not directly impact this habitat as the Project's construction workspaces would occur approximately 0.15 mile removed from the beach shoreline. Because the piping plover does not breed in this region, construction-related impacts on this species would primarily be limited to temporary displacement from foraging/wintering habitat due to noise in the vicinity of active construction on the southern portions of the

Terminal facility. This species is mobile and would likely avoid areas of ongoing construction activity. The Project would not result in the permanent loss of suitable piping plover habitat. Operation of the 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 Calcasieu Ship Channel, most wildlife in the area are accustomed to the noise and artificial lighting associated with these activities. Therefore, we conclude that the Project is *not likely to adversely affect* the piping plover. Further, there would be *no effect* on piping plover designated critical habitat because it occurs at least 0.15 mile from the Project.

Eastern Black Rail

We received multiple comments from the public and from state and federal agencies regarding potential Project impacts on eastern black rails. The FWS listed the eastern black rail as threatened on October 8, 2020, and the rule took effect on November 9, 2020. The FWS has not designated critical habitat for the species. The eastern black rail inhabits both freshwater and saltwater marshes in the United States, Central America, and South America. In the U.S., it has been documented to overwinter in the southernmost part of its breeding range along the Gulf of Mexico coast, and in Florida and Texas (FWS, 2019b). It is an opportunistic feeder, found in both marsh and upland habitat in a variety of vegetative cover (FWS, 2019b). A more detailed discussion of this species and potential impacts that could occur from the Project on this species can be found in FERC's BA issued on May 4, 2021 and the subsequent BO filed by the FWS on September 16, 2021. Commonwealth committed to performing the Terms and Conditions in the BO on October 6, 2021.

Commonwealth did not conduct field surveys to assess or quantify the presence of eastern black rails at the Project site. The National Audubon Society (Johnson, 2020) conducted eastern black rail surveys in coastal Louisiana habitats between 2017 and 2019, including the property immediately west of and contiguous with the Commonwealth Project site. This study indicated eastern black rails were present on the property adjacent to the Commonwealth site during the breeding season (March – September) and the non-breeding, overwintering months (October – March).

Commonwealth collected aerial imagery of the site, conducted desktop surveys, and conducted site visits with the FWS on December 18, 2019 and the National Audubon Society on March 5, 2020. Based on the desktop survey, the Johnson (2020) study, and input from the FWS and National Audubon Society during and after the site visits, Commonwealth determined the Project site contains approximately 81.4 acres of eastern black rail habitat. There is no eastern black rail habitat along the proposed Pipeline route.

The Project would directly impact approximately 33.6 acres of suitable eastern black rail habitat by permanently converting 30.8 acres of this habitat to industrial use and temporarily clearing 2.8 acres of habitat to construct the proposed exclusion buffer enclosure. Commonwealth would attempt to clear the eastern black rail habitat during winter months when the fewest, least vulnerable individuals would be present; however, Commonwealth has stated clearing during the winter months may not be feasible and would therefore attempt to "herd" eastern black rail individuals from Project areas prior to clearing. In addition to a direct loss of habitat, construction-related clearing, especially during non-winter months, is likely to result in direct mortality or impaired fitness of individual eastern black rails. Further, noise related to construction and operation of the Project would likely result in indirect adverse effects on eastern black rails through potential displacement and/or behavior modification of individuals throughout 82.6 acres of eastern black rail habitat adjacent to the Project site. Commonwealth has also agreed to comply with the Terms and Conditions of the Biological Opinion, which consist of the following:

1. Commonwealth would survey and mark the boundaries of the outer work limits for each project feature (on land) for the terminal footprint;

2. Boundary markers would be semi-permanent, be maintained throughout construction activities, and persist until all construction-related activities are completed. Those markers may be the same ones used by contractors to determine appropriate elevations/locations for material placement.
3. The FWS would be notified immediately if any work or project-related actions exceed the boundary markers in existing suitable habitat so that reinitiation of Section 7 consultation can proceed as quickly and efficiently as possible;
4. Commonwealth would work with the FWS to create a restoration plan for the temporary construction and laydown area east of the Terminal that would include consideration of vegetation communities utilized by the eastern black rail for the habitat area. If revegetation efforts are unsuccessful, Commonwealth would work with FWS to re-evaluate the approach toward restoring the habitat;
5. Annual post-construction monitoring to evaluate the success of the terminal exclusion buffer area (i.e., the EEM and chenier habitat west of the Terminal that would not be directly affected by construction) as eastern black rail habitat following feral hog removal and management for invasive/woody vegetation would be conducted on an annual basis for five years after the construction phase ends;
6. If vegetation clearing occurs outside of the December–February window, Commonwealth would immediately notify the FWS. Plans to “flush” eastern black rail from construction areas and any efforts to flag nests or relocate eggs/nest would need to be coordinated with FWS; and
7. A report describing the actions taken to implement the Reasonable and Prudent Measures and terms and conditions of this Incidental Take Statement shall be submitted to the Field Supervisor of the FWS within sixty days of the completion of the project. This report shall include dates of work, assessment, and actions taken to address impacts to the eastern black rail, if they occurred.

Therefore, we conclude the Project is *likely to adversely affect* eastern black rails.

Golden-winged Warbler

In correspondence with Commonwealth, the FWS noted the potential for the Project to negatively impact the golden-winged warbler (FWS, 2018a). The FWS was petitioned in 2010 to list the golden-winged warbler as endangered or threatened. In 2011, the FWS found that listing the species may be warranted but to-date, a 12-month finding has not been issued (FWS, 2019c). The golden-winged warbler is a small songbird that breeds in the northeastern and north-central U.S. and in higher elevations of the Appalachian Mountains. It overwinters in Central America and northern South America and is dependent on forested habitats along the Gulf coast, including coastal Louisiana, to provide food and water resources before and after crossing the Gulf of Mexico during migration. Its population decline is correlated in part with loss of forested habitat in its breeding and overwintering grounds (FWS, 2018a).

The cheniers within the Project area may provide suitable stopover habitat for the golden-winged warbler during migration. Additionally, lighting and flare activity could lead to mortality of individual birds. However, this species is mobile and would likely relocate to adjacent suitable habitats should displacement occur due to construction. Commonwealth would also implement mitigation measures for flare stacks during operation, as discussed in section 4.6.1.3. Therefore, we conclude that the Project *would not contribute to a trend toward federal listing* of this species.

4.7.1.3 Turtles

Alligator Snapping Turtle

On November 9, 2021, the FWS announced it was proposing to list the alligator snapping turtle as threatened (89 FR 62434). The alligator snapping turtle is the largest species of freshwater turtle in North America (FWS, 2021b). The LDWF notes the habitat for this species is most commonly freshwater lakes and bayous but that it is also found in coastal marshes. Further, the LDWF states the alligator snapping turtle occurs in the Calcasieu River Basin (LDWF, 2007). The FWS Species Status Assessment specifies that alligator snapping turtles are generally found near structures (e.g., tree root masses, stumps, and submerged trees) and their habitat typically contains a high percentage of canopy cover or undercut stream banks (FWS, 2021b). The marsh portions of the Project site do not contain an abundance of canopy or woody structure that would provide cover for the alligator snapping turtle and habitat maps in the FWS Species Status Assessment indicate suitable habitat exists north and east of the Project site, at the north end of Calcasieu Lake and in the vicinity of the White Lake Wetlands Conservation Area, respectively, but not within or near the Project footprint. In correspondence with Commonwealth, FWS confirmed there is no alligator snapping turtle habitat in the Project area and therefore no further ESA Section 7 consultation would be necessary for this species (FWS, 2021c). Therefore, we conclude the Project would have *no effect* on the alligator snapping turtle.

4.7.1.4 Fish

Gulf Sturgeon

In 1991, Gulf sturgeon were listed as threatened under the ESA after their population was greatly reduced or eliminated throughout much of their range because of overfishing, dam construction, and habitat degradation. NMFS and the FWS jointly manage and protect Gulf sturgeon (NOAA, 2019b). This anadromous fish inhabits coastal rivers from Louisiana to Florida during warmer months and the Gulf of Mexico and its estuaries and bays in cooler months. Gulf sturgeon are typically 4 to 8 feet long, weigh up to 200 pounds, and can live for up to 60 years, though the average lifespan is 20–25 years. Gulf sturgeon are bottom feeders, and eat primarily macroinvertebrates, including brachiopods, mollusks, worms, and crustaceans. Foraging occurs in brackish or marine waters of the Gulf of Mexico and its estuaries. Sturgeons do not forage in riverine habitat. Gulf sturgeons migrate into rivers to spawn in the spring; spawning occurs in freshwater in areas of clean substrate composed of rock and rubble. Their eggs are sticky, sink to the bottom, and adhere in clumps to clean surfaces such as snags and outcroppings. Threats to Gulf sturgeon were historically overfishing, but today the threats include construction of water control structures that exacerbate habitat loss, dredging, groundwater extraction, irrigation, flow alterations, poor water quality, and contaminants, primarily from industrial sources (NMFS, 2014b).

Gulf sturgeon generally occur in the bays and estuarine areas of Louisiana and coastal Gulf of Mexico during the overwintering period. While in the bays, they show a preference for sandy shoreline habitats with water depths less than 11 feet. Gulf sturgeon overwintering in the Gulf of Mexico are generally in nearshore areas, from 0.5 to 2.0 miles from shore at water depths of 15 to 40 feet (FWS, 2015). In Louisiana, Gulf sturgeon spawning habitat is limited to freshwater rivers in the southeastern portion of the state; most records of the Gulf sturgeon are from outside the Project area in the Pearl, Bogue Chitto, and Tchefuncte Rivers, although they are likely to be found in any large river in the Lake Pontchartrain drainage (LDWF, 2015e). There are no known records of Gulf sturgeon in the Calcasieu River (LDWF, 2014). Gulf sturgeon occurrence within the Calcasieu Ship Channel is highly unlikely, and its presence in the Project area would only be incidental due to the Terminal site's proximity to potential overwintering habitat in the Gulf of Mexico.

While the presence of the Gulf sturgeon in the Project area would be rare and incidental, the potential presence of Gulf sturgeon in the Project area cannot be completely ruled out. Therefore, we conclude that the Project is *not likely to adversely affect* the Gulf sturgeon.

Giant Manta Ray

We received multiple comments from the public regarding potential impacts on protected oceanic fish species, such as the giant manta ray and oceanic white tip shark, resulting from increased LNG traffic and marine pollution during operation of the Project. The giant manta ray is listed by NMFS as threatened under the ESA. It is the world's largest ray with a wingspan of up to 29 feet. It is a filter feeder that eats large quantities of zooplankton. It is a slow-growing, migratory animal with small, highly fragmented populations that are sparsely distributed across the world (NOAA, 2019c). The main threat to the giant manta ray is commercial fishing, with the species both targeted and caught as bycatch in many global fisheries throughout its range. The manta ray is particularly valued for its gill rakers, which are traded internationally.

The giant manta ray is found worldwide in tropical, subtropical, and temperate bodies of water and is commonly found offshore, in oceanic waters, and as a seasonal visitor along productive coastlines with regular upwelling, in oceanic island groups, and near offshore pinnacles and seamounts. The timing of these visits varies by region and seems to correspond with the movement of zooplankton, current circulation and tidal patterns, seasonal upwelling, seawater temperature, and possibly mating behavior. The species has also been observed in estuarine waters near oceanic inlets, with use of these waters thought to serve as potential nursery grounds.

Suitable habitat for giant manta rays is only present along vessel transit routes for the LNG carriers. Manta rays could be vulnerable to vessel strikes during operation of the Terminal. Vulnerability to collision with LNG carriers would be greatest while these animals feed, swim, and rest near the surface of the water. In areas of intense ship traffic, they could experience propeller or collision injuries. NMFS (2020) states reliable estimates of overall giant manta ray strikes throughout the Gulf are not available. However, given that the Project would increase shipping traffic in the Gulf of Mexico by just 0.03 percent, the potential for the proposed action to result in an increase in ship strikes on these species is extremely low. The LNG carriers would use established and well-traveled shipping lanes and, as noted above, to address the potential marine pollution impacts associated with offshore spills of fuel, lubricants, or other hazardous materials, the USCG requires LNG carriers to develop and implement a SOPEP, which includes measures to be taken if an oil pollution incident occurs or a ship is at risk of one.

Given that the most likely route for injury of the giant manta ray would be from vessel collision and the probability of such an injury occurring is noted by NMFS as being extremely low, we conclude the Project is *not likely to adversely affect* the giant manta ray.

Oceanic White Tip Shark

Oceanic whitetip shark is listed by NMFS as threatened under the ESA. It is a large shark found in tropical and subtropical oceans throughout the world. The oceanic whitetip shark is long-lived, late maturing, and has low to moderate productivity (NOAA, 2019d). It is a pelagic species, generally remaining offshore in the open ocean, on the outer continental shelf, or around oceanic islands in water depths greater than 600 feet. The oceanic whitetip shark has a strong preference for the surface mixed layer in warm waters above 68 degrees Fahrenheit and is therefore considered a surface-dwelling shark.

Bycatch in commercial fisheries combined with the rise in demand for shark fins are the primary threats to the oceanic whitetip shark. It is frequently caught in pelagic longline, purse seine, and gillnet fisheries worldwide and its fins are highly valued in the international trade for shark products. Substantial abundance declines have been estimated for the Atlantic Ocean, including an 88 percent decline in the Gulf of Mexico due to commercial fishing. Given its life history traits, particularly its late age of maturity and low reproductive output, the oceanic whitetip shark is inherently vulnerable to depletions, with low likelihood of recovery. However, additional research is needed to better understand the population structure and global abundance of the oceanic whitetip shark.

Suitable habitat for this species is only present along vessel transit routes for the LNG carriers. Given that it is a surface-dwelling shark, oceanic whitetip sharks could be vulnerable to vessel strikes during operation of the Terminal. Vulnerability to collision with LNG carriers would be greatest while these animals feed, swim, and rest near the surface of the water. In areas of intense ship traffic, they could experience propeller or collision injuries. NMFS (2020) states reliable estimates of overall oceanic whitetip shark strikes throughout the Gulf are not available. However, given that the Project would increase shipping traffic in the Gulf of Mexico by just 0.03 percent, the potential for the proposed action to result in an increase in ship strikes on these species is extremely low. The LNG carriers would use established and well-traveled shipping lanes and, as noted above, to address the potential marine pollution impacts associated with offshore spills of fuel, lubricants, or other hazardous materials, the USCG requires LNG carriers to develop and implement a SOPEP, which includes measures to be taken if an oil pollution incident occurs or a ship is at risk of one.

Given that the most likely route for injury of the oceanic whitetip shark would be from vessel collision and the probability of such an injury occurring is noted by NMFS as being extremely low, we conclude the Project is *not likely to adversely affect* the oceanic white tip shark.

4.7.1.5 Sea Turtles

Five species of federally listed sea turtles under the joint jurisdiction of the NMFS (NMFS has jurisdiction over the marine environment) and the FWS (FWS has jurisdiction over nesting beaches) inhabit the Gulf of Mexico. These sea turtles occasionally occupy inlets and shallow bays, occurring on land only to nest on sandy beaches. There are no documented nesting occurrences in the Project area; the nearest documented nesting occurrence is greater than 70 miles west of the Project (SWOT, 2018). No suitable nesting habitat would be impacted by the proposed Project. Potential impacts on sea turtles would be related to dredging operations, LNG carrier strikes with swimming turtles, and noise from pile driving during construction of the berthing docks. Potential impacts are discussed in more detail below.

Loggerhead Sea Turtle

Loggerhead sea turtles are a federally and state listed threatened species. In the Atlantic, the range of the loggerhead sea turtle extends from Newfoundland to Argentina. Although the major nesting concentrations in the U.S. are found from North Carolina through southwest Florida, minimal nesting occurs outside of this range westward to Texas and northward to Virginia (NMFS, 2015). The greatest threats to this sea turtle are erosion of barrier islands on which the species nest; take of eggs, young, and adult turtles as food for people; incidental take of turtles by fishing and shrimping gear; and coastal land loss (LDWF, 2015a). Loggerhead sea turtles inhabit continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters.

In the southeastern U.S., mating takes place from late March to early June and eggs are laid between late April and early September. Loggerheads nest on ocean beaches, generally preferring high energy, relatively narrow, steeply sloped, coarse-grained beaches. The eggs incubate for approximately 2 months between late June and mid-November. Loggerhead hatchlings move from their nest to the sea and often float on sargassum masses for 3 to 5 years. Juveniles occupy near-shore and estuarine habitats and continue maturing until adulthood (NMFS, 2015). The young feed on prey such as gastropods, crustacean fragments, and sargassum.

Adults occupy a variety of habitats that range from turbid bays to clear water, foraging mainly on the bottom on whelks and conch, though they may also feed on jellyfish from the surface. Loggerheads generally inhabit warm water over the continental shelf and regularly enter marshes, estuaries, and coastal rivers. In Louisiana, this species has been found throughout the coastal region, but nesting has only been recorded on the Chandeleur Islands (LDWF, 2015a). Suitable nesting habitat is not available at or near the Project site; therefore, we conclude no impacts on nesting habitat or nesting behavior would occur from this Project.

Kemp's Ridley Sea Turtle

Kemp's ridley sea turtles are federally and state listed as endangered. They inhabit warm bays and coastal waters, tidal rivers, estuaries, and seagrass beds, and are typically found near the bottom where they feed on a variety of aquatic animals, such as crustaceans, mollusks, fish, jellyfish, squid, and sea stars. Kemp's ridleys are distributed throughout the Gulf of Mexico and U.S. Atlantic seaboard, from Florida to New England. Threats to this species include harvesting of eggs and adults for food, and incidental catch in fishing gear (LDWF, 2015d).

Kemp's ridleys display one of the most unique synchronized nesting habits in the natural world. Large groups of individuals gather off a particular nesting beach near Rancho Nuevo, Mexico in the State of Tamaulipas. Then waves of females come ashore and nest in what is known as an "arribada." Nesting occurs in May to July, and the eggs incubate for 50 to 60 days. Approximately 95 percent of nesting occurs at one confirmed arribada in the State of Tamaulipas, Mexico; nesting also occurs near Veracruz, Mexico and in Texas, but on a much smaller scale, and occasional nesting has been documented in North Carolina, South Carolina, and Florida. Newly emerged hatchlings enter the water and swim immediately to the open ocean to escape near shore predators. Some hatchlings remain in currents within the Gulf of Mexico, while others may be swept out of the Gulf and into the Atlantic Ocean by the Gulf Stream. Juveniles drift on floating sargassum seaweed for approximately 2 years before returning to neritic zones of the Gulf of Mexico or northwestern Atlantic Ocean to feed and develop until they reach adulthood (NMFS, 2015).

Although this species does not nest in Louisiana, the estuarine and offshore waters of Louisiana may provide key feeding and developmental sites. In addition, some of the deepwater channels and estuaries in Louisiana may provide important hibernation sites (LDWF, 2015d). However, based on the lack of suitable nesting habitat crossed by the Project and the absence of known nesting sites in Louisiana for this species, we conclude no impacts on nesting habitat or nesting behavior would occur from this Project.

Leatherback Sea Turtle

Leatherback sea turtles are a federally and state endangered species. They are the largest turtle in the world, and the only sea turtle that does not have a hard, bony shell. They spend most of their time in the open ocean, but they also forage in coastal waters; jellyfish are the primary food source of adults. Leatherbacks are the most migratory and wide ranging of sea turtle species and are distributed worldwide in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans (NMFS, 2015). Threats to this species include harvesting of eggs and turtles for food and/or oil, incidental capture in fishing gear, ingestion of indigestible materials such as plastics, and beach erosion resulting in loss of nesting habitat (LDWF, 2015c).

Leatherbacks mate in the waters adjacent to nesting beaches and along migratory corridors. Females nest on coastal beaches and barrier islands and prefer sandy beaches with a deepwater approach for nesting. Leatherbacks have been known to nest in Georgia and South Carolina, but only on rare occasions. There are also historic records of nesting on Padre Island, Texas, but no nesting has been reported since the 1930s. Leatherback nesting was once considered extremely rare, but the leatherback is now known to nest regularly in small numbers on Florida's east coast and nesting has been reported on the west coast and in south Florida. Little is known of the distribution of hatchling or juvenile leatherback turtles (FWS, 1999). Based on the lack of suitable nesting habitat crossed by the Project and the absence of known nesting sites in Louisiana for this species, we conclude no impacts on nesting habitat or nesting behavior would occur from this Project.

Green Sea Turtle

Green sea turtles are a federally and state-threatened sea turtle that are found throughout the warmer waters of the world. Preferred habitats include shallow water bays, estuaries, and shoals containing an abundance of submerged aquatic vegetation. The greatest threats to this species are harvesting of eggs, young, and adults for food; erosion of barrier islands and other loss of seagrass beds; development of beachfront property; and incidental capture in fishing gear (LDWF, 2015b).

Females generally nest in the summer between June and September, with peak nesting occurring in June and July. Females lay eggs on the same beaches where they were born ("natal" beaches). After emerging from the nest, hatchlings swim to offshore areas, where they are believed to live for several years, feeding close to the surface on a variety of pelagic plants and animals. Once the juveniles reach a certain age/size range, they leave the pelagic habitat and travel to nearshore foraging grounds; adults are almost exclusively herbivores, feeding on seagrasses and algae (NMFS, 2015).

In U.S. Atlantic and Gulf of Mexico waters, green turtles are found in inshore and nearshore waters from Texas to Massachusetts, the U.S. Virgin Islands, and Puerto Rico (NMFS, 2015). In Louisiana, this species is relatively rare, with most sightings from the eastern coast. There are no known nesting records of this species in Louisiana (LDWF, 2015b). Therefore, we conclude no impacts on nesting habitat or nesting behavior would occur from this Project.

Hawksbill Sea Turtle

Hawksbill sea turtles are a federally and state listed endangered species. They frequent warm, shallow water habitats such as bays, shoals, seagrass beds, estuaries, and coral reefs where sponges, their primary food source, are abundant. They are found in warm water regions worldwide. In Louisiana and other coastal regions of the Gulf of Mexico, this is one of the most infrequently encountered sea turtles and is considered one of the most endangered sea turtles. Threats to this species include harvesting of eggs and adults for food or tortoise shell; loss of coral reefs; and erosion of barrier islands and other factors that decrease available seagrass beds (LDWF, 2004; NMFS, 2015).

Female hawksbills are solitary nesters and return to the beaches where they were born every 2 to 3 years to nest. Nesting habitat includes exposed sandy beaches. Because of its inclination to nest in small, isolated areas, there are no reliable estimates of history or current abundance (LDWF, 2004). The most significant nesting within the U.S. occurs in Puerto Rico and the U.S. Virgin Islands; nesting also occurs on other beaches in the Caribbean islands. Within the continental U.S., nesting is restricted to the southeast coast of Florida and the Florida Keys, but nesting is rare in these areas (NMFS, 2015). Based on the lack of suitable nesting habitat crossed by the Project and the absence of known nesting sites in Louisiana for this species, we conclude no impacts on nesting habitat or nesting behavior would occur from this Project.

Sea Turtle Impacts

Due to the specific nesting habitat requirements that are absent in the Project area, sea turtles would not likely be present onshore within the Project area; therefore, no direct impacts on sea turtles would be anticipated from land-based construction activities. Further, due to the absence of known nesting locations in the Project area for any of the listed sea turtles and the lack of suitable nesting habitat in the vicinity of the Project, we conclude indirect impacts on nesting behavior would not occur from construction or operational noise or lighting. In general, sea turtles would be rare visitors to the Project area. However, they may be occasional visitors to the Calcasieu Ship Channel. Potential impacts on sea turtles from the Project may result from dredging activities, vessel strikes, and pile driving.

Dredging impacts on sea turtles may include entrainment of adults, subadults, and juveniles and disruption of foraging grounds. Impacts on sea turtles from dredging have been well documented. Between 1980 and 2011, there were 693 documented sea turtle takes by hopper dredges; 68 percent of these were loggerheads, 12 percent were green sea turtles, 11 percent were Kemp's ridley, and 9 percent were unknown. The COE implements the following protection methods to reduce the likelihood of a take: minimization of hopper use; timing restrictions; use of draghead turtle deflectors; reduction of pumps in the water column; and relocation trawling. Since the implementation of many of these protection methods in 1992, the COE has substantially reduced the average annual turtle takes per project from 13.8 between 1980 and 1991 to 0.8 between 1992 and 2008 (Dickerson, 2009). Commonwealth does not propose to use a hopper dredge as part of this Project. Instead, Commonwealth would use a hydraulic suction cutter head for dredging, which substantially minimizes the potential to impact sea turtles. Dredging activities during construction would be temporary and local in nature because dredging would be confined to the marine facility. Commonwealth anticipates that maintenance dredging would be necessary every two years and would remove approximately 152,000 cubic yards of material from approximately 47 acres of water bottom. Dredged material would be disposed of at the BUDM site on the southeast shore of Calcasieu Lake, approximately 6 miles northeast of the Project site within the Cameron Prairie NWR,.

Activities at the BUDM site would similarly not affect sea turtles because suitable nesting habitat is not present at the site .

Many of the sea turtles have feeding, swimming, or resting behaviors that keep them near the surface, where they may be vulnerable to vessel strikes, especially if the turtles are cold-stunned from cold weather events. To help reduce the risk of strikes or other potential disturbances associated with the presence of construction vessels, Commonwealth would adhere to the measures outlined in the NMFS *Vessel Strike Avoidance Measures and Reporting for Mariners* (NMFS, 2008).

Pile driving noise has the potential to affect sea turtles. Although sea turtles would be expected to largely avoid the Project area during pile driving activities, a potential exists for sea turtles to be injured during the first several strikes of the pile driving hammer, especially if the turtles are cold-stunned from cold weather events. Commonwealth would ensure that actual underwater noise from pile driving is not significantly greater than the predicted noise and measures would be implemented to reduce pile driving noise to acceptable levels.

If the rare occurrence of the species were to overlap with the rare incidence of a spill, a turtle could be at risk due to effects on respiration, skin, blood chemistry, and salt gland function. To address the potential impacts associated with offshore spills of fuel, lubricants, or other hazardous materials, LNG carriers are required to develop and implement a SOPEP, which includes measures to be taken when an oil pollution incident has occurred or a ship is at risk of one.

Given the avoidance and minimization measures identified above, we conclude that the Project is *not likely to adversely affect* federally listed sea turtles along the vessel transit route and would not affect nesting loggerhead or Kemp's ridley sea turtles.

4.7.1.6 Federally Listed Species Conclusions

Consultation for Project impacts on federally listed threatened and endangered species is concluded. NMFS provided concurrence on October 19, 2020 (NMFS, 2020b) and the FWS provided concurrence on June 21, 2019 (FWS, 2019d) and November 17, 2021 that the Project likely would have *no effect*, would be *not likely to adversely affect*, or *would not contribute to a trend toward federal listing* for all species listed in table 4.7-1, except for the eastern black rail. The FWS concurred that the Project *is likely to adversely affect* the eastern black rail. The FWS issued a BO on September 16, 2021 concluding that the Project is not likely to jeopardize the continued existence of the eastern black rail.

4.7.2 State Listed Threatened and Endangered Species

4.7.2.1 Birds

Given the brown pelican is no longer listed as endangered in the state of Louisiana, the section that addressed the brown pelican in the draft EIS has been removed. However, impacts on this species and corresponding mitigation would be the same as those described above in sections 4.6.1.3 and 4.6.1.4.

Interior Least Tern

We received comments from the public regarding potential Project impacts on interior least terns. The interior least tern is classified as endangered in Louisiana, but this subspecies only occurs in populations found along the Mississippi River and tributaries north of Baton Rouge, Louisiana. The coastal least tern is the species that could be present in the vicinity of the Project. This species is not listed at the state or federal level. Generally, least terns are one of the smallest of the tern species. Least tern subspecies range from Maine to Venezuela and winter from the Gulf coast southward. They primarily nest in areas remote from trees or other vegetation that may hide or support predators. They may also nest on anthropogenic sites near waterbodies with appropriate fish species in abundance, including industrial sites, dredged-material deposition sites, sand pits, created habitats, and rooftops (FWS, 2013). Given that the state-endangered interior least tern does not occur in the region of the Project, we conclude the Project would have no impacts on the interior least tern.

Snowy Plover and Wilson's Plover

We also received comments from the public regarding potential Project impacts on snowy and Wilson's plovers. The snowy and Wilson's plovers are classified by LDWF as critically imperiled to imperiled in Louisiana. They occur year-round in the state, breeding along the Gulf coast and wintering in coastal Louisiana. They are solitary nesters with breeding seasons that extend from late-March into August. They are commonly found on beaches, sand flats, and freshly dredged substrate. Threats to snowy and Wilson's plovers include habitat loss and habitat degradation due to coastal development, beach stabilization and re-nourishment, sediment diversion, disturbance by humans, environmental contaminants, and un-naturally high populations of predators (LDWF, 2019a).

LDWF records indicate both species may be present in the vicinity of the Project area (LDWF, 2019a). Potentially suitable foraging habitat (i.e., inter-tidal sand flat) may be present at the Terminal site along the Calcasieu Ship Channel. This habitat would be impacted by construction of the marine facility. Both species are highly mobile and would likely avoid the area during construction, in favor of equally or more suitable habitat present in the general Project vicinity. Potentially suitable breeding habitat is present along the sandy beach approximately 0.15 mile south of the Terminal site. This habitat would not be directly affected by construction or operation of the Project. Therefore, we conclude that the Project is not likely to significantly impact this species.

4.7.2.2 Reptiles

Diamondback Terrapin

The diamondback terrapin is classified as rare and is a "restricted harvest" species in Louisiana (LDWF, 2019b). It is found in brackish coastal waters. Typical habitats include coastal swamps, estuaries, lagoons, tidal creeks, mangrove thickets, and salt marshes. Although the species is found in brackish water, periodic access to freshwater is necessary for health.

Primary threats to diamondback terrapins include pollution, disturbed habitat, nest destruction near populated coastal sites, and coastal erosion. The Diamondback terrapin may breed and nest from April to July with nest cavities dug at the sandy edges of marshes and dunes. Nests are 12.5 cm to 15 cm cavities dug at the sandy edges of marshes and dunes. Hatchlings usually emerge from nests during August and September but may overwinter in nests until the following spring.

LDWF records do not show this species as potentially present at the site (LDWF, 2019c). As a result, we conclude that the Project is not likely to significantly impact this species.

Ornate Box Turtle

The Ornate box turtle is classified as critically imperiled in Louisiana (LDWF, 2019d). There is no suitable habitat present within the Project site. On September 26, 2019, the LDWF provided comments to the FERC that did not identify the ornate box turtle as a species that would potentially be impacted by the Project (LDWF, 2019a). As a result, we conclude that the Project would have no effect on this species.

4.7.2.3 State Listed Species Conclusion

Generally, the Commonwealth Project would have no effect on or would be unlikely to significantly impact state listed species given that the species are not known to have suitable nesting habitat in the Project area or suitable habitat for foraging is available in nearby areas and the unavailability of such habitat at the Project site would only result in minor displacement of the species.

4.8 LAND USE, RECREATION, AND VISUAL RESOURCES

Land use near the Project is generally classified into the following categories: forest, open land, developed land, and open water. The definitions of each land use type are as follows:

- Forests: includes both upland forests and forested wetlands.
- Open land: includes non-forested open lands, such as existing utility rights-of-way; grassland/rangeland; pasture/hay; emergent and scrub-shrub wetlands; and uplands.
- Developed land: includes barren land (less than 15 percent vegetated), industrial land, and residential land. Industrial land includes all developed areas, such as roads and railroads; residential land includes residential yards, subdivisions, and planned new residential developments.
- Open water: includes lakes, ponds, and major streams/rivers (greater than 100 feet wide).

4.8.1 Land Use

4.8.1.1 Terminal

Commonwealth would construct its facilities on primarily undeveloped land about 2.1 miles southwest of the Town of Cameron on the western shore of the Calcasieu Ship Channel. The Terminal would be on land bounded by coastal terrain fringing the Gulf of Mexico to the south, and undeveloped land and coastal marshlands to the north and west.

Existing land uses at the 393-acre site consist primarily of emergent wetland, with some smaller areas of developed and upland open land. About 135.4 acres would be affected by construction of the Terminal facilities, including the on-site (118.8 acres) and Park and Ride facilities (16.6 acres). About 105.7 acres would be permanently impacted by the operation of the Terminal facilities. Commonwealth would return the remaining 13.1 acres on-site, comprising the temporary construction and laydown areas, to preconstruction conditions following construction. Details regarding acreage impacts on land use are provided in table 4.8.1-1.

In order to limit traffic entering and exiting the Terminal site, Commonwealth would use two existing Park and Ride or bus lots in Carlyss for workers to park and be shuttled to the Project site. Each of the bus lots are graveled lots and have previously been used for parking. The lots are 6.7 acres and 9.9 acres in size. After construction of the Terminal is complete, Commonwealth would return the bus lots to the landowners.

The Terminal would be on open land (89.3 percent), developed land (8.2 percent), open water (2.3 percent), and forested land (0.2 percent) that is surrounded by open water and undeveloped open wetlands. Commonwealth would dredge about 47 acres of existing open water for the LNG carrier berth/access; however, these acreages are not listed in table 4.8.1-1 since the land use would not change. An additional 2.4 acres of open water would be filled for operation of the Project. Operation of the Terminal would result in a conversion of 105.7 acres from its existing land use to industrial use. The mitigation of impacts on coastal marshes and wetlands as a result of the construction of the Terminal, including the marine facility, is discussed in section 4.4.2 of this EIS. The mitigation of impacts on open water is discussed in section 4.3.2. However, due to the industrial use of lands in the general vicinity and the similar land use in the Project area, removal of this acreage would result in less than significant changes in land use.

TABLE 4.8.1-1 **Land Use Acreages Affected During Construction and Operation of the Project a/, b/**										
Facility	**Forested Land**		**Open Land**		**Developed Land**		**Open Water**		**Project Total**	
	Const	**Oper**	**Const**	**Oper**	**Const**	**Oper**	**Const**	**Oper**	**Const**	**Oper**
Terminal										
Liquefaction Facility	0.0	0.0	80.3	80.3	4.2	4.2	0.0	0.0	84.5	84.5
Construction and Laydown Area	0.0	0.0	9.3	0.0	3.5	0.0	0.3	0.0	13.1	0.0
Marine Facility	0.0	0.0	5.3	5.3	1.0	1.0	1.7	1.7	8.0	8.0
Stormwater Culvert	0.0	0.0	3.2	3.2	0.0	0.0	0.3	0.3	3.5	3.5
Administration and Maintenance Buildings	0.0	0.0	1.5	1.5	0.0	0.0	0.0	0.0	1.5	1.5
Access Roads (outside surge wall)	0.2	0.2	5.5	5.5	0.2	0.2	0.0	0.0	5.9	5.9
Moran Towing	0.0	0.0	1.0	1.0	0.9	0.9	0.4	0.4	2.3	2.3
Bus Lot / Off-site Parking Lots	0.0	0.0	0.0	0.0	16.6	0.0	0.0	0.0	16.6	0.0
Terminal Subtotal	***0.2***	***0.2***	***106.1***	***96.8***	***26.4***	***6.3***	***2.7***	***2.4***	***135.4***	***105.7***
Pipeline										
Right-of-way	0.0	0.0	30.9	0.0	0.0	0.0	3.6	0.0	34.5	0.0
ATWS	0.0	0.0	11.5	0.0	0.0	0.0	1.2	0.0	12.7	0.0
Temporary Access Roads	0.0	0.0	0.5	0.0	0.1	0.0	0.0	0.0	0.9	0.0
Aboveground Facilities										
MP 0.0 Pig Launcher	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1
MP 0.8 Interconnect/Meter Station	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.2	0.2
Pipeline Subtotal	***0.0***	***0.0***	***43.5***	***0.3***	***0.1***	***0.0***	***4.8***	***0.0***	***48.4***	***0.3***
Project Total	**0.2**	**0.2**	**149.6**	**97.2**	**26.5**	**6.3**	**7.5**	**2.4**	**183.8**	**106.0**
a/ Acreage values in this table are based on National Land Cover Database classifications (NLCD, 2016) and may therefore vary slightly from acreage sums in other sections of this document. b/ The numbers in this table have been rounded for presentation purposes; therefore the totals may not reflect the sums of the addends.										

4.8.1.2 Pipeline

The Pipeline associated with the Project would consist of a new 3.0-mile-long, 42-inch-diameter natural gas pipeline. The Pipeline would originate at the Bridgeline interconnect and run south toward the Terminal. The entire Pipeline would be within Cameron Parish, Louisiana.

Construction of the Pipeline and appurtenant facilities would impact a total of 48.4 acres of land. Construction of the Pipeline would require a 110-foot-wide construction right-of-way, which comprises a 3.5-foot-wide permanent easement for operation and a 106.5-foot-wide temporary easement for construction. ATWS would be necessary in certain locations along the Pipeline route (see section 2.2.2). Pipeline construction and operational impacts on land use are listed in table 4.8.1-1.

The Pipeline construction right-of-way, including ATWS, would impact 47.5 acres of land. An additional 0.9 acre would be used for a temporary access road during construction to access the right-of-way. The southern extent of the access road is an existing road about 340 feet in length. Commonwealth would maintain the existing road by adding gravel as needed and use timber mats to extend the road to a total distance of about 1,650 feet. Construction of the aboveground facilities associated with the Pipeline would impact approximately 0.3 acre. No compressor facilities beyond the Terminal would be required for the Project.

Open land would be the primary land use impacted by construction of the Pipeline and associated facilities, a majority of which is emergent wetlands. All construction impacts on open land (including within ATWS) would be temporary and would be allowed to revert to preconstruction conditions once construction is completed. For the aboveground facilities, about 0.3 acre of open land (all of which is emergent wetlands) would be permanently impacted by construction and operation of the two interconnections, which would be elevated on pile structures. This would result in a change in land use from wetlands to industrial use where the pilings are inserted into the ground. See section 4.4.2 for a more detailed discussion of impacts on wetlands and associated mitigation measures.

Commonwealth has obtained the approval of all landowners along the entire length of the proposed right-of-way to construct the Pipeline (including the associated aboveground facilities). Easements would give Commonwealth access to properties and the rights to construct, operate, and maintain the Pipeline and establish a permanent right-of-way. Commonwealth would compensate landowners for the use of their land. The easement agreements would specify compensation for the loss of use during construction, loss of nonrenewable or other resources, and allowable uses and restrictions on the permanent rights-of-way after construction. These restrictions could include prohibition of construction of aboveground structures, including house additions, garages, patios, pools, or any other objects not easily removable, and roads or driveways over the Pipeline, or the planting and cultivating of trees or orchards within the permanent easement. The areas used as temporary construction right-of-way and ATWS would be allowed to revert to preconstruction uses with no restrictions.

Commonwealth would construct and maintain the Pipeline according to measures contained in FERC's Plan, and Commonwealth's *Workplace Restoration Plan* and *Procedures*. All lands affected by Pipeline construction, with the exception of lands identified for aboveground facilities, would be restored to preconstruction contours, and would thus not be subject to a change in land use. The Pipeline right-of-way would be allowed to revegetate. Commonwealth would maintain vegetation on the permanent right-of-way in non-agricultural areas by mowing, cutting, or trimming, as necessary. Commonwealth would conduct routine vegetation maintenance along the 3.5-foot-wide permanent Pipeline right-of-way as frequent as necessary to maintain herbaceous cover and facilitate periodic corrosion/leak surveys.

4.8.2 Existing and Planned Residences and Commercial Developments

4.8.2.1 Terminal

The Terminal would be sited in mainly open land (dominated by emergent wetlands) and surrounded by existing wetlands and industrial and commercial development. There are currently no existing or planned residential developments within 0.25 mile of the Terminal. There is one residential campsite within the boundaries of the Terminal site. The private camp is owned and used by the property landowner. The camp residence would be removed as part of the lease agreement between Commonwealth and the landowner. Additionally, there is a poured concrete slab and metal canopy about 0.15 mile west of the Terminal site fence line (1,700 feet from facility structures). Based on comments from the property owner, this is a permanent RV residence.

There are both existing and planned industrial developments within the vicinity of the Project. The John W. Stone Distribution Facility is directly adjacent to the Terminal boundary. The distribution facility may experience some minor delays due to increases in marine traffic. These traffic impacts are not expected to result in any significant impacts on operation of the distribution facility. The Lake Charles Pilots boat dock is about 0.2 mile from the Terminal site. During construction of the Terminal, there may be an increase in marine traffic. This may result in temporary delays in reaching the boat dock at the pilot station. However, these impacts are expected to be minor. Marine traffic impacts are discussed in section 4.9.11. The Moran Towing facility is within the planned Terminal site. Moran Towing has agreed to have Commonwealth move its existing tugboat facility to a location northeast of its existing location (see figure 2.1-1).

Planned industrial developments within 1 mile of the Terminal site include the Calcasieu Pass LNG Project, about 0.3 mile east of the proposed Project site. The Calcasieu Pass LNG Project is currently under construction; initial commencement of service was authorized in May 2022.

4.8.2.2 Pipeline

There are no residences, buildings, or aboveground structures within 50 feet of the construction work area for the Pipeline. The Pipeline would be sited in a rural area; there is one residence within 0.5 mile of the pipeline.[60] No planned commercial or industrial developments are within 0.25 mile of the Pipeline. Therefore, the Pipeline would not adversely impact existing residences or planned developments.

4.8.3 Recreation and Special Interest Areas

4.8.3.1 Terminal

Commonwealth has acquired the land for the Terminal site through lease and purchase agreements. No federally managed public or conservation lands, including national historic landmarks, national forests, national parks, national recreational trails, National Wild and Scenic Rivers, NWRs, Indian Lands, or wilderness areas have been identified within 0.25 mile of the proposed Terminal. Several recreational and special interest sites are in proximity to the Project (see table 4.8.3-1). While none would be directly impacted by the Project except for the Calcasieu River, some may experience indirect impacts such as change in viewshed and/or increases in traffic in the area of the recreation site.

60 This residence is approximately 0.4 mile southwest of the Pipeline’s southern terminus at MP 3.0.

TABLE 4.8.3-1 **Distance to Natural, Recreational, and Scenic Areas**			
Feature	**Owner/Managing Agency**	**Distance and Direction to the Project**	**Distance Crossed by the Project**
Calcasieu River	U.S. Army Corps of Engineers	Adjacent to the East of the Terminal	1.7 acres of marine berth, 47 acres of dredging
Creole Nature Trail All-American Road (Highway 27/82)	Louisiana Department of Transportation and Development	Adjacent to the north of Terminal Crossed by the Pipeline	n/a – HDD crossing
Cameron Ferry	Louisiana Department of Transportation and Development	2 miles Northeast of Terminal)	n/a
Cameron Jetty Pier (closed)	Cameron Parish Police Jury	>1,000 feet East of Terminal	n/a
Sabine NWR	U.S. Fish and Wildlife Service	7 miles Northwest of the Terminal	n/a
Cameron Prairie NWR	U.S. Fish and Wildlife Service	4 miles Northeast of Terminal	n/a
Holly Beach	Cameron Parish Police Jury	Directly south of the Terminal site, 900 feet from structures	n/a
Constance Beach	Cameron Parish Police Jury	13 miles southwest of Terminal	n/a
Broussard Beach	Cameron Parish Police Jury	1,700 feet southeast of Terminal	n/a
Peveto Woods Bird and Butterfly Sanctuary	Baton Rouge Audubon Society	15 miles	n/a

Cameron Parish is home to vital fishery resources, as described in sections 4.6.2 and 4.6.3, and serves as a conduit for access to such resources in the Calcasieu Ship Channel and the Gulf of Mexico. Construction associated with the Terminal may temporarily impact local recreational fishing, bird watching, trapping, hunting, and boating activities. Temporary impacts would occur throughout the construction period. During this time, material and equipment deliveries may delay or impede recreational boat traffic due to increased ship/barge traffic within the Calcasieu Ship Channel. A discussion of impacts on marine traffic are discussed in section 4.9.11. Commonwealth estimates that the peak daily traffic in the ship channel associated with barge deliveries would be about one barge per day. This increase in traffic related to construction of the Project would be minor and short term. During operations, up to 156 LNG carriers would call at the Terminal per year. While some delays would be expected during these periods, these delays would be minor and localized, expected to last no more than one hour with each ship, approximately every other day, as described further in section 4.9.11. We have determined the Project would not have any significant adverse impacts on recreational or commercial boating or fishing along the Calcasieu River Ship Channel and Gulf of Mexico.

The Creole Nature Trail All-American Road (Highway 27/82) is a 180-mile road, a portion of which runs adjacent to the Terminal site. The Creole Nature Trail is classified as an "All-American Road," the highest designation of national scenic byways. The National Scenic Byways Program is part of the DOT Federal Highway Administration and was established to help recognize, preserve, and enhance selected roads throughout the United States. Locally, the road is promoted by the Southwest Louisiana/Lake Charles Convention and Visitors Bureau to highlight Cajun culture and wildlife found in the bayous and marshes of southwest Louisiana. Several beaches are directly south of the Terminal site, including Broussard Beach and Holly Beach. The Terminal site would not directly impact the road or the beaches; however, there may be impacts related to traffic and changes to the viewscape. Traffic impacts are discussed in section 4.9.11, and visual impacts are discussed further in section 4.8.4.

The Cameron Jetty Pier is about 1,000 feet east of the Terminal site, across the ship channel. However, due to the construction of the Calcasieu Pass LNG Project, the pier has been permanently closed and is no longer accessible by the public.

There is one NWR within 5 miles of the Terminal: the Cameron Prairie NWR (previously established as the Sabine NWR). This NWR offers various recreational activities, including hunting, fishing, and wildlife viewing but is only accessible by boat (FWS, 2019e). Commonwealth would deposit dredge spoils within this NWR during construction and on at least two additional occasions during biennial maintenance dredging of the Terminal marine facility (see section 4.4.2.2). Commonwealth's construction and maintenance dredging would affect approximately 640 acres within the NWR. The total size of this portion of the NWR is 14,927 acres. Given the expansive area of the NWR that would not be affected by the Project, we do not anticipate any significant impacts on recreational opportunities.

4.8.3.2 Pipeline

The Creole Nature Trail All-American Road National Scenic Byway would be crossed by the Pipeline near MP 3.0. Physical disturbance to this roadway would be avoided by use of HDD at the crossing location. The viewshed adjacent to the Creole Nature Trail National Scenic Byway would only be temporarily impacted during the construction of the Pipeline because the Pipeline would be buried and no forest would be cleared, allowing the landscape to return to preconstruction conditions. HDD entry and exit pits would be set back from the byway; however, given the flat landscape, construction vehicles and personnel would still be visible to motorists. These impacts would be temporary and limited to the period of construction.

No other federally managed public or conservation lands, including national historic landmarks, national forests, national parks, national recreational trails, National Wild and Scenic Rivers, NWRs, Indian Lands, or wilderness areas have been identified within 0.25 mile of the proposed Pipeline. Likewise, no state-managed lands, including historic sites, Natural and Scenic Rivers, state parks, preservation areas, or other state-recognized public areas would be within 0.25 mile of the Pipeline. In addition, no public or private conservation easements or land trusts are within 0.25 mile of the proposed Pipeline.

Cameron Parish offers many recreational opportunities for birding and wildlife viewing, beach use, boating, camping, hunting, and fishing. The closest beaches near the Pipeline are Holly Beach and Broussard Beach, which are within 0.6 mile of the end of the pipeline route within the Terminal.

Pipeline construction impacts would be short-term and confined to the period of active construction, which would be limited to several days up to several weeks in any one area. Once Pipeline construction is completed, Commonwealth would restore the disturbed right-of-way to preconstruction conditions. The Pipeline would be constructed within a wide expanse of similar land use, thereby minimizing the likelihood of impacting recreational opportunities in the vicinity of the construction activities. No recreational use areas would be crossed by Pipeline construction. Due to the temporary nature of Pipeline construction, the proximity of the proposed construction to known recreational areas, and restoration/revegetation of the Pipeline within 1 to 3 years, we conclude that impacts from construction and operation of the Pipeline would be short-term and would not adversely impact recreation or special use areas.

4.8.4 Visual Resources

4.8.4.1 Terminal

The degree of visual impact that may result from a Project is typically determined by considering the general character of the existing landscape and the visually prominent features of the proposed facilities.

As described above, there is a poured concrete slab and metal canopy about 0.15 mile west of the Terminal site fence line (1,700 feet from the closest facility structures), which is a permanent RV residence. Construction of the Terminal would result in a significant change in this residence's viewshed based on visual renderings created by Commonwealth (see figures E-4 and E-5 in appendix E). The Terminal and all associated structures and buildings would be highly visible and would result in a significant impact as the area of the Terminal would be converted from open marsh land to industrial land. Commonwealth would limit the visual impacts on this residence by avoiding disturbance of the native vegetation within the terminal exclusion area, an area 1,300 feet wide between the residence and the nearest LNG structures. Additionally, in response to staff's data request, Commonwealth would plant native sugar berry trees 30 feet inside of Commonwealth's exclusion fence for about 150 feet. These trees would provide some visual screening; however, given the naturally low height of the species, and the overall size (e.g., the LNG storage tanks would be 167 feet tall, and the flare stacks would rise to heights of 200 and 300 feet) and proximity of the LNG facility to the residence, the facility would still be visible to the resident. In addition, the RV residence may experience minor to significant changes in ambient lighting from the facility. Overall, even with Commonwealth's visual screening plan, the visual impacts on this residence could be significant. We have not identified any additional mitigation within our jurisdiction (i.e., within the Project area) that would reduce these visual impacts. Due to the proximity of the Terminal to the RV site, Commonwealth has provided offers to the landowner of the RV site to purchase the property. To-date, the landowner has declined such offers.

The proposed Terminal would be visible to users of the Calcasieu Ship Channel, users of Holly and Broussard Beaches, residents of Holly Beach and Cameron, and motorists along the Creole Nature Trail All-American Road. Construction of the Terminal would increase the number of barges within the Calcasieu Ship Channel; however, since a large number of barges and commercial vessels currently use the ship channel, this would not represent a significant change in existing visual conditions. Recreational and commercial boaters would be able to view construction of the Terminal from the ship channel. This would result in a permanent change in the viewshed and would add an additional industrial element to this portion of the channel. The addition of the facility would represent a significant impact on the viewshed of boaters.

Based on visual renderings created by Commonwealth (see appendix E), the Terminal, including the six LNG storage tanks, flare stack, and liquefaction trains, would be highly visible from Holly and Broussard Beaches. Broussard Beach is south of Cameron, and based on review of aerial photos, appears to be dominated by PSS and PEM wetlands with no public access points to the water. While the town of Holly Beach is about 6 miles southwest of the Terminal, there are several dune crossings that are closer to the Terminal facility, allowing public access to the beach. The closest public access point at Holly Beach is about 2 miles west of the Terminal site. From this location, beach users would have clear views of the tallest structures at the site. If beachgoers drive or walk east along the beach, the closer to the Terminal site that beachgoers get, the more substantial the visual impact. Because the current land use is mainly emergent wetlands and flat land, the facility would be easily viewable from the beach itself. As previously described, this would result in a permanent change in the viewshed for users of the beach and would add an additional industrial element to the area. The change from the existing views would be significant.

Given the distance of the town of Holly Beach, visual impacts are expected to be minor in the town limits and along the beach in the direct area. The town of Cameron is about 2.5 miles northeast of the Terminal site. Depending on the location of residential structures, portions of the terminal may be visible to residents. While the presence of the Terminal would result in an increase in industrial activities in the area, it would only be a less than significant change to the overall views from residents in Cameron. At night, lights from the Terminal would be visible, but they likely would not represent a major change given the other industrial areas along the ship channel.

Increased lighting around the Terminal facility would have an influence on visual resources. The surrounding developed areas along the Calcasieu Ship Channel, including Cameron and the facilities along the channel north of Cameron, are currently heavily lit during the nighttime hours. Lighting is integral to the safety of ship navigation, perimeter security, and operational safety and would be shielded and pointed downward so as not to interfere with navigational lighting. Proper installation of lighting fixtures would keep substantial light from reflecting off the water and thereby avoid any significant impacts on fish or wildlife (see section 4.6). The proposed lighting at the Terminal site would be consistent with nearby industrial/commercial facilities and would follow all federal, state, and local ordinances per Commonwealth's *Facility Lighting Plan*.[61]

As discussed above, the Creole Nature Trail All-American Road (Highway 27/82) is a 180-mile-long national scenic byway, a portion of which runs adjacent to the Terminal site. Based on the surrounding terrain, we estimate that at least some portion of the Terminal would be visible to motorists along the byway between Holly Beach and Cameron. This is approximately 12 miles of the total 180-mile road. As motorists travel along the road, visual impacts due to the presence of the Terminal would increase as they approach the Terminal and would decrease as they travel further away. For users directly adjacent to the Terminal, the change from open marshland to a large industrial site would be a significant change.

Overall, the proposed Terminal would be visible to varying degrees to users of the Calcasieu Ship Channel, nearby beaches and towns, and motorists along the Creole Nature Trail All-American Road. Although the addition of the facility would be consistent with the general character of the Calcasieu Ship Channel, the addition of the Terminal at this location would represent a significant impact on the viewshed of boaters, beachgoers, and local residents, including the RV residence adjacent to the site, as it would detract from the overall quality of the scenic views of this portion of the region.

4.8.4.2 Pipeline

Construction and operation of the Pipeline may impact visual resources by altering terrain and vegetation patterns during construction or right-of-way maintenance and from the presence of new aboveground facilities. The landscape setting along the proposed Pipeline route is generally flat. A majority of the proposed Pipeline route would be within wetlands, which would not alter the landscape of the region.

As mentioned in section 4.8.3.2, construction of the Pipeline could result in a temporary visual impact within the viewshed of the Creole Nature Trail National Scenic Byway. Impacts within this viewshed and other visual resources due to the Pipeline would be primarily short-term, occurring during construction and revegetation. The terrain over a majority of the Project area is flat; therefore, during construction, the cleared and graded right-of-way, as well as construction equipment, would be visible from local roads. The Project area is not forested; therefore, no visual corridor would be created as a result of Pipeline installation. Following the completion of construction activities, Commonwealth would restore

61 See appendix 3D of accession number 20190820-5125.

areas disturbed by construction and allow activities that previously occurred in the area to resume. Therefore, the construction and operation of the Pipeline would not result in long-term visual impacts.

Commonwealth would also install one interconnect and one pig launcher site along the Pipeline right-of way. Both would be constructed in open emergent wetlands. The closest visual receptors would be motorists who are traveling along the Creole Nature Trail National Scenic Byway, which is about 0.4 mile east of the interconnection at MP 0.7. The interconnect site would be about a 200 square foot site surrounded by fencing. While it may be visible from the road, given the distance, it is unlikely that it would be noticed by those driving along the road. Therefore, we conclude that the visual impact of the aboveground facilities would not have a significant impact on the aesthetics of the landscape along the Pipeline route.

A majority of the land impacted by the Pipeline would be allowed to revert to preconstruction conditions following completion of construction. Some areas, including those used for aboveground facilities, would permanently convert to an industrial use. The implementation of the measures discussed above would result in minimization of impacts on land use. Most impacts on visual resources would be short-term and associated with the construction phase of the Pipeline.

4.8.5 Coastal Zone Management

The Terminal and the Pipeline would be within the Louisiana Coastal Zone. We received comments from the public expressing concern about whether the Project would abide by the Louisiana's Coastal Use Guidelines. All activities or developments that may affect the Louisiana Coastal Zone require a federal consistency review under the National CZMP, which is delegated to the states. The Terminal and Pipeline would require a Coastal Use Permit from the LDNR-OCM. Consultation for the Coastal Use Permit would be performed throughout the JPA review process, and the LDNR would issue its coastal zone consistency determination based on its JPA review. Commonwealth submitted its JPA in August 2019 to the LDNR-OCM, LDEQ, and COE; the JPA is currently under review (see table 1.4-1). Commonwealth would construct and operate the Project in compliance with conditions that would be set forth in the FERC authorization, the COE Section 404/10 and 408 permits, and the LDNR-OCM's Coastal Use Permit. Because Commonwealth has not yet obtained its CZMP, we **recommend that**:

- **<u>Prior to construction of the Project</u>, Commonwealth should file with the Secretary a copy of the determination of consistency with the CZMP issued by the LDNR.**

4.8.6 Land Use, Recreation, and Visual Resources Conclusions

The land use classifications of the land on which the Terminal would be constructed include open land, developed land, open water, and forested land. The Pipeline would be constructed in open land, a majority of which is emergent wetlands. Due to the industrial use of lands in the general vicinity and the previously disturbed nature of the surrounding area, impacts on land use from the Project would be minor. Construction of the Terminal and Pipeline aboveground facilities would result in a change in land use from wetlands to industrial use. Commonwealth's proposed wetland mitigation is discussed in section 4.4.2.

The Project would not impact any federally managed public or conservation lands. Several recreational and special interest sites are in proximity to the Project and could experience indirect impacts, such as change in viewshed and/or increases in traffic in the area of the recreation site. Due to the temporary nature of Pipeline construction and the lack of proximity to known recreational areas, we conclude that impacts from construction and operation of the Pipeline would be short-term and would not adversely impact recreation or special use areas.

Construction of the Terminal would result in changes in the existing views of surrounding beaches; however, the Terminal would be northeast of the beach itself. Despite the existing industrial nature of the Calcasieu Ship Channel, the new facility would have a significant impact on the visual character of the region. Specifically, although Commonwealth has developed a visual screening plan for the RV site adjacent to the Terminal, given its proximity and the size of Terminal structures, visual impacts on the landowner of the RV site could be significant. The proximity, size, and additional lighting at the Terminal site would be easily visible to the RV resident. Most impacts on visual resources from construction and operation of the Pipeline would be temporary and associated with the construction phase.

4.9 SOCIOECONOMICS

Construction and operation of the Terminal and Pipeline could impact socioeconomic conditions, either adversely or positively, in the general vicinity of the proposed facilities. These potential impacts include increased population levels, increased employment opportunities, increased demand for housing and public services, increased traffic on area roadways and waterways, and an increase in government revenue associated with sales and payroll taxes.

Although all of the Project facilities are proposed in Cameron Parish, these socioeconomic impacts may affect the adjacent Calcasieu Parish. For the purposes of our socioeconomic analysis, these two parishes constitute the affected environment and are defined as the "Project area" or "Study Area."

4.9.1 Population

Table 4.9.1-1 provides a summary of selected population and demographic information for the Project area. Commonwealth estimates that construction of the Project would require an average of 800 workers with an estimated peak of 2,000 workers. Based on the Project schedule, Commonwealth expects that the workforce would be around 800 workers for the first 12 months, increasing to 2,000 workers for 14 months, decreasing to 800 workers for 4 months, and then declining to 400 workers during the commissioning phase. Commonwealth estimates that half of the workers would be non-local, while the other half would be employed from within the Study Area. During operation, Commonwealth anticipates adding approximately 65 full-time positions to operate the Terminal site facilities and Pipeline.

TABLE 4.9.1-1 **Existing Socioeconomic Conditions in the Project Area**							
State/ Parish	**Population a/**		**Population Density (per square mile) a/**	**Per Capita Income a/**	**Civilian Labor Force b/**	**Median Household Income a/**	**Unemployment Rate (percent) b/**
	2010	**2019**	**2019**	**2015-2019**	**February 2021**	**2015-2019 (2019 dollars)**	**February 2021**
Louisiana	4,533,485	4,648,794	107.6	$27,923	2,041,035	$49,469	7.4
Cameron	6,868	6,973	5.4	$28,358	3,311	$53,423	5.6
Calcasieu	192,773	203,436	191.3	$28,778	91,961	$51,148	7.6
Project Area Total	**199,641**	**210,409**	**N/A**	**N/A**	**95,272**	**N/A**	**N/A**
a/ U.S. Census Bureau, 2019a. b/ Bureau of Labor Statistics (BLS), 2021.							

The total population change would equal the total number of non-local workers, plus any family members accompanying them, that move into the area. As discussed further in sections 4.9.2 and 4.9.6, Commonwealth would attempt to utilize predominantly local workers during construction. Using Commonwealth's estimate that 50 percent of the workforce would be non-local and would need to move into the area, during peak construction that would result in 1,000 workers relocating to the Study Area. While it is unlikely that all non-local workers would relocate their families during construction, for the purposes of this assessment, if all non-local workers did relocate their families, and assuming an average household size of 2.63 persons (Census Bureau, 2019), this conservatively could result in a total population increase of 2,630 people. This would result in a 1.2 percent increase in the total population within the Study Area (Cameron and Calcasieu Parishes). Overall, the influx of non-local workers and their families would represent a temporary and minor impact on the overall population in the Study Area.

Commonwealth anticipates that the 65 permanent workers during operation would be local. However, if all workers were non-local operation of the Project could result in a permanent increase to the population in the Project area,[62] but this increase is consistent with normal population changes in the area. Therefore, we determined the Project, as a whole, would not significantly affect local population size.

4.9.2 Economy and Employment

The estimated civilian labor workforce for the Project area is a combined total of 95,272, the majority of which resides in Calcasieu Parish, Louisiana (BLS, 2021). The unemployment rate in Cameron Parish is lower than that for the state of Louisiana, while the unemployment rate in Calcasieu is slightly higher than the state (BLS, 2021). Construction of the Project would positively affect employment

62 Assuming that all workers during the operation of the Project are non-local, 2.63 people per household, and an increase in 65 operations people, this would equal about 171 additional people to the Project area (and would equate to about a 0.08 percent increase in population within Cameron and Calcasieu Counties).

opportunities for the state and in the surrounding parishes. However, these impacts would be minor and temporary.

Table 4.9.1-1 shows income data for the Project area. Per capita income represents the average wealth of the population within the given geographic area. The per capita income in the Study Area from 2014 to 2018 averaged $28,568. Commonwealth anticipates average salaries during construction and operation at the Terminal site of $73,500 per year. The proposed salary may influence the pool of available workers during construction.

Commonwealth intends to hire half of its peak workforce of 2,000 workers from within the Project area, though primarily from outside the town of Cameron. Overall, the percentage of local workers would be dependent upon several factors, including the availability of local workers, timing of need for different skilled trades, and other proposed or ongoing projects in the Project area.

The hiring of a local workforce at an annual salary that is higher than the Project area per capita income could reduce unemployment and provide an economic benefit to the local economy. However, this reduction in unemployment would be temporary.

4.9.3 Property Values

The Terminal site would be in an undeveloped area surrounded by industrial development. There are currently no planned residential developments within 0.25 mile of the Terminal site. The closest single residence (RV site) is about 1,700 feet northwest of the closest Terminal structure and is used throughout the year by the landowner. The closest residential area, the town of Holly Beach, is about 5.5 miles west of the Terminal site.

The Pipeline would primarily cross undeveloped portions of Cameron Parish. There are no existing residences within 50 feet of the Project construction work area. The closest residential structure to the Pipeline right-of-way would be the RV site adjacent to the Terminal Site and about 0.4 mile from the pipeline.

Land values are determined by appraisals that take into account objective characteristics of the property such as size, location, and any improvements. The value of a tract of land is related to many tract-specific variables, including the current value of the land, the utilities and services available or accessible, the current land use, and the values of the adjacent properties. The valuations generally do not consider subjective aspects such as the potential effect of a pipeline or an LNG terminal.

While there is limited data for the effect of LNG Terminals on property value, there are several studies that assess the effects of natural gas pipeline compressor stations; however, most of these studies were produced or funded by the natural gas industry. As these studies were peer-reviewed, we will include their results here for informational purposes. The first study was prepared for the National Fuel Gas Supply Corporation and assesses the impacts on property values in 56 neighborhoods surrounding compressor stations in seven locations in New York (Griebner, 2015). Sales data over the previous 15 years was evaluated and assessors from six of the seven areas were interviewed. The study found no quantifiable evidence of a discernable effect on property values or appreciation rates of properties within 0.5 mile of compressor stations. The study, which notes the general lack of sales data for analysis, identified the following commonalities among the seven areas: the compressor stations were sited on large land parcels and set back from the road, and compressor station sites were generally in rural areas removed from higher density development. These characteristics are generally consistent with the location of the Commonwealth LNG Terminal Site (with the notable exception of the RV site).

The second study, "A Study of Natural Gas Compressor Stations and Residential Property Values," prepared for Tennessee Pipeline Company LLC, was based on four case studies in New Hampshire and Massachusetts and compared the value of properties close to compressor stations to properties farther away. The study relied on available market data and interviews with town assessors, building department representatives, and other government representatives. The study concluded that the presence of a compressor station did not generally affect property values in the area. The study indicated a higher confidence in this conclusion for properties more than 0.5 mile from compressor stations. The reason for this is that the areas surrounding the compressor stations in each of the case studies were more rural in nature, and therefore there was a comparative lack of sales data in the immediate vicinity of the compressor stations as compared to the area 0.5 mile away. Overall, the study concluded that "well designed and operated compressor stations on larger sites with adequate buffers should have minimal impact on surrounding land uses and residential property values" (Foster, 2016).

A 2011 study analyzed sales data from approximately 1,000 residential properties in Arizona to test whether proximity to a natural gas pipeline affected real estate sales prices. The study compared sales prices for properties encumbered by or adjacent to a natural gas transmission pipeline with comparable properties not along a pipeline right-of-way. The study was unable to identify a systematic relationship between proximity to a pipeline and sales price or property values (Diskin et al., 2011).

We recognize that the studies cited above do not have a direct applicability to the Project given the location of the studies compared to the Project and that none of the studies were for LNG facilities. The studies considered compressor stations that are generally in rural areas with a mix of residential and industrial/commercial property. However, we are not aware of any studies that would provide a more direct comparison to the Project. The proposed Terminal site is substantially larger than a compressor station, with most residential structures more than 2 miles from the site. There is a single residential site within 0.5 mile of the terminal site.

We acknowledge that it is reasonable to expect that property values may be impacted differently based on the setting and inherent characteristics of each property. However, we find no conclusive evidence indicating that the Project would have a significant negative impact on property values.

Based on the factors discussed above, no significant impacts on property values are anticipated from construction and operation of the Project. However, due to the proximity of the Terminal to the RV site, Commonwealth has provided offers to the landowner of the RV site to purchase the property. To-date the landowner has declined such offers.

4.9.4 Construction Payroll and Material Purchase

The Project would have an estimated total construction payroll of approximately $234 million over the 36- to 38-month construction period. Because the region supports infrastructure for the energy and shipping industries, many construction materials and equipment supplies would be purchased locally. Locally purchased concrete, miscellaneous consumable materials, and fuel supply would have a positive impact on local economies and would stimulate indirect expenditures within the region, as inventories are restocked, and additional business earnings are reinvested. Additionally, Commonwealth expects that construction and other pre-operational activities associated with the Project would result in beneficial cumulative impacts on the local economy and tax revenues. Commonwealth would expend additional capital on maintenance material and contracts over the minimum 30 years of Project operation, resulting in secondary effects producing a positive economic benefit. However, these benefits would be temporary would not be significant.

4.9.5 Tax Revenues

Construction of the Project would result in increased tax revenues for the Project area. Revenue sources include operating grants, property taxes, ad valorem taxes, sales tax, and income taxes. Commonwealth estimates that a portion of the $234 million annual construction payroll would be spent locally for the purchase of housing, food, gasoline, entertainment, and luxury items, which would be subject to local sales taxes and would create an economic benefit to local businesses.

Worker spending would also generate state sales tax revenue. Though it is not possible to predict what amount of worker expenditures would be subject to state sales tax, a conservative estimate can be made for demonstration purposes. Assuming 20 percent of workers' gross income is spent on items subject to the state sales tax of 4.45 percent, an estimated $2 million would accrue to the State of Louisiana during the 3-year construction period.

Worker income would also be subject to the state income tax. The income tax rate for the State of Louisiana varies from 2 to 6 percent based on income earned. State income tax revenue would range from $4 million to $14 million.

Commonwealth states that it would purchase a portion of required construction materials locally. All locally purchased materials would be subject to the state sales tax rate of 4.45 percent. Additionally, the state of Louisiana allows local governments to also collect additional sales taxes. These additional taxes vary by local governments. The purchase of materials locally would result in a temporary increase in the state and local government's collection of sales taxes.

During operation, the Project would pay property taxes to Cameron Parish. Commonwealth notes it has been approved to receive the State of Louisiana's Industrial Tax Exemption Program. Initially, the Terminal would receive an 80 percent property tax abatement period of 10 years. Commonwealth would pay the remaining 20 percent of property tax to Cameron Parish and would pay full property tax after 10 years.

The Project would boost local economies by creating jobs, purchasing construction materials locally, hiring local firms and contractors, and directly or indirectly supporting other regional suppliers in the industry. With additional spending and the employment of workers, ripple effects would perpetuate throughout the communities. These would include potential economic benefits to local hotels, restaurants, and from purchases made by non-local workers. The estimated 65 full-time workers hired during operation are estimated to earn average salaries of $73,000 per year, which is up to $4.8 million annually. It is anticipated that these workers would spend a portion of their combined earnings in the Project area, supporting local economies by purchasing goods and services and paying rents and mortgages, all of which would generate direct and indirect increases in tax revenue. Impacts on tax revenue from construction and operation of the Project would not be significant.

4.9.6 Housing

It is anticipated that non-local temporary construction workers would be more likely to live in rental units than to purchase homes. A variety of temporary housing units are available in the Project area including single-family homes, apartments, hotels/motels, campgrounds, and recreational vehicle (RV) parks. The number of temporary housing units available is provided in table 4.9.6-1 below. Due to the rural nature of Cameron Parish, there are a limited number of available units, and non-local workers would likely have to disperse to the surrounding communities to find housing during construction. Calcasieu Parish, Louisiana provides greater sources of temporary housing units.

TABLE 4.9.6-1 **Temporary Housing Units Available in the Project Area**					
State, Parish, or County	**Vacant Housing Units c/**	**Rental Vacancy Rate (percent) c/**	**Number of Vacant Rental Units c/**	**Number of Hotel/Motel Units a/ b/**	**Number of Campgrounds and RV Park Spaces a/ b/**
Louisiana	320,321	8.6	56,993	NA	NA
Cameron Parish	1,391	0.0	0.0	107	238
Calcasieu Parish	12,388	8.8	2,529	5,686	2,414
Project Area Total	**13,779**	**N/A**	**2,529**	**5,793**	**2,652**

a/ Cameron Parish Tourist Commission, 2021
b/ Calcasieu Parish Tourist Commission, 2021
c/ U.S. Census Bureau, 2019d

Impacts on local housing markets during construction would depend on the number of workers commuting from remote locations versus the number of workers housed locally. Commonwealth anticipates that half of the construction and operational workforce would be sourced from the Study Area. Considering the number of temporary housing units available, such as hotel/motel rooms, vacant housing units for rent, and RV spaces (see table 4.9.6-1), sufficient housing would be available for the non-local temporary construction workforce (peak 1,000 workers). The peak non-local workforce would use about 10 percent of the available temporary housing in the Study Area.

In addition to the temporary housing units available, a number of new housing projects have been proposed in the Project area. The Southwest Louisiana Economic Development Alliance created a strategic plan for temporary housing for the parishes of Allen, Beauregard, Calcasieu, Cameron, and Jefferson Davis (2014). The strategic plan was created in recognition of a growing need for temporary worker housing. The analysis noted that worker villages were the preferred alternative to meet short-term, but temporary, demand for housing. The only facility currently operating is Moss Lake Village in Calcasieu Parish, which has 2,500 beds (American Press, 2018). These units may also be available to non-local workers if other types of temporary housing are unavailable.

Additionally, the proposed permanent staff of 65 to operate the proposed Project facilities is primarily anticipated to come from current local residents and therefore would not create pressure on the local housing market. Therefore, we conclude that construction and operation of the Project would not have a significant impact on housing in the Project area.

4.9.7 Commercial Fisheries

The commercial fisheries in Louisiana include crab, crawfish, finfish, oyster, and shrimp. The LDWF manages commercial fisheries in the state out to 9 nautical miles. Offshore federal waters extend from 9 to 200 nautical miles. The only managed fishery in the Calcasieu Ship Channel is shrimp. Shrimping seasons in the portion of the Calcasieu Ship Channel adjacent to the Project occurs from May to July and mid-August to mid-December. However, various other commercial fishing vessels use the Calcasieu Ship Channel to traverse to areas north or south of the Terminal.

Given the location of the Terminal site at the entrance of the Calcasieu Ship Channel, it is not anticipated that construction or operation would cause significant congestion within the Calcasieu Ship Channel nor would closures of the Calcasieu Ship Channel be required. During construction, Commonwealth would deliver major material supplies and equipment by barge to the Terminal site (see table 4.9.7-1). The largest number of barge deliveries would occur between months 19 and 28 of construction. While the timing and number of barges would be dependent on the delivery needs of the Project, Commonwealth estimates an average of 7 barge deliveries per week during construction. Barge delivery of material supplies and equipment has the potential to affect commercial fishing due to the additional number of barges and the seasonal aspect of the fisheries. The Calcasieu Ship Channel was specifically created to provide deep-water access for maritime commerce. As such, use of the channel by barges and support vessels to deliver materials during construction of the liquefaction facility would be consistent with the planned purpose and use of this active shipping channel and would be managed by the Port of Lake Charles in partnership with the Lake Charles Pilots Association. Furthermore, the Captain of the Port has jurisdiction over navigational safety considerations. As part of filing of its Water Suitability Assessment, Commonwealth was required to coordinate with the Captain of the Port. Commonwealth received its LOR from the USCG in March 2019. We conclude this oversight is adequate to ensure impacts on commercial fishing are appropriately minimized and not significant.

TABLE 4.9.7-1

Construction Marine Vessel Trip Estimates

Time Period	Type of Vessel	Total Number of Vessels during Construction
Between Months 16 and 25	Tug-Assisted Dumb Barges	3
Between Months 19 and 28	Tug-Assisted Dumb Barges	30
Between Months 26 and 28	Heavy Haul Transport Vessel	6
After month 28	Tug-Assisted Dumb Barges	6

Other potential impacts on commercial fishing from construction of the Project would be associated with direct impacts on those species and/or their habitats. A detailed discussion on impacts on commercial fish species and their habitats are discussed in detail in section 4.6.2. Overall, we concluded that construction of the Project would have a temporary and not significant impact on aquatic resources, and therefore would not significantly impact commercial fishing.

During operations, Commonwealth estimates three LNG carrier visits per week at the Terminal site. Based on navigational simulations that were conducted, Commonwealth estimates that the average time for a vessel to turn 180 degrees within the turning basin and pull alongside the terminal berth would be about 30 to 40 minutes. A vessel departing the terminal would take on average 30 minutes to leave the berth and pass the outbound jetties. Assuming a worst-case scenario, Commonwealth estimates that the channel could be closed for a maximum of one hour during LNG inbound vessels and LNG outbound vessels. During these times, commercial vessels would experience a minor delay when attempting to traverse the portion of the channel that would be closed. Given the relatively short transit, the short duration of turning operations (approximately 30 to 40 minutes), and the limited number of LNG carrier visits (approximately three per week), operation of the Project is not likely to significantly affect inshore shrimping or commercial fishing in general in Cameron Parish. Closure of the Calcasieu Ship Channel in the vicinity of the Terminal associated with LNG carrier security zones (see section 4.9.11.2) would be expected to last no more than one hour during an LNG carrier's arrival and one hour during the subsequent departure.

Twice a year, for approximately 2 weeks each time, large numbers of shrimp migrate in or out of the Calcasieu River Ship Channel. During these times, which typically occur at night and during the full moon from May to July and from mid-August to mid-December, shrimp trawlers cluster at the inside/outside shrimp line in the ship channel in order to catch as many shrimp as possible. However, the LDWF-mandated inside/outside shrimp line is now north of Monkey Island, which would not be impacted by construction or operation of the Terminal (LDFW 2020). Therefore, we conclude that the Project would contribute negligibly to overall temporary and minor impacts on commercial fisheries in the Calcasieu Ship Channel.

No commercial fisheries are along the Pipeline route; therefore, the Pipeline would not impact any commercial fishing operations during construction or operation.

4.9.8 Public Services

The parishes in the Project area have infrastructure that provides health, police, fire, emergency, and social services near the Project site (see table 4.9.8-1). Cameron Parish has one general hospital, while Calcasieu Parish has four. South Cameron Memorial Hospital is the closest hospital, approximately 14 miles from the Terminal site (table 4.9.8-2). This hospital has 49 beds (American Hospital Directory, 2020). The next closest hospital is in Calcasieu Parish, about 45 miles north of the Terminal site. Urgent care facilities are present in the Study Area, primarily in Calcasieu Parish. Table 4.9.8-1 below provides a summary of the public services provided in the Project area.

Law enforcement in Cameron Parish is provided by the local sheriff's office. The Cameron Parish Sheriff's Office also patrols the parish's waterways and lakes. Other law enforcement services are provided by the sheriff offices in Calcasieu Parish, as well as additional municipal police departments. Additional law enforcement services are available in Texas.

The Cameron Parish Fire Department provides fire protection through nine fire stations, all of which are volunteer departments. Calcasieu Parish has 38 fire stations, which are a mix of volunteer and career firefighters. In total, the Study Area has 21 police and sheriff departments and 47 fire departments to protect citizens and associated property in the Study Area. This information is summarized in table 4.9.8-1. The closest fire departments are in the towns of Cameron and Holly Beach (table 4.9.8-2).

TABLE 4.9.8-1 **Public Services in the Project Area**				
Parish, State	**Number of Police/Sheriff's Departments a/**	**Number of Fire and Rescue Departments a/**	**Number of General Hospitals b/**	**Number of Staffed Hospital Beds**
Cameron Parish	3	9	1	49
Calcasieu Parish	18	38	5	761
Project Area Total:	21	47	6	810
a/ County Office, 2019 b/ American Hospital Directory, 2020				

TABLE 4.9.8-2 **Distance to Public Services in the Project Area**			
Service Type	**Approximate Distance to the Project (miles)**	**City, Parish**	**Facility Name**
Hospital	17	Cameron, Cameron	South Cameron Memorial Hospital
Police/sheriff's Department	4	Cameron, Cameron	Cameron Parish Sheriff's Department
Emergency Medical Service (EMS)	14	Hackberry, Cameron	Cameron Parish Ambulance Services
Fire Department	7	Holly Beach, Cameron	Holly Beach Fire Station
	3	Cameron, Cameron	Cameron Parish Fire Department

The Cameron Parish Fire Department provides fire protection through nine fire stations, all of which are volunteer departments. Calcasieu Parish has 38 fire stations, which are a mix of volunteer and career firefighters. In total, the Study Area has 21 police and sheriff departments and 47 fire departments to protect citizens and associated property in the Study Area. This information is summarized in table 4.9.8-1. The closest fire departments are in the towns of Cameron and Holly Beach (table 4.9.8-2).

Impacts on public services would be greatest while constructing the Project, as the greatest number of workers would be present. Cameron Parish public services would be in highest demand during construction because the Terminal site is within this parish. The Project could result in additional use of medical services. While this increase may be the result of work-related injuries, the influx of non-local workers could also result in the need for workers to visit local medical facilities for checkups, sick visits, or other regular appointments. Increases in the need for police and fire services may also occur. These could be directly related to construction, such as the need for flaggers or traffic control; however, this increased need may also be the result of the population influx. An increase in population could result in increased traffic stops or emergency service calls. Because the influx of workers would be limited to the time of construction, impacts on public services would be temporary and minor.

Impacts on public services during operation of the Terminal would be mainly associated with the ability to respond to an emergency. Commonwealth conducted an Emergency Services Gap Analysis

(AcuTech, 2019) that assessed the current capabilities of emergency services within the Project area. Based on the analysis, Commonwealth identified several areas where local resources are lacking training and or appropriate equipment to respond to an emergency at the Terminal facility. In order to address the limitations of the local fire departments, Commonwealth would train Terminal personnel to address non-LNG fires, establish a mutual aid agreement to support more advanced fire scenarios, and assist in the development of the local fire departments capabilities based on coordination with those agencies.

Overall, construction of the Project would have a minor temporary impact on available public services. Additionally, based on Commonwealth's commitment to supplement local fire department gaps by expanding internal training and aiding local fire departments, impacts on public services due to operation would not be significant.

4.9.9 Public Schools

Cameron Parish has four public schools serving students from pre-kindergarten through twelfth grade with a total enrollment in 2017 of 1,363 students (Kids Count Data Center, 2019). In Calcasieu Parish, there are a total of 63 public schools with a total enrollment of 34,992 students (Kids Count Data Center, 2019).

As a conservative estimate of new students that could be added to the local school system due to the Project, we looked at the expected influx of workers and estimated number of school-aged children that would accompany them. Commonwealth stated that half of its workers during construction would be non-local. As stated in section 4.9.1, the average household size is estimated at 2.63 people. If the entire non-local workforce relocated with their families, this would result in an influx of 2,630 people. Based on information from the Census Bureau (U.S Census Bureau, 2010), about 25 percent of people in a household are under the age of 18. Therefore, assuming that 25 percent of the population influx would be under the age of 18, about 658 school-aged children would need to be enrolled in local schools. This would result in an enrollment increase of 1.8 percent within the Project area. As these students would be spread out over multiple schools within two parishes, we believe that this would result in minor, temporary impacts on the schools.

During operation, Commonwealth anticipates adding approximately 65 full-time positions to operate the Terminal facilities. Commonwealth expects that this workforce would be sourced predominantly from the local population. However, if all 65 permanent workers were non-local and had two school-aged children each, this would result in 130 additional children in local parish school systems. This addition would represent a 9.5 percent increase in total enrollment if all of the students were in Cameron Parish.

Based on existing enrollments, existing school capacity, and the limited increase to the local population, we conclude operation of the Project would not have a significant impact on local schools.

4.9.10 Public Utilities

Various types of public utilities could be affected by the Project, including electric, waste disposal, and water. The water and wastewater district in the Project area (Cameron Parish Water Works District) is operated by Cameron Parish. Based on Commonwealth's coordination with the Cameron Parish Water Works District, the water supply pipeline that is adjacent to the Terminal has sufficient capacity to meet the needs of the Project, both during construction and operation. According to the Cameron Parish Water Works District, the Water District has a monthly surplus in excess of three million gallons. Project requirements during both construction and operation would be less than one million gallons per month.

Cameron Parish operates dump sites in several areas across the parish. The two closest sites to the Terminal site are about 6 miles to the west and 23 miles to the north. The nearest landfill that handles industrial and special waste is in Sulphur. The projected remaining capacity for the landfill would not be significantly affected by the Project.

Overall, no public utilities in the Project area are expected to be significantly affected by construction or operation of the Project.

4.9.11 Transportation and Traffic

4.9.11.1 Land Transportation

There would be an increase in heavy truck traffic and workforce traffic to the Terminal site during the construction phase (see table 4.9.11-1). Commonwealth anticipates that, during construction of the Terminal, material supplies and equipment would be delivered by both road and water transportation. The sole access to the Terminal site is from Gulf Beach Highway (Highway 27/82). The Pipeline right-of-way would also be accessed from Highway 27/82. The town of Holly Beach is about 6.5 miles west of the Terminal site along Highway 27/82. Populated areas north along Highway 27/82 where many non-local workers may stay include Hackberry, Carlyss, and Sulphur.

TABLE 4.9.11-1

Traffic Counts and Average Daily Round Trips Estimates for Construction Work

Location	Primary Access Road	AADT (count year) a/	Estimated Peak Daily Trips from Construction	Construction Percent Increase in AADT a/	Estimated Daily Trips from Operation	Operational Percent Increase in AADT	AM Peak Capacity of Roadway (Vehicles per hour) b/
Terminal Site	Gulf Beach Highway (Route 27/82)	1,484 (2021)	125	8.4	85	5.7	1,700
Park and Ride (Southland Airport Lot)	Highway 108	1,677 (2013)	700	41.7	0	NA	
Park and Ride (Circle K Lot)	Highway 27	8,497 (2020)	1,000	11.8	0	NA	

a/ LADOTD 2021
b/ Commonwealth Traffic Impact Study, 2019

Commonwealth conducted a Traffic Impact Study to assess impacts from construction vehicles, including deliveries and workers, on traffic within the Project area. The Project's peak construction workforce would be 2,000 workers, who would all need access to the Terminal and Pipeline work areas. However, as part of the assumptions in its Traffic Impact Study, Commonwealth assumed that a majority of the workforce would be transported to the Project area by 31 buses, each capable of transporting 65 passengers. Using this assumption, Commonwealth estimates that peak construction traffic would consist of 75 light vehicles per day and 50 heavy vehicles per day (which would include construction equipment) for a total of 125 trips per day. The Project would be sited in an area that is undeveloped, and the only traffic currently in the area directly adjacent to the Project area is traffic traveling to and from the existing industrial sites or Holly Beach. The 2020 annual average daily traffic (AADT) on Highway 27/82 is about 1,677 vehicles near Holly Beach, which is along the main access route to the Project area (LADOTD, 2021).

Commonwealth assessed the existing Level of Service (LOS) along LA-27 and Gulf Beach Highway (Highway 27/82) as part of its Traffic Impact Study and modeled what the estimated LOS would be once construction started. The LOS categorizes the estimated traffic flow along roads and highways from best (LOS A) to worst (LOS F). LOS A indicates roads that are free flowing; LOS B are roads that are reasonably free flowing; LOS C is stable flow but drivers are restricted in choosing their own speed; LOS D is approaching unstable flow; LOS E is an unstable flow with short stoppages; and LOS F indicates traffic that requires frequent stopping and slowing (DOT, 2018). The current LOS along LA-27 during peak am and pm hours was determined to be LOS C, while Gulf Beach Highway (including the portion that runs adjacent to the Terminal site) has an LOS A. Based on the assumption that a majority of the workforce would use shuttles/buses to reach the Project area, Commonwealth estimated in its Traffic Impact Study[63] that there would be no change in the LOS during construction near the area of the Terminal or Holly Beach. Based on Commonwealth's Traffic Impact Study, we conclude that there would not be any significant delays along Highway 27/82 in the vicinity of the Project. However, residents of the town of Holly Beach may notice an increase in the number of vehicles and construction equipment.

Due to the large workforce that is expected during construction, and to limit the number of vehicles driving directly to the Project site, Commonwealth states in its Traffic Impact Study that it plans to address worker and material transport through off-site parking, shuttles, and infrastructure. Commonwealth has identified two Park and Ride locations in Carlyss, Louisiana, about 41 miles north of the Project site. The first site would be the existing Southport Airport parking lot, which has a maximum capacity of 700 vehicles, which would be accessed along Route 108. The second site is an existing gravel parking area (Circle K Lot) with a maximum capacity of 1,000 vehicles, which would be accessed from Route 108/27. Commonwealth prepared a traffic impact analysis for the two lots.[64] Commonwealth's models indicate the roadways passing the two parking lots would operate unchanged at LOS A or B throughout construction of the Project. Drivers exiting the parking lots during peak afternoon traffic hours would potentially experience an LOS F. That is, drivers exiting the parking lots may experience long wait times for breaks in traffic, but non-Project-related traffic would not be affected.

Operating the Terminal would require an estimated 65 employees. Commonwealth estimates that operation would average about 75 light vehicles per day (includes full time staff and visitors) and 10 heavy vehicles per day. No change in the LOS for the area roadways is anticipated. Based on the construction traffic assessment along LA-27, we conclude that the additional traffic generated by operations employees, visitors, and deliveries would not result in a significant increase in traffic volume on area roadways.

4.9.11.2 Marine Transportation

The Calcasieu Ship Channel, originally constructed in 1926 by the COE for navigation in support of industry, allows passage from the Gulf of Mexico to Lake Charles in neighboring Calcasieu Parish. The proposed Terminal site for the Project is at the southernmost extent of the Calcasieu Ship Channel, approximately 500 feet from its confluence with the Gulf of Mexico, on the eastern shoreline of the ship channel. Per the LOR analysis conducted by the USCG, the channel is approximately 800 feet wide and 40 feet deep, although the channel width decreases to 400 feet wide at some points. In 2013, there were 1,022 vessel calls to the Calcasieu Ship Channel. According to the Calcasieu Ship Channel Traffic Study

63 See accession number 20200114-5188.

64 See accession number 20220210-5163.

(Ausenco, 2018), traffic in the channel is projected to double to 2,183 vessel calls in 2023. Approximately 800 of these new vessel calls are projected to involve LNG carriers.

Barge deliveries would occur throughout the Project's 36- to 38-month construction period, with a higher number of deliveries expected to occur during certain phases of construction. Commonwealth estimates that an average of seven barges per week would be expected during peak construction. Since the Terminal site is near the mouth of the ship channel, we do not anticipate that barge deliveries would result in any significant impacts on marine traffic in the ship channel.

During operations, up to 156 LNG carriers would call at the Terminal per year. In a letter dated March 7, 2019, the USCG issued the LOR for the Project, which stated that the Calcasieu Ship Channel is considered suitable for LNG marine traffic in accordance with the guidance in the USCG's Navigation and Vessel Inspection Circular 01-11. The USCG also indicated that if an increase in port calls is expected, it recommended that appropriate studies showing additional traffic impact on the waterways be conducted.

The proposed increase in vessels over the estimated 2023 number of approximately 2,183 vessels annually and projected future increase in vessels would not likely affect the capability of the channel to handle the proposed ship movements (Ausenco, 2018). The Terminal would be at the entrance of the ship channel, resulting in short inbound and outbound transits. Given the location of the facility, it is possible that LNG carriers may be able to proceed directly to the Terminal without forming a convoy, as is required for other LNG carriers bound for other facilities.

During operations, security zones for LNG carriers in transit would impact recreational and commercial fishing vessels within the Calcasieu Ship Channel because they would be required to exit the security zone while the LNG carrier passes. The need and size of a security zone would be established by the USCG. After the moving security zone passes, recreational boaters and fishermen could return and continue their prior activities. However, these delays would be temporary, security zone closures would be expected to last no more than one hour and are not expected to significantly impact recreational or commercial fishermen.

4.9.12 Environmental Justice

According to the EPA, "environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental, and commercial operations or policies (EPA, 2021). Meaningful involvement means:

1. people have an opportunity to participate in decisions about activities that may affect their environment and/or health;
2. the public's contributions can influence the regulatory agency's decision;
3. community concerns will be considered in the decision-making process; and
4. decision makers will seek out and facilitate the involvement of those potentially affected (EPA, 2021).

In conducting NEPA reviews of proposed natural gas projects, the Commission follows the instruction of Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which directs federal agencies to identify and address "disproportionately high and adverse human health or environmental effects" of their actions on minority and low-income populations (i.e., environmental justice communities). Executive Order 14008, Tackling the Climate Crisis at Home and Abroad, also directs agencies to develop "programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts." The term "environmental justice community" includes disadvantaged communities that have been historically marginalized and overburdened by pollution.[65] Environmental justice communities include, but may not be limited to minority populations, low-income populations, or indigenous peoples.[66]

Commission staff used the Federal Interagency Working Group on Environmental Justice & NEPA Committee's publication, *Promising Practices for EJ Methodologies in NEPA Reviews* (*Promising Practices*) (EPA, 2016), which provides methodologies for conducting environmental justice analyses throughout the NEPA process for this project. Commission staff's use of these methodologies is described throughout this section.

Commission staff used EJScreen, EPA's environmental justice mapping and screening tool, as an initial step to gather information regarding minority and/or low-income populations; potential environmental quality issues; environmental and demographic indicators; and other important factors. EPA recommends that screening tools, such as EJScreen, be used for a "screening-level" look and a useful first step in understanding or highlighting locations that may be candidates for further review.

4.9.12.1 Meaningful Engagement and Public Involvement

The Council on Environmental Quality's (CEQ) Environmental Justice Guidance Under the National Environmental Policy Act (CEQ Environmental Justice Guidance) (CEQ, 1997) and Promising Practices recommend that federal agencies provide opportunities for effective community participation in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities and improving the accessibility of public meetings, crucial documents, and notices.[67] They also recommend using adaptive approaches to overcome linguistic, institutional, cultural, economic, historical, or other potential barriers to effective participation in the decision-making processes of federal agencies. In addition, Section 8 of Executive Order 13985, Advancing Racial Equity and Support for Underserved Communities Through the Federal Government, strongly encourages independent agencies to "consult with members of communities that have been historically underrepresented in the Federal Government and underserved by, or subject to discrimination in, federal policies and programs."

As discussed in section 1.2 of this EIS, there have been opportunities for public involvement during the Commission's environmental review process. On July 28, 2017, Commonwealth filed a request with FERC to use our pre-filing review process. We approved Commonwealth's request on August 15, 2017 and established pre-filing docket number PF17-8-000 for the Terminal and Pipeline. Information and documents filed by Commonwealth for the Project, as well as related documents, were placed into the public record.[68] Commonwealth held an initial open house meeting on October 23, 2017, in Johnson Bayou, Louisiana, to introduce the Project to the local community. On February 22, 2018, the Commission issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Commonwealth LNG*

65 Exec. Order No. 14,008, 86 Fed. Reg. 7619, 7629 (Feb. 1, 2021).Id. § 219, 86 Fed. Reg. 7619, 7629

66 See EPA, EJ 2020 Glossary (Sep. 7, 2021), https://www.epa.gov/environmentaljustice/ej-2020-glossary.

67 CEQ, *Environmental Justice: Guidance Under the National Environmental Policy Act,* 4 (Dec. 1997) (CEQ's *Environmental Justice Guidance*), https://www.energy.gov/sites/default/files/nepapub/nepa_documents/RedDont/G-CEQ-EJGuidance.pdf.

68 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 early resolution of issues, prior to a formal application being filed with the FERC.

Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Sessions (NOI).[69] In addition, we conducted a public scoping session in Johnson Bayou, Louisiana, on March 13 2018. Commonwealth held a second open house meeting on July 30, 2018, in Cameron Parish, Louisiana. Each meeting was held close to the Project area and Project information, maps, and schedules were available to the public for review.[70]

Commonwealth filed its formal application for the Project on August 20, 2019. On September 3, 2019, FERC issued a Notice of Availability. On June 8, 2021, Commonwealth filed an Amendment to its Application to modify the proposed LNG storage tank designs and capacities and on July 13, 2021, the Commission issued a *Notice of Application for Amendment and Establishing Intervention Deadline*, which established an additional 15-day comment period and intervention deadline. On September 24, 2021, the Commission issued a *Notice of Intent to Prepare an Environmental Impact Statement, Request for Comments on Environmental Issues, and Revised Schedule for Environmental Review for the Project,* which established an additional 30-day scoping period.

All documents that form the administrative record for these proceedings are available to the public electronically through the internet on the FERC's website (www.ferc.gov). Anyone may comment to FERC about the Project, either in writing or electronically. All substantive environmental comments received prior to issuance of this EIS have been addressed within this document.

In addition, in 2021, the Commission established the Office of Public Participation (OPP) to support meaningful public engagement and participation in Commission proceedings. OPP provides members of the public, including environmental justice communities, with assistance in FERC proceedings—including navigating Commission processes and activities relating to the Project. For assistance with interventions, comments, requests for rehearing, or other filings, and for information about any applicable deadlines for such filings, members of the public are encouraged to contact OPP directly at 202-502-6592 or OPP@ferc.gov for further information.

We recognize that not everyone has internet access or is able to file electronic comments. Each notice was physically mailed to all parties on the environmental mailing list. Further, FERC staff has consistently emphasized in meetings with the public that all comments, whether spoken or delivered in person at meetings, mailed in, or submitted electronically, receive equal weight by FERC staff for consideration in the EIS. In addition, Commonwealth sent copies of its FERC application in hard copy and/or digital format to the Cameron Parish Library in the Project area.

Commonwealth has stated it began having its land agents reach out to affected landowners prior to the start of any surveys.[72] Commonwealth has continued to communicate with affected landowners and has continued to receive landowner feedback regarding siting of the Project.

In its joint comments on the Project, the Sierra Club *et al.*[73] stated that the Commission must adequately consider the environmental justice impacts of the Project. Particularly, Sierra Club *et al.* stated

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69 The NOI was sent to about 300 interested parties, including affected landowners; elected officials; tribal governments; local, state, and federal regulatory agencies; libraries; local emergency responders; and local newspapers in the Project area.

70 Commonwealth has stated it began having its land agents reach out to affected landowners prior to the start of any surveys. Commonwealth has continued to communicate with affected landowners and has continued to take landowner feedback regarding siting of the Project.

72 See page 1-59 of Resource Report 1 of Commonwealth's application to the FERC (accession no. 20190820-5125).

73 Commenters in this letter include Sierra Club, Healthy Gulf, National Audubon Society, PACAN, Turtle Island Restoration Network, Scenic Galveston Inc., and the Louisiana Environmental Action Network. (continued)

that given that there are at least eight existing, proposed, or planned LNG Terminals in Calcasieu and Cameron Parishes, air quality impacts must be evaluated for all environmental justice communities that would be impacted by air emissions from the Project and not limited to a 10-mile radius. Sierra Club *et al.* stated that noise and air impact assessments must consider the cumulative contribution of all of these projects within surrounding communities. Discussions of these impacts are provided below in section 4.9.12.3. Cumulative impacts on environmental justice communities associated with other terminal projects are discussed in section 4.13.2.7. We also received several comments regarding the Project's impact on wetland loss and climate change and the effect this would have on the population in the town of Cameron. Discussions of population impacts are provided below in section 4.9.12.3.

4.9.12.2 Identification of Environmental Justice Communities

According to the *CEQ Environmental Justice Guidance* and *Promising Practices*, minorities are those groups that include American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. Following the recommendations set forth in *Promising Practices*, FERC uses the **50 percent** and the **meaningfully greater analysis** methods to identify minority populations. Using this methodology, minority populations are defined in this EIS where either: (a) the aggregate minority population of the block groups in the affected area exceeds 50 percent; or (b) the aggregate minority population in the block group affected is 10 percent higher than the aggregate minority population percentage in the parish. The guidance also directs low-income populations to be identified based on the annual statistical poverty thresholds from the U.S. Census Bureau. Using *Promising Practices'* **low-income threshold criteria** method, low-income populations are identified as census block groups where the percent low-income population in the identified block group is equal to or greater than that of the parish. Here, Commission staff selected Calcasieu Parish, Cameron Parish, and Jefferson Davis Parish in Louisiana and Jefferson and Orange Counties Texas, as the comparable reference communities to ensure that affected environmental justice communities are properly identified. A reference community may vary according to the characteristics of the particular project and the surrounding communities.

According to the current U.S. Census Bureau information,[74] minority and low-income populations exist within the Project area, as discussed further below. Appendix F identifies the minority populations by race and ethnicity and low-income populations within Louisiana, for the parishes affected, and census block groups within 54 kilometers of the LNG Terminal,[75] 1 mile of the Park and Ride locations,[76] and crossed by the Pipeline segments. We have determined that a 54-kilometer radius around the proposed aboveground facilities and 1 mile around the Park and Rides are the appropriate distances for assessing impacts on the environmental justice communities. As stated, 54-kilometers represents the furthest extent of potential impacts on environmental justice communities (air quality) and 1-mile radius around the Park and Ride locations is sufficiently broad considering the likely air quality and traffic impacts associated with these locations. To ensure we are using the most recent available data, we use U.S. Census American Community Survey File# B03002 for the race and ethnicity data and Survey File# B17017 for poverty data

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Subsequent joint comments on the Project's potential impacts on environmental justice communities addressed below and in appendix M include the following signatories: Sierra Club, Audubon Society, Center for Biological Diversity, Louisiana Bucket Brigade, Micah 6:8 Mission, RESTORE, and Turtle Island Restoration Network.

74 Although the U.S. Census Bureau American Community Survey block group data for 2020 was scheduled for release on March 17, 2022, not all block groups associated with this proposal have been updated. U.S. Census Bureau, 2020 Data Release Schedule, Mar. 17, 2022, https://www.census.gov/programs-surveys/acs/news/data-releases/2020/release-schedule.html#par_textimage_0. As a result, the most current American Community Survey for identification of environmental justice communities is 2019.

75 Census block groups are statistical divisions of census tracts that generally contain between 600 and 3,000 people (U.S. Census Bureau, 2019).

76 See section 2.1.1.5

at the census block group level.[77] Figure 4.9-1 provides a geographic representation of potential environmental justice communities relative to the location of the Project (see also appendix G).

All Project facilities, including the Terminal and the Pipeline, would be within Census Tract 9702.01, Block Group 2, which is not an environmental justice community. An additional 148 block groups are within the 54-kilometer radius of the LNG Terminal site (see appendix F). There are 91 block groups within this radius that are identified as environmental justice communities as defined in section 4.9.12 (figure 4.9-1 and appendixes F and G). Twenty-four of the block groups are identified as environmental justice populations based on poverty levels, 18 based on the minority threshold, and 49 based on both the poverty and minority thresholds. Additionally, one of the census block groups within 1-mile of the Park and Ride locations was identified as an environmental justice community based on poverty levels (Census Tract 33, Block Group 2). Appendix F provides detail of race and ethnicity and poverty status for all block groups within the geographic scope. Appendix G contains figures illustrating the locations of all block groups identified as environmental justice communities within the geographic scope. Potential impacts on these communities from the Project are further discussed below.

4.9.12.3 Environmental Justice Impacts Analysis

As previously described, Promising Practices provides methodologies for conducting environmental justice analyses. Issues considered in the evaluation of environmental justice include human health or environmental hazards; the natural physical environment; and associated social, economic, and cultural factors. Consistent with Promising Practices and Executive Order 12898, we reviewed the Project to determine if its resulting impacts would be disproportionately high and adverse on minority and low-income populations and also whether impacts would be significant.[78] Promising Practices provides that agencies can consider any of a number of conditions for determining whether an action will cause a disproportionately high and adverse impact.[79] EPA states in their comment that the presence of any of these factors "could indicate a potential disproportionately high and adverse impact."[80] For this Project, a disproportionately high and adverse effect on an environmental justice community means the adverse effect is predominantly borne by such population. Relevant considerations for this determination include the location of Project facilities and the Project's human health and environmental impacts on identified environmental justice communities, including direct, indirect and cumulative impacts. The EPA recommended that the EIS include impacts on environmental justice communities from the Project. The analysis of impacts is included in this section.

No project related activities would take place in an environmental justice community. All project activities would take place within Calcasieu Parish Census Tract 9702.01, Block Group 2 (Terminal, meter station, and Pipeline) and Cameron Parish Census Tract 33, Block Group 3 and Census Tract 32, Block Group 1 (Park and Rides), which are not environmental justice communities. The closest environmental justice community is Census Tract 9702.01, Block Group 3 (approximately 0.1 mile from the LNG

77 U.S. Census Bureau, American Community Survey 2019 ACS 5-Year Estimates Detailed Tables, File# B17017, Poverty Status in the Past 12 Months by Household Type by Age of Householder, https://data.census.gov/cedsci/table?q=B17017; File #B03002 Hispanic or Latino Origin By Race, https://data.census.gov/cedsci/table?q=b03002.

78 *See Promising Practices* at 33 (stating that "an agency may determine that impacts are disproportionately high and adverse, but not significant within the meaning of NEPA" and in other circumstances "an agency may determine that an impact is both disproportionately high and adverse and significant within the meaning of NEPA").

79 *See Promising Practices* at 45-46 (explaining that there are various approaches to determining whether an impact will cause a disproportionately high and adverse impact). We recognize that CEQ and EPA are in the process of updating their guidance regarding environmental justice and we will review and incorporate that anticipated guidance in our future analysis, as appropriate.

80 See EPA's comments filed on eLibrary under accession no. 20220523-5141.

Terminal), Census Tract 9701, Block Group 1 (approximately 2.7 miles from the Pipeline) and Census Tract 33 Block Group 2 (approximately 0.2 mile from the northern Park and Ride lot).

Based on the scope of the Project and our analysis of the Project's impacts on the environment as described throughout this EIS, we have determined Project-related impacts on wetlands, surface water, visual resources, tourism, socioeconomics, traffic, noise, and air quality may adversely affect the identified environmental justice communities. Impacts on environmental justice communities associated with safety are addressed in section 4.12, Reliability and Safety.[84]

In general, the magnitude and intensity of the aforementioned impacts would be greater for individuals and residences closest to the Project's facilities and would diminish with distance. These impacts are addressed in greater detail in the associated sections of this EIS. Environmental justice concerns are not present for other resource areas, such as geology, groundwater, wildlife, land use, or cultural resources due to the minimal overall impact the Project would have on these resources and the absence of any suggested connection between such resources and environmental justice communities.

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84 See supra page 4-286.

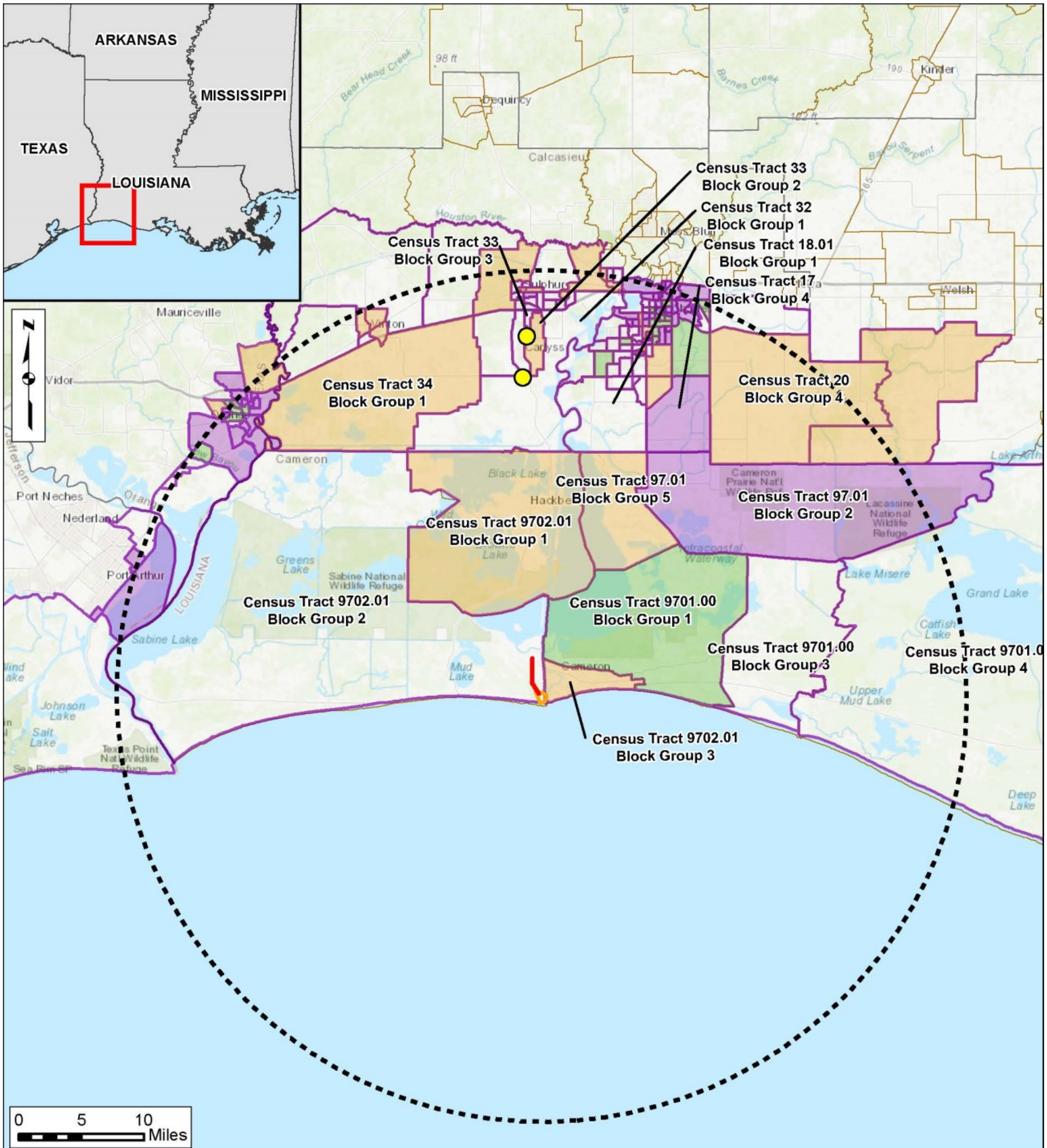

Figure 4.9-1

Commonwealth LNG Project

Low-Income and Minority Environmental Justice Communities

Wetlands

Construction and operation of the Project would result in short-term, temporary (during construction), and permanent (during operation) impacts on wetlands (section 4.4). Wetlands provide various benefits to local populations including shoreline protection, provides habitat for a variety of plant and animal species that can be used for recreation and/or sustenance, and are used by the public for recreation and education (NRCS, 2021). While all the wetland impacts would be outside the boundaries of the identified environmental justice communities, the loss of wetland habitat, and the subsequent decrease in wetland benefits, could affect those environmental justice communities near the Project, particularly the environmental justice community closest to the project (Census Tract 9702.01, Block Group 3). However, the total impacted wetland area for the Project (89.9 acres) represents about 0.3 percent of the approximately 27,000 acres of wetlands contained within the HUC 12 watershed, in which the Project is located. In addition, through implementation of the measures in Commonwealth's revised *Workspace Restoration Plan* and Project-specific *Procedures* and Commonwealth's compliance with CWA permitting (see section 4.4.2), we conclude that the impacts on wetlands would be adequately minimized and sufficiently mitigated and would not have a significant impact on environmental justice communities. Wetland impacts are more fully addressed in section 4.4.

Water Resources

Construction and operation of the terminal would permanently impact two unnamed waterbodies (a drainage ditch and a tidal slough) within the Project area and would both temporarily (during construction) and permanently (during operation) impact portions of the adjacent Calcasieu Ship Channel. These impacts would result from dredging activities, site construction, marine traffic, stormwater runoff, water use, hydrostatic testing, and could occur from accidental spills or other releases of hazardous substances. Environmental justice communities in proximity to the Project, particularly the environmental justice community closest to the project (Census Tract 9702.01, Block Group 3) would be mostly affected by dredging and resuspension of sediments. Resuspension of sediments within the ship channel could potentially mobilize contaminants. However, as discussed in section 4.2.1, it is unlikely that contaminated sediment is present. Commonwealth would attempt to minimize waterbody impacts by minimizing the Project footprint to the extent possible and using the turning basin that was dredged for the Calcasieu Pass LNG Project, thus minimizing the amount of dredging needed within the Calcasieu Ship Channel. Further, Commonwealth would minimize impacts on water quality by using a hydraulic suction dredge, where turbidity would be focused close to the river bottom and would equate to a storm event within a short distance of the cutterhead. Overall, we do not anticipate significant impacts on environmental justice communities related to surface water.

Construction and operation of the terminal, as well as marine traffic to and from the terminal, have the potential to adversely impact water quality in the event of an accidental release of a hazardous substance such as fuel, lubricants, coolants, or other material. In order to minimize the risk of a release, Commonwealth would implement the measures outlined in the FERC's *Plan* and Commonwealth's *Procedures* to minimize the likelihood of a spill and would implement its *SPAR Plan* in the event of a spill. These plans would minimize the risk of a spill by requiring Commonwealth to conduct personnel training, equipment inspection, install secondary and spill containment structures for fuels, vehicles, or equipment, and identifying refueling procedures. Additionally, LNG carriers are required to develop and implement a Shipboard Oil Pollution Emergency Plan (SOPEP), which includes measures to be taken when an oil pollution incident has occurred, or a ship is at risk of one. If an accidental release was to occur, environmental justice communities along the ship channel, particularly the environmental justice community closest to the project (Census Tract 9702.01, Block Group 3), as well as individuals from these communities that use the channel, would be affected. However, with the mitigation measures Commonwealth and LNG carriers would implement, we conclude that environmental justice communities would not be significantly impacted by an accidental release.

Aquatic Resources

Recreational and commercial fishing could be impacted by construction activities associated with the Terminal. Project activities are anticipated to occur during peak fishing and recreational seasons; however, due to the overall size of the waterway, access to and maneuverability within the Calcasieu Ship Channel would not be significantly affected by the use of barges. Temporary impacts on recreational and commercial users in the Calcasieu Ship Channel, which would likely include individuals from environmental justice communities, may occur in areas where construction is occurring. The construction impacts on recreational and commercial fisheries would be temporary, lasting the duration of construction activities. Permanent impacts on recreational and commercial fisheries in the ship channel, which likely include individuals from environmental justice communities, may occur due the loss of available fishing areas from operation of the marine facilities and LNG carrier traffic. Although we expect fish, crab, and shrimp species common to the bay could be present, the location does not have any unique features or habitat characteristics that would draw recreational or commercial users to this particular location. The Project area does not support special habitat that is different from the miles of surrounding habitat. Given these characteristics, and due to the overall size of the waterway, we conclude that these impacts on environmental justice communities would not be significant. Aquatic resources impacts are more fully addressed in section 4.6.2.

Visual Resources

The LNG Terminal would be constructed on marsh land with the Calcasieu Ship channel and existing industrial sites to the east, sandy shoreline and the Gulf of Mexico to the south, marsh land and the town of Holly Beach to the west, and marshland to the north (see section 4.8). Construction of the LNG Terminal would result in a permanent change in the viewshed and would add an industrial element to the area. The Terminal and all associated structures and buildings would be highly visible from vehicles along Gulf Beach Highway and users of Holly Beach and the Calcasieu Ship Channel. A majority of residences are not within close proximity to the Terminal site, with most residents 5.5 miles west in the town of Holly Beach and the town of Cameron (which is located within an environmental justice community), 2.4 miles east across the ship channel. There are several residences at the southern tip of Monkey Island, within environmental justice Census Tract 9702.01, Block Group 3, that house Lake Charles ship pilots and their offices. These residences have a direct and uninhibited view of the Terminal Site. The addition of the Terminal would result in a similar visual change as with the construction of the Calcasieu Pass facility. Based on visual renderings created by Commonwealth (appendix E), the Terminal, including the six LNG storage tanks, flare stack, and liquefaction trains, would be highly visible from Holly Beach. While the town of Holly Beach is not considered an environmental justice community, given the number of outside communities in proximity to the Project that are, it is probable that at least some visitors to the beach could reside in low-income or minority communities. There are various public access points to the beach. The extent of the visual impact on Holly Beach users would depend on where a person would access or use the beach. The closer to the Terminal that a visitor would access, the larger the overall impact.

After construction, all disturbed areas associated with Pipeline construction would be restored and areas outside of the permanent right-of-way would be returned to preconstruction conditions. There are no residences or other sensitive receptors in view of any aboveground structures associated with the Pipeline.

While the direct visual changes would be outside the boundaries of the identified environmental justice communities, the permanent changes in the viewshed, would have a permanent and significant adverse effect on those environmental justice communities near the Project. Visual impacts are more fully addressed in section 4.8.4.

Tourism

No significant impacts on tourism are anticipated from the Project for environmental justice communities. The main tourism near the Terminal would be Holly Beach. If the number of visitors significantly decreased to the area, adjacent communities that would be a source of food, fuel, or entertainment could also be affected. This includes adjacent environmental justice communities. There are several access points to the beach near the Terminal that may experience visual and/or noise impacts. Given these impacts, users of Holly Beach may choose to access the beach near the town, which is further from the site and would not be subject to significant visual or noise impacts. Given the availability of alternate areas on Holly Beach, further from the facility, we do not anticipate that the construction and operation of the Project would result in fewer visitors to the area. Because we do not anticipate a decrease in visits, impacts on environmental justice communities associated with tourism would not be significant. Impacts on tourism are more fully addressed in section 4.8.

Socioeconomics

Project impacts on environmental justice populations may include impacts on socioeconomic factors. Constructing the Project would require, at its peak, about 2,000 workers/contractors. The combined populations of Cameron and Calcasieu Parishes are about 210,000 individuals. The 2,000 workers/contractors would increase the combined populations of the two parishes by about 0.5 percent. The closest environmental justice communities would be those that include the towns of Cameron (Census Tract 9702.01, Block Group 3) and Hackberry (Census Tract 9702.01, Block Group 1). The temporary flux of workers/contractors into the area could increase the demand for community services, such as housing, police enforcement, and medical care. An influx of workers could also affect economic conditions and other community infrastructure. We received several comments concerned that construction and operation of the Project would result in people moving out of the town of Cameron due to the continued industrialization of the area resulting in wetland loss and climate change. Based on US Census Data, between 2010 and 2019, the population of town of Cameron went from 537 individuals to 203. While this does suggest that there is a migration of people out of town of Cameron, we are unable to assess the cause of the population change. While there is potential that people would move away due to additional facilities, the influx of temporary and permanent jobs could potentially also result in additional people moving to the area. Socioeconomic impacts on environmental justice communities would be less than significant. Socioeconomic impacts are more fully addressed in section 4.9.

Traffic

Area residents may be affected by traffic delays during construction of the Project. There would be a temporary increase in use of area roads by heavy construction equipment and associated trucks and vehicles. Increased use of these roads would result in a higher volume of traffic, increased commute times, and greater risk of vehicle accidents. These impacts would most likely affect those environmental justice communities within close proximity of the Project, such as Cameron (Census Tract 9702.01 Block Group 3) and Hackberry (Census Tract 9702.01 Block Group 1), as well as those communities to the north where workers would find housing. Mitigation measures would be implemented to alleviate any potential road congestion during construction. These measures include the use of bus lots in Carlyss, Louisiana, about 40 miles north of the Terminal site to limit the number of vehicles traveling to the site and the establishment of temporary travel lanes and the use of flaggers and signs, as necessary, to ensure the safety of local traffic. One of the census block groups within 1-mile of both Park and Ride lots is considered an environmental justice community. These impacts would also be limited to time of construction, which is approximately 36 to 38 months. Once construction is complete, Commonwealth estimates that operation would average about 75 light vehicles per day (includes full time staff and visitors vehicles) and 10 heavy vehicles (i.e. trucks) per day. Impacts on environmental justice communities associated with operation of the facility would be less than significant. The Project would not result in a change in the roadway level of service for any of the area roadways during construction or operation. Therefore, traffic impacts on environmental justice communities would be less than significant. Project transportation needs and impacts are more fully addressed in section 4.9.11.

Barge deliveries would occur throughout the Project's 36- to 38-month construction period, with a higher number of deliveries expected to occur during certain phases of construction. Commonwealth estimates that an average of seven barges per week would be expected during peak construction. Because the Terminal site is near the mouth of the ship channel, we do not anticipate that barge deliveries would result in any significant impacts on marine traffic in the ship channel. Recreational boaters and fishers, which likely include individuals from environmental justice communities, would not experience any significant changes in marine traffic. During operations, up to 156 LNG carriers would call (or stop) at the Terminal per year. The proposed increase in vessels would not likely affect the capability of the channel to handle the proposed ship movements (Ausenco, 2018). The Terminal would be at the entrance of the ship channel, resulting in short inbound and outbound transits. Given the location of the facility, it is possible that LNG carriers may be able to proceed directly to the Terminal without forming a convoy, as is required for other LNG carriers bound for other facilities. Marine transportation is discussed further in section 4.9.11.2.

Noise

Noise levels above ambient conditions, attributable to construction activities, would vary over time and would depend upon the nature of the construction activity, the number and type of equipment operating, and the distance between sources and receptors. The closest noise sensitive area (NSA) located within an environmental justice community (Census Tract 9702.01 Block Group 3) is located about 3,300 feet east of the proposed Terminal site and is a set of temporary houses on the southern tip of Monkey Island that is used to house Calcasieu Ship Channel pilots. The human ear's threshold of perception for noise change is considered to be 3 decibels on the A-weighted scale (dBA). Peak construction noise related to Project activities would increase noise levels over ambient by 7 decibels at this NSA and would be temporary. Commonwealth expects peak construction noise to occur during construction months 10 through 12. During this time, Commonwealth expects civil works, facilities equipment assembly, pile driving, and dredging to occur simultaneously throughout the Terminal site. All increases over ambient due to construction would be temporary and only occur during daytime hours. Operational noise associated with the Terminal site would be persistent; however, Commonwealth would be required to meet sound level requirements. Operational noise would increase noise levels over ambient by about 3 decibels at the closest NSA. With the implementation of proposed mitigation measures, the Project would not result in significant noise impacts on local residents and the surrounding communities, including environmental justice populations. Noise impacts are more fully addressed in section 4.11.2.

Air Quality

As discussed in section 4.11.1, construction and operation of the Terminal site would result in long-term impacts on air quality. Construction air emissions from the Project, when considered with current background concentrations, would be below the NAAQS, which are designated to protect public health. Emissions during Terminal and Pipeline construction would generally be associated with onshore construction activities conducted using on-road and off-road mobile equipment and offshore construction activities conducted using marine vessels such as tugboats or barges and a dredging vessel. Construction emissions in the form of particulate matter (e.g., dust) would occur, and construction emissions from equipment exhaust would result in short-term, localized impacts in the immediate vicinity of construction work areas. Efforts to mitigate exhaust emissions during construction would include using construction equipment and vehicles that comply with EPA mobile and non-road emission regulations, and usage of commercial gasoline and diesel fuel products that meet specifications of applicable federal and state air pollution control regulations. Fugitive dust would be mitigated by applying water to the roadways and reducing vehicle speed. We conclude the construction-related impact on local air quality during construction of the Terminal and Pipeline would not be significant.

Commonwealth conducted air dispersion modeling to assess air quality impacts and show compliance with applicable NAAQS and Class II Prevention of Significant Deterioration (PSD) Increments for the pollutants subject to PSD review. Additionally, FERC modeled the impacts of mobile sources (LNG carriers and tugs) in addition to the PSD and NAAQS modeling required by the state. The cumulative modeling indicated that operation of the Project (including LNG Terminal stationary sources and mobile sources) would contribute to a potential nitrogen dioxide (NO_2) 1-hour NAAQS exceedance, however the Project's contribution (including LNG stationary and mobile sources) would be less than the significant impact level at each exceedance location. A majority of these potential exceedances within the modeled area would be within an environmental justice community (Census Tract 9702.01, Block Group 1) (see appendix F). Commonwealth's contribution to all exceedances is estimated to be less than the significant impact level at all exceedance locations. Therefore, we conclude that the Project would not cause or significantly contribute to a potential exceedance of the NAAQS and would not result in significant impacts on air quality in the region. Although the Project would be in compliance with the NAAQS and the NAAQS are designated to protect sensitive populations, we acknowledge that NAAQS attainment alone may not assure there is no localized harm to such populations due to project emissions of volatile organic compounds (VOC), hazardous air pollutants (HAP), as well as issues such as the presence of non-Project related pollution sources, local health risk factors, disease prevalence, and access (or lack thereof) to adequate care. Air Quality impacts are more fully addressed in section 4.11.1.

4.9.12.4 Environmental Justice Mitigation Measures

As described in *Promising Practices*, when an agency identifies potential adverse impacts, it may wish to evaluate practicable mitigating measures. Commonwealth has committed to several minimization and mitigation measures to reduce impacts related to wetlands, surface water, aquatic resources, visual resources, recreation, socioeconomics, traffic, noise, and air quality. Commonwealth has committed to:

- implementing its compensatory wetland mitigation plan that requires replanting temporarily disturbed wetlands and purchasing wetland bank mitigation credits;
- minimizing the amount of dredging needed within the Calcasieu Ship Channel;
- following Commonwealth's Facility Lighting Plan;
- using bus lots in Carlyss, Louisiana to limit the number of vehicles traveling to the site and establishment of temporary travel lanes and the use of flaggers and signs, as necessary, to ensure the safety of local traffic;
- using construction equipment and vehicles that comply with EPA mobile and non-road emission regulations, and usage of commercial gasoline and diesel fuel products that meet specifications of applicable federal and state air pollution control regulations;
- mitigating fugitive dust applying water to the roadways and reducing vehicle speed;
- implementing soft starts, bubble curtains, and vibratory hammers; and
- requiring the operational noise associated with the Terminal site to meet sound level requirements.

4.9.12.5 Disproportionately High and Adverse Impact Determination

As described throughout this EIS, the proposed Project would have a range of impacts on the environment and on individuals living in the vicinity of the Project facilities, including environmental justice populations. The closest environmental justice block groups are Census Tract 9702.01, Block Group 3 approximately 0.1 mile from the LNG Terminal (with the closest residence [pilot's temporary housing] approximately 3,300 feet away) and Census Tract 9701, Block Group 1 approximately 2.7 miles from the Pipeline. The closest town within an environmental justice community is Cameron (within Census Tract 9702.01, Block Group 3) over 2 miles away. Visual impacts on environmental justice communities near the Terminal would be significant. As outlined in section 4.9.12.4, Commonwealth has committed to implementing a Facility Lighting Plan, which would reduce visual impacts on the environmental justice communities. Environmental justice communities in the area could also experience cumulative impacts due to the addition of other projects within the geographic scope (see section 4.13). Due to the presence of significant visual impacts on an environmental justice community and overall cumulative impacts in the project area, we conclude that impacts on environmental justice communities would be disproportionately high and adverse.

4.10 CULTURAL RESOURCES

Section 106 of the NHPA, as amended, requires that the FERC take into account the effects of its undertakings on historic properties, and to afford the Advisory Council on Historic Preservation an opportunity to comment. Commonwealth, as a non-federal party, is assisting the FERC in meeting our obligations under Section 106 by preparing the necessary information, analyses, and recommendations, as authorized by 36 CFR 800.2(a)(3).

4.10.1 Survey Results

Cultural resources surveys for the Terminal were conducted in two field studies. The resulting reports, an initial report for 2018 surveys (Jordan-Greene et. al., 2019), and an addendum report for 2019 surveys (TRC, 2019), were provided to the FERC and the Louisiana State Historic Preservation Office (SHPO). The 2018 survey covered about 246 acres at the Terminal. About 80 percent of the proposed Terminal footprint is inundated marsh, with a few natural levees, alluvial dune remnants, and/or cheniers. The entire Terminal, except for areas that were inaccessible, was visually inspected for cultural materials by Commonwealth. Special attention was given to potential high-probability areas adjacent to roadways and along sand dunes. A total of 51 shovel tests were excavated during the survey, all of which were negative for cultural materials.

The 2018 survey identified two abandoned shipwrecks of commercial fishing vessels, which are approximately 2,743 feet from the Gulf of Mexico shoreline. The shipwrecks were likely deposited during Hurricane Rita storm surges, and neither qualifies as a cultural resource. Additionally, the ruins of a circa-1960 residence (structure 12-00209) were identified during the survey. Commonwealth recommended structure 12-00209 as not eligible for the NRHP. In a letter dated April 3, 2019, the SHPO concurred with this recommendation, and indicated that no properties listed in or eligible for listing in the NRHP would be affected by the Project. We concur with the SHPO.

The 2019 survey covered 128.8 acres, of which 115.8 acres were part of the Terminal, and 13 acres comprised of three access roads. A total of 77 shovel tests were excavated, all of which were negative for cultural resources. Previously recorded site 16CM149 was reported within the boundary of the Terminal; however, the existing site form noted that the site was destroyed, and the current survey did not identify any evidence of the site. In a letter dated October 25, 2019, the SHPO indicated that no properties listed in or eligible for listing in the NRHP would be affected by the Project. We concur with the SHPO.

Commonwealth contacted the SHPO regarding the Pipeline, providing a description of this Project component, an assessment of cultural resource probability, and mapping, and requested the SHPO's concurrence that no survey was necessary. On September 28, 2019, the SHPO indicated that no known historic properties would be affected by the Pipeline. Commonwealth contacted the SHPO regarding the revised Pipeline route, providing a description of this Project component, an assessment of cultural resource probability, and mapping, and requested the SHPO's concurrence that no survey was necessary. On June 11, 2021, the SHPO indicated that no known historic properties would be affected by the revised Pipeline. We concur with the SHPO.

Commonwealth also contacted the SHPO regarding the LNG berth and barge dock area, providing a description of these project components, an assessment of cultural resource probability, and mapping, and requested the SHPO's concurrence that no survey was necessary. On January 12, 2020, the SHPO indicated that no known historic properties would be affected by these project components. We concur with the SHPO.

Commonwealth identified two locations that would be used as Park and Ride lots to shuttle workers to and from the Terminal site during construction. Both locations are existing graveled parking lots. Commonwealth contacted the SHPO regarding the two Park and Ride locations, providing a description of the two lots and mapping. On January 9, 2022, the SHPO indicated that no known historic properties would be affected by use of these Project components. We concur with the SHPO.

In response to our NOI, the Sabin Center for Climate Change Law noted that impacts from climate change (e.g., sea level rise, storm surge, flooding, and erosion) could affect other issues including cultural resources. Climate change is addressed in section 4.13.2.11 of this EIS.

4.10.2 Native American Consultation

We sent our February 22, 2018 NOI to the following federally recognized Native American tribes: Alabama-Coushatta Tribe of Texas; Alabama-Quassarte Tribal Town; Apache Tribe of Oklahoma; 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 Tribe of Louisiana. In letters dated March 29, 2018 and October 4, 2019, the Choctaw Nation of Oklahoma requested formal consultation with the FERC for the Project, GIS shapefiles of the Project area, and the cultural resources survey report(s). Commonwealth sent a copy of the cultural resources survey report, SHPO letter, and GIS shapefiles to the Choctaw Nation of Oklahoma. No further comments were received from the Choctaw Nation of Oklahoma. No other tribes responded to this NOI. We sent our September 24, 2021 NOI to these same tribes. The Choctaw Nation of Oklahoma requested a copy of the final EIS. The Choctaw Nation of Oklahoma is on our environmental mailing list to receive the Notice of Availability of the final EIS. The final EIS is available on the FERC website. No further comments have been received.

Commonwealth wrote letters to the nine tribes on February 26, 2018, describing the Project and requesting comments. One tribe responded to the letter. The Choctaw Nation of Oklahoma responded that the tribe had requested formal consultation with the FERC for the Project and requested GIS shapefiles of the Project area and cultural resources surveys. As noted above, Commonwealth provided the Choctaw Nation with the requested information.

Commonwealth spoke over the telephone with the Coushatta Tribe of Louisiana in April 2018. The tribe requested to be kept informed of the Project. Commonwealth sent a copy of the cultural resources survey report and SHPO letter to the Coushatta Tribe of Louisiana on August 2, 2019.

Commonwealth called the nine tribes on May 2, 3, and 9, 2018, as a follow-up to the February 26 letters. The Apache Tribe of Oklahoma indicated they did not have an interest in the Project on May 3, 2018.

Commonwealth also sent follow-up emails to the Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town, 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 Tribe of Louisiana on April 2, 2019. No further comments have been received.

4.10.3 Unanticipated Discoveries

Commonwealth submitted a plan addressing the unanticipated discovery of cultural resources and human remains during construction. The SHPO provided comments to Commonwealth on the plan in a letter dated April 3, 2019. We also requested revisions to the plan. Commonwealth provided a revised plan addressing the SHPO's and our comments. We have reviewed the revised plan and found it acceptable.

4.10.4 Cultural Resources Conclusions

Cultural resources surveys are complete for the Project and the SHPO and FERC concur that no historic properties would be affected. Therefore, compliance with Section 106 of the NHPA is complete.

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

We received comments from the public expressing concern about the Project's impact on public health. Air quality would be affected by construction and operation of the Project. Though air pollutant emissions would be generated by Project construction, most air emissions associated with the Project would result from the long-term operation of the Terminal site. This section of the EIS addresses the construction- and operation-based emissions from the Project, as well as projected impacts on air quality and applicable regulatory requirements.

4.11.1.1 Regional Climate

The Project is proposed in Cameron Parish, Louisiana, where the climate is humid and subtropical with long, hot summers and short, mild winters. Southern Louisiana is mostly low and level with elevations generally less than 60 feet above mean Gulf of Mexico level. The runoff is through numerous sluggish streams or bayous, which flow through lakes and marshland. The larger marshlands are mainly in the coastal area, extending farthest inland in the southeast. A great part of the southwestern region of the state is drained through the Calcasieu River. The principal influences that determine the climate of Louisiana are its subtropical latitude and its proximity to the Gulf of Mexico. The average water temperatures of the Gulf of Mexico along the Louisiana shore range from 64°F in February to 84°F in August.

The average annual temperature is 69°F in the Project area. The number of days with temperatures equal to or greater than 90°F averages 75 days. Temperatures dip below freezing on average about 10 days per year in the Project vicinity. The Project area receives an annual average of 57.2 inches of rain. February is typically the driest month of the year with a monthly mean of 3.3 inches, whereas June tends to be the wettest month with a monthly mean of 6.1 inches. Rains of as much as 20 inches in a month have occurred, and as much as 10 inches of rain in 24 hours is not rare. Proximity to the Gulf of Mexico and the Calcasieu River means that humidity in the Project area is relatively high. Snow events are rare, with an annual mean of 0.3 inch of snow, which is most likely to occur in January or February.

Wind direction in the Project area is dependent on the time of year. Spring and summer months experience winds coming from the south, whereas during the fall and winter months wind direction is typically from the north or northeast. In summer, the prevailing southerly winds provide moist, semitropical weather often favorable for afternoon thunderstorms. With westerly to northerly winds, periods of hotter and drier weather interrupt the prevailing moist condition. In the colder season, the area is subject alternately to tropical air and cold, continental air, in periods of varying length (NOAA, 2022b).

4.11.1.2 Existing Air Quality

Air quality would be affected by construction and operation of the Project. Commonwealth would construct natural gas liquefaction and export facilities in Cameron Parish, Louisiana. The proposed Project would include six liquefaction trains with ancillary utilities and support facilities; two flare systems; six LNG storage tanks; one marine facility consisting of an LNG carrier berth, barge dock, and turning basin; a 26-foot storm surge protection concrete wall; operation and safety systems; approximately 3 miles of 30-

inch-diameter pipeline; two interconnection facilities with existing pipelines; and one metering station. This section describes existing laws and regulations relevant to air quality and the potential effects related to air quality that would result from implementation of the Project.

Ambient Air Quality Standards

The EPA has established NAAQS for the following "criteria" pollutants: carbon monoxide (CO), NO_2, O_3, particulate matter (PM) less than 10 microns in diameter (PM_{10}), PM less than 2.5 microns in diameter ($PM_{2.5}$), sulfur dioxide (SO_2), and lead (Pb). O_3 forms in the atmosphere as a result of a chemical reaction between nitrogen oxides (NO_x) and VOCs in the presence of sunlight. Therefore, NO_x and VOCs are often referred to as O_3 precursors. $PM_{2.5}$ may be directly emitted and can 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. Lead emissions are primarily generated by industry such as ore and metals processing, waste incinerators, lead-acid battery manufacturers, and lead smelters. Because there are no sources of lead emissions associated with the Project, lead is not carried forward in the air analysis.

There are two classifications of NAAQS: primary and secondary standards. Primary standards set limits the EPA believes are necessary to protect human health, including sensitive populations such as children, the elderly, and asthmatics. Secondary standards are set to protect public welfare from detriments such as reduced visibility and damage to crops, vegetation, animals, and buildings. States have the authority to adopt ambient air quality standards if they are at least as stringent as the NAAQS. While states can promulgate more stringent standards than the NAAQS, the LDEQ has adopted all NAAQS established by the EPA (LDEQ, 2015). Table 4.11.1-1 lists the NAAQS for the criteria pollutants described above.

TABLE 4.11.1-1 **National Ambient Air Quality Standards**				
Pollutant	**Primary/ Secondary**	**Averaging Time**	**Level**	**Form**
CO a/	Primary	8 hours	9 parts per million	Not to be exceeded more than once per year
		1 hour	35 ppm	
Pb	Primary and secondary	Rolling 3-month average	0.15 μg/m^3 b/	Not to be exceeded
NO_2	Primary	1 hour	100 parts per billion	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Primary and secondary	1 year	53 ppb c/	Annual Mean
Ozone (O_3) d/	Primary and secondary	8 hours	0.070 ppm e/	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
$PM_{2.5}$	Primary	1 year	12.0 μg/m^3	Annual mean, averaged over 3 years
	Secondary	1 year	15.0 μg/m^3	Annual mean, averaged over 3 years
	Primary and secondary	24 hours	35 μg/m^3	98th percentile, averaged over 3 years
PM_{10}	Primary and secondary	24 hours	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)	Primary	1 hour	75 ppb f/	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

Source: EPA, 2016.

a/ The federal primary standards for CO are also listed as a secondary standards in LAC 33:711 (LDEQ, 2015).

b/ In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 μg/m^3 as a calendar quarter average) also remain in effect.

c/ The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

d/ Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

e/ Federal ozone standard in LAC 33:711 has not been updated to the 2015 standard (0.070 ppm) (LDEQ, 2015).

f/ The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)). An SIP call is an EPA action requiring a state to resubmit all or part of its SIP to demonstrate attainment of the required NAAQS.

Air Quality Control Regions and Attainment Status

Air Quality Control Regions (AQCRs) are areas established for air quality planning purposes in which implementation plans describe how ambient air quality standards will be achieved and maintained. AQCRs were established by the EPA and local agencies, in accordance with Section 107 of the CAA and its amendments, to implement the CAA and comply with the NAAQS through SIPs. The AQCRs are intrastate and interstate regions, such as large metropolitan areas, where the improvement of the air quality in one portion of the AQCR requires emission reductions throughout the AQCR.

Each AQCR, or portion(s) of an AQCR, is classified as either "attainment," "non-attainment," "unclassifiable," or "maintenance" with respect to the NAAQS. Areas where ambient air concentrations of the criteria pollutants are below the levels listed in the NAAQS are considered in attainment. If ambient air concentrations of criteria pollutants are above the NAAQS levels, then the area is designated non-attainment. Areas that have been designated non-attainment but have since demonstrated compliance with the NAAQS are reclassified, upon approval by EPA, as a maintenance area for that pollutant. Maintenance areas are treated similarly to attainment areas for the permitting of stationary sources; however, specific provisions may be incorporated through the state's approved maintenance plan to ensure that air quality will remain in compliance with the NAAQS for that pollutant. Maintenance areas retain the classification for 20 years before being reclassified as attainment areas. Areas where air quality data are not available are unclassifiable and are treated as attainment areas.

The entire Project area (including the Terminal and Pipeline) is in the Southern Louisiana–Southeast Texas Interstate AQCR (40 CFR 81.53), which includes Cameron Parish. Likewise, LNG carrier transit would impact the same AQCR. Cameron Parish, where the facility would operate and the transits occur, meets or exceeds the NAAQS for all criteria pollutants and is in attainment.

Air Quality Monitoring and Existing Air Quality

Along with state and local agencies, the EPA created a network of ambient air quality monitoring stations that collect data on background concentrations of criteria pollutants across the United States. The state and local agency sites are designated as part of the State and Local Air Monitoring Stations (SLAMS). National Air Monitoring Stations and Photochemical Air Monitoring Stations are a subset of SLAMS (EPA, 1998). To characterize the existing ambient air quality for the proposed Project, data were gathered from SLAMS sites that are closest to and most representative of the Project site.

TABLE 4.11.1-2

Nearest or Most Representative Air Quality Monitoring Stations a/

Station Name	Criteria Pollutant	Location (Site ID)	Distance and Direction to Project Site
Carlyss Station	O_3	Carlyss, LA (22-019-0002)	25 miles North
SETRPC 40 Sabine Pass		Sabine Pass, TX (48-245-0101)	33 miles West
Vinton Station	O_3, $PM_{2.5}$	Vinton, LA (22-019-0009)	34 miles Northwest
Westlake Station	SO_2, NO_2	Westlake, LA (22-019-0008)	35 miles North
Port Arthur Memorial School	$PM_{2.5}$	Port Arthur, TX (48-245-0021)	35 miles Northwest
Nederland High School	CO	Nederland, TX (48-245-1035)	42 miles Northwest
Lafayette/USGS Station	PM_{10}	Lafayette, Louisiana (22-055-0007)	85 miles Northeast

a/ EPA 2019a

For O_3, the closest SLAMS site is in Carlyss, Louisiana (Calcasieu Parish). In Texas, the Sabine Pass O_3 monitoring station lies about 33 miles to the west. For $PM_{2.5}$ and O_3, the Vinton Louisiana monitoring station (Calcasieu Parish) lies about 34 miles north of the Project site. The closest site for NO_2 and SO_2 monitoring is in Westlake, Louisiana, approximately 35 miles north of the Project site. For CO, the closest site is a monitoring location in Nederland, Texas, which is 42 miles northwest of the Project site. For PM_{10}, the closest monitoring site is at the USGS facility in Lafayette, Louisiana, 85 miles northeast of the Project site. Table 4.11.1-2 provides information on these SLAMS sites.

Table 4.11.1-3 shows monitoring data for criteria pollutants for 2016 to 2019, as applicable, from the monitoring sites, along with the appropriate primary NAAQS standard. All monitored values were below the NAAQS.

TABLE 4.11.1-3 **SLAMS Data and NAAQS a/**			
Station Name	**Criteria Pollutant**	**Data b/**	**NAAQS**
Carlyss Station	O_3	0.065	0.70 ppm
SETRPC 40 Sabine Pass	O_3	0.068	0.70 ppm
Vinton Station	O_3	0.064	0.70 ppm
	$PM_{2.5}$ annual	7.76	12/15 μg/m^3
	$PM_{2.5}$ 24-hour	21.2	35 μg/m^3
Westlake Station	SO_2 3-hour	0.04	0.5 ppm
	SO_2 1-hour	28.6	75 ppb
	NO_2 annual	6.6	53 ppb
	NO_2 1-hour	38.8	100 ppb
Port Arthur Memorial School	$PM_{2.5}$ annual	9.6	12.0 μg/m^3
	$PM_{2.5}$ 24-hour	21	35 μg/m^3
Nederland High School	CO 8-hour	0.5	9 ppm
	CO 1-hour	1.0	35 ppm
Lafayette/USGS Station	PM_{10}	80	150 μg/m^3

a/ EPA 2019a

b/ Values based on NAAQS criteria; where required, 3-year period = 2016–2018 except for Port Arthur $PM_{2.5}$, which does not have a full 3-year set of data; 205 days of data from 2019 were used to represent year 3 and will be updated in future versions.

Greenhouse Gases

Greenhouse gases (GHGs) occur in the atmosphere both naturally and as a result of human activities, such as the burning of fossil fuels. These gases are the integral components of the atmosphere's greenhouse effect, which warms the Earth's surface and moderates day/night temperature variation. In general, the most abundant GHGs are water vapor, CO_2, methane (CH_4), nitrous oxide (N_2O), and O_3. On December 7, 2009, the EPA defined air pollution to include a mix of six long-lived and directly emitted GHGs, finding that the presence of the following GHGs in the atmosphere may endanger public health and welfare through climate change: CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Though the EPA's finding was based on emissions associated with new motor vehicles, the EPA has expanded its regulations to include the emission of GHGs from major stationary sources under the PSD program. The EPA's current rules require that a stationary source must be regulated as a major source for a non-GHG pollutant to be evaluated as a major source for GHGs. As a result, New Source Review (NSR) sources must also obtain a GHG PSD permit prior to beginning construction of a new major source with significant net emission increases of carbon dioxide equivalent (CO_2e) equal to or greater than 75,000 tons per year (tpy). There are no NAAQS for GHGs.

The principal GHGs that would be produced by the Project are CO_2, CH_4, and N_2O. Emissions of GHGs are quantified and regulated in units of CO_2e. The CO_2e unit of measure takes into account the global warming potential (GWP) of each GHG. The GWP is a ratio relative to CO_2 that is based on the particular GHG's ability to absorb solar radiation as well as its residence time within the atmosphere. Thus, for a 100-year horizon, CO_2 has a GWP of 1, CH_4 has a GWP of 25, and N_2O has a GWP of 298 (Intergovernmental Panel on Climate Change, 2021). To obtain the CO_2e quantity, the mass of the particular compound is multiplied by the corresponding GWP, the product of which is the CO_2e for that compound. The CO_2e value for each of the GHG compounds is then summed to obtain the total CO_2e GHG emissions.

4.11.1.3 Regulatory Requirements for Air Quality

The Project would be potentially subject to a variety of federal and state regulations pertaining to the construction of the Terminal and Pipeline, and operation of air emission sources. The following sections summarize the applicability of various state and federal regulations.

Federal Air Quality Requirements

The CAA, 42 USC 7401 et seq., as amended in 1977 and 1990, and 40 CFR Parts 50 through 99 are the basic federal statutes and regulations governing air pollution in the United States. The following federal requirements have been reviewed for applicability to the Project:

- NSR/PSD;
- New Source Performance Standards (NSPS);
- National Emission Standards for Hazardous Air Pollutants (NESHAP);
- Title V Operating Permits;
- General Conformity; and
- Greenhouse Gas Reporting.

New Source Review/Prevention of Significant Deterioration

Federal preconstruction review for sources in nonattainment areas is referred to as Nonattainment New Source Review, while federal preconstruction review for sources in attainment areas is referred to as PSD. The review process aids in preventing new sources and modifications to existing systems from causing existing air quality to deteriorate beyond acceptable levels.

A source is classified as PSD major if it has the potential to emit (PTE) more than 100 tpy of a pollutant regulated under the CAA and it is listed in one of the 28 named source categories in Section 169 of the CAA, or if it has PTE more than 250 tpy and is not listed in one of the 28 named source categories in Section 169 of the CAA. If a new source is determined to be a major source for any criteria pollutant, then other PSD pollutants would be subject to PSD review if those pollutants are emitted at rates that exceed significant emission rates (SERs). These include criteria pollutants (100 tpy for CO; 40 tpy for NO_x, VOC, and SO_2; 25 tpy for total suspended particulate; 15 tpy for PM_{10} and 10 tpy for [direct] $PM_{2.5}$) and non-criteria pollutants (10 tpy for H_2S; 7 tpy for sulfuric acid mist; and 75,000 tpy for CO_2e). Sources that exceed the major source threshold are then subject to a PSD review.

The Pipeline would not include any stationary combustion sources of emission and would only emit fugitive natural gas during operation. Emissions from the Terminal would be above the PSD major source thresholds for NO_x and CO. If a source is subject to PSD review for one regulated pollutant, the source is also subject to PSD review for all other pollutants causing a significant increase in emissions level, as noted above. For this reason, the new Terminal facility would be subject to PSD review.

New Source Performance Standards

The NSPS, codified in 40 CFR 60, regulate emission rates and provide requirements for new or significantly modified sources. NSPS requirements include emission limits, monitoring, reporting, and record keeping.

Applicable NSPS for the Project, based on the types of emission units and the expected date of installation, would potentially include, but not be limited to, the subparts listed below.

- 40 CFR 60 Subpart A – General Provisions. Subpart A contains the general requirements applicable to all emission units subject to 40 CFR 60.
- 40 CFR 60 Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units. Subpart Db applies to each steam generating unit for which construction, modification, or reconstruction is commenced after June 19, 1984, and which has a maximum design heat input capacity of greater than 29 megawatts (100 MMBtu/hr [million British thermal units per hour]). Commonwealth would operate the hot oil heaters at the Terminal in compliance with Subpart Db.
- 40 CFR Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (including Petroleum Liquid Storage Vessels). This subpart applies to each storage vessel with a capacity greater than or equal to 75 m^3 that is used to store volatile organic liquids for which construction, reconstruction, or modification is commenced after July 23, 1984. This subpart does not apply to storage vessels with a capacity greater than or equal to 151 m^3 storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals or with a capacity greater than or equal to 75 m^3 but less than 151 m^3 storing a liquid with a maximum true vapor pressure less than 15.0 kilopascals. This subpart sets standards for VOC emissions reduction. This subpart applies to any condensate/off-specification fuel storage tank at the Terminal. Commonwealth would comply with all applicable Subpart Kb standards and requirements for monitoring, recordkeeping, and reporting.
- 40 CFR Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. Subpart IIII applies to owners and operators of stationary Compression Ignition Internal Combustion Engines as described in the subpart. This subpart sets emission standards for NO_x plus non-methane hydrocarbons, CO, and PM. This subpart applies to emergency generators and firewater pumps slated for the Terminal. Commonwealth would comply with all applicable Subpart IIII standards and requirements for monitoring, recordkeeping, and reporting.
- 40 CFR Subpart KKKK – Standards of Performance for Stationary Combustion Turbines. This subpart applies to stationary combustion turbines that commenced construction, modification, or reconstruction after February 18, 2005, and have a heat input at peak load equal to or greater than 10.7 gigajoules per hour (10 MMBtu/hr). The proposed compressor gas turbines would be subject to NSPS Subpart KKKK as their fuel heat input ratings would exceed 10 MMBtu/hr, and their manufacturing date would be after February 18, 2005. Subpart KKKK regulates emissions of NO_x and SO_2. The turbines would be subject to a NO_x emission limit of 25 parts per million (ppm) at 15 percent oxygen. Commonwealth would comply with the fuel sulfur requirements by using fuel with sulfur content at or below 0.060 pound of SO_2 per MMBtu. Commonwealth would comply with all applicable Subpart KKKK standards and requirements for monitoring, recordkeeping, and reporting.

National Emissions Standards for Hazardous Air Pollutants

The NESHAPs, codified in 40 CFR 61 and 63, regulate the emissions of HAPs from new and existing sources. Part 61, promulgated before the 1990 CAA Amendments, regulates eight hazardous substances: asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride.

The 1990 CAA Amendments established a list of 189 HAPs, resulting in the promulgation of Part 63, also known as the Maximum Achievable Control Technology standards. Part 63 regulates HAPs from major sources of HAPs and specific source categories emitting HAPs. Some NESHAPs may apply to non-major sources (area sources) of HAPs. Major source thresholds for NESHAPs are 10 tpy of any single HAP or 25 tpy of total HAPs. The highest single total HAP of 1.44 tons per year is expected from each of the refrigeration units (RCT A-F), and generators (GCT A-C). The Terminal would not emit more than 18.4 tpy of all HAPs combined. Therefore, the Project would not be a major source for HAPs and only those NESHAPs for relevant area sources at the Project would be applicable. NESHAPs that are applicable to the Terminal site are listed below.

Applicable NESHAPs for the Project, based on the types of emission units and the expected date of installation, would potentially include, but not be limited to, the subparts listed below.

- 40 CFR 63 Subpart A – General Provisions. Subpart A contains the general requirements applicable to all emission units subject to 40 CFR 63.
- 40 CFR 63 Subpart HHH – National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities. Although this subpart applies to the facility, there are no glycol dehydration units and thus no applicable requirements.
- 40 CFR 63 Subpart YYYY – National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines. In 2004, the EPA stayed the effectiveness of the emission and operating limitations for lean-premixed gas-fired and diffusion flame gas-fired turbines. These turbines must only comply with the initial notification requirements at this time.
- 40 CFR 63 Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants Reciprocating Internal Combustion Engines (RICE). Subpart ZZZZ applies to any existing, new, or reconstructed stationary RICE located at a major or area source of HAP emissions. For stationary RICE located at an area source of HAP emissions, a stationary RICE is "existing" if construction or reconstruction of the stationary RICE commenced before June 12, 2006. A stationary RICE located at an area source of HAP emissions is "new" if construction of the stationary RICE commenced on or after June 12, 2006. For area sources, this subpart sets operating limitations and emission limitations for CO and formaldehyde, as well as management practices and work practice standards. This subpart applies to the diesel emergency engines and diesel firewater pumps slated for the Terminal. Commonwealth would comply with all applicable Subpart ZZZZ standards and requirements for monitoring, recordkeeping, and reporting.
- 40 CFR 63 Subpart DDDDD – National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters. This subpart applies to major source of HAPs, specifically the hot oil heaters planned for the Terminal. Commonwealth would comply with all applicable Subpart DDDDD standards and requirements for monitoring, recordkeeping, and reporting.

Title V Operating Permit

The required elements of Title V operating permit programs are outlined in 40 CFR 70 and 40 CFR 71. Title V operating permits may be referred to as "Part 70" or "Part 71" permits, or as Title V permits. A Title V permit should list all air pollution requirements that apply to the source, including emissions limits and monitoring, recordkeeping, and reporting requirements. Regulations also require that the permittee annually report the compliance status of its source with respect to permit conditions to the corresponding regulatory agency.

A Title V major source, as defined in 40 CFR 70.2, is a source or group of stationary sources (including new and existing sources) within a contiguous area and under common control, emitting or with the PTE criteria pollutants or HAPs above the criteria pollutant threshold values. The Title V major source threshold is 100 tpy for any of the criteria pollutants, 10 tpy for any single HAP, and 25 tpy for any combination of HAPs. The Project would be subject to Title V permitting requirements.

General Conformity

General Conformity regulations are designed to ensure that federal actions within nonattainment and maintenance areas do not interfere with a state's ability to attain or maintain compliance with NAAQS. As part of the general conformity applicability determination process, the sum of non-exempt direct and indirect emissions of nonattainment pollutants or designated precursors associated with a federal action is compared to the General Conformity applicability de minimis levels in 40 CFR Part 93.153. If an applicability threshold is exceeded, then general conformity applies, and a conformity determination is required. If emissions are below the applicability thresholds, the emissions are considered *de minimis*, General Conformity requirements do not apply, and a conformity determination is not required.

The new Terminal facility would be entirely within an attainment/unclassifiable area and therefore would not be subject to General Conformity. The closest nonattainment areas to the Project site are the Houston-Galveston-Brazoria O_3 nonattainment area, west of the Project site, and the St. Bernard Parish New Orleans) SO_2 nonattainment area, east of the Project site. LNG vessels calling at the Terminal would not transit through these areas and therefore would not contribute to emissions in the areas. Vessels delivering construction equipment to the Project site would likely pass through the Houston-Galveston-Brazoria O_3 nonattainment area when traveling from Corpus Christi. However, the emissions from these vessels would be considered *de minimis* and therefore General Conformity requirements would not apply.

GHG Reporting Rule

In September 2009, the EPA issued the final Mandatory Reporting of Greenhouse Gases Rule, requiring reporting of GHG emissions from suppliers of fossil fuels and facilities that emit greater than or equal to 25,000 metric tpy of GHG (reported as CO_{2e}). In November 2010, the EPA signed a rule finalizing GHG reporting requirements for the petroleum and natural gas industry in 40 CFR Part 98, Subpart W. The industry separates LNG storage facilities from LNG import and export equipment because the former are considered part of the source category regulated by Subpart W. The rule does not apply to construction emissions.

The Terminal facility would be subject to the GHG Mandatory Reporting Rule. The rule establishes reporting requirements based on actual emissions; however, it does not require emission controls. Commonwealth would monitor emissions in accordance with the reporting rule. If actual emissions exceed the 25,000 metric tpy CO_{2e} reporting threshold, Commonwealth would be required to report its GHG emissions to the EPA. Commonwealth would calculate the actual GHG emissions from the Project and report GHGs in compliance with the GHG Mandatory Reporting Rule.

Applicable State Air Quality Regulations

In addition to the federal regulations identified above, the LDEQ has its own air quality regulations and is the lead air permitting authority for the Project. The LDEQ's air quality regulations are codified in LAC Title 33, Part III, Chapters 1 through 59. The regulations incorporate the federal program requirements listed in 40 CFR 50 through 99 and establish permit review procedures for all facilities that can emit pollutants to the ambient air. Louisiana also requires applicants for an air quality permit to prepare an environmental assessment statement pursuant to state-only requirements set forth in Louisiana Revised Statute 30:2018.A. New facilities are required to obtain an air quality permit prior to initiating construction. LAC Title 33, Part III, Chapters 1 through 59 set forth the air quality regulations for emission sources in Louisiana. In addition, LAC Title 33, Part III, Chapter 1 delegates authority to the LDEQ to maintain air quality resources in Louisiana and enforce LDEQ air quality regulations. The following regulations are applicable 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; and
- Chapter 56: Prevention of Air Pollution Emergency Episodes.

4.11.1.4 Construction Emission Impacts and Mitigation

Emissions during Terminal and Pipeline construction would generally be associated with onshore construction activities conducted using on-road and off-road mobile equipment and offshore construction activities conducted using marine vessels such as tugboats or barges and a dredging vessel. Commonwealth anticipates construction and commissioning of the Terminal to be completed in approximately 36 to 38 months. Commonwealth would construct the Pipeline over a 12-month period, which would occur concurrently with the Terminal during the second year of construction. Commonwealth expects peak construction emissions would occur over the first 14 months. During this time, most of the concrete materials and pilings would be delivered and Commonwealth would prepare the Terminal site and construct the facility foundations, barge dock, barge dock off-loading platform, and LNG carrier berth. Increases in land vehicle and waterway traffic during this time are described in section 2.5.1.6.

Onshore On-road and Off-road Mobile Equipment Emissions

Potential impacts on ambient air quality for construction projects typically include generation of combustion and fugitive dust emissions from mobile construction equipment operation. Combustion emissions would occur as tailpipe emissions from gasoline- or diesel-fueled engines in on-road and off-road mobile equipment.

Fugitive dust results from construction activities such as land clearing, grading, excavation, and concrete work, as well as from vehicles traveling on paved and unpaved roads. Fugitive dust generation depends on the area of construction, silt and moisture contents of the soil, wind speed, frequency of precipitation, amount of vehicle traffic, and vehicle and roadway type. Fugitive dust would be produced during all phases of construction. The control of fugitive particulate emissions is typically addressed through compliance with state or local nuisance regulations such as 33 LAC Part 3, Chapter 13, §1305. Table 4.11.1-4 provides a summary of expected combustion and fugitive dust construction emissions.

Construction is anticipated to occur during 2023 to 2026. Equipment used for the Terminal and Pipeline construction would contribute GHG emissions, which are estimated here as CO_2e.[86]

86 Commonwealth's supporting calculations, emissions factors, fuel consumption rates, vehicle power ratings, utilization rates, and estimated hours of operation used to estimate construction emissions are available as appendix A of accession number 20220728-5187 on the FERC docket.

TABLE 4.11.1-4

Summary of Terminal and Pipeline On-road and Off-road Mobile Equipment and Fugitive Dust Construction Phase Emissions a/ (Tons)

Year	Facility	Emission Source	NOx	SO_2	CO	PM_{10}	PM2.5	VOC	CO_2	CH4	N2O	CO_2e b/	HAP
2023	Terminal	Commuter transit	0.97	4.3E-3	5.96	0.08	0.04	0.13	825	0.02	2.9E-3	826	0.02
		Material delivery vehicles	0.69	1.3E-3	0.39	0.03	0.01	0.02	381	3.2E-3	4.1E-4	381	2.2E-3
		On-road vehicles	0.15	2.9E-4	0.14	8.1E-3	4.0E-3	9.2E-3	86.6	7.4E-4	1.4E-4	86.6	1.2E-3
		Off-road equipment	13.3	23.2	7.40	1.35	1.35	0.91	2,370	1.10	0.09	2,424	0.09
		Barge deliveries	4.73	0.06	1.10	0.14	0.13	0.13	333	0.04	9.7E-4	334	9.0E-3
		Open burning	-	-	-	-	-	-	-	-	-	-	-
		Fugitive dust c/	-	-	-	33.7	3.42	-	-	-	-	-	-
		2023 Subtotal	***19.9***	***23.3***	***15.0***	***35.3***	***4.95***	***1.20***	***3,995***	***1.16***	***0.09***	***4,052***	***0.11***
2024	Terminal	Commuter transit	2.92	0.01	19.8	0.28	0.12	0.37	2,812	0.06	9.7E-3	2,816	0.04
		Material delivery vehicles	0.64	1.2E-3	0.37	0.03	0.01	0.02	373	3.0E-3	4.1E-4	373	1.9E-3
		On-road vehicles	0.62	1.3E-3	0.58	0.03	0.02	0.03	380	3.2E-3	6.1E-4	380	4.3E-3
		Off-road equipment	41.1	46.5	12.5	3.32	3.32	2.46	11,192	0.36	0.52	11,355	0.22
		Barge deliveries	17.0	0.23	3.97	0.49	0.48	0.47	1,199	0.16	3.5E-3	1,204	0.03
		Open burning	0.43	-	15.1	-	-	2.05	390	0.62	-	406	-
		Fugitive dust c/	-	-	-	67.4	6.83	-	-	-	-	-	-
	Pipeline	Commuter transit	6.4E-4	1.4E-5	0.02	1.7E-4	3.4E-5	1.6E-4	2.05	5.5E-5	7.6E-6	2.06	1.2E-5
		On-road vehicles	8.6E-3	1.7E-5	5.0E-3	3.9E-4	1.7E-4	2.4E-4	4.97	4.0E-5	5.5E-6	4.97	2.6E-5
		Off-road equipment	1.77	0.01	9.51	0.09	0.09	0.41	823	0.03	0.04	835	0.02
		Open burning											
		Fugitive dust c/				23.5	2.41						
		2024 Subtotal	***64.5***	***46.8***	***61.9***	***95.2***	***13.3***	***5.82***	***17,175***	***1.22***	***0.57***	***17,375***	***0.32***

TABLE 4.11.1-4

Summary of Terminal and Pipeline On-road and Off-road Mobile Equipment and Fugitive Dust Construction Phase Emissions a/ (Tons)

Year	Facility	Emission Source	NOx	SO_2	CO	PM_{10}	PM2.5	VOC	CO_2	CH4	N2O	CO_2e b/	HAP
2025	Terminal	Commuter transit	2.99	0.02	21.6	0.31	0.12	0.38	3,147	0.06	0.01	3,152	0.04
		Material delivery vehicles	0.61	1.2E-3	0.36	0.03	0.01	0.02	365	2.8E-3	4.1E-4	366	1.7E-3
		On-road vehicles	0.25	5.5E-4	0.25	0.01	6.4E-3	0.01	165	1.3E-3	2.7E-4	166	1.6E-3
		Off-road equipment	26.7	46.5	9.80	2.60	2.60	1.16	4,875	0.16	0.22	4,945	0.28
		Barge deliveries	16.3	0.22	3.79	0.47	0.46	0.45	1,145	0.15	3.3E-3	1,149	0.03
		Open burning	-	-	-	-	-	-	-	-	-	-	-
		Fugitive dust c/	-	-	-	67.4	6.83	-	-	-	-	-	-
	Pipeline	Commuter transit	6.4E-4	1.4E-5	0.02	1.7E-4	3.4E-5	1.6E-4	2.05	5.5E-5	7.6E-6	2.06	1.2E-5
		On-road vehicles	8.6E-3	1.7E-5	5.0E-3	3.9E-4	1.7E-4	2.4E-4	4.97	4.0E-5	5.5E-6	4.97	2.6E-5
		Off-road equipment	0.45	1.8E-3	0.17	0.03	0.03	0.08	264	8.4E-3	0.01	268	5.6E-3
		Fugitive dust c/	-	-	-	5.87	0.60	-	-	-	-	-	-
		2025 Subtotal	***47.2***	***46.7***	***36.0***	***76.8***	***10.7***	***2.09***	***9,968***	***0.38***	***0.25***	***10,052***	***0.37***
2026	Terminal	Commuter transit	2.99	0.02	21.6	0.31	0.12	0.38	3,147	0.06	0.01	3,152	0.04
		Material delivery vehicles	0.61	1.2E-3	0.36	0.03	0.01	0.02	365	2.8E-3	4.1E-4	366	1.7E-3
		On-road vehicles	0.25	5.5E-4	0.25	0.01	6.4E-3	0.01	165	1.3E-3	2.7E-4	166	1.6E-3
		Off-road equipment	26.7	46.5	9.80	2.60	2.60	1.16	4,875	0.16	0.22	4,945	0.28
		Barge deliveries	-	-	-	-	-	-	-	-	-	-	-

TABLE 4.11.1-4 **Summary of Terminal and Pipeline On-road and Off-road Mobile Equipment and Fugitive Dust Construction Phase Emissions a/ (Tons)**													
Year	**Facility**	**Emission Source**	**NOx**	**SO_2**	**CO**	**PM_{10}**	**PM2.5**	**VOC**	**CO_2**	**CH4**	**N2O**	**CO_2e b/**	**HAP**
		Open burning	-	-	-	-	-	-	-	-	-	-	-
		Fugitive dust c/	-	-	-	33.7	3.42	-	-	-	-	-	-
		2026 Subtotal	***30.5***	***46.5***	***32.0***	***36.7***	***6.16***	***1.57***	***8,552***	***0.22***	***0.24***	***8,628***	***0.33***
		TOTAL	**162.1**	**163.3**	**144.9**	**244.0**	**35.11**	**10.68**	**39,690**	**2.98**	**1.15**	**40,107**	**1.13**

a/ Construction emissions encompass commuter transit vehicles, materials delivery vehicles, on-road construction vehicles, off-road equipment (including dredging equipment and vessels), and open burning emissions.

b/ CO_{2e} emission factors for off-road vehicles, equipment, and vessels are calculated using CO_2, CH_4, and N_2O global warming potentials of 1, 25, and 298, respectively.

c/ Fugitive dust emissions from WRAP Fugitive Dust Handbook, Countess Environmental, September 2006

Offshore Marine Vessel Emissions

Criteria air pollutant emissions from marine vessel operations would also be expected during the construction period. The emissions would come from vessels, tugboats, and barges carrying materials and equipment needed for construction of the Project traveling to and from the place of origin by barge to the supply docks. Marine vessel traffic emissions listed in table 4.11.1-5 would be anticipated across the 3-year construction period. Barges are expected to deliver construction supplies such as precast concrete materials and pilings over the first 19 months of construction. Once the facility foundations are in place and the barge dock and off-loading platform are constructed, the LNG storage tanks, pre-treatment and liquefaction train modules, and pipe rack modules would be delivered throughout the following 8 months.

Commonwealth anticipates approximately 238 barges would be required to deliver construction components to the Project site. Commonwealth has yet to source the construction components, but expects they would be sourced from, or manufactured in, Louisiana and Texas. For the emissions estimates provided in table 4.11.1-5, we assume the barges would originate from Lake Charles.

The modular portion of the LNG storage tanks would require three total barge deliveries. Two barge deliveries of four LNG storage tanks would likely originate from Corpus Christi, Texas. One barge delivery of two LNG storage tanks would likely originate from Morgan City, Louisiana. Barges originating from Corpus Christi would transit through the Houston-Galveston-Brazoria O_3 nonattainment area en route to the Project site. These barges would emit *de minimis* levels of the O_3 precursors NO_x and VOC. The barges that originate from Morgan City would not transit through a nonattainment or maintenance area. It is conservatively assumed that all three barges would originate from Corpus Christi, which is the farthest potential port from the Project site.

Six barge deliveries of main cryogenic heat exchanger units would originate from Pensacola, Florida. Barges that originate in Pensacola would not transit through a nonattainment or maintenance area. The Gulf Intracoastal Waterway is near, but does not cross, the St. Bernard Parish SO_2 nonattainment area.

Approximately 30 tug-assisted barge deliveries of 60 pipe racks would transit to the Terminal site via the Gulf Intracoastal Waterway from established fabrication yards. There are several fabrication yards with access to the Intracoastal Waterway of Texas and Louisiana that are suited to fabricate the pipe racks. The pipe racks would likely originate in either Corpus Christi or Morgan City. Again, it is conservatively assumed that these barges would originate from Corpus Christi. As noted above, barges originating from Corpus Christi would transit through the Houston-Galveston-Brazoria O_3 nonattainment area; however, the barges would emit *de minimis* levels of the O_3 precursors NO_x and VOC.

The pre-treatment and liquefaction modules would likely be manufactured outside of the United States and would require transport by general cargo carrier vessels. Each vessel would likely transport one pre-treatment module and one liquefaction module. Commonwealth expects that two vessels would be used to transport the 12 modules (i.e., 6 pre-treatment modules and 6 liquefaction modules) to the Terminal site over a 10-month period.

Table 4.11.1-5 provides a summary of construction-related marine vessel emissions. The values, presented in tons per year, encompass the total calculated emissions output of the combined number of transits (i.e., number of barge-calls at the Terminal) from the listed port of origin to the Terminal. Calculations are based on engine emissions values provided by the EPA (2009) and distances to ports provided by NOAA (2019).[87]

87 Commonwealth's supporting calculations for its marine vessel emissions are available as appendix A of accession number 20220728-5187 on the FERC docket.

TABLE 4.11.1-5

Summary of Construction Phase Material and Equipment Barge Delivery Emissions

Year	Port of Origin	Barge Calls (#)	Annual Pollutant Emissions by Construction Year (tons)										
			NO_x b/	CO	PM_{10}	$PM_{2.5}$	VOC b/	SO_2	CO_2	CH_4	N_2O	CO_2e	HAP
2023	Lake Charles	70	4.73	1.10	0.14	0.13	0.13	0.06	333	0.04	9.7E-4	334	9.0E-3
	Corpus Christi	0	--	--	--	--	--	--	--	--	--	--	--
	Pensacola	0	--	--	--	--	--	--	--	--	--	--	--
Subtotal		70	4.73	1.10	0.14	0.13	0.13	0.06	333	0.04	9.7E-4	334	9.0E-3
2024	Lake Charles	119	8.04	1.87	0.23	0.23	0.22	0.11	566	0.07	1.6E-3	568	0.02
	Corpus Christi	17	8.99	2.09	0.26	0.25	0.25	0.12	633	0.08	1.8E-3	635	0.02
	Pensacola	0	--	--	--	--	--	--	--	--	--	--	--
Subtotal		136	17.03	3.97	0.49	0.48	0.47	0.23	1,199	0.16	3.5E-3	1,204	0.03
2025	Lake Charles	49	3.31	0.77	0.10	0.09	0.09	0.04	233	0.03	6.8E-4	234	6.3E-3
	Corpus Christi	16	8.46	1.97	0.25	0.24	0.23	0.11	596	0.08	1.7E-3	598	0.02
	Pensacola	6	4.49	1.05	0.13	0.13	0.12	0.06	316	0.04	9.2E-4	317	8.5E-3
Subtotal		71	16.26	3.79	0.47	0.46	0.45	0.22	1,145	0.15	3.3E-3	1,149	0.03
2026	Lake Charles	0	--	--	--	--	--	--	--	--	--	--	--
	Corpus Christi	0	--	--	--	--	--	--	--	--	--	--	--
	Pensacola	0	--	--	--	--	--	--	--	--	--	--	--
	Subtotal	0	--	--	--	--	--	--	--	--	--	--	--
Total		**277**	**38.02**	**8.86**	**1.10**	**1.07**	**1.05**	**0.50**	**2,677**	**0.35**	**0.008**	**2,688**	**0.07**

a/ The emissions from transport of pre-treatment and liquefaction equipment from outside of the U.S. were not available for this current estimate.
b/ Vessels transiting from Corpus Christi would pass through the Houston-Galveston-Brazoria O_3 nonattainment area; General Conformity *de minimis* emissions thresholds for NO_x and VOC (O_3 precursors) are 100 tons per year.

Mitigation Measures

Terminal construction is estimated to last 36 to 38 months and would involve disturbance of the entire site. Pipeline construction is estimated to last 12 months and would occur concurrently with Terminal construction during the second year of construction. Fugitive dust emissions would range from an estimated maximum of 90.9 tons for PM_{10} and 9.2 tons of $PM_{2.5}$ in 2024 when initial Terminal and Pipeline construction (e.g., earth moving) would be occurring simultaneously to lows of 33.7 tons of PM_{10} and 3.4 tons of $PM_{2.5}$ in 2023 and 2026, which are expected to be partial construction years when only the Terminal would be under construction. To minimize impacts on air quality during construction, Commonwealth would adopt the following measures:

- require that contractors meet all air quality requirements and employ equipment that meets relevant emission standards;

- require contractors to properly maintain and operate construction equipment to minimize exhaust emissions, including minimizing engine idling time; use paved roads, when practical; and water unpaved roads, as needed;
- apply water to dirt stockpiles;
- cover open haul trucks, as needed;
- limit vehicle speeds;
- apply water to disturbed areas, as needed; and
- stabilize disturbed areas upon completion of construction.

Vehicular and/or barge exhaust and crankcase emissions from gasoline and diesel engines would comply with applicable EPA mobile source emission regulations (40 CFR 85) by using equipment manufactured to meet these specifications and using commercial gasoline and diesel fuel products that meet specifications of applicable federal and state air pollution control regulations.

The combustion and fugitive dust emissions that would occur during construction would be largely limited to the immediate vicinity of the existing Terminal site and to a lesser extent in the areas where the Pipeline would be constructed. These emissions would represent a small portion of Cameron Parish's yearly emissions inventories and would subside once construction has been completed. Therefore, we conclude the construction-related impact on local air quality during construction of the Terminal and Pipeline would not be significant.

4.11.1.5 Operating Emission Impacts and Mitigation

Commissioning and Start-up Emissions

Commonwealth anticipates that construction of the liquefaction trains would be completed on a staggered basis from the fourth quarter of 2025 through the second quarter of 2026. Commonwealth further anticipates commissioning of the LNG trains and start-up of the Terminal to begin in the fourth quarter of 2025, with all trains commissioned by the third quarter of 2026. The commissioning process would last nine months and would produce emissions separate from construction and operation. Commonwealth anticipates only minor overlap between construction and commissioning activities (e.g., construction of utilities systems or common facilities may overlap with the start of commissioning). Commercial operations at the Terminal would begin after all of the LNG trains have been commissioned. A summary of the emissions associated with the commissioning process is provided in table 4.11.1-6.

TABLE 4.11.1-6

Estimated Combined Commissioning and Start-Up Emissions (tons) for the 6 LNG Trains

Year	Equipment	NO_x	SO_2	CO	PM_{10}	$PM_{2.5}$	VOC	CO_2	CH_4	N_2O	CO_2e b/	HAP
2025	Refrigeration Turbines A, B, C, D, E, F	2.00	0.08	13.9	1.58	1.58	0.80	7,796	0.14	0.01	7,804	0.27
	Power Generation Turbine A	4.53	0.15	1.61	2.86	2.86	0.72	17,421	0.32	0.03	17,438	0.48
	Power Generation Turbine B	2.26	0.07	0.81	1.43	1.43	0.36	8,710	0.16	0.02	8,719	0.24
	Power Generation Turbine C	2.26	0.07	0.81	1.43	1.43	0.36	8,710	0.16	0.02	8,719	0.24
	Startup Hot Oil Heater	2.59	0.02	1.56	0.14	0.14	0.71	2,572	0.05	4.7E-03	2,574	0.05
	Thermal Oxidizer A	0.47	0.61	0.22	0.03	0.03	0.01	10,331	0.01	3.3E-03	10,332	5.6E-03
	Wet Flare	29.4	0.44	132	3.26	3.26	259	50,402	357	0.92	59,594	1.05
	Dry Flare	26.4	0.24	119	2.89	2.89	204	44,810	317	0.84	52,992	0.93
2025 Commissioning Total		*69.9*	*1.68*	*270*	*13.6*	*13.6*	*466*	*150,752*	*675*	*1.85*	*168,173*	*3.26*
2026	Refrigeration Turbines A, B, C, D, E, F	4.00	0.16	27.9	3.16	3.16	1.60	15,592	0.29	0.03	15,608	0.53
	Power Generation Turbine A	9.05	0.29	3.23	5.71	5.71	1.44	34,842	0.64	0.06	34,877	0.96
	Power Generation Turbine B	4.53	0.15	1.61	2.86	2.86	0.72	17,421	0.32	0.03	17,438	0.48
	Power Generation Turbine C	4.53	0.15	1.61	2.86	2.86	0.72	17,421	0.32	0.03	17,438	0.48
	Startup Hot Oil Heater	5.19	0.04	3.11	0.28	0.28	1.42	5,143	0.09	9.4E-03	5,148	0.09
	Thermal Oxidizer A	0.94	1.21	0.44	0.06	0.06	0.03	20,662	0.02	6.6E-03	20,665	0.01

TABLE 4.11.1-6

Estimated Combined Commissioning and Start-Up Emissions (tons) for the 6 LNG Trains

	Wet Flare	58.7	0.88	264	6.52	6.52	518	100,803	714	1.83	119,189	2.10
	Dry Flare	52.8	0.48	238	5.78	5.78	407	89,620	634	1.69	105,983	1.86
2026 Commissioning Total		*140*	*3.36*	*540*	*27.2*	*27.2*	*931*	*301,504*	*1,350*	*3.69*	*336,346*	*6.52*

Routine Operation

Operation of the Project would result in long-term air emissions from the following stationary equipment.

At the Terminal:

- six simple-cycle refrigeration gas turbines, each rated at 58 MW;
- three generator turbines (including one installed spare), each rated at 60 MW;
- one essential generator in the power generation area rated at 4,290 kW;
- three firewater pumphouse diesel generators each rated at 759 kW;
- one firewater lift pump diesel generator rated at 821 kW;
- hot oil start-up fired heater rated at 122 MMBtu/hr;
- six 50,000 m^3 LNG storage tanks;
- two thermal oxidizers, each rated at 65.4 MMBtu/hr;
- condensate and refrigerant storage tanks;
- a liquefaction facility flare stack containing: a wet flare, rated at 2.57 million standard cubic feet per hour; a dry flare, rated at 3.17 million standard cubic feet per hour, and a spare flare, sized to control the load of the dry flare;
- a marine facility flare stack containing one marine flare, rated at 2.58 MMBtu/hr;
- gas pre-treatment unit (containing equipment for dehydration and heavy hydrocarbon removal); and
- fugitive emissions from various components.

At the LNG carrier berth:

- LNG carrier loading emissions (emission units located onshore); and
- fugitive emissions from various onshore components.

Emissions common to all facilities:

- vehicle travel emissions.

At the Pipeline:

- pig launcher/receivers;
- meter station;
- block valves; and
- fugitive emissions from various components.

From marine vessels:

- LNG carriers at berth (hoteling emissions);
- escort tugboats;

- LNG carrier movement within state waters; and
- security vessels.

Operational emissions, including combustion and dust emissions, are presented in table 4.11.1-7. We received comments from the public suggesting that we should assess the potential emissions of the Project based on the Terminal operating at full capacity (9.5 MTPA). The modeled emissions output presented herein assume the Terminal would be operating at full capacity. Combustion sources primarily include engines, turbines, heaters/furnaces, and flares. Non-combustion sources primarily include storage tanks, LNG loading and transfer operations, and fugitive emissions from pipeline and equipment leaks. Non-combustion emissions would occur from the Terminal facilities, Pipeline, and meter stations, as well as from one annually scheduled pipeline pigging event. Commonwealth's emissions calculations are based on the detailed Terminal design, regulatory requirements, the Best Available Control Technology (BACT) analysis conducted by Commonwealth for the process equipment, and supplemented by the EPA's Compilation of Air Pollutant Emission Factors (AP-42).[88]

In comments on the draft EIS, EPA requested that Commonwealth identify technologies that it would implement to identify leaking equipment at the Terminal. Commonwealth would employ leak detection methods at the Terminal in accordance with 49 CFR 192.706. Common methods of leak detection include 24-hour per day pressure monitoring of the facilities, monthly volumetric material balances, and annual leakage surveys. To identify leaking equipment such as valves, flanges, and seals, Commonwealth would use a site-specific program using 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. Proper design and installation practices would include the following:

- design piping for adequate/desired pressure;
- install proper bracing;
- manually verify all joints are tight;
- confirm all pipes are properly assembled;
- ensure proper seal design/selection;
- ensure proper installation of valve packing or O-rings; and
- manually inspect the installation of the disk gaskets on pressure-relief devices.

Commonwealth Pipeline operations would comply with all applicable PHMSA codes and advisories regarding leak detection and repair and LDEQ air quality regulations. Common methods of leak detection along the Pipeline are consistent with those of the Terminal and also include 24-hour per day pressure monitoring of the Pipeline, monthly volumetric material balances, and annual leakage surveys. Commonwealth would determine specific leak detection methods and technologies for the Terminal and Pipeline during final design of the Project and provide the information to FERC staff.

EPA also requested that Commonwealth provide the methane mitigation measures that it would commit to implementing at the Terminal. Commonwealth would ensure the appropriate piping design and components would be used and installed; equip mechanical seals or an equivalent equipment on all rotary

88 The methods and calculations Commonwealth used for its emissions estimates are available as appendices A and C under accession number 20210604-5170 on the FERC docket

pumps and compressors that handle VOCs with a true vapor pressure of 1.5 per square inch absolute or greater at handling conditions; and implement a Leak Detection and Repair program that would consist of quarterly monitoring of accessible compressors, pumps, and valves that contain more than 10 percent by weight of VOCs or methane following Method 21 of 40 CFR 60, Appendix A. Method 21 entails determination of VOC leaks using a portable instrument that meets the specifications and performance criteria defined in the code.

Commonwealth is continuing to assess additional measures to implement that would reduce fugitive emissions of methane and other VOCs. These measures would be determined during final design of the Terminal. Mitigation measures for fugitive emissions that Commonwealth would consider include maximizing the use of welded pipe connections; using advanced mechanical couplings and enhanced valve stem seals with minimum leakage rates; implementing compressor-seal gas recovery to capture potential VOC leaks; and using nitrogen to purge flare headers, as opposed to natural gas, which would reduce potential non-combusted methane slippage at the flare pilot from escaping to the atmosphere. Commonwealth would also determine during final design of the Terminal whether to participate in EPA's Natural Gas STAR Program, which provides a framework for U.S. oil and gas company operations to implement methane reducing technologies and practices and document their voluntary emission reduction activities, or EPA's Methane Challenge Program, which consists of transparently reporting systematic and comprehensive actions to reduce methane emissions to be publicly recognized as a leader in reducing methane emissions in the U.S.

TABLE 4.11.1-7

Operational Emissions (tons per year)

Equipment	NO_x	SO_2	CO	PM_{10}	$PM_{2.5}$	VOC	CO_2e	HAP
Stationary Emissions Sources								
Refrigeration Combustion Turbines (6)	136.8	18.2	56.5	136.8	136.8	57.1	1,776,018	8.6
Generator Combustion Turbines (3)	68.4	9.1	28.3	68.4	68.4	28.6	888,009	4.3
Essential Generator (1)	4.00	0.003	0.57	0.03	0.03	0.15	341	0.003
Flare Systems (wet, dry, spare, and dock flares)	147.8	1.7	804.6	16.2	16.2	23.1	298,318	5.2
Firewater (3) and Canal (1) Pump Reciprocating Internal Combustion Engines	1.88	0.00	0.19	0.04	0.04	0.13	220.00	0.00
Hot Oil Startup Fired Heater	6.04	0.05	3.63	0.33	0.33	0.24	5,289	0.17
Thermal Oxidizer	14.04	34.04	23.59	2.13	2.13	1.88	566,344	0.06
LNG Tanks (6)	0.00	0.00	0.00	0.00	0.00	2.14	0.00	0.00
Terminal Fugitive Emissions a/	0.00	0.00	0.00	0.00	0.00	38.58	14,149	0.00
Pipeline Fugitive Emissions b/	0	0	0	0	0	0	18.65	0
Stationary Emissions Subtotal	376	63	917	224	224	152	3,548,707	18 c/
Mobile Emissions Sources								
Worker Vehicle Commutes	1.48	0.006	0.002	0.003	0.003	0.01	263	0.003
Berthed Vessels d/	158	1.11	57	1.4	1.36	9.76	8,154	3.36
Main Propulsion Engines of Vessels in Transit e/	1.15	0.11	0.7	0.09	0.09	0.06	1,130	0.02
Auxiliary Engines of Vessels in Transit f/	16.42	0.09	6.21	0.08	0.08	1.12	735	0.41
Maintenance Dredging g/	0.73	1.345	0.105	0.065	0.065	0.001	102	0.001
Mobile Emissions Subtotal	*178*	*3*	*64*	*2*	*2*	*11*	*10,384*	*4*
Total	**554**	**66**	**981**	**226**	**226**	**163**	**3,559,091**	**22**

TABLE 4.11.1-7 **Operational Emissions (tons per year)**								
Equipment	**NO_x**	**SO_2**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**VOC**	**CO_2e**	**HAP**

a/ Sources of fugitive emissions include valves, compressor seals, pump seals, connectors, flanges, open-ended lines and other components (e.g., compressors, diaphragms, drains, dump arms, hatches, instruments, meters, pressure relief valves, polished rods, relief valves, and vents)

b/ Pipeline emissions are limited to fugitive GHG emissions.

c/ Highest single HAP constituent is formaldehyde (8.01 tpy)

d/ Berthed vessel emissions include LNG carrier and tugboat emissions operating in the moored safety zone; these emissions include auxiliary engine operation on the carrier for hoteling at berth; estimates based on 156 LNG carrier calls per year by Kawasaki Sakaide, Mitsubishi Nagasaki or equivalent (NK Class) carriers with capacities equal to or greater than 145,000 cubic meters (which would accommodate export of 9.5 MTPA).

e/ Main propulsion engines emissions are based on vessel operations within the 9 nautical mile state water boundary; based on 156 LNG carrier calls per year.

f/ Auxiliary engines emissions are based on vessel operations within the 9 nautical mile state water boundary; based on 156 LNG carrier calls per year.

g/ Commonwealth expects maintenance dredging to be necessary every 2 years.

4.11.1.6 Air Quality Impacts Analyses for NAAQS and PSD Increments

Commonwealth conducted air dispersion modeling to assess the potential air quality impacts of the Project and show compliance with applicable NAAQS and Class II PSD Increments for the pollutants subject to PSD review. The EPA Guideline on Air Quality Models provides the basic modeling guidance and recommendations of specific air dispersion models for use in assessing potential air quality impacts. The American Meteorological Society/EPA Regulatory Model (AERMOD) is designated by the guideline as a preferred air quality model for assessing potential impacts at receptors within 50 km of a subject source and was used for the Class II air dispersion modeling analysis. We received a comment during scoping and the draft EIS comment period, expressing concern that Commonwealth used a source for ambient meteorological conditions in its AERMOD analyses that is too far from the Project site to be accurate. Commonwealth used the Lake Charles Regional Airport National Weather Service station 03937 based on guidance specified by LDEQ in its Air Quality Modeling Procedures document (LDEQ, 2006). All modeling methods and results are reviewed and assessed for appropriateness and accuracy by LDEQ. Additionally, LDEQ staff provided written confirmation to Commonwealth on June 16, 2022 that the Lake Charles Regional Airport National Weather Service station 03937 was the appropriate meteorological station for Commonwealth to use in the dispersion modeling

Commonwealth conducted a PSD Significance Analysis to determine if emissions from the Project would cause a significant impact. Generally, the PSD Significance Analysis considers emissions only associated with the Project and compares the modeled concentrations to corresponding significant impact levels (SIL) to determine if any predicted concentrations at any receptor locations would be "significant." If the predicted Significance Analysis impacts for a particular pollutant are below the applicable SIL(s), then no further analyses are required for that pollutant. If the Significance Analysis reveals that modeled concentrations for a particular pollutant and averaging period are greater than the applicable SIL, a full impact analysis (e.g., NAAQS and PSD Increment Analysis) is performed at the significant receptors. Full impact analyses consider emissions from existing regional sources in addition to the Project. In cases where a potential NAAQS violation is identified, a source is not considered to have caused or contributed to the violation if its own impact from the modeling significance analysis is not significant (e.g., modeled impact is less than the SIL) at the violating receptor at the time of the predicted violation. If no simultaneous exceedance of the SIL and the NAAQS is found in this process, the modeling analysis demonstrates that the proposed LNG Terminal would not cause or contribute to the potential NAAQS exceedance.

4.11.1.7 Significance Modeling Results

Table 4.11.1-8 presents the initial AERMOD modeling results for the Project sources only. As noted in section 4.11.1.2, the Project did not require an air dispersion modeling demonstration for Pb, because the Project emissions would not exceed the SER thresholds for that pollutant. O_3 was addressed using EPA-approved methodology that does not require air dispersion modeling. As required by LDEQ, Commonwealth used the modeled emission rates for [O_3] precursors (MERPs) Tier 1 demonstration tool to evaluate project source impacts for PSD permitting purposes. Using the MERPs and the modeling results of the most representative hypothetical source, Commonwealth performed a screening analysis of the O_3 precursors. The resulting emissions were added to the O_3 background concentration. The total emissions were compared to, and found to be below the NAAQS, thus demonstrating compliance.

The maximum modeled impacts from Commonwealth's sources showed 1-hour and annual NO_2, 1-hour SO_2, and 24-hour $PM_{2.5}$ that exceeded the SIL, therefore, a full impact analysis was performed for those air pollutants and averaging periods to assess compliance with the applicable NAAQS and PSD increments. For all other pollutants and averaging periods presented, the maximum modeled impacts were below the SIL, so compliance was demonstrated with the NAAQS and PSD Increments and no further analyses are required for those air pollutants and averaging periods.

In addition to the modeling required by the LDEQ, FERC performed additional modeling to analyze the impact of the mobile LNG carrier and support vessel emissions in order to fully assess the impacts of the LNG Terminal operations. The modeling results summarized in table 4.11.1-9 below include LNG carriers and support vessels in addition to the LNG Terminal stationary sources. FERC maintained the assumptions used in Commonwealth's original modeling with respect to background concentrations and NO_x to NO_2 conversion methodology.[90] Marine sources were assumed to have an elevation of zero meters based on the elevation of the adjacent building. Cumulative modeling for 1-hour NO_2 used the receptor grid developed from 1-hour NO_2 SIL modeling. Cumulative modeling was not performed for annual NO_2, 1-hour SO_2, or 24-hour $PM_{2.5}$ as the SIL results that included marine sources were nearly identical to the modeling performed by Commonwealth without mobile sources.

90 See appendix C of Accession No. 20210604-5170.

TABLE 4.11.1-8

AERMOD Significance Modeling Results for Commonwealth LNG Stationary Sources

Pollutant	Averaging Time	SIL (µg/m³)	Maximum Modeled Impact (µg/m³)	Distance from Terminal of Maximum Impact Location (km)	Full Impact Analysis Necessary
NO_2	1-hour a/	7.5	**37.7**	1.9	**Yes**
	Annual	1.0	**3.02**	0.004	**Yes**
SO_2	1-hour a/	7.8	**11.0**	0.01	**Yes**
	3-Hour	25.0	10.4	0.01	No
	24-Hour	5.0	2.70	0.3	No
	Annual	1.0	0.14	0.2	No
CO	1-Hour	2,000	449	1.1	No
	8-Hour	500	280	0.004	No
PM_{10}	24-Hour	5.0	2.76	0.3	No
	Annual	1.0	0.188	0.3	No
$PM_{2.5}$ b/	24-Hour c/	1.2	**2.61**	0.4	**Yes**
	Annual	0.2	0.169	0.3	No

a/ Maximum daily H1H averaged over 5 years
b/ Secondary formation impacts added
c/ Averaged over 5 years
NOTE: Bold Values = greater than SIL

TABLE 4.11.1-9

AERMOD Significance Modeling Results for Commonwealth LNG Stationary and Mobile Sources

Pollutant	Averaging Time	SIL (µg/m³)	Maximum Modeled Impact (µg/m³)	SIL Distance (km)	Distance from Terminal of Maximum Impact Location (km)
NO_2	1-hour a/	7.5	**124.53**	54	**0.5**
	Annual	1.0	**4.44**	1.4	**0.5**
SO_2	1-hour a/	7.8	**11.0**	0.8	**0.5**
	3-Hour	25.0	10.4	N/A	0.5
	24-Hour	5.0	2.70	N/A	0.6
	Annual	1.0	0.14	N/A	0.8
CO	1-Hour	2,000	451.5	N/A	0.5
	8-Hour	500	279.84	N/A	0.5
PM_{10}	24-Hour	5.0	2.76	N/A	0.8
	Annual	1.0	0.21	N/A	0.8
$PM_{2.5}$ b/	24-Hour c/	1.2	**2.47**	2.9	**0.9**
	Annual	0.2	0.18	N/A	0.8

a/ Maximum daily H1H averaged over 5 years
b/ Secondary formation impacts added
c/ Averaged over 5 years

Note: Bold Values = greater than SIL

Table 4.11.1-9 indicates that concentrations of 1-hr and annual NO_2, 1-hr SO_2, and 24-hr $PM_{2.5}$ due to stationary and mobile sources at the LNG Terminal would exceed the respective SIL. With the exception of 1-hr NO_2, all remaining pollutants with maximum modeled concentrations that exceeded the SIL resulted in concentrations nearly equivalent to those in the stationary source-only modeling required by the state. Therefore, additional modeling was not completed for those pollutants as the results are expected to be similar to the NAAQS modeling results reviewed below. Additional modeling was performed for 1-hr NO2 impacts due to LNG Terminal stationary and mobile sources and is reviewed further below.

NAAQS Analysis Results

Commonwealth performed a modeling analysis for each Project pollutant that exceeded the SIL in table 4.11.1-8. Commonwealth's pollutant sources were modeled along with additional (background) sources from off-site inventory (obtained from LDEQ's Emissions and Inventory Reporting Center) within the pollutant-specific area of impact and averaged over five years to determine source contribution in comparison with the NAAQS. The area of impact was established as the distance from the Project to the farthest receptor that showed a modeled impact greater than the SIL in the significance modeling analysis. The background sources inventory included all sources within the area of impact plus 15 km and all major sources, including the Venture Global Calcasieu Pass LNG project, within the area of impact plus 20 km (in either case the area of impact would not extend beyond a 50 km by 50 km grid from the LNG Terminal due to the accuracy constraints of dispersion models).[91] Table 4.11.1-10 provides the Project sources maximum modeled design concentration, plus background values, in comparison to the NAAQS values for the respective Project pollutant and averaging period.

91 Note that due to the 50 by 50 km square receptor grid, some receptors near the corners may be more than 50 km from the LNG Terminal

TABLE 4.11.1-10

Summary of National Ambient Air Quality Standards Analysis for LNG Terminal Stationary Sources

Pollutant / Period	Area of Impact (major background sources) Distance (km)	Modeled Maximum Impact Plus Background Sources (ug/m^3) a/	Project Contribution to Maximum Impact Concentration (ug/m^3)	Project Contribution to Maximum Impact Concentration (percentage)	Non-Project Contribution to Maximum Impact Concentration (ug/m^3) b/	Background Concentration (ug/m^3) c/	NAAQS (ug/m^3)	Distance from the Project Location (km)	NAAQS Exceedance? (Yes/No)
NO_2 1-Hour	50.0	**229**	**0.00043**	**0.0002**	182	46.7	**188**	13.2	**Yes**
NO_2 Annual	20.3	11	3.01	27.4	1.35	6.6	100	0.3	No
SO_2 1-Hour	20.8	65	6.69	10.3	1.44	57.1	196	0.5	No
$PM_{2.5}$ 24-Hour	23.0	22	1.99	9.0	0.04	19.8	35	0.6	No

a/ Modeled maximum impact of the 8th highest high

b/ Non-Project Contributors are non-Commonwealth point-source facilities that emit air pollutants; an inventory of these pollutant sources is included in the LDEQ Emission Inventory Survey (LDEQ, 2006).

c/ Background concentrations are the ambient atmospheric values of pollutants (adjusted to account for the presence of surrounding industry, as applicable); background pollutant concentrations are recorded by LDEQ at ambient monitoring sites throughout Louisiana; ambient monitoring data are also available from the EPA (LDEQ, 2006).

TABLE 4.11.1-11

Summary of National Ambient Air Quality Standards Analysis for LNG Stationary and Mobile Sources

Pollutant / Period	Area of Impact (major background sources) Distance (km)	Modeled Maximum Impact Plus Background Sources (ug/m³) a/	Project Contribution to Maximum Impact Concentration (ug/m³)	Project Contribution to Maximum Impact Concentration (percentage)	Non-Project Contribution to Maximum Impact Concentration (ug/m³) b/	Background Concentration (ug/m³) c/	NAAQS (ug/m³)	Distance from the Project Location (km)	NAAQS Exceedance? (Yes/No)
NO_2 1-Hour	50.0	**307**	**0.0055**	**0.0018**	260.97	46.7	**188**	3.1	**Yes**

a/ Modeled maximum impact of the 8th highest high

b/ Non-Project Contributors are non-Commonwealth point-source facilities that emit air pollutants; an inventory of these pollutant sources is included in the LDEQ Emission Inventory Survey (LDEQ, 2006).

c/ Background concentrations are the ambient atmospheric values of pollutants (adjusted to account for the presence of surrounding industry, as applicable); background pollutant concentrations are recorded by LDEQ at ambient monitoring sites throughout Louisiana; ambient monitoring data are also available from the EPA (LDEQ, 2006).

As indicated in table 4.11.1-10, the results of the modeled maximum impact plus background stationary sources for 1-hour NO_2 (229 micrograms per meter cubed [$\mu g/m^3$]) also exceeded the NAAQS of 188 $\mu g/m^3$. None of the other three pollutants exceeded the respective NAAQS concentration. In addition, FERC conducted an additional analysis inclusive of the LNG carriers and tugs, as summarized in table 4.11.1-11.

Commonwealth conducted a source contribution analysis to determine whether the Project would contribute significantly to the modeled NAAQS exceedance. Appendix H provides predicted modeled maximum impact (for stationary sources only and stationary sources plus LNG carriers and tugs) plus background sources concentrations for all locations within 50 km of the Project site that exceeded the NAAQS for 1-hour NO_2. Appendix I includes maps of the Project vicinity and the locations where the NAAQS would be exceeded. The proportions of the exceedance concentrations attributable to the project are very small. In the instance of the highest overall modeled maximum impact for stationary sources plus background sources concentration (229 $\mu g/m^3$), the Project-only concentration contribution (0.0004 $\mu g/m^3$) is well below the SIL concentration for 1-hour NO_2 (7.5 $\mu g/m^3$). Similarly, in the instance of the highest overall modeled maximum impact for LNG stationary sources and LNG carriers and tugs, plus background sources concentration (308 $\mu g/m^3$), the Project-only (inclusive of LNG carriers and tugs) concentration contribution (0.005 $\mu g/m^3$) is well below the SIL concentration for 1-hour NO_2 (7.5 $\mu g/m^3$). The Project-only (LNG stationary sources) and Project-only plus LNG carriers and tugs concentration contributions at the NAAQS-exceedance locations in which the Project's contribution is the highest of the total modeled maximum impact plus background sources concentration (0.43 $\mu g/m^3$ and 2.8 $\mu g/m^3$, respectively) are both well below the SIL concentration for 1-hour NO_2. In fact, the exceedances would still be predicted in the absence of the Project (i.e., the existing background emissions sources from LDEQ's Emissions and Inventory Reporting Center are driving the NAAQS exceedances). This modeling analysis demonstrates that the proposed Project would have a minor contribution to the modeled maximum impact. Based on this small level of impact that does not exceed the SIL, we do not believe the Project would cause or contribute to the potential NAAQS exceedance.

PSD Increment Modeling

PSD increment is the amount pollution in an area is allowed to increase. PSD increments prevent the air quality in clean areas from deteriorating to the level set by the NAAQS. PSD Class II increment standards apply to the Project. PSD increments for four pollutants have been established for the Class II standards: annual NO_2; annual, 24-hour, and 3-hour SO_2; annual and 24-hour PM_{10}; and annual and 24-hour $PM_{2.5}$. Commonwealth conducted modeling analyses to assess whether the Project could demonstrate compliance with the PSD Increments for the corresponding Project pollutants that exceeded the SIL: annual NO_2 and 24-hour $PM_{2.5}$. Commonwealth used the same background sources inventory for the PSD incremental modeling as was used for the NAAQS analysis. As shown in table 4.11.1-12, the maximum modeled increment concentrations for both pollutants were well below the established PSD increment.

TABLE 4.11.1-12 **PSD Increment Modeling Results for Commonwealth LNG**			
Pollutant	**Averaging Time**	**PSD Increment Concentration (μg/m^3)**	**Maximum Modeled Increment Concentration of the Commonwealth LNG Project (μg/m^3)**
NO_2	Annual	25	4.4
$PM_{2.5}$	24-Hour	9	3.4

4.11.1.8 Air Quality Conclusions

The dispersion modeling analyses, and additional impact analyses performed demonstrated compliance with all ambient air quality standards applicable to Commonwealth LNG. The analyses showed that operation of the facility would not cause or make a significant contribution to any violation of either the NAAQS or the existing PSD increments. Although Project operation would be in compliance with the NAAQS and the NAAQS are designated to protect sensitive populations, we acknowledge that NAAQS attainment alone may not assure there is no localized harm to such populations due to project emissions of VOCs, HAPs, or issues such as the presence of non-Project related pollution sources, local health risk factors, disease prevalence, and access (or lack thereof) to adequate care. Project dispersion modeling analysis, summarized above, conclude operational emissions from the Project are not significant.

We received comments during the public comment period for the draft EIS stating FERC had not taken a hard look at the local air quality impacts of the Project. However, the dispersion modeling analysis conducted as part of the Project, coupled with source culpability analyses, constitutes an in-depth review of local air quality impacts. While modeling predicts potential exceedances of the NAAQS, the project contributions to the potential exceedances are negligible. The EPA, in conjunction with LDEQ, works to identify and remedy ambient air quality concerns through State Implementation Plans. The output of the dispersion modeling analysis and the LDEQ's permitting of emissions for the Project conclude operational emissions from the Project are not significant. We concur. The detailed analyses and results reflected in the information provided in this section are contained in Commonwealth's *Class II Modeling Report in Support of Part 70 (Title V) Operating Permit and Prevention of Significant Deterioration Permit*.[93]

In addition to assessing whether the Project would demonstrate compliance with air quality standards, we also assessed the potential effects the Project could have on environmental justice communities. Appendix I provides figures from Commonwealth's modeling illustrating the concentration plumes, showing the full range of concentrations for all criteria pollutants that have maximum modeled concentrations that exceeded the SIL and NAAQS, in relation to environmental justice populations by block group. The potential impacts of Project air emissions on environmental justice communities are discussed in section 4.9.12.

4.11.2 Noise

Noise would affect the local environment during both construction and operation of the Project facilities. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. This variation is caused in part by changing weather

93 Commonwealth's Class II Modeling Report in Support of Part 70 (Title V) Operating Permit and Prevention of Significant Deterioration Permit can be viewed on eLibrary under Accession Number 20210817-5051.

conditions, the effects of seasonal vegetative cover, and human activities. Construction and operational noise impacts as well as proposed mitigation measures are discussed in section 4.11.2.4.

4.11.2.1 Noise Levels and Terminology

Sound is what we hear when our ears are exposed to small pressure fluctuations in the air. There are many ways in which pressure fluctuations are generated, but typically they are caused by vibrating movement of a solid object (Federal Transit Administration, 2018). When sound becomes excessive, annoying, or unwanted, it is referred to as noise. Noise levels are quantified using decibel (dB) units. Noise may be continuous (constant noise with a constant decibel level), steady (constant noise with a fluctuating decibel level), impulsive (having a high peak of short duration), stationary (occurring from a fixed source), intermittent (at intervals of high and low sound levels), or transient (occurring at different rates).

Noise levels are quantified using dB, which is a unit of sound pressure. The A-weighted sound level, expressed as dBA, can be used to quantify sound and its effect on people (EPA, 1978). On the dBA scale, normal conversation falls at about 60 to 65 dBA, and sleep disturbance occurs at about 40 to 45 dBA. The A-weighted scale is used because human hearing is less sensitive to low and high frequencies than mid-range frequencies. A person's threshold of perception for a perceivable change in loudness on the A-weighted sound level is on average 3 dBA, whereas a 5 dBA change is clearly noticeable, and a 10 dBA change is perceived as twice or half as loud.

Ambient sound levels, or background sound levels, result from sound emanating from natural and artificial sources. The magnitude and frequency of background noise may vary considerably over the course of a day and throughout the year, caused in part by weather conditions, seasonal vegetative cover, and human activity. Two measures used by federal agencies to relate the time-varying quality of environmental sound levels to known effects on people are the 24-hour equivalent sound level ($L_{eq(24)}$) and the day-night sound level (L_{dn}). The $L_{eq(24)}$ is the level of steady sound with the same total energy as the time-varying sound, averaged over a 24-hour period. The L_{dn} is the $L_{eq(24)}$ with 10 decibels on the dBA scale added to the nighttime sound levels between the hours of 10 p.m. and 7 a.m., to account for people's greater sensitivity to sound during nighttime hours.

Table 4.11.2-1 demonstrates the relative sound levels of common sounds measured in the environment and industry.

TABLE 4.11.2-1 **Typical Sound Levels of Various Activities**	
Noise Source or Activity	**Sound Level (dBA)**
Threshold of pain	140
Jet taking off (200-foot distance)	130
Operating heavy equipment	120
Night club with music	110
Construction site	100
Boiler room	90
Freight train (100-foot distance)	80
Classroom chatter	70
Conversation (3-foot distance)	60
Urban residence	50
Soft whisper (5-foot distance)	40
North rim of Grand Canyon	30
Silent study room	20
Threshold of hearing (1,000 hertz)	0
Source: Occupational Safety and Health Administration, 2013	

4.11.2.2 Regulatory Requirements

In 1974, the EPA published information for state and local governments to use in developing their own ambient noise standards (EPA, 1974). The EPA 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 use it to evaluate the potential noise impacts from the Project at noise-sensitive areas (NSAs) such as residences, schools, or hospitals. Due to the 10 dBA nighttime penalty added prior to calculation of the L_{dn}, for a facility to meet the L_{dn} of 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.

The State of Louisiana has not adopted noise regulations applicable to construction and operation of the Project. Cameron Parish maintains noise regulations in the Cameron Parish Code of Ordinances, Chapter 15, section 15 to 28, which lists a general prohibition on excessive noise, stating, "No person shall make, continue, or cause to be made or continued any loud, unnecessary or excessive noise which unreasonably interferes with the comfort and repose of others within the parish." The regulation further prohibits, "The operating of any equipment used in construction work within one hundred sixty-five (165) feet of any residential or noise sensitive area between sunset and sunrise on weekdays and Saturdays; and 9:00 p.m. to 8:00 a.m. on Sundays and holidays, except for emergency work." There are no residences or NSAs within 165 feet of the proposed Project.

4.11.2.3 Existing Noise Levels

The proposed Terminal site is in a primarily rural area with a few industrial sites to the north along the Calcasieu Ship Channel. The noise sources in the area include wind, birds, insects, nearby industrial facilities, marine traffic, and vehicular traffic on local roads. The 3.0-mile Pipeline is also in a rural area, with noise levels along the Pipeline route influenced by rural background sources. There is one RV residence (see below) within 0.5 mile of the proposed Pipeline. This residence is approximately 0.4 mile southwest of the Pipeline's southern terminus at MP 3.0 and thus also within 0.5 mile of the HDD site.

Commonwealth conducted a preconstruction ambient noise survey for the Terminal site on September 28 and 29, 2018 (TRC, 2019). During the study, Commonwealth identified four potential NSAs and determined noise monitoring locations (MLs) based on the locations of these NSAs. Additionally, Commonwealth collected noise data at a fifth ML across (i.e., north of) Highway 27/82 from the Terminal site to approximate ambient noise in the vicinity of where the HDD would occur. In the interim since Commonwealth conducted the ambient noise survey, Venture Global constructed the Calcasieu Pass LNG facility. Two of the four NSAs initially identified by Commonwealth are on the opposite (i.e., east) side of the Calcasieu Pass LNG facility from the Commonwealth site. Noise from Commonwealth would no longer reach these NSAs, as it would be obstructed by the Calcasieu Pass LNG terminal. A third NSA was within the footprint of the Calcasieu Pass LNG facility and no longer exists. These three NSAs are no longer applicable for the Project and will not be discussed further.

The fourth NSA identified by Commonwealth in its preconstruction survey is a group of temporary residences for ship pilots on the southern end of Monkey Island, approximately 3,350 feet northeast of the Terminal site. This site will be referred to as NSA 1. In July of 2020, we received a comment from the owner of the parcel immediately west of the Terminal site noting that he maintained a secondary residence on the parcel that should be included as part of noise assessments for the Project. This site, approximately 1,962 feet west of the main Terminal site (and about 1,700 feet northwest of the flare stack location on the west side of the Terminal), will be referred to here as NSA 2 (referred to as the RV residence or RV site in sections 4.8 and 4.9). As Commonwealth did not recognize that there was a residence at the NSA 2 location at the time of the preconstruction survey, ambient noise levels from that location were not available in the preconstruction survey data. In the draft EIS, we recommended that Commonwealth complete an updated Ambient Noise Survey to include the current ambient noise values for NSAs 1 and 2. Commonwealth filed the updated Ambient Noise Survey with FERC on May 23, 2022.[95] Commonwealth recorded ambient noise levels at the boat dock for the temporary residences on the southern end of Monkey Island to represent NSA 1 and from two representative locations for NSA 2. Commonwealth recorded nighttime ambient noise levels for NSA 2 on Commonwealth-accessible property immediately south of Highway 27/82 and approximately 0.5 mile northeast of NSA 2. While Commonwealth was recording daytime ambient noise levels at the same location, Commonwealth determined that construction at a nearby industrial facility would skew the ambient noise levels to be higher than what would normally be considered ambient. Therefore, Commonwealth chose an alternate location in a vegetation clearing approximately 0.6 mile south of the original location and about 0.7 mile southeast of NSA 2 to serve as the proxy location for daytime ambient noise levels at NSA 2.

95 See Appendix B of accession no. 20220523-5182.

TABLE 4.11.2-2 **Ambient Noise Survey Results a/**					
Location	**Distance from LNG Terminal Site**	**Direction from LNG Terminal Site**	**Measured Daytime Noise Level, L_d b/ d (dBA)**	**Measured Night Noise Level, L_n c/ (dBA)**	**Calculated Day-Night Noise Level, L_{dn} d/ (dBA)**
NSA 1	3,350 feet	Northeast	50.9	44.7	52.7
NSA 2 e/	1,962 feet	West	45.4 f/	37.1 g/	46.0

a/ The data summarized in this table are a logarithmic average of the 1-minute L_{eq} data logged by the Larson Davis 831C for each monitoring location.

b/ L_d is the daytime L_{eq}, as recorded with the sound level meter.

c/ L_n is the nighttime L_{eq}.

d/ L_{dn} is the calculated day-night average sound level, where $L_{dn} = 10\log_{10}((15/24)10^{Ld/10} + (9/24)10^{(Ln+10)/10})$. 10 dBA were logarithmically added to the night survey results to account for increased noise sensitivity at night. This is considered a conservative assumption given that noise levels are typically lower at night (except for at NSA 1, where nighttime insect noise resulted in higher measurements than compared to daytime levels).

e/ NSA 2 noted in the text and this table corresponds to NSA 3 in Commonwealth's 2018 Noise Study (TRC, 2019).

f/ Proxy data from approximately 0.6 mile south of Highway 27/82 are used for NSA 2 daytime noise levels (see 4.11.2.3 text).

g/ Proxy data from immediately south of Highway 27/82 are used for NSA2 nighttime noise levels (see 4.11.2.3 text).

Figure 4.11.2-1 shows the locations of NSAs 1 and 2 (and their respective ambient noise proxy locations) in relation to the Terminal and Pipeline footprints. The results of the updated 2022 preconstruction ambient noise survey for NSAs 1 and 2 are listed in table 4.11.2-2. As shown in table 4.11.2-2, the nearest NSA's ambient Ldn noise level was estimated at 46.0 dBA. Commonwealth did not conduct an ambient noise survey along the Pipeline route; however, ML 5/NSA 2 proxy is used to assess ambient noise at the terminus of the Pipeline at the Terminal facility, the closest point the construction right-of-way would be relative to an NSA. As noted in section 2.1.2, the Pipeline would not contain a compressor station; therefore, noise impacts related to the Pipeline would only occur during construction. There are no other potential NSAs within two miles of the Project site. The next closest potential NSAs east of the Project site are within the town of Cameron on the opposite side of the Calcasieu Pass LNG facility from the Project site. The closest potential NSA west of the Project site (beyond NSA 2) is the town of Holly Beach, which is more than five miles from the Project site

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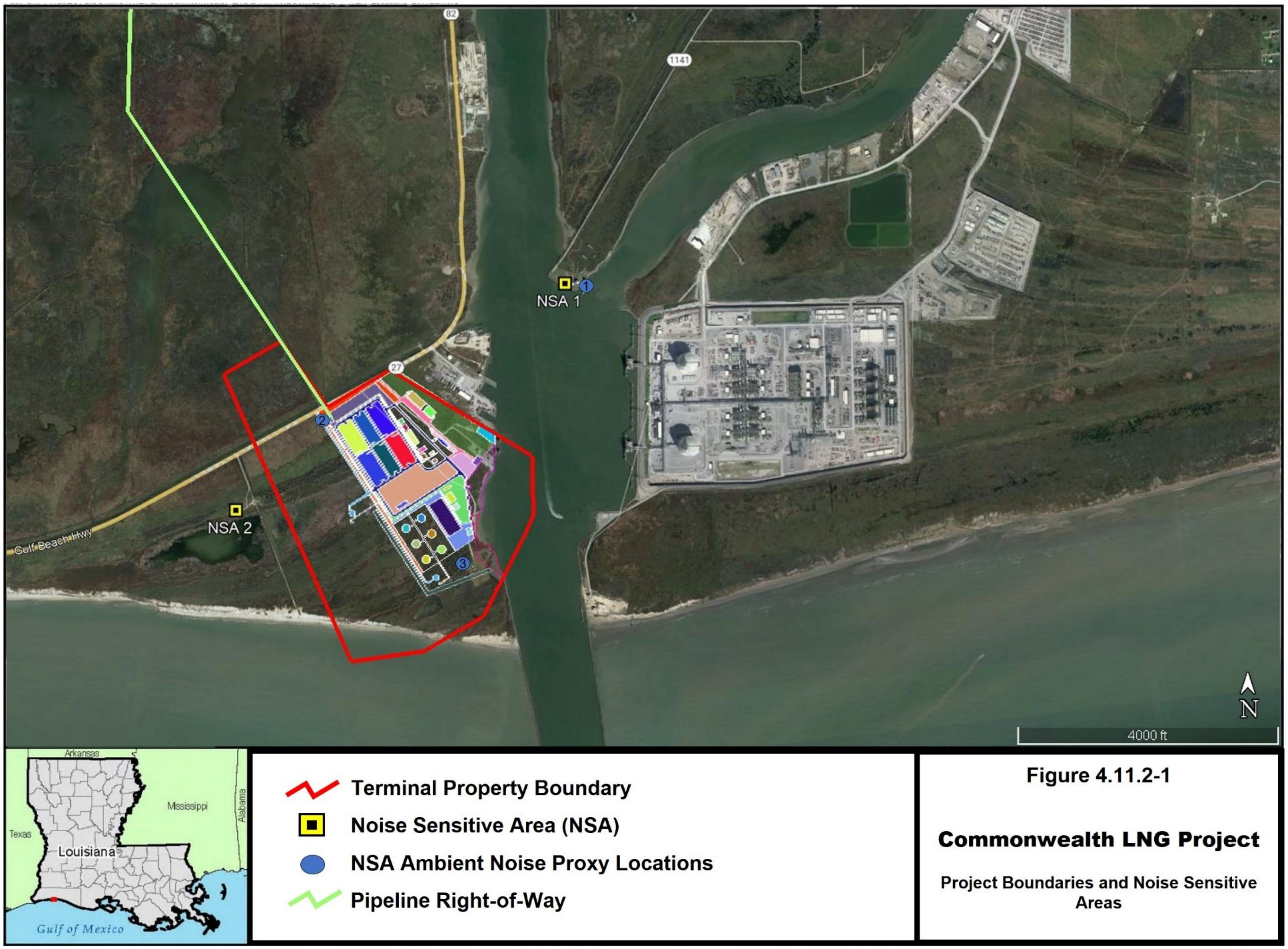


Figure 4.11.2-1

Commonwealth LNG Project

Project Boundaries and Noise Sensitive Areas

4.11.2.4 Noise Impacts and Mitigation

Construction Noise

Construction noise would be generated over an extended period of approximately 36 to 38 months at the Terminal site and for about 12 months along the Pipeline right-of-way. Commonwealth states general construction activities (including pile driving) at the Terminal site and along the Pipeline right-of-way would be scheduled for six days per week (Monday through Saturday) and generally from 7:00 a.m. to 7:00 p.m. along the Pipeline right-of-way and 7:00 a.m. to 10:00 p.m. at the Terminal. Dredging activities would occur on a 24-hour schedule and one day of the Pipeline HDD process would require an uninterrupted session for the pipeline pullback process that could extend into nighttime hours (i.e., 10:00 p.m. to 7:00 a.m.). Noise impacts of construction are discussed below. Additionally, construction activities have the potential to impact terrestrial and aquatic wildlife species. Noise impacts on terrestrial wildlife are discussed in section 4.6.1. Underwater noise impacts on aquatic wildlife are discussed in section 4.6.2.

<u>Terminal</u>

The most prevalent noise-generating activity and equipment during construction at the Terminal site is anticipated to be pile driving, dredging, and the internal combustion engines associated with construction equipment. The noise levels experienced in the general vicinity would depend on the type of equipment used, the mode of operation of the equipment, the length of time the equipment is in use, the amount of equipment used simultaneously, and the distance between the sound generation source and the receptor. Construction activities associated with the Terminal would be localized to the Terminal site. Construction activities are projected to last approximately 36 months with civil work (e.g., earth moving) occurring during the initial 12 months, followed by equipment assembly. Commonwealth expects that pile driving would begin during the ninth construction month and would last for 6 months.

Commonwealth conducted an environmental noise modeling assessment in June 2021 to evaluate construction and operation noise sources and levels at the site and impacts on NSAs 1 and 2.[96] Commonwealth subsequently supplemented the environmental noise assessment in filings provided to the FERC in August 2021.[97] In response to our recommendation in the draft EIS, Commonwealth conducted an updated ambient noise survey in April 2022 to reflect the current ambient noise levels more accurately at the two NSAs.[98] Sound levels were modeled in SoundPLAN software using the same environmental conditions for both the construction phase and the operational phase of the Project. Noise modeling for the study used assumptions based on occupational safety limits and likely equipment types planned for installation and use. The estimated sound emission levels were taken from equipment submittals with like or very similar projects. We received a comment from the landowner adjacent to the Project site requesting to know whether the parameters of Commonwealth's modeling including the noise buffering capacity of the vegetation that is currently at the site but would be cleared during construction. Commonwealth's modeling did not assume the presence of this vegetation.

Commonwealth expects peak construction noise to occur during construction months 10 through 12. During this time, Commonwealth expects civil works (i.e., earth moving equipment), pile driving, assembly of the facility structures, and dredging to occur simultaneously throughout the Terminal site. Again, Commonwealth has proposed for civil works, pile driving, and structure assembly to be conducted between 7:00 a.m. and 10:00 p.m.. Table 4.11.2-3 provides the model-estimated individual noise impacts for each construction phase and the combined noise impacts of all phases occurring simultaneously during

96 See accession no. 20210604-5170.

97 See accession no. 20210805-5099.

98 See appendix B of accession no. 20220523-5182.

the peak construction period relative to the revised ambient noise levels at NSAs 1 and 2. Commonwealth expects pile driving activity would occur during construction months 9 through 14. During this period, pile driving activities could include no fewer than 7 pile driving rigs and as many as 11 pile driving rigs operating simultaneously (for both onshore and in-water pile driving). Table 4.11.2-4 provides the peak and hourly noise impacts for the minimum and maximum number of simultaneously operated pile driving rigs during the peak pile driving period.

TABLE 4.11.2-3

Modeled Average Individual and Total Construction Noise Impacts at NSAs 1 and 2

Location	Existing Daytime Ambient Leq (dBA)	Civil Works (dBA)		Assembly (dBA)		Dredging (dBA) a/		Pile Driving (dBA)		Total Construction Noise (dBA)	
		Daytime (L_{eq})	Combined Construction and Ambient (L_{eq})	Daytime (L_{eq})	Combined Construction and Ambient (L_{eq})	Daytime (L_{eq})	Combined Construction and Ambient (L_{eq})	Daytime (L_{eq})	Combined Construction and Ambient (L_{eq})	Daytime (L_{eq})	Combined Construction and Ambient (L_{eq})
NSA 1	50.9	54.6	56.1	51.2	54.1	47.9	52.7	47.0	52.4	57.3	58.2
NSA 2 b/	45.4	59.3	59.5	55.2	55.6	37.0	46.0	52.1	52.9	61.3	61.4

a/ Dredging would occur 24 hours per day
b/ NSA2 noted in the text and this table corresponds to NSA3 in Commonwealth's 2018 Noise Study (TRC, 2019).

TABLE 4.11.2-4

Peak and Average Pile Driving Noise Impacts for the Minimum and Maximum Number of Pile Driving Rigs Operating During Peak Construction

Location	Existing Daytime Ambient Noise L_{eq} (dBA)	Peak L_{max} (dBA)				Hourly Average L_{eq} (dBA)			
		Minimum Number of Rigs Operating (7)	Increase over Ambient (dBA)	Maximum Number of Rigs Operating (11)	Increase over Ambient (dBA)	Minimum Number of Rigs Operating (7)	Increase over Ambient (dBA)	Maximum Number of Rigs Operating (11)	Increase over Ambient (dBA)
NSA 1	50.9	58.0	7.1	60.5	9.6	44.0	--	47.0	--
NSA 2 a/	45.4	64.1	18.7	65.2	19.8	50.9	5.5	52.1	6.7

a/ NSA 2 noted in the text and this table corresponds to NSA3 in Commonwealth's 2018 Noise Study (TRC, 2019).

Excavation and dredging would be required to construct the marine facility and create a berthing area for LNG carriers. Commonwealth would excavate the upland area associated with the marine facility using a land-based excavator. Commonwealth would dredge the open water associated with the marine facility using a barge-mounted cutterhead suction dredge. Dredging would begin within the first nine months of construction and last for 5 months (Commonwealth would also dredge the marine facility footprint every two years during operation, which would require approximately 7 days to complete). Dredging would be conducted on a continuous, 24-hour schedule and in accordance with COE and USCG regulations and FWS and NOAA guidelines to minimize potential impacts on protected species.

Primary noise sources from dredging activities would include diesel engines with associated pumps, as well as a tugboat used to position the dredge for in-water activities and construction equipment and dump trucks for transportation of soils and other materials on land. Table 4.11.2-5 provides the modeled noise impacts for the dredging activities at NSAs 1 and 2. Given the broad extent along the Terminal shoreline that dredging would occur, Commonwealth modeled the dredging noise at different locations within the dredge footprint relative to the two NSAs to reflect noise impacts of the dredging at the locations closest to each respective NSA. For NSA 1, the values in table 4.11.2-5 are modeled as though the dredging activities are in the northernmost portion of the proposed dredge footprint, approximately 1,000 feet southwest of NSA 1. For NSA 2, the values in table 4.11.2-5 are modeled as though the dredging activities are in the berthing area of the proposed marine facility, approximately 3,745 feet southeast of NSA 2.

The modeling results indicate that the total noise impacts (L_{eq}) during peak construction activities (table 4.11.2-3), and the maximum noise impacts (L_{max}) during peak pile driving (table 4.11.2-4), would exceed expected ambient sound levels at NSA 2 by more than 10 dBA (i.e., the increase in noise would be perceived as twice as loud as ambient conditions). Noise impacts at NSA 1 would be less severe relative to ambient conditions but total noise impacts would nonetheless still exceed 55 dBA. The total construction noise impacts appear to be driven by L_{eq} values of the civil works activities (i.e., earth moving equipment). The modeled results are considered as worst-case scenarios and the increases over ambient noise would be short term and would occur primarily during daytime hours. To ensure that this is the case, **we recommend that:**

- **<u>During construction activities at the Terminal</u>, Commonwealth should monitor noise levels between 7:00 p.m. and 7:00 a.m., document the noise levels in the <u>construction</u> status reports, and restrict the noise attributable to construction activities to no more than 55 dBA L_{dn} (48.6 dBA L_{eq}) at NSAs 1 and 2.**

TABLE 4.11.2-5 **Modeled Dredge Noise Impacts at NSAs 1 and 2**									
Location	**Existing Daytime Ambient, L_d (dBA)**	**Existing Nighttime Ambient, L_n (dBA)**	**Calculated Ambient Day-Night Noise Level, L_{dn} (dBA)**	**Dredging (dBA)**					
				Daytime (L_{eq})	**Nighttime (L_{eq})**		**Day-Night (L_{dn})**	**Combined Construction and Ambient (L_{dn})**	**Increase Over Ambient (L_{dn})**
NSA 1	50.9	44.7	52.7	47.9	47.9	54.3	56.6	3.9	
NSA 2 a/	45.4	37.1	46.1	37.0	37.0	43.4	48.0	1.9	

a/ NSA 2 noted in the text and this table corresponds to NSA3 in Commonwealth's 2018 Noise Study (TRC, 2019).

The only construction activities to occur during nighttime hours would be dredging operations (table 4.11.2-5). Dredging would increase noise relative to ambient levels at NSA 1 by approximately 4 dBA, which would also exceed the 55 dBA. In the draft EIS, we requested that Commonwealth file a dredging noise mitigation plan comprised of measures Commonwealth would implement to reduce the projected nighttime noise levels to at or below 55 dBA L_{dn}. In response, Commonwealth noted a more suitable metric for assessing whether nighttime dredging would cause noise impacts at NSA 1 would be nighttime L_{eq} value measuring just nighttime noise rather than L_{dn}, which is a 24-hour weighted average. As shown in table 4.11.2-5, the expected nighttime L_{eq} at NSA 1 would be 47.9 dBA. This value would be below FERC's nighttime L_{eq} threshold of 48.6. Commonwealth has also filed a nighttime noise monitoring plan that it would use to confirm nighttime dredging noise would not cause adverse impacts at NSA 1.[99] In following this plan, Commonwealth would position an automated noise monitor at NSA 1 that records audio and L_{eq} values at 1-minute intervals. Commonwealth would retrieve data from the monitor on a weekly basis while dredging operations are being conducted. If L_{eq} values at NSA 1 exceed the FERC threshold and the audio recordings indicate dredging is that cause of the exceedance, Commonwealth would adjust its dredging operations to limit nighttime dredging to areas within the dredge footprint that are further away from NSA 1. Commonwealth would include the results of the noise monitoring in its construction status reports to FERC. Additionally, Commonwealth would contact a representative of the Calcasieu Pilots after the first night of dredging to determine whether noise from the nighttime dredging operations was perceivable inside of NSA 1 and whether the noise rose to nuisance levels. At that time, Commonwealth would also determine with the Calcasieu Pilots representative whether subsequent inquiries with the Calcasieu Pilots regarding nighttime dredging noise would be necessary. Given that Commonwealth would conduct general construction activities during daytime hours and Commonwealth's nighttime noise monitoring plan would ensure nighttime noise associated with dredging would not cause adverse impacts on NSAs, we conclude noise impacts from construction of the Terminal would be short-term and not significant.

99 See appendix C of accession no. 20220523-5182.

Pipeline

During construction of the Pipeline, noise would be generated primarily by construction equipment, including HDD equipment used to install the Pipeline under Highway 27/82. Construction of the Pipeline would result in relatively temporary increases in ambient noise levels along the Pipeline right-of-way for approximately 12 months. The changing number and type of construction equipment present along the right-of-way would result in varying levels of noise. NSA 1 is approximately 0.8 mile northeast of the southern terminus of the Pipeline route (the closest point that NSA 1 is to the Pipeline). NSA 2 is approximately 0.4 mile southwest of the southern terminus of the Pipeline route and within 0.5 mile of both the proposed HDD entry and exit points. The remainder of the Pipeline route would be more than 0.5 mile from NSA 2. Pipeline construction would primarily only occur during daytime hours, with the exception of pipeline pullback as part of the HDD methods, and other potential 24-hour activities such as hydrostatic testing, operating dewatering pumps, etc. Pipeline pullback must be conducted as a single, continuous effort and typically takes approximately 11 to 12 hours to complete. Commonwealth would plan to begin the pullback phase at the beginning of the workday and therefore minimize the duration of nighttime work required to complete this phase. Nonetheless, the modeled noise levels for the HDD provided in table 4.11.2-6 assume a worst-case scenario that includes the HDD activity occurring across daytime and nighttime hours. The modeled values indicate HDD-only operations combined with ambient conditions would result in a minor increase over ambient conditions but noise levels at both NSAs would remain below the 55 dBA threshold for this activity.

TABLE 4.11.2-6

Modeled HDD 24-Hour Noise Impacts at NSAs 1 and 2

Location	**NSA Distance from HDD Entry Point (feet)**	**NSA Direction from HDD Entry Point**	**Calculated Ambient Day-Night Noise Level, L_{dn} (dBA)**	**HDD Only Noise Impacts L_{dn} (dBA)**	**Combined HDD and Ambient L_{dn} (dBA)**	**Increase Over Ambient (L_{dn})**
NSA 1	4,210	ENE	52.7	37.8	52.8	0.1
NSA 2 a/	1,965	SW	46.1	46.0	49.1	3.0

a/ NSA 2 noted in the text and this table corresponds to NSA 3 in Commonwealth's 2018 Noise Study (TRC, 2019).

Operational Noise

Terminal

Operation of the Terminal site would produce noise on a continuous basis. Many of the dominant noise sources (compressor piping and air coolers) would be at elevations of more than 20 feet above grade and, as such, may have a greater influence on NSAs than if ground based. Commonwealth conducted a sound level assessment to evaluate if the Project could be constructed with sufficient noise mitigation technology to operate in accordance with FERC noise criteria. Commonwealth conducted the modeling exercise using performance data for the proposed gas turbines and equipment of the current Terminal design. Generally, equipment to be used would include:

- Air Cooled Heat Exchanger (ACHE) fans with electric motor drivers. There are approximately 78 individual fans for each LNG train or 468 fans total for the production equipment. The A-weighted sound power level for each fan/driver was assumed to be approximately 88 dBA.

- One Trent 60 gas turbine (GT) used as the liquefaction compressor driver in each LNG train. The GT driver noise emissions were refined into three separate sources:

  - The GT skid mounted enclosure, which includes enclosure ventilation.
  - The GT intake air system. For the modeling, the ducting is assumed to have a muffle and the duct entry is assumed to have an air filter.
  - The GT exhaust system. For the modeling, the turbines are assumed to be simple cycle exhaust with a muffler in the exhaust stack.
  - One liquefaction mixed refrigerant compressor system in each LNG train, which was segregated into the following:
  - Mixed refrigerant compressor body.
  - The mixed refrigerant compressor suction piping system between the compressor body and the suction scrubber. The model assumes this piping would be externally insulated with a Class C 4-inch-thick acoustical lagging system.
  - The mixed refrigerant compressor discharge piping between the compressor body and the ACHE. The model assumes this piping would be externally insulated with a 4-inch-thick acoustical lagging system.
  - Three BOG compressor units for ship loading. This was evaluated as a worst-case condition that may occur over a 24-hour period during ship loading.
  - Three BOG after-cooler ACHEs (after-cooler and second stage inter-cooler).
  - Two Trent 60 electrical generating units (simple cycle). Each of the GTs has the three separate sources as described above.

Simulations in Commonwealth's study incorporated the operation of these equipment to estimate sound levels at NSAs 1 and 2. Table 4.11.2-7 provides the estimated sound levels of the Terminal operating at full load production (9.5 MPTA) with an LNG vessel loading at the marine facility and the combined sound levels of Terminal operations and ambient noise. The estimate of the sound level of Terminal operations at NSA 1 is an L_{dn} of 52.3 dBA. The estimated sound level of Terminal operations at NSA 2 is an L_{dn} of 54.0. Both values are below the FERC criterion of 55 dBA L_{dn}. The combined sound levels of the Terminal operating at full capacity and the expected ambient noise at the NSAs is 55.5 dBA for NSA 1 and 54.7 dBA for NSA 2. These values are 2.8 dBA and 8.6 dBA above the expected ambient noise levels at the respective NSAs. Residents at NSA 2 would likely experience much greater noise levels due to Terminal operations compared with current ambient levels. However, because the estimated sound level of Terminal operations at NSA 2 is less than 55 dbA L_{dn}, the impacts would not be significant. Figure 4.11.2-2 depicts the boundaries of the 55 dBA L_{dn} contour with the Terminal operating at full capacity.

TABLE 4.11.2-7

Terminal Full Load Operations Noise Impacts at NSAs 1 and 2

Noise Sensitive Area	Ambient (L_{dn})	Total Facility a/ (L_{dn})	Total Facility plus Ambient (L_{dn})	Increase Above Ambient (L_{dn})
NSA 1	52.7	52.3	55.5	2.8
NSA 2	46.1	54.0	54.7	8.6

a/ Total Facility assumes 9.5 MTPA output and 1 LNG vessel loading at the marine facility.

The normal full load operation L_{dn} 55 dBA contour boundary shown in figure 4.11.2-2 is adjacent to the driveway of NSA 2. Given that actual noise levels may be different from those obtained from modeling, to ensure that the NSAs are not significantly affected by noise during operation of the Terminal, **we recommend that:**

- **Commonwealth should file a full power load noise survey with the Secretary for the Terminal no later than 60 days after each liquefaction train is placed into service. If the noise attributable to operation of the equipment at the Terminal exceeds an Ldn of 55 dBA at any nearby NSA, within 60 days Commonwealth should modify operation of the liquefaction facilities or install additional noise controls until a noise level below an Ldn of 55 dBA at the NSAs is achieved. Commonwealth 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.**

In addition, **we recommend that:**

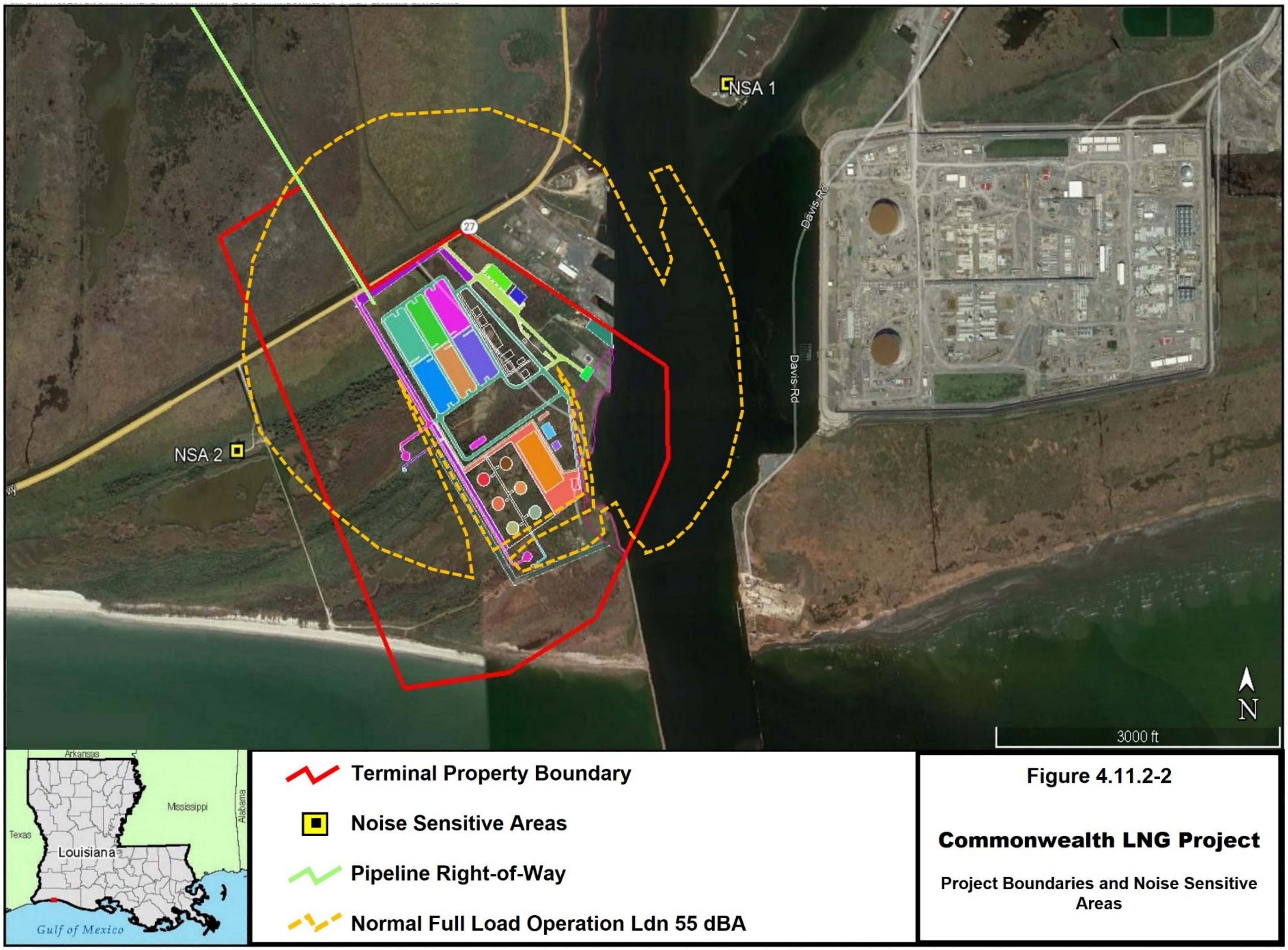
- **Commonwealth should file a noise survey with the Secretary no later than 60 days after placing the entire Terminal into service. If a full load condition noise survey is not possible, Commonwealth should provide an interim survey at the maximum possible horsepower load within 60 days of placing the Terminal into service and provide the full load survey within 6 months. If the noise attributable to operation of the equipment at the Terminal exceeds an Ldn of 55 dBA at any nearby NSA under interim or full horsepower load conditions, Commonwealth should file a report on what changes are needed and should install the additional noise controls to meet the level within 1 year of the in-service date. Commonwealth 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.**

Flares

As noted in section 2.1.1.4, the Terminal would include two flare systems, one associated with the liquefaction facilities and one associated with the marine facility, for venting excess natural gas, if necessary, during maintenance, startup/shutdown, and upset activities. Outside of emergency situations, Commonwealth estimates flaring would be required for up to 30 days during startup of the Terminal and then for no more than 12 hours during the first year of operation and 6 hours per year in subsequent years. Commonwealth expects the durations of different emergency events to last approximately 1 hour per event at likely frequencies of once every 3, 5, or 25 years depending on the emergency type. Commonwealth expects shutting down the Terminal due to a hurricane would require 6 hours of flaring (i.e., one hour per train), which would represent the largest flaring event.

TABLE 4.11.2-8 Terminal Flare Event Noise Impacts at NSAs 1 and 2					
Noise Sensitive Area	**Distance to Nearest Flare (ft)**	**Start-Up and Normal Operations**		**Emergency Events**	
		Peak Ranges (L_{max})	**24-Hour Ranges (L_{dn})**	**Peak Ranges (L_{max})**	**24-Hour Ranges (L_{dn})**
NSA 1	1,660	29.4 – 43.5	30.7 – 49.9	42.7 – 66.1	38.8 – 71.7
NSA 2	1,700	33.9 – 48.1	35.2 – 54.5	47.2 – 70.6	43.4 – 76.2

Table 4.11.2-8 provides the L_{max} and L_{dn} ranges for normal and emergency flaring events at NSAs 1 and 2. The modeled L_{dn} values of start-up flaring at the Terminal would range between 48.0 dBA and 49.9 dBA at NSA 1 and between 52.5 dBA and 54.5 dBA at NSA 2. The modeled L_{dn} values for flaring during normal operations would be 30.7 dBA at NSA 1 and 35.2 dBA at NSA 2. The maximum modeled values for the emergency events are associated with Terminal shutdowns due to an approaching hurricane when, ostensibly, the NSAs will have been evacuated. We received comments from a nearby landowner expressing concern about the duration and noise impacts of flaring at NSA 2. As discussed above, residents at this NSA would experience temporary noise impacts due to flaring. Based on the temporary nature of flaring, we do not believe these impacts would be significant.


NSA 1
NSA 2
27
Davis Rd
Davis Rd
N
3000 ft
Arkansas
Mississippi
Alabama
Texas
Louisiana
Gulf of Mexico
Terminal Property Boundary
Noise Sensitive Areas
Pipeline Right-of-Way
Normal Full Load Operation Ldn 55 dBA
Figure 4.11.2-2
Commonwealth LNG Project
Project Boundaries and Noise Sensitive Areas

Pipeline

Normal operations of the proposed Pipeline would not emit any noise perceptible to NSAs 1 or 2. Generally, pipeline blowdown events, however, can generate noise impacts. Planned pipeline blowdown events can happen during inspections or maintenance, requiring a segment of pipeline to be evacuated of natural gas. The duration of a blowdown depends on factors such as the extent of the maintenance activity and the gas pressure and could generally last between 20 minutes and 2 hours. Planned events could allow for slower gas release and be scheduled for daytime hours, thus reducing the noise impacts. Unplanned pipeline blowdowns occur only in emergency situations. Unplanned events could occur at any time but are typically infrequent and of short duration and would therefore cause temporary and minor noise impacts. All blowdowns for the Pipeline would be routed through the Terminal flaring system and are included in the above noise impacts assessment.

4.11.2.5 Noise Conclusions

Construction activities are projected to last approximately 36 months. Civil works (i.e., earth moving) could result in noise impacts greater than 55 dBA at NSA 2; pile driving maximum noise levels (L_{max}) during the peak construction period would result in noise impacts greater than 55 dBA at NSAs 1 and 2; and dredging activities at the northernmost portion of the proposed dredge footprint would result in day-night (L_{dn}) values greater than 55 dBA at NSA 1. Civil works and pile driving would only take place during daylight hours; however, dredging would occur on a 24-hour schedule and associated noise levels would result in an expected increase of 3.9 dBA (L_{dn}) relative to ambient noise levels at NSA 1. Commonwealth filed a dredging noise mitigation plan detailing the measures it would implement to reduce the projected nighttime noise levels to at or below 55 dBA L_{dn} at NSA 1 and how it would monitor the noise levels during dredging activities. We recommended above that Commonwealth monitor construction noise levels between 7:00 p.m. and 7:00 a.m. and restrict the noise attributable to construction activities to no more than 55 dBA Ldn (48.6 dBA L_{eq}) at NSAs 1 and 2. Construction of the Pipeline would not cause an increase in noise levels above expected ambient conditions at either NSA.

Operating noise levels at the Terminal would be permanent for the duration of the life of the Project. Modeling of the Terminal operating at full capacity (9.5 MTPA) and with an LNG vessel loading at the marine facility indicates noise levels at NSAs 1 and 2 would remain below the 55 dBA threshold. However, given the proximity of the modeling L_{dn} 55 dBA contour boundary to NSA 2, and that actual noise levels may be different from those obtained from modeling, we recommend above that Commonwealth conduct noise surveys after placing each liquefaction train into service and after placing the entire Terminal into service. Based on the analyses conducted and our recommendations, we conclude that operation of the Terminal would not result in significant noise impacts on the NSAs.

Start-up and normal operations-related flaring activity would not result in noise levels in exceedance of the 55 dBA threshold at either NSA. Emergency flaring activities could result in maximum (L_{max}) and day-night (L_{dn}) noise levels upwards of 70 dBA at both NSA 1 and 2. However, these events would be, by definition, emergency events and would be temporary (approximately 1 hour in duration) or during times when the NSAs are unlikely to be populated (i.e., during hurricane evacuations). Therefore, we conclude noise impacts from flaring would not be significant.

4.12 RELIABILITY AND SAFETY

4.12.1 LNG Terminal

4.12.1.1 LNG Facility Reliability, Safety, and Security Regulatory Oversight

LNG facilities handle flammable and sometimes toxic materials that can pose a risk to the public if not properly managed. These risks are managed by the companies owning the facilities, through selecting the site location and plant layout, as well as through suitable design, engineering, construction, and operation of the LNG facilities. Multiple federal agencies share regulatory authority over the LNG facilities and the operator's approach to risk management. The safety, security, and reliability of the Commonwealth LNG Project would be regulated by PHMSA, the USCG, and the FERC.

In February 2004, PHMSA, the USCG, and the FERC entered into an Interagency Agreement to ensure greater coordination among these three agencies in addressing the full range of safety and security issues at LNG terminals and LNG marine vessel operations and maximize the exchange of information related to the safety and security aspects of LNG facilities and related marine operations. Under the Interagency Agreement, the FERC is the lead federal agency responsible for the preparation of the analysis required under NEPA for impacts associated with terminal construction and operation. PHMSA and the USCG participate as cooperating agencies but remain responsible for enforcing their regulations covering LNG facility siting, design, construction, operation, and maintenance. All three agencies have some oversight and responsibility for inspection and compliance during the LNG facility's operation.

PHMSA establishes and has the authority to enforce the minimum 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.). PHMSA'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 is subject to federal pipeline safety laws (49 U.S.C. 60101 et seq.), and 49 CFR 192. On August 31, 2018, PHMSA 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, PHMSA agreed to issue an LOD stating whether a proposed LNG facility would be capable of complying with the siting requirements in Subpart B of Part 193. The Commission committed to relying upon the PHMSA's determination in conducting its review of whether the facilities would be consistent with the public interest. The issuance of the LOD does not abrogate PHMSA's continuing authority and responsibility over a proposed project's compliance with Part 193 during construction and future operation of the facility. PHMSA's conclusion on the siting and hazard analysis required by Part 193 is based on preliminary design information which may be revised as the engineering design progresses to final design. PHMSA 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 in 49 CFR 193, which would be completed during later stages of the Project. If the Project is authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, would be subject to PHMSA'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 vessel traffic, as well as over security plans for the waterfront facilities handling LNG and LNG marine vessel traffic. The USCG regulations for waterfront facilities handling LNG are codified in 33 CFR 105 and 33 CFR 127. As a cooperating agency, the USCG assists the FERC staff in evaluating whether an applicant's proposed waterway would be suitable for LNG marine vessel traffic and whether the waterfront facilities handling LNG would be operated in accordance with 33 CFR 105 and 33 CFR 127. If the facilities are constructed and become operational, the facilities would be subject to the USCG inspection program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

The FERC authorizes the siting and construction of LNG terminals under the NGA and delegated authority from the DOE. The 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 provide information on the reliability and safety of its facilities and engineering design, including how its proposed design would comply with PHMSA's requirements of 49 CFR 193. The level of detail necessary for the reliability, safety, and engineering information 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 mitigation measures for the Commission to consider for incorporation as conditions in the order. If the facilities are approved and the suggested mitigation measures are incorporated into the order as conditions, FERC staff would review material filed to satisfy the conditions of the order and conduct periodic inspections throughout construction and operation.

In addition, the Energy Policy Act of 2005 requires FERC to coordinate and consult with the DOD on the siting, construction, expansion, and operation of LNG terminals that would affect the military. On November 21, 2007, the FERC and the DOD entered into a MOU formalizing this process.[100] On April 5, 2018, the FERC received a response letter from the DOD Siting Clearinghouse stating that the Commonwealth Project would have a minimal impact on military training and operations conducted in the area.

4.12.1.2 PHMSA Siting Requirements and 49 CFR Part 193 Subpart B Determination

Siting LNG facilities, as defined in 49 CFR 193, to ensure that the proposed site selection and location would not pose an unacceptable level or risk to the safety of plant personnel and the public is required by the PHMSA's regulations in 49 CFR 193 Subpart B. The Commission's regulations under 18 CFR §380.12 (o) (14) require Commonwealth to identify how the proposed design complies with the siting requirements in PHMSA's regulations, including those under 49 CFR 193 Subpart B. The scope of PHMSA'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.[101]

The regulations in 49 CFR 193 Subpart B require the establishment of an exclusion zone surrounding an LNG facility in which an operator or government agency must exercise legal control over the activities where specified levels of thermal radiation and flammable vapors may occur in the event of a release for as long the facility is in operation. Approved mathematical models must be used to calculate the dimensions of these exclusion zones. The siting requirements specified in NFPA 59A (2001), an industry consensus standard for LNG facilities, are incorporated into 49 CFR 193 Subpart B by reference, with regulatory preemption in the event of conflict. The following sections of 49 CFR 193 Subpart B specifically address siting requirements:

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100 Memorandum of Understanding between the FERC and US DOD to ensure consultation and coordination on effect of LNG Terminals on Active Military Installations, https://www.ferc.gov/media/2007-mou-dod, access March 2022.

101 49 CFR §193.2001 (b) (3), Scope of part, excludes any matter other than siting provisions pertaining to marine cargo transfer systems between the LNG marine vessel and the last manifold (or in the absence of a manifold, the last valve) located immediately before a storage tank.

- 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 PHMSA Administrator finds a lower wind speed is justified or the most critical combination of wind velocity and duration for a 10,000-year mean return interval.

As stated in 49 CFR §193.2051, under Subpart B, LNG facilities must meet the siting requirements of NFPA 59A (2001), Chapter 2, which includes but are not limited to:

- NFPA 59A (2001) section 2.1.1 (c) requires consideration of protection against forces of nature.
- NFPA 59A (2001) section 2.1.1 (d) 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) for ignition of a design spill and fire over an impounding area 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 PHMSA.
- NFPA 59A (2001) section 2.2.3.4 requires provisions to minimize the possibility of any flammable mixture of vapors from a design spill from reaching a property line that can be built upon and that would result in a distinct hazard. Determination of the distance that the flammable vapors extend is to be determined with DEGADIS or approved alternative models that take into account physical factors influencing LNG vapor dispersion.[102]

NFPA 59A (2001) also specifies three radiant heat flux levels which must be considered for the damaging effects of fire from the LNG storage tank impounding areas for as long as the facility is in operation:

102 PHMSA 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).

- 1,600 Btu/ft2-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;[103]
- 3,000 Btu/ft2-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;[104] and
- 10,000 Btu/ft2-hr - This level cannot extend beyond the plant property line that can be built upon.[105]

NFPA 59A (2001) requires the design spill be determined in accordance with Table 2.2.3.5. For containers, design spills are based upon the largest flow from any single line or penetration below the liquid level resulting in the largest flow from an initially full container. For impounding areas serving only vaporization, process, or LNG transfer areas, the design spill is based on any single accidental leakage source. However, NFPA 59A (2001) does not define a single accidental leakage source. In order to clarify single accidental leakage source, PHMSA provides guidance on the determination of single accidental leakage sources on their website of frequently asked questions, which indicate use of 2-inch diameter holes in piping 6 inches in diameter or larger and full guillotine ruptures of piping less than 6 inches in diameter and full guillotine ruptures of transfer hoses and single ply expansion bellows.[106]

In addition, section 2.1.1 of NFPA 59A (2001) requires that factors applicable to the specific site with a bearing on the safety of plant personnel and the surrounding public must be considered, including an evaluation of potential incidents and safety measures incorporated into the design or operation of the facility. PHMSA has indicated that potential incidents, such as vapor cloud explosions and toxic releases should be considered to comply with Part 193 Subpart B.[107]

In accordance with the August 31, 2018 MOU, PHMSA issued an LOD on August 2, 2022[108] to the Commission on the 49 CFR 193 Subpart B siting requirements. The LOD provided PHMSA's analysis and conclusions regarding the proposed Project's compliance with 49 CFR 193 Subpart B for the

103 The 1,600 Btu/ft2-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 to 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.

104 The 3,000 Btu/ft2-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 to 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.

105 The 10,000 Btu/ft2-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.

106 PHMSA, LNG Plant Requirements, Frequently Asked Questions, https://www.phmsa.dot.gov/pipeline/liquified-natural-gas/lng-plant-requirements-frequently-asked-questions#ds1, accessed March 2022.

107 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 Feb. 2022.

108 "DOT PHMSA 49 CFR Part 193, Subpart B, Siting Letter of Determination (LOD) and Analysis for the Commonwealth LNG Terminal Project – Docket No. CP19-502-000" FERC eLibrary accession number 20220802-3044. "Clarification statement – DOT PHMSA 49 CFR Part 193, Subpart B, Siting Letter of Determination (LOD) and Analysis for the Commonwealth LNG Terminal Project – Docket No. CP19-502-000" FERC eLibrary accession number 20220811-3001.

Commission to consider in its decision to authorize, with or without modification or conditions, or deny an application.

4.12.1.3 Coast Guard Safety Regulatory Requirements and Letter of Recommendation

LNG Marine Vessel Historical Record

Since 1959, marine vessels have transported LNG without a major release of cargo or a major accident involving an LNG marine vessel. There are approximately 700 LNG marine vessels in operation routinely transporting LNG between approximately 200 import/export terminals currently in operation worldwide.[109,110] Since U.S. LNG terminals first began operating under FERC jurisdiction in the 1970s, there have been thousands of individual LNG marine vessel arrivals at terminals in the U.S. For more than 40 years, LNG shipping operations have been safely conducted in U.S. ports and waterways.

A review of the history of LNG maritime transportation indicates that there has not been a serious accident at sea or in a port which resulted in a spill due to rupturing of the cargo tanks. However, insurance records, industry sources, and public websites identify a number of incidents involving LNG marine vessels, including minor collisions with other marine vessels of all sizes, groundings, minor LNG releases during cargo unloading operations, and mechanical/equipment failures typical of large vessels. Some of the more significant occurrences, representing the range of incidents experienced by the worldwide LNG marine vessel fleet, are described below:

- **El Paso Paul Kayser** grounded on a rock in June 1979 in the Straits of Gibraltar during a loaded voyage from Algeria to the United States. Extensive bottom damage to the ballast tanks resulted; however, no cargo was released because no damage was done to the cargo tanks. The entire cargo of LNG was subsequently transferred to another LNG marine vessel and delivered to its U.S. destination.
- **Tellier** was blown by severe winds from its docking berth at Skikda, Algeria in February 1989 causing damage to the loading arms and the LNG marine vessel and shore piping. The cargo loading had been secured just before the wind struck, but the loading arms had not been drained. Consequently, the LNG remaining in the loading arms spilled onto the deck, causing fracture of some plating.
- **Mostefa Ben Boulaid** had an electrical fire in the engine control room during unloading at Everett, Massachusetts on February 5, 1996. The LNG marine vessel crew extinguished the fire and the ship completed unloading.
- **Khannur** had a cargo tank overfill into the LNG marine vessel's vapor handling system on September 10, 2001, during unloading at Everett, Massachusetts. Approximately 100 gallons of LNG were vented and sprayed onto the protective decking over the cargo tank dome, resulting in several cracks. After inspection by the USCG, the Khannur was allowed to discharge its LNG cargo.
- **Mostefa Ben Boulaid** had LNG spill onto its deck during loading operations in Algeria in 2002. The spill, which is believed to have been caused by overflow rather than a mechanical failure,

109 Vessel Finder, Vessel Database, LNG Tankers, https://www.vesselfinder.com/vessels?type=604, Accessed August 2022.

110 International Group of Liquefied Natural Gas Importers (GIIGNL), Annual Report, 2022 Edition, World LNG Maps, https://giignl.org/wp-content/uploads/2022/05/GIIGNL2022_Annual_Report_May24.pdf, Accessed August 2022.

caused significant brittle fracturing of the steelwork. The LNG marine vessel was required to discharge its cargo, after which it proceeded to dock for repair.

- **Norman Lady** was struck by the USS Oklahoma City nuclear submarine while the submarine was rising to periscope depth near the Strait of Gibraltar in November 2002. The 87,000 m3 LNG marine vessel, which had just unloaded its cargo at Barcelona, Spain, sustained only minor damage to the outer layer of its double hull but no damage to its cargo tanks.
- **Tenaga Lima** grounded on rocks while proceeding to open sea east of Mopko, South Korea due to strong current in November 2004. The shell plating was torn open and fractured over an approximate area of 20 by 80 feet, and internal breaches allowed water to enter the insulation space between the primary and secondary membranes. The LNG marine vessel was refloated, repaired, and returned to service.
- **Golar Freeze** moved away from its docking berth during unloading on March 14, 2006, in Savannah, Georgia. The powered emergency release couplings on the unloading arms activated as designed, and transfer operations were shut down.
- **Catalunya Spirit** lost propulsion and became adrift 35 miles east of Chatham, Massachusetts on February 11, 2008. Four tugs towed the LNG marine vessel to a safe anchorage for repairs. The Catalunya Spirit was repaired and taken to port to discharge its cargo.
- **Al Gharrafa** collided with a container ship, Hanjin Italy, in the Malacca Strait off Singapore on December 19, 2013. The bow of the Al Gharrafa and the middle of the starboard side of the Hanjin were damaged. Both ships were safely anchored after the incident. No loss of LNG was reported.
- **Al Oraiq** collided with a freight carrier, Flinterstar, near Zeebrugge, Belgium on October 6, 2015. The freight carrier sank, but the Al Oraiq was reported to have sustained only minor damage to its bow and no damage to the LNG cargo tanks. According to reports, the Al Oraiq took on a little water but was towed to the Zeebrugge LNG terminal where its cargo was unloaded using normal procedures. No loss of LNG was reported.
- **Al Khattiya** suffered damage after a collision with an oil 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 marine vessel to keep the cargo tanks cool. The collision damaged the hull and two ballast tanks on the Al Khattiya, but did not cause any injury or water pollution. No loss of LNG was reported.
- **Assem** collided with a very large crude carrier Shinyo Ocean off the Port of Fujairah on March 26, 2019. The Shinyo Ocean suffered severe portside hull height breach and the Assem had damage to its bow. Both marine vessels were unloaded at the time of the collision and subsequently no LNG or oil was released. Aseem was moved to port for anchorage and Shinyo Ocean was relocated to another point of anchorage.

LNG Marine Vessel Safety Regulatory Oversight

The USCG exercises regulatory authority over LNG marine vessels under 46 CFR 154, which contains the United States safety standards for self-propelled LNG marine vessels transporting bulk liquefied gases. The LNG marine vessels visiting the proposed facility would also be constructed and operated in accordance with the International Marine Organization (IMO), *International Convention for the Safety of Life at Sea (SOLAS)*. Since 1986, the *International Convention for the Safety of Life at Sea* Chapter VII requires LNG marine vessels to meet IMO, *International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk.* LNG marine vessels built from October 31, 1976 to July 1, 1986 would have to comply with IMO, *Code for Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* and LNG marine vessels in built and in operation before then would have to meet

IMO, *Code for Existing Ships Carrying Liquefied Gas in Bulk.* Under 46 CFR 154, no ship entering U.S. waters may carry a cargo of bulk liquid hazardous material without possessing a valid IMO Certificate of Fitness and either a USCG Certificate of Inspection (for U.S. flag vessels) or a USCG Certificate of Compliance (for foreign flag vessels). These documents certify that the LNG marine vessel is designed and operating in accordance with both international standards and the U.S. regulations for bulk LNG marine vessels under 46 CFR 154.

Pilotage is compulsory for foreign marine vessels and U.S. marine vessels under registry in foreign trade when in U.S. waters. All deep draft marine vessels currently entering the shared waterway would employ a U.S. pilot. The National Vessel Movement Center in the U.S. would require a 96-hour advance notice of arrival for deep draft marine vessels calling on U.S. ports. During transit, LNG marine vessels would be required to maintain voice contact with controllers and check in on designated frequencies at established way points.

The LNG marine vessels that would deliver or receive LNG to or from a 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 ships and ports to conduct vulnerability assessments and to develop security plans. The purpose of the code is to prevent and suppress terrorism against ships; improve security aboard ships and ashore; and reduce the risk to passengers, crew, and port personnel on board ships and in port areas. All LNG marine vessels, as well as other cargo vessels (e.g., 500 gross tons and larger), and ports servicing those regulated vessels, must adhere to the IMO standards. Some of the IMO requirements for ships are as follows:

- marine vessels must develop security plans and have a Vessel Security Officer;
- marine vessels must have a ship security alert system to transmit ship-to-shore security alerts identifying the ship, its location, and indication that the security of the ship 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 ships; and
- marine vessels may have equipment onboard to help maintain or enhance the physical security of the ship.

In 2002, the Maritime Transportation Security Act (MTSA) was enacted by the U.S. Congress and aligned domestic regulations with the maritime security standards of the IMO, *International Ship and Port Facility Security Code;* IMO, *Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk;* and IMO, *International Convention for the Safety of Life at Sea*. The USCG's regulations in 33 CFR 104 require marine vessels to conduct a vessel security assessment and develop a vessel security plan that addresses each vulnerability identified in the vessel security assessments. All LNG marine vessels servicing the facility would have to comply with the MTSA requirements and associated regulations while in U.S. waters.

The USCG also exercises regulatory authority over LNG facilities that affect the safety and security of port areas and navigable waterways under EO 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 marine vessel engineering and safety standards, and all matters pertaining to the safety of facilities or equipment located in or adjacent to navigable waters up to the last valve immediately before the receiving tanks. The USCG also has authority for LNG 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 marine vessel and the last manifold or valve immediately before the receiving tanks. Title 33 CFR 127 applies to the marine transfer area for LNG of each new waterfront facility handling LNG and to new construction in the marine transfer areas for LNG of each existing waterfront facility handling LNG. The scope of the regulations includes the design, construction, equipment, operations, inspections, maintenance, testing, personnel training, and firefighting 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, Commonwealth would be required to submit copies of its Operations and Emergency Manuals to the USCG Captain of the Port (COTP) for examination.

An LNG marine vessel's transit to the terminal would begin at the pilot boarding station located at the channel's sea buoy in the Gulf of Mexico outside the Calcasieu River. The LNG marine vessel then would travel northward approximately 32 nautical miles (NM) toward the Cameron Jetties, which marks the mouth of the Calcasieu River. Once a vessel passes the Cameron Jetties, the LNG carriers would continue up the channel approximately 0.5 NM before reaching the proposed turning basin at the Commonwealth facility. The route would be reversed for outbound LNG marine vessel transits.

Commonwealth LNG Project's Waterway Suitability Assessment

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 to submit a 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 proposed facility and transit routes. It provides an overview of the expected impacts LNG operations may have on the port and the waterway. Generally, the Preliminary WSA does not contain detailed studies or conclusions. This document is used by the COTP to begin his or her evaluation of the suitability of the waterway for LNG marine traffic. The Preliminary WSA must provide an initial explanation of the following:

- port characterization;
- characterization of the LNG facility and the LNG marine vessel route;
- risk assessment for maritime safety and security;
- risk management strategies; and
- resource needs for maritime safety, security, and response.

A Follow-On WSA must be provided no later than the date the owner/operator files an application with FERC, but in all cases at least 180 days prior to transferring LNG. The Follow-on WSA must provide a detailed and accurate characterization of the waterfront facilities handling LNG, the LNG marine vessel route, and the port area. The Follow-on WSA provides a complete analysis of the topics outlined in the Preliminary WSA. It should identify credible security threats and navigational safety hazards for the LNG marine vessel traffic, along with appropriate risk management measures and the resources (i.e., federal, state, local, and private sector) needed to carry out those measures. Until a facility begins operation, applicants must also annually review their WSAs and submit a report to the COTP as to whether changes are required. This document is reviewed and validated by the USCG and forms the basis for the agency's LOR to the FERC.

In order to provide the USCG COTPs/Federal Maritime Security Coordinators, members of the LNG industry, and port stakeholders with guidance on assessing the suitability of a waterway for LNG marine traffic, the USCG has published a Navigation and Vessel Inspection Circular – *Guidance on Assessing the Suitability of a Waterway for Liquefied Natural Gas Marine Traffic* (NVIC 01-11).

NVIC 01-11 directs the use of the three concentric Zones of Concern, based on LNG marine vessels with a cargo carrying capacity up to 265,000 m^3, used to assess the maritime safety and security risks of LNG marine traffic. The Zones of Concern are:

- Zone 1 – impacts on structures and organisms are expected to be significant within 500 meters (1,640 feet). The outer perimeter of Zone 1 is approximately the distance to thermal hazards of 37.5 kilowatts per square meter (kW/m^2) (approximately 12,000 Btu/ft^2-hr) from a pool fire.[111]
- 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.[112]
- Zone 3 – impacts on people and property from a pool fire or an unignited 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 credible worst-case unignited release. Impacts to people and property could be significant if the vapor cloud reaches an ignition source and burns back to the source.

Like the USCG, FERC staff also uses characteristics of the structures and population within the Zones of Concern for accidental and intentional events to identify challenges to evacuating or sheltering in place to inform its review of emergency response plans and corresponding cost sharing plans, which are described in more detail in the Onsite and Offsite Emergency Response Plans Section.

On July 23, 2017, Commonwealth submitted a LOI and a Preliminary WSA to the COTP, Sector Port Arthur, to notify the USCG that it proposed to construct an LNG export terminal. In addition, Commonwealth submitted a follow-on WSA to the USCG on November 15, 2018. On February 28, 2019, the USCG accepted the Project's Follow-on WSA.

U.S. Coast Guard Letter of Recommendation and Analysis

Once the applicant submits a complete Follow-On WSA, the USCG reviews the document to determine if it presents a realistic and credible analysis of the public safety and security implications from LNG marine traffic both in the waterway and when in port. As required by its regulations (33 CFR §127.009), the USCG is responsible for issuing a LOR to the FERC regarding the suitability of the waterway for LNG marine traffic with respect to the following items:

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111 The 37.5kW/m^2 (approximately 12,000 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 less than 10 seconds, and 100 percent mortality in approximately 30 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.

112 The 5kW/m^2 flux level is associated with producing pain in less than 15 seconds, first degree burns in 20 seconds, second degree burns in approximately 30 to 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 an average 10-minute exposure.

- physical location and description of the facility;
- the LNG marine vessel's characteristics and the frequency of LNG shipments to or from the facility;
- waterway channels and commercial, industrial, environmentally sensitive, and residential areas in and adjacent to the waterway used by LNG marine vessels en route to the facility, within 25 kilometers (15.5 miles) of the facility;
- density and character of marine traffic in the waterway;
- locks, bridges, or other manmade obstructions in the waterway;
- depth of water;
- tidal range;
- protection from high seas;
- natural hazards, including reefs, rocks, and sandbars;
- underwater pipes and cables; and
- distance of berthed LNG marine vessels from the channel and the width of the channel.

The USCG may also prepare an LOR Analysis, which serves as a record of review of the LOR and contains detailed information along with the rationale used in assessing the suitability of the waterway for LNG marine traffic.

In a letter dated March 7, 2019, the USCG issued an LOR and LOR Analysis to FERC stating that the Calcasieu River Ship Channel would be considered suitable for accommodating the type and frequency of LNG marine traffic associated with this Project. As part of its assessment of the safety and security aspects of this Project, the COTP Sector Port Arthur consulted a variety of stakeholders including the Area Maritime Security Committees, Harbor Safety Committees, state representatives, pilot organizations, and local emergency responders. The LOR was based on full implementation of the strategies and risk management measures identified by the USCG to Commonwealth in its WSA.

Although Commonwealth has suggested mitigation measures for responsibly managing the maritime safety and security risks associated with LNG marine traffic, the necessary 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 and submit a report to the USCG identifying any changes in conditions, such as changes to the port environment, the LNG facility, or the LNG marine vessel route, that would affect the suitability of the waterway for LNG marine traffic.

The USCG's LOR is a recommendation, regarding the current status of the waterway, to the FERC, the lead agency responsible for siting the on-shore LNG facility. Neither the USCG nor the FERC has authority to require waterway resources of anyone other than the applicant under any statutory authority or under the 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 would be necessary to safeguard the public health and welfare, critical infrastructure and key resources, the port, the marine environment, and the LNG marine vessel.

Under the Ports and Waterways Safety Act, the Magnuson Act, the MTSA, and the Security and Accountability For Every Port Act, the COTP has the authority to prohibit LNG transfer or LNG marine vessel movements within his or her area of responsibility if he or she determines that such action is necessary to protect the waterway, port, or marine environment. If this Project is approved and if appropriate resources are not in place prior to LNG marine vessel movement along the waterway, then the

COTP would consider at that time what, if any, vessel traffic and/or facility control measures would be appropriate to adequately address navigational safety and maritime security considerations.

4.12.1.4 LNG Facility Security Regulatory Requirements

The security requirements for the proposed project are governed by 33 CFR 105 and 49 CFR 193 Subpart–J - Security. Title 33 CFR 105, as authorized by the MTSA, 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. Commonwealth 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, vessel and facility operations, conditions, security measures, emergency preparedness, response, and contingency plans, who would be responsible for implementing the FSA and FSP and performing an annual audit for the life of the Project;
- conducting an FSA to identify site vulnerabilities, possible security threats and consequences of an attack, and facility protective measures; developing a FSP based on the FSA, with procedures for: responding to transportation security incidents; notification and coordination with federal, state, and local authorities; prevention of unauthorized access; measures to prevent or deter entrance with dangerous substances or devices; training; and evacuation;
- defining the security organizational structure with facility personnel with knowledge or training in current security threats and patterns; recognition and detection of dangerous substances and devices, recognition of characteristics and behavioral patterns of persons who are likely to threaten security; techniques to circumvent security measures; emergency procedures and contingency plans; operation, testing, calibration, and maintenance of security equipment; and inspection, control, monitoring, and screening techniques;
- implementing scalable security measures to provide increasing levels of security at increasing maritime security levels for facility access control, restricted areas, cargo handling, LNG marine vessel stores and bunkers, and monitoring; ensuring that the Transportation Worker Identification Credential (TWIC) program is properly implemented;
- ensuring coordination of shore leave for LNG marine vessel personnel or crew change out as well as access through the facility for visitors to the LNG marine vessel;
- conducting drills and exercises to test the proficiency of security and facility personnel on a quarterly and annual basis; and
- reporting all breaches of security and transportation security incidents to the National Response Center.

Title 33 CFR 127 has requirements for lighting and emergency power. In addition, an LNG facility regulated under 33 CFR 105 would be subject to the TWIC Reader Requirements Rule issued by the USCG on August 23, 2016. This rule requires owners and operators of certain 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 USCG's June 22, 2018 notice initially delayed the effective date to implement this rule to August 23, 2021. Subsequently, USCG's June, 2022 final rule further delayed the effective date to implement requirements for electronic inspections of TWICs for facilities that handle certain dangerous cargoes in bulk and transfer such cargoes from or to a vessel to May 8, 2026. Although the implementation of this rule has been postponed, the company should 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 components of LNG facilities, as defined in 49 CFR 193, including requirements for conducting security inspections and patrols, liaison with local law enforcement officials, design and construction of protective enclosures, lighting, monitoring, alternative power sources, and warning signs. If the Project is authorized, constructed, and operated, it would be subject to the security requirements of 33 CFR 105 and 49 CFR 193 Subpart J and the respective USCG and PHMSA inspection and enforcement programs.

As part of its application to FERC, Commonwealth provided preliminary information on security features and indicated additional details would be completed in the final design. The details of these systems and are assessment of them are not described in this document as they are considered Critical Energy Infrastructure Information. We recommend in section 4.12.1.6 that Commonwealth provide final design details on these security features for review and approval, including:

- vehicle barrier and controlled access point drawings that demonstrate crash-rated barriers are provided to prevent uncontrolled access, inadvertent entry, and impacts to components containing hazardous fluids from vehicles;
- fencing drawings that demonstrate a fence would deter or mitigate entry along the perimeter of the entire facility and is set back from exterior structures and vegetation, and from interior hazardous piping and equipment by at least 10 feet;
- camera coverage drawings that illustrate camera characteristics and coverage areas of each camera such that the entire perimeter of the plant is covered with redundancy and the interior of plant is covered, including a camera be provided at the top of each LNG storage tank, within pretreatment areas, within liquefaction areas, within truck transfer areas, within marine transfer areas, and buildings; and
- photometric analyses or equivalent and associated lighting coverage drawings that illustrate the lux levels at the interior of the terminal along the perimeter fence line and along paths/roads of access and egress are in accordance with API 540, and applicable federal regulations.

Furthermore, in accordance with the February 2004 Interagency Agreement among FERC, PHMSA, and USCG, FERC staff would collaborate with the USCG and PHMSA on the Project's security features.

4.12.1.5 FERC Engineering and Technical Review of the Preliminary Engineering Designs

LNG Facility Historical Record

The operating history of the U.S. LNG industry has been free of safety-related incidents resulting in adverse effects on the public or the environment with the exception of the October 20, 1944, failure at an LNG plant in Cleveland, Ohio. The 1944 incident in Cleveland led to a fire that killed 128 people and injured 200 to 400 more people.[113] 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

113 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.

constructed properly to contain a spill at the site. To ensure that this potential hazard would be addressed for proposed LNG facilities, we evaluate the preliminary and final specifications for suitable materials of construction and for the design of spill containment systems that would properly contain a spill at the site.

Another operational accident occurred in 1979 at the Cove Point LNG plant in Lusby, Maryland. A pump electrical seal located on a submerged electrical motor LNG pump leaked causing flammable gas vapors to enter an electrical conduit and settle in a confined space. When a worker switched off a circuit breaker, the flammable gas ignited, causing severe damage to the building and a worker fatality. With the participation of the FERC, lessons learned from the 1979 Cove Point accident led to changes in the national fire codes to better ensure that the situation would not occur again. To ensure that this potential hazard would be addressed for proposed facilities that have electrical seal interfaces, we evaluated the preliminary designs and recommend in section 4.12.1.6 that Commonwealth provide, for review and approval, the final design details of the electrical seal design at the interface between flammable fluids and the electrical conduit or wiring system, details of the electrical seal leak detection system, and the details of a downstream physical break (i.e. air gap) in the electrical conduit to prevent the migration of flammable vapors.

On January 19, 2004, a blast occurred at Sonatrach's Skikda, Algeria, LNG liquefaction plant that killed 27 and injured 56 workers. No members of the public were injured. Findings of the accident investigation suggested that a cold hydrocarbon leak occurred at Liquefaction Train 40 and was introduced into a high-pressure steam boiler by the combustion air fan. An explosion developed inside the boiler firebox, which subsequently triggered a larger explosion of the hydrocarbon vapors in the immediate vicinity. The resulting fire damaged the adjacent liquefaction process and liquid petroleum gas separation equipment of Train 40 and spread to Trains 20 and 30. Although Trains 10, 20, and 30 had been modernized in 1998 and 1999, Train 40 had been operating with its original equipment since start-up in 1981. To ensure that this potential hazard would be addressed for proposed facilities, we evaluated the preliminary design for mitigation of flammable vapor dispersion and ignition in buildings and combustion equipment to ensure they would be adequately covered by hazard detection equipment that could isolate and deactivate any combustion equipment whose continued operation could add to or sustain an emergency. We also recommend in section 4.12.1.6 that Commonwealth provide, for review and approval, the final design details of hazard detection equipment, including the location and elevation of all detection equipment, instrument tag numbers, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment.

On March 31, 2014, a detonation occurred within a gas heater at Northwest Pipeline Corporation's LNG peak-shaving plant in Plymouth, Washington.[114] 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 for proposed facilities, we recommend in section 4.12.1.6 that Commonwealth 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

114 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.

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*.

On June 8, 2022, a pipe rupture and subsequent fireball and fire occurred at Freeport's LNG terminal near Quintana, Texas. On June 9, 2022, the U.S. Coast Guard issued an order (2022-0074) to Freeport LNG suspending all transfer operations to or from any vessel. On June 30, 2022, the Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) issued a Notice of Proposed Safety Order (CPF 4-2022-051-NOPSO) requiring Freeport LNG Development, L.P. (Freeport LNG) to take certain measures. In addition, on June 30, 2022, FERC issued a letter requiring Freeport to receive written authorization before restarting any non-emergency operations in existing facilities, constructing new or modified facilities, and commissioning and placing any facilities back into service. Such authorization will only be granted following a determination that the facilities are fit for service and acceptable measures have been put into place to safely return facilities to operation. Lessons learned from the incident will also be applied to other facilities, as needed. We recommend certain modifications to recommendations in section 4.12.1.6 to address some of the preliminary findings in this regard.

We also recommend in section 4.12.1.6 that Commonwealth provide, for review and approval, operating and maintenance plans, including safety procedures, prior to commissioning. In evaluating such plans, we would assess whether the plans cover all standard operations, including purging activities associated with startup and shutdown. Also, in order to prevent other sources of projectiles from affecting occupied buildings and storage tanks, we recommend in section 4.12.1.6 that Commonwealth 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 Preliminary Engineering Review

FERC requires an applicant to provide safety, reliability, and engineering design information as part of its application, including hazard identification studies and front-end-engineering-design (FEED) information for its proposed Project. FERC staff evaluates this information with a focus on potential hazards from within and nearby the site, including external events, which may have the potential to cause damage or failure to the Project facilities, and the engineering design and safety and reliability concepts of the various protection layers to mitigate the risks of potential hazards.

The primary concerns are those events that could lead to a hazardous release of sufficient magnitude to create an offsite hazard or interruption of service. Furthermore, the potential hazards are dictated by the site location and the engineering details. In general, FERC staff considers an acceptable design to include various layers of protection or safeguards to reduce the risk of a potentially hazardous scenario from developing into an event that could impact the 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 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, state, and federal emergency management officials and first responders, to mitigate the consequences of a release and prevent it from escalating to an event that could impact the public.

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 proposed project in final design if authorization is granted by the Commission.

The reliability of these layers of protection is informed by occurrence and likelihood of root causes and the potential severity of consequences based on past incidents and validated hazard modeling. As a result of the continuous engineering review, we recommend mitigation measures and continuous oversight to the Commission for consideration to include as conditions in the order. If a facility is authorized and recommendations are adopted as conditions to the order, FERC staff would continue its engineering review through final design, construction, commissioning, and operation.

Process Design

Commonwealth provided a narrative description and engineering information on the process design as part of its application consistent with FERC, Guidance Manual for Environmental Report Preparation for Applications filed under the Natural Gas Act, Volume II, Liquefied Natural Gas Project Resource Reports 11 & 13 Supplemental Guidance, 2017. The process engineering information includes narrative descriptions of each major system of the LNG facilities and process design information, including, but not limited to: basis of design and design philosophies, process flow diagrams (PFDs), Heat and Material Balances (HMBs), piping and instrumentation drawings (P&IDs), and equipment lists and datasheets. This engineering design information in the 2017 Guidance Manual and application are consistent with the engineering design defined in NFPA 59A (2019) 3.3.9 and examples of such listed in NFPA 59A (2019) Annex A.3.3.9.

Title 49 CFR 193 and 33 CFR 127 have relatively minimal to no requirements on the process design. Title 49 CFR §193.2703, under Subpart H, does require that persons used for the design have demonstrated competence by training or experience in the design of comparable components and similar designer competence requirements in NFPA 59A (2001 and thereafter) and there are some other general requirements for material compatibility, isolation valves, shutdown valves, emergency shutdown, and pressure relief valves, which we will describe in applicable descriptions of each major process system; however, there is minimal to no specific requirements on the process design necessary to reliably and safely operate the LNG facilities. For example, in order to liquefy natural gas, most liquefaction technologies require that the feed gas stream be pre-treated to remove components that could freeze out and clog the liquefaction equipment or would otherwise be incompatible with the liquefaction process or equipment, including mercury, H_2S, CO_2, water, and heavy hydrocarbons. If water and carbon dioxide are not removed to certain concentrations the downstream plate heat exchangers could clog and over-pressurize leading to a catastrophic failure of equipment or if mercury is not limited to certain concentrations it can induce embrittlement and corrosion of downstream brazed aluminum heat exchangers resulting in a catastrophic failure of equipment. However, there are no requirements that water, carbon dioxide, or mercury be removed and applications have not always included these features. Therefore, FERC engineering staff evaluated the FEED process design information to better ensure that the LNG facilities would reliably and safely operate. As part of the process design review, FERC staff also evaluated the piping and instrumentation (P&ID) drawings to verify equipment operating and design conditions consistent with the PFDs and HMBs and that adequate process monitoring, controls, and shutdowns are in place consistent with the operating and design conditions and that their reliability or redundancy is commensurate with potential consequences of failure. However, the FEED P&IDs are subject to have changes in final design after additional details and engineering is conducted. Therefore, we recommend in section 4.12.1.6 that Commonwealth provide updated P&IDs reflective of the final design. In addition, the margins between operating and design conditions would not be finalized until final design and many of the instrumentation and control set points would not be determined until final design. Therefore, we recommend in section 4.12.1.6 that Commonwealth file the safe operating limits (upper and lower), alarm and shutdown set points for all instrumentation (e.g., temperature, pressures, flows, and compositions). Below we discuss each major system in the proposed LNG export terminal and specific requirements and recommendations applicable to those major systems based upon our process design review. DOT PHMSA and USCG would be responsible for enforcing any of the applicable minimum federal requirements in their respective regulations that would be applicable.

The inlet feed gas would first pass through an insulating kit, followed by a high integrity pressure protection system (HIPPS). A HIPPS often is specified downstream of the feed gas pressure control and consists of three or more pressure monitors and indicators that commonly would automatically shutdown the feed gas flow in the event two or more pressure monitors exceed the design pressure of downstream equipment. HIPPS (or other systems) are specified to prevent over-pressurization of downstream equipment. FERC staff noted the feed gas coalescer design pressure and associated PSV set pressures would match the HIPPS specified pressure. However, the equipment downstream of the HIPPS and Feed Gas Coalescer would have a lower design pressure than the HIPPS set point. As a result, the HIPPS would not protect downstream equipment from upsets in the pipeline which result in pressures to the process higher than the design pressures but lower than the HIPPS set pressure. Therefore, we recommend in section 4.12.1.6 that Commonwealth ensure that all piping, equipment, and PSVs between the HIPPS and the downstream pressure regulators have designs and set pressures that are equal to the HIPPS specified pressure, or that Commonwealth provide justification for why these designs and set pressures are different from the HIPPS specified pressure.

The inlet feed gas would be conditioned to remove solids and water droplets in a coalescer prior to entering feed gas pretreatment processes. Some inlet gas would be taken off as supplemental fuel gas for use in start-up operations, fuel gas, and gas turbines. Once the inlet gas is conditioned, the feed gas would enter the mercury removal system to reduce the mercury concentration in the feed gas. As aforementioned, mercury removal is often specified to prevent mercury embrittlement and corrosion of downstream brazed aluminum heat exchangers.

After mercury removal, the feed gas would contact an amine-based solvent solution in the acid gas absorber column to remove the H_2S and CO_2 (i.e., acid gas) present in the feed gas, which, as mentioned, is designed to prevent freezing in the liquefaction process that can lead to lesser performance, more frequent deriming (thawing and disposal of frozen components of the feed gas), or clogging of the downstream heat exchangers that if not derimed can lead to failure from over-pressurization. Acid gas can also increase corrosion rates in certain common materials of construction, depending on pressure and concentration, such as carbon steel, used to handle the relatively warmer natural gas prior to the refrigeration and liquefaction of the natural gas. Once the acid gas components accumulate in the amine solution, the acid gas rich amine solution would be routed to an amine regenerator column that utilizes a reboiler. Contact with the reboiler discharge would regenerate the acid gas rich amine solution back to an acid gas lean amine solution by using heat to release the acid gas. The regenerated amine solution would be recycled back to the acid gas absorber column and the removed acid gas would be sent through a sulfur removal unit to remove H_2S. FERC staff noted that the design includes a swan neck upstream of the acid gas removal column to prevent backflow. Commonwealth indicated that the swan neck was intended to prevent liquid backflow, and that the calculated liquid inventory determined the height of the swan neck. However, Commonwealth did not provide documentation supporting the design basis of the swan neck. Therefore, we recommend in section 4.12.1.6 that Commonwealth provide a check valve upstream of the acid gas removal column or provide a dynamic simulation that demonstrates that the swan neck would be sufficient for preventing backflow.

The acid gas stream would then be routed to thermal oxidizers, where CO_2, trace amounts of H_2S not removed in the sulfur removal unit, and trace amounts of hydrocarbons would be incinerated. A thermal oxidizer is commonly specified downstream of a sulfur removal unit to further reduce emissions and decrease hazard footprints over just venting the acid gas stream. In the event the thermal oxidizers are not available, the acid gas would be disposed of through the wet flare. The feed gas exiting the acid gas absorber column would be cooled, and then sent to a separator where bulk water would be recovered and recycled back to the acid gas absorber column. After the separator, any remaining water in the feed gas would be removed using regenerative molecular sieve beds. During the molecular sieve bed regeneration process, heated regeneration gas would release water from the molecular sieve beds. The three molecular sieve beds would operate in staggered adsorption and regeneration, such that the overall process would be continuous. Water collected during the molecular sieve regeneration process would be routed back to the acid gas absorber column.

After water removal, the treated gas would flow to the natural gas liquids (NGL) extraction unit. Heavier hydrocarbons are removed to prevent freezing of the heavier hydrocarbons in the liquefaction process that can lead to lesser performance, more frequent deriming, or clogging of the downstream heat exchangers that if not derimed can lead to failure from over-pressurization. The NGL extraction unit would consist of a main cold box, a low temperature separator, and a demethanizer column with an overhead heat exchanger and a reboiler. First, the dry feed gas stream would be cooled in the main cold box, then sent to a low temperature separator where the feed gas would be separated from NGLs. The NGL stream exiting the low temperature separator would enter the demethanizer column near the middle. The demethanizer liquid bottoms would be sent to the debutanizer column. The debutanizer column and reflux accumulator vessel would separate the entering liquid stream into three streams: propane-rich fuel gas, which would be sent to a fuel gas scrubber; NGLs, which would be recycled to the main cold box; and hydrocarbon condensate, which would be sent to a storage tank for truck loading. The flashed feed gas stream exiting the low temperature separator would enter the demethanizer column near the top. The purified gas would exit the top of the demethanizer column, where it would be used to cool upstream feed gas and would then be sent to the liquefaction unit.

The liquefaction unit would consist of three heat exchanger bundles: warm, middle, and cold. The gas from the demethanizer column would enter the warm bundle first and would be progressively cooled and liquefied as it passed to the middle and the cold bundles. The LNG exiting the cold bundle would be sent to six full containment LNG storage tanks.

In order to achieve the cryogenic temperatures needed to liquefy the natural gas stream in the above process, the gas would be cooled by a thermal exchange process driven by a closed loop refrigeration system using a single mixed refrigerant (MR). The single mixed refrigerant would be comprised of a mixture of nitrogen, methane, ethylene, propane, and isopentane. Methane would be provided from the treated dry feed gas stream entering the refrigeration process and the other refrigerants required for the liquefaction process would be delivered by truck and stored onsite for initial filling and use, as needed, for make-up. Truck unloading facilities would be provided to unload make-up refrigerants. Individual mercury removal beds would be provided for ethylene, propane, and isopentane. Individual dehydration vessels would also be provided for propane and isopentane.

The MR would flow in a closed loop through each heat exchanger bundle. MR would flow in tubes parallel with the feed gas, then would exit and reenter the bundle and flow counter currently to the feed gas on the shell side. The three bundles would be connected in series such that MR flowing on the shell side of the cold bundle would flow down to the shell side of the middle bundle, and then the middle bundle to the warm bundle. As a result, all MR would exit the bundles at the outlet of the warm bundle as vapor, where it would then be compressed, cooled, and sent back to the liquefaction unit heat exchanger bundle. FERC staff evaluated the process flow diagrams (PFDs) and heat and material balances (HMBs) to determine the liquefaction capacities relative to the requested capacity in the application. The application requests exports with peak rates of up to 9.5 MTPA. FERC staff confirmed the HMBs support the application export capacity in terms of net maximum production during low ambient conditions. However, HMBs may be updated in final design that increase liquefaction production without increasing export capacity, therefore we recommend in section 4.12.1.6 that Commonwealth provide updated PFDs and HMBs and any other engineering documentation that demonstrates the design would be capable of liquefying natural gas and producing LNG for up to 9.5 MTPA export capacity.

During liquefaction operation, LNG from each of the six liquefaction trains would be sent to the six LNG storage tanks. Each LNG storage tank is designed to receive LNG rundown from two liquefaction trains. NFPA 59A (2001) section 11.3.7 requires that when making bulk transfer into stationary storage containers, the LNG be compatible in composition or temperature and density with the LNG already in the containers, or where they are incompatible, means shall be taken to prevent stratification, which might result in "rollover" and excessive vapor evolution. NFPA 59A (2001) section 4.1.2.4 also requires all LNG containers be designed to accommodate both top and bottom filling unless other positive means are provided to prevent stratification. Commonwealth's tank design indicates both top and bottom fill and procedures for bulk transfer would be developed during design and construction. The LNG storage tanks represent the potential largest hazard if there is a failure. Therefore, we ensure there are multiple redundancies for monitoring and controlling the liquid level, pressure, and temperatures. Title 49 CFR 193 incorporates NFPA 59A (2001), which specifies in sections 7.1.1.1 that LNG storage containers be equipped with two independent liquid level gauging devices and in section 7.1.1.2 that the LNG storage containers be also equipped with two independent high liquid level alarms, which may be part of the liquid level gauging devices, and that the alarms are audible to the operators and would be set so that the operator has sufficient time to stop the flow without exceeding the maximum permitted filling height. NFPA 59A (2001) section 7.1.1.3 also specifies LNG containers be equipped with a high liquid flow cutoff device, which shall be separate from all gauges. In this regard, we recommend in section 4.12.1.6 that Commonwealth provide each LNG storage tank with a fill flow measurement with a high flow alarm as another means of monitoring and controlling liquid flow into the tank.

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) and would be routed through a marine transfer line and multiple liquid marine transfer arms connected to an LNG marine vessel. The marine transfer lines have several emergency shutoff valves between the LNG storage tank pumps and the loading arms. A sudden closure of the shutoff valves could cause surge pressures that exceed allowable pressures. To mitigate the pressure surge effects, Commonwealth would install a surge vessel on the Jetty. We recommend in section 4.12.1.6 that Commonwealth file an evaluation demonstrating the pressure surge events do not exceed the design pressures. To keep the marine transfer line cold between LNG export cargoes and avoid a cooldown prior to every marine vessel loading operation, an LNG recirculation line would maintain the marine transfer line temperature between ship loading operations. The LNG transferred to the LNG marine vessel would displace vapors from the marine vessel. Displaced vapors would be routed through a vapor marine transfer arm, a vapor return line, and into the BOG header. Once loaded, the LNG marine vessel would disconnect and leave for export.

Low pressure BOG generated from stored LNG (LNG is continuously boiling) and vapors returned during LNG marine vessel filling operations would be compressed and would either be routed to the fuel gas system, recycled back to the main cryogenic heat exchanger to be liquefied, or sent to the vacuum gas header to supply pad gas to the LNG storage tanks to mitigate a vacuum condition. NFPA 59A (2001) section 3.4.5 requires a BOG and flash gas handling system separate from pressure relief valves and that the BOG and flash gas discharge safely into the atmosphere or into a closed system and so that it cannot normally inspirate air during operation. The closed BOG system would prevent the release of BOG to the atmosphere and would be in accordance with NFPA 59A (2001). This would be an inherently safer design when compared to allowing the BOG to vent to the atmosphere. However, the BOG system is the only source of vacuum breaker gas for the LNG storage tanks. If the BOG compressors were off-line, vacuum breaker gas could still be drawn from the process stream prior to the MCHE. However, in the event of long periods of liquefaction shutdown, the train would be shut down and there would be no source of vacuum breaker gas for the LNG storage tanks, which could cause it to inspirate air through the vacuum relief valves. It is common to have a secondary source of vacuum breaker gas often directly from the pipeline. Therefore, we recommend in section 4.12.1.6 that Commonwealth provide a secondary source of vacuum breaker gas that does not rely on the operation of the liquefaction facilities. NFPA 59A (2001) section 7.2 also requires each container be equipped with a pressure gauge connected to the container at a point above the maximum intended liquid level. However, NFPA 59A (2019) edition requires each LNG container to be equipped with a minimum of two independent pressure gauging devices for continuous monitoring with high and low pressure alarms. Commonwealth's tank design indicates it would meet these requirements. NFPA 59A (2001) section 4.7.3 also lists several scenarios which must be considered in sizing the pressure and vacuum safety relief valves for the LNG storage tanks. Commonwealth provided sizing calculations for the pressure and vacuum safety relief valves associated with the LNG storage tanks. In addition, we also recommend in section 4.12.1.6 that Commonwealth should specify a discretionary vent valve on each LNG storage tank that is operable through the Distributed Control System (DCS), so that it has a means of better controlling the pressure within the tank other than the pressure relief valves in the event the BOG handling system is down. In addition, we recommend in section 4.12.1.6 that Commonwealth install a car sealed open manual block valve upstream of the discretionary vent valve to allow maintenance of it and prevent inadvertent isolation of it.

The Project would include many utilities and associated auxiliary equipment. The major auxiliary systems required for the operation of the liquefaction facility include BOG, fuel gas, flares, instrument and utility air supply, water supply, demineralized water, steam, hot oil, glycol water, nitrogen, diesel, and backup power.

Three flare systems (i.e., wet, dry, and dock flares) would be designed to handle and control the vent gases from the process areas. The wet, dry, and spare flare would be routed to separate elevated flare tips located in a common derrick. The dock flare would be routed to a dedicated elevated flare. The pressure relief valves, blowdown valves, and vent and flare systems were evaluated to ensure they were consistent with operating and design pressures and sizing scenarios that are consistent with NFPA 59A, API 520 and API 521. The safety relief valves would be designed to handle process upsets and thermal expansion. NFPA 59A (2001) section 6.8.2 requires thermal expansion relief valves be installed as required to prevent overpressure in any section of a liquid or cold vapor piping that can be isolated by valves. FERC staff notes Commonwealth's P&IDs showed numerous piping segments which did not show adequate over-pressure protection for process fluids susceptible to thermal expansion. We recommend in section 4.12.1.6

that Commonwealth provided updated P&IDs for review and approval. FERC staff would coordinate any findings with PHMSA, which would be responsible for enforcement of the requirements in their regulations. In addition, piping and instrumentation drawings typically show more than one pressure relief valves on the refrigerant storage, hot oil storage, and LNG storage vessels. However, most of Commonwealth's drawings note the quantity of relief valves for these vessels is on hold. Given the increased consequences for incidents involving the process vessels, and storage vessels that handle ethylene, propane, isopentane, condensate, and LNG, we recommend in section 4.12.1.6 Commonwealth provide spare pressure relief valves to provide overpressure protection for these vessels when a PSV is offline for testing or maintenance. Vent and flare systems were also evaluated for preliminary sizing and that the flammable vapors and radiant heat would not pose a hazard consistent with the limits in API 521. However, sizing and hazard calculations would not be finalized until final design. Therefore, we recommend in section 4.12.1.6 that Commonwealth provide final design information on pressure and vacuum relief devices, vent stack, 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 referenced and other recommended and generally accepted good engineering practices.

An onsite simple-cycle power plant with gas turbines generator drivers would provide electricity for the facility. Back-up power would be provided by the local co-op utility and power to equipment essential for safe shutdown is also powered by an emergency diesel generator. A power management system would be utilized to shed nonessential loads following a simple cycle turbine upset. A diesel storage tank would be provided to supply three diesel firewater pumps and the emergency backup generator. The diesel generator would include black-start capability. Additionally, a battery back-up system would provide emergency power for essential services.

Hot oil would provide heat to the Inlet Gas Preheater, Amine Regenerator Reboiler, Regeneration Gas Hot Oil Heater, Demethanizer Reboiler, and Debutanizer Reboiler. The hot oil would be heated by waste heat from mixed refrigerant compressor gas turbine exhaust, and a fired heater would be used during start-up.

Air compressors would provide both instrument air and utility air to the facility. To provide instrument air for safe plant shutdowns, two air compressors would be connected to the essential load bus which can receive power from the backup generator.

Trucks would fill a liquid nitrogen storage tank and vaporizers would supply high purity gaseous nitrogen for refrigerant make-up. This high purity nitrogen would also provide a backup to the instrument air system and the low purity nitrogen system. Site generated low purity nitrogen would be produced by a pressure swing adsorption system and would be used for purging activities, blanketing, and utility stations.

The failure of process equipment could pose potential harm if not properly safeguarded through the use of appropriate engineering controls and operation. Commonwealth 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. Commonwealth would design their control systems and human machine interfaces to the International Society for Automation (ISA) Standards 5.3, 5.5, 60.1, 60.3, 60.4, and 60.6, and other standards and recommended practices. Commonwealth indicates that an alarm management program in accordance with ISA Standard 18.2 would be in place to ensure the effectiveness of the alarms. We recommend in section 4.12.1.6 that Commonwealth develop and implement the alarm management program prior to introduction of hazardous fluids.

Operators would have the capability to act from the control room to mitigate an upset. Commonwealth would develop facility operation procedures after completion of the final design; this timing is fully consistent with accepted industry practice. Title 49 CFR §193.2503, under Subpart F, requires written operating procedures for normal and abnormal operation, including, but not limited to purging and inerting components, cooldown, startup and shutdown, liquefaction, transfer, and vaporization, as applicable, as well as recognizing abnormal operating conditions. Title 49 CFR §193.2707, under Subpart H, requires the operator perform assigned functions only after they have demonstrated capability by successful completion of training in accordance with 49 CFR §193.2713 and §193.2717, experience related to the assigned function, and have acceptable performance on a proficiency test relevant to the assigned function. Otherwise, the operator or maintenance personnel must be accompanied and directed by an individual that has met those requirements. Title 49 CFR 193 Subpart G also contains requirements for maintenance, including requiring written procedures for the maintenance of components. In addition, 49 CFR §193.2017, under Subpart A, requires that operating and maintenance plans and procedures are reviewed and updated when a component is changed significantly or a new component is installed at intervals not exceeding 27 months, but at least once every 2 calendar years. Title 33 CFR 127 also has similar requirements for written operations, training, and experience for persons in charge of shoreside transfer operations. Title 33 CFR §127.401 also requires equipment is maintained in a safe condition. We recommend in section 4.12.1.6 that Commonwealth provide more information, for review and approval, on the operating and maintenance procedures, including safety procedures, hot work procedures and permits, abnormal operating conditions procedures, and personnel training prior to commissioning. We would evaluate these procedures in coordination with DOT PHMSA and USCG 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 (AIChE) Center for Chemical Process Safety (CCPS), *Guidelines for Writing Effective Operating and Maintenance Procedures*, AIChE CCPS, *Guidelines for Management of Change for Process Safety*, AIChE CCPS, *Guidelines for Effective Pre-Startup Safety Reviews, AGA, Purging Principles and Practices*, and NFPA 51B, *Standards for Fire Prevention During Welding, Cutting, and Other Hot Work*. In addition, we recommend in section 4.12.1.6 that Commonwealth tag and label instrumentation and valves, piping, and equipment and provide car-seals/locks to address human factor considerations and improve facility safety and prevent incidents.

In the event of a process deviation, emergency shutdown (ESD) valves and instrumentation would be installed to monitor, alarm, shutdown, and isolate equipment and piping during process upsets or emergency conditions. NFPA 59A (2001) section 9.2.1 requires each LNG facility to incorporate an ESD system(s) that, when operated, isolates or shuts off a source of LNG, flammable liquid, flammable refrigerant, or flammable gas, and shutdown equipment whose continued operation could add to or sustain an emergency. The Project would also have a plant-wide emergency shutdown system to initiate closure of valves and shutdown of the process during emergency situations as well as the ability to shutdown specific areas to address local emergency conditions. Safety-instrumented systems would comply with ISA Standard 84.00.01 and other recommended and generally accepted good engineering practices. We also recommend in section 4.12.1.6 that Commonwealth 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.

ESD valves and other safety valves which isolate and depressurize a process in emergencies have a failsafe position. If the valve loses instrument air or control signal, the valve will resort to its position which shuts off the source of hazardous fluids or reduces the pressure of the hazardous fluids within the process. For instance, in the event of loss of instrument air or control signal, an ESD valve might failsafe to the closed position to shutoff the source of hazardous fluids to or from a vessel, while a blowdown valve would failsafe to the open position to reduce the vessel pressure. All process valves with a failsafe position rely on an electrical signal to an instrument air solenoid valve to keep the process valve in its non-failsafe position during normal operation. In the event of an emergency, that signal would change, and the valve would move to the failsafe position.

Failsafe valves are used in industries other than LNG, such as the nuclear power plant industry. Since the Browns Ferry Fire incident in 1975, the Nuclear Regulatory Commission (NRC) has supported testing to examine how electrical cabling commonly used for control and safety purposes would behave during fire exposure. This testing expanded in 2007 to 2012, including a series of testing and reports followed for alternating current (AC) and direct current (DC) circuits. The AC testing methods and results are described in the NRC report NUREG-6931, “Cable Response to Live Fire (CAROLFIRE)”, 2007. The DC testing methods and results are described in the NRC report NUREG-7100 “Direct Current Electrical Shorting in Response to Exposure Fire (DESIRRE-Fire): Test Results”, 2012. Probabilistic risks are described in NUREG-7150, Joint Assessment of Cable Damage and Quantification of Effects from FIRE (JACQUE-FIRE)”, 2012. The test results showed that fire exposed electrical cables could experience electrical shorts and faults which resulted in spurious action, meaning a valve position could change from its failsafe position to its normal position. The test results also showed many different types of cables experienced spurious action within 20 minutes from the onset of the fire exposure, and some experienced the duration of the spurious action for over 20 minutes.

ESD valve closures, and other safety valves moving to and remaining in their failsafe position is a layer of protection LNG facilities utilize to mitigate hazardous fluid releases following accidents. In the event of a release and or fire which damages cabling used to control failsafe valves, spurious opening and closing of the valves could unexpectedly create situations which hamper the facility personal response to control the emergency. Therefore, we recommend in section 4.12.1.6 that Commonwealth demonstrate electrical and control equipment which activate emergency systems be designed to withstand a 20-minute UL 1709 fire exposure..

In developing the FEED, Commonwealth conducted a Hazard Identification (HAZID) review of the project’s preliminary design based on the proposed process flow diagrams and the plot plans. This is consistent with NFPA 59A (2019) which requires consideration of a process hazard analysis for the plant and site evaluation. A more detailed hazard and operability review (HAZOP) analysis would be performed by Commonwealth during the final design to identify the major process hazards that may occur during the operation of the facilities. The HAZOP study would be intended to address hazards of the process, engineering, and administrative controls and would provide a qualitative evaluation of a range of possible safety, health, and environmental consequences that may result from the process hazard, and identify whether there are adequate safeguards (e.g., engineering and administrative controls) to prevent or mitigate the risk from such events. Where insufficient engineering or administrative controls were identified, recommendations to prevent or minimize these hazards would be generated from the results of the HAZOP review. We recommend in section 4.12.1.6 that Commonwealth file the HAZOP study on the completed final design for review and approval. We would evaluate the HAZOP to ensure all systems and process deviations are addressed appropriately based on likelihood, severity, and risk values with commensurate layers of protection in accordance with recommended and generally accepted good engineering practices, such as AIChEs, *Guidelines for Hazard Evaluation Procedures*. We also recommend in section 4.12.1.6 that Commonwealth file the resolutions of the recommendations generated by the HAZOP review be provided for review and approval by FERC staff. Once the design has been subjected to a HAZOP review, the design development team would track, manage, and keep records of changes in the facility design, construction, operations, documentation, and personnel. Commonwealth would evaluate these changes to ensure that the safety, health, and environmental risks arising from these changes are addressed and controlled based on its management of change procedures. If our recommendations are adopted into the order, resolutions of the recommendations generated by the HAZOP review would be monitored by FERC staff. We also recommend in section 4.12.1.6 that Commonwealth file all changes to their FEED for review and approval by FERC staff. However, major modifications could require an amendment or new proceeding.

If the Project is authorized and constructed, Commonwealth would install equipment in accordance with its design. We recommend in section 4.12.1.6 that Project facilities be subject to construction inspections and that Commonwealth provide, for review and approval, commissioning plans, procedures and commissioning demonstration tests that would verify the performance of equipment. In addition, we recommend in section 4.12.1.6 that Commonwealth provide semi-annual reports that include abnormal operating conditions and planned facility modifications. Furthermore, we recommend in section 4.12.1.6 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.

Mechanical Design

Commonwealth provided codes and standards for the design, fabrication, construction, and installation of piping and equipment and specifications for the facility. Although FERC staff generally agreed the design specifies appropriate materials of construction and ratings suited to the pressure and temperature conditions of the process design, we recommend in section 4.12.1.6 that Commonwealth provide for review and approval the final piping specifications for the project. Piping must be designed, fabricated, assembled, erected, inspected, examined, and tested in accordance with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPVC), ASME Standard B31.3, as applicable, and all valves must meet ASME B31.3, B31.5, B31.8, or API 6D, as applicable. In addition, Commonwealth's application indicated they would also meet ASME Standards B31.1, B36.10, and B36.19, as applicable. Valves and fittings would also be designed to standards and recommended practices such as API Standards 594, 598, 600, 602, 603, 607, 608, 609, and 623; ASME Standards B16.5, B16.9, B16.10, B16.20, B16.21, B16.25, B16.34, B16.36 and B16.47; and ISA Standards 75.01.01, 75.05.01, 75.08.01, and 75.08.05. 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.

Pressure vessels must be designed, fabricated, inspected, examined, and tested in accordance with ASME Boiler and Pressure Vessel Code (BPVC) Section VIII and per 49 CFR 193 Subparts C, D, and E and NFPA 59A (2001). LNG storage tanks must be designed, fabricated, tested, and inspected in accordance with 49 CFR 193 Subpart D, NFPA 59A (2001 and 2006), and API Standard 620.

In addition, Commonwealth would design, fabricate, test, and inspect the LNG storage tanks in accordance with API Standard 625 and American Concrete Institute (ACI) 376. Other low-pressure storage tanks such as the amine storage tank would be designed, inspected, and maintained in accordance with API Standards 650 and 653.

The Heat exchangers would be designed to ASME BPVC Section VIII standards; API Standards 660, 661, and 662 - Part II; the Tubular Exchanger Manufacturers Association (TEMA) standards; the Heat Exchanger Institute (HEI) standards; the American Society for Testing and Materials (ASTM) standards; and Aluminum Plate-Fin Heat Exchanger Manufacturer's Association (ALPEMA) guidelines.

Rotating equipment would be designed to standards and recommended practices, such as API Standards 610, 613, 614, 617, 618, 619, 670, 671, 672, 674, 675, 676, and 682; and ASME Standards B73.1, B73.2, and B73.3.

Pressure and vacuum safety relief valves, a vent stack, and flares would be installed to protect the storage containers, pressure vessels, process equipment, and piping from an unexpected or uncontrolled pressure excursion. The safety relief valves would be designed in accordance with API Standards 520, 521, 526, 527, 537, and 2000; ASME Standard B31.3; and other recommended and generally accepted good engineering practices. In addition, the operator should verify the set pressure of the pressure relief valves meet the requirements in 33 CFR §127.407.

Commonwealth intends to utilize prefabricated LNG storage tanks with a 9 percent nickel steel inner tank, and prefabricated field erected concrete panels for the outer tank. The LNG storage tanks would be prefabricated off site and shipped to site on a barge. The pretreatment and liquefaction equipment and piping would also be prefabricated off site as modules and transported to site for installation. Commonwealth intends to perform the pressure testing of piping in the fabrication yard prior to shipment to site. Therefore, we recommend in section 4.12.1.6 to include shipping accelerations in the facility design criteria. We also recommend in section 4.12.1.6 that Commonwealth provide an overall Quality Control/Quality assurance plan which includes monitoring the accelerations experienced by each module and tank during shipment to ensure mechanical integrity of the equipment and piping is maintained.

Although many of the codes and standards were listed as ones the project would meet, Commonwealth did not reference all codes and standards required by regulations or are recommended and generally accepted good engineering practices. Therefore, we recommend in section 4.12.1.6 that Commonwealth provide the final specifications for all equipment and a summarized list of all referenced codes and standards for review and approval. If the Project is authorized and constructed, Commonwealth would install equipment in accordance with its specifications and design, and FERC staff would verify equipment nameplates to ensure equipment is being installed based on approved design. In addition, FERC staff would conduct construction inspections including reviewing quality assurance and quality control plans to ensure construction work is being performed according to proposed Project specifications, procedures, codes, and standards. We recommend in section 4.12.1.6 Commonwealth provide semi-annual reports that include equipment malfunctions and abnormal maintenance activities. In addition, we recommend in section 4.12.1.6 that the Project facilities be subject to inspections to verify that the equipment is being properly maintained during the life of the facility.

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) requires applicants to provide engineering studies on the design approach and 18 CFR §380.12 (o) (14) requires applicants to demonstrate how they comply with 49 CFR 193 and NFPA 59A. As required by 49 CFR 193 Subpart I and by incorporation section 9.1.2 of NFPA 59A (2001), fire protection must be provided for all PHMSA-regulated LNG 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 the evaluation on 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, constructed, and operated, LNG facilities as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 Subpart I and would be subject to PHMSA's inspection and enforcement programs. However, NFPA 59A (2001) also indicates the wide range in size, design, and location of LNG facilities precludes the inclusion of detailed fire protection provisions that apply to all facilities comprehensively and includes subjective performance-based language on where ESD systems and hazard control are required and does not provide any additional guidance on placement or selection of hazard detection equipment and provides minimal requirements on firewater. Also, the project marine facilities would be subject to 33 CFR 127, which incorporates sections of NFPA 59A (2019), which have similar performance-based guidance. Therefore, FERC staff 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 ensure they would provide adequate protection of the LNG facilities as described below.

Commonwealth 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 recommend in section 4.12.1.6 that Commonwealth provide a final fire protection evaluation that evaluates 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 in accordance with NFPA 59A (2001), 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.

<u>Spill Containment</u>

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. If authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 Subpart C and would be subject to PHMSA'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 is not defined as 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. Commonwealth proposes six full-containment LNG storage tanks for which the outer tank wall would serve as the impoundment system. FERC staff 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. Per NFPA 59A (2001), section 2.2.2.4, an outer shell of a double wall tank is allowed to be considered as the impounding area for siting purposes, provided the outer wall material is designed to withstand rapid cooling to the temperature of the liquid being confined. In addition, Commonwealth would also install a tertiary berm around the LNG storage tank area to prevent liquid in the storage tank area from flowing off-site in the event of an outer tank impoundment failure.

Commonwealth proposes to install curbing, paving, troughs, and trenches to direct potential hazardous liquid spills, involving LNG, refrigerant, heavy hydrocarbon and other hazardous material releases to Impoundment Basins serving the Liquefaction Trains, LNG Storage/Loading, or Truck Loading/Unloading Areas. LNG releases from the Liquefaction Trains would be directed to the Liquefaction Trains Area Impoundment Basin. LNG releases from LNG rundown piping would be directed to the LNG Storage/Loading Impoundment Basin first by elevated troughs, and then by a ground level trench to the basin. Liquid releases from the Wet and Dry Flare KO drums, Refrigerant Storage, and the BOG area would also be directed to the LNG Storage/Loading Impoundment Basin via ground level trenches. Liquid releases from tank top piping would be conveyed via a downcomer to an elevated trough which would also collect spills from the ground level rundown piping and ship loading piping in the tank farm area. Commonwealth provided preliminary sizing for the tank down-comer; however, we recommend in section 4.12.1.6 Commonwealth provide final design calculations for the down-comer. Releases from refrigerant delivery trucks would be directed to a Truck Loading/Unloading Area Impoundment Basin.

Commonwealth would also include secondary containment dikes for the Condensate Storage, Hot Oil/Amine Tank Farm, Slop Oil, and Liquid Nitrogen Storage Areas. The Condensate Storage Area containment dike would have a volumetric capacity of greater than 110 percent of the maximum liquid volume in the Condensate Storage Tank. The Tank Farm Area containment dike would have a volumetric capacity for a release from all tanks in the Tank Farm Area. The Liquid Nitrogen Storage Area containment dike would have a volumetric capacity of greater than 110 percent of the maximum liquid volume in Liquid Nitrogen Storage Tank. The impoundment basins and tank dikes do not consider firewater volumes in their sizing. However, the impoundments are located remotely enough that any impoundment fire would not require firewater to protect equipment which drains into the impoundment.

Under NFPA 59A (2001), section 2.2.2.2, the capacity of impounding areas for vaporization, process, or LNG transfer areas must equal the greatest volume that can be discharged from any single accidental leakage source during a 10-minute period or during a shorter period based upon demonstrable surveillance and shutdown provisions acceptable to the PHMSA. If authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 Subpart C and would be subject to PHMSA'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, we evaluate whether all hazardous liquids are provided with spill containment based on the largest flow capacity from a single pipe for 10 minutes accounting for de-inventory or the liquid capacity of the largest vessel (or total of impounded vessels) served, whichever is greater and whether providing spill containment reduces consequences from a release. We note that the Impoundment Basin for the LNG Storage/Loading Area was sized based on the 10-minute spill from the LNG ship loading header. However, the sizing of this basin did not include an allowance for pump runout. Additionally, Commonwealth provided sizing basis for the trenches leading to the impoundment basins. We recommend in section 4.12.1.6 that Commonwealth provide additional information on the final design of the impoundment systems for review and approval.

Commonwealth indicated that all piping, hoses, and equipment that could produce a hazardous liquid spill would be provided with spill collection and/or spill conveyance systems. Furthermore, Commonwealth indicates that the stormwater pumps would be automatically operated by level control and interlocked using redundant low temperature detectors for LNG or refrigerants, high temperature for hot oil, or gas detection for heavy hydrocarbons, including isopentane refrigerant and condensate to prevent pumps from operating if hazardous material is present within the spill basins. Although stormwater removal pumps would be proposed for the large impoundment basins, curbed areas and dike walls would not have stormwater removal pumps installed. The PHMSA's 49 CFR 193.2173 under Subpart C has specific requirements for stormwater removal from dikes and impoundments. Therefore, we recommend in section 4.12.1.6 that Commonwealth provide correspondence from PHMSA on their plan to remove stormwater from curbed areas and dikes which would not have dedicated stormwater removal pumps. If authorized, constructed, and operated, final compliance with the requirements of 49 CFR 193 Subpart C, would be subject to PHMSA's inspection and enforcement programs.

If the project is authorized and constructed, Commonwealth would install spill impoundments in accordance with its design and FERC staff would verify during construction inspections that the spill containment system including dimensions, and slopes of curbing and trenches, and volumetric capacity matches final design information. In addition, we recommend in section 4.12.1.6 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 must meet the requirements of 49 CFR 193 Subparts C, D, and E, which incorporate NFPA

59A (2001). NFPA 59A (2001) includes spacing and plant layout requirements and further references NFPA 30, NFPA 58, and NFPA 59 for additional spacing and plant layout requirements. If authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to PHMSA's inspection and enforcement programs.

In addition, FERC staff 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. If spacing to mitigate the potential for cascading damage was not practical, we evaluated whether other mitigation measures were in place and evaluated those systems in further detail as discussed in subsequent sections. We evaluated the spacing of buildings in line with AIChE CCPS *Guidelines for Evaluating Process Plant Buildings for External Explosions and Fires* and API 752, which provide guidance on identifying and evaluating explosion and fire impacts to plant buildings and occupants resulting from events external to the buildings. If the project is authorized, Commonwealth would submit a building siting analysis based on API 752 during the final design phase of the project and would also indicate it would meet ASCE 59 to determine explosion impacts to plant buildings. In addition, FERC staff evaluated other hazards associated with releases and whether any damage would likely occur at buildings or would result in cascading damage.

To minimize the risk of cryogenic spills causing structural supports and equipment from cooling below their minimum design metal temperature, Commonwealth would generally locate cryogenic equipment away from process areas and would have spill containment systems for cryogenic spills that would direct them to a remote impoundment. In addition, Commonwealth would protect equipment and structural steel against cold shocks through selection of suitable materials of construction or by the application of cold spill protection. We recommend in section 4.12.1.6 that Commonwealth file drawings and specifications for structural passive protection systems to protect equipment and supports that could be exposed to cryogenic releases.

To minimize risk for flammable or toxic vapor ingress into buildings and from reaching areas that could result in cascading damage from explosions, Commonwealth would generally locate buildings away from process areas and would locate fired equipment and ignition sources away from process areas. Commonwealth would include flammable gas detection near HVAC air intake locations such that upon activation, the gas detectors would alert operators and the associated air intake would shut down. In addition, the LNG storage tanks are generally located away from process equipment and process facilities are relatively unconfined and uncongested. Therefore, we recommend in section 4.12.1.6 that Commonwealth conduct a technical review of facility, for review and approval, identifying 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 4.12.1.6 that Project facilities be subject to periodic inspections during construction to verify flammable/toxic gas detection equipment is installed in heating, ventilation, and air condition intakes of buildings at appropriate locations. In addition, we recommend in section 4.12.1.6 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.

To minimize overpressures from vapor cloud explosions, we evaluated how flammable vapors would be prevented from accumulating within confined areas. Commonwealth would design for overpressures in accordance with API RP 752, ASCE 41088, and other recommended and generally accepted good engineering practices. In addition, explosions in process areas were evaluated and demonstrated to produce less than 1 pound per square inch (psi) side on overpressure at the LNG storage tanks. However, vapor dispersion could disperse underneath the LNG storage tanks. Therefore, we recommend in section 4.12.1.6 that Commonwealth file an analysis for review and approval that demonstrates the flammable vapor dispersion from design spills would be prevented from dispersing underneath the elevated LNG storage tanks or detail how the LNG storage tanks would be able to withstand an overpressure due to ignition of the flammable vapors that disperse underneath the elevated LNG storage tanks. Additionally, Commonwealth would construct an elevated control room. Despite installation of vapor fencing between the process areas and the control room, hazard modeling suggests vapor clouds could disperse underneath the elevated control room. Therefore, we recommend in section 4.12.1.6 that Commonwealth file and analysis for review and approval that demonstrates flammable vapor dispersion from design spills would not disperse underneath the elevated control room, or detail how the control room would withstand an overpressure due to ignition of the flammable vapors that disperse underneath.

To minimize the risk of pool fires from causing cascading damage, Commonwealth located the spill impoundments such that the radiant heats would have a minimal impact on most areas of the plant. Fires within the process impoundments would be spaced such that there would not be high radiant heats on any equipment. A fire from the LNG storage tank roof would result in radiant heats just under 10,000 Btu/ft^2-hr at the adjacent LNG storage tank. Therefore, we recommend in section 4.12.1.6 that Commonwealth file an analysis for review and approval demonstrating the LNG storage tanks can withstand the radiant heat from a tank roof fire and adjacent LNG storage tank roof fires. A fire from the Hot Oil/Amine/Diesel/Propylene Glycol Tank Farm Area would result in radiant heats over 10,000 Btu/ft^2-hr on the refrigerant storage area, liquid nitrogen storage area, and portions of the Train F liquefaction and pretreatment process. A fire from the Condensate Storage Area would result in radiant heats over 10,000 Btu/ft^2-hr on the refrigerant storage area, and truck unloading area. Commonwealth would install deluge water spray systems that would cover pressure vessels and critical equipment within the 4,000 Btu/ft^2-hr zone. In addition, Commonwealth would apply fireproofing for vessel and equipment supports and pipe racks within the 4,000 Btu/ft^2-hr zone. NFPA 59A (2001) section 2.2.3.6 requires LNG impounding areas to be located such that heat fluxes shall not cause major structural damage to any LNG marine carrier that could prevent its movement.

To minimize vaporization rates and the radiant heat fluxes from an impoundment fire, the process impoundment and LNG storage tank area impoundment would be installed with high expansion foam generator system, and the condensate storage area would be installed with low expansion foam generators. To mitigate cascading impacts from impoundment fires, Commonwealth has installed firewater hydrants and monitors on the marine dock and other areas throughout the plant. We recommend in section 4.12.1.6 that Commonwealth file supporting firewater demand calculations that demonstrates there would be adequate firewater supply and delivery devices to mitigate the consequences of radiant heats from impoundment fires. We also recommend in section 4.12.1.6 that Commonwealth file drawings and specifications of the passive structural fire protection for review and approval for structural supports and equipment.

To minimize the risk of jet fires from causing cascading damage that could exacerbate the initial hazard, Commonwealth would generally locate flammable and combustible containing piping and equipment away from buildings and process areas that do not handle flammable and combustible materials. However, FERC staff noted that some jet fire scenarios would result in radiant heats above 1,600 Btu/ft^2-hr to occupied buildings, which could present harm to plant personnel. Specifically, jet fire scenarios associated with LNG marine transfer piping could result in radiant heats above 10,000 Btu/ft^2-hr on the platform control room, dock, and LNG marine vessel. In addition, a jet fire scenario associated with LNG rundown piping could result in radiant heats above 10,000 Btu/ft^2-hr on operator shelters. A jet fire scenario associated with the Reflux Accumulator could result in radiant heats above 10,000 Btu/ft^2-hr on the fire water system tanks and pumps, and emergency generator. In addition to the installation of firewater in these areas for exposure cooling, Commonwealth indicated the project would relocate or design emergency equipment to withstand potential overpressures and high heat flux during final design to ensure the availability of the equipment during an emergency. Additionally, the jet fire scenario associated with the

Reflux Accumulator could also result in radiant heats above 3,000 Btu/ft^2-hr on the Control Room and Administrative Building. However, the control room location could be relocated to minimize the exposure to radiant heats. Therefore, we recommend in section 4.12.1.6 that Commonwealth should provide a technical review of its proposed facility design that evaluates other potential locations for the proposed control room, or additional mitigation measures to protect the control room from high radiant heats. Jet fire scenarios associated with an ethylene hose break could result in radiant heats above 1,600 Btu/ft^2-hr on the Maintenance Building. To mitigate these exposures, Commonwealth would install emergency shutdown systems that would limit the duration of a jet fire event, depressurization systems that would reduce the pressure in equipment, and would install firewater systems to cool equipment and structures as described in section 4.12.1.5. Therefore, we recommend in section 4.12.1.6 that Commonwealth file drawings of the passive structural fire protection for review and approval for structural supports and equipment. Further, we recommend in section 4.12.1.6 that Commonwealth demonstrate how personnel in occupied buildings within the 1,600 Btu/ft^2-hr zone of pool and jet fires would be protected from exposure. In addition, we recommend in section 4.12.1.6 that Commonwealth file a detailed quantitative analysis demonstrating that adequate mitigation would be provided for each significant component within the 4,000 Btu/ft^2-hr zone from jet fires that could cause failure of the component.

In addition, FERC staff 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. Thermal radiation levels from an LNG tank roof top fire, and other impoundments, could potentially impact process equipment, process vessels, and piperacks located within the pretreatment area, liquefaction trains, refrigerant storage area, and utility tank farm. To mitigate against a LNG tank roof top fire, impoundment fires, and jet fires within the plant, Commonwealth proposes thermal radiation mitigation measures to prevent cascading events in the design, including thermal protection insulation, fire-retardant insulation materials, emergency depressurization, flame, combustible gas and low temperature detectors, fire proofing of structural steel columns supporting critical equipment, fixed automatic firewater spray system, high expansion foam system, insulating foam blocks in LNG impoundments, and firewater monitors and hydrants. However, details of these systems would be developed in final design. Therefore, we recommend in section 4.12.1.6 that Commonwealth provide the final design of these thermal mitigation measures, for review and approval, to demonstrate cascading events would be mitigated.

If the project is authorized, Commonwealth would finalize the plot plan, and we recommend in section 4.12.1.6 that Commonwealth provide any changes for review and approval to ensure capacities and setbacks are maintained. If the facilities are constructed, Commonwealth would install equipment in accordance with the spacing indicated on the plot plans. In addition, we recommend in section 4.12.1.6 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. We also recommend in section 4.12.1.6 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

Commonwealth LNG plant areas would be designated with a hazardous electrical classification and process seals commensurate with the risk of the hazardous fluids being handled in accordance with NFPA 59A (2001), 70, 497, and API RP 500. If authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to PHMSA's inspection and enforcement programs, which require compliance, by incorporation by reference, with NFPA 59A (2001). NFPA 59A (2001) subsequently references NFPA 70 (1999) for installation of electrical equipment and wiring.

The marine transfer area must comply with USCG regulations in 33 CFR 127 and incorporation of NFPA 70 (2020). However, 33 CFR 127 excludes NFPA 59A (2019) hazardous area classifications and

NFPA 70 (2020) no longer contains hazardous area classification extents. Nonetheless, Commonwealth's hazardous electrical classification drawings meet NFPA 59A (2001) and API RP 500 which stipulates the hazardous areas for marine transfer areas.

Depending on the risk level, areas where electrical equipment would be located and wiring routed would either be unclassified or classified as Class 1 Division 1, or Class 1 Division 2. Electrical equipment and wiring 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 Commonwealth's electrical area classification drawings to determine whether Commonwealth would meet these electrical area classification requirements and good engineering practices in NFPA 59A, 70, 497, and API RP 500. Commonwealth meets NFPA 59A (2001), NFPA 70 (1999 and 2020), NFPA 497, however, for areas handling LNG, API RP 500 was not fully met. Therefore, we recommend in section 4.12.1.6 that Commonwealth provide final electrical area classification drawings for review and approval.

If the project is authorized, Commonwealth would finalize the electrical area classification drawings and would describe changes made from the FEED design. We recommend in section 4.12.1.6 that Commonwealth file the final design of the electrical area classification drawings for review and approval. If facilities are constructed, Commonwealth would install appropriately classed electrical equipment, and we recommend in section 4.12.1.6 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 4.12.1.6 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, panels provided with purge, etc.), and electrical equipment are appropriately de-energized and locked out and tagged out when being serviced.

In addition, submerged pumps and instrumentation must be equipped with electrical process seals, and instrumentation in accordance with NFPA 59A (2001) and NFPA 70 (1999 and 2020). We recommend in section 4.12.1.6 that Commonwealth 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 (1999 or 2020, as applicable). In addition, we recommend in section 4.12.1.6 that Commonwealth 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 4.12.1.6 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

Commonwealth 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 72, ISA Standard 12.13, and other recommended and generally accepted good engineering practices. Additionally, Commonwealth would install an ESD system in accordance with NFPA 59A. The ESD shutdown would include failsafe, or fireproof, valves within 50 feet of the equipment they protect. ESD manual push buttons would be installed at least 50 feet from the equipment they serve. FERC staff reviewed the proposed location of ESD push buttons and while most areas would have appropriate ESD button access, several areas such as the refrigerant storage, condensate storage and LNG storage tank area did not have ESD pushbuttons proposed. Therefore, we recommend in section 4.12.1.6 that Commonwealth provide drawings showing the locations of the emergency shutdown buttons, including at the refrigerant storage, condensate storage, and LNG storage areas. In addition, we recommend in section

4.12.1.6 that Commonwealth provide specifications, for review and approval, for the final design of fire safety specifications, including hazard detection, hazard control, and firewater systems.

FERC staff 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). The proposed hazard detection design utilizes an array of point gas, open path, flame, and low temperature detectors to provide adequate coverage of process equipment containing flammable fluids. Furthermore, the alarm setpoints for these detectors are appropriate for the hazard they would detect. FERC staff noted that while there was low temperature detection at the LNG Jetty Platform, there was no flame detector coverage. Commonwealth stated that a minimum of three flame detectors would be installed on the loading platform to provide full coverage of the area during final design. FERC staff also noted that the truck loading/unloading impoundment basin did not include hazard detection. Commonwealth stated that the final design would include high temperature, low temperature, and IR point gas detectors in this area. FERC staff also noted that the Liquefaction Train Impoundment Basin and associated trenches did not have sufficient low and high temperature detection. Commonwealth stated that the final design would include additional low and high temperature detection in these areas. FERC staff also noted that the Utilities Tank Farm Dike and Nitrogen Storage/Vaporization areas lacked hazard detection. Commonwealth stated that the final design would include flame detectors at the Utilities Tank Farm Dike and low oxygen detectors at the Nitrogen Storage/Vaporization area. We recommend in section 4.12.1.6 that Commonwealth file a hazard detection study to evaluate the effectiveness of their flammable and combustible gas detection and flame and heat detection systems in accordance with ISA 84.00.07 or equivalent methodologies. This evaluation would need to demonstrate that 90 percent or more of releases (unignited and ignited) that could result in an off-site or cascading impact would be detected by two or more detectors and result in isolation and de-inventory within 10 minutes. The analysis should consider the set points, voting logic, wind speeds, and wind directions.

Commonwealth specified low oxygen detectors in the pretreatment and liquefaction Motor Control Center (MCC) Buildings and Remove Instrument Enclosure (RIE) Buildings. In addition, Commonwealth specified low oxygen detectors at the liquid nitrogen storage tanks but did not denote the location of the low oxygen detectors in the Project drawings. The proposed alarm setpoints for these detectors would be appropriate for low oxygen detection.

Commonwealth indicated that hydrogen detection is not required in battery rooms because no hydrogen is released from the sealed type Absorbed Glass Mat batteries that would be utilized. In addition, Commonwealth indicated that normal outside fresh air quantities coming in from the HVAC systems would be adequate ventilation for buildings utilizing the Absorbed Glass Mat batteries. We recommend in section 4.12.1.6 that Commonwealth file an analysis of the off gassing of hydrogen in battery rooms and ventilation calculations that limit concentrations below the LFLs (e.g., 25-percent LFL) as well as provide hydrogen detectors that alarm and initiate mitigative actions or alarms in the event the ventilation equipment is not operating or functioning as designed.

FERC staff also reviewed the fire and gas cause and effect matrices to evaluate if the detectors that would initiate an alarm, shutdown, depressurization, or other action based on the FEED. The cause-and-effect matrices included all detector types but did not include all hazard detection devices. The hazard detection devices that were included did specify the hazard detector device type, device tag number, voting logic, and set points that would initiate any type of action. Therefore, we recommend in section 4.12.1.6 that Commonwealth provide, for review and approval, the cause-and-effect matrices for process instrumentation, fire and gas detection system, and emergency shutdown system. In addition, we recommend in section 4.12.1.6 that Commonwealth 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, constructed, and operated, Commonwealth would install hazard detectors according to its final specifications and drawings, and we recommend in section 4.12.1.6 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 4.12.1.6 that Project facilities be subject to regular inspections throughout the life of the facility to verify hazard detector coverage and functionality is being maintained and are not being bypassed without appropriate precautions.

Hazard Control

If ignition of flammable vapors occurred, hazard control devices would be installed to extinguish or control incipient fires and releases, and would meet NFPA 59A; NFPA 10, 12, 17, and 2001; API Standard 2510A; and 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. FERC staff also evaluated whether the spacing of the fire extinguishers would meet NFPA 10 and agent type and capacities meet NFPA 59A (2009 and later editions). The hazard control plans appeared to meet NFPA 10 travel distances to most components containing flammable or combustible fluids (Class B) for handheld fire extinguishers (30 to 50 feet) and wheeled extinguishers (100 feet) and NFPA 10 travel distance to most other components that could pose an ordinary combustible hazard (Class A) or associated electrical (Class C) hazard for handheld extinguishers (75 feet). Buildings also appear to be provided with handheld extinguishers to satisfy NFPA 10 requirements, including placement at each entry/exit. The agent type (potassium bicarbonate) and agent storage capacities for wheeled (minimum 250 pounds [lb]) and for handheld extinguishers (minimum 20 lb) also appear to meet NFPA 59A requirements. In addition, travel distances, installation heights, visibility, flow rate capacities, and other requirements should be confirmed in final design and in the field where design details, such as manufacturer, obstructions, and elevations, would be better known. Therefore, we recommend in section 4.12.1.6 that Commonwealth file 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.

In addition, we evaluated whether clean agent systems would be installed in all instrumentation buildings in accordance with NFPA 2001. Commonwealth would install clean agent fire suppression systems in accordance with NFPA 2001 in buildings that house electrical and control equipment such as the Control Room, power distribution equipment rooms, and power generation houses. Commonwealth also indicated that clean agent fire suppression systems and CO_2 extinguishers would be provided in the MCC Buildings and RIE Buildings. In addition, Commonwealth would provide a carbon dioxide extinguishing system for the simple cycle power generating and refrigerant compressors gas turbines in accordance with NFPA 12.

If the Project is authorized, constructed, and operated, Commonwealth would install hazard control equipment, and we recommend in section 4.12.1.6 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 4.12.1.6 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 Temperature and Fire Protection

If cryogenic releases or fires could not be mitigated from impacting facility components to insignificant levels, passive protection (e.g., fireproofing structural steel, cryogenic protection, etc.) should 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. NFPA 59A (2001) section 6.4.1 requires pipe supports, including any insulation systems used to support pipe whose stability is essential to plant safety, to be resistant to or protected against fire exposure, escaping cold liquid, or both, if they are subject to such exposure. However, NFPA 59A (2001) does not provide the criteria for determining if they are subject to such exposure or the level of protection needed to protect the pipe supports against such exposures. In addition, NFPA 59A does not address cryogenic or structural protection of pressure vessels or other equipment.

Therefore, FERC staff evaluated whether passive cryogenic and fire protection would be applied to pressure vessels and structural supports to facilities that could be exposed to cryogenic liquids or radiant heats of 4,000 Btu/ft^2-hr or greater from fires with durations that could result in failures[115] and that they are specified in accordance with recommended and generally accepted good engineering practices with a fire protection rating commensurate to the exposure. The structural fire protection design would comply with NFPA 59A (2001); API RP 2218; International Organization for Standardization (ISO) 22899; Underwriters Laboratories (UL) 1709; and other recommended and generally accepted good engineering practices.

To minimize the risk of cryogenic spills causing structural supports and equipment from cooling below their minimum design metal temperature, Commonwealth would protect equipment and structural steel against cold shocks through selection of suitable materials of construction or by the application of cold proofing. In addition, Commonwealth would have spill containment systems surrounding cryogenic equipment and would generally locate cryogenic equipment away from process areas that do not handle cryogenic materials. Cryogenic protection would comply with NFPA 59A (2001), ISO 20088, and other recommended and generally accepted good engineering practices. We recommend in section 4.12.1.6 that Commonwealth file drawings and specifications of the final design, for review and approval, for the structural passive protection systems to protect equipment and supports from cryogenic releases.

To minimize the risk of a pool or jet fire from causing cascading damage, Commonwealth would generally locate flammable and combustible containing piping, equipment, and impoundments away from buildings and other process areas that do not handle flammable and combustible materials. Commonwealth provided drawings that show fire exposed areas, including equipment and components, and demonstrated that the radiant heats from pool fires from the LNG storage tank outer containment walls and impoundments would have a minimal impact on most areas of the plant with the exceptions described in the Spacing and Plant Layout section above. Commonwealth specified that process equipment structural supports subject to pool and jet fires would have fire ratings of at least 2 hours, either per design or the use of fireproofing. Fireproofing would be provided in accordance with the Fireproofing/Fire Insulation Specification, which would be developed during final design.

Therefore, we recommend in section 4.12.1.6 that Commonwealth demonstrate that passive protection is provided in areas where pool or jet fires may result in failure of structural supports. Commonwealth would need to file drawings of the passive structural fire protection for review and approval for structural supports and equipment that could result in a failure when exposed to a pool or jet fire. In addition, we recommend in section 4.12.1.6 that Commonwealth provide additional information on 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.

115 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 with or without structural fire protection.

FERC staff also evaluated whether the design would include blast or fire walls for transformers per NFPA 850. Commonwealth does not propose to install fire walls in transformer areas, nor would the transformer spacing comply with NFPA 850. However, Commonwealth indicated their transformers would utilize a high fire point liquid which can justify reduced separation distances per NFPA 850 and NFPA 70. Furthermore, Commonwealth specified that requirements for blast walls, hardened structures, and blast resistant design needs around the facility would be based on a hazard analysis study and building risk assessment study, which would be developed during final design. Therefore, we recommend in section 4.12.1.6 that Commonwealth provide final datasheets for the transformers and transformer fluid and an analysis in accordance with NFPA 850 to justify the acceptability of the transfer spacing and lack of firewalls. We also recommend in section 4.12.1.6 that Commonwealth provide additional information on final design for blast walls, hardened structures, and blast resistant design, including the hazard analysis and building risk assessment studies, in order to prevent cascading damage.

If the Project is authorized, constructed, and operated, Commonwealth would install structural cryogenic and fire protection according to its design, and we recommend in section 4.12.1.6 that Project facilities be subject to periodic inspections during construction to verify structural cryogenic and fire protection is properly installed in the field as designed prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.1.6 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

Commonwealth would also provide firewater systems, including fixed and manually operated firewater monitors, sprinkler systems, fixed water spray systems, and firewater hydrants and hoses for use during an emergency to cool the surface of storage vessels, piping, and equipment exposed to heat from a fire. These firewater systems would be designed, tested, and maintained to meet NFPA 59A (2001), 13, 14, 15, 20, 22, 24, and 25 requirements. The firewater system would be installed as a loop to supply firewater to a user from multiple flow paths. Post indicator and sectional valves would be installed to isolate portions of the firewater loop out of service for maintenance. NFPA 24 (2013, 2016, 2019, 2022) section 6.6 requires sectional valves be provided on looped systems at locations within piping sections such that the number of fire protection connections between sectional valves does not exceed six. However, FERC staff evaluated the adequacy of the firewater loop and found several areas with insufficient placement of post indicator and sectional valves. Therefore, we recommended in section 4.12.1.6 that Commonwealth provide plan drawings of the firewater loop which show the location of post indicator valves and sectional valves in accordance with NFPA 24 (2013 or thereafter). Commonwealth indicated that water spray and deluge system protection that is compliant with NFPA 15 would be provided for all metal vessels containing substantial liquid volumes of flammable liquids. FERC staff evaluated the water spray and deluge systems and found that firewater calculations showing the prescribed firewater capacity and water density appeared to be adequate for the firewater demand case scenarios. Commonwealth indicated that the firewater demand table would be updated during final design to reflect final equipment data. We recommend in section 4.12.1.6 that Commonwealth file additional drawings showing details of the firewater system.

Commonwealth would also provide high expansion foam for each LNG spill impoundment basin to reduce vaporization rates from LNG pools and would meet NFPA 59A (2001) and NFPA 11. Additionally, Commonwealth would provide foam blocks in the LNG spill impoundments to reduce vaporization rates. FERC staff evaluated the adequacy of the general firewater or foam system coverage and verified the appropriateness of the associated firewater demands of those systems and worst-case fire scenarios to size the firewater and foam systems. Commonwealth provided firewater coverage drawings for the firewater monitors, fire hydrants, and deluge systems. However, where firewater monitor 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.

Commonwealth also indicated that automatic sprinkler systems would be installed in buildings with diesel engines per NFPA 850 and in select close roofed buildings around the site per NFPA 13. We recommend in section 4.12.1.6 that Commonwealth 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, nozzle types, etc.) and where the final design could change as a result of these details or other changes in the final design of the Project. Many hydrants and monitors would be installed along the internal facility roads. Commonwealth stated they would install bollards and guards for hydrants and monitors installed in close proximity to the roadways. We recommend in section 4.12.1.6 that Commonwealth file additional information detailing the internal road vehicle protections not only for fire protection equipment, but for other plant equipment as well.

FERC staff also assessed whether the reliability of the firewater pumps, firewater source, and onsite storage volume would be appropriate. Commonwealth would provide a primary and backup firewater pump with different drivers per NFPA 20 that would draw firewater from the firewater tank. The firewater tank volume would be sufficient to supply the maximum fire water demand case. The makeup supply for the firewater tank would come from the local municipal water supply. The firewater tank fill piping would be installed with back flow prevention in accordance with state and local requirements. In addition, two separate firewater pumps would provide backup firewater from the shipping channel. Commonwealth also states that the firewater tanks would meet NFPA 22 and API Standard 650. However, the firewater tank data sheet does not make reference to NFPA 22 or API Standard 650. Therefore, we recommend in section 4.12.1.6 that Commonwealth design the firewater tanks in accordance with NFPA 22.

We also recommend in section 4.12.1.6 that Commonwealth should specify that the firewater flow test meter is equipped with a transmitter and that a pressure transmitter is installed upstream of the flow transmitter, which should both be connected to the DCS and recorded to keep a history of flow test data. In addition, we recommend in section 4.12.1.6 that the largest firewater pump or component be able to be removed for maintenance from the firewater pump shelter.

If the Project is authorized, constructed, and operated, Commonwealth would install the firewater and foam systems as designed, and we recommend in section 4.12.1.6 that Project facilities be subject to periodic inspections during construction and that companies provide results of commissioning tests to verify the firewater and foam systems are installed and functional as designed prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.1.6 that Project facilities be subject to regular inspections throughout the life of the facility to ensure firewater and foam systems are being properly maintained and tested.

Geotechnical and Structural Design

Commonwealth 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 o 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, seiches, hurricanes, tornadoes, floods, rain, ice, snow, regional subsidence, sea level rise, landslides, wildfires, volcanic activities, and geomagnetism.

<u>Geotechnical Evaluation</u>

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 PHMSA's inspection and enforcement programs. PHMSA regulations incorporate by reference NFPA 59A (2001). NFPA 59A (2001) section 2.1.4 requires soil and general investigations of the site to determine the design basis for the facility. However, no additional requirements are set forth in 49 CFR 193 or NFPA 59A on minimum requirements for evaluating existing soil site conditions or evaluating the adequacy of the foundations. Therefore, FERC staff evaluated the existing site conditions, geotechnical report, and proposed foundations to ensure they are adequate for the LNG facilities as described below.

The Project would be located at a greenfield location in south Cameron Parish, Louisiana on the west bank of Calcasieu Ship Channel near the confluence of the ship channel and the Gulf of Mexico. Commonwealth contracted GeoEngineers to conduct the geotechnical investigation and report to evaluate the existing soil site conditions and proposed foundation design for the Project.

GeoEngineers completed field exploration activities including at LNG Storage Tanks area: 1 soil boring at the center of each tank; 1 cone penetration test (CPT) sounding at each quarter point of the tank perimeter (6 borings and 24 CPT soundings total for the 6 LNG tanks); 20 feet deeper than expected foundation depth and 200 feet below ground surface (bgs) or deeper at opposite ends of the tank area to capture deep soil conditions. At Process Units area: 1 soil boring or CPT sounding every 200 to 300 feet; 20 feet deeper than expected foundation depth. At the Perimeter Surge Barrier Wall area: regular spacing (including overlap from other nearby facility borings with 70-100 feet bgs sounding depth. At Marine Facility area: 11 borings with 120 feet bgs sounding depth. At Administration Building area: 1 boring and 1 CPT at opposite corners with 70 feet bgs sounding depth. At Flares area: 1 boring or CPT per flare unit with 70 feet bgs sounding depth. At Stormwater Detention Basin area: 1 boring with 70 feet bgs sounding depth. At other support facilities: 1 boring or CPT sounding per facility – smaller support features may share an exploration with 70-100 feet bgs sounding depth. The field exploration also included the following: four (4) temporary piezometers to monitor groundwater levels and obtain groundwater samples to assess chloride content of site groundwater, and bulk grab samples from each of the piezometer locations for California Bearing Ratio (CBR) testing. A total of 45 electric piezocone CPT soundings were completed around the site. In addition, three seismic CPTs were performed at the site. The CPT sounding holes were backfilled with grout upon completion. GeoEngineers completed numerous laboratory tests on representative samples from each soil boring perform at the site during exploration activities to support preliminary foundation design and site recommendations which included identification tests, strength tests, compressibility and compaction tests, corrosivity tests, chemical analysis of dredge material tests, etc.

The regional and site geology information is based on review of the geologic map and the available geotechnical information that includes boring logs, CPT logs, in situ test results, geophysical test results, and laboratory test data. The Project site subsurface soil conditions generally consist of Holocene alluvial and coastal deposits on top of Pleistocene Prairie Terrace and coastal deposits. Depth to the Holocene-Pleistocene horizon ranged from 12 to about 40 feet below the ground surface, with the horizon encountered between 20 and 30 feet below the ground surface. Soil borings and CPT soundings completed in chenier ridge features generally encountered sand and silt mixtures up to 4 feet in thickness near the ground surface, and sand/silt interlayering with surface soils was common throughout the site. Other than the loose sands and silts near the surface, Holocene soils generally consisted of very soft to soft clay with varying silt and sand content, punctuated by occasional silt and sand layers. Shell fragments were observed in a few of the soil borings, particularly those closer to the Ship Channel. A transitional zone of aged, softer soil or firm silt and sand generally preceded the Pleistocene material. Pleistocene soils generally consisted of medium to very stiff clay with varying sand and silt content. Occasional silt and/or sand lenses, pockets and layers were found throughout the profile. About 200 feet below the ground surface, the soil transitions to very dense clayey sand, which continues until at least 250 feet below the ground surface.

GeoEngineers indicated that compressible soils at the site would adversely affect foundation performance unless the soils are remediated. To mitigate potential hazard, Commonwealth state the LNG site grade raise would be accomplished using following methodology: 1) Commonwealth would clear and grub the site to remove plants, roots, and deleterious elements; 2) Commonwealth would install 12 to 24 inches of clean sand with less than 12 percent passing the U. S. No. 200 sieve (0.075 mm); 3) Commonwealth would install 30-foot, 4-inch wide wick grains on a triangular grid with 5-foot spacing between wick drains in the process train area, with an option to increase the spacing between wick drains to 8 feet under the LNG storage tanks, which would allow a longer settlement time while the process train foundations are installed; 4) Commonwealth would install compacted structural clay fill to bring site grade to El. +8 feet in the process train area and El. +5 feet in the LNG storage tank area and other areas of the site; 5) Commonwealth would install an additional two feet of compacted structural clay as surcharge to accelerate foundation settlements. To address the potential hazard of compressible soils, we recommend in section 4.12.1.6 that prior to initial site preparation, Commonwealth should file with the Secretary the following: a) finalized ground improvement solution of wick drains combined with surcharge for the Project site; b) site soil compaction via surcharge procedures, and specifications; c) finalized wick drains installation design package; d) these filings should be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.

GeoEngineers conducted a study to assess whether there is evidence of Quaternary tectonic or growth faults within 5 miles of the site and whether there has been historical seismicity that can be reasonably associated with the identified faults. GeoEngineers performed detailed evaluation of growth faults to assess if there are faults that could potentially cause surface displacement at or in proximity (e.g., within 1 mile and 500 feet) of the project site. Based on the study completed, GeoEngineers concluded that there was no direct evidence for seismicity to be reasonably associated with a known or inferred within 5 miles of the project site nor was a growth fault or tectonic fault identified with a potential to cause differential surface displacement at or near (within 500 feet) of the project site. A fault rupture investigation was not performed because it was deemed inapplicable to the site based on no direct evidence of any active quaternary faults with 5 miles from the project site. The fault study is discussed in more detail later in this section. In most soil borings, relatively (compared to Holocene near-surface soils) high-strength, desiccated soil typical of Pleistocene-age soils was generally encountered between El. -20 feet and El. -30 feet. The site is generally grassy, with roseau cane, scrub trees and large bushes dominating the ridges that intersect the site. Site topography alternates between marshy flatland and chenier ridges. The site is generally higher near Louisiana Highway 27 and lower as it approaches the ship channel and the Gulf of Mexico, but significant sloping toward the two water bodies is not noticeable until after the last ridge. Surface elevations are at or below El. 0 feet in the marshy areas of the site and reach up to about El. +10 feet at the highest ridge.

GeoEngineers stated that groundwater was generally encountered at or within approximately 5 feet of the ground surface in the site explorations. The groundwater elevations are expected to vary with season, tidal fluctuations, and other factors. The groundwater at a depth of 2 feet has been assumed for the project site. GeoEngineers states the project site grade would be raised to elevation +8 feet NAVD88 (El. +8 feet) under the proposed process units and generally sloped to El. +5 feet to the rest of the site. GeoEngineers stated the project site would be surrounded by perimeter barrier walls constructed to El. +26 feet on the south (Gulf of Mexico) and east (ship channel) sites of the plant and to El. +21 feet on the north and west sides of the plant to protect the facilities from storm surge hazard as discussed in more detail later in this section. The LNG storage tank area crosses marsh and pond areas on the site, where groundwater is at or above the existing ground surface. The site grade in this area would be raised and positive drainage established to prevent issues due to surface water. However, high groundwater conditions would create corrosion potential for near surface foundation components and potential stability issues for grade supported structures. Protecting steel foundation members with concrete and galvanic protection measures could mitigate corrosion concerns.

The Commonwealth LNG site is categorized as Seismic Site Class E per ASCE 7-05 based on the results of soil strata and shear wave velocities measurements from CPTs and microtremor array method surface wave geophysical testing. GeoEngineers tested select soil samples in the top ten feet bgs of the site for pH, chloride ion (Cl-), sulfate ion (SO_4), and electrical resistivity. Below ten feet bgs, soils are saturated and below the influence of natural groundwater fluctuations. This makes them much less likely to contribute to foundation corrosion. GeoEngineers also evaluated pH, chloride content, and sulfate content in four (4) water samples, one from each of the temporary piezometers at which we monitored ground water levels. Susceptibility of steel foundation elements exposed to soil and groundwater is increased by a lower soil/water pH, by lower soil electrical resistivity, and by higher chloride levels. Sulfate content of soil and water is primarily an indicator of corrosion potential concerns for reinforced concrete foundation elements. Elevated sulfate levels increase the risk and potential severity of sulfate attack on buried concrete. Samples tested in the top 10 feet of the Commonwealth LNG soil profile generally indicated high to very high corrosion potential for buried steel due to the chloride concentration and electrical resistivity of the soil. Concrete buried at the site would generally be exposed to moderate sulfate attack risk and severity. Erosion is a particularly concerning issue at the marine facility, where wave dynamics and prop washing would create more erosive energy than the rest of the site would experience. In areas susceptible to prop wash, erodibility of clay slopes should be evaluated. Therefore, to address the potential corrosion/erosion, we recommend in section 4.12.1.6 that prior to initial site preparation, Commonwealth should file with the Secretary the following: a) the corrosion control and prevention plan for any underground piping, structure, foundations, equipment, and components; and b) the erosion control and prevention plan for the marine facility area. The filings should be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.

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. Because subsidence is recognized concern in the area of the Project, Commonwealth proposes to install the full containment LNG storage tanks and all major site facilities on deep piled foundations. To mitigate potential subsidence, Commonwealth indicated the permanent piezometer wells would be installed in each corner and the center of facility. Commonwealth stated monthly readings of the permanent piezometer would be performed to collect adequate data over the life of the facility to assess long-term groundwater conditions. In addition, Commonwealth would implement ground improvement solution of wick drains combined with surcharge to stabilize subsurface soil profile at the Project site.

GeoEngineers indicated it would likely result in about 12 to 15 inches of subgrade settlement due to site grade raise on 5 feet of fill across the site. Final settlement criteria would be dependent on piping and structural requirements. All Seismic Category I and Structures, systems and components of the facility would be piled to target depth to limit settlement. Settlements would be considered and controlled for the Seismic Category III structures, systems, and components. Total and differential settlement for Seismic Category I and II structures can be controlled by varying pile diameter and toe penetration. Settlement for the LNG storage tank design with the center of the tank settling 5 to 6 inches and the edge of the order of 3 to 5 inches. Differential settlement is therefore of the order of up to 3 inches. Settlement for individual isolated shallow footings with widths less than about four feet and designed are expected to be on the order of 1 to 2 inches. This settlement is in addition to any settlements resulting from site grading activities. The differential settlement may approach the total settlements due to the planned site grading activities and subsurface soil condition. Long-term settlement monitoring would be beneficial in observing potential future subsidence. Hence, Commonwealth would monitor settlement due to the planned site grade raising activities. Commonwealth proposed to install at least 2 settlement monitors in the LNG storage tank area, 2 in the liquefaction train area, and up to 4 other locations throughout the remainder of the facility. Settlement monitoring would be accomplished through the use of settlement monitoring plates. Specific monitoring systems, monitoring frequency, and layout would be determined once the final structure layout has been established. Due to wide range of settlements, we recommend in section 4.12.1.6 that prior to construction of final design, Commonwealth should file with the Secretary: a) the finalized settlement monitoring program and procedures for the Project site; b) the total and differential settlement of final designed structures, systems, and components foundations for the Project site; c) the total and differential settlement monitoring system of LNG storage tank foundation design should comply with applicable LNG industrial code/standards, including but not limited to API 620, API 625, API 650, API 653, and ACI 376. These filings should be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.

GeoEngineers states the project site raising activities would introduce the potential for perimeter slope stability issues. GeoEngineers evaluated slope stability based on a general site elevation of about +5 feet to a theoretical ground elevation of about 0 feet. Based on the analyses, GeoEngineers indicates the slopes for site grading should be no steeper than 3 feet horizontal for every vertical foot drop. This would also allow for maintenance convenience. We recommend in section 4.12.1.6 that prior to initial site preparation, Commonwealth should file with the Secretary the finalized plot plan with slopes and elevations contour lines for the Project site. The finalized plot plan should be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.

FERC staff evaluated the geotechnical investigation to ensure the adequacy in the number, coverage, and types of the geotechnical borings, CPTs, CPTu, CBR, seismic CPTs, and other tests, and found them to adequately cover major facilities, including the marine facilities, liquefaction area, pretreatment area, flare system, buildings, power generation, storage tanks, and storm surge protection barrier wall at the site. Commonwealth states that additional investigation would be performed to support final design, including soil borings, CPTs, and geophysical explorations. If authorized and constructed, FERC staff would continue its review of the results of the geotechnical investigation to ensure facility foundation designs are appropriate prior to construction of final design and throughout the life of the facilities.

The results of Commonwealth's geotechnical investigation at the Project site indicate that subsurface conditions are generally suitable for the proposed 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 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 what 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.[116] PHMSA regulations in 49 CFR 193 has specific requirements on designs to withstand certain loads from natural hazards and incorporates by reference NFPA 59A (2001 and 2006) and ASCE/SEI 7-05 and ASCE 7-93 via NFPA 59A (2001). NFPA 59A (2001) section 2.1.1 (c) also requires Commonwealth to consider the plant site location in the design of the Project, with respect to the proposed facilities being protected, within the limits of practicality, against natural hazards, such as from the effects of flooding, storm surge, and seismic activities. PHMSA's LOD on 49 CFR 193 Subpart B discusses Commonwealth's proposed wind speed design and studies of site-specific natural hazards. If authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193 must comply with the requirements of 49 CFR 193 and would be subject to PHMSA's inspection and

116 FERC regulations do not specify what edition of NFPA 59A an applicant should demonstrate compliance with. In most applications, applicants have interpreted this as the edition(s) incorporated into DOT PHMSA regulations, which for this case would be the 2001 and 2006 editions at the time of application. Others have interpreted this as the NFPA 59A edition published at the time of application or another edition they intend on incorporating in addition to those incorporated into DOT PHMSA regulations.

enforcement programs. The marine transfer areas would be subject to 33 CFR 127, which requires if the waterfront facility handling LNG is in a region subject to earthquakes, 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 (2019) and ASCE/SEI 7-16 via NFPA 59A (2019). Although USCG regulations do not provide seismic criteria for a region subject to earthquakes, or the earthquake forces the piers and wharves are to withstand, 33 CFR 127 incorporates NFPA 59A (2019) Chapter 12 seismic design requirements. In response to data requests, Commonwealth has committed to meeting NFPA 59A (2019) as incorporated by 33 CFR 127. Furthermore, we evaluated the basis of design for all facilities for all natural hazards under FERC jurisdiction, including those under PHMSA and USCG jurisdiction.

Commonwealth states that the facilities would be constructed to satisfy the FERC and NFPA 59A requirements in accordance with 2009 International Building Code (IBC), ASCE/SEI 7-05, and ASCE/SEI 7-10. These regulations and standards require various structural loads to be applied to the design of the facilities, including live (i.e., dynamic) loads, dead (i.e., static) loads, and environmental loads. FERC staff also evaluated whether the engineering design would withstand impacts from natural hazards, such as earthquakes, tsunamis, seiches, hurricanes, tornadoes, floods, rain, ice, snow, regional subsidence, sea level rise, landslides, wildfires, volcanic activity, and geomagnetism. We recommend in Section 4.12.1.6 that prior to construction of final design, Commonwealth should file with the Secretary the final design package (e.g., finalized civil design basis, criteria, specifications, structures and foundations drawings, and calculations, etc.) and associated quality assurance and quality control procedures with the documents reviewed, approved, and stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.

Commonwealth states that the full containment LNG storage tanks and all major site facilities would be supported by deep piled foundations. No Seismic Category I and II structures would use shallow foundations. Seismic Category III foundations may be shallow, depending on the function requires. Commonwealth states the load carrying capability of deep piled foundation would be verified through pile load testing program. Test piles would be installed, and the piles load testing would be conducted after settlement induced by the grade raise surcharge is complete. The pile load testing would be performed in accordance with American Society for Testing and Material (ASTM) D1143 for axial compression, ASTM D3689 for axial tension, and ASTM D3966 for lateral loading. The final design of foundations would be submitted for FERC staff review. We recommend in Section 4.12.1.6 that prior to initial site preparation, Commonwealth should file with the Secretary for review and approval of the finalized pile load test program (e.g., pile load test procedure, locations, configuration, quality assurance, and quality control, etc.). The filing should be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.

If a project is authorized, and constructed, and operated, the company would install equipment in accordance with its final design. We recommend in Section 4.12.1.6 that prior to commissioning, Commonwealth should file with the Secretary, 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 Standards 620, 625, 650, 653, and ACI 376.

Earthquakes, Tsunamis, and Seiche

FERC regulations under 18 CFR 380.12(h)(5) requires evaluation of earthquake hazards based on whether there is potential seismicity, surface faulting, or liquefaction. 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, Commonwealth evaluated historic earthquakes along fault locations and their resultant ground motions.

The U.S. Geological Survey (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).[117] The Commonwealth LNG Project is located on the northern margin of the Gulf of Mexico in the central Gulf of the Coastal Plain Physiographic Province (Peel et al. 1995). This province is characterized by extension in the Oligocene that was absorbed within a preexisting giant salt canopy overlying the basement rock. The faults in the basement rock are steeply dipping normal faults that formed during continental margin rifting during the Triassic. The top of basement is approximately 3 to 9 miles (5 to 14 kilometers [km]) below the ground/sea floor surface (Angell and Hitchcock 2007). Within this province faults on the shelf margin in the overlying Mesozoic and Cenozoic sedimentary rocks are syndepositional growth faults which sole into a detachment at or within the underlying salt or shale. The Commonwealth LNG site is located near the boundary between the Oligocene–Miocene detachment and salt dome tectono-stratigraphic provinces that cover most of the modern slope offshore and parts of coastal onshore Texas and Louisiana (Diegel et al. 1995). The Oligocene–Miocene detachment province is characterized by large-displacement, dominantly down-to-the-basin listric growth faults that sole on a regional detachment above the Paleogene sedimentary rocks. Downslope (basinward) gravitational spreading and gliding of cover sediments on the weak salt and shale detachments produces significant faulting above the detachments. The up-dip limit of the detachments is irregular (Diegel et al. 1995). Several growth faults that underlie southern Louisiana have been reactivated and displace the late Pleistocene and or Holocene deposits at the ground surface (Heinrich 2005; McCulloh and Heinrich 2012; Gagliano et al. 2003; Gagliano 2005).

To address the potential ground motions at the site, PHMSA regulations in 49 CFR §193.2101 under Subpart C require that field-fabricated LNG tanks comply with section 7.2.2 of NFPA 59A (2006) for seismic design. NFPA 59A (2006) requires LNG storage tanks 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, section 7.2.2 of NFPA 59A (2006) requires that LNG tanks and its impounding system 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), termed the safe shutdown earthquake (SSE). PHMSA regulations in 49 CFR §193.2101 under Subpart C also incorporate by reference of NFPA 59A (2001) Chapter 6, which requires piping systems conveying flammable liquids and flammable gases with service temperatures below −20°F, be designed as required for seismic ground motions. If authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, would be subject to the PHMSA's inspection and enforcement programs.

In addition, FERC staff recognizes Commonwealth would also need to address hazardous fluid piping with service temperatures at −20°F and higher and equipment other than piping, and LNG storage (shop built and field fabricated) containers. We also recognize the current FERC regulations under 18 CFR 380.12(h)(5) continue to incorporate National Bureau of Standards Information Report (NBSIR) 84-2833. NBSIR 84-2833 provides guidance on classifying stationary storage containers and related safety equipment as Category I and classifying the remainder of the LNG project structures, systems, and components as either Category II or Category III, but does not provide specific guidance for the seismic

117 USGS. Earthquake Hazards Program. Quaternary Fault and Fold Database of the United States. Available at: https://www.usgs.gov/natural-hazards/earthquake-hazards/faults.

design requirements for them. Absent any other regulatory requirements, we recommend that other LNG project structures classified as Seismic Category II or Category III be seismically designed to satisfy the design earthquake and seismic requirements of the ASCE/SEI 7-05 or equivalent in order to demonstrate there is not a significant impact on the safety of the public. ASCE/SEI 7-05 or equivalent is recommended as it is a complete American National Standards Institute (ANSI) consensus design standard, its seismic requirements are based directly on the National Earthquake Hazards Reduction Program (NEHRP) Recommended Provisions, and it is referenced directly by the IBC. Having a link directly to the IBC and ASCE/SEI 7 is important to accommodate seals by the engineer of record because the IBC is directly linked to state professional licensing laws while the NEHRP Recommended Provisions are not.

The geotechnical investigations of the existing site indicate the site is classified as Site Class E[118] in accordance with ASCE/SEI 7-05, which is in accordance with IBC (2009) based on a site time-averaged shear wave velocity (Vs) in approximately the upper 100 feet that ranged between 396.1 and 439.3 feet per second 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.

GeoEngineers performed a site-specific seismic hazard study for the site. The study concluded that the site would have a horizontal OBE spectral PGA of 0.024 g, a horizontal SSE PGA of 0.085 g; a short-period (0.2-second) spectral response acceleration parameter S_s=0.190 g at 5% damped, a 1.0-second spectral acceleration parameter S_1=0.118 g at 5% damped; Site Coefficient at short period F_a=2.5; Site Coefficient at long period F_v=3.5; and the long-period transition period, T_L is 12 second. GeoEngineers stated that for seismic Category II & III structures, design earthquake spectral response acceleration parameters at short-period (0.2-second), S_{DS} is equal to 0.127 g, and at 1.0-second period, S_{D1} equals 0.086 g. The vertical response spectra to horizontal response spectra (V/H) would be at a minimum of two-third ratio to comply with NFPA 59A (2006) requirement. FERC staff independently evaluated the OBE, SSE, short-period (0.2-second) spectral acceleration parameter, 1.0-second spectral acceleration parameter, and the long-period transition period for the site using the ASCE 7 Hazard Tool[119], USGS Earthquake Hazards Program Seismic Design Maps[120] and Applied Technology Council Hazard[121] tools for all occupancy categories (I through IV). FERC staff believe the SSE PGA, OBE PGA, and 5 percent-damped response spectral acceleration parameters proposed by Commonwealth are acceptable. These ground motions are relatively low compared to other locations in the United States.

Based on the severity of the potential impacts, 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.

118 There are six different site classes in ASCE/SEI 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).

119 ASCE 7 Hazard Tool: https://asce7hazardtool.online/. Accessed February 2022.

120 USGS. Unified Hazards Tool: https://earthquake.usgs.gov/hazards/interactive/. Accessed February 2022.

121 Applied Technology Council: https://hazards.atcouncil.org/. Accessed February 2022.

ASCE/SEI 7-05 also requires determination of the Seismic Design Category based on the Occupancy Category (or Risk Category in ASCE/SEI 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.[122] FERC staff has identified the Seismic Design Category C based on ASCE/SEI 7-05. ASCE/SEI 7-05 Table 11.6-1 and 11.6-2 indicate the Seismic Design Category C for Occupancy Category IV structures with S_{D1}=0.086 g, which is the one governing in this case. This seismic design categorization would be consistent with the IBC (2009) and ASCE/SEI 7-05 (and ASCE/SEI 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. However, due to the low seismicity of the region, the potential for soil liquefaction to occur is low. GeoEngineers performed additional evaluation to assess the potential for liquefaction triggering and liquefaction induced ground settlement at the site during strong earthquake shaking. Liquefaction is a phenomenon by which cohesionless soils experience rapid loss of internal strength during strong ground shaking. Conditions favorable to liquefaction occur in loose to medium dense, clean to moderately silty sand (granular soil) and low plasticity silts located below the groundwater table. Dense sands are less susceptible to liquefaction. Ground settlement, lateral spreading and sand boils may result from liquefaction. Structures supported directly on liquefied soils could suffer foundation settlement or lateral movement that could be severely damaging to the structures. Evaluation of liquefaction potential is dependent on numerous site parameters, including soil grain size, soil density, site geometry, static stresses, and the magnitude and Seismic Ground Motion Level PGA. Liquefaction at the site was evaluated using simplified semi-empirical methods based on in-situ cone penetration tests (CPT). Based on the analysis, the site has a low potential for liquefaction for the MCE/SSE, with isolated locations are estimated to experience up to 0.6-inches of liquefaction-induced settlement. The estimated liquefaction-induced settlement for the DE is considered negligible. Therefore, the site is also anticipated to have a low potential for liquefaction for the OBE/ALE. In addition, Commonwealth would address possible issues relating to the potential for soil liquefaction and loss of soil strength by using piles in the foundation design and utilizing surcharge with wick drains as a remedial measure.

Commonwealth indicated they would implement a seismic monitoring program at the Project site to monitor seismic activities impacts on the critical structures and facilities. Required seismic monitoring during construction would be elaborated on during the final design stage of the Project. Therefore, we recommend in Section 4.12.1.6 that prior to construction of the final design, Commonwealth should file with the Secretary the finalized seismic monitoring program for the Project site. The seismic monitoring program should comply with NFPA 59A, (2019 edition) sections 8.4.14.10, 8.4.14.12, 8.4.14.12.1, 8.4.14.12.2, and 8.4.14.13; ACI 376 (2011 edition) sections 10.7.5 and 10.8.4; U.S Nuclear Regulatory Commission Regulatory Guide RG 1.12 (Revision 3) sections 1 and 3 through 9 and all subsections, or

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122 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.

equivalents subject to review and approval A free-field seismic monitoring device should be included in the seismic monitoring program for the Project site. The proposed seismic monitoring system must include installation location plot plan; description of the triaxial strong motion recorders or other seismic instrumentation; the proposed alarm set points and operating procedures (including emergency operating procedures) for control room operators in response to such alarms/data obtained from seismic instrumentation; and testing and maintenance procedures.

Seismic events in waterbodies can also cause tsunamis or seiches by sudden displacement of the sea floors in the ocean or standing water. Tsunamis and seiche may also be generated from volcanic eruptions or landslides. Tsunami wave action can cause extensive damage to coastal regions and facilities. The Terminal site's low-lying position would make it potentially vulnerable were a tsunami to occur. There is little evidence that the northern Gulf of Mexico is prone to tsunami events, but the occurrence of a tsunami is possible. Two did occur in the Gulf of Mexico in the early 20th century and had wave heights of 3 feet or less (USGS, 2009), which is not significantly higher than the average breaking wave height of 1.5 feet (Owen, 2008). Hydrodynamic modeling conducted off the coast of south Texas in 2004 indicated that the maximum tsunami run-up could be as high as 12 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). GeoEngineers' *Site-Specific Seismic Design Services* report included a Tsunami Hazard Assessment for the Liquefaction 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 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, Commonwealth evaluated such events historically. The severity of these events is 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. Commonwealth states that all LNG facilities would be designed to withstand a sustained wind velocity of not less than 150 miles per hour (mph) per 49 CFR §193.2067. Other structures and equipment wind speed design would comply with ASCE/SEI 7-10 requirements. A sustained wind speed of 150 mph is equivalent to a 183 mph 3-second gust wind speed at 33 feet (10 meters) above ground for Exposure C category, using the Durst Curve in ASCE/SEI 7-10 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 47,000-year mean return interval or 0.11 percent probability of exceedance in a 50-year period for the site, based on ASCE 7-22 wind speed return period conversions (ASCE 7 Hazard Tool). Per ASCE/SEI 7-10, the 183 mph 3-second gust wind speed equates to a strong Category 4 Hurricane using the Saffir-Simpson Hurricane Wind Scale (130-156 mph sustained wind speed)). Commonwealth must meet 49 CFR §193.2067 under Subpart B for wind load requirements. In accordance with the MOU, the PHMSA evaluated in its LOD whether an applicant's proposed project meets the PHMSA 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 PHMSA staff.

However, as noted in the limitation of ASCE/SEI 7-05/7-10, tornadoes were not considered in developing basic wind speed distributions. This leaves a potential gap in potential impacts from tornados. However, tornado speed and load design have been officially implemented in ASCE/SEI 7-22. The proposed Project site is in the tornado-prone region as indicated in ASCE/SEI 7-22. Per ASCE/SEI 7-22, the design tornado loads for buildings and other structures, including the Main Wind Force Resisting System and Components and Cladding elements thereof, should be determined using one of the procedures as specified in section 32.1.2 and subject to the applicable limitations of Chapters 26 through 32, excluding Chapter 28 of ASCE/SEI 7-22. FERC staff independently evaluated the potential of tornados hazard for the Project site, using ASCE Hazard Tool along with ASCE/SEI 7-22. With the maximum effective plan area of 4,000,000 ft^2 and a mean recurrence interval of 10,000 years, the tornado speed corresponds to a 3-second gust speed at 33 feet (10 meters) above the ground would be V_T = 142 mph at the proposed Project location. However, the proposed Commonwealth project site is more than 8,000,000 ft^2, Commonwealth proposed a 183 mph 3-second gust wind speed at 33 feet (10 meters) above the ground for all the LNG facilities design, which is above the tornado speed V_T=142 mph at 4,000,000 ft^2 effective plan area. However, the tornado loads design procedure is unlike the wind loads design. Commonwealth's proposed wind speed may not be sufficient for the tornado loads design for the Project site per ASCE/SEI 7-22 Chapter 32 tornado loads. Therefore, we recommend in Section 4.12.1.6 that prior to initial site preparation, Commonwealth should file with the Secretary the finalized wind design basis for the project facility, which should include the tornado loads determination and consideration of its load combination as required by ASCE/SEI 7-22. As a result, FERC staff believe the use of a 150 mph sustained wind speed, which is equivalent to a 183 mph 3-second gust wind speed at 33 feet (10 meters) above ground for all the LNG facilities design, is adequate for the LNG storage tanks and other LNG facilities, if both the wind and tornado loads design procedures are followed appropriately as recommended during the Project final design and construction.

The PHMSA regulations in 49 CFR §193.2067 under Subpart B would require the impounding system for the LNG storage tanks to withstand impact forces from potential penetrations by windborne missiles. ASCE/SEI 7 also recognizes the facility would be in a windborne debris region. Windborne 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/missile wind speed, characteristics of projectile/missile, and methodology or model used to determine whether penetration or perforation would occur. Unfortunately, no criteria are provided in 49 CFR 193 or ASCE/SEI 7 for these specific parameters. NFPA 59A (2016) recommends Comite Euro-International du Beton 187[123] be used to determine projectile/missile perforation depths. In order to address the potential impact, we recommend in section 4.12.1.6 that prior to construction of the final design, Commonwealth should file with the Secretary for review and approval of the finalized projectile/missile impact analysis to demonstrate that the outer concrete container wall of the full containment LNG storage tank could withstand projectile/missile impact. The analysis should detail the projectile/missile speeds and characteristics and methods used to determine penetration resistance and perforation depths. The finalized projectile/missile impact analysis should be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana. FERC staff would continue our evaluation for the finalized projectile/missile impacts analysis and specified

123 Comite Euro-International du Beton Bulletin. Concrete Structures under Impact and Impulsive Loading-Synthesis Report 187 (1988).

projectile/missile and speeds using established methods, such as Comite Euro-International du Beton 187, DOD[124], DOE[125], and Nuclear Regulatory Commission[126] guidance.

In addition, FERC staff evaluated historical tropical storm, hurricane, and tornado tracks in the vicinity of the project facilities using data from the Department of Homeland Security Homeland Infrastructure Foundation Level Data and NOAA Historical Hurricane Tracker.[127,128] Between 1856 and October 2020, there were 92 hurricanes and tropical storms made landfall within 60 nautical miles of the Project site (NOAA, 2020), including numerical Unnamed Hurricanes at Hurricane Categories 1, 2, and 3. Three unnamed Hurricanes in 1856/1986/1918, Hurricane Audrey in 1957, Hurricane Carmen in 1974, Hurricane Andrew in 1992, and Hurricane Laura in 2020, which all made Hurricane Category 3 landfall within 60 nautical miles of Cameron Parish, Louisiana. Category 5 Hurricane Rita in 2005 was the most intense tropical cyclone on record in the Gulf of Mexico and the fourth-most intense Atlantic hurricane ever recorded. However, it weakened to a Category 3 Hurricane with winds of 115 mph before making landfall in Johnson's Bayou, Louisiana, which is about 20 nautical miles from proposed Project site area. However, it produced significant storm surges, with maximum heights greater than 18 feet struct southwestern Louisiana, and coastal parishes experienced extensive damage. Category 5 Hurricane Katrina in 2005 was large and destructive. However, it was weakening to Category 3 strength when it made its second landfall over southeast Louisiana. There is no known historic Category 5 Hurricane, which has made direct landfall with 60 nautical miles of proposed Project site area. Commonwealth climate data report indicated the Lake Charles Region received 25 inches of rain in 24 hours for 1,000-year mean recurrence interval and the dominant flood mechanism at the project site is driven by coastal storm surge rather than high precipitation events. Commonwealth states the project site would be designed with a 183 mph 3-second gust wind speed at 33 feet (10 meters) above ground for Exposure C category, and adequate floodwall elevations to withstand Category 4 Hurricanes and 500 years flood events.

Title 33 CFR 127 requires the marine transfer area to meet NFPA 59A (2019) criteria. NFPA 59A (2019) Section 8.3.2 requires: a 500-year mean occurrence interval including relative sea level rise and wind-driven wave effects shall be used for determining flood and hurricane storm surge design hazards.

Potential flood levels may also be informed from the FEMA Flood Insurance Rate Maps, which identify Special Flood Hazard Areas (base flood) that have a 1 percent probability of exceedance in 1 year to flood (or a 100-year mean return interval) and moderate flood hazard areas that have a 0.2 percent probability of exceedance in 1 year to flood (or a 500-year mean return interval). According to the FEMA National Flood Hazard Layer Viewer[129], the Project site would be in special flood hazard areas, Zone VE with base flood elevation BFE at approximately +19 feet. Zone VE is defined as Areas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. 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

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124 DOD. Unified Facilities Criteria (UFC) Structures to Resist the Effects of Accidental Explosions (UFC 3-340-02), December 5, 2008.

125 DOE. Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities (2002). DOE Standard DOE-STD-1020-2002.

126 NCR. Regulatory Guide 1.76, Design Basis Tornado and Tornado Missiles for Nuclear Power Plants, Revision 1 (2007a). Regulatory Guide 1.221, Design Basis Hurricane and Hurricane Missiles for Nuclear Power Plants (2011).

127 Department of Homeland Security. Homeland Infrastructure Foundation Level Data: https://hifld-geoplatform.opendata.arcgis.com/. Accessed February 2022.

128 NOAA. Historical Hurricane Tracker: https://coast.noaa.gov/hurricanes/. Accessed February 2022.

129 FEMA National Flood Hazard Layer Viewer: https://hazards-fema.maps.arcgis.com/apps/webappviewer. Accessed February 2022.

Construction. Commonwealth states the facility would be designed to withstand at a minimum a 500-year return storm, rain, and associated storm surge event, with overtopping limited to ensure that internal flooding is of no consequence. The FEMA National Flood Hazard Layer will be reviewed to confirm for the elevations. The floodwall design would be completed prior to final design. This would incorporate the FEMA National Flood Hazard Layer elevations, and the Storm Surge Exclusion Wall Design prior to construction.[130]

The majority of Commonwealth Project site would be enclosed for flood protection by construction of storm surge protection walls (floodwalls). A current Commonwealth plan layout present several structures and buildings outside the floodwalls area, which include admin office/main control room, maintenance building, elevated flare, warm flare, jetty platform control room, etc. We received a comment from the public expressing concern regarding the safety of the flare stacks being outside of the floodwalls. Commonwealth indicated the facility components that would be constructed outside of the floodwalls have not been engineered as yet. Commonwealth confirmed these items would be designed per the applicable codes, inclusive of elevation for the flood hazard area, wave, and wind loading. Building elevations would be derived and confirmed during the engineering of these structures, in a future stage of the project. The flares would be designed to withstand wave loading during a hurricane event. A 500-year return for resiliency is the design case. The floodwall minimum height would reflect this elevation.

We generally evaluate the design against a 500-year stillwater flood elevation (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 model developed by NOAA National Hurricane Center, a 500-year event would equate to a Category 2 Hurricane and approximately 3-9 feet MEOW. This is lower than indicated in the 500-year FEMA maps. In addition, while NOAA seems to provide higher resolution of topographic features, it limits its SLOSH maps to storm surge levels at high tide above 9 feet. As a result, FERC staff evaluated the storm surge against other sources using SLOSH maps that indicate a similar upper range of 8-10 feet MEOW for Category 2 Hurricanes, and also indicated 13-16 feet MEOW for Category 3 Hurricanes, 16-20 feet MEOW for Category 4 Hurricanes, and 20-25 feet MEOW for Category 5 Hurricanes. This data suggests that current Commonwealth design may not withstand Category 3 or 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 and vertical land movement to be closer to the 1.21 feet over a 30-year intermediate projection provided by the COE Sea-Level Change Curve Calculator with NOAA et al. 2017 Scenario Source.[131] Commonwealth indicated the floodwalls height would be designed to a 500-year SWEL, 500-year wave, and sea level rise height of 8.15 inches, and 8-12 inches of expected settlement, 6.3 inches of local subsidence yielding. Although the sea level rise and subsidence values are different, in total, they are equivalent to the intermediate projections by NOAA

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 disagree that the current 20 feet and 25 feet post settlement storm surge floodwalls elevations would provide adequate protection of the Commonwealth site. Commonwealth committed that the Project facility would be designed to handle a 500-year mean recurrence interval flood event to comply with USCG regulations under 33 CFR 127 requirements. In addition, given the uncertainty in storm surge floodwalls settlement, we recommend in section 4.12.1.6 that Commonwealth periodically monitor and maintain the storm surge floodwalls to be no

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130 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, February 2022.

131 COE, https://cwbi-app.sec.usace.army.mil/rccslc/slcc_calc.html, Accessed September 2022

less than a minimum elevation of 500-year mean recurrence interval flood event. We recommend in the section 4.12.1.6 that Commonwealth shall file with the Secretary the final design of storm surge floodwalls to comply with applicable code/standards requirements including but are not limited to 33 CFR 127, NFPA 59A (2019), ASCE/SEI 7(2022 edition) or equivalent, and ASCE/SEI 24 (2014 edition) or equivalent, etc. The floodwalls should be designed and maintained to withstand a minimum of a 500-year mean occurrence interval in consideration of relative sea level rise, local subsidence, site settlement, shoreline recession, erosion and scour effect, and wind-driven wave effects, etc. The sea level rise and vertical land movement should be in accordance with at a minimum intermediate curve corresponding to life of facility in 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, February 2022 or equivalent. The final design of floodwalls shall be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana. In addition, we recommend in section 4.12.1.6 that prior to construction of final design, Commonwealth shall file with the Secretary the final design elevation for the structures/buildings outside floodwalls area, including but are not limited to admin office/main control room, maintenance building, elevated flare, marine flare, jetty platform control room, etc. The final design elevation drawings and calculations should be 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). The average coastal erosion rate is -1.2 meters per year between 2000 and 2012 along the Texas coastal shoreline, with the area between Sabine Pass and Rollover Pass experiencing a shoreline loss rate of -4.7 meters per year between 2000 and 2012 (McKenna, 2014). Shoreline erosion could occur at the Project site and along the opposite shoreline as a result of waves, currents, and vessel wakes. Commonwealth stated that marine slopes would be protected against wave, current, and prop-wash-induced scour using rock rip rap or concrete revetment. Scour protection would be designed by a hydraulic engineer to resist tidal influence, wave action and prop wash forces. As required by ASCE/SEI 7-05/7-10, the erosion and scour should be included in the calculation of flood loads on buildings and other structures in flood hazard areas as recommended above. FERC staff would continue our evaluation of final flood loads design within erosion and scour effect for the proposed Project. Even though shoreline erosion is a concern at the site, the recommended and proposed 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. Landslides in the United States occur in all 50 states. Commonwealth states that there is little likelihood that landslides or slope movement at the site would be a realistic hazard as the topography across the Project site is relatively flat. We reviewed the Commonwealth geotechnical investigation report and conclude the landslide would not be a significant risk for the proposed Project site.

Wildfires are prevalent on the West Coast, especially in California, Alaska, and Hawaii. The proposed Project site is surrounded by the Calcasieu Ship Channel on the Eastern side and Gulf of Mexico on the Southern side. There is no significant evidence that vegetation on the northern and western side of the plant would cause potential wildfires. Therefore, we conclude that it is unlikely that a wildfire would occur at the Project site. Volcanic activity is primarily a concern along plate boundaries on the West Coast and in Alaska and Hawaii. Based on FERC staff review of maps from USGS[132] and Department of

132 United States Geological Survey, U.S. Volcanoes and Current Activity Alerts, https://volcanoes.usgs.gov/index.html, Accessed February 2022.

Homeland Security[133] of the nearly 1,500 volcanoes with eruptions since the Holocene period (in the past 10,000 years) there has been no known active or historic volcanic activity closer than approximately 700 miles across the Gulf of Mexico in Los Atlixcos, Mexico.

Geomagnetic disturbances 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 geomagnetic disturbances intensities with an estimated 100-year mean return interval.[134] The map indicates the Commonwealth site could experience geomagnetic disturbances intensities of 10-50 nano-Tesla with a 100-year mean return interval. However, Commonwealth would be designed such that if a loss of power were to occur the valves would move into a fail-safe position. In addition, Commonwealth is an export facility that does not serve any U.S. customers.

External Impact Review

To assess the potential impact from external events, FERC staff conducted a series of reviews to evaluate transportation routes, land use, and activities within the facility and surrounding the LNG terminal site, and the safeguards in place to mitigate the risk from events, where warranted. FERC staff coordinated the results of the reviews with other federal agencies to assess potential impacts from vehicles and rail; aircraft impacts to and from nearby airports and heliports; pipeline impacts from nearby pipelines; impacts to and from adjacent facilities that handle hazardous materials under the EPA's Risk Management Plan (RMP) regulations and power plants, including nuclear facilities under the Nuclear Regulatory Commission's regulations. Specific mitigation of impacts from use of external roadways, rail, helipads, airstrips, or pipelines are also considered as part of the engineering review done in conjunction with the NEPA review.

FERC staff uses a risk-based approach to assess the potential impact of the external events and the adequacy of the mitigation measures. The risk-based approach uses data based on the frequency of events that could lead to an impact and the potential severity of consequences posed to the LNG terminal site and the resulting consequences to the public beyond the initiating events. The frequency data is based on past incidents and the consequences are based on past incidents and/or hazard modeling of potential failures.

<u>Road</u>

FERC staff reviewed 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 a project site and subsequently increase the risk to the public. In addition, if authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to the PHMSA's inspection and enforcement programs. PHMSA 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

133 Department of Homeland Security, Homeland Infrastructure. Foundation-Level data (HIFLD). Natural Hazards, hifld-geoplatform.opendata.arcgis.com, Accessed February 2022.

134 United States Geological Survey. Magnetic Anomaly Maps and Data for North America, https://mrdata.usgs.gov/magnetic/map-us.html#home, Accessed February 2022.

compressors to be located or protected by barriers so that they are safe from damage by rail or vehicle movements. However, the PHMSA regulations and NFPA 59A (2001) requirements do not indicate what collision(s) or explosion(s) could reasonably be expected to cause the most severe loading. 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 (FHWA)[135], DOT National Highway Traffic Safety Administration (NHTSA)[136], PHMSA[137], EPA, NOAA[138], and other reports[139,140,141], and frequency of trucks and proposed mitigation to prevent or reduce the impacts of a vehicular incident.

Incident data from PHMSA and estimated lane mileage from the FHWA and NHTSA, indicate hazardous material incidents are very infrequent (2e-3 incidents per lane mile per year) and nearly 75 percent of hazardous material vehicular incidents occur during unloading and loading operations while the other 25 percent occur while in transit or in transit storage. In addition, approximately 95 percent of hazardous liquid 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.

The EPA and NOAA report that 80 percent of fires that lead to container ruptures results in projectiles and that 80 percent of projectiles from liquefied petroleum gas (LPG) incidents, which constitute the largest product involved in BLEVEs, travel less than 660 feet. The EPA also reports that on average container ruptures would result in less than four projectiles for cylindrical containers and 8.3 for spherical vessels. FERC staff evaluated other reports that affirmed the EPA estimates based on data for approximately 150 experimental and accidental pressure vessel bursts (PVBs) and BLEVEs with approximately 683 total projectiles (4.6 average fragments per incident) that showed approximately 80 percent of fragments traveled 490 to 820 feet and within 6.25 times the estimated or observed fireball radius. The data also showed projectiles have traveled up to 3,900 feet for large LPG vessels and 1,200 feet for LPG rail cars. In all the documented cases, the projectiles traveled less than 15 times the fireball diameter, but one of the reports indicated up to 30 times the fireball diameter is possible albeit very rare.

Unmitigated consequences under average ambient conditions from releases of 1,000 gallons through a 1-inch hole would result in distances ranging from 25 to 200 feet for flammable vapor dispersion, and 75 to 175 feet for jet fires. Unmitigated consequences under worst case weather conditions from catastrophic failures of trucks proposed at the site generally can range from 200 to 2,000 feet for flammable vapor dispersion, 275 to 350 feet for radiant heat of 5 kW/m^2 from jet fires, 800 to 1,050 feet to a 1 psi overpressure from a BLEVE, 850 to 1,500 feet for a heat dose equivalent to a radiant heat of 5 kW/m^2 over

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135 FHWA, Office of Highway Policy Information, *Highway Statistics 2020*, https://www.fhwa.dot.gov/policyinformation/statistics/2020/, accessed March 2022.

136 NHTSA, *Traffic Safety Facts Annual Report Tables*, https://cdan.nhtsa.gov/tsftables/tsfar.htm, accessed March 2022.

137 PHMSA, Office of Hazardous Material Safety, *Incident Reports Database Search*, https://hazmatonline.phmsa.dot.gov/IncidentReportsSearch/Welcome.aspx, accessed March 2022.

138 U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration, ALOHA®, User's Manual, The CAMEO® Software System, February 2007.

139 Birk, A.M., BLEVE Response and Prevention Technical Documentation, 1995.

140 American Institute of Chemical Engineers, Center for Chemical Process Safety, Guidelines for Vapor Cloud Explosion, Pressure Vessel Burst, BLEVE, and Flash Fire Hazards, Second Edition, 2010.

141 Lees, F.P, Lees' Loss Prevention in the Process Industries: Hazard Identification, Assessment, and Control, Volume 2, Second Edition, 1996.

40 seconds from 250 to 325 feet radii fireballs burning for 5 to 15 seconds from a BLEVE, and projectiles from BLEVEs possibly extending farther. Based on distribution function of the projectile distances, FERC staff estimate approximately 90 percent of all projectiles for a 10,000-gallon tanker truck would be within 0.5 mile and there is approximately a 1 percent probability they would extend beyond 1 mile and less than 0.1 percent probability they would extend 30 times the fireball diameter. These values are also close to the distances provided by the DOT FHWA for designating hazardous material trucking routes (0.5 mile for flammable gases for potential impact distance) and PHMSA for emergency response (0.5 to 1 mile for initial evacuation and 1 mile for potential BLEVEs for flammable gases).

During normal operation of the project, Commonwealth estimates 49 refrigerant make-up trucks, 5 amine trucks, 31 nitrogen trucks, and 5 diesel trucks would be needed at the site annually. Depending on feed gas composition, between 3 and 9 trucks daily would be required to dispose of NGL separated from the feed gas. During commissioning and startup, Commonwealth estimates 133 refrigerant trucks, 56 amine trucks, and 2 diesel trucks to conduct the first fill of the facility. The most frequent truck deliveries would occur during commissioning and startup activity at the site and would deliver refrigerants to load the liquefaction trains. Commonwealth does not plan to utilize any trucks to deliver LNG.

The Gulf Beach Highway (Highway 27/82), runs northwest paralleling the facility property then continues west along the gulf coast shoreline and would be used to access the Commonwealth Project site. The Gulf Beach Highway is a two-lane bi-directional route with a 55 mph speed limit. Commonwealth provided a Road Safety and Reliability Impact Study. The Road Safety and Reliability Impact Study 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 the Gulf Beach Highway. The separation distance between the Gulf Beach Highway and the Project facilities that would contain hazardous fluids would be greater than 300 feet which would exceed the distances estimated for flammable vapor dispersion and radiant heat from a liquid hydrocarbon truck 1-inch hole release. In addition, the Project would utilize the 21-feet tall site perimeter wall to separate the Gulf Beach Highway and the process equipment. FERC staff did not identify any other major highways or roads within close proximity to piping or equipment containing hazardous materials at the site that would raise concerns of direct impacts from a vehicle impacting the site.

Therefore, we conclude that the Project would not pose a significant risk or significant increase in risk to the public due to vehicle impacts as a result of the potential consequences, incident data, frequency of trucks, proposed mitigation by Commonwealth, and additional mitigation measures proposed by FERC staff.

<u>Rail</u>

FERC staff reviewed whether any rail operations would be associated with the Project and whether any existing rail lines would be located near the site. FERC staff uses 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 Commonwealth site and subsequently increase the risk to the public. In addition, if authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to PHMSA's inspection and enforcement programs. The PHMSA regulations under 49 CFR §193.2155 (a) (5) (ii) under Subpart C state that if the LNG facility adjoins the right-of-way of any railroad, the structural members of an impoundment system must be designed and constructed to prevent impairment of the system's performance reliability and structural integrity as a result of a collision by or explosion of a train or tank car that could reasonably be expected to cause the most severe loading.

Section 8.5.4 of NFPA 59A (2001), incorporated by reference in 49 CFR 193, requires transfer piping, pumps, and compressors to be located or protected by barriers so that they are safe from damage by rail or vehicle movements. However, the PHMSA regulations and NFPA 59A (2001) requirements do not indicate what collision(s) or explosion(s) could reasonably be expected to cause the most severe loading. Therefore, 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 Federal Rail Administration (FRA) and PHMSA, and frequency of rail operations nearby Commonwealth.

FERC staff evaluated the risk of the rail operations based on the consequences from a release, incident data from PHMSA,[142] and rail miles from DOT Bureau of Transportation Statistics.[143] Incident data from PHMSA and rail miles from DOT Bureau of Transportation Statistics indicates hazardous material incidents are very infrequent (7e-3 incidents per rail mile per year). In addition, approximately 95 percent of liquid 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 hospital injuries and less than 0.1 percent of hazardous material incidents result in fatalities.

As previously discussed, the EPA and NOAA report that 80 percent of fires that lead to container ruptures results in projectiles and that 80 percent of projectiles from LPG incidents, which constitute the largest product involved in BLEVEs, travel less than 660 feet. The EPA also reports that on average container ruptures would result in less than four projectiles for cylindrical containers and 8.3 for spherical vessels. FERC staff evaluated other reports that affirmed the EPA estimates based on data for approximately 150 experimental and accidental PVBs and BLEVEs with approximately 683 total projectiles (4.6 average fragments per incident) that showed approximately 80 percent of fragments traveled 490 to 820 feet and within 6.25 times the estimated or observed fireball radius. The data also showed projectiles have traveled up to 3,900 feet for large LPG vessels and 1,200 feet for LPG rail cars. In all the documented cases, the projectiles traveled less than 15 times the fireball diameter, but one of the reports indicated up to 30 times the fireball diameter is possible albeit very rare.

Unmitigated consequences under average ambient conditions from releases of 1,000 gallons through a 1-inch hole would result in distances ranging from 25 to 200 feet for flammable vapor dispersion, and 75 to 175 feet for jet fires. Unmitigated consequences under worst-case weather conditions from catastrophic failures of rail cars containing various flammable products generally can range from 300 to 3,000 feet for flammable vapor dispersion, 450 to 575 feet for radiant heat of 5 kW/m^2 from jet fires, 1,225 to 1,500 feet to a 1 psi overpressure from a BLEVE, 1,250 to 2,100 feet for a heat dose equivalent to a radiant heat of 5 kW/m^2 over 40 seconds from 350 to 450 feet radii fireballs burning for 7 to 20 seconds from a BLEVE, and projectiles from BLEVEs possibly extending farther. Based on distribution function of the projectile distances, FERC staff estimate approximately 80 percent of all projectiles for a 30,000-gallon rail car would be within 0.5 mile and there is approximately a 5 percent probability they would extend beyond 1 mile and less than 0.1 percent probability they would extend 30 times the fireball diameter. These values are also close to the distances provided by PHMSA for emergency response (0.5 to 1 mile for initial evacuation and 1 mile for potential BLEVEs for flammable gases).

The closest rail line would be Union Pacific terminus located approximately 24 miles north of the Project site near the Trunkline LNG terminal. Therefore, FERC staff conclude there are no potential rail

142 PHMSA, Incident Statistics, https://www.phmsa.dot.gov/hazmat-program-management-data-and-statistics/data-operations/incident-statistics, Hazmat Incident Report Search Tool 2010 – 2020, accessed March 2022.

143 DOT Bureau of Transportation Statistics, System Milage Within the United States, https://www.bts.gov/content/system-mileage-within-united-states, 2010 – 2020, Accessed March 2022.

safety or reliability impacts of significance that railroad lines would pose due to vapor dispersion, fireball, jet fire, pool fire, BLEVE, or projectile hazard to the proposed Project.

Air

FERC staff reviewed whether any aircraft operations would be associated with the Project and whether any existing aircraft operations would be located near the site. FERC staff uses 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, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to the PHMSA's inspection and enforcement programs. PHMSA regulations under 49 CFR §193.2155 (b) under Subpart C require an LNG storage tank must not be located within a horizontal distance of one mile from the ends, or 0.25 miles from the nearest point of a runway, whichever is longer. In addition, 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.

Two mixed use aviation airports, Chennault International Airport and Lake Charles Regional Airport, would be located 23 miles northeast and 24.7 miles northeast of the LNG terminal site, respectively. Additionally, a small, infrequently used heliport is located adjacent to the proposed Commonwealth facility location at the Stone Oil facility along with other small heliports in the area.

DOT FAA regulations in 14 CFR 77 require Commonwealth 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 LNG marine vessels that would be above the height of the highest mobile object that would normally traverse it would require notification to FAA ..

The Project would include permanent and temporary (construction) structures that would be taller than 200 feet, but the mobile objects traversing the waterway would not be above the height of the highest mobile object that would normally traverse it. In accordance with the DOT FAA regulations in 14 CFR 77, Commonwealth submitted notice to the DOT FAA for an aeronautical obstruction study for the tallest permanent structures at its property. On September 24, 2019, Commonwealth received a Determination of No Hazard to Air Navigation from the DOT FAA provided the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, paint/red lights – Chapters 3 (Marked), 4, 5 (Red), & 12. The letter states "This determination does include temporary construction equipment such as cranes, derricks, etc. which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above." This determination expired on March 24, 2021. Commonwealth would need to file an extension for the permanent structures and would need to provide notice to DOT FAA for any temporary (construction) structures that would exceed permanent structure heights.

In addition, FERC staff used DOE Standard 3014, Accident Analysis for Aircraft Crash into Hazardous Facilities, which utilizes a 22-mile threshold radius around the hazardous facility for consideration of hazards posed by airport and heliport operations to the Project facilities. Given the initial DOT FAA determination, the FERC analysis of the airport proximity of greater than 22- miles using DOE Standard 3014, and infrequent usage of the nearby heliport, we do not anticipate a determination of hazard for permanent or temporary (construction) structures. In the unlikely event of a determination of hazard, DOT FAA could alter the operations of air traffic to mitigate any safety risks to and from air traffic. Based on these analyses, we conclude the impact risk due to airport and heliport operations would not be significant.

Pipelines

FERC staff reviewed whether any pipeline operations would be associated with the 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 the PHMSA regulations under 49 CFR 192 as discussed in section 4.12.3. 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 PHMSA, and proposed mitigation to prevent or reduce the impacts of a pipeline incident from Commonwealth.

For existing pipelines, FERC staff identified three existing natural gas pipelines located north between 2.1 and 2.8 miles north of the site. FERC staff evaluated the potential risk from an incident from the pipelines and its potential impacts by considering the design and operating conditions and location of the pipeline. These pipelines would be located too far to impact the Project site in the event of an incident.

In addition, based on the potential likelihood of pipeline incidents and potential consequences from a pipeline incident, we conclude that the Project would not significantly increase the risk to the public beyond existing risk levels that would be present from a pipeline leak or pipeline rupture worst-case event near the proposed Project site.

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 Project site and whether the Project site could increase the risk to the EPA RMP facilities and power plants and subsequently increase the risk to the public.

There are two facilities handling hazardous materials adjacent to the site. The John W. Stone Oil Distribution site contains a storage tank about 650 feet from the nearest proposed project facility, and the Venture Global Calcasieu Pass LNG facility, about 4,000 feet away on the other side of the Calcasieu River. The closest EPA RMP regulated facilities handling hazardous materials would be the Barracuda Plant located approximately 17.18 miles away, and the Cameron Meadows Gas Processing Facility located approximately 17.26 miles away. The EPA RMP regulations require certain hazard distances to be calculated and a risk management plan to be developed commensurate with those consequences. In addition, the closet power plant identified would be the Calcasieu Natural Gas Plant approximately 26.5 miles north and the closest nuclear plant would be the River Bend Station located approximately 138 miles to the northeast of the proposed facility.

Given the distances, locations, and risk management plan requirements of the facilities relative to the populated areas near the proposed site, we recommend in section 4.12.1.6 that Commonwealth coordinate its ERP with the John W. Stone Oil Distribution site and Venture Global Calcasieu Pass LNG facility. Based on this mitigation, we conclude that the Project would not pose a significant increase in risk to the public or that the hazardous material facilities and power plants would not pose a significant risk to the Project and subsequently to the public.

Onsite and Offsite Emergency Response Plans

As part of its application, Commonwealth indicated that the Project would develop a comprehensive ERP with local, state, and federal agencies and emergency response officials to discuss the

Facilities. Commonwealth would continue these collaborative efforts during the development, design, and construction of the Project. 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 personal protective equipment to enable operations personnel and first responder access to the area.

As required by 49 CFR §193.2509 under Subpart F, Commonwealth 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. PHMSA regulations under 49 CFR §193.2905(d) under Subpart J also require at least two access points in each protective enclosure to be located to minimize the escape distance in the event of emergency.

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 5000 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 l meter of 125 decibels 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. Commonwealth 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 ERP covering the terminal and ship 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 marine vessels 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 marine vessel, and the state and local resources required for safety and emergency management, such as:

- 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.

Commonwealth has not submitted a draft ERP to address emergency events and potential release scenarios in the Application. As part of the FEED review, FERC staff takes into consideration elements of recommended and generally accepted good engineering practices for emergency response plans and resource requirements for cost-sharing plans, including, but not limited to:

- NFPA 1600, Standard on Continuity, Emergency, and Crisis Management;[144]
- NFPA 1616, Standard on Mass Evacuation, Sheltering, and Re-Entry Programs;[145]
- NFPA 1620, Standard for Pre-Incident Planning;[146]
- NFPA 470, Hazardous Materials and Weapons of Mass Destruction Standard for Responders;[147]
- NFPA 475 Recommended Practice for Organizing, Managing, and Sustaining a Hazardous Materials and Weapons of Mass Destruction Response Program.[148]

NFPA 1600 (2019 edition) provides provisions for the planning and design process of an emergency management program. NFPA 1600 section has the following provisions:

- Section 5.2.2 specifies a risk assessment to be conducted evaluating the likelihood and severity of hazards, including accidental and intentional events that may result in hazardous material releases, explosions, and fires as well as consideration of specific causes and preceding events, such as geological events (e.g., subsidence, earthquakes, tsunamis, volcanic, etc.) and meteorological events (e.g., extreme temperatures, hurricanes, tornadoes, floods, snow and ice storms, and wildland fires, etc.) as discussed in previous sections.
- Section 5.2.2.2 specifies the vulnerability of people, property, operations, environment, and supply chain operations to be evaluated.
- Section 5.2.3 specifies the analysis of the impacts of the hazards identified in section 5.2.2 on the health and safety of persons in the affected area and personnel responding to the incident as well as impacts to properties, facilities, and critical infrastructure.
- Section 5.2.4 specifies an analysis of the escalation of impacts over time.
- Section 5.2.5 specifies evaluation of incidents that could have cascading impacts.
- Section 5.2.6 specifies the risk assessment to evaluate the adequacy of existing prevention and mitigation measures.

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144 Freely and publicly accessible to view in English and Spanish at NFPA, https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1600, accessed March 2022.

145 Freely and publicly accessible to view in English only at NFPA, https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1616, accessed March 2022.

146 Freely and publicly accessible to view in English only at NFPA, https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1620, accessed March 2022.

147 Freely and publicly accessible to view in English only at NFPA, https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=470, accessed March 2022.

148 Freely and publicly accessible to view in English only at NFPA, https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=475, accessed March 2022.

Chapter 6 covers the implementation of the plans, including health and safety of personnel, roles and responsibilities of internal and external entities, lines of authority, process for delegation of authority, liaisons with external entities, and logistics support and resource requirements.

- Section 6.3.1 specifies the implementation of a mitigation strategy that includes measures to limit or control the consequences, extent, or severity of an incident that cannot be prevented based on the results of hazard identification and risk assessment and analysis of impacts.
- Section 6.9.2 specifies that emergency response plans should identify actions to be taken to protect people, including people with disabilities and other access and functional needs.[149]
- Sections 6.6 and 6.9.4 stipulate an emergency response plan include warning, notification, and communication should be determined and be reliable, redundant, and interoperable and tested and used to alert stakeholders potentially at risk from an actual or impending incident.
- Section 6.8 specifies the development of an incident management system to direct, control, and coordinate response, continuity, and recovery operations.
- Section 6.8.1 stipulates primary and alternate emergency operations centers be established capable of managing response, continuity, and recovery operations and may be physical or virtual.

In addition, NFPA 1600 Chapter 7 provides specifications for execution of the plan, Chapter 8 provides for training and education provisions, Chapter 9 provides for exercises and tests to be conducted periodically, and Chapter 10 provides for its continued maintenance and improvement.

NFPA 1616 (2020 edition) covers organizing, planning, implementing, and evaluating a program for mass evacuation, sheltering, and re-entry. Similar to NFPA 1600, NFPA 1616:

- Section 4.5 also requires similar hazard identification, risk assessment, and requirements analysis as NFPA 1600.
- Section 5.1 also requires plans to address the health and safety of personnel including persons with disabilities and access and functional needs.150
- Section 5.6 also requires a requirements analysis in sub-section 5.6.1 that is based upon the threat, hazard identification, and risk assessment. Sub-section 5.6.2(1) specifies the requirements analysis include characteristics of the potentially affected population, including persons with disabilities and other access and functional needs. In addition, sub-section 5.6.2(2) requires consideration of existing mandatory evacuation laws and expected enforcement of those laws. Sub-section 5.6.2(3) requires the requirements analysis to include characteristics of the incident that trigger consideration for evacuation based on weather, season, and environmental conditions, speed of onset, magnitude, location and direction, duration, resulting damages to essential functions, risk for cascading effects and secondary disasters, and capability of transportation routes and systems to transport life-sustaining materials (e.g., water, medical supplies, etc.) into the affected area.

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149 NFPA 1600 defines "access and functional need" as "Persons requiring special accommodations because of health, social, economic, or language challenges."

150 NFPA 1616 defines people with access and functional needs as "People with Access and Functional Needs" as "Persons with disabilities and other access and functional needs include those from religious, racial, and ethnically diverse backgrounds; people with limited English proficiency; people with physical, sensory, behavioral and mental health, intellectual, developmental and cognitive disabilities, including individuals who live in the community and individuals who are institutionalized; older adults with and without disabilities; children with and without disabilities and their parents; individuals who are economically or transportation disadvantaged; women who are pregnant; individuals who have acute and chronic medical conditions; and those with pharmacological dependency."

- Section 5.6.3 requires the determination if evacuation or sheltering-in-place is appropriate to the situation and resources available based on 1) the anticipated impact and duration of the event, 2) the distance to appropriate sheltering facilities, 3) the availability of and access to transportation to those facilities, and 4) the ability to communicate with the affected population within the required timeframe.
- Section 5.6.4 requires 1) establishment of a single or unified command, 2) development of information system to notify public and provide an assessment of the time needed to reach people with the information, 3) identification of appropriate sheltering facilities by location, size, types of services available, accessibility, and building safety, and 4) identification of the modes and routes for evacuee transportation and the time needed to reach them, sources of evacuee support services, and manpower requirements based on various potential shelters.
- Section 5.8 also has requirements for dissemination of information on evacuation, shelter in place, and re-entry before, during, and after an incident to personnel and to the public.
- Section 5.9 has requirements for warning, notification, and communication needs that are reliable and interoperable and redundant where feasible that takes into account persons with disabilities and other access and functional needs.

Similar to NFPA 1600, NFPA 1616 has requirements in Chapter 6 on Implementation, Chapter 7 on Training and Education, Chapter 8 on Exercises, and Chapter 9 on Program Maintenance and Improvement with additional specifics for mass evacuation, sheltering in place and re-entry.

NFPA 1620 (2020 edition) specifies the characteristics of the facility and personnel onsite that should be within a pre-incident plan, such as emergency contact information, including those with knowledge of any supervisory, control, and data acquisition systems, communication systems, emergency power supply systems, and facility access controls as well as personnel accountability and assistance for people with self-evacuation limits, means of egress, emergency response capabilities, spill containment systems, water supply and fire protection systems, hazardous material information (e.g., safety datasheets), special considerations for responding to hazardous materials (e.g., firewater may exacerbate LNG fires, BLEVE potential, etc.), and access to emergency action plans developed by the facility. Similar to NFPA 1600 and NFPA 1616, NFPA 1620 section 8.5.2 also addresses the implementation of an incident management system for the duration of the event and Chapter 10 establishes maintenance of a pre-incident plan.

NFPA 1600, NFPA 1616, and NFPA 1620 provisions for threat, hazard identification, and risk assessment provisions and identification of resource requirements and gaps are also consistent with Department of Homeland Security FEMA's Comprehensive Preparedness Guide 101, Developing and Maintaining Emergency Operations Plans, Version 3.0, September 2021, and Comprehensive Preparedness Guide 201, Threat and Hazard Identification and Risk Assessment and Stakeholder Preparedness Review Guide, Third Edition, May 2018, and other FEMA guidance.

NFPA 470 covers the competencies and job performance requirements for emergency response personnel to incidents involving hazardous materials, including awareness level personnel (i.e., personnel onsite that would call for emergency responders and secure the scene), operations level responders (i.e., personnel responding to incident for implementing supporting actions to protection public), hazardous material technicians (i.e., personnel responding to incident for analyzing and implementing planned response), hazardous materials officers, hazardous materials safety officers, emergency medical services (EMS) personnel, incident commanders, and other specialist employees. The standard covers competencies and JPRs, including the ability to identify hazardous material releases and hazardous materials involved and identifying surrounding conditions, such as topography, weather conditions, public exposure potential, possible ignition sources, land use and adjacent land use, overhead and underground wires and pipelines, rail lines, and highways, bodies of water, storm and sewer drains, and building information (e.g., ventilation ducts and air returns), Part of the standard also describes the ability and requirement to estimate potential outcomes in order to properly plan response strategies and tactics and selection and use of proper personnel protective equipment (PPE). Many of these provisions are similar and synergistic with NFPA 1600, NFPAA 1616, and NFPA 1620.

NFPA 475 covers the organization, management, and sustainability of a hazardous material response program, including identifying facilities with hazardous materials, analyzing the risk of hazardous material incidents, including identifying hazardous materials at each location, (e.g., quantity, concentration, hazardous properties, etc.), type and design of containers; surrounding population and infrastructure, including vulnerable populations and critical facilities (e.g., schools, hospitals, businesses, etc.). NFPA 475 similar calls for analyzing the risk of an incident based on the consequences of a release and predicting its behavior and estimating the probability for an incident to take place and potential for cascading incidents. NFPA 475 Chapter 7 also has provisions for resource management, including the identification, acquisition, and management of personnel, equipment, and supplies to support hazardous material response programs. NFPA 475 Chapter 8 expands upon staffing requirements and use of different staffing models and Chapter 9 expands upon training program with reference and similarities to NFPA 470.

In accordance with these recommended and generally accepted good engineering practices, FERC staff evaluated the potential impacts from incidents caused by a range of natural hazards, accidental events, intentional events, and potential for cascading damage at the LNG terminal, including up scenarios that would lead to a potential catastrophic failure of a tank required to be accounted in emergency response plans by PHMSA regulations in 49 CFR §193.2509, and along the LNG carrier route using the Zones of Concern referenced in USCG NVIC 01-11. In addition, FERC staff identified potential emergency response needs based on the potential impacts to and characteristics of the population and infrastructure for potential intentional and accidental incidents along the LNG marine vessel route and at the LNG terminal. Consistent with these practices, FERC staff evaluated the potential hazards from incidents, the potential impacts to areas from incidents and the evaluation of characteristics of population, including those with potential access and functional needs, and infrastructure that require special considerations in pre-incident planning, including but not limited to:

- daycares;
- elementary, middle, and high schools and other educational facilities;
- elderly centers and nursing homes and other boarding and care facilities;
- detention and correctional facilities;
- stadiums, concert halls, religious facilities, and other areas of assembly;
- densely populated commercial and residential areas, including high rise buildings, apartments, and hotels;
- hospitals and other health care facilities;
- police departments, stations, and substations;
- fire departments and stations;
- military or governmental installations and facilities;
- major transportation infrastructure, including evacuation routes, major highways, airports, rail, and other mass transit facilities as identified in external impacts section; and

- industrial facilities that could exacerbate the initial incident, including power plants, water supply infrastructure, and hazardous facilities with quantities that exceed thresholds in EPA RMP and/or OSHA PSM standards as identified in external impacts section.

Many of these facilities are also identified and defined in NFPA 101, Life Safety Code, and require emergency response plans themselves. NFPA 101 is currently used by every U.S. state and adopted statewide in in 43 of the 50 states.[151] Louisiana currently adopts NFPA 101 (2015 edition) with amendments.[152,153] These areas are also similar to "identified sites" defined in 49 CFR 192 that define high consequence areas and those identified within Pipelines and Informed Planning Alliance (PIPA) for special land use planning considerations near pipelines.[154]

Potential Hazards

An incident can result in various potential hazards and are initiated by a potential liquid and/or gaseous release with the formation of vapor at the release location, as well as from any liquid that pooled. The fluid released may present low or high temperature hazards and may result in the formation of toxic or flammable vapors. The type and extent of the hazard will depend on the material released, the storage and process conditions, and the volumes and durations released.

Exposure to either cold liquid or vapor could cause freeze burns and depending on the length of exposure, more serious injury or death. However, spills would be contained to on-site areas and the cold state of these releases would be greatly limited due to the continuous mixing with the warmer air. The cold temperatures from the release would not present a hazard to the public, which would not have access to on-site areas. The cold temperatures may also quickly cool any materials contacted by the liquid on release, causing extreme thermal stress in materials not specifically designed for such conditions. These thermal stresses could subsequently subject the material to brittleness, fracture, or other loss of tensile strength and result in cascading failures. However, regulatory requirements and recommendations made herein would ensure that these effects would be accounted for in the design of equipment and structural supports.

A rapid phase transition (RPT) can occur when a cryogenic liquid is spilled onto water and changes from liquid to gas, virtually instantaneously. Unlike an explosion that releases energy and combustion products from a chemical reaction, an RPT is the result of heat transferred to the liquid inducing a change to the vapor state. RPTs have been observed during LNG test spills onto water. In some test cases, the overpressures generated were strong enough to damage test equipment in the immediate vicinity of the LNG release point. The sizes of the overpressure events have been generally small and are not expected to cause significant damage. Six of the 18 Coyote spills produced RPT explosions. Most were early RPTs that occurred immediately with the spill, and some continued for the longer periods. Including RPTs near the end of the spills on three tests. LNG composition, water temperature, spill rate and depth of penetration all seem to play a role in RPT development and strength. The maximum strength RPT yielded equivalent to up to 6.3 kg of TNT free-air point source at the maximum spill rate of $18 m^3/min$ (4,750 gpm). This would produce an approximate 1 psi overpressures less than 100 ft from the spill source. These events are typically limited to the area within the spill and are not expected to cause damage outside of the area

151 NFPA, NFPA 101 Fact Sheet, https://www.nfpa.org/assets/files/AboutTheCodes/101/NFPA101FactSheet0809.pdf, accessed 2022-02-17.

152 Up Codes, Louisiana Codes, https://up.codes/codes/louisiana, accessed 2022-02-17.

153 Louisiana Office of State Fire Marshal, Department of Public Safety and Corrections, Public Safety Services, Codes, Rules, and Laws Enforced by the Louisiana State Fire Marshal, http://sfm.dps.louisiana.gov/insp_crl.htm, accessed 2022-02-17.

154 Pipelines and Informed Planning Alliance, Partnering to Further Enhance Pipeline Safety in Communities through Risk-Informed Land Use Planning, Final Report of Recommended Practices, https://primis.phmsa.dot.gov/comm/pipa/landuseplanning.htm, November 2010.

engulfed by the LNG pool. However, a RPT may affect the rate of pool spreading and the rate of vaporization for a spill on water.

Vapor Dispersion

Depending on the size and product of the release, liquids may form a liquid pool and vaporize. Additional vaporization would result from exposure to ambient heat sources, such as water or soil. The vapor may form a toxic or flammable cloud depending on the material released. The dispersion of the vapor cloud will depend on the physical properties of the cloud, the ambient conditions, and the surrounding terrain and structures. Generally, a denser-than-air vapor cloud would sink to the ground and would travel with the prevailing wind, while a lighter-than-air vapor cloud would rise and travel with the prevailing wind. The density will depend on the material releases and the temperature of the material. For example, an LNG release would initially form a denser than-air vapor cloud and transition to lighter-than-air vapor cloud as the vapor disperses downwind and mixes with the warm surrounding air. However, experimental observations and vapor dispersion modeling indicate an LNG vapor cloud would not typically be warm, or buoyant, enough to lift off from the ground before the LNG vapor cloud disperses below its lower flammable limit (LFL).

A vapor cloud formed following an accidental release would continue to be hazardous until it dispersed below toxic levels and/or flammable limits. Toxicity is primarily dependent on the airborne concentration of the toxic component and the exposure duration, while flammability of the vapor cloud is primarily dependent just on the concentration of the vapor when mixed with the surrounding air. In general, higher concentrations within the vapor cloud would exist near the spill, and lower concentrations would exist near the edge of the cloud as it disperses downwind.

Toxicity is defined by several different agencies for different purposes. Acute Exposure Guideline Level (AEGL) and Emergency Response Planning Guidelines (ERPG) can be used for emergency planning, prevention, and response activities related to the accidental release of hazardous substances. Other federal agencies, such as the DOE, EPA, and NOAA, use AEGLs and ERPGs as the primary measure of toxicity.

There are three AEGLs and three ERPGs, which are distinguished by varying degrees of severity of toxic effects with AEGL-1 and ERPG-1 (level 1) being the least severe to AEGL-3 and ERPG-3 (level 3) being the most severe.

- AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non sensory effects. However, these effects are not disabling and are transient and reversible upon cessation of the exposure.
- AEGL-2 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long lasting adverse health effects or an impaired ability to escape.
- AEGL-3 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

The EPA directs the development of AEGLs in a collaborative effort consisting of committee members from public and private sectors across the world. FERC staff uses AEGLs preferentially as they are more inclusive and provide toxicity levels at various exposure times (10 minutes, 30 minutes, 1 hour, 4 hours, and 8 hours). The use of AEGLs is also preferred by the DOE and NOAA. Under the EPA RMP regulations in 40 CFR 68, the EPA currently requires the determination of distances to toxic concentrations based on ERPG-2 levels. ERPG levels have similar definitions but are based on the maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing similar effects defined in each of the AEGLs. The EPA provides ERPGs (1 hour) for a list of chemicals. These toxic concentration endpoints are comparable to AEGLs endpoints.

In addition, any non-toxic release that does not contain oxygen would be classified as simple asphyxiants and may pose extreme health hazards, including death, if inhaled in significant quantities within a limited time. Very cold methane and heavier hydrocarbons vapors may also cause freeze burns. However, the locations of concentrations where cold temperatures and oxygen-deprivation effects could occur are greatly limited due to the continuous mixing with the warmer air surrounding the spill site. For that reason, exposure injuries from contact with releases of methane, nitrogen, and heavier hydrocarbons normally represent negligible risks to the public.

Flammable vapors can develop when a flammable material is above its flash point and concentrations are between the LFL and the upper flammable limit (UFL). Concentrations between the LFL and UFL can be ignited, and concentrations above the UFL or below the LFL would not ignite.

The extent of the affected area and the severity of the impacts on objects within a vapor cloud would primarily be dependent on the material, quantity, and duration of the initial release, the surrounding terrain, and the environmental conditions present during the dispersion of the cloud.

Flammable Vapor Ignition

If the flammable portion of a vapor cloud encounters an ignition source, a flame would propagate through the flammable portions of the cloud. In most circumstances, the flame would be driven by the heat it generates. This process is known as a deflagration, or a flash fire, because of its relatively short duration. However, exposure to a deflagration, or flash fire, can cause severe burns and death, and can ignite combustible materials within the cloud. If the deflagration in a flammable vapor cloud accelerates to a sufficiently high rate of speed, pressure waves that can cause damage would be generated. As a deflagration accelerates to super-sonic speeds, the large shock waves produced, rather than the heat, would begin to drive the flame, resulting in a detonation. The flame speeds are primarily dependent on the reactivity of the fuel, the ignition strength and location, the degree of congestion and confinement of the area occupied by the vapor cloud, and the flame travel distance. Once a vapor cloud is ignited, the flame front may propagate back to the spill site if the vapor concentration along this path is sufficiently high to support the combustion process. When the flame reaches vapor concentrations above the UFL, the deflagration will transition to a pool or jet fire back at the source. If ignition occurs soon after the release begins, a fireball may occur near the source of the release and would be of a relatively short duration compared to an ensuing jet or pool fire. The extent of the affected area and the severity of the impacts on objects in the vicinity of a fire would primarily be dependent on the material, quantity, and duration of the fire, the surrounding terrain, and the environmental conditions present during the fire.

Overpressures

If the deflagration in a flammable vapor cloud accelerates to a sufficiently high rate of speed, pressure waves that can cause damage would be generated. As a deflagration accelerates to super-sonic speeds, large pressure waves are produced, and a shock wave is created. In this scenario, the shock wave, rather than the heat, would drive the flame, resulting in a detonation. Deflagrations or detonations are generally characterized as "explosions" as the rapid movement of the flame and pressure waves associated with them cause additional damage beyond that from the heat. The amount of damage an explosion causes is dependent on the amount the produced pressure wave is above atmospheric pressure (i.e., an overpressure) and its duration (i.e., pulse). For example, a 1 psi overpressure, often cited as a safety limit in NFPA 59A (2019 edition) and U.S. regulations, is associated with glass shattering and traveling with velocities high enough to lacerate skin.

Flame speeds and overpressures are primarily dependent on the reactivity of the fuel, the ignition strength and location, the degree of congestion and confinement of the area occupied by the vapor cloud, and the flame travel distance.

The potential for unconfined LNG vapor cloud detonations was investigated by the USCG in the late 1970s at the Naval Weapons Center in China Lake, California. Using methane, the primary component of natural gas, several experiments were conducted to determine whether unconfined LNG vapor clouds would detonate. Unconfined methane vapor clouds ignited with low-energy ignition sources (13.5 joules), produced flame speeds ranging from 12 to 20 mph. These flame speeds are much lower than the flame speeds associated with a deflagration with damaging overpressures or a detonation.

To examine the potential for detonation of an unconfined natural gas cloud containing heavier hydrocarbons that are more reactive, such as ethane and propane, the USCG conducted further tests on ambient-temperature fuel mixtures of methane-ethane and methane-propane. The tests indicated that the addition of heavier hydrocarbons influenced the tendency of an unconfined natural gas vapor cloud to detonate. Less processed natural gas with greater amounts of heavier hydrocarbons would be more sensitive to detonation.

Although it has been possible to produce damaging overpressures and detonations of unconfined LNG vapor clouds, the feed gas stream proposed for the project would have lower ethane and propane concentrations than those that resulted in damaging overpressures and detonations. The substantial amount of initiating explosives needed to create the shock initiation during the limited range of vapor-air concentrations also renders the possibility of detonation of these vapors at an LNG plant as unrealistic. Ignition of a confined LNG vapor cloud could result in higher overpressures. To prevent such an occurrence, Commonwealth would take measures to mitigate the vapor dispersion and ignition into confined areas, such as buildings. Commonwealth would install hazard detection devices at all combustion and ventilation air intake equipment to enable isolation and deactivation of any combustion equipment whose continued operation could add to, or sustain, an emergency. In general, the primary hazards to the public from an LNG spill that disperses to an unconfined area, either on land or water, would be from dispersion of the flammable vapors or from radiant heat generated by a pool fire.

In comparison with LNG vapor clouds, there is a higher potential for unconfined propane clouds to produce damaging overpressures. This has been shown by multiple experiments conducted by the Explosion Research Cooperative to develop predictive blast wave models for low, medium, and high reactivity fuels and varying degrees of congestion and confinement. The experiments used methane, propane, and ethylene, as the respective low, medium, and high reactivity fuels. In addition, the tests showed that if methane, propane, or ethylene are ignited within a confined space, such as in a building, they all have the potential to produce damaging overpressures.

Fires and overpressures may also cause failures of nearby storage vessels, piping, and equipment if not properly mitigated. These failures are often termed cascading events or domino effects and can exceed the consequences of the initial hazard. The failure of a pressurized vessel could cause fragments of material to fly through the air at high velocities, posing damage to surrounding structures and a hazard for operating staff, emergency personnel, or other individuals in proximity to the event. In addition, failure of a pressurized vessel when the liquid is at a temperature significantly above its normal boiling point could result in a boiling-liquid-expanding-vapor explosion (BLEVE). BLEVEs can produce overpressures when the superheated liquid rapidly changes from a liquid to a vapor upon the release from the vessel. BLEVEs of flammable fluids may also ignite upon its release and cause a subsequent fireball.

Potential Infrastructure Impacts from LNG facilities

Although the likelihood of incidents and the hazards described above are extremely low due to the mitigation required by regulations and recommendations made herein by FERC staff, the potential impacts from these hazards could impact onsite personnel and offsite public.[155]

FERC staff evaluated a range of releases to evaluate the potential impacts to populations and infrastructure within vicinity of the plant. Impacts would vary based on the initiating event and subsequent release characteristics (e.g., size, location, direction, process conditions, etc.), hazard (i.e., vapor dispersion, overpressures, fires, BLEVE and PVB), weather conditions, and surrounding terrain. Distances to radiant heats of 5kW/m^2 (or approximately 1,600 BTU/ft^2-hr) from fires produced by accidental and intentional acts could impact onsite personnel or offsite public. For example, Section 2.2.2.2 in NFPA 59A-2001, incorporated by reference in 49 CFR Part 193, requires spill containments, serving vaporization, process, or LNG transfer area, to contain liquid releases from 2-inch diameter holes and guillotine releases of piping less than 6-inches in diameter. Additionally, PHMSA siting regulations for flammable vapor dispersion and thermal radiation exclusion zones limit the dispersion of flammable vapors and 1,600 BTU/ft^2-hr radiant heats from LNG pool fires in those spill containment systems in certain weather conditions from extending beyond the control of the operator or government agency and prevent it from extending onto areas accessible by the public. FERC staff also recommends spill containment systems be designed to capture all liquid from guillotine ruptures of the single largest line and largest vessel(s) to limit their pool spread and vaporization. This effectively limits the extent of the 1,600 BTU/ft^2-hr radiant heat from pool fires to onsite for even the largest releases from a single source and considerably reduces the dispersion distance of flammable and toxic vapors. FERC staff also recommends mitigation to prevent these larger releases from resulting in cascading damage. However, superheated and/or pressurized releases greater than those covered by the siting regulations can result in significant flashing and jetting that can lead to larger dispersion distances to flammable vapors. In addition, ignition of releases larger than those used in the siting analyses can result in 1,600 BTU/ft^2-hr and 10,000 BTU/ft^2-hr radiant heats from jet and pool fires that extend offsite onto publicly accessible areas.

The infrastructure and communities that could be impacted by a fire with 10,000 BTU/ft^2-hr radiant heats extending offsite, include a residence, the John W. Stone Oil distribution center, and a portion of Louisiana Highway 27/82. The infrastructure and communities that could be impacted by a fire with 1,600 BTU/ft^2-hr radiant heats extending offsite, including the Calcasieu Pass LNG facility, the Monkey Island Pilot's Dormitory and the previously mentioned infrastructure and communities within the 10,000 BTU/ft^2-hr radiant heats. The unignited vapor dispersion is extremely unlikely but, if it occurred, could extend farther offsite and could impact the following critical infrastructure: the Calcasieu shipping channel ferry; Louisiana Highway 27/82 on both sides of the Calcasieu Shipping Channel; numerous local government buildings including the Cameron Parish Health Unit, Court House, Police Jury Building, Cameron Parish Sheriff's department, Cameron Fire Department, Cameron Parish School District Offices, the Cameron Parish Branch Library, and the Post Office. The following communities within the extent of the unignited vapor release from a catastrophic failure of one of the LNG storage tanks could also impact the following communities: multiple residential homes, multiple RV parks, several places of worship, and the Cameron Parish Jail. FERC staff did not locate any schools, daycare facilities, boarding and care facilities, or hospitals within the hazard footprints.

155 Specific distances of potential impacts from incidents at a LNG terminal have not been provided at this time to try and balance the potential security interests in releasing such information. Specific distances for various hazards described would be provided in emergency response plans for reference and use by emergency responders, Further, potential hazards have been described and potential impacts to communities are disclosed to balance the importance of public disclosure and transparency on the balance of potentially releasing information that has not been previously released and could be used by intentional actors.

Potential Infrastructure Impacts Along LNG Marine Vessel Route

As LNG marine vessels proceed along the intended transit route, the estimated impacts would extend onto populated areas and infrastructure. These distances are provided as Zones of Concern in the publicly available guidance document NVIC 01-11 used by the USCG and correspond to 37.5 kW/m^2 radiant heats from fires for Zone 1, 5 kW/m^2 radiant heats from fires for Zone 2, and flammable vapor dispersion distances for Zone 3. The areas impacted by the three different hazard zones are illustrated for accidental and intentional events in figures 4.12-1 and 4.12-2, respectively.

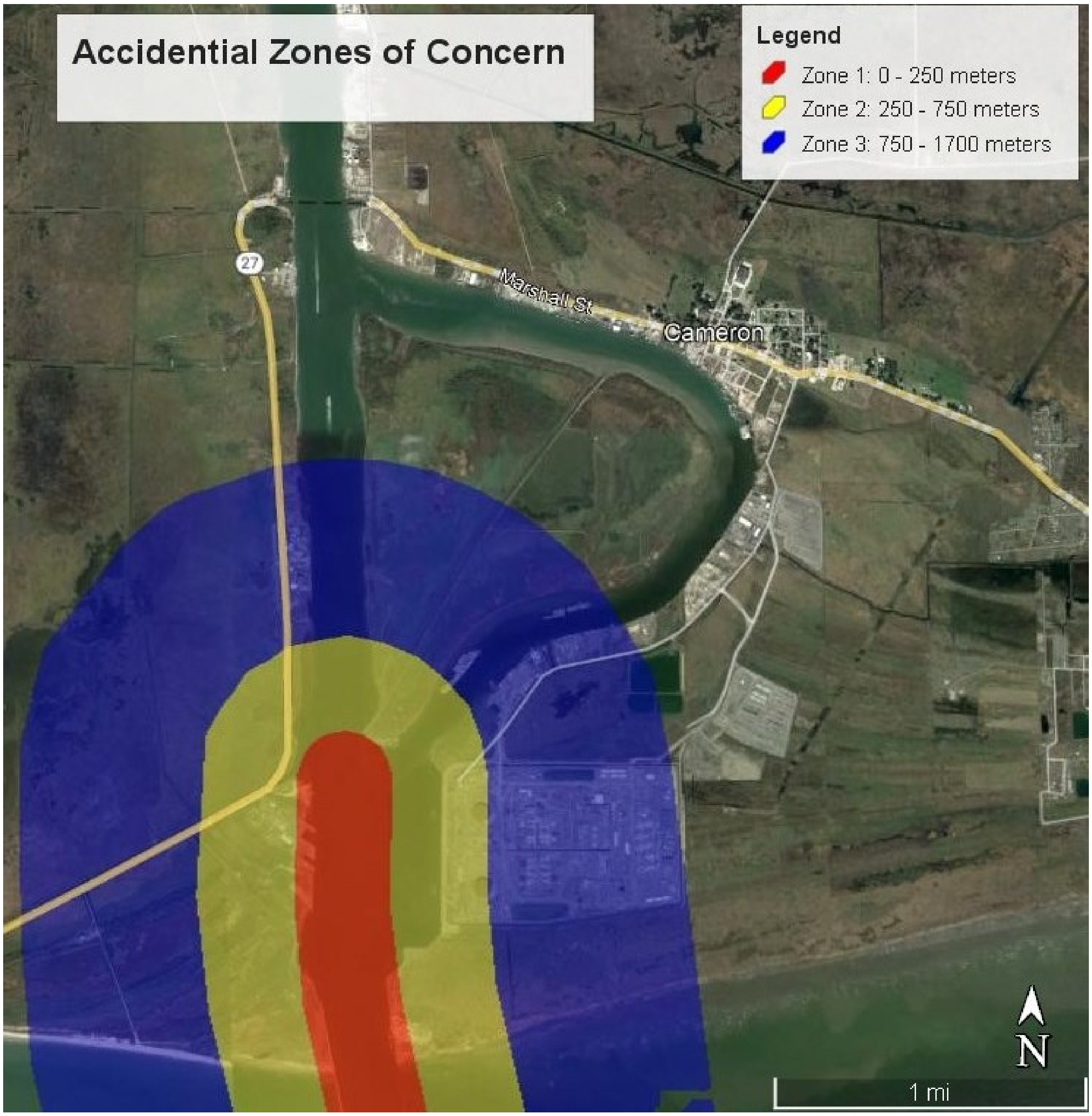


Figure 4.12-1 Accidental Hazard Zones along LNG Marine Vessel Route

Distances to radiant heats of 37.5kW/m^2 (or approximately 12,000 BTU/ft^2-hr) from fires demarked by Zone 1 for accidental acts would remain entirely over the water and would encompass coastal areas in

Cameron and any commercial and recreational vessels if they would be allowed within 830 ft (250m) of the LNG marine vessel. Zone 2 for accidental acts would encompass the waterway, coastal areas in Cameron, any commercial and recreational vessels if they would be allowed with 1,660 ft (500 m) of the LNG marine vessel, the John W. Stone Oil Distribution facility, and a portion of the Calcasieu Pass LNG facility. Zone 3 for accidental acts would also encompass a wider swath of coastal areas along Cameron and would include multiple places of business, and the Monkey Island Pilot's Dormitory.

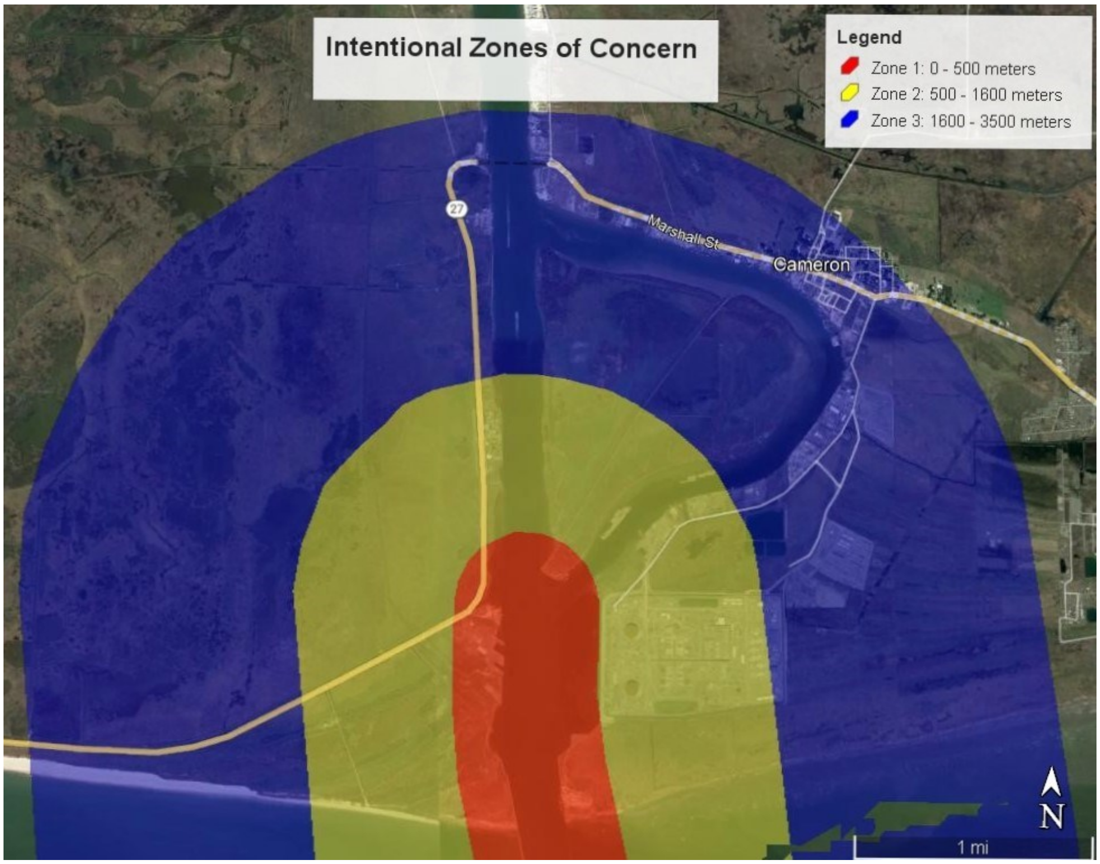


Figure 4.12-2. Intentional Hazard Zones along LNG Marine Vessel Route

Zone 1 for intentional acts would remain almost entirely over the water and would encompass coastal areas in Cameron and any commercial and recreational vessels if they would be allowed within 1,640 feet (500 meters) of the vessel. Zone 2 for intentional acts would cover a wider swath of coastal areas along Cameron and would include multiple places of business, Venture Global Calcasieu Pass LNG, John W. Stone Oil Distribution, and the Monkey Island Pilot's Dormitory. Zone 3 for intentional acts would span larger portions of Cameron and would include multiple residences, places of business, municipal facilities (Cameron Fire Department, Cameron Parish Sheriff's Department), and all of Monkey Island.

Potential Impacts on People with Access and Functional Needs and Environmental Justice Communities

FERC staff used EJScreen[156] as an initial screening tool to identify the potential impacts from incidents identified along the LNG marine vessel transit route and at the LNG terminal, including potential impacts to people with access and functional needs as defined in NFPA 1600 and 1616. Table 4.12.1-1 shows the resultant percentages of people with potential access and functional needs within these areas based on 2015-2019 U.S. Census Bureau, American Community Survey (ACS) as follows:[157]

TABLE 4.12.1-1

People with Access and Functional Needs within Potential Incident Impact Areas

Potential Incident Impact Area	Population Density (per sq. mile) a/	Households a/	Housing Units a/	Age 0-4 Population (percent) a/	Age 65+ Population (percent) a/	Linguistically Isolated Population (percent) a/, b/
Zone 1 (accidental)	0	0	0	NA	NA	NA
Zone 2 (accidental)	0	0	0	NA	NA	NA
Zone 3 (accidental)	2	2	4	4%	17%	0%
Zone 1 (intentional)	0	0	0	NA	NA	NA
Zone 2 (intentional)	2	2	4	4%	17%	0%
Zone 3 (LNG marine vessel intentional)	12	31	50	4%	17%	0%
10,000 BTU/ft^2-hr (LNG Terminal)	0	0	1	NA	NA	NA
1,600 BTU/ft^2-hr (LNG Terminal)	0	0	1	NA	NA	NA

156 EPA, EJScreen, https://ejscreen.epa.gov/mapper/, Accessed March 2022.

157 Based on EPA, EJScreen User Guide, 2022, the impact area would aggregate appropriate portions of the intersecting block groups, weighted by population, to create a representative set of data for the entire ring area, honoring variation and dispersion of the population in the block groups within it. For each indicator, the result is a population-weighted average, which equals the block group indicator values averaged over all residents who are estimated to be inside the impact area. A weight factor for each block group is determined by summing each block point population percentage for that block group. If the impact area touches part of a neighboring block group that contains no block points, nothing will be aggregated; if an impact area intersects a number of block groups, EJScreen indices will be aggregated within each block group based on the affiliated block points. The aggregation is done by using factor-weighted block points.

TABLE 4.12.1-1 **People with Access and Functional Needs within Potential Incident Impact Areas**						
Potential Incident Impact Area	**Population Density (per sq. mile) a/**	**Households a/**	**Housing Units a/**	**Age 0-4 Population (percent) a/**	**Age 65+ Population (percent) a/**	**Linguistically Isolated Population (percent) a/, b/**
Flammable Vapor Cloud (LNG Terminal)	3	77	129	5%	19%	0%
a/ American Community Survey, 2015-2019, ACE Estimates b/ Households in which no one 14 and over speaks English "very well" or speaks English only.						

The worst-case distances from these potential incidents would potentially impact three block groups, two of which are considered environmental justice communities, as defined in the 4.9.12 Environmental Justice Section. The block groups located with environmental justice communities that exceed the thresholds for minority and low income identified in 4.9.12 Environmental Justice Section would include Census Tract 9702.01, Block Group 3 (based on the low-income threshold); and Census Tract 9701, Block Group 1 (based on the minority threshold). Minority and low-income population percents for these Census Tract Block Groups are provided in detail in 4.9.12 Environmental Justice Section.

Should a catastrophic incident or other more likely emergency occur at the Commonwealth LNG Terminal or at the LNG marine vessel along its route, people with access and functional needs and environmental justice communities could experience significant public safety impacts. However, Commission staff has determined that the risk (i.e., likelihood and consequence) of accidental and intentional events would be less than significant with implementation of the proposed safety and security measures recommendations. These measures further enhance the safety and security of the engineering design of the layers of protection for review subject to the approval by Commission staff and in accordance with recommended and generally accepted good engineering practices, which go above the minimum federal requirements that would also be required at the LNG terminal by DOT PHMSA regulations under 49 CFR 193 and USCG regulations under 33 CFR 127 and 33 CFR 105, and those required for the LNG marine vessel by USCG regulations under 33 CFR 104 and 46 CFR 154, such that they would further reduce the risk of incidents impacting the public to less than significant levels, including impacts to those with access and functional needs and environmental justice communities.

Emergency Response Plans and Mitigation

In order to mitigate these potential offsite risks, additional recommendations are made by FERC staff to further enhance the safety and security measures beyond that which would normally be required at the LNG terminal by the minimum standards for LNG safety promulgated in PHMSA regulations under 49 CFR 193 and USCG regulations under 33 CFR 127 and 33 CFR 105.

As stated in Sandia National Laboratories Report, Guidance on Risk Analysis and Safety Implications of a Large LNG Spill Over Water, SAND2004-6258, which was the basis for the Zones of Concern and referenced in NVIC 01-011, Zone 1 represents "risks and consequences of an LNG spill could be significant and have severe negative impacts" and radiant heat demarked by this zone "poses a severe public safety and property hazard, and can damage or significantly disrupt critical infrastructure." Subsequently, the Sandia report concludes that for accidental Zone 1 impacts, "risk management strategies for LNG operations should address both vapor dispersion and fire hazards" and the most rigorous deterrent measures, such as vessel security zones, waterway traffic management, and establishment of positive control over vessels are options to be considered as elements of the risk management process." Zone 1 is based upon a 37.5 kW/m^2 radiant heat from a fire, which would cause significant damage to equipment and structures that are located within 1,640 feet as described more fully in footnote describing impacts of radiant heat corresponding to Zone 1. Sandia recommends that "incident management and emergency response measures should be carefully evaluated to ensure adequate resources (i.e., firefighting, salvage, etc.) are available for consequence and risk mitigation."

Sandia indicates Zone 2 represents where radiant heat "transitions to less severe hazard levels to public safety and property" and the consequence of an accidental LNG spill are reduced and risk reduction and mitigation approaches and strategies can be less extensive." Zone 2 is based upon a 5 kW/m^2 radiant heat, which would cause significant impacts to individuals, but would not be expected to significantly impact most structures as described more fully in footnote describing impacts of radiant heat corresponding to Zone 2. Sandia concludes that for accidental Zone 2 impacts, "risk management strategies for LNG operations should focus on approaches dealing with both vapor dispersion and fire hazards" and "should include incident management and emergency management and emergency response measures, such as ensuring areas of refuge (e.g., enclosed areas, buildings) are available, development of community warning signals, and community education programs to ensure persons know what precautions to take."

Sandia indicates Zone 3 represents "risks and consequences to people and property of an accidental LNG spill over water are minimal" and radiant heat "poses minimal risks to public safety and property". Zone 3 is based upon the dispersion distance to flammable vapors under worst-case wind conditions. In the rare circumstance that the flammable vapors are not ignited until later, there could be flash fires or explosions depending on congestion, confinement, and ignition strength and location. Subsequent pool fires that would be demarked from the Zone 1 and 2 fire hazard distances, Sandia concludes that for accidental Zone 3 impacts, "risk reduction and mitigation strategies can be significantly less complicated or extensive" and "should concentrate on incident management and emergency response measures that are focused on dealing with vapor cloud dispersion...", such as ensuring "areas of refuge are available, and community education programs...to ensure that persons know what to do in the unlikely event of a vapor cloud." Sandia makes similar recommendations for the Zones of Concern for intentional acts. We recommend the Sandia recommendations be incorporated into Emergency Response Plans consistent with the recognized and generally accepted good engineering practices for evacuating and sheltering in place, such as NFPA 1600, NFPA 1616, NFPA 1620, NFPA 470, and NFPA 475.

Commission Staff determined that the risk of accidental and intentional events would be less than significant with implementation of the proposed safety and security recommendations that further enhance the safety and security measures that would be required at the LNG terminal by PHMSA regulations under 49 CFR 193 and USCG regulations under 33 CFR 127 and 33 CFR 105, and those required for the LNG marine vessel by USCG regulations under 33 CFR 104 and 46 CFR 154. Furthermore, EPAct 2005 requires LNG terminal operator's Emergency Response Plan be developed in consultation with the USCG and State and local agencies and be approved by the commission prior to final approval to begin construction. To satisfy this requirement, FERC staff recommends in section 4.12.1.6 that prior to initial site preparation, Commonwealth develop an ERP (including evacuation and any sheltering and re-entry) and coordinate procedures with the USCG; state, county, and local emergency planning groups; fire departments; state and local law enforcement; and other appropriate federal agencies. We also recommend this plan should be consistent with recommended and good engineering practices and based on potential impacts and onsets of hazards from accidental and intentional events along the LNG marine vessel route and potential impacts and onset of hazards from accidental and intentional events at the LNG terminal, including but not limited to a catastrophic failure of the largest LNG tank. We also recommend the plan address any special considerations and pre-incident planning for infrastructure and public with access and functional needs and should include at a minimum:

a. materials and plans for periodic dissemination of public education and training materials for evacuation and/or shelter in place of the public within any transient hazard areas along the marine vessel route, and within LNG terminal hazard areas;

b. plans to competently train emergency responders required to effectively and safely respond to hazardous material incidents including, but not limited to LNG fires and dispersion;

c. plans to competently train emergency responders to effectively and safely evacuate or shelter public within transient hazard areas along the marine vessel route, and within hazard areas from LNG terminal;

d. designated contacts with federal, state and local emergency response agencies responsible for emergency management and response within any transient hazard areas along the marine vessel route, and within hazard areas from LNG terminal;

e. scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;

f. scalable procedures for mobilizing response and establishing a unified command, including identification, location, and design of any emergency operations centers and emergency response equipment required to effectively and safely to respond to hazardous material incidents and evacuate or shelter public within transient hazard areas along the marine vessel route, and within LNG terminal hazard areas;

g. scalable procedures for notifying public, including identification, location, design, and use of any permanent sirens or other warning devices required to effectively communicate and warn the public prior to onset of debilitating hazards within any transient hazard areas along the LNG marine vessel route and within hazard areas from LNG terminal;

h. scalable procedures for evacuating the public, including identification, location, design, and use of evacuation routes/methods and any mustering locations required effectively and safely evacuate public within any transient hazard areas along the LNG marine transit route and within hazard areas from LNG terminal; and

i. scalable procedures for sheltering the public, including identification, location, design, and use of any shelters demonstrated to be needed and demonstrated to effectively and safely shelter public prior to onset of debilitating hazards within transient hazard areas that may better benefit from sheltering in place (i.e., those within Zones of Concern 1 and 2), along the route of the LNG marine vessel and within hazard areas that may benefit from sheltering in place (i.e., those within areas of 1,600 BTU/ft^2-hr and 10,000 BTU/ft^2-hr radiant heats from fires with farthest impacts, including from a catastrophic failure of largest LNG tank) of the LNG terminal.

FERC staff recommends Commonwealth notify FERC staff of all planning meetings in advance and should report progress on the development of its ERP at 3-month intervals. EPAct 2005 requires LNG terminal operators develop a cost-sharing plan to reimburse direct costs to state and local agencies. To satisfy this requirement, FERC staff also recommends a Cost Sharing Plan that includes sustained funding of any requirement or resource gap analysis identified above to be needed and to effectively and safely evacuate and shelter public and required to effectively and safely respond to hazardous material incidents If the project is authorized and constructed, we would evaluate the ERP and Cost Sharing Plan in accordance with recommended and good engineering practices such as, but not limited to, NFPA 1600, NFPA 1616, NFPA 1620, NFPA 470 and NFPA 475, or equivalents.

Based on our preliminary analysis of the hazards from the LNG facilities and along the LNG marine vessel route, we recommend in section 4.12.1.6 that Commonwealth provide additional information, for review and approval, on development of emergency response plans prior to initial site preparation. We also recommend in section 4.12.1.6 that Commonwealth file three dimensional drawings, for review and approval, that demonstrate there is a sufficient number of access and egress locations. If this Project is authorized, constructed, and operated, Commonwealth would coordinate with local, state, and federal agencies on the development of an emergency response plan and cost sharing plan. We recommend in section 4.12.1.6 that Commonwealth provide periodic updates on the development of these plans for review and approval, and ensure they are in place prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.1.6 that Project facilities be subject to regular inspections throughout the life of the facility and would continue to require companies to file updates to the ERP.

4.12.1.6 Recommendations from FERC Preliminary Engineering and Technical Review

Based on our preliminary engineering and technical review of the reliability and safety of the Commonwealth LNG Project, we recommend the following mitigation measures as conditions to any order authorizing the Project. 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 initial site preparation</u>, Commonwealth should file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana:**
  a. **finalized ground improvement solution of wick drains combined with surcharge for the Project site;**
  b. **site soil compaction via surcharge procedures and specifications; and**
  c. **finalized wick drains installation design package.**
- **<u>Prior to initial site preparation</u>, Commonwealth should file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana:**
  a. **the corrosion control and prevention plan for any underground piping, structures, foundations, equipment, and components; and**
  b. **the erosion control and prevention plan for the marine facility area.**
- **<u>Prior to initial site preparation</u>, Commonwealth should file with the Secretary the finalized plot plan with final design of finished slopes and elevations contour lines for the Project site. The finalized plot plan should be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.**
- **<u>Prior to initial site preparation</u>, Commonwealth should file with the Secretary the finalized pile load test program (e.g., pile load test procedure, locations, configuration, quality assurance, and quality control, etc.). The filing should be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.**
- **<u>Prior to site initial preparation</u>, Commonwealth should file with the Secretary the final design of floodwalls (storm surge protection barriers) to comply with applicable code/standards requirements including but are not limited to NFPA 59A (2019edition) as incorporated by 33 CFR 127, and NFPA 59A (2001 edition) in 49 CFR 193. In addition, the floodwalls should be**

designed and maintained in accordance with ASCE/SEI 7 (2022 edition) or equivalent and ASCE/SEI 24 (2014 edition) or equivalent and to withstand a minimum of a 500-year mean occurrence interval in consideration of relative sea level rise, local subsidence, site settlement, shoreline recession, erosion and scour effect, and wind-driven wave effects, etc. The sea level rise and vertical land movement should be in accordance with at a minimum intermediate curve corresponding to design life of facility in 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, February 2022 or equivalent. The final design of floodwalls should be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.

- **<u>Prior to construction of final design,</u> Commonwealth should file with the Secretary consultation with PHMSA that determines whether the use of normally closed valves to remove stormwater from curbed areas would meet PHMSA regulations.**
- **<u>Prior to construction of final design</u>, Commonwealth should file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana:**

  a. the finalized settlement monitoring program and procedures for the Project site;

  b. the total and differential settlement of final designed structures, systems, and components foundations for the Project site; and

  c. the total and differential settlement monitoring system of LNG storage tank foundation design should comply with applicable LNG industrial code/standards, including but not limited to API 620 (12th edition), API 625 (1st edition), API 650 (13th edition), API 653 (5th edition), and ACI 376 (2011 edition) or approved equivalents.

- **<u>Prior to construction of final design</u>, Commonwealth should file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana:**

  a. site preparation drawings and specifications;

  b. finalized civil design basis, criteria, specifications;

  c. LNG terminal structures, LNG storage tank, and foundation design drawings and calculations (including prefabricated and field constructed structures);

  d. seismic specifications for procured Seismic Category I equipment prior to the issuing of request for quotations;

  e. quality control procedures to be used for civil/structural design and construction; and

  f. a determination of whether soil improvement is necessary to counteract soil liquefaction.

In addition, Commonwealth should file, in its Implementation Plan, the schedule for producing this information.

- **<u>Prior to construction of the final design</u>, Commonwealth should file with the Secretary the finalized seismic monitoring program for the Project site. The seismic monitoring program should comply with NFPA 59A (2019 edition) sections 8.4.14.10, 8.4.14.12, 8.4.14.12.1, 8.4.14.12.2, and 8.4.14.13; ACI 376 (2011 edition) sections 10.7.5 and 10.8.4; U.S. Nuclear Regulatory Commission Regulatory Guide RG 1.12 (Revision 3) sections 1 and 3 through 9**

and all subsections, or equivalents subject to review and approval. A free-field seismic monitoring device should be included in the seismic monitoring program for the Project site. The proposed seismic monitoring system must include installation location plot plan; description of the triaxial strong motion recorders or other seismic instrumentation; the proposed alarm set points and operating procedures (including emergency operating procedures) for control room operators in response to such alarms/data obtained from seismic instrumentation; and testing and maintenance procedures.

- **<u>Prior to construction of final design</u>, Commonwealth should file with the Secretary the settlement monitoring and maintenance plan that have been reviewed, approved, stamped and sealed by a professional engineer of record registered in the state of Louisiana, which ensures the facilities are protected for the life of the LNG terminal considering settlement, subsidence, and sea level rise.**
- **<u>Prior to construction of final design</u>, Commonwealth should file with the Secretary the final design elevation for the structures/buildings outside floodwalls area, including but are not limited to admin office/main control room, maintenance building, elevated flare, marine flare, jetty platform control room, etc. The final design elevation drawings and calculations should be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.**

Information pertaining to the following specific recommendations should be filed with the Secretary for review and written approval by the Director of OEP, or the Director's designee, within the timeframe indicated by each recommendation. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 833 (Docket No. RM16-15-000), including security information, should be submitted as critical energy infrastructure information pursuant to 18 CFR §388.113. See Critical Electric Infrastructure Security and Amending Critical Energy Infrastructure Information, Order No. 833, 81 Fed. Reg. 93,732 (December 21, 2016), FERC Stats. & Regs. 31,389 (2016). Information pertaining to items such as offsite emergency response, procedures for public notification and evacuation, and construction and operating reporting requirements would be subject to public disclosure. All information should be filed <u>a minimum of 30 days</u> before approval to proceed is requested.

- **<u>Prior to initial site preparation</u>, Commonwealth should file an overall Project schedule, which includes the proposed stages of initial site preparation, construction, commissioning, and in-service plan relative to notice to proceed requests and related conditions.**
- **<u>Prior to initial site preparation</u>, Commonwealth should file procedures for controlling access during construction.**
- **<u>Prior to initial site preparation</u>, Commonwealth should file quality assurance and quality control procedures for construction activities, including transportation load monitoring for prefabricated process modules and LNG storage tanks.**
- **<u>Prior to initial site preparation</u>, Commonwealth should file with the Secretary the finalized wind design basis for the project facility, which should include the tornado loads determination and consideration of its load combination as required by ASCE/SEI 7-22.**
- **<u>Prior to initial site preparation</u>, Commonwealth should file its design wind speed criteria for all other facilities not covered by PHMSA's LOD to be designed to withstand wind speeds commensurate with the risk and reliability associated with the facilities in accordance with ASCE 7-(2022 edition) or approved equivalent.**
- **<u>Prior to initial site preparation</u>, Commonwealth should develop an ERP (including evacuation and any sheltering and re-entry) and coordinate procedures with the USCG; state,**

county, and local emergency planning groups; fire departments; state and local law enforcement; and other appropriate federal agencies. This plan should be consistent with recommended and good engineering practices and based on potential impacts and onsets of hazards from accidental and intentional events along the LNG marine vessel route and potential impacts and onset of hazards from accidental and intentional events at the LNG terminal, including but not limited to a catastrophic failure of the largest LNG tank. This plan should address any special considerations and pre-incident planning for infrastructure and public with access and functional needs and should include at a minimum:

a. **materials and plans for periodic dissemination of public education and training materials for evacuation and/or shelter in place of the public within any transient hazard areas along the marine vessel route, and within LNG terminal hazard areas;**

b. **plans to competently train emergency responders required to effectively and safely respond to hazardous material incidents including, but not limited to LNG fires and dispersion;**

c. **plans to competently train emergency responders to effectively and safely evacuate or shelter public within transient hazard areas along the marine vessel route, and within hazard areas from LNG terminal;**

d. **designated contacts with federal, state and local emergency response agencies responsible for emergency management and response within any transient hazard areas along the marine vessel route, and within hazard areas from LNG terminal;**

e. **scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;**

f. **scalable procedures for mobilizing response and establishing a unified command, including identification, location, and design of any emergency operations centers and emergency response equipment required to effectively and safely to respond to hazardous material incidents and evacuate or shelter public within transient hazard areas along the marine vessel route, and within LNG terminal hazard areas;**

g. **scalable procedures for notifying public, including identification, location, design, and use of any permanent sirens or other warning devices required to effectively communicate and warn the public prior to onset of debilitating hazards within any transient hazard areas along the LNG marine vessel route and within hazard areas from LNG terminal;**

h. **scalable procedures for evacuating the public, including identification, location, design, and use of evacuation routes/methods and any mustering locations required effectively and safely evacuate public within any transient hazard areas along the LNG marine transit route and within hazard areas from LNG terminal; and**

i. **scalable procedures for sheltering the public, including identification, location, design, and use of any shelters demonstrated to be needed and demonstrated to effectively and safely shelter public prior to onset of debilitating hazards within transient hazard areas that may better benefit from sheltering in place (i.e., those within Zones of Concern 1 and 2), along the route of the LNG marine vessel and within hazard areas that may benefit from sheltering in place (i.e., those within areas of 1,600 BTU/ft^2-hr and 10,000 BTU/ft^2-hr radiant heats from fires with farthest impacts, including from a catastrophic failure of largest LNG tank) of the LNG terminal.**

Commonwealth should notify the FERC staff of all planning meetings in advance and should report progress on the development of its ERP <u>at 3-month intervals</u>.

- **<u>Prior to initial site preparation</u>, Commonwealth 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. This plan should include sustained funding of any requirement or resource gap analysis identified to effectively and safely evacuate and shelter public and to effectively and safely respond to hazardous material incidents consistent with recommended and good engineering practices. Commonwealth should notify FERC staff of all planning meetings in advance and should report progress on the development of its Cost Sharing Plan at <u>3-month intervals</u>.**

- **<u>Prior to construction of final design</u>, Commonwealth should file change logs that list and explain any changes made from the FEED provided in Commonwealth's application and filings. A list of all changes with an explanation for the design alteration should be provided and all changes should be clearly indicated on all diagrams and drawings.**

- **<u>Prior to construction of final design</u>, Commonwealth should file information/revisions pertaining to Commonwealth's response: numbers 15, 45, 65, and 106 of its February 4, 2020 filing; numbers 124, 125c, 127, 134, 135, 148, 153, 154, 155, 157, 161, 162, 164, 165, and 167 of its March 4, 2020 filing; numbers 7, 17, and 18 of its June 4, 2021 filing; numbers 5, 23, 27, 28, 29, 30, 31, 32, and 33 of its November 9, 2021 filing, which indicated features to be included or considered in the final design.**

- **<u>Prior to construction of final design</u>, Commonwealth should file drawings and specifications for crash rated vehicle barriers in accordance with ASTM F2656 (2015 edition) or approved equivalent at each facility entrance for access control. The crash rating vehicle type should be supported by a security vulnerability assessment that takes into account the potential target attractiveness, threats, vulnerabilities, consequences, and mitigation effectiveness consistent with American Institute of Chemical Engineers, *Guidelines for Analyzing and Managing the Security Vulnerabilities of Fixed Chemical Sites*, 2003, or approved equivalent. The crash rating speed should be supported by an analysis of the maximum attainable vehicle velocity based on vehicle type acceleration and road characteristics (e.g., straight length, radius of curvature, sloped/banked, coefficient of friction, etc.).**

- **<u>Prior to construction of final design</u>, Commonwealth should file drawings of internal road vehicle protections, such as guard rails, barriers, and bollards to protect transfer piping, pumps, compressors, hydrants, monitors, etc. to ensure that they are located away from roadway or protected from inadvertent damage from vehicles.**

- **<u>Prior to construction of final design</u>, Commonwealth should file drawings of the security fence. The fencing drawings should provide details of fencing that demonstrates it is in accordance with NFPA 59A (2019 edition) or approved equivalent and would restrict and deter access around the entire facility and has a setback from exterior features (e.g., power lines, trees, etc.) and from interior features (e.g., piping, equipment, buildings, etc.) that does not allow the fence to be overcome.**

- **<u>Prior to construction of final design</u>, Commonwealth should file security camera and intrusion detection drawings. The security camera drawings should show the locations, mounting elevation, areas covered, and features of each camera (e.g., fixed, tilt/pan/zoom, motion detection alerts, low light, etc.) and should provide camera coverage at access points and along the entire perimeter of the terminal with redundancies and camera coverage interior of the facility to enable rapid monitoring of the terminal, including a camera at the top of each LNG storage tank, and coverage within pretreatment areas, within liquefaction**

areas, within truck transfer areas, within marine transfer areas, and within buildings. The drawings should show or note the location and type of the intrusion detection and should cover the entire perimeter of the facility.

- **<u>Prior to construction of final design</u>, Commonwealth should file photometric analyses or equivalent and associated lighting drawings. The lighting drawings should show the location, elevation, type of light fixture, and lux levels of the lighting system and should provide illumination along the perimeter of the terminal, process equipment, mooring points, and along paths/roads of access and egress to facilitate security monitoring and emergency response operations in accordance with API 540 (4th edition) or approved equivalent and applicable federal regulations.**
- **<u>Prior to construction of final design</u>, Commonwealth should file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.**
- **<u>Prior to construction of final design</u>, Commonwealth should file a building siting assessment to ensure plant buildings that are occupied or critical to the safety of the LNG plant are adequately protected from potential hazards involving fires and vapor cloud explosions.**
- **<u>Prior to construction of final design</u>, Commonwealth should file three-dimensional plant drawings to confirm plant layout for maintenance, access, egress, and congestion.**
- **<u>Prior to construction of final design</u>, Commonwealth should file up-to-date process flow diagrams (PFDs), heat and mass balances (HMBs), and piping and instrument diagrams (P&IDs) including vendor P&IDs. The HMBs should demonstrate a peak export rate of 9.5 MTPA. 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>, Commonwealth should file P&IDs, specifications, and procedures that clearly show and specify the tie-in details required to safely connect subsequently constructed facilities with the operational facilities.**
- **<u>Prior to construction of final design</u>, Commonwealth should file a car seal and lock philosophy and car seal and lock program, including a list of all car-sealed and locked valves consistent with the P&IDs. The car seal and lock program should include monitoring and periodically reviewing correct car seal and lock placement and valve position.**
- **<u>Prior to construction of final design</u>, Commonwealth should file information to demonstrate the EPC contractor has verified that all FEED HAZID recommendations have been addressed.**

- **<u>Prior to construction of final design</u>, Commonwealth should file a hazard and operability review of the final design P&IDs, a list of the resulting recommendations, and action taken on the recommendations. The issued for construction P&IDs should incorporate the hazard and operability review recommendations and justification should be provided for any recommendations that are not implemented.**
- **<u>Prior to construction of final design</u>, Commonwealth should file design pressure and set point information for the piping, equipment, and pressure relief valves located between the inlet feed gas high integrity pressure protection system (HIPPS) and the downstream pressure regulators to demonstrate pressures would not exceed the design pressures of these components.**
- **<u>Prior to construction of final design</u>, Commonwealth should provide a check valve upstream of the acid gas removal column to prevent backflow or provide a dynamic simulation that shows that upon plant shutdown, the swan neck would be sufficient for this purpose.**
- **<u>Prior to construction of final design,</u> Commonwealth should specify a second source of vacuum breaker gas (i.e., pad gas) for the LNG storage tanks independent of the liquefaction facility.**
- **<u>Prior to construction of final design</u>, Commonwealth should include LNG tank fill flow measurement with high flow alarm.**
- **<u>Prior to construction of final design</u>, Commonwealth should specify a discretionary vent valve on each LNG storage tank that is operable through the Distributed Control System (DCS). In addition, a car sealed open manual block valve should be provided upstream of the discretionary vent valve.**
- **<u>Prior to construction of final design</u>, Commonwealth should file the safe operating limits (upper and lower), alarm and shutdown set points for all instrumentation (e.g., temperature, pressures, flows, and compositions).**
- **<u>Prior to construction of final design</u>, Commonwealth should file cause-and-effect matrices for the process instrumentation, fire and gas detection system, and emergency shutdown system. 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> Commonwealth 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> Commonwealth should demonstrate that all electrical, instrument, and control systems at the project, which activate emergency systems or are relied upon for isolation or shutdowns, will be designed to withstand a 20-minute fire exposure per UL 1709 (6th edition) or approved equivalent..**
- **<u>Prior to construction of final design</u>, Commonwealth should file an up-to-date equipment list, process and mechanical data sheets, and specifications. The specifications should include:**
  - **a. building specifications (e.g., control buildings, electrical buildings, compressor buildings, storage buildings, pressurized buildings, ventilated buildings, blast resistant buildings);**
  - **b. mechanical specifications (e.g., piping, valve, insulation, rotating equipment, heat exchanger, storage tank and vessel, other specialized equipment);**

c. electrical and instrumentation specifications (e.g., power system, control system, safety instrument system [SIS], cable, other electrical and instrumentation); and

d. security and fire safety specifications (e.g., security, passive protection, hazard detection, hazard control, firewater).

- **<u>Prior to construction of final design</u>, Commonwealth should file a list of all codes and standards and the final specification document number where they are referenced.**
- **<u>Prior to construction of final design</u>, Commonwealth should file a complete specifications and drawings of the proposed LNG tank design and installation.**
- **<u>Prior to construction of final design</u>, Commonwealth should file an evaluation of emergency shutdown valve closure times. The evaluation should account for the time to detect an upset or hazardous condition, notify plant personnel, and close the emergency shutdown valve(s).**
- **<u>Prior to construction of final design</u>, Commonwealth should file an evaluation of dynamic pressure surge effects from valve opening and closure times and pump operations that demonstrate that the surge effects do not exceed the design pressures.**
- **<u>Prior to construction of final design</u>, Commonwealth 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>, Commonwealth should clearly specify the responsibilities of the LNG tank contractor and the EPC contractor for the piping associated with the LNG storage tank.**
- **<u>Prior to construction of final design</u>, Commonwealth 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>, Commonwealth should file the sizing calculations for the PSVs of the following vessels: E-A0101 Inlet Gas Preheater, E-A0403 Demethanizer Reboiler, E-A0301 Regeneration gas hot oil heater. Specifically, the calculations should show the influence of the backpressure on these PSVs since they vent to the hot oil expansion drum (V-2101A) instead of the flare.**
- **<u>Prior to construction of final design,</u> Commonwealth should specify the process vessels, and storage vessels for ethylene, propane, isopentane, condensate, hot oil, and, LNG are installed with spare pressure relief valves to ensure overpressure protection during relief valve testing or maintenance.**
- **<u>Prior to construction of final design</u>, Commonwealth 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. The evaluation should justify the type, quantity, and location of hazard detection and hazard control, passive fire protection, emergency shutdown and depressurizing systems, firewater, and emergency response equipment, training, and qualifications in accordance with NFPA 59A (2001). The justification for the flammable and combustible gas detection and flame and heat detection systems should be in accordance with ISA 84.00.07 (2018 edition) or approved equivalent methodologies and would need to demonstrate 90 percent or more of releases (unignited and ignited) that could result in an off-site or cascading impact would be detected by two or more detectors and result in isolation and de inventory within 10 minutes. The analysis should take into account the set points, voting logic, wind speeds, and wind**

directions. The justification for firewater should provide calculations for all firewater demands based on design densities, surface area, and throw distance as well as specifications for the corresponding hydrant and monitors needed to reach and cool equipment.

- **<u>Prior to construction of final design</u>, Commonwealth should file spill containment system drawings with dimensions and slopes of curbing, trenches, impoundments, tertiary containment and capacity calculations considering any foundations and equipment within impoundments, as well as the sizing and design of the down-comers. The spill containment drawings should show containment for all hazardous fluids including all liquids handled above their flashpoint, from the largest flow from a single line for 10 minutes, including de-inventory, or the maximum liquid from the largest vessel (or total of impounded vessels) or otherwise demonstrate that providing spill containment would not significantly reduce the flammable vapor dispersion or radiant heat consequences of a spill.**

- **<u>Prior to construction of final design</u>, Commonwealth should file an analysis that demonstrates the flammable vapor dispersion from design spills would be prevented from dispersing underneath the elevated LNG storage tanks, or the LNG storage tanks would be able to withstand an overpressure due to ignition of the flammable vapor that disperses underneath the elevated LNG storage tanks.**

- **<u>Prior to construction of final design</u>, Commonwealth should file an analysis that demonstrates the flammable vapor dispersion from design spills would be prevented from dispersing underneath the elevated control room, or the control room would be able to withstand an overpressure due to ignition of the flammable vapor that disperses underneath the elevated control room.**

- **<u>Prior to construction of final design</u>, Commonwealth should file a technical review of its proposed facility design that evaluates other potential locations for the proposed control room, or additional mitigation measures to protection the control room from high radiant heats.**

- **<u>Prior to construction of final design</u>, Commonwealth should file electrical area classification drawings, including cross sectional drawings. The drawings shall demonstrate compliance with NFPA 59A (2019 edition), NFPA 70 (2017 edition), NFPA 497 (2017 edition), and API RP 500 (3rd edition), or approved equivalents. In addition, the drawings shall include revisions to the electrical area classification design or provide technical justification that supports the electrical area classification of the following areas using most applicable API RP 500 figures (e.g., figures 20 and 21) or hazard modeling of various release rates from equivalent hole sizes and wind speeds (see NFPA 497 release rate of 1 lb-mole/minute).**

- **<u>Prior to construction of final design</u>, Commonwealth should file analysis of the buildings containing hazardous fluids and the ventilation calculations that limit concentrations below the LFLs (e.g., 25-percent LFL), including an analysis of off gassing of hydrogen in battery rooms, and shall also provide hydrogen detectors that alarm (e.g., 20- to 25-percent LFL) and initiate mitigative actions (e.g., 40- to 50-percent LFL) in accordance with NFPA 59A (2019 edition) and NFPA 70 (2017 edition), or approved equivalents.**

- **<u>Prior to construction of final design</u>, Commonwealth 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) or approved equivalents.**

- **<u>Prior to construction of final design</u>, Commonwealth 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.

- **Prior to construction of final design, Commonwealth 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 as well as their coverage area. The list should include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment.**
- **Prior to construction of final design, Commonwealth 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 shutdown any combustion or heating ventilation and air conditioning equipment whose continued operation could add to or sustain an emergency.**
- **Prior to construction of final design, Commonwealth should file a design that includes hazard detection suitable to detect high temperatures and smoldering combustion products in electrical buildings and control room buildings.**
- **Prior to construction of final design, Commonwealth should file an evaluation of the voting logic and voting degradation for hazard detectors.**
- **Prior to construction of final design, Commonwealth should file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of the hazard detectors when determining the lower flammable limit set points for methane, ethylene, propane, isopentane, and condensate.**
- **Prior to construction of final design, Commonwealth should file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of hazard detectors when determining the set points for toxic components such as condensate and hydrogen sulfide.**
- **Prior to construction of final design, Commonwealth should file a drawing showing the location of the emergency shutdown buttons, including, but not limited to the refrigerant storage, condensate storage, and LNG storage areas. Emergency shutdown buttons should be easily accessible, conspicuously labeled, and located in an area which would be accessible during an emergency.**
- **Prior to construction of final design, Commonwealth 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 and should demonstrate the spacing of extinguishers meet prescribed NFPA 10 (2018 edition) or approved equivalent travel distances. 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 and should demonstrate they meet NFPA 59A (2019 edition) or approved equivalent.**

- **<u>Prior to construction of final design</u>, Commonwealth should file drawings and specifications for the structural passive protection systems to protect equipment and supports from cryogenic releases.**

- **<u>Prior to construction of final design</u>, Commonwealth should file calculations or test results for the structural passive protection systems to protect equipment and supports from cryogenic releases.**

- **<u>Prior to construction of final design</u>, Commonwealth should file drawings and specifications for the structural passive protection systems to protect equipment and supports from pool and jet fires.**

- **<u>Prior to construction of final design</u>, Commonwealth should file a detailed quantitative analysis to demonstrate that adequate mitigation would be provided for each pressure vessel that could fail within the 4,000 BTU/ft2-hr zone from a pool or jet fires; each critical structural component (including the LNG marine vessel) and emergency equipment item that could fail within the 4,900 BTU/ft2-hr zone from a pool or jet fire; and each occupied building that could expose unprotected personnel within the 1,600 BTU/ft2-hr zone from a pool or jet fire. Trucks at truck transfer stations should be included in the analysis of potential pressure vessel failures, as well as measures needed to prevent cascading impact due to the 10-minute sizing spill at the marine area. A combination of passive and active protection for pool fires and passive and/or active protection for jet fires should be provided and demonstrate the effectiveness and reliability. Effectiveness of passive mitigation should be supported by calculations or test results for the thickness limiting temperature rise over the fire duration, and active mitigation should be supported by reliability information by calculations or test results, such as demonstrating flow rates and durations of any cooling water would mitigate the heat absorbed by the component. The total firewater demand should account for all components that could fail to a pool or jet fire.**

- **<u>Prior to construction of final design</u>, Commonwealth should file an evaluation and associated specifications, drawings, and datasheets for transformers demonstrating how it would prevent cascading damage of transformers (e.g., fire walls or spacing) in accordance with NFPA 850 (2015 edition) or approved equivalent.**

- **<u>Prior to construction of final design</u>, Commonwealth 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 and sectional valves, and the location and area covered by, each monitor, hydrant, hose, water curtain, deluge system, foam system, water-mist system, and sprinkler. The drawings should demonstrate that each process area, fire zone, or other sections of piping with several users can be isolated with post indicator or sectional valves and that firewater coverage is provided by at least two monitors or hydrants with sufficient firewater flow to cool exposed surfaces subjected to a fire. The drawings should also include piping and instrumentation diagrams of the firewater and foam systems.**

- **<u>Prior to construction of final design</u>, Commonwealth should specify that the firewater pump shelter is designed to remove the largest firewater pump or other component for maintenance with an overhead or external crane.**

- **<u>Prior to construction of final design</u>, Commonwealth should demonstrate that the firewater storage tank is in compliance with NFPA 22 (2018 edition) or approved equivalent.**

- **<u>Prior to construction of final design</u>, Commonwealth should specify that the firewater flow test meter is equipped with a transmitter and that a pressure transmitter is installed upstream**

of the flow transmitter. The flow transmitter and pressure transmitter should be connected to the DCS and recorded.

- **<u>Prior to construction of final design</u>, Commonwealth 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.**

- **<u>Prior to construction of final design</u>, Commonwealth should file the structural analysis of the LNG storage tank and outer containment demonstrating they are designed to withstand all loads and combinations, including shipping loads.**

- **<u>Prior to construction of the final design</u>, Commonwealth should file the finalized projectile/missile impact analysis to demonstrate that the outer concrete container wall of the full containment LNG storage tank could withstand projectile/missile impact. The analysis should detail the projectile/missile speeds and characteristics and methods used to determine penetration resistance and perforation depths. The finalized projectile/missile impact analysis should be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.**

- **<u>Prior to construction of final design</u>, Commonwealth should file an analysis of the structural integrity of the outer containment of the full containment LNG storage tank demonstrating it can withstand the radiant heat from a roof tank top fire or adjacent tank roof fire.**

- **<u>Prior to construction of final design,</u> Commonwealth should file an analysis of the structural integrity of the outer containment of the full containment LNG storage tank demonstrating it can withstand the thermal shock caused by a failure of the inner tank.**

- **<u>Prior to commissioning</u>, Commonwealth 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. Commonwealth should file documentation certifying that each of these milestones has been completed before authorization to commence the next phase of commissioning and startup will be issued.**

- **<u>Prior to commissioning</u>, Commonwealth 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>, Commonwealth should file settlement results from the hydrostatic tests of the LNG storage containers and should file a plan to periodically verify settlement is as expected and does not exceed the applicable criteria set forth in API 620 (12th edition), API 625 (1st edition), API 650 (13th edition), API 653 (5th edition), and ACI 376 (2011 edition) or approved equivalents. The program should also specify what actions would be taken after various levels of seismic events.**

- **<u>Prior to commissioning</u>, Commonwealth 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>, Commonwealth 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>, Commonwealth 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>, Commonwealth should file a plan to maintain a detailed training log to demonstrate that operating, maintenance, and emergency response staff have completed the required training.**

- **<u>Prior to commissioning</u>, Commonwealth should file the procedures for pressure/leak tests which address the requirements of ASME BPVC Section VIII (2017 edition) and ASME B31.3 (2016 edition) or approved equivalents. In addition, Commonwealth should file a line list of pneumatic and hydrostatic test pressures.**

- **<u>Prior to introduction of hazardous fluids</u>, Commonwealth 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.**

- **<u>Prior to introduction of hazardous fluids</u>, Commonwealth should complete and document all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the DCS and SIS that demonstrates full functionality and operability of the system.**

- **<u>Prior to introduction of hazardous fluids</u>, Commonwealth should develop, file, and implement an alarm management program consistent with ISA 18.2 (2016 edition) or approved equivalent to reduce alarm complacency and maximize the effectiveness of operator response to alarms.**

- **<u>Prior to introduction of hazardous fluids</u>, Commonwealth should complete and document a clean agent acceptance tests.**

- **<u>Prior to introduction of hazardous fluids</u>, Commonwealth should complete and document a firewater pump acceptance test and firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant should be shown on facility plot plan(s).**

- **<u>Prior to introduction of hazardous fluids</u>, Commonwealth should complete and document foam system and sprinkler system acceptance tests.**

- **Commonwealth should file a request for written authorization from the Director of OEP <u>prior to unloading or loading the first LNG commissioning cargo</u>. After production of first LNG, Commonwealth should file weekly reports on the commissioning of the proposed systems that detail the progress toward demonstrating the facilities can safely and reliably operate at or near the design production rate. The reports should include a summary of activities, problems encountered, and remedial actions taken. The weekly reports should also include the latest commissioning schedule, including projected and actual LNG production by each liquefaction train, LNG storage inventories in each storage tank, and the number of anticipated and actual LNG commissioning cargoes, along with the associated volumes loaded or unloaded. Further, the weekly reports should include a status and list of all planned and completed safety and reliability tests, work authorizations, and punch list items. Problems of significant magnitude should be reported to the FERC within 24 hours.**

- **<u>Prior to commencement of service</u>, Commonwealth should file a request for written authorization from the Director of OEP. Such authorization would only be granted following a determination by the USCG, under its authorities under the Ports and Waterways Safety**

Act, the Magnuson Act, the MTSA of 2002, and the 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 Commonwealth or other appropriate parties.

- **Prior to commencement of service, Commonwealth should file any proposed revisions to the security plan and physical security of the plant.**
- **Prior to commencement of service, Commonwealth should label piping with fluid service and direction of flow in the field consistent with ASME A13.1 (2007 edition) or approved equivalent, in addition to the pipe labeling requirements of NFPA 59A (2001).**
- **Prior to commencement of service, Commonwealth should provide plans for any preventative and predictive maintenance program that performs periodic or continuous equipment condition monitoring.**
- **Prior to commencement of service, Commonwealth should develop procedures for offsite contractors' responsibilities, restrictions, monitoring, training, and limitations and for supervision of these contractors and their tasks by Commonwealth staff. Specifically, the procedures should address:**

  a. selecting a contractor, including obtaining and evaluating information regarding the contract employer's safety performance and programs.

  b. informing contractors of the known potential hazards, including flammable and toxic release, explosion, and fire, related to the contractor's work and systems they are working on.

  c. developing and implementing provisions to control and monitor the entrance, presence, and exit of contract employers and contract employees from process areas, buildings, and the plant.

  d. developing and implementing safe work practices for control of personnel safety hazards, including lockout/tagout, confined space entry, work permits, hot work, and opening process equipment or piping.

  e. developing and implementing safe work practices for control of process safety hazards, including identification of layers of protection in systems being worked on, recognizing abnormal conditions on systems they are working on, and re-instatement of layers of protection, including ensuring bypass, isolation valve, and car-seal programs and procedures are being followed.

  f. developing and implementing provisions to ensure contractors are trained on the emergency action plans and that they are accounted for in the event of an emergency.

  g. monitoring and periodically evaluating the performance of contract employers in fulfilling their obligations above, including successful and safe completion of work and re-instatement of all layers of protection.

In addition, we recommend that the following measures should apply throughout the life of the Commonwealth LNG Project.

- **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, Commonwealth should respond to a specific data**

request including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed P&IDs reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, should be submitted.

- **<u>Semi-annual</u> operational reports should be filed with the Secretary to identify changes in facility design and operating conditions; abnormal operating experiences; activities (e.g., ship 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 tank, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, hazardous fluids releases, fires involving hazardous fluids and/or from other sources, negative pressure (vacuum) within a storage tank, and higher than predicted boil off rates. Adverse weather conditions and the effect on the facility also should be reported. Reports should be submitted <u>within 45 days after each period ending June 30 and December 31</u>. In addition to the above items, a section entitled "Significant Plant Modifications Proposed for the Next 12 Months (dates)" should be included in the semi-annual operational reports. Such information would provide the FERC staff with early notice of anticipated future construction/maintenance at the LNG facilities.**
- **In the event the temperature of any region of the LNG storage container, including any secondary containment and imbedded pipe supports, becomes less than the minimum specified operating temperature for the material, the Commission should be notified <u>within 24 hours</u> and procedures for corrective action should be specified.**
- **Significant non-scheduled events, including safety-related incidents (e.g., LNG, 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 the FERC staff. In the event that an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification should be made <u>immediately</u>, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification should be made to the FERC staff <u>within 24 hours</u>. This notification practice should be incorporated into the liquefaction 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 an LNG facility that contains, controls, or processes hazardous fluids;

g. **any crack or other material defect that impairs the structural integrity or reliability of an LNG 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 LNG facilities) plus the build-up allowed for operation of pressure-limiting or control devices;**

i. **a leak in an LNG 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 an LNG 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 facility'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 should include investigation results and recommendations to minimize a reoccurrence of the incident.

4.12.2 Conclusions

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

As a cooperating agency, the DOT assists the FERC by determining whether Commonwealth LNG Project's proposed design would meet the DOT's 49 CFR 193 Subpart B siting requirements. On August 2, 2022, the PHMSA provided an LOD on the Project's compliance with 49 CFR 193 Subpart B. This determination is provided to the Commission as further consideration on the Commission's decision to authorize or deny the Project. If the Project is authorized, constructed, and operated, 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 PHMSA.

As a cooperating agency, the USCG also assisted the FERC staff by reviewing the proposed LNG terminal and the associated LNG marine vessel traffic. We received a comment from the public inquiring about the completeness of Commonwealth's WSA. The USCG reviewed a WSA submitted by Commonwealth that focused on the navigation safety and maritime security aspects of LNG marine vessel transits along the affected waterway. On March 7, 2019, the USCG issued an LOR that recommended the Calcasieu River Ship Channel 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. Commonwealth provided an update regarding its WSA in the context of the Calcasieu Pass LNG terminal beginning operations to the USCG in April 2022 as specified in the USCG LOR. If the Project is authorized, constructed, and operated, the facilities would be subject to the USCG's inspection and enforcement program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

FERC staff conducted a preliminary engineering and technical review of the Commonwealth LNG Project design, including potential external impacts based on the site location. Based on this review, we recommend a number of mitigation measures, which would ensure 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 concluded that the Commonwealth LNG 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.

4.12.3 Pipeline Safety Standards

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. CH_4, 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. CH_4 is inactive biologically and essentially nontoxic. It is not listed in the International Agency for Research on Cancer (2017), National Toxicology Program (2017), or by the Occupational Safety and Health Administration (2017) as a carcinogen or potential carcinogen. CH_4 has an auto-ignition temperature of 1,000 °F and is flammable at concentrations between 5 and 15 percent in the air (NIOSH, 2017). Unconfined mixtures of CH_4 in air are not explosive; however, it may ignite 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.

The DOT is mandated to provide pipeline safety under Title 49, USC Chapter 601. PHMSA's Office of Pipeline Safety administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards that set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve the required safety standard. PHMSA's mission is to protect people and the environment from the risks of pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local level.

Title 49, USC 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. The State of Louisiana has delegated authority to inspect interstate pipeline facilities.

The DOT pipeline standards are published in 49 CFR Parts 190–199. Part 192 specifically addresses natural gas pipelines.

Under a *Memorandum of Understanding on Natural Gas Transportation Facilities* dated January 15, 1993, between the DOT and FERC, the DOT is recognized as having 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 would design, install, inspect, test, construct, operate, replace, and maintain the facility for which a Certificate is requested in accordance with federal safety standards and plans for maintenance and inspection; or should 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 other than the DOT standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the MOU to promptly alert the DOT. The MOU also provides instructions 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.

We also participate 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 would be designed, constructed, operated, and maintained in accordance with or to exceed the DOT *Minimum Federal Safety Standards* in 49 CFR 192. These regulations, which are intended to protect the public and to prevent natural gas facility accidents and failures, include specifications for material selection and qualification; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion.

The DOT defines area classifications based on population density in the vicinity of the Pipeline and specifies more rigorous safety requirements for populated areas. 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. The class locations 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; and,
- Class 4 – Location where buildings with four or more stories aboveground are prevalent.

In accordance with federal standards, class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. 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. We note that the proposed Pipeline does not cross any areas of consolidated rock within trenching depth. All pipelines installed in navigable rivers, streams, and harbors must have a minimum cover of 48 inches in soil or 24 inches in consolidated rock. Class locations also specify the maximum distance to sectionalized block valves (that is 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).

Currently, the entire Pipeline system is in a Class 1 location. If the Project is approved, the regulations require that the Pipeline be designed, at a minimum, to the appropriate class location standards and that the spacing between the mainline valves meets the DOT requirements.

During operation of the Pipeline, if a subsequent increase in population density adjacent to the right-of-way indicates a change in class location for the Pipeline, Commonwealth would be required to reduce the MAOP or replace the segment with pipe of sufficient grade and wall thickness, if required, to comply with the DOT regulations for the new class location. The Pipeline Safety Improvement Act of 2002 also requires operators to develop and follow a written integrity management program that contains all the elements described in 49 CFR 192.911 and addresses the risks on each transmission pipeline segment. Specifically, the law establishes an integrity management program that applies to all high consequence areas (HCAs).

The DOT 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 the 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; or
- any area in Class 1 or 2 locations where the potential impact radius is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle; or,
- any area in Class 1 or 2 locations where the potential impact circle includes an identified site.

In the second method, an HCA includes any area within a potential impact circle that contains:

- 20 or more buildings intended for human occupancy; or
- 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.

Once a pipeline operator has determined the HCAs on its pipeline, it must apply the elements of its integrity management plan to those segments of the pipeline within the HCAs. The DOT regulations specify the requirements for the integrity management plan at Part 192.911. The pipeline integrity management rule for HCAs requires inspection of the pipeline every 7 years. Currently, there are no HCAs along the Pipeline system.

After construction, and as required by the DOT regulations, the Pipeline would be marked at line-of-sight intervals and at crossings of roads, railroads, and other key points. The markers would indicate the presence of the Pipeline and provide a telephone number and address where a company representative could be reached in the event of an emergency or before any excavation in the area of the Pipeline by a third-party.

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 contractors or other maintenance workers on the underground location of pipes, cables, and culverts. Commonwealth would participate in the "Call Before You Dig" and "One Call" programs and other related pre-excavation notification organizations in the states in which they operate. Commonwealth would develop and employ an integrity management plan for the Pipeline. Commonwealth would also follow a Continuing Pipeline Surveillance Plan, which specifies procedures for performing routine surveillance of the Pipeline.

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 must establish an emergency plan that includes procedures to minimize the hazards in a natural gas pipeline emergency. Key elements of the plan would include procedures for:

- receiving, identifying, and classifying emergency events such as gas leakage, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- ESD of system and safe restoration of service;
- making personnel, equipment, tools, and materials available at the scene of an emergency; and
- protecting people first and then property, and making them safe from actual or potential hazards.

Commonwealth would prepare an *Emergency Response Plan* that would provide procedures to be followed in the event of an emergency that would meet the requirements of 49 CFR 192.615. The plan would include the procedures for communicating with emergency services departments, prompt responses for each type of emergency, logistics, ESD and pressure reduction, emergency service department notification, and service restoration.

4.12.4 Pipeline Accident Data

The DOT requires all operators of natural gas transmission pipelines to notify the DOT of any significant incidents and to submit a report within 30 days. Significant incidents are defined as any leaks that:

- cause a death or personal injury requiring hospitalization; or
- involve property damage of more than $50,000 in 1984 dollars.[158]

Data available from PHMSA indicates that during the 20-year period from 2001 through 2020, a total of 1,142 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 4.12.3-1 provides a distribution of the causal factors, as well as the number of each incident by cause.

158 $50,000 in 1984 dollars is approximately $131,979 as of November, 2021 (U.S Bureau of Labor Statistics, 2022).

TABLE 4.12.3-1

Natural Gas Transmission Dominant Incident Causes, 2001-2020

Incident	Number of Incidents a/	Percentage
Pipeline material, weld, or equipment failure	429	37.6
Corrosion	193	16.9
Excavation b/	182	15.9
Natural force damage	99	8.7
Other Outside forces c/	80	7.0
Incorrect operation	64	5.6
All other causes d/	95	8.3
Total	**1,142**	**--**

a/ All data gathered from PHMSA's Significant Incident files, January 20, 2022 (PHMSA, 2022).
b/ Includes third party damage..
c/ Fire, explosion, vehicle damage, previous damage, intentional damage..
d/ Miscellaneous causes or unknown causes..

The dominant incident cause of pipeline incidents were pipeline material, weld, or equipment failure and corrosion, constituting 54.5 percent of all significant incidents. The pipelines included in the data set in table 4.12.3-1 vary widely in terms of age, pipe 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, since corrosion is a time-dependent process. The use of both an external protective coating and a cathodic protection system,[159] required on all pipelines installed after July 1971, significantly reduces the corrosion rate compared to unprotected or partially protected pipe.

Outside forces, including excavations and natural events were the cause of 31.6 percent of significant pipeline incidents nationwide from 2001 to 2020. Table 4.12.3-2 provides a breakdown of outside force incidents by cause. These mostly 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.

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.

159 Cathodic protection is a technique to reduce corrosion (rust) of the natural gas pipeline using an induced current or a sacrificial anode (like zinc) that corrodes at faster rate to reduce corrosion.

TABLE 4.12.3-2

Outside Forces Incidents by Cause, 2001 – 2020 a/

Cause	Number of Incidents	Percent of Outside Force Incidents
Third party excavation damage	143	39.6%
Vehicle (not engaged with excavation)	44	12.2%
Lightning/temperature/high winds	30	8.3%
Heavy rains/floods	29	8.0%
Earth movement	27	7.5%
Operator excavation damage	26	7.2%
Unspecified excavation damage/previous damage	13	3.6%
Natural force (unspecified and other)	13	3.6%
Fire/explosion	12	3.3%
Unspecified/other outside force	11	3.0%
Previous mechanical damage	5	1.4%
Electrical arcing from other equipment/facility	4	1.1%
Fishing or maritime activity/maritime equipment or vessel adrift	3	0.8%
Intentional damage	1	0.3%
Total	**361**	--

a/ PHMSA, 2022.

4.12.5 Impact on Public Safety

The service incident data summarized in table 4.12.3-1 include pipeline failures of all magnitudes with widely varying consequences. Table 4.12.4-1 presents the annual injuries and fatalities that occurred on natural gas transmission lines between 2017 and 2021. The data has been separated into employees and public (nonemployees) to better identify a fatality rate experienced by the general public.

The majority of fatalities from pipelines involve local distribution pipelines (not included in table 4.12.4-1). These are natural gas pipelines that are not regulated by FERC and 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, often made of plastic or cast iron rather than welded steel and tend to be older pipelines that are more susceptible to damage. In addition, distribution systems do not have large rights-of-way and pipeline markers common to the FERC-regulated natural gas transmission pipelines.

The nationwide totals of accidental fatalities from various manmade and natural hazards are listed in table 4.12.4-2 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. Furthermore, the fatality rate is more than 25 times lower than the fatalities from natural hazards such as lightning, tornados, floods, etc.

TABLE 4.12.4-1 **Injuries And Fatalities – Natural Gas Transmission Pipelines a/**				
	Injuries		**Fatalities**	
Year	**Employees**	**Public**	**Employees**	**Public**
2017	1	2	1	2
2018	2	3	0	1
2019	0	8	0	1
2020	1	1	1	1
2021	3	1	2	2
Total	**7**	**15**	**4**	**7**

a/ PHMSA, 2022.

TABLE 4.12.4-2 **Nationwide Accidental Deaths**	
Type of Accident	**Annual Number of Deaths**
Motor vehicles	42,336 a/
Falls	42,113 a/
Choking on object or substance	4,963 a/
Drowning	4,176 a/
Fires, Flames, or Smoke	2,951 a/
Total for all weather events	446 b/
Floods	126 b/, c/
Tornadoes and Thunderstorms (not including lightning strikes)	76 b/, d/
Lightning	17 b/, c/
Natural gas transmission and gathering pipelines (2020)	2 e/
Natural gas transmission and gathering pipelines (January 2001 – December 2020 annual average)	2 e/

a/ NSC, 2022.
b/ Reflects 2020 statistics (National Weather Service, 2022).
c/ These fatalities are included in the total for all weather events.
d/ These fatalities due not include fatalities during hurricanes or tropical storms and these fatalities are included in the total for all weather events.
e/ PHMSA, 2022.

The available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation. From 2001 to 2020, there was a national average of 57.1 significant incidents, 7.9 injuries and 1.8 fatalities per year. For Louisiana over the past 20 years there was an average of 8.2 significant incidents and 0.4 injuries per year with only 0.4 fatality over that period, well below the national average. The number of significant incidents over the more than 300,000 miles of natural gas transmission lines indicates the risk is low for an incident at any given location. The operation of the Pipeline would represent a slight increase in risk to the nearby public.

Commonwealth has identified it would use a limited 3.5-foot-wide permanent right-of-way for operation of the pipeline, which would accommodate little more than the width of the pipeline (i.e., the diameter of a 42-inch pipeline). However, this width would not appear to allow sufficient space for the full outer diameter of the pipeline, including the concrete coating, or for maintenance, or repairs of the pipeline. In the draft EIS we recommended that Commonwealth file a plan clarifying how it would adequately protect, inspect, maintain, operate, and repair the pipeline in accordance with PHMSA's requirements in 49 CFR 192 using the proposed 3.5-foot-wide right-of-way, or provide an alternate permanent pipeline right-of-way width to accommodate the operational needs of the pipeline.

Commonwealth filed a response stating it would develop and implement a Pipeline Operations and Maintenance program in accordance with 49 CFR 192 requirements that would serve as the basis for safe operation of the Pipeline, and Commonwealth would monitor and operate the Pipeline using a 24 hour per day pipeline controller position in accordance with 49 CFR 192 requirements. Commonwealth would execute a permanent right-of-way easement with all landowners of parcels that would be traversed by the Pipeline for the 3.5-foot-wide right-of-way. This permanent easement would include the right to access the right-of-way for activities necessary to protect, inspect, maintain, operate, and repair the Pipeline in accordance with 49 CFR 192 for the duration of Pipeline operation. The easement would further allow Commonwealth to use airboats, low-ground-pressure vehicles, or timber equipment mats, as needed. If additional workspace or access were to be required for an activity, Commonwealth would have the right to negotiate appropriate compensation to the landowners to secure the necessary additional workspace or access for the duration of the activity and to subsequently monitor the workspace to ensure successful restoration and revegetation. We conclude this approach would allow Commonwealth to safely operate and maintain the Pipeline.

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.

This cumulative impacts analysis uses an approach consistent with the methodology set forth in relevant guidance (CEQ, 1997, 2005; EPA, 1999). Under these guidelines, inclusion of actions within the analysis is based on identifying commonalities between the impacts that would result from the Project and the impacts likely to be associated with other potential projects.

The purpose of this analysis is to identify and describe cumulative impacts that would potentially result from construction and operation of the Project. To avoid unnecessary discussions of insignificant impacts and projects and to adequately address and accomplish the purposes of this analysis, an action must first meet the following three criteria to be included in the cumulative analysis:

- impact a resource potentially affected by the proposed Project;
- impact that resource within all, or part of, the geographic scope of the Project. The geographical area considered varies depending on the resource being discussed, which is the general area in which the Project could contribute to cumulative impacts on that particular resource; and
- impact that resource within all, or part of, the time span for the potential impact from the proposed Project.

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.

To understand the contribution of past actions to the cumulative effects of the proposed action, this analysis relies on current environmental conditions as a proxy for the effects of past actions. Existing conditions reflect the aggregate effects of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. In this analysis, we generally consider the effects of past projects within the resource-specific geographic scopes as part of the affected environment (environmental baseline), which was described previously. However, this analysis does consider, as applicable, the present effects of past actions. In accordance with the CEQ regulations and guidance[160], we identified actions near Commonwealth and evaluated the potential for a cumulative impact on the environment. This analysis evaluates other actions that affect resources also affected by the Project, within the resource-specific geographic scopes described below. Actions outside the geographic scopes are generally not evaluated because their potential to contribute to a cumulative impact diminishes with increasing distance from the projects.

Several present and reasonably foreseeable actions with impacts during the Project's temporal extent would commence construction or operation during the Project's three-year construction period. Commonwealth anticipates beginning construction in the second quarter of 2023 and initiating commercial operation by the second quarter of 2026 (assuming receipt of all required certifications, authorizations, and permits). Commonwealth anticipates construction and commissioning of the Terminal to be completed in approximately 36 to 38 months. Commonwealth proposes a 12-month construction schedule for the Pipeline, which would occur concurrent with construction of the Terminal. Commonwealth would initiate construction of the Pipeline in the first quarter of 2024 and expect to complete it during the first quarter of 2025. We received comments stating that given the length of long-term leases, the operational life of the Project would be 50 years. However, Commonwealth proposes that the Project would have an operational life of 30 years. Although Commonwealth holds lease options for a total of 50 years, Commonwealth has not entered into any agreements for service for a period of time longer than 30 years. Commonwealth has not identified any plans for future expansion or abandonment. Any plans for expansion or abandonment would require the appropriate authorization from the FERC (e.g., environmental analyses, abandonment regulations) and other federal, state, and local agencies at that time. A facility lifespan beyond 30 years is not reasonably foreseeable. Additionally, as noted in the introductory text of section 4.0, this EIS assesses impacts in the context of temporary, short-term, long-term, and permanent impacts. Temporary impacts are those that generally would not last beyond the duration of construction; short-term impacts are those are likely to continue for up to 3 years following construction; long-term impacts are those that would continue for longer than three years but would return to pre-existing conditions within the life of the Project; and permanent impacts are those that would not return to pre-existing conditions within the life of the Project. The assessments of these impacts would not change with a longer project lifespan. In fact, the assessments of long-term and permanent impacts could be considered conservative if the Project lifespan was to extend beyond 30 years.

160 On July 16, 2020, CEQ issued a final rule, Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act (Final Rule, 85 Fed. Reg. 43,304), which was effective as of September 14, 2020; however, the NEPA review of this project was in process at that time and was prepared pursuant to the 1978 regulations.

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 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.

TABLE 4.13-1

Geographic Scope for Cumulative Impact Analysis

Resources and Affected Communities	Geographic Scope	Justification for Geographic Scope
Geologic Resources and Soils	Construction workspaces and the Calcasieu Ship Channel from the Gulf to Commonwealth	Impacts on soils and surficial geology would be highly localized and not expected to extend beyond the area of direct disturbance associated with the Project. Cumulative impacts to riverbanks/shorelines would only occur in areas where Commonwealth LNG carriers operate.
Water Resources (Groundwater, Surface Water, and Wetlands)	Hydrological unit code "HUC"-12 sub-watersheds	Impacts on groundwater and surface water resources could reasonably extend throughout a HUC-12 sub-watersheds (i.e., a detailed hydrologic unit that can accept surface water directly from upstream drainage areas, and indirectly from associated surface areas such as remnant, noncontributing, and diversions to form a drainage area with single or multiple outlet points [NRCS, 2007]), as could the related impacts on aquatic resources and fisheries.
Vegetation and Wildlife	HUC-12 sub-watersheds	Consideration of impacts within a HUC-12 sub-watershed sufficiently accounts for impacts on vegetation and wildlife that would be directly affected by construction activities and for indirect impacts such as changes in habitat availability and displacement of transient species.
Aquatic Resources	HUC-12 sub-watersheds	Consideration of impacts within a HUC-12 sub-watershed sufficiently accounts for impacts on aquatic resources within waterbodies that would be directly affected by construction activities and for indirect impacts such as changes in habitat availability and displacement of transient species.
Threatened and Endangered Species	HUC-12 sub-watersheds	HUC-12 subwatershed – impacts within the HUC-12 subwatershed could contribute to impacts on vegetation communities and threatened and endangered species habitat within the watershed. For marine species, impacts on marine/estuarine waterbodies in the HUC-12 sub-watersheds and established shipping channels used by LNG carriers are also within the geographic scope.
Land Use and Recreation	1 mile radius	Impacts on general land uses would be restricted to the construction workspaces and the immediate surrounding vicinity; therefore, the geographic scope for land use and recreation is 1.0 mile from the Terminal and Pipeline.

TABLE 4.13-1 **Geographic Scope for Cumulative Impact Analysis**		
Resources and Affected Communities	**Geographic Scope**	**Justification for Geographic Scope**
Visual Resources	For aboveground facilities, distance that the tallest feature at the planned facility would be visible from neighboring communities. For the Pipeline System, a 0.25-mile buffer and existing visual access points (e.g., road crossings).	Assessing the impact based on the viewshed allows for the impact to be considered with any other feature that could have an effect on visual resources.
Socioeconomics	Parishes where project activities are proposed.	The geographic scope of potential impact for socioeconomics was considered to include Cameron Parish and Calcasieu Parish where Commonwealth would construct the Project.
Environmental Justice	Affected environmental justice block groups.	The geographic scope of potential impacts for environmental justice includes all environmental justice block groups affected by the Project.
Cultural Resources	Area of Potential Effect of the proposed Project	Overlapping effects within the Area of Potential Effect could contribute to cumulative impacts.
Air Quality – Construction	Within 0.25 mile of the proposed pipeline facilities and within 1.0 mile of the Terminal	Air emissions during construction would be limited to vehicle and construction equipment emissions and dust and would be localized to the project construction sites.
Air Quality – Operations	Within 50 kilometers (31.1 miles) of the proposed Terminal	The distance used by the EPA for cumulative modeling of large PSD sources during permitting (40 CFR 51, appendix W) which is a 50-kilometer (31.1 mile) radius. Impacts on air quality beyond this would be de minimis.
Noise - Construction	General construction activities: within 0.25 mile from pipeline or aboveground facilities, 0.5 mile from HDD entry and exit locations; underwater noise due to pile driving: up to 3 miles, as determined by NMFS (2021)	Areas in the immediate proximity of pipeline or aboveground facility construction activities (within 0.25 mile) would have the potential to be affected by construction noise. NSAs within 0.5 mile of an HDD, direct pipe installation, or pile driving could be cumulatively affected if other projects had a concurrent impact on the NSA. Aquatic life could be cumulatively affected if other projects conduct pile driving within 3 miles of the Project
Noise - Operations	NSAs within 1 mile of a noise-emitting permanent aboveground facility	Noise from the Project's permanent facilities could result in cumulative noise impacts on NSAs within 1 mile.

As in sections 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 temporary, short-term, long-term, and permanent. Temporary cumulative impacts generally occur during construction with the resource returning to preconstruction condition almost immediately afterward. Short-term cumulative impacts could continue for up to 3 years following construction. Cumulative impacts were considered long-term if the resource would require more than 3 years to recover. A permanent cumulative impact could occur as a result of any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the Project.

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 Commonwealth and by a general literature review of publicly available sources including, but not limited to:

- FERC eLibrary;
- LDEQ;
- Louisiana Economic Development;
- COE Regulatory Public Notices;
- Southwest Louisiana Economic Development Alliance; and
- the Permitting Dashboard for Federal Infrastructure Projects.

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 44 total actions, not including the Project, there are:

- 11 FERC-jurisdictional LNG and pipeline projects;
- 4 energy projects;
- 8 industrial projects;
- 9 transportation, port, and road improvement projects
- 3 municipal, medical, and educational projects; and
- 18 commercial and residential projects.

Number	Name	Number	Name	Number	Name
1	Calcasieu Pass LNG Terminal and Trans Cameron Pipeline	16	Calcasieu Pass Slurry Line	31	Subdivision: Maple Creek
2	Cameron LNG Project	17	Calcasieu Ship Channel (USACE Port of Lake Charles)	32	Subdivision: Orleans Run
3	Cameron LNG Expansion Project	18	Advanced Refining Technologies	33	Subdivision: Wisteria Vine
4	Driftwood LNG Project	19	Lake Charles Methanol	34	Subdivision: Audubon Place
5	Lake Charles LNG	20	Indorama Ventures	35	Subdivision: Savannah Lakes
6	Magnolia LNG	21	Lotte Axiall	36	Subdivision: Lakes at Morganfield
7	Delfin LNG	22	G2X Big Lake Fuels	37	Subdivision: Village at Morganfield
8	Sabine Pass Liquefaction Expansion Project	23	Port of Vinton	38	Subdivision: Cove at Morganfield
9	Port Arthur Pipeline Louisiana Connector	24	Port Louisiana (formerly Port Cameron)	39	Subdivision: Oak Grove
10	CP2 LNG and CP Express Project	25	West Calcasieu Port Projects	40	Subdivision: Beau Blanc
11	Cameron Access Project	26	I-10 Calcasieu River Bridge	41	Subdivision: Crest at Morganfield
12	Cameron LNG – Entergy Transmission Line and Switchyard	27	LA-378 Adaptive Management	42	Subdivision: Highland Hills
13	Lake Charles LNG – Entergy Transmission Line	28	Port Wonder	43	Graywood Subdivision
14	Magnolia LNG – Entergy Transmission Line	29	Subdivision: Belle Savanne	44	Morganfield Subdivision
15	Bayou Bridge Pipeline	30	Subdivision: Carlyss Place	45	Hackberry Carbon Sequestration Project

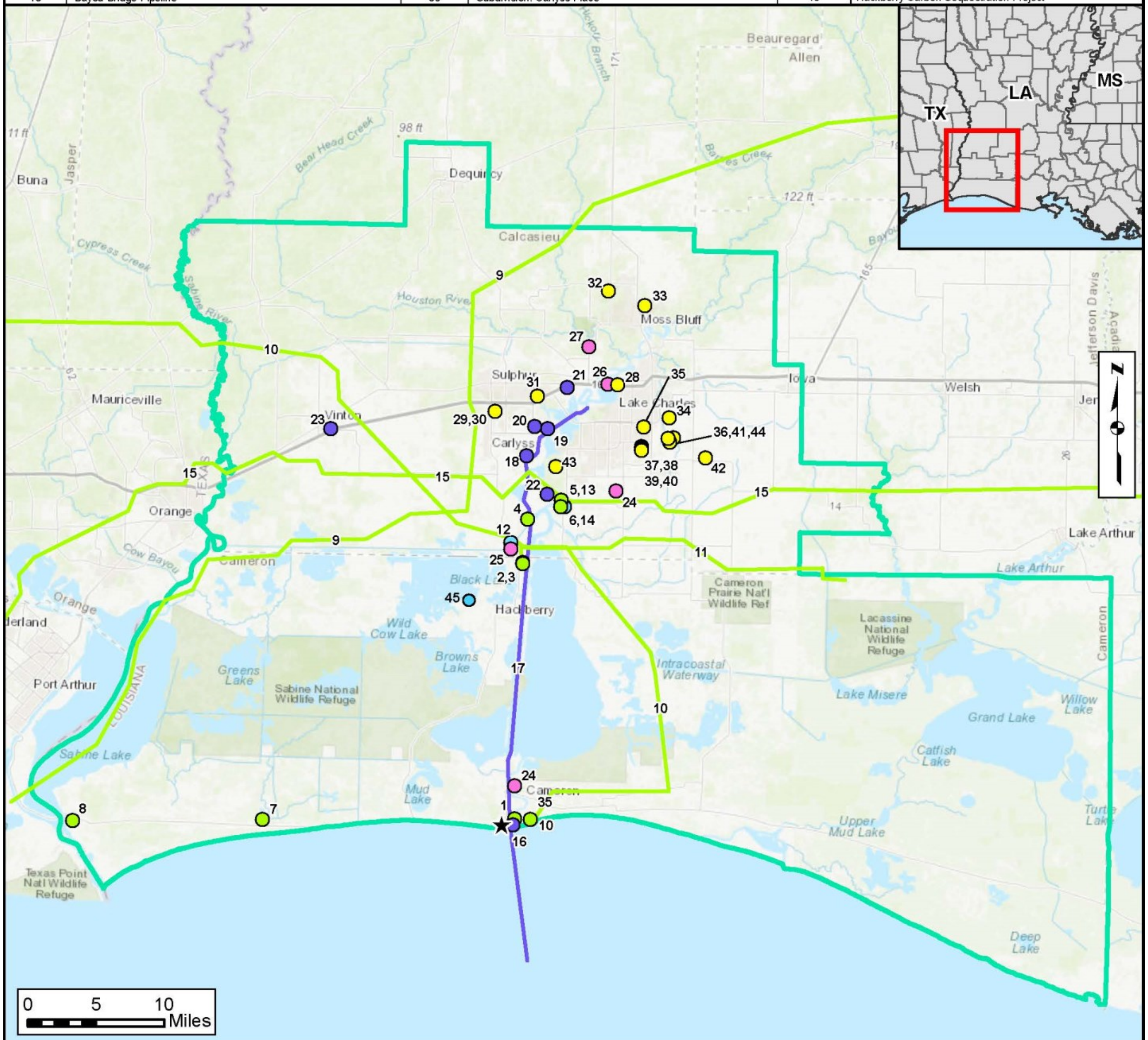


Figure 4.13-1

Commonwealth LNG Project

Past, Present and Future Activities Considered in the Cumulative Impact Analysis

TABLE 4.13-2

Past, Present and Reasonably Foreseeable Activities Considered in the Cumulative Impact Analysis

Action (Proponent)	Parish, Distance from Facility (F) and/or Pipeline (P)	Anticipated Construction (C) and Operation (O) Start Dates	Project Type a/	Workforce	Approximate Size of Project (acres) a/	Impacts on Wetlands (acres)	Impacts on Waterbodies (# crossed)	Resources Potentially Affected b/
FERC-jurisdictional LNG and Pipeline Projects								
Commonwealth LNG (Commonwealth LNG, LLC)	Cameron F/O: 0.0 mile	C: 2023 O: 2026	LNG export facility	C: 2,000 O: 65	230.8	89.9	8	N/A
Calcasieu Pass LNG Terminal and Trans Cameron Pipeline (Venture Global) Docket # CP15-550-000	Cameron F: 0.3 mile east P: 0.8 mile east	C: Complete O: Ongoing	LNG export facility	C: 1,410 (peak) O: 130	F: 413 P: 370	445	123	All
Cameron LNG (Cameron LNG Holdings, LLC) Docket # CP13-25-000	Cameron F: 18 miles north P: 16 miles north	C: Complete O: Ongoing	LNG export facility	O: 90	824	214	28	AO, AR, GW, LS, RT, S, SW, VT, VW, W
Cameron LNG Expansion (Cameron LNG Holdings, LLC) Docket # CP15-560-000	Cameron F: 18 miles north	C: Pending O: 2026	LNG export facility	C: 3,269 (peak) O: 69	141 c/	0	0	AO, AR, GW, LS, RT, S, SW, VT, VW, W
Driftwood LNG (Driftwood LNG, LLC) Docket # CP17-117-000	Calcasieu F: 22 miles north P: 20 miles north	C: Ongoing O: 2026	LNG export facility	C: 6,500 (peak) O: 539	Facility: 720 Pipeline: 1,880	Facility: 319 Pipeline: 426	317	AO, AR, GW, LS, RT, S, VT, VW, W
Lake Charles LNG (Lake Charles LNG Company, LLC) Docket # CP14-120-000	Calcasieu F: 24 miles north P: 22 miles north	C: Pending O: 2028	LNG export facility	C: 5,600 (peak) O: 176	1,516	253	104	AO, AR, GW, LS, RT, S, VT, VW, W

TABLE 4.13-2

Past, Present and Reasonably Foreseeable Activities Considered in the Cumulative Impact Analysis

Action (Proponent)	Parish, Distance from Facility (F) and/or Pipeline (P)	Anticipated Construction (C) and Operation (O) Start Dates	Project Type a/	Workforce	Approximate Size of Project (acres) a/	Impacts on Wetlands (acres)	Impacts on Waterbodies (# crossed)	Resources Potentially Affected b/
Magnolia LNG (Magnolia LNG, LLC) Docket #s CP14-347-000, CP14-511-000, CP19-19-000	Calcasieu F: 23 miles north P: 21 miles north	C: Pending O: 2026	LNG export facility	C: 781 O: 67	Facility: 129 Pipeline: 76	15	10	AO, AR, GW, LS, RT, S, VT, VW, W
Delfin LNG (Delfin LNG LLC) Docket #s CP 15-490-000, and CP 16-20-000	F/P: 45 miles south-southeast	C: Pending O: 2024	LNG export facility (offshore)	C: 200 O: 200-400	N/A (offshore)	0	1	S
Sabine Pass Liquefaction Expansion (Cheniere LNG) Docket # CP13-552-000	Cameron F: 30 miles west P: 30 miles west	C: Present O: 2019/2023	LNG export facility expansion	C: 2,500 (peak) O: 150	Facility: 401 Pipeline: 1,697	Facility: 154 Pipeline: 276	Facility: 0 Pipeline: 109	S, AO
Port Arthur Pipeline Louisiana Connector (Sempra LNG & Midstream) Docket #s CP17-20-000, CP17-21-000, CP18-7-000	Calcasieu, Cameron F: 22.8 miles north-northwest P: 19.4 miles north-northwest	C: Pending O: 2028	Natural gas pipeline	C: 600 (peak) O: 10	2,807	636.9	167	S, AO
CP2 LNG and CP Express Project (Venture Global) Docket # CP22-21-000	Cameron F: 1.3 miles E P: 1.7 miles E	C: 2023 O: 2025	New LNG Facility and 87.5-mile pipeline	C: 4,400 (facility peak) 1,625 (pipeline peak) O: 250 (facility) 10 (pipeline)	Facility: 672.2 Pipeline: 1,384 (estimated)	Facility: 86.9	120	AO, AR, GS, GW, LS, R, S, SW, VW, VT, W

TABLE 4.13-2								
Past, Present and Reasonably Foreseeable Activities Considered in the Cumulative Impact Analysis								
Action (Proponent)	**Parish, Distance from Facility (F) and/or Pipeline (P)**	**Anticipated Construction (C) and Operation (O) Start Dates**	**Project Type a/**	**Workforce**	**Approximate Size of Project (acres) a/**	**Impacts on Wetlands (acres)**	**Impacts on Waterbodies (# crossed)**	**Resources Potentially Affected b/**
Cameron Access Project Docket#CP15-109-000)	Calcasieu & Cameron F 18.7 miles N P: 16.0 miles N	C: Complete O: Ongoing	34 miles of new 30- and 36-inch pipeline	C: 200 O: 3	560.1	49.2	96	RT, S,
Energy Projects								
Cameron LNG – Entergy Transmission Line and Switchyard (Entergy Louisiana)	Cameron F: 18 miles north P: 16 miles north	C: Complete O: Ongoing	12-mile transmission line and switchyard	N/A	220	N/A	N/A	AO, S
Lake Charles LNG – Entergy Transmission Line (Entergy Louisiana)	Calcasieu F: 24 miles north P: 22 miles north	C: Pending O: 2025	19-mile transmission line	N/A	N/A	N/A	N/A	AO, S
Magnolia LNG – Entergy Transmission Line (Entergy Louisiana)	Calcasieu F: 23 miles north P: 21 miles north	C: 2022 (estimated) O: 2025	Transmission line	N/A	26.1	N/A	N/A	AO, S
Bayou Bridge Pipeline (Energy Transfer)	Calcas ieu F: 25.5 miles NE P: 22.4 miles NE	C: Complete O: Ongoing	163-mile, 24-inch, crude oil pipeline.	C: 2,500 O: 12	N/A	612.76	N/A	S
Industrial Projects								
Calcasieu Pass Slurry Line (Venture Global)	Cameron F: Adjacent P: 0.8 mile south	C: Complete O: Ongoing	Dredge slurry line	N/A	7.2 miles	N/A (<10)	N/A (1)	AC, AO, AR, LS, S, SW, VT, W

TABLE 4.13-2

Past, Present and Reasonably Foreseeable Activities Considered in the Cumulative Impact Analysis

Action (Proponent)	Parish, Distance from Facility (F) and/or Pipeline (P)	Anticipated Construction (C) and Operation (O) Start Dates	Project Type a/	Workforce	Approximate Size of Project (acres) a/	Impacts on Wetlands (acres)	Impacts on Waterbodies (# crossed)	Resources Potentially Affected b/
Calcasieu Ship Channel Dredging (COE Port of Lake Charles)	Cameron and Calcasieu F: adjacent P: 0.4 mile east	Ongoing / as needed	Maintenance dredging	N/A	Over 6,000	0	1	AC, AO, AR, GS, LS, S, SW, VT, W
Advanced Refining Technologies	Calcasieu F: 27.3 miles north P: 24 miles north	C: 2022 (estimated) O: 2024 (estimated)	Aluminum manufacturing facility	190	120	N/A	N/A	AO, S
Lake Charles Methanol	Calcasieu F: 29.3 miles north P: 26 miles north	C: 2021 O: Pending	Petrochemical production facility	1,000	250	N/A	N/A	AO, S
Indorama Ventures	Calcasieu F: 29 miles north-northeast P: 26 miles north-northeast	C: Complete O: Ongoing	Ethane cracker facility	600	125	N/A	N/A	AO, S
Lotte Axiall	Calcasieu F: 31 miles north-northeast P: 28 miles north-northeast	C: Complete O: Ongoing	Ethylene production facility	2,000	215	N/A	N/A	S

TABLE 4.13-2

Past, Present and Reasonably Foreseeable Activities Considered in the Cumulative Impact Analysis

Action (Proponent)	Parish, Distance from Facility (F) and/or Pipeline (P)	Anticipated Construction (C) and Operation (O) Start Dates	Project Type a/	Workforce	Approximate Size of Project (acres) a/	Impacts on Wetlands (acres)	Impacts on Waterbodies (# crossed)	Resources Potentially Affected b/
G2X Big Lake Fuels	Calcasieu F: 23.9 miles northeast P: 20.7 miles northeast	C: Present/on hold O: unavailable	Methanol production facility	2,500	200	N/A	N/A	AO, S
Port of Vinton	Calcasieu F 31.4 miles NW P: 28.7 miles NW	C: Complete O: Ongoing	Dredging	N/A	N/A	N/A	N/A	S
Transportation, Port, and Road Improvement Projects								
Port Louisiana (formerly Port Cameron)	Cameron F: 2.0 miles northeast P: 1.1 mile east	C: Start date unavailable; duration four years. O: unavailable.	Deepwater Port	C: 9,785 (peak) O: 3,860	850	N/A	N/A	AO, AR, LU, LS, R, RT, S, SW, VW, VT, W
West Calcasieu Port Projects	Calcasieu F: 20.1 miles north P: 19 miles north	C: Complete O: Ongoing	Port improvements	N/A	N/A	N/A	N/A	AO, AR, LS, R, RT, S, SW, VW, VT, W
I-10 Calcasieu River Bridge (DOTD)	Calcasieu F 32.7 miles N P: 30.2 miles N	C: Pending O: Pending	Bridge replacement	N/A	N/A	N/A	N/A	RT, S
LA-378 Adaptive Traffic Management (DOTD)	Calcasieu F 32.5 miles N P: 29.9 miles N	C: Complete O: Ongoing	Adaptive traffic signal system	N/A	N/A	0	Calcasieu F 32.5 miles N P: 29.9 miles N	RT

TABLE 4.13-2 **Past, Present and Reasonably Foreseeable Activities Considered in the Cumulative Impact Analysis**								
Action (Proponent)	**Parish, Distance from Facility (F) and/or Pipeline (P)**	**Anticipated Construction (C) and Operation (O) Start Dates**	**Project Type a/**	**Workforce**	**Approximate Size of Project (acres) a/**	**Impacts on Wetlands (acres)**	**Impacts on Waterbodies (# crossed)**	**Resources Potentially Affected b/**
Municipal, Medical, and Educational Projects								
Cameron Courthouse	Cameron F: 2.4 miles northeast P: 2.0 miles east	C: Complete O: Ongoing	Municipal building improvements	N/A	N/A (<10)	N/A (<10)	N/A (0)	AO, S
Commercial and Residential Projects								
Port Wonder	Calcasieu F 32.7 miles N P: 30.2 miles N	C: 2021 O: Pending	New Educational venue	N/A	N/A	N/A	N/A	S
Subdivision: Belle Savanne	Calcasieu F: 29 miles north P: 27 miles north	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	AO, S
Subdivision: Carlyss Place	Calcasieu F: 29 miles north P: 27 miles north	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	AO, S
Subdivision: Maple Creek	Calcasieu F: 30 miles north P: 28 miles north	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	S

TABLE 4.13-2

Past, Present and Reasonably Foreseeable Activities Considered in the Cumulative Impact Analysis

Action (Proponent)	Parish, Distance from Facility (F) and/or Pipeline (P)	Anticipated Construction (C) and Operation (O) Start Dates	Project Type a/	Workforce	Approximate Size of Project (acres) a/	Impacts on Wetlands (acres)	Impacts on Waterbodies (# crossed)	Resources Potentially Affected b/
Subdivision: Orleans Run	Calcasieu F: 39 miles north-northeast P: 37 miles north-northeast	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	S
Subdivision: Wisteria Vine	Calcasieu F: 38 miles north-northeast P: 36 miles north-northeast	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	S
Subdivision: Audubon Place	Calcasieu F: 31 miles northeast P: 29 miles northeast	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	S
Subdivision: Savannah Lakes	Calcasieu F: 30 miles northeast P: 28 miles northeast	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	AO, S
Subdivision: Lakes at Morganfield	Calcasieu F: 30 miles northeast P: 28 miles northeast	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	AO, S

TABLE 4.13-2 **Past, Present and Reasonably Foreseeable Activities Considered in the Cumulative Impact Analysis**								
Action (Proponent)	**Parish, Distance from Facility (F) and/or Pipeline (P)**	**Anticipated Construction (C) and Operation (O) Start Dates**	**Project Type a/**	**Workforce**	**Approximate Size of Project (acres) a/**	**Impacts on Wetlands (acres)**	**Impacts on Waterbodies (# crossed)**	**Resources Potentially Affected b/**
Subdivision: Village at Morganfield	Calcasieu F: 29 miles northeast P: 27 miles northeast	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	AO, S
Subdivision: Cove at Morganfield	Calcasieu F: 29 miles northeast P: 27 miles northeast	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	AO, S
Subdivision: Oak Grove	Calcasieu F: 29 miles northeast P: 27 miles northeast	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	AO, S
Subdivision: Beau Blanc	Calcasieu F: 29 miles northeast P: 27 miles northeast	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	AO, S
Subdivision: Crest at Morganfield	Calcasieu F: 30 miles northeast P: 28 miles northeast	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	AO, S

TABLE 4.13-2

Past, Present and Reasonably Foreseeable Activities Considered in the Cumulative Impact Analysis

Action (Proponent)	Parish, Distance from Facility (F) and/or Pipeline (P)	Anticipated Construction (C) and Operation (O) Start Dates	Project Type a/	Workforce	Approximate Size of Project (acres) a/	Impacts on Wetlands (acres)	Impacts on Waterbodies (# crossed)	Resources Potentially Affected b/
Subdivision: Highland Hills	Calcasieu F: 30 miles northeast P: 28 miles northeast	C: Present O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	AO, S
Graywood Subdivision: Jasmine, Willowbrooke, Myrtle Bay, Sawgrass, Oleander, Primrose, Lemongrass	Calcasieu F 25.4 miles N P: 23.5 miles N	C: Ongoing O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	AO, S
Morganfield Subdivision: Waterside, Waterside II, Ridge, Wildflower, Waterside Meadows (Pending)	Calcasieu F 29.9 miles northeast P: 27.5 miles northeast	C: Ongoing O: Ongoing	Subdivision under construction	N/A	N/A	N/A	N/A	AO, S
Carbon Capture and Sequestration Projects								
Hackberry Carbon Sequestration Project	Calcasieu/Cameron F 16.3 miles northwest P: 13.3 miles northwest	C: pending O: pending	CO_2 sequestration project	N/A	NA	0.2	3	AR, GW, LS, S, SW, VW, W

TABLE 4.13-2

Past, Present and Reasonably Foreseeable Activities Considered in the Cumulative Impact Analysis

Action (Proponent)	Parish, Distance from Facility (F) and/or Pipeline (P)	Anticipated Construction (C) and Operation (O) Start Dates	Project Type a/	Workforce	Approximate Size of Project (acres) a/	Impacts on Wetlands (acres)	Impacts on Waterbodies (# crossed)	Resources Potentially Affected b/

a/ Estimated acreage is based on publicly available project information.

b/ Acronyms:

AC – Air Construction
AO – Air Operations
AR – Aquatic Resources
CR – Cultural Resources*
GS – Geology and Soils
GW – Groundwater
LS – Listed Species
LU – Land Use
NC – Noise Construction
NO – Noise Operation
R – Recreation
RT – Road Traffic
S – Socioeconomics
SW – Surface Water
VW – Vegetation and Wildlife
VT – Vessel Traffic
W – Wetlands

* There are no activities that cross the proposed Area of Potential Effect of the Project; therefore, cumulative impacts on cultural resources are not expected

c/ Based upon readily available public information

N/A = Information not publicly available or not applicable

DOTD = Department of Transportation and Development

4.13.1.1 FERC-jurisdictional LNG and Pipeline Projects

Due to the potential for some overlap in construction schedules, and the proposed project locations on the Calcasieu Ship Channel, the Cameron LNG Project Expansion, Driftwood LNG, Calcasieu Pass LNG, Lake Charles LNG, CP2 LNG, and Magnolia LNG projects all have the potential to contribute to cumulative impacts on multiple environmental resources (see section 4.13-2). These six projects would result in a combined permitted LNG export capacity of approximately 117.4 MPTA, an estimated increase of 1,233 additional vessels operating within the Calcasieu River Ship Channel, 14.3 million cubic yards of dredging, an estimated 22,467 temporary peak construction jobs over the next five years, and approximately 1,279 permanent positions. It should be noted that these projects include modular construction methods, so several of the generated construction jobs may occur outside of Cameron Parish, and even outside of the U.S. The Sabine Pass Liquefaction Expansion project, on the Sabine River approximately 30 miles west of Commonwealth, would not contribute appreciably to cumulative effects on environmental resources, except for air quality during operation and socioeconomics resulting from the creation of temporary construction jobs, and permanent jobs within the study area. Additional details regarding these projects can be obtained through FERC's website at www.ferc.gov, by using the eLibrary system and the docket number(s) assigned to each project.

Given that the G2 LNG and Monkey Island LNG projects are still in early planning stages, there is generally limited information in the public domain for these projects, and no docket numbers are available, construction is not assumed to overlap with Commonwealth's construction timeframe. We conclude there would be no potential for cumulative impacts in conjunction with these projects.

Calcasieu Pass LNG

The Calcasieu Pass LNG export terminal is a 12 MTPA liquefaction facility directly across the Calcasieu Ship Channel from Commonwealth. The project also includes construction of the TransCameron Pipeline, a 23.4-mile-long natural gas pipeline to supply the terminal. The feed-gas pipeline extends to the east of the terminal, also within Cameron Parish. The project was approved by FERC in 2019 and is currently in the commissioning phase. The project encompasses about 1,069 acres with a portion of the project occurring in the Calcasieu Lake-Calcasieu Pass watershed. Calcasieu Pass LNG had an estimated peak construction workforce of 1,810 employees and expects a permanent workforce of 130 employees. The FERC docket number assigned to the project is CP15-550-000.

Cameron LNG

The Cameron LNG project completed construction and received authorization to commence service on July 24, 2020. The project is currently in operation. The project included expansion of an existing LNG facility to include 3 liquefaction trains, 1 additional storage tank, and a new 21- mile, 42-inch-diameter pipeline. Capacity increased to 14.9 MTPA. The project is sited next to Cameron's existing LNG facility/dock, with no expected change in vessel traffic. The FERC docket number assigned to the project is CP13-25-000.

Cameron LNG Expansion

FERC approved expansion of the Cameron LNG terminal to include 2 additional liquefaction trains in 2016, but no financial investment decision to expand was finalized by the proponent. Cameron LNG recently filed for an extension to construct by May 2026. On January 18, 2022, Cameron filed an application to amend the project to, in part, only construct one of the liquefaction trains. If constructed, the expansion export capacity would increase to 20.9 MTPA. Expansion would occur within the permitted footprint of the Cameron LNG Project. The expansion would have a peak construction workforce of 3,269 employees. The combined permanent workforce of Cameron LNG and the expansion is expected to total 225 employees. The FERC docket number assigned to the project is CP22-41-000.

Driftwood LNG

Driftwood LNG is a 27.6 MTPA LNG export Facility approximately 23 miles north of Commonwealth that was certificated by FERC in 2019. Construction of the LNG facility began in March 2022. The project includes five liquefaction trains, three aboveground LNG storage tanks, a dredged turning basin, and three LNG carrier berths to accommodate an expected average of 365 vessel calls annually. The project has an expected peak construction workforce of 6,500 employees, and 539 permanent employees. The currently anticipated in-service timing for the Driftwood project is 2026. The FERC docket number assigned to the project is CP17-117-000.

Lake Charles LNG

The Lake Charles LNG project has been permitted, and includes modification of an existing LNG import terminal, plus construction and operation of new facilities adjacent to the modified terminal. The new liquefaction facilities will have a design production capacity of 16.45 MTPA and would not increase the number of ships that were previously analyzed to call on the terminal, which is currently 225 annually. The Lake Charles LNG Project would have a peak construction workforce of 5,600 employees and a permanent workforce of 176 employees. The export facilities would affect about 785 acres in the Calcasieu River-Prien Lake watershed approximately 24 miles north of Commonwealth, and the associated pipeline segment would affect about 244 acres in the Bayou Arceneaux and Lower Bayou Serpent watersheds. Progress reports indicate construction at the site is not currently active. On May 6, 2022, FERC granted an extension of time request from Lake Charles LNG to extend the period in which Lake Charles LNG could construct and place the project facilities into service through December 16, 2028. The FERC docket number assigned to the project is CP14-120-000.

Magnolia LNG

The Magnolia LNG project, sited on an industrial canal on the east side of the Calcasieu Ship Channel approximately 23 miles north of Commonwealth, includes four liquefaction plants, two LNG storage tanks, and two LNG carrier berths. During operation, approximately 208 LNG vessels (104 LNG carriers and 104 LNG barges) would call on the LNG terminal per year. The project was originally approved by FERC in 2016 at a maximum 8.0 MTPA capacity; however, FERC authorized an amendment to increase the output by 0.8 MTPA on June 18, 2020. The total capacity for Magnolia LNG will be 8.8 MTPA. On September 11, 2020, Magnolia requested an extension until April 15, 2026 to construct the project. The Magnolia Project would have a peak construction workforce of 781 employees and a permanent workforce of 67 employees. Construction has not started on this project as of the issuance of this document. To supply the LNG terminal, Kinder Morgan Louisiana Pipeline (KMLP) would modify its existing pipeline system to include a new compressor station, new natural gas header pipelines adjacent to the existing easement, and modifications at six existing meter stations. Construction of Magnolia LNG would affect about 129 acres within the Calcasieu River-Prien Lake watershed. The FERC docket numbers assigned to the project are CP14-347-000, CP14-511-000, and CP19-19-000.

Delfin LNG

The Delfin LNG project would include the construction of a floating liquefaction and LNG terminal in the Gulf of Mexico, approximately 45 miles south of Commonwealth. This offshore facility would also include an onshore compressor system, monitoring, and piping which would be approximately 20 miles west of the Commonwealth LNG Facility. In 2017, the offshore facility was approved by the U.S. Department of Energy (DOE) (DOE docket number 13-147-LNG), and FERC approved the onshore facilities (docket numbers CP15-490-000, and CP16-20-000). The project has an estimated construction workforce of 200 employees, and 200 to 400 permanent employees. Although the project was slated to begin operations in 2021/2022, construction has not begun, and Delfin received an extension from FERC in 2019 to begin construction by September 2020. Delfin requested an additional extensions in June 2021 and July 2022 to place onshore facilities into service to September 2023. The project is now anticipated to be operational by 2024.

Sabine Pass Liquefaction Expansion

Expansion of the Sabine Pass LNG Terminal was approved by FERC in 2015 to include two additional LNG trains (Trains 5 and 6), each with an average liquefaction capacity of 4.5 MTPA. Trains 5 and 6 are constructed and operational. The maximum number of vessel calls (400) did not increase with the expansion. The project also includes a 104-mile-long pipeline. The FERC docket number assigned to the project is CP13-552-000.

Port Arthur Pipeline Louisiana Connector

The Port Arthur Pipeline Louisiana Connector Project consists of about 131 miles of new 42-inch-diameter natural gas pipeline, one new compressor station, and interconnect facilities in east Texas and western Louisiana. A portion of the project in Louisiana would be in Calcasieu Parish, about 23 miles north of Commonwealth. FERC approved the project in 2019, and the docket numbers assigned to the project are CP17-20-000, CP17-21-000, and CP18-7-000. The Port Arthur Pipeline Louisiana Connector project would have a peak construction workforce of 600 employees and a permanent workforce of 10 employees. Construction would affect about 2,807 acres within 13 watersheds outside the HUC-12 scope of this analysis. On August 2, 2022, the Port Arthur Pipeline, LLC requested from FERC an extension of time until June 18, 2028 to complete construction of the project and make the pipeline available for service.

CP2 LNG and CP Express Project

The CP2 LNG and CP Express project consists of a terminal site, marine facilities, a pipeline, and aboveground facilities. The CP2 LNG project would affect about 737 acres of land with the terminal (600 acres) sited east of the existing Calcasieu Pass Terminal and the associated marine facilities (122 acres) located on the southern portion of Monkey Island. CP Express Pipeline would include 85.4 miles of new, 48-inch-diameter pipeline, 6 miles of new, 24-inch-diameter lateral pipeline, and aboveground facilities. About 30 miles of the pipeline would be in Cameron Parish. The CP2 LNG and CP Express project would have a peak construction workforce of 4,400 employees at the terminal and 1,625 employees for the pipeline and a permanent workforce of 260 employees. Venture Global filed its application in December 2021. The FERC docket number assigned to the project is CP22-21-000.

4.13.1.2 Energy Projects

Entergy Louisiana has three ongoing or planned electrical transmission projects to accommodate the increased demands from LNG export terminal projects. These transmission projects may include construction within existing or new rights-of-way. A 12-mile-long 230-kV transmission line and new switchyard project is underway to accommodate Cameron LNG projects, and 19 miles of new 230- kV electrical transmission line will support the Lake Charles LNG Project. Additionally, the Bayou Bridge Pipeline, a 163-mile-long oil pipeline, was recently completed in 2019. The pipeline crosses about 45 miles through Calcasieu Parish from west to east.

4.13.1.3 Industrial Projects

Dredging

Maintenance dredging of the Calcasieu Ship Channel by the COE is currently authorized for a 40-foot depth and a 400-foot width, although past maintenance deficiencies at discharge facilities have made it necessary for the COE to reduce channel widths in some reaches. The bar channel requires dredging one to two times annually. The inland reaches between Mile 5.0 and 28.0 require dredging every other year, alternating between Mile 5.0 and Mile 17.0 and Mile 17.0 and Mile 28.0 every other year, and the uppermost reaches between Mile 28.0 and 36.0 require dredging every 5 to 8 years. If maintenance dredging in the Project area were to coincide with construction of Commonwealth, it would contribute to the cumulative impact on aquatic species, EFH, surface water, and vessel traffic in the Project area.

Construction of Calcasieu Pass LNG required dredging of the turning basin, which would also be used by vessels transiting to Commonwealth. The dredged material from construction of the turning basin was transported through a 7.2-mile slurry line and deposited at an off-site mitigation site to restore wetland habitat. Calcasieu Pass completed its dredge of the turning basin in 2020.

Port Vinton completed its dredge of the port's navigation channel in 2018. The project dredged about 2,000 linear feet to a depth of 10.5 feet.

Petrochemical and Manufacturing

There are five petrochemical and one manufacturing project that have the potential to cumulatively impact socioeconomic resources and air quality. Lotte Axiall's chemical facility to produce ethylene in Lake Charles, Louisiana began operations in September 2019, and Idorama Ventures has substantially completed renovation of an ethane cracker facility, which will also produce ethylene as well as propylene. The Lake Charles Methanol project, currently delayed due to financing needs, will produce methanol, hydrogen, carbon dioxide, and other chemicals from the oil and gas industry' waste petroleum coke, and will capture excess carbon dioxide to be sold to domestic oilfield operators. Construction of G2X Energy's Big Lake Fuels natural-gas-to-methanol facility in Calcasieu Parish is currently underway although progress appears to be delayed. Advanced Refining Technologies' specialty aluminum manufacturing facility expansion project in Calcasieu Parish is ongoing, although construction appears to currently be delayed. No known completion date is known. These projects are anticipated to generate almost 4,000 construction jobs.

4.13.1.4 Transportation, Port, and Road Improvement Projects

There is one road construction project within the geographic scope of analysis for socioeconomic and air quality impacts. The I-10 Calcasieu River Bridge Replacement project is undergoing a NEPA review, with the final EIS expected in the first quarter of 2022.

West Calcasieu Port, approximately 20 miles north of Commonwealth, has recently completed expansion of its west barge basin, creating an additional 800 linear feet of barge basin shoreline. However, small scale projects, such as regular dredging and maintenance are ongoing. Port Louisiana (formerly known as Port Cameron) has proposed a privately owned deep-water staging port, a little over one mile north of Commonwealth, on the east bank of the Calcasieu Ship Channel. The port complex would cater to the needs of energy development including energy producers, suppliers, and service companies. This development would result in 9,665,683 yd^3 of dredging. Approximately 1,138 acres of vegetated marsh may be impacted as a result of their proposed activities. The project would also impact an estimated 900 acres of EFH (COE et al. 2016). Construction and operation of these port projects may contribute to cumulative impacts on aquatic resources, road traffic, vessel traffic, socioeconomics, surface water, vegetation, wildlife, wetlands, and listed species.

4.13.1.5 Commercial and Residential Projects

Several residential developments are planned, permitted, or under construction in the Lake Charles area in Cameron Parish. Construction is on-going at these projects, and completed residential units are being sold or rented for use. The residential developments would all be constructed more than 20 miles from the proposed Commonwealth Project and would therefore have no impacts near the proposed Project. However, because the developments could potentially increase available housing by nearly 3,500 residential units, these developments were considered in the cumulative socioeconomic impacts analysis as a potential beneficial effect.

4.13.1.6 Carbon Capture and Sequestration Projects

The Hackberry Carbon Sequestration project would be constructed near Hackberry, Louisiana approximately 16 miles northwest of the Commonwealth Project. It would be designed to capture, transport, and store CO_2 from primarily Cameron LNG in a saline aquifer. The project would include installation of a CO_2 injection well, a 5.8-mile-long 6-inch-diameter suction pipeline, a 2.8-mile-long 12-inch-diameter injection pipeline, and facility with boathouse and gangplank. The CO_2 would be captured by acid gas removal units, dehydrated, compressed, and transported from the Cameron LNG terminal by suction pipeline to the injection well at the project site, which is about 6 miles southeast of Cameron LNG.

4.13.2 Potential Cumulative Impacts by Resource

Based on our analysis in section 4.10, the Project would have no impact on cultural resources, so the Project would not contribute to cumulative effects on cultural resources. Additionally, none of the identified present or future actions that involve excavation or significant grading would occur within or adjacent to Commonwealth's construction footprint. Therefore, the Project would not contribute to cumulative impacts on soils either. For each remaining resource, the following sections address the potential cumulative impacts from Commonwealth's Project combined with other projects identified within the geographic scope on specific environmental resources (see table 4.13-1). The other projects considered in each section are those for which impacts on the resource(s) discussed would be within the same geographic scope as those that would result from the Commonwealth Project and would occur within the same timeframe.

4.13.2.1 Geology

The geographic scope for geologic resources and soils is defined as the area that would be affected by, or immediately adjacent to, the Project. Impacts on geology and soils would be highly localized and not expected to extend beyond the area of direct disturbance associated with the Project.

The Terminal and Pipeline would be constructed on 167 acres within the Louisiana Chenier Plain. None of the activities listed in table 4.13-2 are adjacent to the Project footprint. Except for oil and gas, there are no currently known exploitable mineral resources in the general vicinity of the Project; no blasting is required during construction; and no paleontological resources have been identified. Commonwealth would reduce the potential for impacts from natural hazards such as subsidence, coastal erosion, and flooding by following its proposed engineering measures. Operation of Commonwealth in addition to the six permitted or proposed LNG export terminals[161] would result in an estimated increase of 1,233 additional

161 Cameron LNG Project and Expansion, Calcasieu Pass LNG, CP2 LNG, Driftwood LNG, Lake Charles LNG, and Magnolia LNG

vessels operating annually within the Calcasieu Ship Channel. Vessel wakes and propeller thrust from the large commercial vessels that transit the Calcasieu Ship Channel on a daily basis can exacerbate the shoreline erosion of unprotected portions of the riverbank. Commonwealth's proximity to the Gulf requires minimal transit within the channel. Some localized erosion of unprotected banks near the bar entrance may result from the incremental increase in vessel wakes. Overall, the Project would have a negligible contribution to cumulative impacts on geological resources, and these impacts would be minimized with the implementation of Commonwealth's engineering measures to stabilize and armor the shoreline with seawalls and riprap.

4.13.2.2 Water Resources

The geographic scope established for water resources is considered as the HUC-12 watersheds crossed by the Project. Projects listed in table 4.13-2 involving ground disturbance within the HUC-12 watersheds crossed by Commonwealth could result in cumulative impacts on water resources. This includes the Calcasieu Pass LNG, CP2 LNG, Driftwood LNG, Lake Charles, and Magnolia LNG projects.

Groundwater

Cumulative impacts on groundwater may occur through construction activities, including clearing and grading, dewatering, contamination through fuel and other hazardous material spills, and groundwater withdrawal. As discussed in section 4.3.1.2, the potential impacts on groundwater resources associated with the Project would be minimal and temporary in nature, primarily associated with clearing, grading, excavating, filling, and placement of piles and foundations, with groundwater effects limited to water table elevations in the immediate vicinity of the Terminal site. The majority of the other projects considered for cumulative impacts on groundwater would involve similar ground-disturbing activities that could temporarily affect groundwater levels.

Commonwealth would not directly withdraw groundwater during construction or operation of the Project. There are no active public or private drinking water supply wells within 150 feet of the Terminal or Pipeline construction work areas; construction of the proposed Terminal pilings would be at a sufficiently shallow depth to avoid crossing aquifer confining layers; and Commonwealth would implement surficial mitigation measures in the event of a hazardous material spill to prevent groundwater infiltration. Further, the Project area is underlain by multiple strata of dense clay content, which provide a restrictive layer to slow or prevent the downward migration of surface and near-surface waters or contaminants, thereby providing a natural protective barrier to groundwater quality.

The six LNG facilities also in the HUC-12 watershed crossed by the Project would use a mix of municipally sourced water and groundwater withdrawn from the Chicot aquifer for construction and operation of the facilities. Driftwood LNG would use municipally supplied water for both construction and operation; Magnolia LNG would use municipally sourced water for construction; and Cameron LNG uses municipally sourced water for operation. Calcasieu Pass LNG, CP2 LNG, Magnolia LNG, and Lake Charles LNG would require an average of up to 312,445 gallons per day for operations. There is no information on groundwater requirements for the Port Louisiana project also within the HUC-12 watersheds, although the project could require some amount of groundwater withdrawal for construction and operation. Approximately 850 million gallons of water are withdrawn from the Chicot aquifer per day (USGS, 2018).

Commonwealth would require approximately 860,000 gallons per month of fresh water for Project operations (approximately 200 gallons per minute). Commonwealth proposes a tie-in to the existing 10-inch water line parallel to Highway 27/82. This water line is associated with Water District 10. Water District 10 has more than three million gallons of surplus water per month and has notified Commonwealth that it can provide water to the Project site without affecting other users. Given that Commonwealth does not propose any groundwater withdrawal, would implement surficial mitigation measures in the event of a hazardous material spill, and the multiple strata of dense clay content that underlays the Project site and would inhibit groundwater contamination, we conclude that Commonwealth, in addition to the other projects within the geographic scope, would not contribute to cumulative impacts on groundwater.

Surface Waters and Aquatic Species and Habitat

Surface waters and aquatic species 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. As described in section 4.3.2, the creation of the Calcasieu Ship Channel has significantly changed the hydrology of the lower Calcasieu River by allowing ingress of high salinity water; this intrusion of salt water is further amplified by the heavy ship traffic in the Calcasieu Ship Channel. Historical pollution is a concern in the system as the Port of Lake Charles is a major center of the petrochemical industry. The accidental spill and emergency releases of oil and other chemicals into the Calcasieu River are also a concern in the region (LDWF, 2012). Projects that fill waterbodies during construction and/or involve dredging, modification of surface water resources, and/or operational vessel traffic, could result in cumulative impacts on surface waters, aquatic species, and habitats.

<u>Site Construction</u>

Construction and operation of the Project would permanently impact (i.e., fill or dredge) 2.8 acres of waterbodies identified on the site, including the Calcasieu Ship Channel and two unnamed waterbodies. Commonwealth would mitigate for the loss of the waterbodies through purchases of wetland mitigation bank credits. The other major activities in the geographic scope would combine to fill upwards of 150.1 acres of open water, including parts of the Calcasieu River (see table 4.13-3). Surface waters in this region are protected under Sections 404 and 401 of the CWA and the Louisiana State and Local Coastal Resources Management Act of 1978. Projects would be required to obtain authorizations from the COE, LDEQ, and LDNR OCM prior to engaging in actions that would negatively impact surface waters. The fill of the surface waters described here would represent approximately 0.2 percent of the surface water acreage of the geographic scope under consideration. Given the limited volume of fill in relation to the total surface water acreage and that the appropriate resource agencies would require mitigation in accordance with the Clean Water Act, we conclude the fill of the waterbodies during construction of the Project would result in permanent but minor cumulative impacts on surface waters.

TABLE 4.13-3

Actions with the Potential to Cumulatively Impact Surface Waterbodies

Action	Closest Distance to Project (miles)	Permanent Impacts on Surface Waterbodies in Affected HUC-12 Watersheds a/ (acres)
Commonwealth LNG		2.8
Calcasieu Pass LNG	0.3	2.6
CP2 LNG	1.75	[not presented in filings]
Cameron LNG and Expansion Project	16.0	70.1
Driftwood LNG	22.5	67.7
Magnolia LNG	23.5	9.8
	Total	**152.5**

a/ Estimated acreages are based on publicly available project information.

Dredging

Commonwealth would remove up to about 1.73 million cubic yards of dredged and excavated material during construction of the marine facility and about 152,000 cubic yards of dredged material every two years during maintenance dredging during operation. Commonwealth would dredge using a barge-mounted cutterhead suction dredge. Impacts on water quality resulting from dredging include temporary increases in suspended sediment and turbidity levels. Commonwealth conducted Project site-specific turbidity modeling to estimate the potential levels of water column turbidity that could occur during construction and maintenance dredging at the Project location. The modeling report indicates maximum turbidity concentrations associated with dredging would range, depending on the velocity of the tidal flow during dredging, from approximately 122 to 128 mg/L adjacent to the cutter head; 3 to 51 mg/L at 1 meter above the cutter head; and 0.1 to 10 mg/L at 2 meters above the cutter head. Background turbidity concentrations in the Calcasieu River are estimated to range between 10 and 45 mg/L. The COE (2014) reports that the effects of temporarily increased levels of suspended sediments due to dredging are comparable to the common passage of a storm front with high winds and heavy wave action.

Construction of other regional LNG export terminals, the identified port projects, and COE channel maintenance would require dredging millions of cubic yards within the Calcasieu Ship Channel. Four LNG Export terminals have potential construction timeframes that could overlap with Commonwealth would require approximately 7.4 million cubic yards of dredging over the next five years. The COE estimated that the gross 20-year dredging capacity required to maintain the Calcasieu Ship Channel is approximately 97 million cubic yards, which averages to about 5 million cubic yards annually, considering ongoing dredging (COE, 2010).

As mentioned above, Commonwealth proposes to dispose of dredge spoils from the initial construction dredging and at least the first two biennial maintenance dredges at a 640-acre BUDM site. Commonwealth would transport dredge slurry through an anchored, non-jurisdictional slurry pipe from the marine facility across the Calcasieu Ship Channel, northeast through the Cameron Loop Channel, out of the Cameron Loop Channel just west of Rex Street in the Town of Cameron and under Highway 27/82, and then northeast aboveground along existing roadbeds, levees, and wetlands to the BUDM site. Impacts on water resources related to transport and placement of the dredge spoils would be minimal and confined to the BUDM site and temporary impacts along the slurry line. Placement of the dredge material at the BUDM site would cause a short-term increase in turbidity after which the water quality in the BUDM site would return to background conditions.

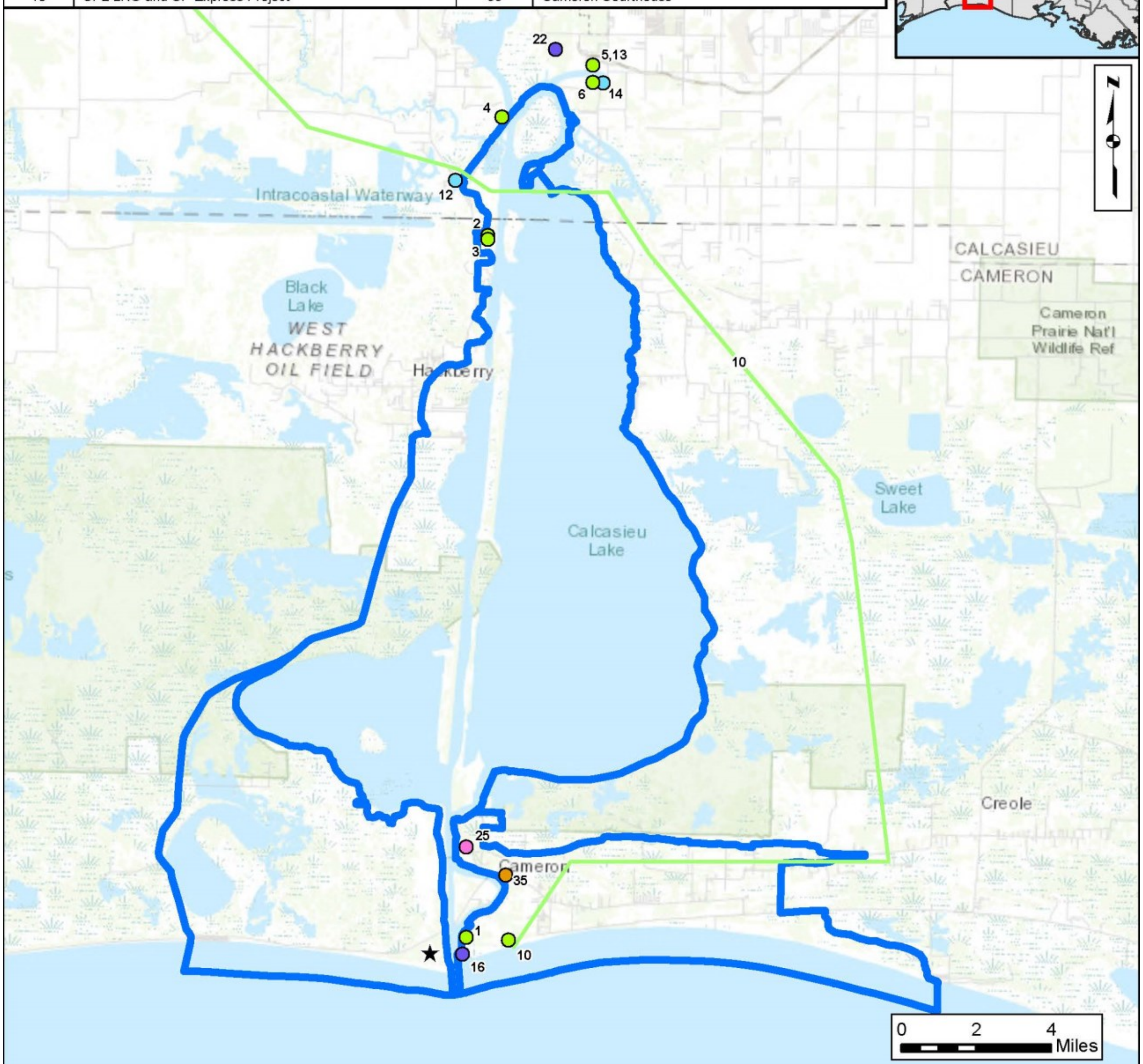
The Project's contribution to cumulative impacts on surface waters caused by turbidity and sediment suspension would be negligible as ambient turbidity levels of the Calcasieu Ship Channel at the location of the Project are already relatively high. All identified dredging activities would require strict permit authorizations to address dredging and dredged material management. These include permits from the COE under Section 404 of the CWA and Sections 10 and 14 of the Rivers and Harbors Action of 1899 and a Coastal Use Permit from the LDNR under LAC 43:I.Ch.7. These authorizations would be contingent on the companies' use of best management practices to minimize effects on water quality and to ensure that state water quality standards are not violated. Additionally, the permits would require that the dredge material be tested before being disposed of in an approved location or being put to beneficial use. These measures would ensure that long-term cumulative impacts on water quality as a result of foreseeable dredging in the Calcasieu Ship Channel are minimized to the extent practicable and not significant.

Therefore, we conclude the Project-related dredging would not significantly contribute to adverse cumulative impacts on surface waters.

Dredging for projects can impact aquatic species by affecting benthos, directly by removing habitat, and indirectly by sedimentation downstream. The impacts on EFH species from increases in turbidity due to dredging for the Terminal and the above projects would be temporary and localized to the dredged area and areas directly adjacent and a relatively short distance downstream. As a result, EFH species would experience localized effects. Dredging projects that are further removed from the Commonwealth dredging area (e.g., projects at the north end of Calcasieu Lake) would have fewer cumulative water quality impacts. If dredging for the Project takes place at the same time as the CP2 LNG Project or maintenance dredging of Calcasieu Ship Channel, the duration of impacts on aquatic species would be longer.

However, the dredging projects are unlikely to occur simultaneously due to differing construction timeframes. Impacts on aquatic species would be temporary and localized and turbidity would return to pre-dredging levels after dredging is completed. Dredging would remove habitat for species that do not tolerate deep water; however, the Calcasieu River has an abundance of shallow water habitat outside of the Calcasieu Ship Channel and the dredged areas. Therefore, we conclude that Project-related dredging would have a minor contribution to overall cumulative impacts on aquatic species.

Number	Name	Number	Name
1	Calcasieu Pass LNG Terminal and Trans Cameron Pipeline	12	Cameron LNG – Entergy Transmission Line and Switchyard
2	Cameron LNG Project	13	Lake Charles LNG – Entergy Transmission Line
3	Cameron LNG Expansion Project	14	Magnolia LNG – Entergy Transmission Line
4	Driftwood LNG Project	16	Calcasieu Pass Slurry Line
5	Lake Charles LNG	22	G2X Big Lake Fuels
6	Magnolia LNG	25	Port Louisiana (formerly Port Cameron)
10	CP2 LNG and CP Express Project	35	Cameron Courthouse



★ Commonwealth LNG Project
Industrial Projects
Energy Projects
FERC-jurisdictional LNG and Pipeline Projects
Transportation, Port, and Road Improvement Projects
Municipal, Medical, and Educational Projects
Residential and Commercial Projects
HUC-12 Geographic Scope

Figure 4.13-2

Commonwealth LNG Project

Activities Within and Adjacent to the HUC-12 Subwatershed

Pile Driving

Commonwealth would construct the bulkhead portion of the Terminal's marine facility from dry land, and thereby avoid in-water pile driving. However, in-water pile driving would be required to construct the overwater portion of the barge dock and the mooring and breasting dolphins, bridges, and walkways of the LNG carrier berth. This would require in-water pile driving of concrete and steel piles ranging between 18 and 96 inches in diameter. NMFS noted that based on the size of the piles that Commonwealth would be driving, the use of noise attenuation devices during pile driving would almost certainly be necessary to avoid adverse impacts on ESA-related species. Commonwealth has committed to using cushion blocks (used with impact hammers) and bubble curtains around the piles during in-water pile driving activities. Use of the NMFS-recommended noise attenuation methods would reduce the geographic scope for acute injury-causing underwater noise to a distance of approximately 28 feet of the pile being driven for fish and 1 foot of the pile being driven for sea turtles and marine mammals. For fish to experience injury due to cumulative exposure to impact pile driving noise would require small (i.e., less than 2 grams) fish to remain within 0.5 mile of the pile driving location throughout a 12-hour period. Large (i.e., greater than or equal to 2 grams) fish would have to remain within 0.3 mile of the pile driving location throughout a 12-hour period. Sea turtles and marine mammals would have to remain within approximately 200 feet of the pile driving location throughout a 12-hour period (see table 4.6.2-5). Given the mobility of these species, their natural tendency to avoid in-water construction activities, and Commonwealth's plan to use the soft-start technique when initiating pile driving, these injury scenarios would be extremely unlikely to occur.. Only pile driving at the CP2 LNG project would have the potential to add cumulative effects with the Project. In filings with the FERC, CP2 LNG has indicated in-water pile driving associated with construction of the CP2 LNG marine facility would likely include the same noise mitigation techniques that Commonwealth would implement. Cumulative impacts on aquatic species from underwater noise associated with pile driving could occur if both projects conduct pile driving activities concurrently; however, if the geographic scope for underwater noise for the CP2 LNG project is reduced to the same distance as that of Commonwealth's, the areas in which impacts on aquatic species could occur would be limited in geographic scope and readily avoidable by most species.

Behavioral effects on aquatic species could occur over a broader area. According to NMFS (2021), pile driving 96-inch steel pilings could cause behavioral changes in fish within about 3 miles of the pile driving location, in marine mammals within about 0.6 mile, and in sea turtles within about 330 feet. Notably, these distances do not account for the closely surrounding shorelines and stone jetties at the mouth of the Calcasieu River that would absorb much of the sound energy radiating from the pile driving. As noted in section 4.6.2, we received a comment from the public expressing concern that pile driving noise could prevent aquatic species from exiting the Calcasieu River into the Gulf of Mexico because the noise impacts would extend across the river from the Terminal site to the opposite shoreline. Concurrent pile driving by Commonwealth and CP2 would have the potential to create cumulative behavioral effects on fish and marine mammals. However, as also noted in section 4.6.2, behavioral effects in aquatic species can include a wide array of actions. Research shows pile driving sounds can elicit increases in swimming speeds, changes in ventilation and heart rate, and startle responses. Yet, are often transient reflexes, after which the animal may rapidly return to their normal behavior (Molnar *et. al*., 2020). Thus, while it is possible concurrent pile driving by Commonwealth and CP2 could hinder passage of fish or marine mammals during construction due to behavioral changes, it is also possible that the noted behavioral change is simply an increase in swimming speed as the animal passes the source of the noise. Additionally, pile driving noise impacts at both locations would be temporary and the behavioral effects would cease once pile driving is completed. Commonwealth anticipates pile driving for the marine facility to require up to 37 days to complete. CP2 filings indicates pile driving for the CP2 marine facility would require up to approximately 5 months to complete. Although the behavioral response of fish or marine mammals could prevent the individuals from passing through the Calcasieu Ship Channel near the mouth of the river during pile driving activities, lulls in pile driving throughout the day could allow the individuals to pass. Therefore, we conclude cumulative impacts on aquatic species due to pile driving would be temporary and not significant.

Ballast Water Discharge

LNG carriers at the Commonwealth Terminal would discharge ballast water as they take on LNG. The amount of ballast water discharged during LNG loading would vary depending on the size of the vessel. Ballast water would generally consist of open ocean water and have a higher salinity than the surrounding water at loading docks along the Calcasieu Ship Channel. Potential impacts on water quality due to ballast water discharge would be a temporary increase in salinity level, a temporary decrease in dissolved oxygen levels, and potential change in pH level in the immediate vicinity of the discharge area. However, given high tidal flow rates at the Project site, mixing of discharged ballast water within the ship channel would occur very quickly and may not be measurable under normal tidal cycles.

Potential impacts on aquatic species due to ballast water discharge would be the potential introduction and spread of exotic aquatic nuisance species. However, LNG carriers calling at the Terminal and at the other LNG facilities along the Calcasieu Ship Channel would discharge all ballast water under federal oversight and in accordance with USCG regulations (33 CFR 151.2025), which require ballast water discharge strategies that prevent the spread of exotic aquatic nuisance species in U.S. waters. Therefore, we conclude that the contribution of ballast water discharge from the Project would not result in a significant cumulative impact on water quality or aquatic species.

Accidental Hazardous Material Spills

Construction and operation of the Terminal, as well as marine traffic to and from the Terminal, have the potential to adversely impact water quality in the event of an accidental release of a hazardous substance such as fuel, lubricants, coolants, or other material. Commonwealth would implement its *SPAR Plan* to minimize the chances of an accidental spill or leak of hazardous materials into or near a waterbody. Should a spill or leak occur, implementation of the response measures in the *SPAR Plan* would reduce response time and ensure appropriate cleanup, thereby minimizing impacts on aquatic resources. In addition, LNG carriers are required to develop and implement a SOPEP, which includes measures to be taken when an oil pollution incident has occurred or a ship is at risk experiencing such an incident. The other LNG projects within the HUC-12 watersheds would present the same potential impacts on water quality but would be required to follow similar practices to minimize the impacts of spills at the respective projects; therefore, we conclude that the occurrence of accidental spills from the Project would not result in a significant cumulative impact on water quality or aquatic species.

Marine Vessel Operations

The Project would add 156 vessels operating annually within the Calcasieu Ship Channel. Increases in vessel traffic could lead to increased shoreline erosion and suspended sediment concentrations due to heightened wave activity and increased stress, injury, and/or mortality of marine mammals and sea turtles due to more frequent vessel strikes. The Project could contribute to the cumulative impacts of added vessel traffic from new LNG projects along the Calcasieu Ship Channel and the general increase in ship traffic expected to occur in the Calcasieu Ship Channel over the coming years (CSRS, 2017). In addition to Project-related vessel traffic, construction of the other LNG projects along the Calcasieu Ship Channel will result in 1,233 vessels transiting through the HUC-12 watersheds. The Calcasieu Ship Channel has the capacity to manage the 2,607 vessels per year forecast for 2033 (Ausenco, 2018); Commonwealth would represent just 6 percent of this additional future traffic forecast, while all cumulative actions within the scope would account for approximately 47 percent of this increase.

Commonwealth would stabilize the shoreline in the vicinity of the Project through construction of the marine facility, which would reduce the potential for coastal erosion (and subsequent increased turbidity) between the entrance to the Calcasieu Ship Channel and the Project location. Additionally, the Project's placement at the entrance to the Calcasieu Ship Channel would minimize the duration and speed at which Project vessels would be traveling within the ship channel. This short duration and Commonwealth's advocacy for construction vessels and LNG carriers to follow measures within the NMFS' *Vessel Strike Avoidance Measures and Reporting for Mariners* would minimize the frequency of vessel strikes of marine mammals and sea turtles within the Calcasieu Ship Channel. Therefore, we conclude that the incremental increase in marine traffic associated with the Project would not result in a significant cumulative impact on water quality or aquatic species.

Pipeline

The Pipeline would cross three major waterbodies (ranging between 114 and 1,170 feet wide) and two intermediate waterbodies (40 and 66 feet wide). An intermediate waterbody that would be crossed at approximate MP 2.9 connects to the Calcasieu Ship Channel via a culvert approximately 0.4 mile east of the proposed crossing. Commonwealth would use the HDD method to cross this waterbody. Commonwealth would use open-cut wet crossing methods at each of the other waterbody crossings. The HDD method would avoid impacts on the MP 3.0 waterbody and potential downstream impacts on the Calcasieu Ship Channel. Commonwealth has provided a revised *HDD Contingency Plan* detailing the procedures it would follow to minimize the potential for an inadvertent release of drilling mud and to undertake effective cleanup should a release occur. Operation of the Pipeline would not impact waterbodies. Of the six LNG facilities also located in the HUC-12 watersheds crossed by the Project, only the Calcasieu Pass LNG and CP2 LNG facilities contain pipelines that would cross waterbodies in the HUC-12 watersheds. The TransCameron Pipeline, associated with the Calcasieu Pass LNG facility crosses approximately 20 waterbodies within the geographic scope of the Project and the CP Express pipeline, associated with CP2 LNG facility would cross approximately 7 waterbodies within the geographic scope of the Project. Construction of the TransCameron Pipeline is complete and therefore its impacts would not overlap with construction of the Commonwealth Pipeline. Construction of the Commonwealth Pipeline could overlap with construction of the CP Express, depending on the latter's construction schedule; however, construction of Commonwealth's Pipeline would contribute little to long-term cumulative impacts on waterbodies because the potential impacts of constructing the Pipeline would be minor and temporary. CP2 LNG would be required to adhere to our Procedures, with approved deviations, which would minimize impacts on waterbodies. Additionally, none of the waterbodies that Commonwealth would cross using open cut methods directly connect to the waterbodies or workspaces associated with the CP2 Express pipeline. Therefore, any of the minimal impacts of constructing the Pipeline on these waterbodies that may be associated with open-cut crossings would not contribute to cumulative impacts on water quality or aquatic species associated with the CP2 LNG project. As a result, we conclude that construction and operation of the Pipeline would not result in a significant cumulative impact on water quality or aquatic species.

4.13.2.3 Wetlands

The geographic scope established for wetlands is considered to be the HUC-12 watersheds crossed by the Project. Construction of the Terminal and Pipeline aboveground facilities and access roads would result in the permanent loss of 89.9 acres of wetlands. Commonwealth has proposed to mitigate the loss of the wetlands through purchase of credits from a certified wetland mitigation bank. Projects within the wetlands geographic scope primarily include regional LNG projects. The total wetland impact of the 9 projects that occur within the wetland geographic scope is 1,095 acres, based on publicly available information (table 4.13-4).

We received comments from the public expressing concern that the Project would contribute to the ongoing cumulative loss of wetlands in Louisiana. Although not all of Louisiana’s wetlands are receding (some wetlands are stable and others are growing), overall, Louisiana's wetlands represent about 40 percent of the wetlands of the continental United States, but about 80 percent of the wetland losses across the country (USGS, 2022). As noted in section 4.4, wetlands can be a source of substantial biodiversity and serve a variety of functions that include providing wildlife habitat, recreational opportunities, flood control, and naturally improving water quality. The watersheds in which the proposed Terminal is sited contain approximately 27,000 acres of wetlands, so the acreage cumulatively affected by the Projects represents approximately 4 percent of this resource within the geographic scope. However, per federal regulations, actions that disturb more than five acres of wetlands must not cause a permanent loss of wetland function. Therefore, to acquire necessary construction permits from the COE, each project 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.

Therefore, we conclude that the Project would not contribute significantly to overall cumulative impacts on wetlands. Additionally, although not proposed as mitigation, Commonwealth would transport the sediments that would be dredged from the Calcasieu River to create and maintain the Terminal’s marine facility, to the Cameron Prairie National Wildlife Refuge south on the southern shore of Calcasieu Lake, approximately 6 miles northeast of the Project site. As described in section 4.4.2.2, Commonwealth would transport 1.73 million cubic yards of sediment to a 640-acre BUDM site within the wildlife refuge during initial construction of the Terminal and subsequently transport 152,000 cubic yards of sediment for a minimum of every two years post-construction. The FWS would use the transported sediment to create shallow subtidal estuarine and mudflat habitats and as substrate for restoration of emergent wetland habitat. This area is documented in Louisiana’s Coastal Master Plan (CPRA, 2017) as a marsh restoration area.

Construction and operation of the Project may also adversely impact adjacent wetlands that are not directly impacted by construction if an accidental release of a hazardous substance such as fuel, lubricants, coolants, or other material were to occur. As noted above, Commonwealth would implement its *SPAR Plan* to minimize the chances of an accidental spill or leak of hazardous materials into or near a wetland. Should a spill or leak occur, implementation of the response measures in the *SPAR Plan* would reduce response time and ensure appropriate cleanup, thereby minimizing impacts on wetland habitats. In addition, LNG carriers are required to develop and implement a Shipboard Oil Pollution Emergency Plan (SOPEP), which includes measures to be taken if an oil pollution incident has occurred or a ship is at risk experiencing such an incident. The other LNG projects within the HUC-12 watersheds would present the same potential impacts on wetlands but would be required to follow similar practices to minimize the impacts of spills at the respective projects; therefore, we conclude that the occurrence of accidental spills from the Project would not result in a significant cumulative impact on wetlands.

TABLE 4.13-4 **Actions with the Potential to Cumulatively Impact Wetlands**		
Action	**Closest Distance to Project**	**Permanent Wetland Impacts in Affected HUC-12 Watersheds a/ (acres)**
Commonwealth LNG		90
Calcasieu Pass LNG	0.3 mile	445
CP2 LNG	1.75 mile	336.1
G2 LNG	0.1 mile	Not Available (in planning)
Cameron LNG	16.0 miles	214
Calcasieu Pass Slurry Line	Adjacent	<10
Calcasieu Ship Channel Maintenance Dredging	Adjacent	0
Port Louisiana	1.1 miles	Not Available (in planning)
Cameron Courthouse	2.0 miles	N/A
	Total	**1,095**
a/ Estimated acreage is based on publicly available project information.		

4.13.2.4 Vegetation and Wildlife

The geographic scope for vegetation and wildlife is considered to be the HUC-12 watershed affected by the Project. A total of 142.0 acres of vegetation would be cleared during construction of the Terminal site and Pipeline. Over 98 percent of the vegetation cleared would be wetland vegetation. After construction, approximately 49.6 acres would be allowed to return to preconstruction vegetated conditions and 92.4 acres would be permanently altered. Wildlife habitats affected by construction and operation include EFO, EEM, ESS wetlands, and chenier habitat. Some wildlife habitat within the Terminal site footprint would be permanently converted to industrial land where most of the vegetated and open water habitats would be replaced with surfacing materials such as concrete or gravel. The greatest impact on wildlife habitat would result from the permanent loss of the 92.4 acres of wetland, chenier, slough, and open water habitat at the Terminal site. Subject to final review and approval by the COE, LDNR-OCM, FWS, and LDWF, Commonwealth would provide mitigation for permanent impacts on the wetlands and chenier habitat.

The major projects that would contribute to cumulative impacts within the vegetation and wildlife geographic scope are the six LNG projects. Combined, these projects along with the Commonwealth Project, would result in permanent loss of upwards of 1,887 acres of vegetation and wildlife habitat. The largest proportion of the vegetation loss would come in the form of the approximately 1,095 acres of wetlands that would be permanently lost. The majority of the remaining habitat would consist of upland scrub, herbaceous, and agricultural or pasture lands. The Magnolia LNG and Driftwood LNG projects would also permanently clear approximately 88 acres of mixed hardwood and pine forest.

Impacts on wildlife could occur as a result of habitat (i.e., vegetation) disturbance and loss and increased noise and light. Wildlife that cannot relocate away from noise emitting sources could be adversely affected by increased stress levels and masking auditory cues necessary to avoid predation, hunt prey, and find mates. In addition to more common wildlife, there are nine protected or special-status species of migratory birds that could potentially occur in the Project area. Some of the same species (e.g., red knot, piping plover, brown pelican, and least terns) are likely present at many or all of the other projects in the geographic scope. Elevated structures at the Project site such as storage tanks, flares, and transmission lines could contribute to cumulative impacts on migratory birds.

During scoping, LDWF (2018) expressed concern for cumulative impacts on chenier communities, formally known as coastal live-oak hackberry forest, in the Project area (see section 4.5.3). The Terminal would result in 13.3 acres of permanent impacts on chenier habitat. Chenier habitat was noted as possibly being present at both the Calcasieu Pass LNG and CP2 LNG project sites but field surveys indicated the areas had become degraded and turned to pasture land prior to either project's proposed construction. Therefore, given that there would only be the Project impacts on chenier habitat, as discussed in section 4.5.3, there would be no cumulative impacts on chenier habitat.

In addition to Commonwealth, each of the major projects in the geographic scope would be expected to implement BMPs to ensure restoration of temporarily impacted vegetation and wildlife habitat and minimize noise and lighting. Further, we anticipate other projects with elevated structures, such as Calcasieu Pass LNG and Cameron LNG, would implement similar deterrent measures to minimize impacts on migratory birds, though bird strikes with elevated structures are still likely to occur. Ultimately, cumulative impacts on wildlife would be greatest during the concurrent construction of the projects with Commonwealth, such as the CP2 LNG project, and would continue, to a lesser extent during operation. As noted, the primary impacts on vegetation, and therefore wildlife, would be through loss of wetland habitat. Calcasieu Pass LNG, Driftwood LNG, Cameron LNG, and Magnolia LNG, have all proposed to mitigate the loss of wetland vegetation, at least in part, at the respective project sites through beneficial use of dredged material programs that would restore degraded wetland habitat in the vicinity of the project sites. As detailed in section 4.4.2, Commonwealth would mitigate the loss of wetland habitat at the Project site through purchase of wetland mitigation bank credits, which would ensure the conservation of wetland habitat in excess of the acreage that would be lost through construction of the Project. Given Commonwealth's proposed mitigation and other measures Commonwealth would implement to minimize or offset impacts on vegetation and wildlife, we have determined the Project would not have significant long-term impacts on vegetation and wildlife. Combined with the other projects in the geographic scope, the Commonwealth LNG Project would not significantly contribute to overall cumulative impacts on vegetation and wildlife.

4.13.2.5 Threatened and Endangered Species

As with water, vegetation, wetland, and aquatic resources, we considered the geographic scope for threatened and endangered species to be the HUC-12 watersheds. Additionally, the geographic scope of potential impact for the protected marine mammals and marine sea turtles also included areas along vessel transit corridors in the Gulf of Mexico.

A total of 25 federal or state-protected, listed, candidate, or special status species have the potential to occur within the vicinity of the Project. We have concluded the Project would have *no effect* or would be *not likely to adversely affect* all but one of the federally listed species and w*ould not contribute to a trend toward federal listing* for the species under federal review**.** We concluded that the Project *is likely to adversely affect* the eastern black rail. Section 7 consultation is complete given concurrence has been received from NMFS and FWS on our determinations and the FWS issued a BO for Project impacts on the eastern black rail (see section 4.7.1).

The major projects that would most contribute to cumulative impacts on threatened and endangered species would include the CP2 LNG, Driftwood LNG, Lake Charles LNG, and Magnolia LNG projects. Each of these projects has a very similar list of threatened and endangered species that would potentially be affected by the Project (e.g., piping plover, red knot, Gulf sturgeon, West Indian manatee, sea turtles and whales). Additionally, each of these projects, for which an EIS has been issued, have received concurrences from the FWS and NMFS that the projects would have *no effect* or would be *not likely to adversely affect* the threatened or endangered species potentially present at the project locations. Generally, the FERC-jurisdictional, industrial, and energy projects listed in table 4.13-2 would be required to comply with Section 7 of the ESA (described in detail in section 4.7.1). As a result of the Section 7 consultation process, the FWS and NMFS would review each project's potential impacts on federally listed species and either provide concurrence that the project would not adversely affect listed species or issue a Biological Opinion that would address whether the project would likely jeopardize the continued existence of listed species. These projects have gone through this process, or are expected to before their approval, as has Commonwealth. More detailed discussion is provided in the following sections.

Marine Mammals

West Indian Manatee

Other projects considered for cumulative impacts on West Indian manatees include the LNG terminals in the geographic scope that may have construction activities that overlap with construction of the Project and the periodic maintenance dredging of the Calcasieu Ship Channel. Project impacts on West Indian manatees would most likely result from activities, such as dredging and pile-driving, and increased vessel traffic in the Calcasieu Ship Channel. In addition to the rarity of manatee presence in western Louisiana, Commonwealth has committed to implementing all measures in the FWS' Standard Manatee Conditions for In-Water Work guidance to avoid and minimize impacts on manatees during construction (see section 4.7.1.1); therefore, although impacts on West Indian manatees would be theoretically possible, they are not anticipated.

Potential Impacts on West Indian manatees resulting from the other projects considered would be similar to those discussed for the proposed Project. Dredging and pile driving associated with the CP2 LNG project, maintenance dredging at the Calcasieu Pass LNG site, COE-led maintenance dredging of the Calcasieu Ship Channel, and increased vessel traffic associated with construction and operation of the LNG terminals, would present the potential for impacts on West Indian manatees. However, the increases in vessel traffic would be consistent with the industrial nature of the Calcasieu Ship Channel and animals present in this area are likely accustomed to frequent vessel traffic. Furthermore, these projects would be expected to implement mitigation measures identified by the respective applicant, the FWS (during project-specific consultations), and/or state and other federal agencies to minimize potential impacts on manatees. Due to the rarity of the West Indian manatee in the Project area, and recommended measures that would be implemented if a manatee were to occur in the vicinity of construction activities, the cumulative impacts of the Project when considered with other projects would be temporary (during construction) to long-term (due to increases in LNG carrier traffic) but would not be significant.

Whales

Projects considered for cumulative impacts on the whales discussed in section 4.7.1.1, including primarily sperm whales and the newly named Rice's whale, encompass the LNG terminals in the HUC-12 subwatershed that would be in operation during the same period as the Project. These whales inhabit offshore waters and therefore would not be affected by construction activities in the nearshore or estuarine waters of the Calcasieu Ship Channel. Potential impacts on whales would be related to increased LNG carrier traffic across the Gulf of Mexico.

Increased LNG carrier traffic during operation of the Project and the other projects considered, could increase the potential for vessel strikes on whales. However, LNG carriers use established and well-traveled shipping lanes that do not overlap with the biologically important area in the northeastern Gulf of Mexico where Rice's whales are known concentrate. Commonwealth would advocate for LNG carrier captains calling on the Terminal to adhere to the measures outlined in the NMFS' Vessel Strike Avoidance

Measures and Reporting for Mariners (NMFS, 2008), which provides standard measures for vessel captains to implement to reduce the risk associated with vessel strikes or disturbance of marine mammals. Additionally, to address the potential impacts associated with offshore spills of fuel, lubricants, or other hazardous materials, LNG carriers are required to develop and implement a SOPEP, which includes measures to be taken if an oil pollution incident occurs or a ship is at risk of one.

NMFS (2020) provides statistics and calculations indicating the very low likelihood of LNG carrier transits associated with operation of the Project (approximately 156 LNG carrier round trips per year) resulting in a vessel strike of a whale. Annual transits of all ships in the entire Gulf of Mexico total approximately 964,316 trips. Sperm whales are by far the most abundant whale occurring in the Gulf of Mexico and an average of 2 sperm whales are struck by vessels per year (NMFS, 2020b). The last documented vessel strike of a Rice's whale was in 2009 (NMFS, 2020b). The increase in LNG carriers related to operation of Commonwealth and the other LNG projects would result in an approximately 0.2 percent increase in annual vessel traffic in the Gulf of Mexico. We received a comment expressing concern that the counts of annual transits in the Gulf of Mexico provided above are too low and that potential near-term increases in oil and gas activities in the Gulf of Mexico would further increase annual transits in the Gulf of Mexico. However, increases in transits of other vessels in the Gulf of Mexico would not change the relative impact of the Project on whales. The contribution of the Project on cumulative impacts on whales would remain very low. Therefore, we conclude that although the Project would contribute to a long-term cumulative increase in risk to whales in the Gulf of Mexico, the magnitude of the increase would not be significant.

Fish

<u>Gulf Sturgeon</u>

As we note in in section 4.7.1.4, Gulf sturgeon occurrence within the Calcasieu Ship Channel is highly unlikely, and its presence in the Project area would only be incidental due to the Terminal site's proximity to potential overwintering habitat in the Gulf of Mexico. The EISs for the LNG projects at the northern portion of the HUC-12 subwatershed (i.e., Cameron LNG, Driftwood LNG, Magnolia LNG, and Lake Charles LNG) determined the projects would have no effect on Gulf sturgeon. Other projects within the geographic scope that could contribute to cumulative impacts on Gulf sturgeon would include the Calcasieu Pass LNG and CP2 LNG projects due to their respective proximity to potential overwintering habitat in the Gulf of Mexico. However, given that the presence of the Gulf sturgeon in the Project area would be rare and incidental, cumulative impacts on Gulf sturgeon resulting from Commonwealth and the Calcasieu Pass LNG, and CP2 LNG projects would be considered minor.

<u>Giant Manta Ray and Oceanic White Tip Shark</u>

We received multiple comments from the public regarding potential impacts on protected oceanic fish species, such as the giant manta ray and oceanic white tip shark, resulting from increased LNG traffic and marine pollution during operation of the Project. As with the whale species, these species of fish inhabit offshore, oceanic waters and therefore potential cumulative impacts resulting from the LNG projects in the HUC-12 subwatershed would be limited to impacts from vessel collision injuries or hazardous liquid spills associated with LNG carriers transiting through the Gulf of Mexico. NMFS (2020) notes reliable estimates of overall giant manta ray and oceanic whitetip sharks strikes throughout the Gulf are not available. However, given that the Projects within the geographic scope would increase shipping traffic in the Gulf of Mexico by just 0.2 percent, the potential for an increase in ship strikes on these species would be correspondingly low. Further, LNG carriers use established and well-traveled shipping lanes and the USCG requires LNG carriers to develop and implement a SOPEP, which includes measures to be taken if an oil pollution incident occurs or a ship is at risk of one. Accordingly, we conclude that although the Project would contribute to a long-term cumulative increase in risk to protected fish species in the Gulf of Mexico, the magnitude of this increase would be minor.

Sea Turtles

We received multiple comments from the public regarding potential impacts on sea turtles. Other projects that could contribute to cumulative impacts on sea turtles, in the form of dredging, pile-driving, and increased construction vessel traffic, would primarily be limited to the Calcasieu Pass LNG and CP2 LNG projects due to their proximity to the Gulf of Mexico. In general, sea turtle presence in the Calcasieu Ship Channel would be rare. Each of the projects within the geographic scope that have LNG vessels transiting through the Gulf of Mexico could also potentially contribute to cumulative impacts in the form of vessel strikes. Dredging impacts on sea turtles would be minimized by Commonwealth, Calcasieu Pass LNG, and CP2 LNG through use of hydraulic suction cutter head dredges as opposed to hopper dredges, the latter of which are associated with increased impacts on sea turtles. Impacts on sea turtles would otherwise be temporary and local in nature because dredging would be confined to the respective marine facilities of the projects. These projects would also follow NMFS-prescribed BMPs for avoiding dredging and construction vessel impacts on sea turtles, thereby further minimizing the potential for impacts on sea turtles. Impacts related to pile driving could occur if Commonwealth and the CP2 LNG project construct their marine facilities during overlapping time periods. However, both Commonwealth and CP2 LNG would use NMFS-prescribed noise mitigation methods for pile driving such as bubble curtains and cushion blocks. Furthermore, as sea turtles are very mobile species, individual sea turtles would likely avoid the construction noise upon initiation of pile driving by swimming away from the sites. Given this mobility and the projects' respective implementation of these methods, cumulative impacts on sea turtles related to pile driving would be localized and temporary.

Cumulative impacts on sea turtles from increased LNG vessel usage of the Gulf of Mexico would be similar to those of the protected fish species discussed above. As with the fish species, NMFS (2020) notes reliable estimates of overall sea turtle strikes throughout the Gulf are not available. However, given that the Projects within the geographic scope would increase shipping traffic in the Gulf of Mexico by just 0.2 percent, the potential for an increase in ship strikes on these species would be correspondingly low. Further, LNG carriers use established and well-traveled shipping lanes and the USCG requires LNG carriers to develop and implement a SOPEP, which includes measures to be taken if an oil pollution incident occurs or a ship is at risk of one. Accordingly, we conclude that although the Project would contribute to a long-term cumulative increase in risk to protected sea turtle species in the Gulf of Mexico, the magnitude of this increase would be minor.

Birds

<u>Piping Plovers and Red Knots</u>

Potential cumulative impacts on piping plovers and red knots from the other LNG projects in the geographic scope would primarily include impacts on foraging and overwintering habitat. The beach shoreline of the Gulf of Mexico south of the Commonwealth, Calcasieu LNG, and CP2 LNG sites is designated as critical habitat for piping plovers. During migration and on their wintering grounds, Piping plovers forage on intertidal beaches, mudflats, and sand flats with little or no emergent vegetation. Similarly, during migration and on their wintering grounds, red knots forage along sandy beaches, tidal mudflats, salt marshes, and peat banks with sparse emergent vegetation. Neither Commonwealth nor the other LNG projects within the geographic scope would directly impact these types of habitats and, specifically, would not directly affect the piping plover designated critical habitat on the beach south of the Commonwealth, Calcasieu LNG, and CP2 LNG sites. Potential impacts on piping plovers and red knots would primarily be limited to temporary displacement from foraging/wintering habitat due to noise in the vicinity of active construction on the southern portions of the Commonwealth, Calcasieu LNG, and CP2 LNG sites. However, these species are mobile and would likely avoid areas of ongoing construction activity. Therefore, cumulative impacts on red knots and piping plovers would be minor.

Golden-winged Warbler

Potential cumulative impacts on golden-winged warblers would be related to loss of chenier habitat, which provides stopover habitat for the golden-winged warbler and other birds during spring and fall migrations. Among the considered LNG projects, only the Commonwealth, Calcasieu LNG, and CP2 LNG projects contain existing or previous chenier habitat. Commonwealth would permanently convert about 13 acres of chenier habitat to industrial land but preserve about 24 acres of chenier habitat, per LDWF recommendation, by removing feral hogs from the land and fencing off the area from hog and human disturbance for the lifetime of the Project. The remnants of what was chenier habitat at the Calcasieu Pass LNG site, based on LDNR guidance, consisted of approximately 2 to 3 acres of hackberry vegetation with no associated live oak trees. At the CP2 LNG site, what was chenier habitat is now cleared land that has been cleared for cattle grazing, according to CP2 LNG field surveys. Calcasieu Pass LNG proposed, as part of its Migratory Bird Habitat Mitigation Plan, to restore upwards of 29 acres of chenier habitat adjacent to the project site by restricting grazing on the land and planting mast-producing tree species and mid-story vegetation. Therefore, we conclude that although the Project would lead to permanent loss of chenier habitat, the cumulative impacts on golden-winged warblers would be minor given Commonwealth's and Calcasieu Pass LNG's intent to protect and restore chenier habitat, which would potentially provide higher quality stopover habitat in the Project area than what currently exists.

Eastern Black Rail

We determine in section 4.7.1.2 that the Project is likely to adversely affect the eastern black rail. The other LNG projects in the HUC-12 subwatershed could also affect eastern black rail habitat; however, eastern black rails were not listed when the EISs for these projects were developed, so eastern black rails were not addressed directly within. Public information available for the CP2 LNG project indicates eastern black rail habitat may be present within the proposed project footprint but that the habitat is degraded and previously mowed to serve as cattle grazing land. Because the eastern black rail is now listed as Threatened, if the other projects in the geographic scope were to proceed with construction, they would need to consult with the FWS, per Section 7 of the ESA, to assess whether the projects would adversely affect eastern black rails. In September of 2021, FWS published a BO regarding the potential effects of the Project on eastern black rails. Within, the FWS determined the Project would not jeopardize the continued existence of the species. The FWS further provided the maximum number of individual eastern black rails the Project could take; reasonable and prudent measures for Commonwealth to follow to minimize take on eastern black rails; and monitoring and reporting requirements for Commonwealth to implement to monitor the impacts of incidental take of eastern black rails. Given the determination of the FWS and associated guidance, and that the other projects in the geographic scope would be required to follow the ESA Section 7 consultation process (and applicants would be required to follow the terms and conditions of any biological opinion), we conclude cumulative impacts on eastern black rails would not be significant.

4.13.2.6 Land Use, Recreation, and Visual Resources

Land Use

The Terminal and Pipeline would be sited in mainly open land (dominated by emergent wetlands), surrounded by existing wetlands and industrial and commercial development. Land use within the geographic scope is generally made up of forest, open land, developed land, and open water. Calcasieu Pass LNG, CP2 LNG, and Port Louisiana would impact primarily open, barren wetland land use areas, and to a lesser extent hay/pasture, herbaceous, developed, open water, and scrub/shrub land uses. The construction of Commonwealth and other nearby projects would result in a cumulative increase in the conversion of a variety of land uses to industrial/commercial use in the cumulative impact area. Because there are many areas of open land that would remain unaffected by the Project and other area projects, we believe that the Terminal and Pipeline would contribute to cumulative land use changes in the area but would not result in a significant cumulative impact.

Recreation

No federally managed public or conservation lands, including national historic landmarks, national forests, national parks, national recreational trails, National Wild and Scenic Rivers, NWRs, Indian Lands, or wilderness areas have been identified within 0.25 mile of the proposed Terminal or Pipeline. Several recreational and special interest sites are in proximity to the Project (see section 4.8.3); however, none would be directly impacted by the Project except for the Calcasieu Ship Channel. Cameron Parish is home to vital fishery resources as described in section 4.6.2 and serves as a conduit for access to such resources in the Calcasieu Ship Channel and the Gulf of Mexico.

Construction associated with Commonwealth, CP2 LNG. Calcasieu Pass LNG, and other concurrent actions may temporarily impact local recreational fishing, bird watching, trapping, hunting, and boating activities. Barge deliveries during peak construction would average about seven deliveries per week. If the other concurrent projects also require barge deliveries during the same time frame, this may result in a minor increase in vessel traffic. However, this increase is not expected to result in a decrease in the availability of recreational fishing.

The construction and use of the Commonwealth marine slip as well as the proposed CP2 LNG marine facilities at the southern tip of Monkey Island would remove those areas from the available recreational fishing area. However, each of these marine slips represent only a small portion of the available areas for recreational fishing. The moving security zone around LNG carriers has the potential to close the channel to traffic and recreation (see section 4.9.11). If all LNG export terminals listed in table 4.13-2 are constructed, this could occur more frequently. Because large ships, such as LNG carriers and crude oil tankers, typically enter the channel in a convoy, channel closures due to the moving security zones would tend to be combined into a longer channel closure that occurs less frequently. Convoys of vessels are typically organized in the most efficient manner for the channel, with vessels headed farthest upstream at the head of the convoy. Recreational activity outside the channel itself is not likely to be affected by moving security zones. Because Commonwealth would be constructed at the mouth of the Calcasieu Ship Channel, LNG carriers associated with the Project typically would be organized at the tail of the convoy and would transit a very short stretch of the Calcasieu Ship Channel before docking, thus having a negligible contribution of impacts on recreational use of the Calcasieu Ship Channel. Therefore, we conclude that the Project would contribute negligibly to overall minor cumulative impacts on recreation.

Visual Resources

The Terminal's six LNG storage tanks, flare stack, and liquefaction trains, the Pipeline, and nighttime lighting would all impact visual resources to a degree. The general character of the Calcasieu Ship Channel continues to become more industrial, and the construction of all projects within the cumulative study area would increase this trend of converting open space into industrial facilities (table 4.13-5). Construction of the other planned area LNG projects and port facilities would contribute to cumulative visual impacts on users of the Calcasieu Ship Channel, users of Holly and Broussard Beaches, residents in the town of Cameron, and motorists along the Creole Nature Trail All-American Road. The Creole Nature Trail is a 180-mile road that runs from Sulphur to Holly Beach and from Lake Charles down to Cameron. Construction of Commonwealth, Calcasieu Pass, and CP2 would result in several industrial sites in a concentrated area. Although the visual impacts along the road would be limited to a short distance, the additional sites, including flares, lighting, and storage tanks, may be visible for several miles.

TABLE 4.13-5 **Projects within the Visual Resources Cumulative Impact Study Area**				
Action	**Distance from Project**	**Site Area**	**River Frontage**	**Readily Visible Features**
Commonwealth LNG	-	106 acres	2,700 feet	- LNG storage tanks - Flares - Facility lighting - LNG vessels
Calcasieu Pass LNG	0.3 mile	315 acres	6,000 feet	
CP2 LNG	1.3 miles	730 acres	3,000 feet	
Port Louisiana	1.1 miles	~540 acres	~22,000 feet	- Loading cranes - Industrial buildings - Facility lighting - Vessels

The extent of these impacts would vary depending on the proximity to the sites. Motorists along the approximate 2-mile stretch of road between the Commonwealth Terminal and the Cameron Ferry West Landing and those traveling along the 2.5-miles between the Cameron Ferry East Landing through the town of Cameron would have direct views of all three facilities and associated structures. Visual changes in this area would be significant compared to the conditions prior to construction of the Calcasieu Pass LNG terminal.

Since construction and operation of Commonwealth would have a significant impact on the RV pad site adjacent to the Terminal, construction and operation of the additional LNG sites would have a minimal cumulative impact given the extent of impacts from the proposed Project. Although all projects within the geographic scope are in an area zoned for heavy industrial use, and the visual character of the Terminal site and other actions would be similar to and consistent with the ongoing industrial facilities and activities along the Calcasieu Ship Channel, the Terminal site would nonetheless result in significant cumulative impacts on visual resources.

4.13.2.7 Socioeconomics

All projects listed in table 4.13-2 could contribute to socioeconomic cumulative impacts within Cameron Parish. Although the visual impacts along the road would be limited to a short distance, the additional sites, including flares, lighting, and storage tanks, may be visible for several miles and may be visible within the environmental justice communities. The extent of these impacts would vary depending on the proximity to the sites. Motorists along the approximate 2-mile stretch of road between the Cameron Ferry West Landing and the Commonwealth Terminal and those traveling along the 2.5-miles between the Cameron Ferry East Landing through the town of Cameron would have direct views of all three LNG facilities and associated structures. However, these would be relatively short periods of time for the views of motorists to be affected. Traveling at approximately 45 miles per hour, motorists views would be affected for approximately 6 minutes while traveling the 4.5 miles described above. .

Economy and Employment

Construction of the Project would generate approximately 2,000 construction jobs for a period of about 24 months starting in 2022 and the peak construction workforces for the Calcasieu Pass LNG Terminal (1,410 workers) and the Driftwood LNG Project (6,500 workers) could also occur during portions of that time period. The peak construction workforces for the Sabine Pass expansion and the Cameron LNG project have already occurred, and the timing of the peak construction workforces for Magnolia LNG, Lake Charles LNG, and Port Louisiana have not been made publicly available. The cumulative effect from this increase in construction positions may be a minor reduction in unemployment in the area, although it should be noted that these projects include modular construction methods, so several of the generated construction jobs may occur outside of Cameron Parish, and even outside of the U.S. Therefore, although construction of Commonwealth, in addition to the other proposed actions identified in table 4.13-2, would generate a large number of jobs over a period of about 5 years, the overall effect on local unemployment would likely be minor.

Housing

The abundance of jobs resulting from Commonwealth and other concurrent actions would lead to an influx of non-local workers, which would impact transient housing in the geographic scope of potential impact (table 4.13-6). A variety of temporary housing units are available in the Project area. The number of temporary housing units available, including single-family homes, apartments, hotels/motels, campgrounds, and RV parks, is approximately 10,000 units (see section 4.9). Due to the rural nature of Cameron Parish, there are a limited number of available units, and non-local workers would likely have to disperse to the surrounding communities to find housing during construction. This would include finding housing in surrounding Parishes and Counties, including Jefferson and Orange Counties, Texas and Jefferson Davis Parish in Louisiana. There are 7,900 vacant housing units within these counties and parishes (US Census, 2019) along with additional potential housing in hotels/motels and RV campgrounds. Considering the number of temporary housing units currently available in the Project Area and adjacent counties, as well as the housing projects identified in table 4.13-2, sufficient units would be available for the peak temporary construction workforce.

Should other major industrial projects listed in table 4.13-2 be constructed at the same time as Commonwealth, the amount of available housing may not be sufficient, and workers would be required to seek transient housing a further distance away with longer commutes. As noted in section 4.9.6, a number of new housing projects are anticipated in the region in addition to the available temporary housing. If all of the proposed housing projects were constructed, an additional 3,500 units would be available. Therefore, we conclude the Project would not contribute to a significant cumulative impact on housing.

TABLE 4.13-6 **Temporary Worker Housing Need a/**			
Action	**Temporary Workers**	**Percent Non-Local b/**	**Temporary Non-Local Workers Requiring Housing**
Commonwealth LNG	2,000	50%	1,000
Driftwood LNG	6,500	70%	4,550
Cameron LNG Expansion	3,269	50%	1,634
Calcasieu Pass LNG	1,410	70%	987
Lake Charles LNG	5,600	80%	4,480
Magnolia LNG	781	40%	312
CP2 LNG	4,000	40%	1,600
Total	**23,560**	**63%**	**14,563**

a/ The estimates conservatively assume that each project construction workforce peaks with Commonwealth. Worker estimates are for peak month. Projects scheduled to be complete prior to the peak month were not included.

b/ Sources: Driftwood LNG Resource Report 5, FERC eLibrary Accession Number 20170331-5058; Calcasieu Pass LNG Resource Report 5, FERC eLibrary Accession Number 20150904-5415; Lake Charles LNG Resource Report 5, FERC eLibrary Accession Number 20140325-5137; Magnolia LNG Resource Report 5, FERC eLibrary Accession Number 20140430-5338.

Commercial Fisheries

The only managed fishery in the Calcasieu Ship Channel is shrimp. Shrimping seasons in the portion of the Calcasieu Ship Channel adjacent to the Project occurs from May to July and mid-August to mid-December. During construction of the Project, barge delivery of material supplies and equipment has the potential to affect commercial fishing due to the additional number of barges and the seasonal aspect of the fisheries. However, the Calcasieu Ship Channel was specifically created to provide deep-water access for maritime commerce and, as such, use of the channel by barges and support vessels to deliver materials during construction of the liquefaction facility would be consistent with the planned purpose and use of this active shipping channel. Additionally, if all proposed projects are completed, once in operation, there would be an overall increase in LNG vessels associated within each terminal within the ship channel. Commercial fishing vessels generally coexist with industrial vessels in the Calcasieu Ship Channel without incident and, as described above, vessel increases within the Calcasieu Ship Channel would be managed by the Port of Lake Charles, Lake Charles Pilots Association, and USCG.

Twice a year, for approximately 2 weeks each time, large numbers of shrimp migrate in or out of the Calcasieu River Ship Channel. During these times, which typically occur at night and during the full moon from May to July and from mid-August to mid-December, shrimp trawlers cluster at the inside/outside shrimp line in the ship channel in order to catch as many shrimp as possible. As with marine transportation in general, assuming most of the other projects along the Calcasieu Ship Channel that are listed in table 4.13-2 were to be constructed at the same time as the Project, cumulative impacts on vessel traffic in the waterway could occur due to increased congestion of construction vessels associated with Commonwealth and the other projects and seasonal shrimp trawlers (FERC 2018). However, the LDWF-mandated inside/outside shrimp line is now north of Monkey Island, which would not be impacted by construction or operation of the Terminal (LDFW 2020). Therefore, we conclude that the Project would contribute negligibly to overall temporary and minor cumulative impacts on commercial fisheries in the Calcasieu Ship Channel.

Public Services

Commonwealth conducted an Emergency Services Gap Analysis that assessed the current capabilities of emergency services within the Project area. Based on the analysis, Commonwealth is coordinating with the local police and fire departments to ensure that adequate resources are available. Construction of the Project would likely result in little to no short-term impact on the availability of these local community facilities and services. If several of the projects listed in table 4.13-2 were to be constructed at the same time as the Project, the combined construction workforces would increase the need for some public services, such as police, fire, medical services, and schools, resulting in a greater potential for cumulative impact on such services, particularly in Cameron Parish. If the medical and emergency services, or other public services, are adversely affected during construction, the project sponsors may mitigate the impact by providing funding for temporarily increasing the staff and equipment of the public services affected. In addition, other LNG projects would be required to file an *Emergency Response Plan* like the Project's requirement, which includes a Cost-Sharing Plan describing any direct cost reimbursements agreed to for state and local agencies. Therefore, we conclude that the Project would contribute to overall temporary minor cumulative impacts on public services.

Traffic

Road Transportation

The greatest potential for cumulative impacts on vehicular traffic and roads during construction and operation of Commonwealth is associated with the Terminal site. Construction-related traffic associated with the Pipeline would result in only minor, temporary impacts on traffic, and would be relatively short-term at any given location. There would be an increase in heavy truck traffic and workforce traffic to the Terminal site during the construction phase. According to the Lake Charles Urbanized Area Transportation Plan 2040, researched and authored by the Imperial Calcasieu Regional Planning and Development Commission, the region is expected to experience a 37 percent increase in population, a 36 percent increase in dwelling units, and a 53 percent increase in employment and projects transportation needs accordingly. Transportation officials in the area have been working to improve transportation corridors to accommodate the economic growth expected in the area. Cumulative impacts on roadway transportation would occur if construction of the Project and Calcasieu LNG, Cameron LNG, CP2 LNG, Port Louisiana, and/or West Calcasieu Port projects occur at the same time. Because all these projects are adjacent to the Calcasieu Ship Channel and within Cameron and Calcasieu Parish, construction vehicles and employee vehicles would use LA-27 to access the sites. CP2 LNG and Calcasieu Pass LNG sites are on the east side of Calcasieu Lake and channel, while the other large LNG projects are on the west side. However, because most parking and housing would be in Carlyss, Sulphur, and Lake Charles, traffic along LA-27 on the east and west side of the channel could see an increase in traffic. Additionally, if all of the large LNG projects have overlapping construction schedules, the local roads within each of those towns may also experience an increase in vehicle traffic.

Commonwealth would file a Final Traffic Management Plan prior to the start of construction. Implementation of this plan, including the use of off-site parking and shuttles, would minimize Project impacts on roadway transportation. Other potential measures such as controlled shift times and coordination among the other projects to reduce peak hour vehicular trips, traffic signal coordination/timing, intersection and road improvements, and use of law enforcement to control traffic, would help mitigate for and alleviate cumulative impacts from the other area projects, if needed. Therefore, we conclude the Project would not contribute significantly to overall cumulative impacts on land transportation.

Marine Transportation

Throughout construction of the Project, general cargo carrier vessels, barges, and support vessels would deliver large equipment and materials to the Terminal. The marine construction fleet would likely include vessels such as dredge barges, heavy lift cranes, derrick crane barges, deck barges, tugs, and support vessels. The support vessels anticipated include booster pump barges, tender boats, work barges, material barges, fuel barges, and survey vessels.

If the other projects along the Calcasieu Ship Channel that are listed in table 4.13-2 were to be constructed at the same time as Commonwealth, a cumulative impact on vessel traffic in the waterway, primarily by increasing congestion and vessel travel times could occur. However, these impacts would be temporary, and the extent of the impacts would depend on the frequency and number of deliveries being made for various projects at any given time during the respective construction periods. In addition, Commonwealth's Terminal would be at the entrance of the ship channel, resulting in short inbound and outbound transits. Therefore, we conclude that the Project would have a non-significant contribution to overall cumulative impacts on marine transportation in the Calcasieu Ship Channel during construction.

The six LNG export projects permitted along the Calcasieu Ship Channel would result in an estimated annual increase of 1,233 additional operating vessels. A Calcasieu Ship Channel Traffic Study (Ausenco, 2018) considered the operation of other planned and proposed terminal projects (based on information as of late 2018) in the general Project area to evaluate the cumulative effects of these projects and existing projects on marine vessel traffic. The study concluded that, even with channel traffic expected to increase to a peak of 2,514 vessel calls by 2026, the Calcasieu Ship Channel would be able to accommodate the additional traffic. Vessel increases within the Calcasieu Ship Channel would be managed by the Port of Lake Charles in partnership with the Lake Charles Pilots Association, and by the USCG. LNG carrier traffic associated with operation of the Terminal would be governed by USCG requirements. Therefore, we conclude that the Project would have a non-significant contribution to overall cumulative impacts on marine transportation in the Calcasieu Ship Channel during operation.

Environmental Justice

Based on the scope of the Project and our analysis of the Project's impacts on the environment as described throughout this EIS, we have determined Project-related impacts on wetlands, surface water, aquatic resources, visual resources, socioeconomics, traffic, noise, and air quality may adversely affect the identified environmental justice communities (see section 4.9.12). Cumulative impacts on environmental justice communities could occur for these resources, as discussed in this section.

Construction and operation of the Project would result in short-term, temporary, and permanent impacts on wetlands. Wetlands provide various benefits to local populations, including environmental justice communities. These benefits could include shoreline protection, flood control, habitat for a variety of plant and animal species that can be used for recreation and/or sustenance and use by the public for recreation and education (NRCS, 2021). Impacts on wetlands associated with the project would be adequately minimized and sufficiently mitigated and would not have a significant impact on environmental justice communities. If constructed, the projects listed in table 4.13-2 would impact approximately 4 percent of the wetlands within the project's geographic scope for cumulative wetland impacts, which contains approximately 27,000 acres of wetlands. However, per federal regulations, actions that disturb more than five acres of wetlands must not cause a permanent loss of wetland function. Therefore, to acquire the required construction permits from the COE, each project proponent would have to demonstrate no net loss of wetland function through a wetland restoration plan or participation in a mitigation program. The Project would contribute to cumulative impacts on wetlands from the projects within the geographic scope. However, overall, we conclude these wetland impacts would be mitigated and would not have a significant cumulative impact on environmental justice communities. Wetland impacts are more fully addressed in section 4.4 and cumulative wetland impacts are discussed in this section.

Construction and operation of the Terminal would both temporarily and permanently impact portions of the adjacent Calcasieu Ship Channel. These impacts would result from dredging activities, site construction, marine traffic, stormwater runoff, water use, hydrostatic testing, and could occur from accidental spills or other releases of hazardous substances. Environmental Justice communities in proximity to the Project could be affected by dredging and resuspension sediments. Resuspension of sediments within the ship channel could potentially mobilize any contaminants. However, as discussed in section 4.2.1, it is unlikely that contaminated sediment is present. If the projects along the ship channel (see table 4.13-2) that require dredging occur simultaneously, there may be increased turbidity within the channel and cumulative impacts on surface water. However, the greatest impacts would be highly localized, thus the potential for cumulative impacts is greatly diminished. Overall, we do not anticipate significant cumulative impacts on environmental justice communities that may use or live near the water related to surface water due to dredging.

Construction and operation of the Terminal, as well as marine traffic to and from the Terminal, have the potential to adversely impact water quality in the event of an accidental release of a hazardous substance such as fuel, lubricants, coolants, or other material. Construction of multiple projects (see table 4.13-2) during the same time period, and the associated vessel traffic, may increase this risk. However, FERC projects would implement the measures outlined in the FERC's *Plan* and Commonwealth's *Procedures* to minimize the likelihood of a spill. Additionally, LNG carriers are required to develop and implement a Shipboard Oil Pollution Emergency Plan (SOPEP), which includes measures to be taken when an oil pollution incident has occurred, or a ship is at risk of one. If an accidental release were to occur, environmental justice communities along the ship channel, as well as individuals from these communities that use the channel, could be affected. However, given that most of these communities are not directly along the ship channel, and given the mitigation measures that would be in place, we conclude that environmental justice communities would not be significantly impacted by an accidental release. Water resource impacts are more fully addressed in section 4.3 and cumulative water resources impacts are discussed in this section.

Recreational and commercial fishing could be impacted by construction activities associated with the Project and the projects listed in table 4.13-2. Project activities are anticipated to occur during peak fishing and recreational seasons; however, due to the overall size of the waterway, access to and maneuverability within the Calcasieu Ship Channel would not be significantly affected by the use of construction barges. Temporary cumulative impacts on recreational and commercial users in the Calcasieu Ship Channel, which would likely include individuals from environmental justice communities, may occur in areas where construction of the various projects is occurring. The construction impacts on recreational and commercial fisheries would be temporary. Cumulative impacts on recreational and commercial fisheries in the ship channel, which likely include individuals from environmental justice communities, may occur due the loss of available fishing areas due to operation of permanent marine facilities. Although we expect fish, crab, and shrimp species common to the area could be present, the location does not have any unique features or habitat characteristics that would draw recreational or users to this particular location. The Project area doesn't support special habitat that is different from the miles of surrounding habitat. Given these characteristics, and due to the overall size of the waterway, we conclude that these cumulative impacts on environmental justice communities would not be significant. Aquatic resources impacts related to fishing are more fully addressed in section 4.8 and cumulative aquatic resources impacts are discussed in this section.

An increase in marine traffic could result in delays to other large vessels as well as commercial and recreational fisherman and boaters, including those from environmental justice communities. If the other projects along the Calcasieu Ship Channel that are listed in table 4.13-2 were to be constructed at the same time, a cumulative impact on vessel traffic in the waterway, primarily by increasing congestion and vessel travel times could occur. Construction vessel traffic would be temporary, and the extent of the impacts would depend on the frequency and number of deliveries being made for various projects at any given time during the respective construction periods. In addition, Commonwealth's Terminal would be at the entrance of the ship channel, resulting in short inbound and outbound transits. Operation of multiple new LNG facilities along the ship channel would result in an increase in LNG vessels using the ship channel. However, Commonwealth would be located at the start of the channel and vessels would be need to traverse long distances, reducing the projects contribution to the overall increase of traffic in the ship channel. According to the Calcasieu Ship Channel Traffic Study (Ausenco, 2018), traffic in the channel is projected to double to 2,183 vessel calls in 2023. Approximately 800 of these new vessel calls are projected to involve LNG carriers (including those listed in table 4.13-2). The proposed increase in vessels over the estimated 2023 number of approximately 2,183 vessels annually and projected future increase in vessels would not likely affect the capability of the channel to handle the proposed ship movements according to the Calcasieu Ship Channel Traffic Study (Ausenco, 2018). Therefore, we conclude that the Project would have a not have a significant contribution to overall cumulative impacts on marine transportation in the Calcasieu Ship Channel. Marine traffic impacts related are more fully addressed in section 4.9.11 and cumulative marine traffic impacts are discussed in this section.

Construction of the Project along with the Calcasieu Pass LNG and CP2 LNG projects, and existing commercial and industrial facilities along the ship channel would result in a cumulative visual impact on local residences and visitors. If constructed, all three LNG terminal projects would be at the southern portion of the ship channel and within 2.5 miles of the town of Cameron. The area surrounding the LNG facilities is predominantly marsh land with existing industrial sites to the east, sandy shoreline and the Gulf of Mexico to the south, marsh land and the town of Holly Beach to the west, and marshland to the north (see section 4.8). Construction of the terminal projects would result in a permanent change in the viewshed and would add industrial elements to the area. The terminals and all associated structures and buildings would be highly visible from vehicles along Gulf Beach Highway and from the town of Cameron (Census Tract 9702.01 Block Group 3). Residences and businesses in Cameron would have a direct view of CP2 LNG and partial views of Commonwealth and Calcasieu Pass LNG while residents in Holly Beach would have a direct view of Commonwealth and partial views of Calcasieu Pass and CP2 LNG. Commonwealth LNG would have a significant contribution to overall significant cumulative visual impacts on environmental justice communities. Visual impacts are more fully addressed in section 4.8.4 and cumulative visual resources impacts are discussed in this section.

Project impacts on environmental justice populations may include impacts on socioeconomic factors. Constructing the Project would require, at its peak, about 2,000 workers/contractors. The combined populations of Cameron and Calcasieu Parishes are about 210,000 individuals. The closest environmental justice communities to the project site would be those that include the towns of Cameron (Census Tract 9702.01 Block Group 3), Hackberry (Census Tract 9702.01 Block Group 1), and Carlyss (Census Tract 33, Block Group 2). We received a comment expressing concern that an influx of construction workers/contractors in the region could increase demand for housing and therefore increase housing costs in the region. There are several large LNG terminal projects that have been proposed or approved that could have overlapping construction schedules with Commonwealth. These include Cameron LNG Expansion, Driftwood LNG, Lake Charles LNG, and CP2 LNG. Driftwood LNG began construction in March of 2022 and CP2 LNG is scheduled to begin construction in 2023. The other LNG projects do not have known construction start dates but are fully permitted and could therefore start at any point. Combined, these additional projects could require a peak of more than 20,000 workers, a 10 percent increase in the current population. The temporary flux of workers/contractors into the area would increase the demand for housing and community services, such as police enforcement, and medical care. Available short- and long-term housing would be limited within the two affected Parishes and associated environmental justice communities. Should other major industrial projects listed in table 4.13-2 be constructed at the same time as Commonwealth, 3,500 units would still be available. However, the increased demand for this housing could drive costs up and adversely impact low-income individuals.

The population increase, as well as various construction projects, may also increase the need for police, fire, and emergency medical services. Because environmental justice and smaller communities could have fewer public service resources available, any increased need due to these projects could negatively affect the availability of these services to the public. However, because applicants would be required to assess the capabilities of local public services and develop appropriate mitigation measures, such as training of internal staff to respond to emergencies, providing training, equipment, or funds to local departments, we have determined that cumulative impacts on police, fire, and emergency medical service within environmental justice communities would be minor.

We received several comments concerned that construction and operation of the Project, in addition to the existing and growing industrial projects, would result in people moving out of the town of Cameron due to the continued industrialization of the area. Based US Census Data, between 2010 and 2019, the population of Cameron went from 537 individuals to 203. While this does suggest that there is a migration of people out of Cameron, we are unable to assess if the cause of the population change is due to the increased industrialization of the area.

Overall, cumulative socioeconomic impacts associated with housing and public services within environmental justice communities would be less than significant; housing units would be available should all the projects be constructed at the same time and impacts on community services would be mitigated as previously described. Socioeconomic impacts are more fully addressed in section 4.9 and cumulative socioeconomic impacts are discussed in this section.

Area residents may be affected by traffic delays during construction of the Project. There would be a temporary increase in use of area roads by heavy construction equipment and associated trucks and vehicles. Increased use of these roads would result in a higher volume of traffic, increased commute times, and greater risk of vehicle accidents. These impacts would most likely affect those environmental justice communities that are in close proximity to several large projects, such as Cameron (Census Tract 9702.01 Block Group 3) and Hackberry (Census Tract 9702.01 Block Group 1), as well as those communities to the north where workers would find housing. Mitigation measures would be implemented to minimize potential road congestion during construction including the use of bus lots away from the facility to limit the number of vehicles traveling to construction sites and the establishment of temporary travel lanes and the use of flaggers and signs, as necessary, to ensure the safety of local traffic. Other large projects in the area would likely use other large available lots for parking for the majority of their workers. Depending on the location of these lots, and timing of construction, there could be some overlap, which would result in minor to significant traffic impacts. These impacts would also be limited to the time of construction. Once construction is complete, the vehicle trips for the permanent workforce and large heavy trucks are not anticipated to significantly increase traffic. Therefore, we do not expect the Project to significantly contribute to cumulative traffic impacts during operation. Traffic impacts are more fully addressed in section 4.9.11 and cumulative traffic impacts are discussed in this section.

Because most of the projects assessed would be along the Calcasieu Ship Chanel or Calcasieu Lake, it is likely that most non-local workers would find housing in larger towns and cities such as Carlyss and Lake Charles, Louisiana or Port Arthur, Texas. These areas could experience increased traffic volumes due to the influx of workers. Because several projects would be accessed along LA-27, traffic volumes along the road would increase if those projects were constructed concurrently. Commonwealth would use bus lots for Project parking in Carlyss, Louisiana, about 40 miles north of the Terminal site. It is likely that other large projects would also use off-site parking for workers to minimize traffic along LA-27 and other local roadways. Additionally, projects would develop and implement project-specific traffic mitigation plans that would further minimize overall traffic impacts from a project. Overall, cumulative traffic impacts on environmental justice communities would be less than significant. Project transportation needs and impacts are more fully addressed in section 4.9.11 and cumulative transportation impacts are discussed in this section.

Noise levels resulting from construction would vary over time and would depend upon the number and type of equipment operating, the level of operation, and the distance between sources and receptors. Noise levels above ambient conditions attributable to construction activities would vary over time and would depend upon the nature of the construction activity, the number and type of equipment operating, and the distance between sources and receptors. The closest NSA located within an environmental justice community (Census Tract 9702.01 Block Group 3), a set of temporary houses on the southern tip of Monkey Island that is used to house Calcasieu Ship Channel pilots, is about 3,300 feet east of the proposed Terminal site. This NSA is also within 1 mile of the Calcasieu Pass LNG and the proposed CP2 LNG projects. Operational noise associated with the Terminal site would be persistent; however, Commonwealth would be required to meet sound level requirements. Operational noise would increase noise levels over ambient by about 2 decibels at the closest NSA. Similarly, all additional facilities would be subject to the same sound level requirements. The construction and operation of LNG Projects along the southern portion of the Calcasieu Ship Channel would not result in significant noise impacts on local residents and the surrounding communities, including environmental justice populations. Noise impacts are more fully addressed in section 4.11.2 and cumulative noise impacts are discussed in this section.

Construction and operation of the Terminal site would result in long-term impacts on air quality. Emissions during Terminal and Pipeline construction would generally be associated with onshore construction activities conducted using on-road and off-road mobile equipment and offshore construction activities conducted using marine vessels such as tugboats or barges and a dredging vessel. Construction emissions in the form of particulate matter (e.g., dust) would occur, and construction emissions from equipment exhaust would result in short-term, localized impacts in the immediate vicinity of construction work areas. Efforts to mitigate exhaust emissions during construction would include using construction equipment and vehicles that comply with EPA mobile and non-road emission regulations, and usage of commercial gasoline and diesel fuel products that meet specifications of applicable federal and state air pollution control regulations. Fugitive dust would be mitigated by applying water to the roadways and reducing vehicle speed. Commonwealth conducted air dispersion modeling to assess air quality impacts and show compliance with applicable NAAQS and Class II PSD Increments for the pollutants subject to PSD review. Additionally, FERC modeled the impacts of mobile sources (LNG carriers and tugs) in addition to the PSD and NAAQS modeling required by the state. The cumulative modeling indicated that operation of the Project would contribute to a potential cumulative nitrogen dioxide (NO_2) 1-hour NAAQS exceedance, however the Project's contribution (including LNG stationary and mobile sources) would be less than the significant impact level at each exceedance location. A majority of these potential exceedances within the modeled area would be within an environmental justice community (Census Tract 9702.01, Block Group 1) (see appendix F). Commonwealth's contribution to these exceedances is estimated to be less than the significant impact level at all exceedance locations Therefore, we conclude that the Project would not cause or significantly contribute to an exceedance of the NAAQS and cumulative impacts on environmental justice communities related to air quality. Air Quality impacts are more fully addressed in section 4.11.1 and cumulative air quality impacts are discussed in this section.

Construction and operation of the project would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources (including those listed in table 4.13-2) and would contribute incrementally to future climate change impacts. While the climate change impacts taken individually may be manageable for certain communities, the impacts of compounded extreme events (such as simultaneous heat and drought, or flooding associated with high precipitation on top of saturated soils) may exacerbate preexisting community vulnerabilities and have a cumulative adverse impact on environmental justice communities.

This EIS is not characterizing the Project's GHG emissions as significant or insignificant because the Commission is conducting a generic proceeding to determine whether and how the Commission will conduct significance determinations going forward.[162] GHG impacts are more fully addressed in section 4.11.1 and cumulative GHG impacts are discussed in this section.

As described throughout this EIS, the proposed Project would have a range of impacts on individuals living in the vicinity of the Project facilities, including environmental justice populations. Based on our analysis, environmental justice communities in the study area would experience cumulative impacts on wetlands, surface water, aquatic resources, socioeconomics, traffic, noise, air quality, GHG and significant visual impacts related to the project and the additional projects listed in table 4.13-2. Cumulative impacts on environmental justice communities related to wetlands, surface water, aquatic resources, visual resources, socioeconomics, traffic, noise, and air quality would be less than significant. However, cumulative impacts related to visual resources would be significant.

4.13.2.8 Air Quality

Construction

Air emissions during construction would be limited to vehicle and construction equipment emissions and dust and would be localized to the project construction sites. Construction of the Project would result in increases in emissions of criteria pollutants, VOCs, HAPs, GHG, and fugitive dust emissions from combustion of fuel in vehicles and equipment; dust generated from excavation, grading, and fill activities and driving on unpaved roads; and general construction activities (e.g., coating and welding operations). Generally, construction projects within the geographic scope for construction air quality with multiple-year overlapping construction schedules or single-year projects that occur in the same year could cumulatively contribute to air quality impacts. Construction impacts vary based on factors such as timing of the construction projects, intensity and type of construction activity underway at any given time, quantity and size of emission-producing equipment in operation, distance separating the projects, soil silt content, quantity of dust-producing material being handled, and dry or windy conditions. Other projects that occur within the geographic scope for analysis of the cumulative impact on air quality during construction include maintenance dredging of the Calcasieu Ship Channel, the Calcasieu Pass LNG project, and the Calcasieu Pass Slurry Line.

Construction activities at the CP2 LNG project could overlap with construction of Commonwealth. Although the main terminal portion of the CP2 LNG project would be constructed beyond the 1.0-mile geographic scope of cumulative impacts on air quality related to construction, a portion of the CP2 LNG marine facilities would be constructed within 1.0 mile of the Terminal. Fugitive dust emissions would be at their peak during facility footprint clearing and earth moving, and if these activities were to occur at the same time, there could be a temporary cumulative air quality impact from fugitive dust. Emissions of criteria pollutants from combustion of fuel in equipment and vehicle exhausts from construction of both projects could also contribute to cumulative air impacts in the region. These emissions would be minimized by typical control techniques such as the use of low-sulfur diesel fuel, proper operation of equipment, and minimization of daily emissions by only working during daylight hours (versus 24-hour operations). If intensive construction activities were occurring simultaneously, such as in the civil phase of construction, there would be a temporary cumulative air quality impact from emissions from equipment and vehicle exhaust.

If maintenance dredging of the Calcasieu Ship Channel and/or operation of CP2 LNG dredge slurry line were to occur at the same time as construction of Commonwealth, emissions of criteria pollutants from

162 *See* Order on Draft Policy Statements, 178 FERC ¶ 61,197 (2022).

combustion of fuel in equipment and vehicle exhausts from the combined projects could also contribute to cumulative air impacts in the region. Commonwealth would minimize impacts on air quality during construction by adopting the following measures:

- require that contractors meet all air quality requirements and employ equipment that meets relevant emission standards;
- require contractors to properly maintain and operate construction equipment to minimize exhaust emissions, including minimizing engine idling time; use paved roads, when practical, and water unpaved roads being used, as needed;
- apply water to dirt stockpiles;
- cover open haul trucks, as needed;
- limit vehicle speeds;
- apply water to disturbed areas, as needed; and
- stabilize disturbed areas upon completion of construction.

Additionally, Commonwealth would require vehicular and/or barge exhaust and crankcase emissions from gasoline and diesel engines to comply with applicable EPA mobile source emission regulations (40 CFR 85) by using equipment manufactured to meet these specifications. The other projects in the geographic scope would also be expected to follow similar BMPs to minimize impacts on air quality.

The combustion and fugitive dust emissions that would occur during construction would be largely limited to the immediate vicinity of the existing Terminal site and to a lesser extent in the areas where the Pipeline would be constructed. These would subside once construction has been completed. Therefore, we conclude the construction-related impact on local air quality during construction of the Terminal and Pipeline would not be significant. Given Commonwealth's implementation of mitigation, and the temporary timeframe of construction activities plus the minor overlap of construction facilities with the CP2 LNG Project (i.e., only a portion of the project would be constructed within the geographic cumulative impacts scope of the Project), we conclude that the Project would not contribute significantly to cumulative impacts on air quality during construction.

Operations

Emission sources from operation of the Project would be associated with the gas turbines, generators, LNG storage tanks, two thermal oxidizers, two flare systems, gas pretreatment unit, LNG carrier emissions, and vehicle travel emissions. Under federal and LDEQ regulations, the Terminal is considered a major PSD emission source and would contribute to cumulative impacts on air quality within the cumulative impact area. The potential for other projects to cumulatively interact with emissions from the Project depends on the type of project, its stage of development, and the impact of significant ongoing air pollutant emissions to overlap with either a compressor station or the Terminal.

Air quality would be affected by operation of the present and future actions considered in the cumulative impact analysis (figure 4.13-3). There are 36 cumulative actions identified within the geographic scope for operational air quality impacts, which is within 50 kilometers (31.1 miles) of the proposed Terminal. These projects include nine FERC-jurisdictional projects, three energy projects, six industrial projects, four transportation projects, 11 residential projects, and three municipal, educational, and commercial projects. Impacts on air quality from projects beyond 50 kilometers would be below *de minimis* thresholds.

Operational emissions from several projects within the operational cumulative geographic scope for air quality are small, dispersed, and accounted for in background concentrations used in NAAQS modelling for larger point sources (e.g., underground pipeline or electrical transmission lines with minimal emissions, residential heating, and vehicle traffic on roadways). Therefore, these projects were not discussed individually.

Construction of the other projects with operational air emissions requiring permits for point source emissions (e.g., Calcasieu Pass LNG, CP2 LNG) would result in air quality impacts similar to the Project. These projects that are considered major sources of air emission would be required to conduct a PSD analysis and meet similar permit conditions as the Commonwealth Project. In addition, any other potential future projects that are considered major sources of air emissions would be required to conduct a PSD analysis. Should operation of a new project result in a significant impact on air quality, the LDEQ would enforce operational limitations or require emissions controls that ensure compliance with the state implementation plan and attainment with the NAAQS. In addition, Commonwealth would be required to comply with any LDEQ permit conditions during operation.

As detailed in section 4.11.1.6, Commonwealth performed a cumulative modeling analysis for each pollutant that exceeded the SIL (1-hour and annual NO_2, 1-hour SO_2, and 24-hour $PM_{2.5}$). Commonwealth's pollutant sources were modeled along with additional (background) sources from off-site inventory (obtained from LDEQ's Emissions and Inventory Reporting Center) within the pollutant-specific area of impact and averaged over five years to determine source contribution in comparison with the NAAQS. The area of impact was established as the distance from the Project to the farthest receptor that showed a modeled impact greater than the SIL in the significance modeling analysis. The background sources inventory included all sources within the area of impact plus 15 km and all major sources within the area of impact plus 20 km (in either case the area of impact would not extend beyond 50 km due to the accuracy constraints of dispersion models). The sources modeled included the Calcasieu Pass LNG facility as well as other existing LNG facilities in the Lake Charles vicinity.

Modeling indicated the maximum impact plus background sources for 1-hour NO_2 also exceeded the NAAQS of 188 $\mu g/m^3$. None of the other three pollutants exceeded the respective NAAQS concentrations. Per LDEQ protocols, Commonwealth conducted a source contribution analysis to determine whether the Project would contribute significantly to the modeled 1-hour NO_2 NAAQS exceedance. The modeling output provided the following: the predicted modeled maximum impact plus background sources concentrations for all locations within 50 km of the Project site that exceeded the NAAQS for 1-hour NO_2; the Project-only maximum concentrations at the locations; the respective percentage that the Project would contribute to the maximum impact concentrations; and the distance from the Project where the NAAQS would be exceeded (see appendix H). FERC conducted additional modeling to incorporate the impacts from the Project's stationary sources as well as LNG carriers and tugs in the moored safety zone into the source contribution analysis conducted for LDEQ.

Number	Name	Number	Name	Number	Name
1	Calcasieu Pass LNG Terminal and Trans Cameron Pipeline	16	Calcasieu Pass Slurry Line	37	Southside Machine Works
2	Cameron LNG Project	17	Calcasieu Chip Channel (USACE Port of Lake Charles)	38	Subdivision: Belle Savanne
3	Cameron LNG Expansion Project	18	Advanced Refining Technologies	39	Subdivision: Carlyss Place
4	Driftwood LNG Project	19	Lake Charles Methanol	44	Subdivision: Savannah Lakes
5	Lake Charles LNG	20	Indorama Ventures	45	Subdivision: Lakes at Morganfield
6	Magnolia LNG	22	G2X Big Lake Fuels	46	Subdivision: Village at Morganfield
7	Delfin LNG	24	Lake Charles Regional Airport	47	Subdivision: Cove at Morganfield
9	Port Arthur Pipeline Louisiana Connector	25	Port Louisiana (formerly Port Cameron)	48	Subdivision: Oak Grove
10	CP2 LNG and CP Express Project	26	West Calcasieu Port Projects	49	Subdivision: Beau Blanc
11	Cameron Access Project	28	I-210 Prien Lake Bridge Project	50	Subdivision: Crest at Morganfield
12	Cameron LNG – Entergy Transmission Line and Switchyard	32	I-10: West of LA 108 to I-210 interchange	51	Subdivision: Highland Hills
13	Lake Charles LNG – Entergy Transmission Line	34	McNeese State University	52	Graywood Subdivision
14	Magnolia LNG – Entergy Transmission Line	35	Cameron Courthouse	53	Morganfield Subdivision

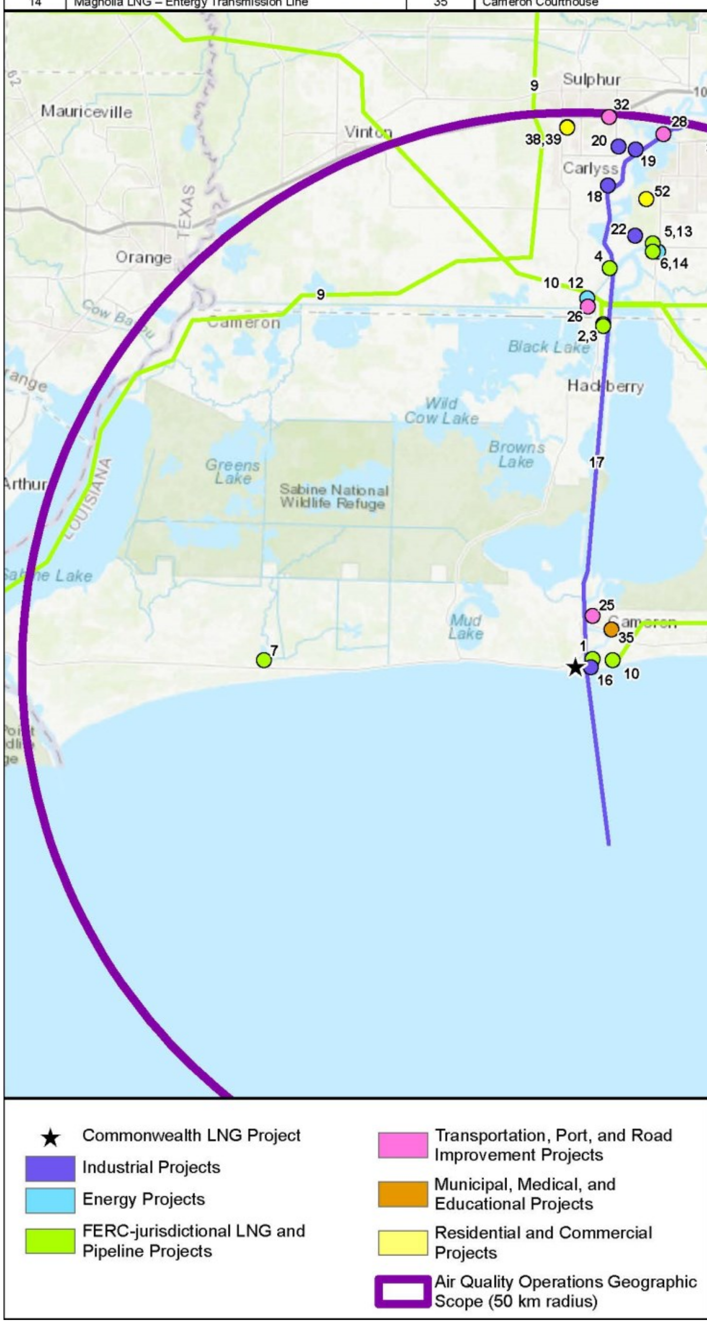


Figure 4.13-3

Commonwealth LNG Project

Activities within the Air Quality Study Area

The modeling results indicate the proportions of the NAAQS exceedance concentrations attributable to the Project are very small, both for the LNG stationary source-only analysis as well as the inclusion of LNG carriers and tugs. In fact, the exceedances would still be predicted in the absence of the Project (i.e., the existing background emissions sources from LDEQ's Emissions and Inventory Reporting Center are driving the NAAQS exceedances). In the instance of the highest overall modeled maximum impact for stationary sources plus background sources concentration (229 $\mu g/m^3$), the Project-only concentration contribution (0.0004 $\mu g/m^3$) is well below the SIL concentration for 1-hour NO_2 (7.5 $\mu g/m^3$). Similarly, in the instance of the highest overall modeled maximum impact for stationary sources and LNG carriers and tugs, plus background sources concentration (308 $\mu g/m^3$), the Project-only (inclusive of LNG carriers and tugs) concentration contribution (0.005 $\mu g/m^3$) is well below the SIL concentration for 1-hour NO_2 (7.5 $\mu g/m^3$). The Project-only (LNG stationary sources) and Project-only plus LNG carriers and tugs concentration contributions at the NAAQS-exceedance locations in which the Project's contribution is the highest of the total modeled maximum impact plus background sources concentration (0.43 $\mu g/m^3$ and 2.8 $\mu g/m^3$, respectively) are both well below the SIL concentration for 1-hour NO_2. The modeling analysis demonstrates that the proposed Project would not cause or contribute to a potential NAAQS exceedance and would only contribute a minor amount to cumulative air impacts with the geographic scope of this analysis.

4.13.2.9 Noise

The proposed Terminal site is in a primarily rural area with a few industrial sites to the north and east along the Calcasieu Ship Channel. The nearest NSA to the proposed Terminal, an RV site used as a year-round residence by the landowner (NSA 2), is approximately 0.4 mile to the west. The 3-mile Pipeline is also in a rural area, with noise levels along the Pipeline route influenced by rural background sources. The RV site west of the Terminal is also within 0.5 mile of the HDD site and the southern terminus of the Pipeline route (section 4.11.2). A second NSA, temporary ship pilot residences on the southern end of Monkey Island (NSA 1), is approximately 0.5 mile northeast of the Terminal. Construction noise would be generated over an extended period of approximately 36 to 38 months at the Terminal site and for about 12 months for the Pipeline. Construction activity and associated noise levels associated with the Project or with other projects within the geographic scope for cumulative impacts would vary depending on the construction activities. The highest level of construction noise typically occurs during earth-moving and pile-driving work. Commonwealth expects peak construction noise to occur during construction months 10 through 12 when earth moving activities would coincide with pile driving and dredging at the Terminal. The sound level impacts on NSAs due to construction activities would depend on the type of equipment used, the duration of use for each piece of equipment, the number of construction vehicles and machines used simultaneously, and the distance between the sound source and receptor. Construction of Commonwealth and CP2 LNG is likely to overlap if both projects are permitted and constructed. Both projects would conduct pile-driving activities during daytime hours. Although the CP2 LNG terminal is more than 1.5 miles east of the Project Terminal, the marine facility would be approximately 0.65 mile northeast of the Terminal. At approximately 1.25 miles northeast of NSA 2, the CP2 LNG marine facility would be beyond the geographic range for cumulative noise impacts on NSA 2. However, NSA 1 is immediately adjacent to the proposed location of the CP2 LNG marine terminal and within 0.5 mile of the Project marine facilities. Cumulative construction noise impacts on NSA 1 if pile driving and/or dredging were to occur simultaneously at both locations would likely be significant, due primarily to impacts from the CP2 LNG project. In section 4.11.2.4 we recommend that Commonwealth restrict construction noise levels to less than 55 dBA L_{dn} (48.6 dBA L_{eq}) between the hours of 7:00 p.m. and 7:00 a.m.

It is possible that dredging at Commonwealth, Calcasieu Pass LNG, CP2 LNG, and/or periodic channel maintenance could occur simultaneously. As detailed in table 4.11.2-5, the likely worst-case noise impacts of dredging at the Project alone at NSA 1 would result in 24-hour (L_{dn}) values of 60.1 dBA. If simultaneous dredging activities occurred, the Project has the potential to contribute to cumulative noise impacts on nearby NSAs. In response to our recommendation in the draft EIS, Commonwealth has provided measures it would implement to reduce the projected nighttime noise levels to at or below 55 dBA Ldn at NSA 1 and how it would monitor the noise levels during dredging activities. With implementation of an effective noise mitigation plan for nighttime dredging, Commonwealth's contribution to cumulative noise impacts would be temporary and limited to daytime hours.

Operation of the Terminal site would produce noise on a continuous basis, primarily from compressor piping and air coolers. The underwater noise impacts on wildlife are discussed in section 4.6.2. The combined operation of the Project and the Calcasieu Pass LNG terminal could result in an increase of the average ambient noise level at NSA 1 (the CP2 LNG terminal would be more than 1 mile from the Project Terminal and NSA 1 and the Calcasieu Pass LNG terminal and the CP2 LNG site are both more than 1 mile from NSA 2). The Commission required Calcasieu Pass LNG to implement noise controls to ensure operating noise levels at NSAs (including Commonwealth's NSA 1) would be at or below the 55 dBA threshold. As detailed in section 4.11.2.4, Commonwealth does not expect 24-hour (L_{dn}) Terminal operation noise levels at NSA 1 to exceed 52.3 dBA (55.5 dBA combined Terminal plus ambient noise). We have included a recommendation in section 4.11.2.4 for Commonwealth to modify operation of the liquefaction facilities or install additional noise controls to keep operation noise levels below 55 dBA if a full power load noise survey conducted by Commonwealth after start-up indicates noise levels due to facility operation are above the 55 dBA threshold. The combined operation of the Project and Calcasieu Pass LNG, if both terminals are operating at 55 dBA noise levels, would be approximately 58.0 dBA. This would be an increase in the average ambient noise level at NSA 1 but, at 3.1 dBA, the increase would likely not be perceptible to humans per EPA documentation (1978). Therefore, operation of the Terminal would likely contribute to cumulative noise increases but these increases would not be significant.

Normal operations of the proposed Pipeline would not result in permanent noise impacts on NSAs. Pipeline blowdown events could generate temporary noise impacts (likely lasting 20 minutes to 2 hours) and planned events could allow for slower gas release and be scheduled for daytime hours, thus reducing the noise impacts. Emergency pipeline blowdowns can occur at any time but are typically infrequent and of short duration. All blowdown events for the Pipeline would be routed through the Terminal flaring system. Due to their temporary nature, blowdown events (planned or unplanned) would cause a negligible contribution to potential cumulative noise impacts on NSAs.

4.13.2.10 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 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 *Emergency Response Plan* (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. Therefore, 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.

4.13.2.11 Climate Change

Several commentors raised concerns regarding Project emissions of GHGs and associated climate change impacts. Climate change is the variation in the Earth's climate (including temperature, precipitation, humidity, wind, and other meteorological variables) over time. Climate change is driven by accumulation of GHGs in the atmosphere due to the increased consumption of fossil fuels (e.g., coal, petroleum, and natural gas) since the early beginnings of the industrial age and accelerating in the mid- to late-20th century.[163] The GHGs produced by fossil-fuel combustion are carbon dioxide, methane, and nitrous oxide.

In 2017 and 2018, the U.S. Global Change Research Program[164] issued its Climate Science Special Report: Fourth National Climate Assessment, Volumes I and II.[165] This report and the recently released report by the Intergovernmental Panel on Climate Change, Climate Change 2021: The Physical Science Basis, state that climate change has resulted in a wide range of impacts across every region of the country and the globe. Those impacts extend beyond atmospheric climate change alone and include changes to water resources, agriculture, ecosystems, human health, and ocean systems.[166] According to the Fourth Assessment Report, the United States and the world are warming; global sea level is rising and oceans are acidifying; and certain weather events are becoming more frequent and more severe.[167] These impacts have accelerated throughout the end of the 20th and into the 21st century.[168]

GHG emissions do not result in proportional local and immediate impacts; it is the combined concentration in the atmosphere that affects the global climate system. These are fundamental global impacts that feedback to local and regional climate change impacts. Thus, the geographic scope for cumulative analysis of GHG emissions is global, rather than local or regional. For example, a project 1 mile away emitting 1 ton of GHGs would contribute to climate change in a similar manner as a project 2,000 miles distant also emitting 1 ton of GHGs.

Climate change is a global concern; however, for this analysis, we focus on the existing and projected climate change impacts on the general Project area. The USGCRP's Fourth Assessment Report notes the following observations of environmental impacts are attributed to climate change in the southeast region of the United States (USGCRP, 2017; USGCRP, 2018):

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163 INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, UNITED NATIONS, *Summary for Policymakers* of CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS (Valerie Masson-Delmotte et al. eds.) (2021), https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf (IPCC Report) at SPM-5. Other sources contribute to climate change, such as agriculture, forest clearing, and other anthropogenically driven sources.

164 The U.S. Global Change Research Program is the leading U.S. scientific body on climate change. It comprises representatives from 13 federal departments and agencies and issues reports every 4 years that describe the state of the science relating to climate change and the effects of climate change on different regions of the United States and on various societal and environmental sectors, such as water resources, agriculture, energy use, and human health.

165 U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE SCIENCE SPECIAL REPORT, FOURTH NATIONAL CLIMATE ASSESSMENT | VOLUME I (Donald J. Wuebbles et al. eds) (2017), https://science2017.globalchange.gov/downloads/CSSR2017_FullReport.pdf (USGCRP Report Volume I); U.S. GLOBAL CHANGE RESEARCH PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT, VOLUME II IMPACTS, RISKS, AND ADAPTATION IN THE UNITED STATES (David Reidmiller et al. eds.) (2018), https://nca2018.globalchange.gov/downloads/NCA4_2018_FullReport.pdf (USGCRP Report Volume II).

166 IPCC Report at SPM-5 to SPM-10.

167 USGCRP Report Volume II at 73-75.

168 *See, e.g.*, USGCRP Report Volume II at 99 (describing accelerating flooding rates in Atlantic and Gulf Coast cities).

- The decade of 2010 through 2017 has been warmer than any previous decade since 1920 for average daily maximum and average daily minimum temperature;
- since 1960, there have been lower numbers of days above 95 degrees F compared to the pre-1960 period but during the 2010's the number of nights above 75 degrees F has been nearly double the average over 1901 – 1960. The length of the freeze free season was 1.5 weeks longer on average in the 2010s compared to any other historical period on record;
- number of days with 3 or more inches of rain has been historically high over the past 25 years. The 1990s, 2000s, and 2010s rank first, third and second, respectively in number of events;
- summers have been either increasingly dry or extremely wet, depending on location;
- due to a combination of sea level rise and soil subsidence, approximately 2,006 square miles of land has been lost in Louisiana between 1932 and 2016, or about 23 square miles per year; and
- in southeast Louisiana, relative sea level is rising at a rate of 1 to 3 feet per 100 years.

The USGCRP'S Fourth Assessment Report notes the following projections of climate change impacts in the Project region (Southeast US) with a high or very high level of confidence[169] (USGCRP, 2018):

- climate models project nighttime temperatures above 75 degrees Fahrenheit and daytime maximum temperatures above 95 degrees Fahrenheit become the summer norm. Nights above 80 degrees Fahrenheit and days above 100 degrees Fahrenheit, which are now relatively rare, would become common;
- 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.

It should be noted that while the impacts described above taken individually may be manageable for certain communities, the impacts of compound events (such as simultaneous heat and drought, wildfires associated with hot and dry conditions, or flooding associated with high precipitation on top of saturated soils) can be greater than the sum of the parts.[170]

The GHG emissions associated with construction and operation of the Project were identified and quantified in section 4.11.1. Project construction would result in 547,314 tpy of CO_2e emissions (equivalent to 496,515 metric tpy of CO_2e), inclusive of pipeline, terminal, barge, and commissioning emissions.

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169 The report authors assessed current scientific understanding of climate change based on available scientific literature. Each "Key Finding" listed in the report is accompanied by a confidence statement indicating the consistency of evidence or the consistency of model projections. A high level of confidence results from "moderate evidence (several sources, some consistency, methods vary and/or documentation limited, etc.), medium consensus." A very high level of confidence results from "strong evidence (established theory, multiple sources, consistent results, well documented and accepted methods, etc.), high consensus." https://science2017.globalchange.gov/chapter/front- matter-guide/.

170 USGCRP Report Volume II.

Emissions of GHGs are typically expressed in terms of CO_2e.[171] Direct GHG emissions from the operation of the Project would result in an annual increase of CO_2e emissions of about 3,559,091 tpy (equivalent to 3,228,754 metric tpy). The estimate for operational emissions is based on the facilities being operated at maximum capacity for 365 days per year, 24 hours per day. Additionally, the estimate includes fugitive and vented blowdown emissions and mobile emissions sources, including berthed vessels, auxiliary engines of vessels in transit, and maintenance dredging. Construction and operation of the Project would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources globally and would contribute incrementally to future climate change impacts. To assess impacts on climate change associated with the Project, Commission staff considered whether it could identify discrete physical impacts resulting from the Project's GHG emissions or compare the Project's GHG emissions to established targets designed to combat climate change.

To date, Commission staff have not identified a methodology to attribute discrete, quantifiable, physical effects on the environment resulting from the Project's incremental contribution to GHGs. Without the ability to determine discrete resource impacts, Commission staff are unable to assess the Project's contribution to climate change through any objective analysis of physical impact attributable to the Project. Additionally, Commission staff have not been able to find an established threshold for determining the Project's significance when compared to established GHG reduction targets at the state or federal level. This EIS is not characterizing the Project's GHG emissions as significant or insignificant because the Commission is conducting a generic proceeding to determine whether and how the Commission will conduct significance determinations going forward.[172]

To provide context for the Project emissions on a national level, we compare the Project's GHG emissions to the total GHG emissions of the United States as a whole. At a national level, 5,222.4 million metric tons of CO_2e were emitted in 2020 (inclusive of CO_2e sources and sinks; EPA, 2021). The construction-related emissions of the Project could potentially increase CO_2e emissions based on 2020 levels by 0.01 percent. The operational emissions could potentially increase CO_2e emissions based on the 2020 national levels by 0.06 percent.

To provide context of the Project emissions on a state level, we compare the Project's GHG emissions to the state GHG inventories. At the state level, energy related CO_2 emissions in Louisiana were 194.9 million metric tons of CO_2e in 2019 (EIA, 2022). GHG emissions in Louisiana would result from the Project's direct construction and operational emissions; no end-use is expected in Louisiana as the natural gas would be exported from the United States. Construction emissions from the Project could potentially increase CO_2e emissions based on the Louisiana 2019 levels by 0.3 percent and Project operations could potentially increase emissions by 1.7 percent.

The state of Louisiana has established executive targets in 2020 to reduce net GHG emissions 26 to 28 percent by 2025 and 40 to 50 percent by 2030, compared to 2005 levels. The targets also aim for net-zero GHG emissions by 2050. As indicated in table 4.11.1-7, direct GHG emissions from the operation of the Terminal would result in an annual increase in CO_2e emissions of about 3,559,091 tpy (equivalent to

171 GHGs are converted to CO_2e by means of the global warming potential; the measure of a particular GHG'sability to absorb solar radiation; and its residence time within the atmosphere, consistent with the EPA's established method for reporting GHG emissions for air permitting requirements that allows a consistent comparison with federal regulatory requirements.

172 *See* Order on Draft Policy Statements, 178 FERC ¶ 61,197 (2022).

3,228,754 metric tpy). This would represent 3.2 percent of Louisiana's 2030 projected GHG emission levels, assuming the reductions from 2005 levels summarized above.[173]

The social cost of GHGs is an administrative tool intended to quantify, in dollars, estimates of long-term damage that may result from future emissions of CO_2, nitrous oxide, and methane. We include a disclosure of the social cost of GHGs associated with the reasonably foreseeable emissions from the Project using the calculations described below. We note there is pending litigation challenging federal agencies' use of the Interagency Working Group (IWG) on Social Cost of Greenhouse Gases' interim values for calculating the social cost of GHGs.[174] In addition, the CEQ noted that it is working with representatives on the GHG IWG to develop additional guidance regarding the application of the Social Cost of Carbon tool in federal decision-making processes, including in NEPA analyses.[175] The Commission has not determined which, if any, modifications are needed to render the Social Cost of Carbon tool useful for project-level analyses.[176]

As both EPA and CEQ participate in the IWG, we used the methods and values contained in the IWG's current draft guidance but note that different values would result from the use of other methods.[177] Accordingly, we calculated the social cost of CO_2, nitrous oxide, and methane. For the analysis, we assumed discount rates of 5 percent, 3 percent, and 2.5 percent,[178] assumed the Project would begin service in 2026, and, based on Commonwealth's statements that the Terminal would have a 30-year operational life,[179] that the Project's operational emissions would be at a constant rate throughout 2050, the last year of values provided by the IWG.[180] Noting these assumptions, the emissions from construction and operation of this Project up to 2050 are calculated to result in a total social cost of GHGs equal to $909,939,824, $3,590,938,694, and $5,481,667,409, respectively (all in 2020 dollars).[181] Using the 95th percentile of the

173 Louisiana's CO2 emissions in 2005 were 201.9 million metric tons; therefore, we consider the 2025 GHG emission target to be 145.4 million metric tons (assuming a 28 percent reduction) and the 2030 target to be 100.9 million metric tons (assuming a 50 percent reduction).

174 *Missouri v. Biden*, 8th Cir. No. 21-3013; *Louisiana v. Biden*, No. 21-cv-1074-JDC-KK (W.D. La). On February 11, 2022, the U.S. District Court for the Western District of Louisiana issued a preliminary injunction limiting federal agencies' employment of estimates of the social costs of GHGs and use of the IWG's interim estimates. On March 16, 2022, the U.S. Court of Appeals for the Fifth Circuit issued a stay of the district court's preliminary injunction, finding among other things that the federal agency respondent's continued use of the interim estimates was lawful. *Louisiana v. Biden*, No. 22-30087 (5th Cir. Mar. 16, 2022).

175 Council on Environmental Quality's May 27, 2021 Comments filed in Docket No. PL18-1-000, at 2.

176 See Order Issuing Certificates and Approving Abandonment, 178 FERC ¶ 61,199 (2022) at fn 141.

177 *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990*, Interagency Working Group on Social Cost of Greenhouse Gases, United States Government, February 2021 (IWG Interim Estimates Technical Support Document).

178 IWG Interim Estimates Technical Support Document at 24. To quantify the potential damages associated with estimated emissions, the IWG methodology applies consumption discount rates to estimated emissions costs. The IWG's discount rates are a function of the rate of economic growth where higher growth scenarios lead to higher discount rates. For example, IWG's method includes the 2.5% discount rate to address the concern that interest rates are highly uncertain over time; the 3% value to be consistent with Office of Management and Budget Circular A-4 (2003) and the real rate of return on 10-year Treasury Securities from the prior 30 years (1973 through 2002); and the 5% discount rate to represent the possibility that climate-related damages may be positively correlated with market returns. Thus, higher discount rates further discount future impacts based on estimated economic growth. Values based on lower discount rates are consistent with studies of discounting approaches relevant for intergenerational analysis. *Id.* at 18-19, 23-24.

179 See accession no. 20220624-5157

180 Tables A-1, A-2, and A-3 in the *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990* provide the cost per year for each GHG through 2050.

181 The IWG draft guidance identifies costs in 2020 dollars. *Id.* at 5 (Table ES-1).

social cost of GHGs using the 3 percent discount rate,[182] the total social cost of GHGs from the Project is calculated to be $ $10,924,865,401 (in 2020 dollars).

We received comments from the public stating that indirect, upstream, and downstream greenhouse gas emissions constitute the vast majority of emissions that would be caused by the Project and therefore FERC should analyze these emissions.. The courts have explained that because the authority to authorize LNG exports rests with DOE, NEPA does not require the Commission to consider the upstream or downstream GHG emissions that may be indirect effects of the export itself when determining whether the related LNG export facility satisfies section 3 of the NGA.[183] Nevertheless, NEPA requires that the Commission consider the direct GHG emissions associated with a proposed LNG export facility.[184]

We also received multiple comments from the public stating that FERC failed to take a hard look at the technological and economic feasibility of reducing the Project's emissions through carbon capture and sequestration (CCS), or even to explain whether FERC agreed with Commonwealth's assertion that CCS is economically infeasible in part due to a lack of existing infrastructure to support CCS. We received another comment stating that CCS is not a feasible solution to address climate change due to it being prohibitively expensive, energy-intensive, and unproven at scale and because it would promote additional fossil fuel production.

The DOE is a cooperating agency on this Project. DOE has conducted research and development to enhance technical understanding and reduce cost for capturing and safely using or storing CO_2. DOE has awarded funding to help projects working to accelerate the deployment of Carbon Capture Utilization and Sequestration. In implementing the Bipartisan Infrastructure Law, DOE is pursuing further advancements in all aspects of Carbon Capture Utilization and Sequestration.

To evaluate the feasibility of CCS on this Project, Commonwealth provided a BACT Analysis, which reviewed the feasibility of implementing carbon capture on this Project.[185] Carbon capture involves CO_2 capture, CO_2 transport, and CO_2 sequestration. CO_2 capture can be accomplished through amine absorption technology or steam methane reforming. CO_2 capture through amine absorption is feasible based on physical, chemical, and engineering principals, while steam methane reforming is not feasible. As Sierra Club notes, Commonwealth is proposing an amine-based absorber system that is essentially equivalent to that used for carbon capture for pipeline pretreatment, which is amenable to capture. The Project is therefore technically able to capture CO_2. Commonwealth also states in their BACT analysis that although CO_2 transport is feasible, there are no CO_2 sequestration facilities beneath the Gulf of Mexico seabed in Cameron Parish or near the Project site. Nearby projects, such as the Gulf Coast Sequestration Project (onshore in southwest Louisiana between near the Sabine River on the Louisiana-Texas border and west of Lake Charles), the Hackberry Carbon Sequestration project (proposed for construction approximately 16 miles northwest of the Project and with the business plan of capturing, transporting, and storing CO_2 primarily from Cameron LNG), and the Denbury Green Pipeline (a CO_2 pipeline, which is 37 miles from the Project) are still in development.. Therefore, Commonwealth states that due to a lack of sequestration infrastructure, carbon capture and sequestration are not feasible for the Project.

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182 This value represents "higher-than-expected economic impacts from climate change further out in the tails of the [social cost of CO_2] distribution." *Id*. at 11. In other words, it represents a higher impact scenario with a lower probability of occurring.

183 *See Freeport*, 827 F.3d at 46-47; *see also Sierra Club v. FERC*, 867 F.3d 1357, 1373 (D.C. Cir. 2017) (*Sabal Trail*) (discussing *Freeport*).

184 *See Freeport*, 827 F.3d at 41, 46.

185 See appendix F within the Agency Correspondence under accession no. 20210930-5255.

Commonwealth's position notwithstanding, we note that other LNG projects in the general Project vicinity, such as Rio Grande LNG, LLC (Docket No. CP22-17) in Texas and Venture Global's CP2 LNG project (Docket No. CP22-21), which would be constructed about 1.5 miles from the proposed Commonwealth LNG terminal, have proposed carbon capture and sequestration as feasible for their projects. To-date Rio Grande LNG has not provided details regarding the process it would use to implement CCS at its project. Venture Global states that CO_2 would be routed from its acid gas removal unit for transport and sequestration to an offshore platform approximately 3 miles south of the project site in State of Louisiana waters.[186] Venture Global states the pipeline alignment, platform location, and well location are in the siting stage of project development. Without additional information, we are unable to evaluate the feasibility of CP2 LNG's sequestration site for the Commonwealth Project.

186 See accession no. 20220722-5160.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS OF THE ENVIRONMENTAL ANALYSIS

The conclusions and recommendations in this final EIS are those of the FERC environmental staff. Our conclusions and recommendations will be further developed with input from the COE, USCG, DOE, DOT, EPA, FWS, and NMFS, as cooperating agencies. However, the cooperating agencies will present their own conclusions and recommendations in their respective Records of Decision or determinations. The cooperating agencies can adopt this EIS consistent with 40 CFR 1501.3 if, after an independent review of the document, they conclude that their requirements have been satisfied. Otherwise, they may elect to conduct their own supplemental environmental analyses.

We conclude that construction and operation of the Commonwealth LNG 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 would also occur as part of the Project. As part of our analysis, we developed specific mitigation measures that are practical, appropriate, and reasonable for the construction and operation of the Project. We are, therefore, recommending that these mitigation measures be attached as conditions to any authorization issued by the Commission. Implementation of our recommended mitigation and the mitigation and minimization measures proposed by Commonwealth would avoid or reduce impacts to mostly less than significant levels. This determination is based on our review of information filed by Commonwealth, and further developed from data requests, scoping, literature research, and contacts with federal agencies. A summary of the Project impacts and our conclusions are presented below by resource.

5.1.1 Geologic Resources

The Project exists within a limited range of geologic conditions and resources. The topography at the Terminal site is primarily flat, ranging from 0 to 8 feet NAVD. Topographical relief throughout the site is limited to chenier ridges and shallow wetland ponds. To construct the Terminal in accordance with federal safety regulations, Commonwealth would raise site topographic elevations to between 5 and 8 feet NAVD using general and engineered fill sourced off-site from state-approved locations free of contamination. The Pipeline and associated aboveground facilities would be constructed inland with the same topography and geologic characteristics as the Terminal (though no chenier ridges are present along the Pipeline right-of-way). The topography of the Pipeline right-of-way is flat, with topographical relief limited to shallow wetland ponds and ditches, consisting of Holocene clay and silt that are underlain by Pleistocene-age soils encountered 25 feet to 35 feet below ground surface.

Oil and natural gas resources are prevalent in Louisiana and offshore of its coastline. However, natural gas or unspecified product wells within 0.25 mile of the Project site are dry and plugged, plugged and abandoned, or inactive. The Project would not affect active mining or nonfuel mineral resources would during construction or operation.

Generally, the potential for geologic hazards such as earthquakes,soil liquefaction, landslides, or fault-induced subsidence to significantly affect construction or operation of the Project is low. The potential for impacts on the Terminal due to geologic hazards discussed in the Reliability and Safety section. The potential impacts on the Pipeline are discussed here. Increased storm activities, shortage of sediment supply, and sea level rise have made shoreline erosion a major concern in southern Louisiana. We received numerous scoping comments regarding the potential susceptibility of the Project to coastal erosion. The Project could potentially be affected by erosion of the coast of the Gulf of Mexico immediately south of the Terminal and erosion of the western shoreline of the Calcasieu Ship Channel on which the Terminal would be constructed. The average shoreline erosion rate in Cameron Parish was 15 feet per year between 1998 and 2009. However, the proposed southern edge of the Terminal is more than 900 feet from the Gulf of Mexico shoreline and the Pipeline would be more than 0.5 mile inland. Therefore, even at the erosion rate of 30 feet per year, the Pipeline would not be affected by erosion of the Gulf of Mexico shoreline within the 30-year design lifespan of the Project.

Vessel wakes and propeller thrust from the large commercial vessels that transit the Calcasieu Ship Channel daily can exacerbate the shoreline erosion of unprotected portions of the riverbank, which occurs naturally due to winds and tides. However, stabilizing and armoring the shoreline with seawalls and riprap can moderate such impacts. The northern extent of the Terminal site shoreline is currently protected by a concrete bulkhead, and the southern extent is protected by an existing riprap revetment that extends to the mouth of the Calcasieu River and connects to the western Calcasieu River Jetty. Commonwealth would stabilize the shoreline of the marine facility, the only area that currently has exposed shoreline, with a sheet pile bulkhead and riprap. Consequently, the full extent of the Terminal site shoreline on the Calcasieu Ship Channel would be protected from erosion. The portion of the Pipeline closest to both the Gulf of Mexico and Calcasieu Ship Channel shoreline is where the Pipeline would enter the Terminal. This portion of the Pipeline would be no closer than approximately 0.5 mile from either shoreline and therefore would not be susceptible to impacts from coastal erosion during the lifespan of the Project.

The full extent of the proposed 3.0-mile-long pipeline would be buried, protecting it from direct physical forces related to waves, wind, and floodwaters. In areas of open water or where the right-of-way is generally inundated, the Pipeline would be fitted with a concrete coating as a buoyancy countermeasure. This would further protect the Pipeline from the effects of floodwaters.

Commonwealth has proposed to use the HDD method to cross Highway 27/82 and a roadside ditch immediately adjacent to the highway. The total distance of the HDD would span approximately 1,940 feet. Commonwealth's risk assessment of the hydraulic fracture and drilling fluid surface release potential for the Highway 27/82 HDD indicates that, based on the proposed depth of cover, the diameter of the final reamed hole, and the low shear-strength fine-grained soils, typical of coastal marsh environments, that are expected to be present along the HDD alignment, there is a "moderate" risk of an inadvertent release under Highway 27/82 and subsequent highway settlement on the order of one inch. For the remainder of the HDD alignment, including the roadside ditch waterbody adjacent to Highway 27/82, Commonwealth's assessment indicates the risk of an inadvertent release is "high" to "very high." In response to our recommendation in the draft EIS, Commonwealth filed a revised *HDD Contingency Plan*, which provides a detailed approach for reducing the potential for inadvertent releases along the HDD alignment and a detailed plan for responding to inadvertent releases in wetland and waterbodies. Additionally, Commonwealth is engaging the LDOTD to develop an alternative plan for crossing Highway 27/82 if an unacceptable amount of settlement beneath Highway 27/82 occurs during construction despite the approaches presented in its revised *HDD Contingency Plan*. To avoid environmental impacts in the event LDOTD requires Commonwealth to cross Highway 27/82 at a different location if settlement beneath the highway is deemed unacceptable, we recommend in section 4.1.5.6 that Commonwealth complete and file with the Secretary an alternative plan for crossing Highway 27/82 that has been developed in consultation with the LDOTD and successfully complete the HDD or alternative plan for crossing Highway 27/82 prior to the start of construction of the remainder of the Pipeline right-of-way.

With implementation of our recommendation and Commonwealth's revised *HDD Contingency Plan*, we conclude that impacts on geological resources would be adequately minimized and the potential for impacts on the Project from geologic hazards also would not be significant.

5.1.2 Soils

The soils of the Project site are relatively uniform. All soils at the Project site are classified as hydric soils with high compaction potential and low to moderate potential to be eroded by water or wind.

Construction of the Terminal would impact 118.8 acres of soils. The impacts on 105.7 acres would be permanent. Construction of the Pipeline would impact 48.4 acres, of which 0.3 acre would be permanent.

Commonwealth assessed the Project site for potentially contaminated sediments. A Phase I Environmental Site Assessment identified fill and dredged material near the north end of the proposed marine facility. Therefore, Commonwealth conducted an Inland Testing Manual Tier I Evaluation, which consists of a comprehensive analysis of existing information and data from field evaluations conducted in the Project area, to assess whether there are known instances of contaminated soils in the Project area. The results of the evaluation indicate there are no known contaminated soils present.

Four locations (13 individual sites) of potential contamination were identified within 0.125 mile of the Terminal; however, none of the sites are within the proposed construction work area and the regulatory status of the sites are such that no further action is required to remediate the locations. Therefore, the Project is not anticipated to be affected by any of the identified sites. Consequently, the Terminal site would not impact contaminated soils and sediments.

If construction activities were to uncover any type of contamination, Commonwealth would coordinate with the appropriate agencies, and follow the procedures in its *Unanticipated Contaminated Sediment and Soils Discovery Plan.* We have reviewed this plan and found it acceptable.

All 48.4 acres of soils that the Pipeline would cross are classified as compaction prone. Commonwealth would use low-ground pressure construction equipment and geo-textile fabric or mats during construction to reduce potential rutting and compaction, where appropriate. Commonwealth would implement the FERC's *Plan* and Commonwealth's *Procedures* during construction and restoration of the Pipeline construction right-of-way. Accordingly, the right-of-way would be graded and restored to natural site contours. Restoration would include deep tilling in areas of compaction and Commonwealth would repair rutted areas prior to seeding, mulching, and final revegetation.

Construction and operation of the Project would convert about 106 acres of hydric and compaction-prone soils to industrial/commercial use. This constitutes a permanent, but not significant, impact due to the abundance of similar soil types in the vicinity of the Project. Based on the overall soil conditions present in the Project area and the Project's proposed construction and restoration methods, we conclude that construction and operation of the Project would not significantly alter the soils of the region.

5.1.3 Water Resources

5.1.3.1 Groundwater Resources

Although the Project is within the Chicot aquifer system (an EPA designated sole-source aquifer), its location is within a coastal area that does not provide recharge to any major Louisiana freshwater aquifers; therefore, we conclude the Project would not affect the availability or quality of water within the sole-source aquifer. Additionally, Commonwealth conducted several Phase I Environmental Site Assessments to gauge the potential for groundwater contamination in the vicinity of the Project. The results of these extensive database searches indicate no evidence of groundwater contamination at or within the vicinity of the Project location.

Project activities with the greatest potential to affect groundwater include excavation, pile installation, potential spills of hazardous materials, and groundwater withdrawals. Excavations for construction have the potential to intercept groundwater, thereby affecting groundwater quality and/or quantity. Although these excavations would generally be shallow (e.g., facility foundation piles driven to approximately 120 feet below ground level), groundwater throughout much of the Terminal site is expected to be at or near the ground surface. Therefore, dewatering may be required during excavation and would occur in accordance with the FERC *Plan* and Commonwealth's *Procedures*. A potential impact associated with driven piles is the cross contamination of lower permeable aquifer zones through downward vertical seepage from one layer to another. The piles proposed for the Project facilities are 80 to 120 feet long and would not penetrate the confining unit, which is greater than 200 feet under the Project site. At this depth, the piles would stay within the upper (shallow) permeable zone of the Chicot aquifer. Subsurface materials above the aquifer consist of clay, silty clay, and sandy clay, which reduce permeability and limit both vertical and horizontal water flow. Due to the proposed depth of pile foundations and the characteristics of the material above the Chicot aquifer, we conclude the potential for cross-contamination of groundwater is low.

An accidental release of hazardous substances, such as fuels, lubricants, and coolants while constructing or operating the Terminal could potentially impact groundwater. Commonwealth would construct and operate the Terminal in accordance with its *SPAR Plan*. The *SPAR Plan* includes planning and measures for spill avoidance; general BMPs, including refueling procedures, lists of required spill response equipment to be kept on-site, and proper management of typical fuels, lubricants, and hazardous materials management; general spill response procedures; reportable spill response procedures; cleanup requirements; and waste storage and disposal requirements. We have reviewed the *SPAR Plan* and found it to be acceptable.

Commonwealth would use surface water from the Calcasieu Ship Channel for hydrostatic testing of Project components such as the LNG storage tanks and the pipeline. Commonwealth would use municipally sourced water from Water District 10 for dust control and needs for fresh and potable water during construction and operation. Water District 10 has informed Commonwealth that it has the infrastructure and water availability to provide water to the Project site without affecting other users in the district.

Overall, we conclude that significant impacts on the groundwater resources underlying the Terminal would not occur due to a lack of active public or private drinking water supply wells within 150 feet of the site's construction work area; construction of the proposed Project would avoid crossing aquifer confining layers; and surficial mitigation measures that Commonwealth would implement in the event of a hazardous material spill. Further, the Terminal site is underlain by multiple strata of dense clay content, which provide a restrictive layer to slow or prevent the downward migration of surface and near-surface waters or contaminants, thereby providing a natural protective barrier to groundwater quality.

5.1.3.2 Surface Water

Surface water resources associated with the Project include the Calcasieu Ship Channel, two unnamed waterbodies within the 118.8-acre Terminal site workspace, and five unnamed waterbodies along the Pipeline right-of-way. The primary impacts on surface waters related to construction and operation of the Terminal would result from dredging activities, marine traffic, stormwater runoff, water use, hydrostatic testing, and accidental spills or other releases of hazardous substances.

To create a recessed berthing area for the marine facility, Commonwealth would dredge the Calcasieu Ship Channel at the Terminal location using a barge-mounted cutterhead suction dredge. Commonwealth would dredge about 1.73 million cubic yards of material during construction and about 152,000 cubic yards from a 47-acre area during each maintenance dredge. During construction and the subsequent maintenance dredges, the dredged material would be primarily transported via floating pipeline to an approved DMPA. In-water dredging would increase the rates of turbidity and sedimentation in the Calcasieu Ship Channel and the DMPA. In April 2021, Commonwealth conducted Project site-specific turbidity modeling to estimate the potential levels of water column turbidity that could occur during construction and maintenance dredging. The modeling report indicates maximum turbidity concentrations associated with dredging would range, depending on the velocity of the tidal flow during dredging, from approximately 122 to 128 mg/L adjacent to the cutter head; 3 to 51 mg/L at 1 meter above the cutter head; and 0.1 to 10 mg/L at 2 meters above the cutter head. Background turbidity concentrations in the Calcasieu River are estimated to range between 10 and 45 mg/L. Based on dredging literature published by NMFS and Commonwealth's site-specific modeling, we conclude the proposed dredging at the Terminal site would increase suspended sediment and turbidity levels at the Terminal site in the immediate vicinity of the dredging activity; however, sediment and turbidity levels would be indistinguishable from ambient water conditions outside of a small radius surrounding the dredge cutterhead. Therefore, we conclude that dredging impacts on surface waters at the Project site would be temporary and not significant.

Marine traffic associated with construction and operation of the Terminal could impact surface water resources as a result of ship movements, including propeller use, wave action, and ballast water exchanges. Throughout construction of the Project, general cargo carrier vessels, barges, and support vessels would deliver heavy equipment and materials to the Terminal. The marine construction fleet would likely include vessels such as dredge barges, heavy lift cranes, derrick crane barges, deck barges, tugs, and support vessels. The support vessels anticipated include booster pump barges, tender boats, work barges, material barges, fuel barges, personnel shuttles, and survey vessels. Commonwealth estimates an average of seven supply barges per week would call at the Terminal site during construction. Commonwealth anticipates an average of three LNG carriers per week (156 LNG carriers per year) would call on the Terminal during operations.

Increased marine traffic related to the Project could impact water quality through an increased likelihood of shoreline erosion due to vessel wakes. Shoreline stabilization to prevent erosion related to vessel wakes would be achieved using a combination of sheet piles and rip rap along the entire Calcasieu Ship Channel-facing shoreline within the LNG Facility. Areas adjacent to the proposed Terminal are already armored for erosion. Use of the channel by barges and support vessels to deliver materials during construction of the Terminal facilities would be consistent with the use of this active shipping channel, and associated impacts on water quality would be minor.

The LNG carriers and some construction delivery vessels would discharge ballast water into the Calcasieu Ship Channel during LNG loading in accordance with federal regulations. USCG regulations require that all vessels that would discharge ballast water into U.S. waters must either ensure the ballast water meets the ballast water discharge standard as defined in 33 CFR 151.2030(a), be fitted with approved ballast water treatment systems (as described in 33 CFR 151.2025(a)(3)), or ballast exclusively with water from a U.S. public water system (33 CFR 151.2035). The ballast water discharged at the LNG carrier berth would be composed mainly of Gulf of Mexico ocean water. Because the proposed Terminal site and berthing area are within the lower Calcasieu River Ship Channel (about 0.2 mile from the Gulf of Mexico), potential differences in salinity, dissolved oxygen, and pH resulting from ballast water discharge are expected to be minor and may not be measurable under normal tidal cycles. Furthermore, Commonwealth would ensure any visiting vessels possess documentation to demonstrate compliance with ballast water regulations and implement BMPs prior to allowing any ballast water to be discharged at the LNG carrier berth. Therefore, we conclude that significant impacts on surface waters would not occur as a result of ballast water discharge.

Commonwealth would grade the Terminal site such that rainwater runoff would flow from north to south into a constructed stormwater retention and settling pond at the south end of the Terminal. Commonwealth would divert runoff from process equipment areas into drainage piping leading to oil-water separators to remove hydrocarbons from the runoff prior to pumping it into the retention and settling pond. Commonwealth would subsequently pump stormwater from the retention pond over the Terminal's storm protection wall and into the Calcasieu Ship Channel. Given that the stormwater retention system is designed to accommodate significant storm events and minimize erosion, we conclude impacts from stormwater runoff at the Terminal would be minor. Further, Commonwealth would construct its stormwater system to be in compliance with LPDES permit conditions.

Commonwealth would use surface water from the Calcasieu Ship Channel for LNG storage tank hydrostatic testing. Hydrostatic testing of the LNG storage tanks would require about 9.7 million gallons of water. The volumetric flow of the Calcasieu Ship Channel is approximately 115 cubic meters per second and water for hydrostatic testing would be withdrawn at a rate of less than 0.23 cubic meters per second. The anticipated water withdrawal is estimated at about 0.2 percent of the volumetric flow of the Calcasieu River. Withdrawals would be only as needed, on an infrequent basis and only during construction. Therefore, we conclude the withdrawal of water from the Calcasieu Ship Channel for hydrostatic testing would have minimal impacts on surface water.

Construction and operation of the Terminal, as well as marine traffic to and from the Terminal, have the potential to adversely impact water quality in the event of an accidental release of a hazardous substance such as fuel, lubricants, coolants, or other material. Commonwealth would implement the measures outlined in the FERC's *Plan* and Commonwealth's *Procedures* to minimize the likelihood of a spill and would implement its *SPAR Plan* in the event of a spill. Additionally, LNG carriers are required to develop and implement a Shipboard Oil Pollution Emergency Plan (SOPEP), which includes measures to be taken when an oil pollution incident has occurred, or a ship is at risk of one. Commonwealth would further minimize the risk of a spill by implementing general preventative BMPs, including personnel training, equipment inspection, secondary and spill containment structures for fuels, vehicles, or equipment, and refueling procedures

Commonwealth would use open-cut methods to install the Pipeline across the three major waterbodies along the right-of-way and HDD methods for the crossings of the two intermediate waterbodies. Commonwealth has also proposed to repair an existing but hurricane-damaged bridge to cross an intermediate waterbody at MP 2.9 as part of its temporary access road to transport equipment to the Pipeline HDD exit point. Crossing the waterbodies using open-cut methods and repairing the damaged bridge for the access road would cause temporary increases in sediment and turbidity and risk spills of hazardous liquids within the waterbodies. Commonwealth would implement measures outlined in its *SPAR Plan* and *Procedures* to minimize the potential impacts of sediment and spills of hazardous materials in waterbodies. Crossings using HDD methods would reduce the potential for impacts. However, use of the HDD method could result in an inadvertent release of drilling fluids in the waterbodies, which could temporarily impact water quality. Commonwealth would follow protocols in its revised *HDD Contingency Plan* that include a detailed approach for responding to inadvertent surface releases of drilling fluids in the waterbodies under which the HDD would pass..

Construction and operation of the Project would impact water quality within the vicinity of the Project resulting from dredging, maintenance dredging, marine traffic, stormwater runoff, and pipeline waterbody crossings. However, through implementation of Commonwealth's *Procedures*, *SPAR Plan*, revised *HDD Contingency Plan* and general BMPs, potential construction and operation impacts on surface waters would be adequately minimized and temporary or avoided and would not be significant.

5.1.4 Wetlands

A total of 95.9 acres of wetlands would be impacted by construction of the Terminal, of which 89.6 acres would be permanently impacted for operations. The wetlands that would be permanently impact include EEM (65.8 acres), EFO (14.3 acres), and ESS (9.5 acres) wetlands. Additionally, 6.3 acres would be temporarily impacted for a construction and laydown area within EEM wetlands. Construction of the Pipeline would disturb 43.6 acres of wetlands, all EEM communities, of which 0.3 acre would be permanently impacted by aboveground facilities. Ninety percent of the Pipeline right-of-way would cross wetlands and the other 10 percent of the right-of-way would cross open water (drainage ditches and ponds). Commonwealth would construct one temporary access road at the south end of the Pipeline right-of-way and otherwise use uses low-ground-pressure equipment and equipment mats during construction.

We received multiple comments from the public expressing concern that construction of the Terminal would negatively alter surface water flow of the wetlands surrounding the Project site. As part of its application to the FERC, Commonwealth conducted a Hydraulic Impact Analysis study to determine how best to maintain water flow through the wetlands. Based on the findings of this study, Commonwealth proposes to construct a culvert extending from the west side of the Terminal, along its southern edge, and into the Calcasieu River. The preliminary design of the structure includes a variable crest weir at its outlet at the Calcasieu River that would allow it to maintain the natural drainage patterns of the existing wetlands. Further, Commonwealth would design the outlet structure to allow tidal inflow into the culvert and surrounding wetlands (i.e., the structure would not contain a backflow prevention device at the outlet) and would contain continuously open fish bays/slots that would allow aquatic fauna to access the culvert and surrounding wetlands. Commonwealth would consult with state and federal agencies, including OCM, NMFS and the COE, to confirm the final design of the structure.

Commonwealth would restore the 6.3 acres of temporarily impacted wetlands at the Terminal site by planting native wetland vegetation in accordance with Commonwealth's *Procedures* and *Workplace Restoration Plan*. Commonwealth proposes to construct the Pipeline using a 110-foot-wide construction right-of-way. After construction, Commonwealth proposes to maintain access to a 3.5-foot-wide permanent right-of-way. Commonwealth would restore the entire Pipeline right-of-way (i.e., including the permanent right-of-way) with native wetland vegetation in accordance with Commonwealth's *Procedures* and revised *Workplace Restoration Plan*. Commonwealth would monitor and record the success of wetland revegetation annually for the first three years following construction. If revegetation does not meet the prescribed restoration criteria specified in Commonwealth's *Procedures* within three years of construction, Commonwealth would develop a remedial revegetation and monitoring plan, in consultation with a professional wetland ecologist, to continue revegetation efforts and file a report annually documenting progress until revegetation is successful.

Commonwealth would use the HDD method to cross Highway 27/82 and adjacent waterbodies. As noted above, Commonwealth's revised HDD risk assessment indicated the likelihood of an inadvertent release of drilling fluids into the EEM wetlands along the HDD alignment is "high" to "very high." Commonwealth would follow protocols in its revised *HDD Contingency Plan*, which provides a detailed approach for reducing the potential for an inadvertent release of drilling mud, a detailed contingency plan for responding to an inadvertent release of drilling mud in wetland habitat, and a plan to mitigate for any adverse impacts on wetlands.

We conclude that through implementation of the measures in Commonwealth's revised *Workspace Restoration Plan,* Project-specific *Procedures*, and revised *HDD Contingency Plan*, construction impacts on wetlands related to the Terminal construction and laydown area and Pipeline construction would be short term and not significant. Commonwealth would comply with the CWA and mitigate for permanent impacts on 89.9 acres of wetlands through purchase of wetland mitigation bank credits at an amount directed by the COE and OCM. We conclude this would sufficiently offset the overall impacts on wetlands of the United States to less than significant levels.

5.1.5 Vegetation

The primary vegetation communities in the Project area are EEM, ESS, and EFO wetlands with brackish or intermediate salinity. Additionally, during scoping, the FWS and LDWF expressed concern for impacts on chenier communities, which are considered communities of special concern in Louisiana, in the Project area. Cheniers provide storm barriers, limit saltwater intrusion, and provide stopover sites for migratory birds.

The Project would impact 142.0 acres of vegetation (not including open water) during construction, of which 92.4 acres would be permanently impacted during operation. The Terminal would impact 98.4

acres during construction, of which 92.1 acres would remain impacted during operation. The Pipeline would impact 43.6 acres during construction, of which 0.3 acre would remain impacted during operation. The majority of the construction impacts would occur in EEM wetlands (82 percent). The remaining vegetation types (EFO wetland and cheniers, ESS wetland, and open) would each comprise 10 percent or less of the construction impacts. Operation would primarily impact EEM wetlands (72 percent), EFO wetlands and cheniers (16 percent), and ESS wetlands (10 percent). EEM wetlands would comprise the entirety of the temporarily impacted vegetation communities. Commonwealth would restore the temporarily impacted vegetation as described in the wetlands section. Commonwealth would comply with the CWA and mitigate for the permanent loss of wetland vegetation through purchase of wetland mitigation bank credits at an amount determined by the COE and OCM. Therefore, we conclude that Project impacts on vegetation resources would be short-term and minor or adequately mitigated.

Commonwealth would use measures outlined in our Plan and Commonwealth's *Procedures* and *Invasive Species Management Plan* to the minimize risk of invasive species proliferating at the Project site and would monitor disturbed areas for invasive species. Commonwealth has worked with the NRCS and LDWF to establish appropriate restoration seed mixes, weed and invasive plant treatment methods, and monitoring protocols. Additionally, Commonwealth would also implement the restoration measures in its *Workspace Restoration Plan*, which includes planting and monitoring a mixture of gulf cordgrass, smooth cordgrass, saltmeadow cordgrass, and saltgrass seedlings at 36-inch spacing within the temporary construction and laydown area. Eight chenier areas were identified within the Project area, all within the Terminal site. Seven of the chenier areas displayed wetland soil and hydrology characteristics and were also considered forested marsh. One chenier area was in an area identified as upland. Due to the similarities in vegetation composition between the wetland and upland chenier areas, all chenier areas were grouped together in the forested marsh/chenier vegetation class used for impact calculations. Permanent impacts from the Terminal would total 13.3 acres of chenier and represent a small portion of the overall surrounding chenier community. A total of 23.6 acres of existing chenier would remain within the Terminal property. The LDNR reports over 2,000 acres of existing chenier habitat in coastal southwest Louisiana. LDWF recommended that Commonwealth restore and preserve unaffected chenier habitat in the vicinity of the Project to mitigate for unavoidable permanent impacts on chenier habitat at the Project site. Accordingly, Commonwealth has committed to eradicating feral hogs from the Terminal property and installing a hog exclusion fence around the perimeter of the Terminal property and the 23.6 acres of chenier habitat that would not be affected by construction. Commonwealth would preserve the chenier areas on the Terminal property for the life of the Project (anticipated to be 30 years). The relatively small permanent loss of chenier and the anticipated mitigation would result in a minor overall reduction in acreage, but potentially higher value cheniers within the Project area would be preserved. Therefore, we conclude that Project impacts on cheniers would not be significant.

5.1.6 Wildlife Resources

Wildlife habitats associated with the Project site are dominated by coastal wetlands, scrub/shrub and forested wetlands, areas of open water, cheniers, open land, and beach. The Terminal site consists of each of these habitat types, whereas the proposed Pipeline right-of-way is entirely comprised of EEM wetlands. Generally, these habitat types support a diverse ecosystem that provides nutrients, cover, shelter, and water for a variety of terrestrial and aquatic wildlife species, including waterfowl, wading birds, nesting birds, raptors, mammals, fish, reptiles, and amphibians.

Project impacts on wildlife habitat broadly consist of replacing the vegetated and open water habitat with surfacing materials such as concrete or gravel. Potentially suitable cover, nesting, and foraging habitat for some wildlife species would be reduced due to clearing and removal of vegetation. Individuals of smaller, less mobile wildlife, such as reptiles and amphibians, could be inadvertently killed by construction equipment. More mobile species, such as adult birds and larger mammals, may relocate to similar habitats nearby when construction activities commence. The permanent reduction in available habitat within the area as well as the influx of individuals to other nearby areas may increase population densities of certain species, resulting in increased inter- and intra-specific competition and reduced reproductive success of individuals.

Other indirect effects on wildlife may include increased noise and light during construction. Construction noise could force individuals to move out of the Project area and expend more energy finding replacement habitat. This disruption of normal behavioral patterns could lead to reduced feeding, increased risk of predation, delayed reproduction, and increased juvenile mortality. Increased lighting associated with Project construction could also result in animal displacement, including the avoidance or abandonment of an area. The level of displacement is dependent on the sensitivity of the species and the surrounding vegetation types. Most of these construction impacts would only last for the duration of construction; however, there would be some displacement resulting from permanent habitat loss.

Operation of the Terminal would also result in increased noise, lighting, and human activity that could disturb wildlife in the area. The potential disturbance to wildlife would be similar as those described for construction. However, much of the wildlife known to be present at the site (e.g., racoons, nutria, waterfowl) are common species that are habitat generalists (with the notable exception of the eastern black rail) and are generally tolerant of anthropogenic. Other wildlife may be driven away from the site and not return. Impacts on wildlife related to operation of the Pipeline would primarily include periodic noise associated with maintenance vehicles and human activity near the aboveground facilities. However, these impacts would be temporary and infrequent. Therefore, it is anticipated that operational impacts of the Project on wildlife would be minimized to the extent practical and would not have any population level effects on the wildlife.

There are 44 Birds of Conservation Concern species that have been documented in or are probable to occur in the vicinity of the proposed Project. Additionally, the Project location is entirely within the Chenier Plain IBA, one of Louisiana's largest IBAs. The extensive wetlands in this IBA are home to over 360 species of birds, including ducks, egrets, geese, rails, raptors, wading birds, and shorebirds. A small but disproportionately important feature of this IBA is the Louisiana Chenier Plain. As noted above, cheniers provide important stopover habitat for neotropical migratory birds.

Commonwealth would attempt to clear vegetation at the Terminal and Pipeline right-of-way to avoid the migratory bird nesting season (March 1 to July 31). If the construction schedule requires clearing during the migratory bird nesting season, Commonwealth would consult with the FWS regarding appropriate methods to minimize impacts on migratory birds. Additionally, prior to construction, Commonwealth would conduct field surveys for the presence of colonial nesting waterbird rookeries, following FWS and LDWF guidance. Although there are currently no known rookeries in the vicinity of the Project site, if an active rookery is identified, Commonwealth would comply with FWS and LDWF requirements for construction activities during nesting season.

Commonwealth has also committed to implementing FWS-recommended measures to avoid or reduce potential flare impacts on migratory birds during Terminal operations. Commonwealth would follow its *Facility Lighting Plan* to minimize, to the extent feasible for safe operations, light pollution impacts on migratory birds. Given the extent of industrial activities and lighting to the north and east on the Calcasieu Ship Channel, we conclude Commonwealth's proposed flare structures, flaring activities,[187] and artificial lighting at the Terminal would not represent a significant impact on migratory birds.

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187 Outside of emergency situations, Commonwealth estimates flaring would be required for approximately 30 days during startup of the Terminal and then for no more than 12 hours during the first year of operation and 6 hours per year in subsequent years.

As noted, Commonwealth has proposed a compensatory wetland mitigation plan that requires replanting temporarily disturbed wetlands and purchasing wetland bank mitigation credits at an amount determined by the COE and OCM. Commonwealth has also proposed eradicating feral hogs from the chenier habitat at the Terminal site that would not be affected by construction and subsequently fencing the chenier habitat to preserve it from human and hog impacts for the life of the Project. The proposed compensatory wetland mitigation would preserve migratory bird habitat, in the form of wetlands, in the general Project vicinity and removing hogs from the cheniers would promote the recovery of an important migratory bird habitat type. Given Commonwealth's proposed mitigation and its commitment to implementing the construction and operation BMPs noted above, we conclude the Project would not represent a significant impact on migratory birds.

5.1.7 Aquatic Resources and Essential Fish Habitat

5.1.7.1 Aquatic Resources

Construction and operation of the Project would impact the estuarine waters of the Calcasieu Ship Channel at the mouth of the Calcasieu River, a tidal slough that flows across the Project footprint from its west side and into the Calcasieu Ship Channel to the east, and tidally influenced wetlands present within the footprint of the Terminal and the Pipeline. Each of these resources likely provides year-round habitat for various aquatic species.

The primary impacts on aquatic resources during construction and operation of the Terminal include those associated with dredging and construction of the marine facility (including pile installation). Impacts on aquatic resources resulting from construction and operation of the Pipeline could include loss or modification of habitat, increased sedimentation and turbidity levels, and alteration of vegetative cover resulting from waterbody crossings; entrainment of small organisms during withdrawal of hydrostatic test water; and introduction of pollutants resulting from inadvertent spills or leaks of hazardous materials.

Dredging would temporarily increase turbidity, and suspended solids within the water column. Increases in turbidity and suspended solids can affect the physiology and behavior of marine organisms. Impacts on aquatic resources due to increased turbidity and suspended solid levels would vary by species; however, the aquatic resources within the Project area are likely accustomed to regular fluctuations in turbidity levels. On this basis, we conclude that impacts on aquatic resources from dredging-related turbidity and sediment resuspension would be localized, temporary, and minor.

Dredging would remove the estuarine bottom sediments used as habitat by some aquatic species. Although the dredging-related impacts would be greatest on the benthic community within the dredging area, impacts on fish and shrimp species, such as red drum and brown and white shrimp, could also occur. However, these impacts are expected to be localized and temporary.

Generally, shallow habitats (less than 60 feet) that frequently experience disturbances from waves, wind, and/or currents typically contain early successional species assemblages that reestablish themselves relatively quickly after a disturbance. Therefore, we conclude that the impacts on the benthic community due to the initial and maintenance dredging of the marine facility would be temporary and minor.

Dredging of the marine facility and subsequently placing the dredge spoils at a non-jurisdictional BUDM site approximately 6 miles northeast of the Project site, within the Cameron Prairie NWR, would temporarily affect 47.0 acres of estuarine mud bottom and estuarine water column at the marine facility and 666.2 acres of tidal intermediate marsh and estuarine soft bottom and estuarine water column through placement of the dredge slurry transport pipeline and deposition of dredged sediment at the BUDM site. The FWS would use the dredged sediment at the BUDM site for restoration of estuarine shallow subtidal habitat, mudflat habitat, and as substrate for restoration of estuarine emergent marsh. Commonwealth has not proposed to use the placement of the dredged sediment at the DMPA as wetland mitigation under Section 404 of the CWA.

Pile driving would produce underwater noise sufficient to injure and/or alter the behavior of fish, sea turtles, and marine mammals a considerable distance from the point of disturbance. Although existing noise levels in the Calcasieu Ship Channel are generally high, NMFS noted that based on the size of the piles that Commonwealth would be driving the use of noise attenuation devices and pile driving BMPs would be necessary to avoid adverse impacts on aquatic species. Commonwealth has committed to using cushion blocks and bubble curtains around the piles during in-water pile driving activities and would also implement NMFS-recommended BMPs to mitigate noise impacts on aquatic species.

The potential effects of ballast water on water quality are described in the water resources section. Resident species within the Calcasieu Ship Channel are euryhaline and are well adapted to natural spatiotemporal variation in salinity and oxygen levels. This adaptability and the ability to move over a short distance to more suitable conditions minimizes adverse impacts on aquatic resources associated with ballast water discharges. Therefore, we conclude that the impacts on aquatic resources from ballast water discharges associated with the Project would not be significant.

Vessels berthed at the marine facility would also withdraw water from the Calcasieu Ship Channel. Ballast and cooling water intake can cause aquatic organisms to become impinged (i.e., becoming trapped against an intake screen due to the velocity of the intake flow) or entrained (i.e., being pulled through an intake screen and into the cooling water system). Studies indicate each LNG carrier call at the marine facility would result in potential entrainment of less than one-tenth of one percent of the ichthyoplankton population in the Calcasieu Ship Channel. Given the generally high natural mortality rates of eggs and larvae in the water column, we conclude that these impacts would not be significant.

Aquatic resources could be adversely affected by an accidental spill or leak of hazardous materials into or near a waterbody. To minimize impacts on aquatic resources, Commonwealth would implement its *SPAR Plan*, which would minimize the potential for releases to occur and reduce response time and ensure appropriate cleanup if a spill occurred. In addition, LNG carriers are required to develop and implement a SOPEP that include measures to be taken when an oil pollution incident has occurred or a ship is at risk of one. Increased vessel traffic, related to construction and operation of the Project, could impact marine mammals and sea turtles, resulting in an increase in stress, injury, and/or mortality.

Commonwealth would implement FWS-recommended measures to minimize impacts on the West Indian manatee and measures within the NMFS *Vessel Strike Avoidance Measures and Reporting for Mariners* (NMFS, 2008) to minimize impacts on other marine mammals and sea turtles. Based on existing levels of disturbance, the increase in ship traffic would be relatively small, and because of the NMFS-recommended vessel strike avoidance measures that would be communicated by Commonwealth to vessel captains, we have determined that impacts on marine mammals and turtles would not be significant.

The waterbodies that would be crossed by the pipeline are discussed in the Water Resources section. The use of open-cut methods would result in temporary loss or modification of aquatic habitat, increase in sedimentation and turbidity levels, and alteration of vegetative cover. 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. This temporary increase in suspended solids would decrease rapidly following the completion of instream activities.

Commonwealth would use the HDD method to cross intermediate waterbodies, which would avoid or minimize impacts on aquatic resources within and adjacent to waterbodies unless an inadvertent release of drilling mud were to occur. Commonwealth would follow its revised *HDD Contingency Plan* that, in part, provides a detailed approach for reducing the potential for an inadvertent release of drilling fluids, a detailed contingency plan for responding to an inadvertent release in aquatic habitat, and a plan to mitigate for any adverse impacts on aquatic habitat, including EFH.

With implementation of the measures outlined in its Project-specific *Procedures* and revised *HDD Contingency Plan*, Commonwealth would minimize impacts on waterbodies and aquatic resources during pipeline construction. Once construction is complete, streambeds and banks would be restored to their preconstruction conditions and contours to the maximum extent practicable, which would aid in preventing erosion and minimize long-term impacts on aquatic resources. With implementation of the mitigation measures described above, we anticipate that the Project would have minimal and localized impacts on aquatic resources.

5.1.7.2 Essential Fish Habitat

NMFS has emphasized that the aquatic resources potentially affected by the Project, comprising tidal brackish marsh, tidal intermediate marsh, estuarine soft bottom and estuarine water column habitat, and estuarine oyster reef habitat are areas designated as EFH for various life stages of federally managed species. Federal agencies that authorize, fund, or undertake activities that may adversely impact EFH must consult with NMFS. We requested NMFS to consider the draft EIS as our initiation of EFH consultation. Commonwealth has since revised its plans for dredge materials management and we have revised the final EIS accordingly. As such, we are now reinitiating EFH consultation with NFMS with this final EIS and appendix D.

Based on our review of the Project and correspondence from NMFS, we have concluded that construction and operation of the Project could affect EFH for species of shrimp, reef fish, red drum, coastal migratory pelagic fishes, and Atlantic highly migratory species in the Gulf of Mexico. Impacts associated with the Project would occur in the estuarine zones. The habitat types that would be affected are listed below.

- Estuarine emergent marsh: EEM wetlands present at the Terminal site, along the Pipeline right-of-way, and at the DMPA that are hydrologically connected to the Calcasieu River and Calcasieu Lake. Includes tidal brackish marsh and tidal intermediate marsh.
- Soft bottom: the estuarine mud bottom of the Calcasieu River where construction and operation of the marine facility would occur and on which the dredge slurry pipeline would be placed.
- Pelagic: the estuarine water column of the Calcasieu Ship Channel where construction and operation of the marine facility would occur.
- Estuarine oyster reef: present on shoreline armoring riprap in the intertidal and subtidal zones of the Calcasieu River shoreline within the proposed footprint of the marine facility.

The Project would result in the permanent loss of 21.1 acres of tidal estuarine emergent marsh EFH associated with the construction of the Terminal and the Pipeline's aboveground facilities. The Project would also result in the permanent loss of 2.0 acres of estuarine mud/soft bottom EFH within the Terminal footprint and short- to long-term loss of 0.05 acre of estuarine oyster reef EFH. It would permanently convert 47.0 acres of estuarine mud/soft bottom EFH present in the marine facility dredge footprint, including 2.8 acres of intertidal mudflat deemed by the COE to be a "special aquatic site," from shallow water habitat to deep estuarine mud/soft bottom EFH. We conclude these impacts would be appropriately mitigated for by Commonwealth's compliance with the CWA and MSA permitting processes. The Project is also expected to cause temporary impacts associated with in-water construction (i.e., dredging, turbidity, and pile driving-related underwater noise affecting estuarine and nearshore habitat). Dredging would account for the majority of this impact area. These impacts are expected to be of short duration, as populations of FMP species and their food sources would be expected to recover quickly following construction and maintenance dredges. Construction impacts would also be minimized through implementation of Commonwealth's *Procedures*, the *SPAR Plan*, use of a hydraulic suction dredge during dredging and bubble curtains and cushion blocks during pile driving, and the revised *HDD Contingency Plan*. Therefore, we conclude that these Project impacts would adversely affect EFH, but would be temporary to short-term in duration and not significant.

5.1.8 Threatened, Endangered, and Other Special Status Species

A total of 20 federally protected species, 1 proposed species, and 1 species that is under federal review have the potential to occur in the vicinity of the Project. Of these species, nine are marine mammals, four are birds, six are turtles, and three are fish. Potential impacts on aquatic and terrestrial habitats and species are described above and those same impacts apply to threatened and endangered species. We conclude the Project would have *no effect* or would be *not likely to adversely affect* 19 federally listed species, would have *no effect* on the species proposed as threatened, would *not contribute to a trend toward federal listing* for the 1 species under federal review. We conclude the Project *is likely to adversely affect* the threatened eastern black rail.

On June 21, 2019, the FWS concurred with our findings that the Project *is not likely to adversely affect* all listed species and critical habitat under the jurisdiction of the FWS that may be found in the vicinity of the Project, *except* the eastern black rail. However, at the time of the FWS notification, the eastern black rail was still only proposed for listing (as of October 9, 2018) and the FWS determined that Project implementation was not likely to jeopardize the continued existence of the species. The FWS provided conservation measures for Commonwealth to consider to minimize impacts on the eastern black rail and noted that additional consultation may be required if the status of the eastern black rail changed from proposed to threatened. On October 19, 2020, the NMFS stated that because all potential project effects to listed species and critical habitat under the jurisdiction of NMFS were found to be extremely unlikely to occur, insignificant, or beneficial, NMFS concluded that the proposed action *is not likely to adversely affect* listed species and critical habitat under NMFS's purview. NMFS continued that their notification concluded consultation responsibilities under the ESA for species under NMFS's purview.

The FWS formally listed the eastern black rail as threatened on October 8, 2020, effective November 9, 2020. On May 4, 2021, as required by section 7 of the ESA, the FERC submitted a BA to the FWS and requested to initiate formal consultation regarding the potential impacts of the Project on the eastern black rail. On September 16, 2021, the FWS published a BO, which stated the FWS concurred with the findings of the BA that the Project would have *no effect*, was *not likely to adversely affect*, or *would not contribute to a trend toward federal listing* for all species potentially affected by the Project, except for the eastern black rail. The FWS concurrence fulfilled the FERC's responsibilities for the Project under section 7 of the ESA for all federally listed species in the BA other than the eastern black rail. In the BO, the FWS reviewed the status of the eastern black rail, the environmental baseline for the Project area and the effects of the Project and determined that the Project is *not likely to jeopardize the continued existence* of the eastern black rail.

Additionally, the FWS issued an incidental take statement, a list of Terms and Conditions that are mandatory for Commonwealth to follow during construction of the Project, accompanying Monitoring and Reporting Requirements necessary to monitor the impacts of the allowed incidental take, and conservation recommendations for the Project. On October 6, 2021, Commonwealth formally accepted the Terms and Conditions of the BO, thereby concluding formal consultation for the Project.[188]

188 See accession no. 20211006-5079.

5.1.9 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 LDNR. To ensure compliance with this federal requirement, we recommend in section 4.8.5 that Commonwealth file the consistency determination with FERC prior to any Project construction.

The Terminal would be constructed on open land (106.1 acres), which consists primarily of emergent wetlands, developed land (26.4 acres), open water (2.7 acres), and forested land (0.2 acres). The Pipeline would be constructed on open land (43.5 acres) and open water (4.8 acres). The Terminal site is surrounded by open water and undeveloped open wetlands and the proposed Pipeline right-of-way is surrounded by open wetlands. The Terminal site and proposed Pipeline right-of-way are 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 Project. There is one residential campsite, owned by the property landowner, within the boundaries of the Terminal site. The camp residence would be removed as part of the lease agreement between Commonwealth and the landowner. There are both existing and planned industrial developments within the vicinity of the Project. Due to the industrial use of lands in the general vicinity and the previously disturbed nature of the surrounding area, impacts on land use from the Project would not be significant.

Several recreational and special interest sites are in proximity to the Project site. While the Calcasieu River would be the only one directly impacted by the Project, some may experience indirect impacts such as change in viewshed and/or increases in traffic in the area of the recreation sites. Cameron Parish is home to vital fishery resources and serves as a conduit for access to such resources in the Calcasieu Ship Channel and the Gulf of Mexico. Construction associated with the Project may temporarily impact local recreational fishing, bird watching, trapping, hunting, and boating activities as a result of increased vessel traffic within the Calcasieu Ship Channel. This increase in vessel traffic related to construction of the Project would be short term. During operations, up to 156 LNG carriers would call at the Terminal per year. While some delays would be expected during these periods, these delays would be minor and temporary and in compliance with the purpose of the waterway. The Calcasieu Ship Channel was originally constructed by the COE for navigation in support of industry. Therefore, we have determined the Project would not have any significant adverse impacts on recreational or commercial boating or fishing along the Calcasieu Ship Channel and Gulf of Mexico.

Overall, the proposed Terminal would be visible to varying degrees to users of the Calcasieu Ship Channel, nearby beaches and towns, and motorists along the Creole Nature Trail All-American Road. Although the addition of the facility would be consistent with the general character of the Calcasieu Ship Channel, the addition of the Terminal at this location would represent a significant impact on the viewshed of boaters, beachgoers, and local residents, including the RV residence adjacent to the site, as it would detract from the overall quality of the scenic views of this portion of the region.

The Pipeline would be constructed through generally flat wetlands but would not alter the landscape of the region, as the pipeline would be buried during operation. Construction of the Pipeline could result in a temporary visual impact within the viewshed of the Creole Nature Trail All-American Road but Commonwealth would restore areas disturbed during construction to their prior condition. Aboveground facilities associated with the Pipeline would include an interconnection and pig launching facility and a meter station. The closest visual receptors of the aboveground facilities would be motorists traveling along the Creole Nature Trail All-American Road, which is about 0.9 mile east of the proposed meter station location. Although the meter station may be visible from the road, given the distance, it is unlikely that it would be noticed by those driving along the road. Therefore, the visual impact of the aboveground facilities would not have a significant impact on the aesthetics of the landscape along the Pipeline route.

5.1.10 Socioeconomics

Construction of the Project would result in temporary positive impacts due to increases in construction jobs, payroll taxes, purchases made by the workforce, and expenses associated with the acquisition of material goods and equipment. Operation of the Project would not have a significant effect on the local governments' tax revenues. Construction of the Project would not have a significant adverse impact on local populations, employment, provision of community services, housing, or property values.

Vehicle traffic is anticipated to temporarily increase during construction of the Terminal due to worker vehicles, construction vehicles, and trucks taking materials and equipment to and from the site. To minimize the increase, Commonwealth would transport a majority of the construction workforce to the Project area using passenger buses from two existing parking lots in Carlyss, Louisiana. Commonwealth's traffic models indicate there would be no disruption to local traffic flow related to the off-site parking and use of passenger buses. Construction of the Pipeline would result in only minor, temporary impacts on traffic in the Project area, and operation would not result in any significant impacts on traffic or roadways. Operating the Terminal would require an estimated 65 employees. Commonwealth estimates that operation would average about 75 light vehicles per day (includes full time staff and visitors) and 10 heavy vehicles per day. No change in the LOS for the area roadways is anticipated. Based on the construction traffic assessment along LA-27, we conclude that the additional traffic generated by operations employees, visitors, and deliveries would not result in a significant increase in traffic volume on area roadways.

A 2018 marine traffic study commissioned by the Port of Lake Charles found that a projected twofold increase of vessel traffic within the Calcasieu Ship Channel would not affect the capability of the channel to effectively provide deep-water access for maritime commerce. During construction, Commonwealth proposes to deliver major material supplies and equipment to the Project via barge transport. Commonwealth estimates that an average of seven barges per week would be expected during peak construction. During operations, up to 13 LNG vessels per month (156 per year) would call on the Terminal. The USCG issued the Letter of Recommendation for the Project, which stated that the Calcasieu Ship Channel is considered suitable for LNG marine traffic in accordance with its guidance. During operations, security zones for LNG carriers in transit and use of exclusion zones could impact recreational and commercial fishing vessels within the Calcasieu Ship Channel because they would be required to stay out of the security zone while the LNG carrier passes. After the moving security zone passes, recreational boaters and fishing vessels could return and continue their prior activities. Given the Terminal's proximity to the mouth of the Calcasieu River (about 0.5 mile), we conclude the increase in construction vessel traffic and the delays associated with LNG carrier security zones are not expected to significantly impact recreational or commercial fishing.

5.1.10.1 Environmental Justice

As described throughout this EIS, the proposed Project would have a range of impacts on the environment and on individuals living in the vicinity of the Project facilities, including environmental justice populations. The closest environmental justice block groups are Census Tract 9702.01, Block Group 3 approximately 0.1 mile from the LNG Terminal (with the closest residence [pilot's temporary housing] approximately 3,300 feet away) and Census Tract 9701, Block Group 1 approximately 2.7 miles from the Pipeline. The closest town within an environmental justice community is Cameron (within Census Tract 9702.01, Block Group 3) over 2 miles away. Based on the scope of the Project and our analysis of the Project's impacts on the environment, we have determined Project-related impacts on wetlands, surface water, aquatic resources, visual resources, recreation, socioeconomics, traffic, noise, and air quality may adversely and disproportionately affect the identified environmental justice communities. In general, the magnitude and intensity of the impacts would be greater for individuals and residences closest to the Project's facilities and would diminish with distance. Visual impacts on environmental justice communities near the Terminal would be significant. As outlined in section 4.9.12.4, Commonwealth has committed to implementing a Facility Lighting Plan, which would reduce visual impacts on the environmental justice communities. Environmental justice communities in the area could also experience cumulative impacts due to the addition of other projects within the geographic scope (see section 4.13). Due to the presence of significant visual impacts on an environmental justice community and overall cumulative impacts in the project area, we conclude that impacts on environmental justice communities would be disproportionately high and adverse. Cultural Resources

Section 106 of the NHPA, as amended, requires that the FERC consider the effects of its undertakings on historic properties, and to afford the Advisory Council on Historic Preservation an opportunity to comment on proposed projects. Cultural resources surveys for the Terminal were conducted in two field studies conducted in 2018 and 2019, respectively. The resulting reports were provided to the FERC and the Louisiana SHPO. The entire Terminal, except for areas that were inaccessible, was visually inspected for cultural materials. Special attention was given to potential high-probability areas adjacent to roadways and along sand dunes. A total of 51 shovel tests were excavated during the 2018 survey and 77 shovel tests were excavated during the 2019 survey. All of the tests were negative for cultural materials. After the 2018 and 2019 surveys, the SHPO provided letters stating that no properties listed in or eligible for listing in the NRHP would be affected by the Project. We concur with the SHPO.

Commonwealth contacted the SHPO regarding the Pipeline, the marine facility, and the proposed Park and Ride lots. Commonwealth did not conduct field surveys for these locations. Instead, Commonwealth provided the SHPO a description of the Project component under inquiry, an assessment of cultural resource probability, and maps of the area and requested the SHPO's concurrence that no survey was necessary. In each instance, the SHPO indicated that no known historic properties would be affected by the project components. We concur with the SHPO.

We sent the 2018 and 2021 Project NOI to nine federally recognized Native American tribes. The Choctaw Nation of Oklahoma responded with a request for formal consultation with the FERC for the Project, GIS shapefiles of the Project area, and the cultural resources survey report. Commonwealth sent a copy of the cultural resources survey report, SHPO letter, and GIS shapefiles to the Choctaw Nation of Oklahoma. No further comments were received from the Choctaw Nation of Oklahoma. No other tribes responded to the NOIs.

In 2018 we wrote letters to the nine tribes describing the Project and requesting comments. One tribe responded to the letter. The Choctaw Nation of Oklahoma responded that the tribe had requested formal consultation with the FERC for the Project and requested GIS shapefiles of the Project area and cultural resources surveys. As noted above, Commonwealth provided the Choctaw Nation with the requested information. Commonwealth spoke over the telephone with the Coushatta Tribe of Louisiana in April 2018. The tribe requested to be kept informed of the Project. Commonwealth sent a copy of the cultural resources survey report and SHPO letter to the Coushatta Tribe of Louisiana on August 2, 2019. Commonwealth also sent follow-up emails to the Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town, 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 Tribe of Louisiana on April 2, 2019. No further comments have been received.

Commonwealth submitted a plan addressing the unanticipated discovery of cultural resources and human remains during construction. The SHPO provided comments to Commonwealth on the plan in a letter dated April 3, 2019. We also requested revisions to the plan. Commonwealth provided a revised plan addressing the SHPO's and our comments. We have reviewed the revised plan and found it acceptable.

Cultural resources surveys are complete for the Project and the SHPO and FERC concur that no historic properties would be affected. Therefore, compliance with Section 106 of the NHPA is complete.

5.1.11 Air Quality and Noise

5.1.11.1 Air Quality

Air quality would be affected by construction and operation of the Project; however, most air emissions associated with the Project would result from the long-term operation of the Terminal. Emissions during Terminal and Pipeline construction would generally be associated with onshore construction activities conducted using on-road and off-road mobile equipment and offshore construction activities conducted using marine vessels such as tugboats or barges and a dredging vessel. Vehicular and/or marine vessel emissions from gasoline and diesel engines would comply with applicable EPA mobile source emission regulations (40 CFR 85) by using equipment manufactured to meet these specifications. The combustion and fugitive dust emissions that would occur during construction would be largely limited to the immediate vicinity of the Terminal site and to a lesser extent in the areas where the Pipeline would be constructed. These emissions would represent a small portion of Cameron Parish's yearly emissions inventories and would subside once construction has been completed. Therefore, we conclude the construction-related impact on local air quality during construction of the Terminal and Pipeline would not be significant.

Impacts on air quality during operation of the Project would primarily result from emissions related to the liquefaction trains and associated generators and flare systems of the Terminal; mobile emissions sources such as cars and trucks associated with the Terminal facility; LNG carriers and associated escort tugs arriving to, berthing at, and departing from the marine facility; and emissions related to the aboveground facilities of the Pipeline. Combustion sources primarily include engines, turbines, heaters/furnaces, and flares. Non-combustion sources primarily include storage tanks, LNG loading and transfer operations, and fugitive emissions from pipeline and equipment leaks. Non-combustion emissions would occur from the Terminal facilities, Pipeline, and meter stations, as well as from one annually scheduled pipeline pigging event. Commonwealth conducted an air quality dispersion modeling analysis, which indicates that the ambient pollutant concentrations that would result from these emissions would not lead to violation of any ambient air quality standard or exceedance of any other air quality impact criterion.

Commonwealth modeled pollutant sources combined with additional (background) pollutant sources (e.g., other industry facilities) within the pollutant-specific area of impact to determine source contribution in comparison with the NAAQS. The area of impact was established as the distance from the Project to the farthest receptor that showed a modeled impact greater than the SIL in the significance modeling analysis. Commonwealth conducted a source contribution analysis to determine whether the Project would contribute significantly to the modeled NAAQS exceedance, while FERC evaluated the additional impact of LNG carriers and tugs. The proportions of the exceedance concentrations attributable to the Project are very small. In the instance of the highest overall modeled maximum impact for stationary sources plus background sources concentration (229 $\mu g/m^3$), the Project-only concentration contribution (0.0004 $\mu g/m^3$) is well below the SIL concentration for 1-hour NO_2 (7.5 $\mu g/m^3$). Similarly, in the instance of the highest overall modeled maximum impact for LNG stationary sources and LNG carriers and tugs, plus background sources concentration (308 $\mu g/m^3$), the Project-only (inclusive of LNG carriers and tugs) concentration contribution (0.005 $\mu g/m^3$) is well below the SIL concentration for 1-hour NO_2 (7.5 $\mu g/m^3$). In fact, the exceedances would still be predicted in the absence of the Project (i.e., the existing background emissions sources from LDEQ's Emissions and Inventory Reporting Center are driving the NAAQS exceedances). This modeling analysis demonstrates that the proposed Project would have a minor contribution to the modeled maximum impact, however, based on this small level of impact, we do not believe the Project would cause or contribute to the potential NAAQS exceedance. Therefore, we conclude the impact on local air quality during operation of the Terminal and Pipeline would not be significant.

Commonwealth would use a site-specific program to identify leaking equipment and minimize fugitive emissions and Commonwealth Pipeline operations would comply with all applicable PHMSA codes and advisories regarding leak detection and repair and LDEQ air quality regulations.

5.1.11.2 Noise

Noise would affect the local environment during both construction and operation of the Project facilities. In response to our recommendation in the draft EIS, Commonwealth provided a revised ambient noise survey representing current ambient conditions in the vicinity of the Terminal site. Pile driving, dredging, and internal combustion engines associated with Terminal construction would generate noise, but general construction activities associated with the Terminal would be localized to the Terminal site. Commonwealth would conduct land-based and in-water pile-driving activities during construction of the Terminal and marine facilities and use heavy machinery (e.g., earth moving equipment) powered by internal combustion engines throughout construction. Commonwealth has stated it would conduct pile driving and general construction activities between the hours of 7:00 a.m. and 10:00 p.m. We recommend in section 4.11.2.4 that Commonwealth monitor construction noise levels between the 7:00 p.m. and 7:00 a.m. and restrict the noise attributable to construction activities to no more than 55 dBA Ldn (48.6 dBA L_{eq}) at NSAs 1 and 2. Excavation and dredging would be required to create a berthing area for LNG carriers. Primary noise sources from dredging activities would include diesel engines with associated pumps, as well as a tugboat used to position the dredge for in-water activities. Construction dredging activities would be conducted on a 24-hour basis over the course of about 5 months. Maintenance dredging would require about 7 days to complete on a biennial basis. In response to our recommendation in the draft EIS, Commonwealth filed a *Nighttime Noise Monitoring Plan* that details the measures it would implement to reduce projected nighttime dredging noise levels to at or below the 55 dBA L_{dn} threshold.

During construction of the Pipeline, noise would be generated primarily by construction equipment, including HDD equipment used to install the Pipeline. General construction activities associated with the Pipeline would result in relatively temporary increases in ambient noise levels at a given location, the extent of which would vary based on the different types of construction equipment used and would only occur during daylight hours. HDD-related activities could occur during nighttime hours. Modeled noise values indicate HDD-only operations combined with ambient conditions would result in a minor increase over ambient conditions but noise levels at nearby NSAs would remain at or below the 55 dBA threshold. Normal operations of the proposed Pipeline would not result in noise impacts on NSAs.

Operation of the Terminal site would produce noise on a continuous basis. Many of the components of the Terminal facilities would be constructed with integrated noise mitigation technologies or approaches. Commonwealth conducted modeling exercises using performance data for the proposed Terminal equipment to determine whether the Terminal could operate in accordance with FERC criteria. Modeled values indicate the sound level of Terminal operations would remain below the FERC's 55 dBA threshold at nearby NSAs. However, the modeled 55 dBA contour was very close to one NSA. Therefore, in section 4.11.2, we recommend Commonwealth file full power load noise surveys within 60 days of beginning operations to confirm that Terminal noise levels do not exceed the 55 dBA threshold or modify operation of the Terminal to achieve noise levels less than the prescribed threshold.

We conclude that with implementation of the recommended noise mitigation plans for dredging and operation of the Terminal, construction and operation of the Project would not result in significant noise impacts on NSAs.

5.1.12 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 operate safely, reliably, and securely.

As a cooperating agency, the DOT assists the FERC by determining whether Commonwealth LNG Project's proposed design would meet the DOT's 49 CFR 193 Subpart B siting requirements. The PHMSA provided an LOD on the Project's compliance with 49 CFR 193 Subpart B on August 2, 2022. This determination will be provided to the Commission as further consideration to the Commission on its decision to authorize or deny the Project. If the Project is authorized, constructed, and operated, the facility would be subject to the DOT's inspection and enforcement program and final determination of whether a facility is in compliance with the requirements of 49 CFR 193 would be made by the DOT staff.

As a cooperating agency, the USCG also assisted the FERC staff by reviewing the proposed LNG terminal and the associated LNG marine vessel traffic. The USCG reviewed a WSA submitted by Commonwealth that focused on the navigation safety and maritime security aspects of LNG marine vessel transits along the affected waterway. On March 7, 2019, the USCG issued an LOR that recommended the Calcasieu River Ship Channel 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, constructed, and operated, the facilities would be subject to the USCG's inspection and enforcement program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

FERC staff conducted a preliminary engineering and technical review of the Commonwealth LNG Project design, including potential external impacts based on the site location. Based on this review, we recommend a number of mitigation measures, which would ensure 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 concluded that the Commonwealth LNG 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.

The Pipeline System and associated aboveground facilities would be constructed, operated, and maintained in compliance with DOT standards published in 49 CFR 192. These regulations are intended to minimize the potential for natural gas facility accidents and protect the public and environment. The DOT specifies material selection and qualifications; minimum design requirements; and protection from internal, external, and atmospheric corrosion. Because the Pipeline would be constructed according to the DOT regulations, we conclude that the Pipeline System would not have a significant impact on public safety.

5.1.13 Cumulative Impacts

Our analysis of cumulative impacts includes other projects in the vicinity of the proposed Commonwealth Project that could affect the same resources as the Project in the same approximate timeframe. We generally conclude that the potential impacts of the Project, when combined with the impacts from the other projects considered in the geographic scopes, would not result in a significant impact on resources. Commonwealth's proposed mitigation measures would minimize or offset Project impacts on local resources. Additionally, concurrent construction and operation of the Project and the other projects in the area would have a beneficial cumulative effect on revenues for the state and the local parishes resulting from increased expenditures from the workforce and their families and increased property taxes from the projects.

The exceptions to this conclusion are the Project's impacts on visual resources and environmental justice populations. Construction of the Project and other planned area LNG projects and port facilities would contribute to cumulative visual impacts on users of the Calcasieu Ship Channel, users of Holly and Broussard Beaches, residents in the town of Cameron, and motorists along the Creole Nature Trail All-American Road. The Creole Nature Trail is a 180-mile road that runs from Sulphur to Holly Beach and from Lake Charles down to Cameron. Construction of Commonwealth, Calcasieu Pass, and CP2 would result in several industrial sites in a concentrated area and the additional sites, including flares, lighting, and storage tanks, may be visible for several miles. Visual changes in this area would be significant compared to the conditions prior to construction of LNG projects along this portion of the Calcasieu Ship Channel.

Regarding environmental justice communities, we have determined environmental justice communities in the study area would experience cumulative impacts on wetlands, surface water, aquatic resources, socioeconomics, traffic, noise, air quality, GHG and significant visual cumulative impacts related to the project and the additional projects within the respective geographic scopes of the Project. Cumulative impacts on environmental justice communities related to wetlands, surface water, aquatic resources, socioeconomics, traffic, noise, and air quality would be less than significant. However, cumulative impacts related to visual resources would be significant.

Finally, Commonwealth's filings indicate the Project would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources and would contribute to climate change. This EIS is not characterizing the Project's GHG emissions as significant or insignificant because the Commission is conducting a generic proceeding to determine whether and how the Commission will conduct significance determinations going forward.

5.1.14 Alternatives

We evaluated several alternatives to the proposed Project, including the No-Action Alternative; system alternatives for the Terminal; alternative Terminal sites and alternative Pipeline routes. 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.

System alternatives evaluated for the Terminal included 7 existing LNG import 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 Commonwealth's purpose and need. Consequently, we must conclude that the proposed export capacity at any other existing or proposed LNG facility would require an expansion or new facilities similar to the facilities proposed for the Terminal, resulting in environmental impacts similar to the Project. These systems alternatives, therefore, offer no significant environmental advantage over the proposed Project and are not considered to be preferable.

The alternative sites we evaluated in addition to the Project site included six locations in southwest Louisiana along the Calcasieu Ship Channel, one location along the Sabine Pass Ship Channel, and one location in Plaquemines Parish along the Mississippi River. In general, these sites did not provide clear evidence of a significant environmental advantage to Commonwealth's proposed site.

We also evaluated alternative liquefaction designs for the Terminal as well as alternative power sources (i.e., offsite, grid-based electricity versus on-site natural gas-powered generators). Commonwealth's proposed liquefaction design was determined to be the smallest facility footprint that would still allow Commonwealth to achieve its stated Project purpose. Pursuing a grid-based electricity approach would require Commonwealth to construct a new transmission line from the Terminal to the closest electrical substation, approximately 29 miles north of the Terminal, and according to Commonwealth, funding cost-prohibitive upgrades to the closest power station near Lake Charles. We concluded that alternative liquefaction design and grid-based power sources would not provide a significant environmental advantage.

We evaluated four alternative pipeline routes, in addition to the proposed route to assess whether an alternate Pipeline route would significantly reduce the environmental impacts of the Pipeline. Ultimately, none of the four route alternatives assessed provided a significant environmental advantage and/or reduction in impacts on the properties of landowners relative to the proposed Pipeline route. Additionally, Commonwealth would construct the Pipeline pursuant to section 3 of the NGA, which does not grant the applicant eminent domain, and there is limited ability to ensure that a recommended alternative site would be available unless the landowner would make it available for purchase or lease. Therefore, we conclude that Commonwealth's proposed Pipeline route would be the preferred route for the Project.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission authorizes the Commonwealth LNG Project, we are recommending that the following measures be included as specific conditions in the Commission's Order. We have determined that these measures would further mitigate the environmental impacts associated with the construction and operation of the Project.

1. Commonwealth shall follow the construction procedures and mitigation measures described in its application and supplements, including responses to staff data requests and as identified in the EIS, unless modified by the Order. Commonwealth 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, or the Director's designee, **before using that modification**.
2. 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 Commonwealth LNG 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 impacts resulting from Project construction and operation.
3. **Prior to any construction**, Commonwealth shall file an affirmative statement with the Secretary, certified by senior company officials, 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.

4. The authorized facility locations shall be as shown in the EIS, as supplemented by filed plot plans, alignment sheets, and facility diagrams. **As soon as they are available, and before the start of construction**, Commonwealth shall file with the Secretary any revised detailed plans, diagrams, and alignment 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 specify locations designated on these plans, diagrams, and alignment sheets.

5. Commonwealth 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, staging areas, pipe storage yards, new access roads, and other areas that would be used or disturbed that 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 or 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, or aerial photographs. Use of each area must be approved in writing by the Director of OEP, or the Director's designee, **before construction in or near that area**.

   This requirement does not apply to extra workspace allowed by the Commission's *Upland Erosion Control, Revegetation, and Maintenance 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 alignments and facility location changes resulting from:

   a. implementation of cultural resources mitigation measures;

   b. implementation of endangered, threatened, or special concern mitigation measures;

   c. recommendations by state regulatory authorities; and

   d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

6. **At least 60 days before construction begins**, Commonwealth shall file an Implementation Plan with the Secretary for review and written approval by the Director of OEP, or the Director's designee. Commonwealth must file revisions to the plan as schedules change. The plan shall identify:

   a. how Commonwealth 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 Commonwealth 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 onsite construction and inspection personnel;

   c. the number of EIs assigned, and how the company 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 Commonwealth 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 sessions(s));

f. the company personnel (if known) and specific portion of Commonwealth's organization having responsibility for compliance;

g. the procedures (including use of contract penalties) Commonwealth will follow if noncompliance occurs; and

h. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram), and dates for:

   i. the completion of all required surveys and reports;
   ii. the environmental compliance training of onsite personnel;
   iii. the start of construction; and
   iv. the start and completion of restoration.

7. Commonwealth shall employ at least one EI for the Commonwealth LNG Project. The EI(s) 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.

8. Beginning with the filing of its Implementation Plan, Commonwealth shall file updated status reports with the Secretary on a **monthly** basis until all construction and restoration activities are complete. Problems of a significant magnitude shall be reported to the FERC **within 24 hours**. On request, these status reports will also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:

   a. an update on Commonwealth's efforts to obtain the necessary federal authorizations;

b. project schedule, including current construction status of the project and work planned for the following reporting period;

c. a listing of all problems encountered, contractor nonconformance/deficiency logs, and each instance of noncompliance observed by the EI during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);

d. a description of the corrective and remedial actions implemented in response to all instances of noncompliance, nonconformance, or deficiency;

e. the effectiveness of all corrective and remedial actions implemented;

f. a description of any landowner/resident complaints which may relate to compliance with the requirements of the order, and the measures taken to satisfy their concerns; and

g. copies of any correspondence received by Commonwealth from other federal, state, or local permitting agencies concerning instances of noncompliance, and Commonwealth's response.

9. Commonwealth shall develop and implement an environmental complaint resolution procedure, and file such procedure with the Secretary, for review and approval by the Director of OEP, or the Director's designee. The procedure shall provide landowners with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction of the project and restoration of the right-of-way. Prior to construction, Commonwealth shall mail the complaint procedures to each landowner whose property will be crossed by the project.

   a. In its letter to affected landowners, Commonwealth shall:

      (1) provide a local contact that the landowners should call first with their concerns; the letter should indicate how soon a landowner should expect a response;

      (2) instruct the landowners that if they are not satisfied with the response, they should call Commonwealth's Hotline; the letter should indicate how soon to expect a response; and

      (3) instruct the landowners that if they are still not satisfied with the response from Commonwealth's Hotline, they should contact the Commission's Landowner Helpline at 877-337-2237 or at LandownerHelp@ferc.gov.

   b. In addition, Commonwealth shall include in its monthly status report a copy of a table that contains the following information for each problem/concern:

      (1) the identity of the caller and date of the call;

      (2) the location by milepost and identification number from the authorized alignment sheet(s) of the affected property;

      (3) a description of the problem/concern; and

      (4) an explanation of how and when the problem was resolved, will be resolved, or why it has not been resolved.

10. All conditions attached to the water quality certification issued by LDEQ constitute mandatory conditions of this Authorization Order. **Prior to construction**, Commonwealth shall file, for review and written approval of the Director of OEP, or the Director's designee, any revisions to its project design necessary to comply with the water quality certification conditions.

11. Commonwealth must receive written authorization from the Director of OEP, or the Director's designee, **before commencing construction** of any Commonwealth LNG Project facilities. To obtain such authorization, Commonwealth must file with the Secretary documentation that it has received all applicable authorizations required under federal law (or evidence of waiver thereof).

12. Commonwealth must receive written authorization from the Director of OEP, or the Director's designee, **prior to introducing hazardous fluids** into the Commonwealth LNG Project 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.

13. Commonwealth must receive written authorization from the Director of OEP, or the Director's designee, **before placing into service** the Commonwealth LNG Project facilities. 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 areas affected by the project are proceeding satisfactorily.

14. **Within 30 days of placing the authorized facilities in service**, Commonwealth shall file an affirmative statement with the Secretary, certified by a senior company official:

    a. that the facilities have been constructed in compliance with all applicable conditions, and that continuing activities will be consistent with all applicable conditions; or

    b. identifying which of the conditions in the Order Commonwealth has complied with or will comply with. This statement shall also identify any areas affected by the project where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

15. **Prior to construction of the Pipeline**, Commonwealth shall file with the Secretary for review and written approval by the Director of OEP, or the Director's designee**,** an alternative contingency plan for crossing Highway 27/82 in the event that Commonwealth is unable to successfully complete the proposed HDD of Highway 27/82. Commonwealth shall develop the contingency planin consultation with the LDOTD.

16. Commonwealth shall successfully complete the Highway 27/82 crossing **prior to the start of construction of the remainder of the Pipeline**.

17. **Prior to construction of the Project**, Commonwealth shall file with the Secretary a copy of the determination of consistency with the CZMP issued by the LDNR.

18. During construction activities at the Terminal, Commonwealth shall monitor noise levels **between 7:00 p.m. and 7:00 a.m.**, document the noise levels in the construction status reports, and restrict the noise attributable to construction activities to no more than 55 dBA L_{dn} (48.6 dBA L_{eq}) at NSAs 1 and 2.

19. Commonwealth shall file a full power load noise survey with the Secretary for the Terminal **no later than 60 days** after each liquefaction train is placed into service. If the noise attributable to operation of the equipment at the Terminal exceeds an Ldn of 55 dBA at NSAs, **within 60 days** Commonwealth shall modify operation of the liquefaction facilities or install additional noise controls until a noise level below an Ldn of 55 dBA at the NSAs is achieved. Commonwealth 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.

20. Commonwealth shall file a noise survey with the Secretary no later than 60 days after placing the entire Terminal into service. If a full load condition noise survey is not possible, Commonwealth shall provide an interim survey at the maximum possible horsepower load within 60 days of placing the Terminal into service and provide the full load survey within 6 months. If the noise attributable to operation of the equipment at the Terminal exceeds an Ldn of 55 dBA at any

nearby NSA under interim or full horsepower load conditions, Commonwealth 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. Commonwealth 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.

21. Prior to initial site preparation, Commonwealth shall file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana:
    a. finalized ground improvement solution of wick drains combined with surcharge for the Project site;
    b. site soil compaction via surcharge procedures and specifications; and
    c. finalized wick drains installation design package.
22. Prior to initial site preparation, Commonwealth shall file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana:
    a. the corrosion control and prevention plan for any underground piping, structures, foundations, equipment, and components; and
    b. the erosion control and prevention plan for the marine facility area.
23. Prior to initial site preparation, Commonwealth shall file with the Secretary the finalized plot plan with final design of finished slopes and elevations contour lines for the Project site. The finalized plot plan shall be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.
24. Prior to initial site preparation, Commonwealth shall file with the Secretary the finalized pile load test program (e.g., pile load test procedure, locations, configuration, quality assurance, and quality control, etc.). The filing shall be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.
25. Prior to site initial preparation, Commonwealth shall file with the Secretary the final design of floodwalls (storm surge protection barriers) to comply with applicable code/standards requirements including but are not limited to NFPA 59A (2019 edition) as incorporated by 33 CFR 127, and NFPA 59A (2001 edition) in 49 CFR 193. In addition, the floodwalls shall be designed and maintained in accordance with ASCE/SEI 7 (2022 edition) or equivalent and ASCE/SEI 24 (2014 edition) or equivalent and to withstand a minimum of a 500-year mean occurrence interval in consideration of relative sea level rise, local subsidence, site settlement, shoreline recession, erosion and scour effect, and wind-driven wave effects, etc. The sea level rise and vertical land movement should be in accordance with at a minimum intermediate curve corresponding to design life of facility in 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, February 2022 or equivalent. The final design of floodwalls shall be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.
26. Prior to construction of final design, Commonwealth shall file with the Secretary consultation with PHMSA that determines whether the use of normally closed valves to remove stormwater from curbed areas will meet PHMSA regulations.

27. Prior to construction of final design, Commonwealth shall file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana:

    a. the finalized settlement monitoring program and procedures for the Project site;

    b. the total and differential settlement of final designed structures, systems, and components foundations for the Project site; and

    c. the total and differential settlement monitoring system of LNG storage tank foundation design shall comply with applicable LNG industrial codes/standards, including but not limited to API 620 (12th edition), API 625 (1st edition), API 650 (13th edition), API 653 (5th edition), and ACI 376 (2011 edition) or approved equivalents.

28. Prior to construction of final design, Commonwealth shall file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana:

    a. site preparation drawings and specifications;

    b. finalized civil design basis, criteria, specifications;

    c. LNG terminal structures, LNG storage tank, and foundation design drawings and calculations (including prefabricated and field constructed structures);

    d. seismic specifications for procured Seismic Category I equipment prior to the issuing of request for quotations;

    e. quality control procedures to be used for civil/structural design and construction; and

    f. a determination of whether soil improvement is necessary to counteract soil liquefaction.

    In addition, Commonwealth shall file, in its Implementation Plan, the schedule for producing this information.

29. **Prior to construction of the final design**, Commonwealth shall file with the Secretary the finalized seismic monitoring program for the Project site. The seismic monitoring program shall comply with NFPA 59A (2019 edition) sections 8.4.14.10, 8.4.14.12, 8.4.14.12.1, 8.4.14.12.2, and 8.4.14.13; ACI 376 (2011 edition) sections 10.7.5 and 10.8.4; U.S. Nuclear Regulatory Commission Regulatory Guide RG 1.12 (Revision 3) sections 1 and 3 through 9 and all subsections, or equivalents subject to review and approval. A free-field seismic monitoring device should be included in the seismic monitoring program for the Project site. The proposed seismic monitoring system must include installation location plot plan; description of the triaxial strong motion recorders or other seismic instrumentation; the proposed alarm set points and operating procedures (including emergency operating procedures) for control room operators in response to such alarms/data obtained from seismic instrumentation; and testing and maintenance procedures.

30. **Prior to construction of final design**, Commonwealth shall file with the Secretary the settlement monitoring and maintenance plan that have been reviewed, approved, stamped and sealed by a professional engineer of record registered in the state of Louisiana, which ensures the facilities are protected for the life of the LNG terminal considering settlement, subsidence, and sea level rise.

31. **Prior to construction of final design**, Commonwealth shall file with the Secretary the final design elevation for the structures/buildings outside floodwalls area, including but are not limited to admin office/main control room, maintenance building, elevated flare, marine flare, jetty

platform control room, etc. The final design elevation drawings and calculations shall be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.

32. Information pertaining to the following specific recommendations shall be filed with the Secretary for review and written approval by the Director of OEP, or the Director's designee, within the timeframe indicated by each recommendation. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 833 (Docket No. RM16-15-000), including security information, shall be submitted as critical energy infrastructure information pursuant to 18 CFR §388.113. See Critical Electric Infrastructure Security and Amending Critical Energy Infrastructure Information, Order No. 833, 81 Fed. Reg. 93,732 (December 21, 2016), FERC Stats. & Regs. 31,389 (2016). Information pertaining to items such as 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**, Commonwealth shall file an overall Project schedule, which includes the proposed stages of initial site preparation, construction, commissioning, and in-service plan relative to notice to proceed requests and related conditions.

34. **Prior to initial site preparation**, Commonwealth shall file procedures for controlling access during construction.

35. **Prior to initial site preparation**, Commonwealth shall file quality assurance and quality control procedures for construction activities, including transportation load monitoring for prefabricated process modules and LNG storage tanks.

36. **Prior to initial site preparation**, Commonwealth shall file with the Secretary the finalized wind design basis for the project facility, which shall include the tornado loads determination and consideration of its load combination as required by ASCE/SEI 7 (2022 edition) or approved equivalent.

37. Prior to initial site preparation, Commonwealth shall file its design wind speed criteria for all other facilities not covered by PHMSA's LOD to be designed to withstand wind speeds commensurate with the risk and reliability associated with the facilities in accordance with ASCE 7-22 or equivalent.

38. Prior to initial site preparation, Commonwealth shall develop an ERP (including evacuation and any sheltering and re-entry) and coordinate procedures with the USCG; state, county, and local emergency planning groups; fire departments; state and local law enforcement; and other appropriate federal agencies. This plan shall be consistent with recommended and good engineering practices and based on potential impacts and onsets of hazards from accidental and intentional events along the LNG marine vessel route and potential impacts and onset of hazards from accidental and intentional events at the LNG terminal, including but not limited to a catastrophic failure of the largest LNG tank. This plan shall address any special considerations and pre-incident planning for infrastructure and public with access and functional needs and shall include at a minimum:

    a. materials and plans for periodic dissemination of public education and training materials for evacuation and/or shelter in place of the public within any transient hazard areas along the marine vessel route, and within LNG terminal hazard areas;

    b. plans to competently train emergency responders required to effectively and safely respond to hazardous material incidents including, but not limited to LNG fires and dispersion;

c. plans to competently train emergency responders to effectively and safely evacuate or shelter public within transient hazard areas along the marine vessel route, and within hazard areas from LNG terminal;

d. designated contacts with federal, state and local emergency response agencies responsible for emergency management and response within any transient hazard areas along the marine vessel route, and within hazard areas from LNG terminal;

e. scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;

f. scalable procedures for mobilizing response and establishing a unified command, including identification, location, and design of any emergency operations centers and emergency response equipment required to effectively and safely to respond to hazardous material incidents and evacuate or shelter public within transient hazard areas along the marine vessel route, and within LNG terminal hazard areas;.

g. scalable procedures for notifying public, including identification, location, design, and use of any permanent sirens or other warning devices required to effectively communicate and warn the public prior to onset of debilitating hazards within any transient hazard areas along the LNG marine vessel route and within hazard areas from LNG terminal;

h. scalable procedures for evacuating the public, including identification, location, design, and use of evacuation routes/methods and any mustering locations required effectively and safely evacuate public within any transient hazard areas along the LNG marine transit route and within hazard areas from LNG terminal; and

i. scalable procedures for sheltering the public, including identification, location, design, and use of any shelters demonstrated to be needed and demonstrated to effectively and safely shelter public prior to onset of debilitating hazards within transient hazard areas that may better benefit from sheltering in place (i.e., those within Zones of Concern 1 and 2), along the route of the LNG marine vessel and within hazard areas that may benefit from sheltering in place (i.e., those within areas of 1,600 BTU/ft^2-hr and 10,000 BTU/ft^2-hr radiant heats from fires with farthest impacts, including from a catastrophic failure of largest LNG tank) of the LNG terminal.

Commonwealth 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**.

39. Prior to initial site preparation, Commonwealth 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. This plan shall include sustained funding of any requirement or resource gap analysis identified to effectively and safely evacuate and shelter public and to effectively and safely respond to hazardous material incidents consistent with recommended and good engineering practices. Commonwealth 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.

40. Prior to construction of final design, Commonwealth shall file change logs that list and explain any changes made from the FEED provided in Commonwealth'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, Commonwealth shall file information/revisions pertaining to Commonwealth's response: numbers 15, 45, 65, and 106 of its February 4, 2020 filing; numbers

124, 125c, 127, 134, 135, 148, 153, 154, 155, 157, 161, 162, 164, 165, and 167 of its March 4, 2020 filing; numbers 7, 17, and 18 of its June 4, 2021 filing; numbers 5, 23, 27, 28, 29, 30, 31, 32, and 33 of its November 9, 2021 filing, which indicated features to be included or considered in the final design.

42. Prior to construction of final design, Commonwealth shall file drawings and specifications for crash rated vehicle barriers in accordance with ASTM F2656 (2015 edition) or approved equivalent at each facility entrance for access control. The crash rating vehicle type shall be supported by a security vulnerability assessment that takes into account the potential target attractiveness, threats, vulnerabilities, consequences, and mitigation effectiveness consistent with American Institute of Chemical Engineers, Guidelines for Analyzing and Managing the Security Vulnerabilities of Fixed Chemical Sites, 2003 or approved equivalent. The crash rating speed shall be supported by an analysis of the maximum attainable vehicle velocity based on vehicle type acceleration and road characteristics (e.g., straight length, radius of curvature, sloped/banked, coefficient of friction, etc.).

43. Prior to construction of final design, Commonwealth shall file drawings of internal road vehicle protections, such as guard rails, barriers, and bollards to protect transfer piping, pumps, compressors, hydrants, monitors, etc. to ensure that they are located away from roadway or protected from inadvertent damage from vehicles.

44. Prior to construction of final design, Commonwealth shall file drawings of the security fence. The fencing drawings shall provide details of fencing that demonstrates it is in accordance with NFPA 59A (2019 edition) or approved equivalent and would restrict and deter access around the entire facility and has a setback from exterior features (e.g., power lines, trees, etc.) and from interior features (e.g., piping, equipment, buildings, etc.) that does not allow the fence to be overcome.

45. Prior to construction of final design, Commonwealth shall file security camera and intrusion detection drawings. The security camera drawings shall show the locations, mounting elevation, areas covered, and features of each camera (e.g., fixed, tilt/pan/zoom, motion detection alerts, low light, etc.) and shall provide camera coverage at access points and along the entire perimeter with redundancies and camera coverage interior of the facility to enable rapid monitoring of the terminal, including a camera at the top of each LNG storage tank, and coverage within pretreatment areas, within liquefaction areas, within truck transfer areas, within marine transfer areas, and within buildings. The drawings shall show or note the location and type of the intrusion detection and shall cover the entire perimeter of the facility.

46. Prior to construction of final design, Commonwealth shall file photometric analyses or equivalent and associated lighting drawings. The lighting drawings shall show the location, elevation, type of light fixture, and lux levels of the lighting system and shall provide illumination along the perimeter of the terminal, process equipment, mooring points, and along paths/roads of access and egress to facilitate security monitoring and emergency response operations in accordance with API 540 (4th edition) or approved equivalent and applicable federal regulations.

47. Prior to construction of final design, Commonwealth shall file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.

48. Prior to construction of final design, Commonwealth shall file a building siting assessment to ensure plant buildings that are occupied or critical to the safety of the LNG plant are adequately protected from potential hazards involving fires and vapor cloud explosions.

49. Prior to construction of final design, Commonwealth shall file three-dimensional plant drawings to confirm plant layout for maintenance, access, egress, and congestion.

50. Prior to construction of final design, Commonwealth shall file up-to-date process flow diagrams (PFDs), heat and mass balances (HMBs), and piping and instrument diagrams (P&IDs) including vendor P&IDs. The HMBs shall demonstrate a peak export rate of 9.5 MTPA. 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.
51. Prior to construction of final design, Commonwealth shall file P&IDs, specifications, and procedures that clearly show and specify the tie-in details required to safely connect subsequently constructed facilities with the operational facilities.
52. Prior to construction of final design, Commonwealth shall file a car seal and lock philosophy and car seal and lock program, including a list of all car-sealed and locked valves consistent with the P&IDs. The car seal and lock program should include monitoring and periodically reviewing correct car seal and lock placement and valve position.
53. Prior to construction of final design, Commonwealth shall file information to demonstrate the EPC contractor has verified that all FEED HAZID recommendations have been addressed.
54. Prior to construction of final design, Commonwealth shall file a hazard and operability review of the final design P&IDs, a list of the resulting recommendations, and action taken on the recommendations. The issued for construction P&IDs shall incorporate the hazard and operability review recommendations and justification shall be provided for any recommendations that are not implemented.
55. Prior to construction of final design, Commonwealth shall file design pressure and set point information for the piping, equipment, and pressure relief valves located between the inlet feed gas high integrity pressure protection system (HIPPS) and the downstream pressure regulators to demonstrate pressures would not exceed the design pressures of these components.
56. Prior to construction of final design, Commonwealth shall provide a check valve upstream of the acid gas removal column to prevent backflow or provide a dynamic simulation that shows that upon plant shutdown, the swan neck would be sufficient for this purpose.
57. Prior to construction of final design, Commonwealth shall specify a second source of vacuum breaker gas (i.e., pad gas) for the LNG storage tanks independent of the liquefaction facility.
58. Prior to construction of final design, Commonwealth shall include LNG tank fill flow measurement with high flow alarm.
59. Prior to construction of final design, Commonwealth shall specify a discretionary vent valve on each LNG storage tank that is operable through the Distributed Control System (DCS). In addition, a car sealed open manual block valve shall be provided upstream of the discretionary vent valve.

60. Prior to construction of final design, Commonwealth shall file the safe operating limits (upper and lower), alarm and shutdown set points for all instrumentation (e.g., temperature, pressures, flows, and compositions).

61. Prior to construction of final design, Commonwealth shall file cause-and-effect matrices for the process instrumentation, fire and gas detection system, and emergency shutdown system. The cause-and-effect matrices shall include alarms and shutdown functions, details of the voting and shutdown logic, and set points.

62. Prior to construction of final design, Commonwealth shall specify that all ESD valves are to be equipped with open and closed position switches connected to the Distributed Control System (DCS)/SIS.

63. Prior to construction of final design, Commonwealth shall demonstrate that all electrical, instrument, and control systems at the project, which activate emergency systems or are relied upon for isolation or shutdowns, will be designed to withstand a 20-minute fire exposure per UL 1709 (6th edition) or approved equivalent.

64. Prior to construction of final design, Commonwealth shall file an up-to-date equipment list, process and mechanical data sheets, and specifications. The specifications shall include:

    a. building specifications (e.g., control buildings, electrical buildings, compressor buildings, storage buildings, pressurized buildings, ventilated buildings, blast resistant buildings);

    b. mechanical specifications (e.g., piping, valve, insulation, rotating equipment, heat exchanger, storage tank and vessel, other specialized equipment);

    c. electrical and instrumentation specifications (e.g., power system, control system, safety instrument system [SIS], cable, other electrical and instrumentation); and

    d. security and fire safety specifications (e.g., security, passive protection, hazard detection, hazard control, firewater).

65. Prior to construction of final design, Commonwealth shall file a list of all codes and standards and the final specification document number where they are referenced.

66. Prior to construction of final design, Commonwealth shall file a complete specifications and drawings of the proposed LNG tank design and installation.

67. Prior to construction of final design, Commonwealth shall file an evaluation of emergency shutdown valve closure times. The evaluation shall account for the time to detect an upset or hazardous condition, notify plant personnel, and close the emergency shutdown valve(s).

68. Prior to construction of final design, Commonwealth shall file an evaluation of dynamic pressure surge effects from valve opening and closure times and pump operations that demonstrate that the surge effects do not exceed the design pressures.

69. Prior to construction of final design, Commonwealth 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.

70. Prior to construction of final design, Commonwealth shall clearly specify the responsibilities of the LNG tank contractor and the EPC contractor for the piping associated with the LNG storage tank.

71. Prior to construction of final design, Commonwealth 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.

72. Prior to construction of final design, Commonwealth shall file the sizing calculations for the PSVs of the following vessels: E-A0101 Inlet Gas Preheater, E-A0403 Demethanizer Reboiler, E-A0301 Regeneration gas hot oil heater. Specifically, the calculations shall show the influence of the backpressure on these PSVs since they vent to the hot oil expansion drum (V-2101A) instead of the flare.
73. Prior to construction of final design, Commonwealth shall specify the process vessels, and storage vessels for ethylene, propane, isopentane, condensate, hot oil, and LNG are installed with spare pressure relief valves to ensure overpressure protection during relief valve testing or maintenance.
74. Prior to construction of final design, Commonwealth 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. The evaluation shall justify the type, quantity, and location of hazard detection and hazard control, passive fire protection, emergency shutdown and depressurizing systems, firewater, and emergency response equipment, training, and qualifications in accordance with NFPA 59A (2001). The justification for the flammable and combustible gas detection and flame and heat detection systems shall be in accordance with ISA 84.00.07 (2018 edition) or approved equivalent methodologies and would need to demonstrate 90 percent or more of releases (unignited and ignited) that could result in an off-site or cascading impact would be detected by two or more detectors and result in isolation and de inventory within 10 minutes. The analysis shall take into account the set points, voting logic, wind speeds, and wind directions. The justification for firewater shall provide calculations for all firewater demands based on design densities, surface area, and throw distance as well as specifications for the corresponding hydrant and monitors needed to reach and cool equipment.
75. Prior to construction of final design, Commonwealth shall file spill containment system drawings with dimensions and slopes of curbing, trenches, impoundments, tertiary containment and capacity calculations considering any foundations and equipment within impoundments, as well as the sizing and design of the down-comers. The spill containment drawings shall show containment for all hazardous fluids including all liquids handled above their flashpoint, from the largest flow from a single line for 10 minutes, including de-inventory, or the maximum liquid from the largest vessel (or total of impounded vessels) or otherwise demonstrate that providing spill containment would not significantly reduce the flammable vapor dispersion or radiant heat consequences of a spill.
76. Prior to construction of final design, Commonwealth shall file an analysis that demonstrates the flammable vapor dispersion from design spills would be prevented from dispersing underneath the elevated LNG storage tanks, or the LNG storage tanks would be able to withstand an overpressure due to ignition of the flammable vapor that disperses underneath the elevated LNG storage tanks.
77. Prior to construction of final design, Commonwealth shall file an analysis that demonstrates the flammable vapor dispersion from design spills would be prevented from dispersing underneath the elevated control room, or the control room would be able to withstand an overpressure due to ignition of the flammable vapor that disperses underneath the elevated control room.
78. Prior to construction of final design, Commonwealth shall file a technical review of its proposed facility design that evaluates other potential locations for the proposed control room, or additional mitigation measures to protection the control room from high radiant heats.
79. Prior to construction of final design, Commonwealth shall file electrical area classification drawings, including cross sectional drawings. The drawings shall demonstrate compliance with

NFPA 59A (2019 edition), NFPA 70 (2017 edition), NFPA 497 (2017 edition), and API RP 500 (3rd edition), or approved equivalents. In addition, the drawings shall include revisions to the electrical area classification design or provide technical justification that supports the electrical area classification of the following areas using most applicable API RP 500 figures (e.g., figures 20 and 21) or hazard modeling of various release rates from equivalent hole sizes and wind speeds (see NFPA 497 release rate of 1 lb-mole/minute).

80. Prior to construction of final design, Commonwealth shall file analysis of the buildings containing hazardous fluids and the ventilation calculations that limit concentrations below the LFLs (e.g., 25-percent LFL), including an analysis of off gassing of hydrogen in battery rooms, and shall also provide hydrogen detectors that alarm (e.g., 20- to 25-percent LFL) and initiate mitigative actions (e.g., 40- to 50-percent LFL) in accordance with NFPA 59A (2019 edition) and NFPA 70 (2017 edition), or approved equivalents.

81. Prior to construction of final design, Commonwealth 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) or approved equivalent.

82. Prior to construction of final design, Commonwealth 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.

83. Prior to construction of final design, Commonwealth 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 as well as their coverage area. The list shall include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment.

84. Prior to construction of final design, Commonwealth 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 shutdown any combustion or heating ventilation and air conditioning equipment whose continued operation could add to or sustain an emergency.

85. Prior to construction of final design, Commonwealth shall file a design that includes hazard detection suitable to detect high temperatures and smoldering combustion products in electrical buildings and control room buildings.

86. Prior to construction of final design, Commonwealth shall file an evaluation of the voting logic and voting degradation for hazard detectors.

87. Prior to construction of final design, Commonwealth shall file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of the hazard detectors when determining the lower flammable limit set points for methane, ethylene, propane, isopentane, and condensate.

88. Prior to construction of final design, Commonwealth shall file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of hazard detectors when determining the set points for toxic components such as condensate and hydrogen sulfide.

89. Prior to construction of final design, Commonwealth shall file a drawing showing the location of the emergency shutdown buttons, including, but not limited to the refrigerant storage, condensate storage, and LNG storage areas. Emergency shutdown buttons shall be easily accessible, conspicuously labeled, and located in an area which would be accessible during an emergency.

90. Prior to construction of final design, Commonwealth 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 and shall demonstrate the spacing of extinguishers meet prescribed NFPA 10 (2018 edition) or approved equivalent travel distances. 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 and shall demonstrate they meet NFPA 59A (2019 edition) or approved equivalent.

91. Prior to construction of final design, Commonwealth shall file drawings and specifications for the structural passive protection systems to protect equipment and supports from cryogenic releases.

92. Prior to construction of final design, Commonwealth shall file calculations or test results for the structural passive protection systems to protect equipment and supports from cryogenic releases.

93. Prior to construction of final design, Commonwealth shall file drawings and specifications for the structural passive protection systems to protect equipment and supports from pool and jet fires.

94. Prior to construction of final design, Commonwealth shall file a detailed quantitative analysis to demonstrate that adequate mitigation would be provided for each pressure vessel that could fail within the 4,000 BTU/ft2-hr zone from a pool or jet fires; each critical structural component (including the LNG marine vessel) and emergency equipment item that could fail within the 4,900 BTU/ft2-hr zone from a pool or jet fire; and each occupied building that could expose unprotected personnel within the 1,600 BTU/ft2-hr zone from a pool or jet fire. Trucks at truck transfer stations shall be included in the analysis of potential pressure vessel failures, as well as measures needed to prevent cascading impact due to the 10-minute sizing spill at the marine area. A combination of passive and active protection for pool fires and passive and/or active protection for jet fires shall be provided and demonstrate the effectiveness and reliability. Effectiveness of passive mitigation shall be supported by calculations or test results for the thickness limiting temperature rise over the fire duration, and active mitigation shall be supported by reliability information by calculations or test results, such as demonstrating flow rates and durations of any cooling water would mitigate the heat absorbed by the component. The total firewater demand shall account for all components that could fail to a pool or jet fire.

95. Prior to construction of final design, Commonwealth shall file an evaluation and associated specifications, drawings, and datasheets for transformers demonstrating how it would prevent cascading damage of transformers (e.g., fire walls or spacing) in accordance with NFPA 850 (2015 edition) or approved equivalent.

96. Prior to construction of final design, Commonwealth 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 and sectional valves, and the location and area covered by, each monitor, hydrant, hose, water curtain, deluge system, foam system, water-mist system, and sprinkler. The drawings shall demonstrate that each process area, fire zone, or other sections of piping with several users can be isolated with post indicator or sectional valves and that firewater coverage is provided by at least two monitors or hydrants with sufficient firewater flow to cool exposed surfaces subjected to a fire. The drawings shall also include piping and instrumentation diagrams of the firewater and foam systems.

97. Prior to construction of final design, Commonwealth shall specify that the firewater pump shelter is designed to remove the largest firewater pump or other component for maintenance with an overhead or external crane.

98. Prior to construction of final design, Commonwealth shall demonstrate that the firewater storage tank is in compliance with NFPA 22 (2018 edition) or approved equivalent.

99. Prior to construction of final design, Commonwealth shall specify that the firewater flow test meter is equipped with a transmitter and that a pressure transmitter is installed upstream of the flow transmitter. The flow transmitter and pressure transmitter shall be connected to the DCS and recorded.

100. Prior to construction of final design, Commonwealth 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.

101. Prior to construction of final design, Commonwealth shall file the structural analysis of the LNG storage tank and outer containment demonstrating they are designed to withstand all loads and combinations, including shipping loads.

102. Prior to construction of the final design, Commonwealth shall file the finalized projectile/missile impact analysis to demonstrate that the outer concrete container wall of the full containment LNG storage tank could withstand projectile/missile impact. The analysis shall detail the projectile/missile speeds and characteristics and methods used to determine penetration resistance and perforation depths. The finalized projectile/missile impact analysis shall be stamped and sealed by the professional engineer-of-record, registered in the State of Louisiana.

103. Prior to construction of final design, Commonwealth shall file an analysis of the structural integrity of the outer containment of the full containment LNG storage tank demonstrating it can withstand the radiant heat from a roof tank top fire or adjacent tank roof fire.

104. Prior to construction of final design, Commonwealth shall file an analysis of the structural integrity of the outer containment of the full containment LNG storage tank demonstrating it can withstand the thermal shock caused by a failure of the inner tank.

105. Prior to commissioning, Commonwealth 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. Commonwealth shall file documentation certifying that each of these milestones has been completed before authorization to commence the next phase of commissioning and startup will be issued.

106. Prior to commissioning, Commonwealth 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.

107. Prior to commissioning, Commonwealth 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 (12th edition), API 625 (1st edition), API 650 (13th edition), API 653 (5th edition), and ACI 376 (2011 edition) or approved equivalents. The program shall also specify what actions would be taken after various levels of seismic events.

108. Prior to commissioning, Commonwealth 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.

109. Prior to commissioning, Commonwealth 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.

110. Prior to commissioning, Commonwealth shall tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves.

111. Prior to commissioning, Commonwealth shall file a plan to maintain a detailed training log to demonstrate that operating, maintenance, and emergency response staff have completed the required training.

112. Prior to commissioning, Commonwealth shall file the procedures for pressure/leak tests which address the requirements of ASME BPVC Section VIII (2017 edition) and ASME B31.3 (2016 edition) or approved equivalents. In addition, Commonwealth shall file a line list of pneumatic and hydrostatic test pressures.

113. Prior to introduction of hazardous fluids, Commonwealth 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.

114. Prior to introduction of hazardous fluids, Commonwealth shall complete and document all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the DCS and SIS that demonstrates full functionality and operability of the system.

115. Prior to introduction of hazardous fluids, Commonwealth shall develop, file, and implement an alarm management program consistent with ISA 18.2 (2016 edition) or approved equivalent to reduce alarm complacency and maximize the effectiveness of operator response to alarms.

116. Prior to introduction of hazardous fluids, Commonwealth shall complete and document a clean agent acceptance tests.

117. Prior to introduction of hazardous fluids, Commonwealth shall complete and document a firewater pump acceptance test and firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant shall be shown on facility plot plan(s).

118. Prior to introduction of hazardous fluids, Commonwealth shall complete and document foam system and sprinkler system acceptance tests.

119. Commonwealth 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, Commonwealth 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.

120. Prior to commencement of service, Commonwealth shall file a request for written authorization from the Director of OEP. Such authorization would only be granted following a determination by the USCG, under its authorities under the Ports and Waterways Safety Act, the Magnuson Act, the MTSA of 2002, and the 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 Commonwealth or other appropriate parties.

121. Prior to commencement of service, Commonwealth shall file any proposed revisions to the security plan and physical security of the plant.

122. Prior to commencement of service, Commonwealth shall label piping with fluid service and direction of flow in the field consistent with ASME A13.1 (2007 edition) or approved equivalent, in addition to the pipe labeling requirements of NFPA 59A (2001).

123. Prior to commencement of service, Commonwealth shall provide plans for any preventative and predictive maintenance program that performs periodic or continuous equipment condition monitoring.

124. Prior to commencement of service, Commonwealth shall develop procedures for offsite contractors' responsibilities, restrictions, monitoring, training, and limitations and for supervision of these contractors and their tasks by Commonwealth staff. Specifically, the procedures shall address:

a. selecting a contractor, including obtaining and evaluating information regarding the contract employer's safety performance and programs;

b. informing contractors of the known potential hazards, including flammable and toxic release, explosion, and fire, related to the contractor's work and systems they are working on;

c. developing and implementing provisions to control and monitor the entrance, presence, and exit of contract employers and contract employees from process areas, buildings, and the plant;

d. developing and implementing safe work practices for control of personnel safety hazards, including lockout/tagout, confined space entry, work permits, hot work, and opening process equipment or piping;

e. developing and implementing safe work practices for control of process safety hazards, including identification of layers of protection in systems being worked on, recognizing abnormal conditions on systems they are working on, and re-instatement of layers of protection, including ensuring bypass, isolation valve, and car-seal programs and procedures are being followed;

f. developing and implementing provisions to ensure contractors are trained on the emergency action plans and that they are accounted for in the event of an emergency; and

g. monitoring and periodically evaluating the performance of contract employers in fulfilling their obligations above, including successful and safe completion of work and re-instatement of all layers of protection.

In addition, we recommend that the following measures shall apply throughout the life of the Commonwealth LNG Project.

125. 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, Commonwealth 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.

126. Semi-annual operational reports shall be filed with the Secretary to identify changes in facility design and operating conditions; abnormal operating experiences; activities (e.g., ship 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 tank, 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.

127. In the event the temperature of any region of the LNG storage container, including any secondary containment and 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.

128. 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 liquefaction 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 an LNG facility that contains, controls, or processes hazardous fluids;
g. any crack or other material defect that impairs the structural integrity or reliability of an LNG 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 LNG facilities) plus the build-up allowed for operation of pressure-limiting or control devices;

i. a leak in an LNG 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 an LNG 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 facility'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

DISTRIBUTION LIST
FOR THE NOTICE OF AVAILABILITY OF THE
FINAL ENVIRONMENTAL IMPACT STATEMENT

Federal Agencies

Advisory Council on Historic Preservation, DC

Office of Federal Programs

John Eddins, Program Analyst

Army Corps of Engineers, DC

Planning and Policy Division

Attn: CECW-P

Army Corps of Engineers, LA

USACE, New Orleans District

Assistant Operations Manager

Brenda Archer, Regulatory Branch, New Orleans District

Darrell S. Barbara, Chief, Western Evaluation Section

Michael Herrmann, Project Manager, New Orleans District

Tracy Falk, Calcasieu River Operations Manager

Department of Agriculture, DC

Forest Service-Ecosystem Management Coordination

James Smalls, Assistant Director, NEPA

Conservation and Environmental Program Division, Farm Service Agency

Nell Fuller, National Environmental Compliance Manager

Department of Commerce

NOAA National Marine Fisheries Service

NOAA National Marine Fisheries Service, NOAA NEPA Coordinator

NOAA Fisheries Southeast Region

Craig Gothreaux, Habitat Conservation Division

January Murray, Habitat Conservation Division

Department of Energy

Amy Sweeney, Director, Division of Natural Gas Regulatory Activities

Brian Lavoie, Office of Oil & Natural Gas

Office of Fossil Energy and Carbon Management

Brian Lavoie, Division of Natural Gas Regulation, Office of Fossil Energy and Carbon Management

Department of Health and Human Services

Murray Carter, Safety And Occupational Health

Sharunda Buchanan, Director, Division of Emergency and Environmental Health Services

Department of Homeland Security

Customs and Border Protection

Christopher Oh, Branch Chief

Department of Housing and Urban Development, DC

Office of Environment and Energy

Danielle Schopp, Community Planner

Department of Justice, DC

Environment and Natural Resources Division

Stephen Finn, NEPA Coordinator

Department of the Interior, CO

U.S. Bureau of Land Management

US Department of Interior, FERC Contact

National Park Service

Patrick Walsh, Chief, Environmental Planning and Compliance Branch

Department of the Interior

Bureau of Indian Affairs

BJ Howerton

Bureau of Ocean Energy Management

Dr. Jill Lewandowski, Chief, Division of Environmental Assessment

Bureau of Safety and Environmental Enforcement

David Fish, Chief, Environmental Compliance Division

Department of Transportation Pipeline & Hazardous Materials Safety Administration, DC

Pipeline & Hazardous Materials Safety Administration

William Schoonover, Associate Administrator for Hazardous Materials Safety

Pipeline & Hazardous Materials Safety Administration, Engineering and Research

Sentho K. White, P.E.

Department of Transportation, DC

Office of Assistant Secretary for Transportation Policy

Camille Mittelholtz, Environmental Policy Team Coordinator

Environmental Protection Agency, DC

Cindy Barger, Director, NEPA Compliance Division

Environmental Protection Agency, TX

Eli Martinez

Raul Gutierrez, Ph.D, Sediment Quality, Region 6

Robert Houston, Chief, Office of Planning and Coordination, Region 6

Federal Energy Regulatory Commission, DC

Richard McGuire, Director, Division of Gas - Environment and Engineering

Fish and Wildlife Service, LA

Louisiana Ecological Services Field Office

Joshua Marceaux, Fish and Wildlife Biologist

Joseph Ranson, Field Supervisor, Louisiana Ecological Services

NOAA National Marine Fisheries Service, FL

NMFS

Dr. Roy E. Crabtree, Regional Administrator, Protected Resources Division

NOAA Fisheries Southeast Region

Michael Tucker, NOAA Fisheries Protected Resources Division Lead - ESA Compliance

U.S. Coast Guard, DC

U.S. Coast Guard, LA

Cmdr. Nicole Rodriguez, Commanding Officer

LCDR Jessica Galarza, Executive Officer

LTJG Mache Mason

U.S. Coast Guard, TX

Capt. Molly Wike, Commanding Officer

U.S. Geological Survey

Esther Eng, Chief, Environmental Management Branch

<u>State of Louisiana</u>

Governor's Office

Matthew Block, Executive Counsel

Governor's Office of Indian Affairs, LA

Chaunda Allen Mitchell, Director

Louisiana Department of Economic Development

Don Pierson, Secretary L.E.D.

Louisiana Office of State Lands

Cheston Hill, Titles and Surveys Section

Louisiana Department of Culture, Recreation, and Tourism, LA

Kristin Sanders, SHPO, Louisiana Office of Cultural Development

Louisiana Department of Environmental Quality, LA

Bryan Johnston, Administrator, Air Permits Division

Scott Guillams, Water Permits Division

Vivian Aucoin, Environmental Scientist Manager, Office of Environmental Assessment

Louisiana Department of Natural Resources, LA

Karl Morgan, Administrator, Permits and Mitigation Division, Office of Coastal Management

LDNR Office of Coastal Management

Jay Pecot, Coastal Resource Scientist, DCLA

Louisiana Department of Transportation, LA

LDOT

Dr. Shawn D. Wilson, Secretary

Louisiana Department of Wildlife and Fisheries, LA

LDWF

Dave Butler, Permits Coordinator

Marc Maniscalco, Oyster Lease Section

Louisiana Office of Conservation Pipeline Division, LA

LA Office of Conservation Pipeline Division

Steve Giambrone, Director

<u>Cameron Parish</u>

Cameron Parish Police Jury, LA

Kara Bonsall, Coast Zone Coordinator

Magnus "Sonny" McGee, Cameron Parish District 1

Myles Hebert, Flood Plain Administrator and Chief Building Code Official

Ron Johnson, Cameron Parish Sheriff

Scott Trahan, Cameron Parish President; District 5

Cameron Parish, Sewerage District No. 1

Cameron Parish, Sewerage District No. 1,

West Cameron Port Commission

West Cameron Port Commission

Federal Representatives

Senate Energy and Natural Resources Committee

Joe Manchin, Chairman

U.S. House of Representatives

Alan Lowenthal, Energy and Mineral Resources Subcommittee Chair

Clay Higgins, U.S. Representative

Garrett Graves, U.S. Representative

Kevin Roig, Graves Staff

Paul Sawyer, Graves Chief of Staff

Raul M. Grijalva, Natural Resources Committee Chair

U.S. Senate

David Stokes, Kennedy Staff

James Quinn, Cassidy Staff

Jess Andrews, Kennedy Staff

John Kennedy, U.S. Senator

Ty Bofferding, Cassidy Staff

William "Bill" Cassidy, U.S. Senator

State of Louisiana

Billy Nungesser, Lt. Governor

John Bel Edwards, Governor

Louisiana House of Representatives

Ryan Bourriaque, State Representative

Louisiana State Senate

Dan Morrish, State Senator

Native American Tribes

Apache Tribe of Oklahoma, OK

Bobby Komardley, Chairman

Chitimacha Tribe of Louisiana, LA

Kimberly Walden, THPO

Melissa Darden, Chairman

Choctaw Nation of Oklahoma - Historic Preservation Department, OK

Lindsey D. Bilyeu, MS, Senior Compliance Review Officer

Choctaw Nation of Oklahoma, LA

Dr. Ian Thompson, THPO

Gary Batton, Chief

Choctaw Nation of Oklahoma, OK

Daniel Ragle, Compliance Review Officer

Coushatta Tribe of Louisiana, LA

Linda Langley, THPO

Lovelin Poncho, Chairman

Inter-Tribal Council of Louisiana, LA

Barbara Nemes, Director

Jena Band of Choctaw Indians, LA

Alina Shively, THPO

B. Cheryl Smith, Chief

Mississippi Band of Choctaw Indians, MS

Phyliss Anderson, Chief

Tunica-Biloxi Tribe of Louisiana, LA

Earl Barbry, THPO

Joey P. Barbry, Chairman

Non-Governmental Organizations

Audubon Delta, LA

Brent Newman, Senior Policy Director

Erik I. Johnson, Director of Conservation Science

Center for Biological Diversity, MT

Kristine Akland, Staff Attorney

Center for Biological Diversity, OR

Noah Greenwald, Director

Healthy Gulf, LA

Cynthia Sarthou, Executive Director

Naomi Yoder, Staff Scientist

Louisiana Bucket Brigade, LA

Anne Rolfes, Director

Clare Giesen, Board Chair

Louisiana Environmental Action Network, LA

Marylee Orr

Port Arthur Community Action Network, TX

John Beard

RESTORE, LA

Michael Tritico, President

Sierra Club, CA

Nathan Matthews, Senior Attorney

Sierra Club, CO

Rebecca McCreary, Associate Attorney

Turtle Island Restoration Network, TX

Joanie Steinhaus, Gulf Program Director

Natural Resources Defense Council

Gillian R. Giannetti, Senior Attorney

Morgan A. Johnson, Staff Attorney

Micah 6:8 Mission

Cynthia Robertson

Libraries and Newspapers

Grand Lake Library, Lake Charles, LA

Grand Chenier Library, Grand Chenier, LA

Johnson Bayou Library, Cameron, LA

Lowry Library, Lake Arthur, LA

Cameron Main Library, Cameron, LA

Hackberry Library, Hackberry, LA

The Cameron Parish Pilot, Dequincy, LA

The Times-Picayune, New Orleans, LA

Landowners, Individuals, and Organizations

5K Holdings; Dallas, TX

Allaire, John C; Rosenberg, TX

Ardoin Limited Partnership; Lake Charles, LA

Ash, Linda Diane; Orange, TX

Avavia Investments LLC; Lake Charles, LA

Bennett, Dorothy Cooley; Longville, LA

Bennett, Jr., Russell; Lake Charles, LA

Blake, Norma Jean Rogers; Moss Bluff, LA

Bobrow, Sharon Trustee of the Sharon Bobrow Revocable Trust Dtd 10/18/1995; San Francisco, CA

Brooke, Dorothy; Brooklyn, NY

Buford, Janet Cooley; DeQuincy, LA

Bunch, Carolyn R, et al; Kerrville, TX

C F Henry Properties, LLC; Lake Charles, LA

Cameron Commercial Property LLC; Lake Charles, LA

Carolyn R Bunch, Trustee of the Elizabeth Taylor Rush's Children and Grandchildren Trust, Carolyn R. Bunch, Richa; Destin, FL

Catholic Society Of Religious & Literary Education; St. Louis, MO

CEM Properties; Lake Charles, LA

Chad & Michelle Mudd; Lake Charles, LA

Charlene Vincent Ebersole, Shanna Vincent Gilbert, Craig E. Vincent; Hackberry, LA

Chelle Mudd Properties; Lake Charles, LA

Chow, Kim Trustee of the Kim Chow Revocable Trust Dtd 10/23/2019; Lihue, HI

Cliffe E Laborde III; Lafayette, LA

Cooley, Alan David; Longville, LA

Cooley, Buford Claude; Longville, LA

Cooley, Jeffrey Vernon; DeQuincy, LA

Cooley, Rebekaha La Vonne; Longville, LA

Cooley, William Estel; Longville, LA

Dechau, Jana Lee; Palmetto, FL

Dorothy Brooke; Brooklyn, NY

Dorothy Cooley Bennet; Longville, LA

Eichblatt, Linda L.; Hartsdale, NY
Fey, Judith Cooley; DeQuincy, LA
Gibs, Stephanie Cooley; Longville, LA
Goode, Arleen Evelyn - Usufruct Debra K. Doty; Lake Charles, LA
Goode, Arleen Evelyn - Usufruct Mark D. Goode; Lake Charles, LA
Goode, Arleen Evelyn - Usufruct Sharon L. Thomas; Lake Charles, LA
Guiday, Annie O.; Opelousas, LA
Haymark, Francis W, et al; Lake Charles, LA
Henry Henry & Martin LLC; Lake Charles, LA
Henry, Henry & Martin; Lake Charles, LA
Henry, James Company; Lake Charles, LA
Henry, Jane Ann; San Antonio, TX
Henry, Jr., Peter C; Hemphill, TX
Higgins, A P Est; Opelousas, LA
House, Kathryn Jean; Lake Charles, LA
House, Kathryn Jean; Lake Charles, LA
House, Kathryn Jean; Lake Charles, LA
House, Kerry Arthur; Lake Charles, LA
Ireland, Betsy Ann Bennett; Lake Charles, LA
J A Davis Properties, LLC; Lake Charles, LA
J J J Cameron Properties, LLC; Houston, TX
J Lawton Company LLC; Lake Charles, LA
Jeanes, Janet J; Houston, TX
Jennings, Christopher P.; New Orleans, LA
Jennings, David S.; Gretna, LA
Jennings, Dorothy P.; Gramercy, LA
Jennings, Estate of John L.; New Orleans, LA
Jennings, Jr., Edward T.; Lexington, KY
Jennings, Patrick L.; Metairie, LA
Jennings, Thomas J.; Plano, TX
Jennings, William J.; Metairie, LA
Jennings-Cameron, LLC; Lafayette, LA
JJJ Cameron Properties LLC; Houston, TX
John W Stone Oil Distributor, LLC; Cameron, LA
Kent, Louise G; Richardson, TX
L. R. Henry Family, LLC; Lake Charles, LA
Laborde, Margaret Rucks; Lafayette, LA
Laborde, Margaret Rucks; Lafayette, LA
Lake Charles Pilots, Inc.; Lake Charles, LA
Laurents, James Neil; Groves, TX
Marshall, Shirley Ruth Stine; Lake Charles, LA
McCoy, Merri Henry; Dallas, TX
McMahon, Rhett Russell Jr; Silver City, NM

Meyers, Karlyn Little et al; New Iberia, LA
MKS Properties LLC; Lake Charles, LA
Morris, Lillian Cecile; Lake Charles, LA
Mouton, Jerry & Gwendolyn; Mermentau, LA
Moyer, Succession of Clair Jennings; Charlotte, NC
Mudd Chad Ellis & Michelle; Lake Charles, LA
Mudd Land Company LLC; Lake Charles, LA
Mudd, Robert L & Kelly F; Bell City, LA
Noack, Mark; Port Arthur, TX
OPWL LLC; Lake Charles, LA
Ortego, Cynithia; Opelousas, LA
Rainbow Righteous; Sulphur, LA
Rice, Jr., Raymond B.; Houston, TX
Rucks, Margaret Mary Roy, W. W. Rucks III Testamentary GST Trusts fbo Margaret G. Rucks, W. W. Rucks IV, and Elizabeth R. Scott; Lafayette, LA
Rucks, Margaret Mary Roy, W. W. Rucks III Testamentary GST Trusts fbo Margaret G. Rucks, W. W. Rucks IV; Lafayette, LA
Sewerage District No 1 Of The Parish Of; Cameron, LA
Shutts F Sons; Lake Charles, LA
Smith, Barbara; Port Arthur, TX
Spurlock, Katherine L; Kerrville, TX
Stine, John Whitney III; Orange, TX
Stine, Melba June; Lake Charles, LA
Stokes, George W. and Clarke, Lynette Stokes; Lafayette, LA
The Charles William Morris And Barbara Pizanie; Lake Charles, LA
Thomason, Andra L.; Amarillo, TX
Tower Land Company Inc.; Lake Charles, LA
Vincent EST, Russell; Hackberry, LA
West Cameron Port Commission; Cameron, LA
West Cameron Port Commission; Lake Charles, LA
West, Linda Louise; Sulphur, LA
West, Marion Lane; Cordova, TN
Westlands Corp.; Lafayette, LA
Westlands Corp.; Lake Charles, LA
WHT, LLC; Lake Charles, LA
William and Mary Stine Properties, LLC; Lake Charles, LA
Worth, Marion Brooke; Locust Valley, NY
Emily Adams, Foley, AL
David Addison, Staunton, VA
John C Allaire, Rosenberg, TX
Andrea Amar, Baton Rouge, LA
Phyllis Arist, Evanston, IL
Ellen Barr, Tarpon Springs, FL

JoAnne Beemon, Charlevoix, MI
Ed Billeaud, Arnaudville, LA
Scott Billington, New Orleans, LA
Marta Bivins-Badon, New Orleans, LA
Craig Broussard, Holly Beach, LA
Janet Bruno-Small, Slidell, LA
Kailee Brushwood, Lacey, WA
Martha Burton, Lakewood Ranch, FL
Gayle Byrne, Mountain Brook, AL
Aarlene Campion, Leesville, LA
Cheryl Carney, San Antonio, TX
Elizabeth Cerny, Downers Grove, IL
Keely Chow, Huntsville, AL
Anna Cole, Baton Rouge, LA
Donna Cook, Greenville, SC
Kari Cordie, Auburn, AL
Maureen Coughlin, Mattapolsett, MA
Jim Crochet, Schriever, LA
James D'Amour, Ann Arbor, MI
Jacob Danos, Lafayette, LA
Kara Davis, Helena, AL
Kyle de Beausset, Grosse Ile, MI
Robert M. Deems, Lawrenceville, NJ
Carolyn Deyo, Baton Rouge, LA
Kim Domangue, Houma, LA
Aran Donovan, New Orleans, LA
Dianne Doochin, Nashville, TN
Robert Dornfield, Athens, TN
Catherine Dunkirk, Sheldahl, IA
Patricia Ferguson, St Charles, MO
Damien Fisher, New Orleans, LA
Rose Foreman, Metairie, LA
Ellie Forrest, Tempe, AR
DharmaLynne Fuller, Albuquerque, NM
Marie Galletti, Phoenix, AR
Antonio Garcia, Santa Fe, NM
Carol E Gentry, Albuquerque, NM
Cher Gilmore, Newhall, CA
Bob Gordin, Jackson, MS
Savannah Gray, Greenwood, MS
Jeptha Greer II, Sylacauga, AL
Robert Griffin, North Hollywood, CA
Nancy Grush, Baton Rouge, LA

Nancy Hale, W. St. Paul, MN
Ava Harrison, Bossier City, LA
Gabriella Hart, Simi Valley, CA
Paul Hawley, Vestavia, AL
Stephen Hawthorne, Stephen, NC
, Pittsboro, NC
Linda Hayes, Virginia Beach, VA
Rebekah Hinojosa, Brownsville, TX
Donna Hoffman, Austin, TX
Ann Houston, Washington, DC
Roddy Hughes, Albuquerque, NM
Stephen Humphrey, Kennewick, WA
Merrill Hurst, Trumansburg, NY
Ken Hyche, Cullman, AL
Scott Jennings, New Orleans, LA
Deborah Jennison, Ludlow, MA
Aubrey Johnson, Pascagoula, MS
Linda Kaye, Culver City, CA
Allen Brent Kennedy, Greenville, AL
Carlotta Kidd, Sacramento, CA
Rosemarie Kozdron, Rockton, PA
Hattle Lattner, Memphis, TN
Kimbrell Lea, Anacoco, LA
Joe Leblanc, Albany, GA
Kathryn Lemoine, West Monroe, LA
M. Virginia Leslie, Milpitas, CA
Martin Livgren, Albuquerque, NM
Rose Luedtke, Lansdale, PA
Barbara Maccambridge, Longmont, CO
Timothy Machen, Gulf Shores, AL
Julie Manciagli, Auburn, AL
Lynn Masterson-O'Shea, New Orleans, LA
Jane Maya Shippy, Stevens Point, WI
Kathleen McCann, Gretna, LA
Sandra McCarthy, Birmingham, AL
Dianne McGee, Vestavia Hills, AL
Donna McGhee, Grand Rapids, MI
Gary McGrane, Jay, ME
Kathleen McNulty, Oakley, CA
Nellie Medlin, Holly Springs, MS
Effle Michalos, Metairie, LA
Luanne Mierow, Beavercreek, OR
Cecile Mochnek, Berkeley, CA

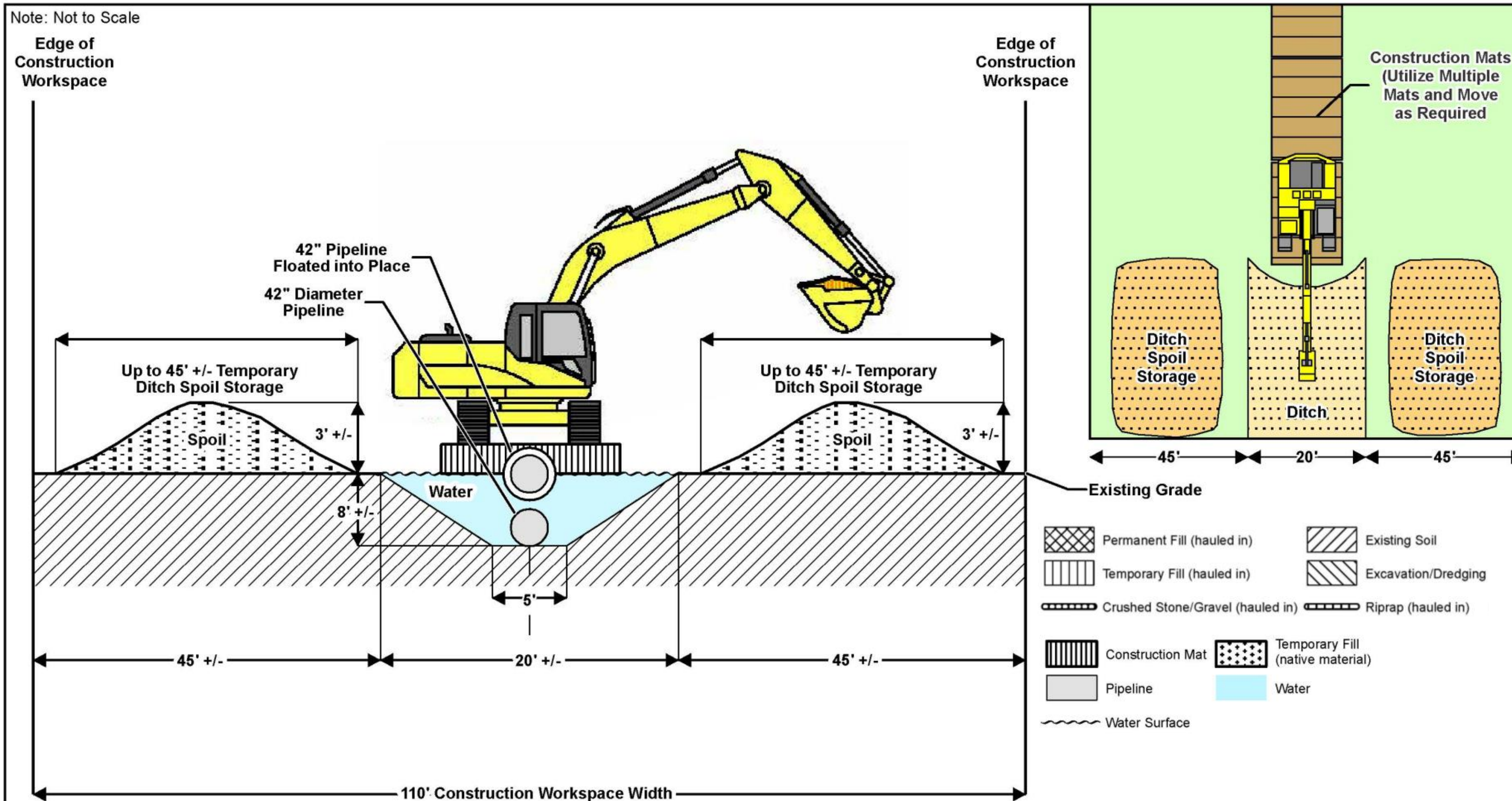
Ji Montgomery, Shiremanstown, PA
Kim Moore, Center Point, AL
Sammantha Neys, Sheldahl, IA
Thomas Nieland, Alamo, TX
Denise Osborn, Shreveport, LA
Karyon Owen, Great Cacapon, WV
Howard Parker, Slidell, LA
Mariangelys Pelet, Davenport, FL
Sheila Pereira, Colorado Springs, CO
Leann Pinniger Magee, Abita Springs, LA
Joseph Polansky, Scranton, PA
Stephanie Poole, Nesbit, MS
Bernadette Powell, New Orleans, LA
Candela Proi, Far Rockaway, NY
Kirsten Prufer, Baton Rouge, LA
Deb Ragar, Shreveport, LA
Antoinette Reyes, Mesilia Park, NM
Edward Richardson, Covington, LA
James Roberts, Lompoc, CA
Sue Roberts, Albequerque, FL
Mella Romine, Toney, AL
Roberta Rubinstein, Ridgefield Park, NJ
Jean Saja, Raymond, MS
Margarite Salone, Shubuta, MS
Margo Salone, Shubuta, MS
Pete Sandifer, Montgomery, AL
Karolyn Schalk, Cincinnati, OH
Donna Smith, Baton Rouge, LA
Karen Smith, Elkins Park, PA
Kevin Smith, Baker, LA
Copley Smoak, Bonita Springs, FL
Elaine Somers, Monroe, WA
Anne Sousanis, Dryden, MI
Karen Spradlin, Jacksonville, AL
Rebecca St Clair, Chicago, IL
Raydon Stamper, Carville, LA
Joanie Steinhaus, Galveston, TX
Lyda Stillwell, Kalamazoo, MI
Kim Sweitzer, Gunnison, CO
Hunter Thompson, Homer, LA
Maryann Tomasik, Cocoa, FL
Sue VanDerzee, Cromwell, CT
Chrissie Waqule, Albuquerque, NM

Julie Ward, Fort Myers, FL
Celeste Watt, Covington, LA
Crystal Whitehead, Matawan, NJ
James Williams, Anniston, AL
Kimberley Wisdom, Olive Branch, MS
David Womack, Jackson, MS
Shirley Wooden, Rockford, IL
Andrea Wyckoff, Eugene, OR
Chloe Young, Alexandra, LA
Dena Yver, New Orleans, LA
Cameron Parish Tourist Commission, Cameron, LA
Entergy Louisiana, Jefferson, LA
South Louisiana Economic Council, Thibodaux, LA
Cameron Parish Port, Harbor & Terminal District, Cameron, LA
Cameron Parish Port, Harbor & Terminal District, Cameron, LA
LR Henry Family LLC, Lake Charles, LA
OPWL LLC, Lake Charles, LA
John W Stone Oil Distributor LLC, Terrytown , LA
MKS Properties LLC, Lake Charles, LA
CF Henry Properties LLC, Henry Henry & Martin LLC, Lake Charles, LA
Avavia Investments LLC, Lake Charles , LA
Ardoin Limited Partnership, Lake Charles, LA
William and Mary Stine Properties LLC, Lake Charles , LA
5K Holdings (LA) LLC, Dallas, TX
Tower Land Company Inc, Lake Charles , LA
WHT LLC, Lake Charles, LA
JJJ Cameron Properties LLC, Gerhart & Associates, Houston , TX
Catholic Society of Religious & Literary Education, Creole , LA
Westlands Corp, Lafayette, LA
Cameron Commercial Property LLC, CEM Properties LLC, Mudd Land Company, LLC, Lake Charles , LA

Mudd Landing LLC, et al, Lake Charles, LA
Shutts F Sons, Lake Charles , LA
Henry James Company, Lake Charles, LA
Lake Charles Pilots Inc, Lake Charles , LA
J A Davis Properties LLC, Lake Charles, LA

APPENDIX B

TYPICAL CONSTRUCTION RIGHT-OF-WAY CONFIGURATIONS



Notes:

The push-pull pipeline construction method is applicable to saturated wetlands and inundated wetlands/shallow ponds.

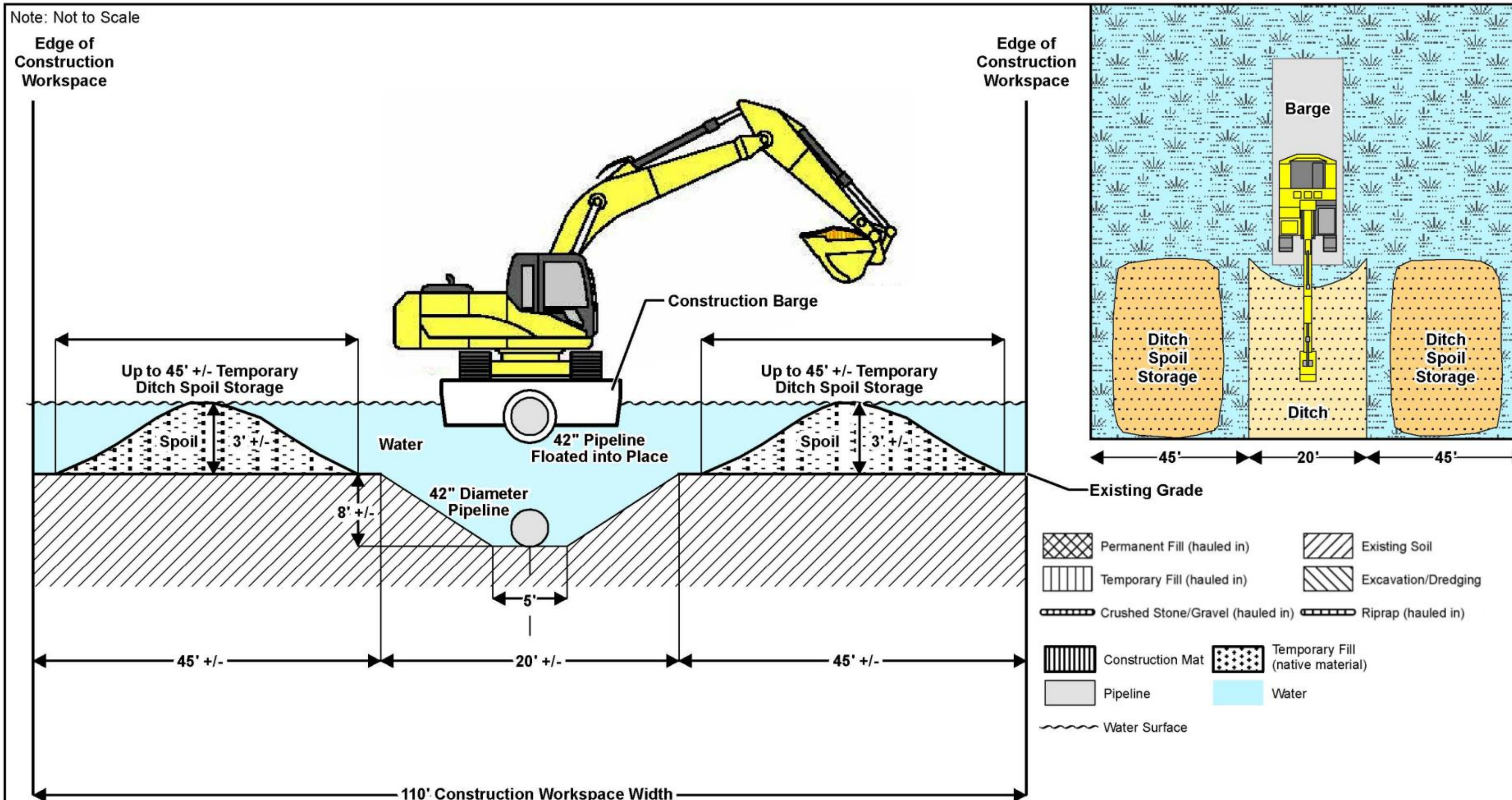
During push-pull pipeline installation, the pipe would be pre-assembled at one end of the wetland. As the pipeline is assembled, pipeline weights and pipeline floats would be attached. The pipeline trench would be excavated by a track hoe on equipment mats working at one end of the trench, moving the mats forward as the trench is extended. The trench would be allowed to fill with water from the surrounding area and the pipeline would be pushed or pulled into position within the trench where the floats would be removed, allowing the pipeline to sink into position. In inundated wetlands, Marsh buggies and/or flat-bottomed boats, traveling within the construction corridor, would be used at points of inflection to guide the advancing pipeline and to remove the floats from the pipeline once it is in place. The trench would then be back-filled and the construction right-of-way restored.

Figure information obtained from supplemental filings provided by Commonwealth LNG on FERC's eLibrary under Docket Number CP19-502-000.

Figure B-1

Commonwealth LNG Project

Typical Configuration for Pipeline Construction in Saturated Wetlands



Notes:

The push-pull pipeline construction method is applicable to saturated wetlands and inundated wetlands/shallow ponds.

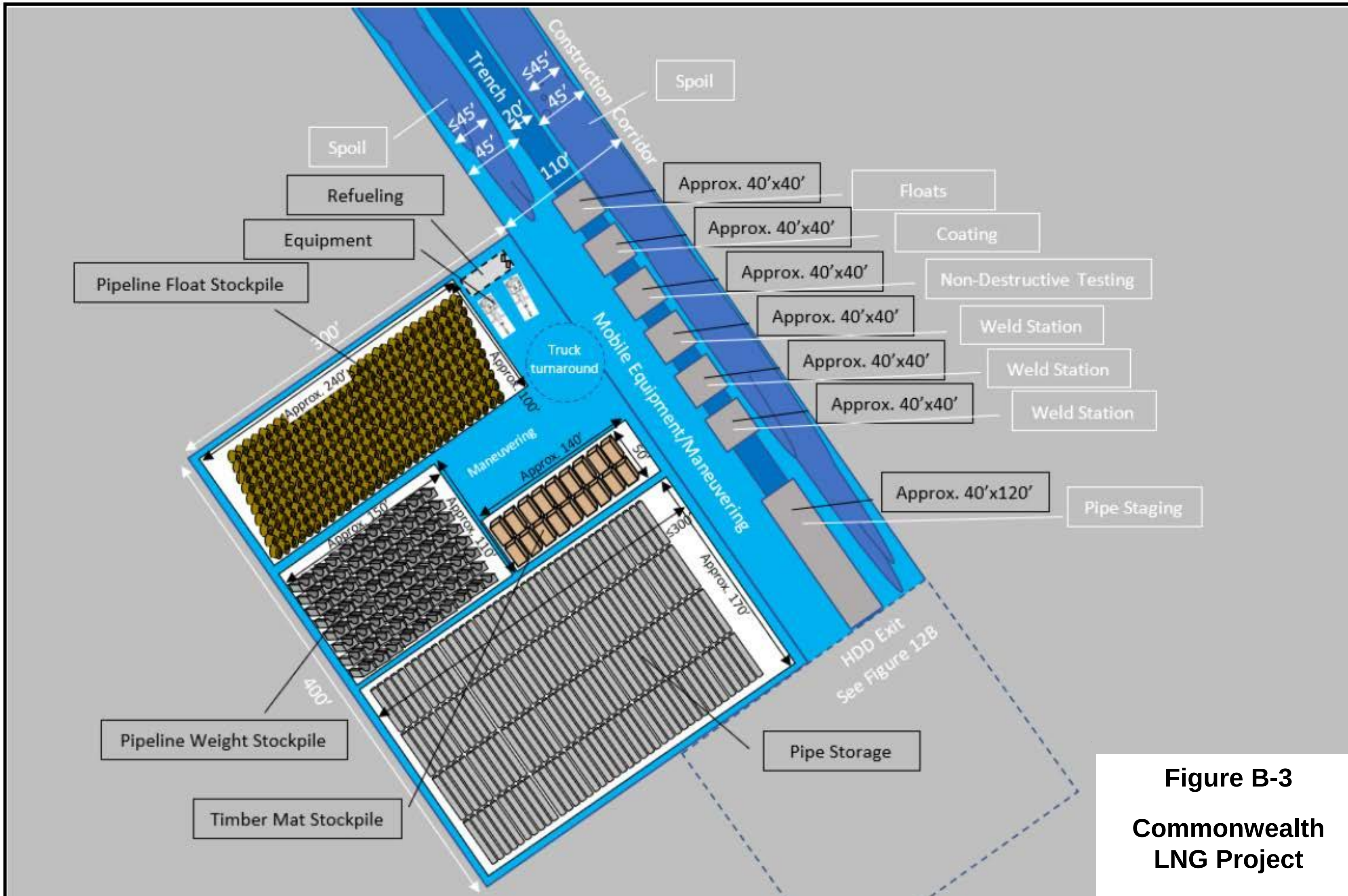
During push-pull pipeline installation, the pipe would be pre-assembled at one end of the wetland. As the pipeline is assembled, pipeline weights and pipeline floats would be attached. The pipeline trench would be excavated by a track hoe on equipment mats working at one end of the trench, moving the mats forward as the trench is extended. The trench would be allowed to fill with water from the surrounding area and the pipeline would be pushed or pulled into position within the trench where the floats would be removed, allowing the pipeline to sink into position. In inundated wetlands, Marsh buggies and/or flat-bottomed boats, traveling within the construction corridor, would be used at points of inflection to guide the advancing pipeline and to remove the floats from the pipeline once it is in place. The trench would then be back-filled and the construction right-of-way restored.

Figure information obtained from supplemental filings provided by Commonwealth LNG on FERC's eLibrary under Docket Number CP19-502-000.

Figure B-2

Commonwealth LNG Project

Typical Configuration for Pipeline Construction in Inundated Wetlands/Ponds



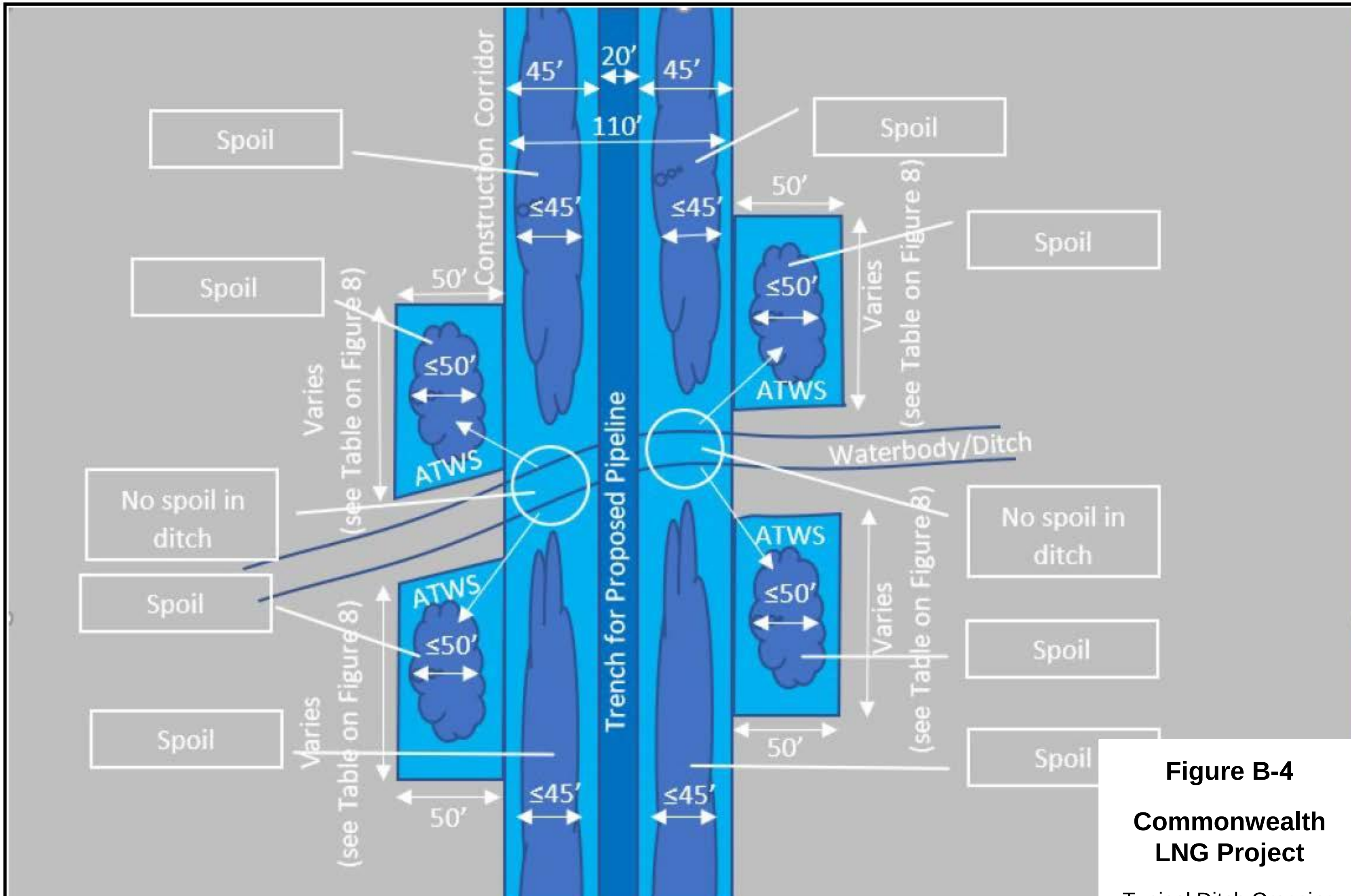
The dimensions of these workspaces were developed in accordance with *Building Interstate Natural Gas Transmission Pipelines: A Primer* (Interstate Natural Gas Association of America [INGAA]), available at https://www.ingaa.org/File.aspx?id=19618&v=7c9acd02, based on minimum workspace requirements for personnel safety, staging of pipe and pipeline appurtenances, efficient movement of materials and equipment, as well as diligent management of environmental impacts.

Figure B-3

Commonwealth LNG Project

Typical Push-Pull Construction Staging and Additional Temporary Workspace

Figure information obtained from supplemental filings provided by Commonwealth LNG on FERC's eLibrary under Docket Number CP19-502-000.



The dimensions of these workspaces were developed in accordance with *Building Interstate Natural Gas Transmission Pipelines: A Primer* (Interstate Natural Gas Association of America [INGAA]), available at https://www.ingaa.org/File.aspx?id=19618&v=7c9acd02, based on minimum workspace requirements for personnel safety, staging of pipe and pipeline appurtenances, efficient movement of materials and equipment, as well as diligent management of environmental impacts.

Figure B-4

Commonwealth LNG Project

Typical Ditch Crossing Construction Plan

Figure information obtained from supplemental filings provided by Commonwealth LNG on FERC's eLibrary under Docket Number CP19-502-000.

APPENDIX C

SUMMARY OF WETLANDS IMPACTS

Summary of wetland impacts at the Commonwealth LNG Project

Wetland ID	MP	Total size of the wetland in the Project footprint (acres)	Cowardin Class	Project Component	Construction Impacts (acres) a/ b/	Operational Impacts (acres) a/	
						Permanent Dredge/Fill	Permanent Right-of-Way
W02	n/a	22.5	EEM	Access Roads	0.6	0.6	n/a
W02	n/a			Liquefaction Facility	13.9	13.9	n/a
W03	n/a	5.5	EFO	Access Roads	0.1	0.1	n/a
W03	n/a			Liquefaction Facility	3.5	3.5	n/a
W04	n/a	2.3	ESS	Access Roads	0.2	0.2	n/a
W04	n/a			Liquefaction Facility	0.1	0.1	n/a
W05	n/a	19.6	EEM	Access Roads	0.5	0.5	n/a
W05	n/a			Liquefaction Facility	14	14	n/a
W06	n/a	0.8	EFO	Liquefaction Facility	0.8	0.8	n/a
W07	n/a	0.3	EFO	Liquefaction Facility	0.3	0.3	n/a
W08	n/a	10.2	ESS	Access Roads	0.8	0.8	n/a
W08	n/a			Liquefaction Facility	0.9	0.9	n/a
W08	n/a			Storm Water Culvert	0.5	0.5	n/a
W09	n/a	5.1	EFO	Access Roads	<0.1	<0.1	n/a
W09	n/a			Storm Water Culvert	0.2	0.2	n/a
W09	n/a			Liquefaction Facility	4.4	4.4	n/a
W10	n/a	6.0	ESS	Liquefaction Facility	6	6	n/a
W11	n/a	11.2	EEM	Access Roads	0.1	0.1	n/a
W11	n/a			Liquefaction Facility	8.3	8.3	n/a
W11	n/a			Marine Berth	0.6	0.6	n/a
W11	n/a			Storm Water Culvert	0.2	0.2	n/a
W12	n/a	0.7	ESS	Liquefaction Facility	0.7	0.7	n/a
W12	n/a			Marine Berth	<0.1	<0.1	n/a
W13	n/a	20.9	EEM	Access Roads	0.3	0.3	n/a
W13	n/a			Liquefaction Facility	12.8	12.8	n/a

Wetland ID	MP	Total size of the wetland in the Project footprint (acres)	Cowardin Class	Project Component	Construction Impacts (acres) a/ b/	Operational Impacts (acres) a/	
						Permanent Dredge/Fill	Permanent Right-of-Way
W13	n/a			Marine Berth	1.2	1.2	n/a
W13	n/a			Storm Water Culvert	0.7	0.7	n/a
W14	n/a	9.9	EFO	Access Roads	0.3	0.3	n/a
W14	n/a			Liquefaction Facility	3.6	3.6	n/a
W14	n/a			Storm Water Culvert	0.3	0.3	n/a
W15	n/a	0.2	EEM	Not affected	n/a	n/a	n/a
W16	n/a	0.3	EFO	Marine Berth	0.2	0.2	n/a
W17	n/a	0.2	ESS	Marine Berth	0.2	0.2	n/a
W18	n/a	0.2	EEM	Marine Berth	0.2	0.2	n/a
W19	n/a	1.2	EFO	Storm Water Culvert	0.6	0.6	n/a
W20	n/a	14.8	EEM	Marine Berth	0.1	0.1	n/a
W20	n/a			Storm Water Culvert	0.1	0.1	n/a
W21	n/a	7.3	ESS	Storm Water Culvert	0.1	0.1	n/a
W22	n/a	7.7	EEM	Access Roads	0.2	0.2	n/a
W22	n/a			Administration and Maintenance Buildings	0.1	0.1	n/a
W22	n/a			Liquefaction Facility	7.4	7.4	n/a
W23	n/a	11.0	EEM	Access Roads	1.8	1.8	n/a
W23	n/a			Administration and Maintenance Buildings	1.3	1.3	n/a
W23	n/a			Construction & Laydown Area	6.3	0	n/a
W23	n/a			Liquefaction Facility	0.5	0.5	n/a
W23	n/a			Moran Towing	0.9	0.9	n/a
W101	n/a	43.6	EEM	ATWS	11.5	0	n/a
W101	n/a			Permanent Easement	0.9	0	0.0 d/

Wetland ID	MP	Total size of the wetland in the Project footprint (acres)	Cowardin Class	Project Component	Construction Impacts (acres) a/ b/	Operational Impacts (acres) a/	
						Permanent Dredge/Fill	Permanent Right-of-Way
W101	n/a			Temporary Workspace	30	0	n/a
W101	3			Temporary Access Road	0.9	0	n/a
W101	0			Pig Launcher	0.1	0.1	n/a
W101	0.8			Meter Station	0.2	0.2	n/a
				Total EEM	**115.7**	**66.1**	**0.0 d/**
				Total ESS	**9.5**	**9.5**	**0.0**
				Total EFO c/	**14.3**	**14.3**	**0.0**
				Total	**139.5**	**89.9**	**0.0 d/**

a/ The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.
b/ Land affected during construction includes both temporary and permanent work areas.
c/ EFO and Chenier habitats contain similar vegetation, which was combined for analysis of vegetation. The EFO & Chenier category in Section 4.5 contains 0.2 acre of upland chenier habitat. The EFO category in this table does not contain this upland chenier habitat.
d/ The wetlands within the permanent easement of the Pipeline will not be affected during operation. Aboveground facilities are considered separately.
ATWS: Additional temporary workspace
EEM: estuarine emergent wetlands
ESS: estuarine scrub-shrub wetlands
EFO: estuarine forested wetlands

APPENDIX D

ESSENTIAL FISH HABITAT ASSESSMENT

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

TECHNICAL ACRONYMS AND ABBREVIATIONS

ADDAMS	Automated Dredging and Disposal Alternatives Modeling System
Bcf	Billion cubic feet
BLH	Bottomland Hardwoods
BM	Brackish Marsh
BUDM	Beneficial Use of Dredged Material
CFR	Code of Federal Regulations
COE	United States Army Corps of Engineers
Commonwealth	Commonwealth LNG, LLC
Commonwealth Project or Project	Terminal and Pipeline
CUP	Coastal Use Permit
ER	Ecological Region
EEM	Estuarine Emergent
EFH	Essential Fish Habitat
ESS	Estuarine Scrub-Shrub
EFO	Estuarine Forested
EOR	Estuarine Oyster Reef
EWB	Estuarine Waterbottom
EWC	Estuarine Water Column
FERC	Federal Energy Regulatory Commission
FERC Plan	FERC Upland Erosion Control, Revegetation & Maintenance Plan
FERC Procedures	FERC Wetland & Waterbody Construction & Mitigation Procedures
FM	Fresh Marsh
GMFMC	Gulf of Mexico Fishery Management Council
HCD	Habitat Conservation Division
IM	Intermediate Marsh
LDEQ	Louisiana Department of Environmental Quality
LDWF	Louisiana Department of Wildlife and Fisheries

LDNR	Louisiana Department of Natural Resources
LNG	Liquefied Natural Gas
LRAM	Louisiana Wetland Rapid Assessment Method
LSU	Louisiana State University
m^3	Cubic Meter
MSA	Magnuson-Stevens Fishery Conservation & Management Act
MTPA	Million Metric Tonnes per Annum
NAVD88	North American Vertical Datum of 1988
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OCM	Office of Coastal Management
Pipeline	Natural Gas Pipeline
ppt	parts per thousand
PRD	Protected Resources Division
SAV	Submerged Aquatic Vegetation
Terminal	Natural Gas Liquefaction and Export Facility
USCG	United States Coast Guard
WCA	Water Column-Associated
WVA	Wetland Value Assessment

1.0 INTRODUCTION

Commonwealth LNG, LLC (Commonwealth) proposes to site, construct, and operate a natural gas liquefaction and export facility (Terminal), which includes a natural gas pipeline (Pipeline), in Cameron Parish, Louisiana. The Terminal and Pipeline (together, the Commonwealth LNG Project or Project) would be located on the west side of the Calcasieu Ship Channel, near its entrance to the Gulf of Mexico (*see* Figure 1). The coordinates of the Terminal site are latitude: 29° 46’ 13.844” N, longitude: 93° 21’ 9.831” W.

The Federal Energy Regulatory Commission (FERC) is providing this Essential Fish Habitat (EFH) Assessment to satisfy the requirements of the Magnuson-Stevens Fishery Conservation & Management Act of 1976, as amended (MSA). The MSA defines EFH as “those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity.”

This EFH Assessment 1) describes the proposed action, 2) provides an analysis of the potential adverse effects of the action on EFH, 3) provides conclusions regarding the effects of the action on EFH, and 4) presents the proposed mitigation.

2.0 DESCRIPTION OF THE PROPOSED ACTION

The Commonwealth LNG Project (Project) encompasses the construction of one liquefied natural gas (LNG) plant, including six gas liquefaction trains and appurtenant facilities. Each train would have a liquefaction design capacity of approximately 65.1 Billion cubic feet (Bcf) of natural gas per year (equivalent to approximately 1.4 million metric tonnes per annum [MTPA]) for a total nominal liquefaction and production capacity of 390.3 Bcf per year (equivalent to approximately 8.4 MTPA of LNG). Under optimal operating conditions, the Project would have a peak capacity of up to 441.4 Bcf per year (equivalent to approximately 9.5 MTPA of LNG). The Project would also include six LNG storage tanks (each with a capacity of 50,000 cubic meters [m^3]), one marine loading berth (capable of loading LNG carriers up to a capacity of 216,000 m^3), and a 3.0-mile-long, 42-inch-diameter Pipeline that would connect the Terminal with existing intrastate and interstate pipelines for the purpose of supplying feed gas to the Project. In this regard, the Pipeline would include interconnections with an existing interstate pipeline, owned by Kinetica Partners, LLC, and two existing intrastate pipelines owned by EnLink Bridgeline Holdings, LP.

Specifically, the Proposed Action includes the following components:

- Terminal;
- Pipeline Route (including right-of-way, temporary workspace, additional temporary workspace, and aboveground facilities);
- Dredged area (including the LNG berth area and Barge Dock area);
- Stormwater Culvert and Water Control Structure; and
- Beneficial Use of Dredged Material (BUDM) area and Slurry Pipeline.

The LNG would be exported from the Project and delivered to global markets via marine vessels. The Project is anticipated to commence operations in 2026.

2.1 TERMINAL CONSTRUCTION

2.1.1 Terminal Site Preparation

The Terminal site would be cleared, grubbed, and graded to establish safe, efficient construction surfaces. General fill material would be brought to the site and placed within the process areas. The purpose of the fill would be to raise the elevation of the process areas to facilitate stormwater management and gravity flow within stormwater drainage piping. Engineered fill would be brought to the site and placed under proposed plant roads to provide a stable road base. Permanent access roads greater than 500 feet long would include one 24-inch culvert approximately every 500 feet to ensure existing flow of surface water is uncompromised. A plan view is provided as figure 2; cross section as figure 3 (sheets 1-5).

2.1.1.1 Stormwater Culvert and Water Control Structure

Commonwealth filed a *Hydraulic Impact Analysis Report* dated September 2018 as appendix 13.J.4 of its application to the FERC on August 20, 2019.[1] The Conclusions and Recommendations section of the *Hydraulic Impact Analysis Report* recommends that an earthen channel be constructed along the western and southern faces of the facility, the purpose of which is to convey runoff from the existing drainage basin as well as enable the remaining marsh complex to exhibit similar drainage/water level characteristics from the pre-development to the post-development period. The fundamental drainage path is unchanged, namely from west to east with water exiting directly to the Calcasieu River, immediately south of the Terminal site. The base width of the earthen channel would be 45 ft, with 1V:3H sloped sides, up to ground level, which would provide marsh water storage to replace storage eliminated by the proposed Terminal site.

Material removed by shore-based excavation and earth-moving equipment (e.g., excavation of the stormwater culvert) may be re-used on site. In particular, sands that form ridges and stiff clays, if found, could be re-purposed as fill materials. The potential for re-use of such materials would be verified, prior to construction.

A water control structure at the outfall location from the earthen channel to the river is also proposed. The purpose of the structure would be to maintain appropriate water and salinity levels in the marsh complex. Pre-construction water and salinity level conditions are described in Commonwealth's *Hydraulic Impact Analysis Report.* Commonwealth would design the water control structure to maintain the pre-construction conditions. The water control structure is expected to consist of a variable crest weir that could be used to manage upstream water levels (see section 2.4 for greater detail). However, Commonwealth would confirm the configuration of the water control structure during final design in coordination with state and federal agencies, such as the Louisiana Department of Natural Resources Office of Coastal Management (OCM) and the National Marine Fisheries Service (NMFS).

The *Hydraulic Impact Analysis Report* for the Commonwealth LNG Project was reviewed by the OCM in support of their Hydrologic Modification Impact Analysis. This analysis typically investigates the pre- and post-development surface water conditions at a site proposed for development and is used by OCM to determine if adverse impacts on adjacent lands and/or waterways would occur as a result of the proposed use (OCM, 2015). Based on the information provided in the *Hydraulic Impact Analysis Report* s, OCM's Hydrologist, Thomas Van Biersel, "determine[d] that the project would have little or no negative impact on the local hydrology" (see Strategic Online Natural Resources Information System [SONRIS], 2020). A

1 See accession no. 20190820-5125.

plan view of the stormwater culvert is shown in figure 2, and a cross section is shown in an inset in figure 3, sheet 1 of 5.

2.1.1.2 Alternatives Analysis for the Stormwater Culvert and Water Control Structure

In response to a request from NMFS, Commonwealth considered two alternatives for the Stormwater Culvert and Water Control Structure: the No-Action Alternative and the proposed Stormwater Culvert and Water Control Structure. Under the No-Action Alternative, stormwater (which may include storm surge during extreme weather events) could enter the wetland west of the Terminal. Because construction of the Terminal would eliminate the drainage feature that currently allows stormwater to flow to the Calcasieu Ship Channel, under the No-Action Alternative, this stormwater would accumulate in the wetland, potentially flooding this area. Because of this potential for flooding, Commonwealth did not select the No-Action Alternative.

Commonwealth selected the proposed design of the Stormwater Culvert and Water Control Structure, described herein, because it was environmentally preferable to the No-Action Alternative. Additional detail regarding the stormwater culvert and water control structure, including modeling results of pre- and post-construction drainage calculations, can be found in Commonwealth's *Hydraulic Impact Analysis Report*.

2.1.2 Dredging

Dredging would be performed in accordance with U.S. Army Corps of Engineers (COE) and U.S. Coast Guard (USCG) regulations. The LNG berth area would be dredged to a maximum water depth of 14.6 meters (48 feet). The Barge Dock would require a water depth of nominally 12 meters (40 feet), so that the proposed general cargo carrier vessel can offload the modules. The dock would comprise a sheet pile wall, with a piled relieving platform behind it to enable load transfer from the general cargo carrier vessel to the haul road. The seabed area immediately in front of the sheet pile wall would require dredging to accommodate the vessel, inclusive of rudder/hull clearance, ballasting, and sag requirements.

The Commonwealth LNG Project would include the following volume of dredging:

- LNG berth area: 1,500,000 cubic yards; and
- Barge dock area: 230,000 cubic yards.

The total volume of dredging would be approximately 1,730,000 cubic yards (comprising the LNG berth and the barge dock area).

2.1.3 Beneficial Use of Dredged Material Area

Commonwealth would dispose of material dredged during construction of the LNG Berth and Barge Dock area at a BUDM area east of Calcasieu Lake, which would also address BUDM requirements in accordance with Louisiana coastal use regulations (Louisiana Administrative Code 43:I Ch. 7 § 724). The BUDM area is not proposed as mitigation for impacts on wetlands, waterbodies, or EFH. Figures of Commonwealth's proposed specifications for the BUDM site are provided in Appendix A. Commonwealth continues to coordinate with OCM regarding the final design of the site.

2.2 PIPELINE CONSTRUCTION

The Pipeline components would be sited, constructed, operated, and maintained in accordance with 49 Code of Federal Regulations (CFR) Part 192 and other applicable federal and state regulations. A plan view of the pipeline route and workspace is provided as figure 4.

Commonwealth addressed our recommendation in the Commonwealth LNG Project Draft Environmental Impact Statement (EIS) to update and file its equipment crossing/temporary access plan for the intermediate waterbody at MP 2.9. As discussed in section 4.3.2.2 of the final EIS, Commonwealth would repair the crossing with a new culverted crossing not more than 25 feet wide, sufficient for access by pipeline construction equipment.

The push-pull method would be used for the majority of Pipeline installation. During the push-pull method, the pipe would be pre-assembled at one end of the wetland to be crossed. The Pipeline trench would be excavated through the wetland by a track hoe on equipment mats or using low-ground-pressure amphibious equipment and allowed to fill with water from the surrounding area. Floats would be attached to the Pipeline, and the Pipeline would be pushed or pulled into position within the trench. Once the Pipeline is in place, the floats would be removed, allowing the pipeline to sink into position with the aid of set-on weights or concrete coating to create negative buoyancy. Finally, the trench would be backfilled by a track hoe on equipment mats and the construction right-of-way would be restored.

For restoration of the Pipeline right-of-way, Commonwealth would implement and adhere to the FERC *Upland Erosion Control, Revegetation and Maintenance Plan* (FERC *Plan*) and Commonwealth's *Wetland and Waterbody Construction and Mitigation Procedures* (Commonwealth's *Procedures*), which incorporate the FERC *Wetland and Waterbody Construction and Mitigation Procedures*[2], and Commonwealth's *Workspace Restoration Plan.*[3] Because the FERC *Plan* and *Procedures* were developed primarily for use with pipeline construction throughout the United States, several alternative measures (as summarized in the final EIS) would be required to adapt the FERC Procedures to Terminal construction in coastal Louisiana. These proposed alternative measures are acceptable to FERC and discussed in section 4.4.3 of the final EIS.

Commonwealth discussed restoration of the Pipeline right-of-way with COE, OCM, and NMFS-Habitat Conservation Division (HCD) on March 23, 2022.[4] Commonwealth's revised *Workspace Restoration Plan* reflects those discussions. COE and OCM would address the potential impacts of Pipeline construction through a permit condition requiring assessment of revegetation of temporarily impacted wetlands (including those classified as EFH) after one growing season and restoration or mitigation where revegetation was unsuccessful. Section 2.1 of Commonwealth's revised *Workspace Restoration Plan* incorporates recommendations of NMFS, including assessment of the contour and elevation of the area overlying the backfilled and restored trenchline to determine whether additional fill should be imported to ensure that the ground surface returns to original grade after settling. We recommend in section 4.4.2.3 of

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2 The FERC Plan and Procedures are sets of baseline construction and mitigation measures developed to minimize the potential environmental impacts of construction on upland areas, wetlands, and waterbodies. The Plan and Procedures can be viewed on the FERC website at: https://www.ferc.gov/sites/default/files/2020-04/upland-erosion-control-revegetation-maintenance-plan.pdf and https://www.ferc.gov/sites/default/files/2020-04/wetland-waterbody-construction-mitigation-procedures.pdf.A

3 Commonwealth's Workspace Restoration Plan Rev. 2 was filed on May 23, 2022 as appendix A under accession no. 20220523-5182.

4 See appendix D of accession no. 20220523-5182

the final EIS that Commonwealth commit to only importing soils from a borrow area approved by the COE and/or the appropriate state agency for use as wetland fill.

The horizontal direction drill (HDD) method is a trenchless construction method involving drilling a pilot hole with a specialized drilling rig with an asymmetric "steerable" bit, directionally guided by adjusting the drill string. After the pilot hole is installed, it would be enlarged by successive passes with larger bits to accommodate the pre-assembled pipeline. Finally, the Pipeline would be pulled into place. An HDD crossing avoids impacts on surface features. In the event of an inadvertent return, Commonwealth would implement its revised *Horizontal Directional Drill Monitoring, Inadvertent Return Response, and Contingency Plan*. Commonwealth's revised Horizontal Directional Drill Feasibility Analysis provides a discussion of risks and contingency plans.[5] Findings of an updated feasibility analysis, completed in June 2022, were consistent with findings of the original survey[6]. In response to our recommendation in the draft EIS, Commonwealth provided additional contingency details in its *Contingency Plan for Inadvertent Release of Drilling Fluid During Horizontal Directional Drilled Waterbody Crossings*.[7]

NMFS recommended that Commonwealth locate HDD entry and/or exit workspaces, open-cut Pipeline installations, and bore crossings in open water to minimize impacts on wetland EFH. Commonwealth is not proposing bore crossings for the Pipeline and there are no waterbodies that would encompass the entirety of the Pipeline route. Commonwealth's HDD entry workspace would be within the proposed Terminal footprint and cause no additional impacts. Relocating it to an open-water location outside the Terminal footprint would increase potential impacts. The suggested relocation of the HDD entry workspace does not provide an environmental advantage over Commonwealth's proposed HDD entry location.

Commonwealth stated that the location of its HDD exit workspace was based on an HDD design primarily focused on reducing the risk of drilling fluid surface release and settlement beneath Highway 27/82.[8]. Locating the HDD exit workspace in open water would require extending the 1,940-foot HDD by approximately 1,500 feet, which would require additional drilling fluid pressure, exacerbating the potential for drilling fluid surface release. Exiting an HDD in open water increases the potential for a release of drilling fluid into the waterbody when the drill head reaches the water. The extended HDD distance would also require a longer HDD stringing corridor at the HDD entry, which would extend beyond the Terminal footprint (where it has no additional impact). This would add additional impact to the Project, including impacts on the Gulf of Mexico shoreline, which is designated critical habitat for the piping plover (*Charadrius melodus*). The suggested relocation of the HDD Exit workspace does not provide an environmental advantage over Commonwealth's proposed HDD exit location.

2.2.1 Pipeline Access Road and Equipment Crossing Bridge

A roadside ditch adjacent to the north side of Highway 27/82 would be crossed by a Temporary Access Road. The impact of the 25-foot-wide access road over this 65-foot-wide waterbody was estimated as less than 0.1 acre. The current/existing waterbody crossing includes four main timber girders, nominally 2 feet wide by 1 foot high by 30 feet long, with a 6-foot center-to-center spacing. These girders are placed onto a gravel foundation. The partial/remnant crossing deck on these timbers is nominally 15 feet long by

5 See accession no. 20211124-5089

6 See appendix E of accession no. 20220624-5166.

7 See appendix B of accession no. 20220728-5187.

8 See accession no. 20211124-5089.

8 feet wide. The deck and girder timbers would be removed from the canal using equipment on the approach road from Highway 27/82. A land-based excavator would be used to skid the timbers onto the approach road, from where they would be transported to a disposal site. The new canal bridging would be placed in accordance with guidance from the Cameron Parish Gravity Drainage District 7 and the Louisiana Department of Transportation and Development. Commonwealth has contacted these authorities with regards to this issue. Flow in the drainage ditch would be maintained by a series of either four 48-inch or three 52-inch pipe culverts, overlain with gravel to form the wearing surface. A land-based excavator would be used to remove in-canal material to the correct elevation, as needed. The pipe culverts would be placed sequentially from the south side of the canal, with each pipe culvert back-filled and overlaid with a gravel wearing surface. Details would be confirmed with Cameron Parish Gravity Drainage District 7 and the Louisiana Department of Transportation and Development. The proposed workspace would be no more than 25 feet wide (i.e., within the originally proposed width of the temporary access road). There would be no change to the impact acreages documented in section 4.3.2 of the EIS.

2.3 TERMINAL OPERATIONS

LNG carriers would likely arrive at the Terminal in a slack condition (minimum volume of LNG in cargo tanks to maintain a cold, cryogenic condition), carrying sufficient ballast water to control trim, draft, stability, and stresses to the vessel. Ballast water would be discharged during loading of LNG after treatment via a USCG-approved ballast water management system, in accordance with USCG regulations (33 CFR Part 151, subpart D and 46 CFR § 162.060) and Navigation and Vessel Inspection Circular 01-18. LNG carriers would also require cooling water for the main engines, generators, condensers, and other shipboard equipment. The typical volume of ballast water released would be up to 15 million gallons (57,000 m^3) for the largest LNG carriers, while the typical volume of cooling water withdrawn and discharged would be up to 10 million gallons (38,000 m^3) during a 24-hour call.

Commonwealth anticipates that an average of up to three vessels per week (or 156 vessels per annum) would call on the Terminal. The facility would have one jetty that accommodates only one LNG carrier, hence loading operations would be one vessel at a time. LNG carriers that arrive when another LNG carrier is at the LNG berth would be asked to wait at the customary anchorage offshore (i.e., normal operation for the Calcasieu Ship Channel), until the LNG berth is vacant and the LNG carrier may be called in for loading by the Terminal. The LNG berth would be able to accommodate LNG carriers ranging in capacity from 10,000 m^3 up to 216,000 m^3 (Q-flex size).

2.3.1 Maintenance Dredging

Commonwealth has assessed the Project's need for ongoing maintenance dredging. The *Technical Memorandum of Hydraulics and Sediment Transport in the Lower Calcasieu Ship Channel and Loop Pass* (Royal Engineers & Consultants, 2013) provides estimates of sediment accumulation and dredging requirements at nearby facilities. Based on an estimated rate of sediment accumulation in the recessed area along the west side of the Calcasieu Ship Channel of approximately one foot per year and an assumption that dredging must be conducted when two feet of material have accumulated, routine maintenance would be necessary every two years and would remove approximately 152,000 cubic yards of material from approximately 47 acres of water bottom. Commonwealth would dispose the dredged material from maintenance dredging at the BUDM site, as discussed above.

2.3.2 Stormwater Culvert and Water Control Structure Operations Plan

Commonwealth would operate the water control structure, which would consist of culverts combined with a variable crest weir, to maintain the hydrologic connection between the estuarine emergent

(EEM) wetlands on the neighboring parcel to the west and the Calcasieu River and manage upstream water levels. The proposed structure functions without manual operation and requires minimal attention during operations. NMFS requested Commonwealth to provide frequency of closure procedures for the structure; however, based on the structure design, no"closure" of the water control structure would be required, nor would there be triggers for closure required. Commonwealth would visually assess the extent of inundation upstream of the stormwater culvert annually and adjust the elevation of the variable crest weir to maintain stable conditions. In response to NMFS' request regarding clarification of the term "stable conditions," Commonwealth states that prior to construction, Commonwealth would complete detailed engineering and design, which would take into account the baseline water depth of the catchments to the west of the facility, during non-storm conditions.[9] The water control structure's sole function is to mimic as close as possible the natural behavior of the existing drainage post-development, primarily of the relatively large catchments. Because the weir is a fixed fixture with no mechanical parts, once installed to the targeted level for maintaining natural drainage, it would not require operation nor maintenance, except for inspection for debris that could impair its function. Visual inspection of the weir at regular intervals and/or following certain weather events would therefore be incorporated in the facility's maintenance program. Commonwealth's Director of Health, Safety, Security, and Environmental would be responsible for these inspections. Backflow protection would be achieved with a flap gate, which would not require manual operation. Based on subsequent analysis by Commonwealth LNG, backflow prevention may not be required for the variable crest weir to be effective at regulating drainage from the surrounding waterbodies or for tidal water influx. During detailed engineering and design, Commonwealth would evaluate the need for this flap gate. Given the flap gate may not be necessary, marsh fauna ingress and tidal inflow would not be prevented. Commonwealth is also considering the use of fish bays/slots, which remain open at all times, to allow for unrestricted passage of aquatic species. The configuration of the water control structure and the elevation of the weir would be confirmed during final design.

2.4 PIPELINE OPERATIONS

Commonwealth would develop an operations and maintenance manual in compliance with 49 CFR Parts 190-192. Pipeline identification markers, containing contact information for a 24/7 hotline, would be installed at line-of-sight intervals and at crossings of roads, railroads, waterbodies, and other key points in accordance with U.S. Department of Transportation regulations. The Pipeline would be part of the Louisiana One Call system.

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9 See accession no. 20220805-5051.

3.0 ANALYSIS OF THE POTENTIAL ADVERSE EFFECTS OF THE ACTION ON EFH

3.1 EXISTING ESSENTIAL FISH HABITAT

The Project is at the mouth of the Calcasieu River, where it discharges into the Gulf of Mexico. The approximately 615,000-square mile Gulf of Mexico is a marginal sea of the Atlantic Ocean, containing highly productive fisheries. Based on NMFS's most recent list, the primary categories of EFH that may occur in the Project area include the following:

- Estuarine Emergent Marsh (EEM);
  - Tidal Brackish Marsh (BM);
  - Tidal Intermediate Marsh (IM);
- Estuarine Oyster Reef (EOR);
- Estuarine Mud/Soft Water Bottoms (EWB); and
- Estuarine Water Column (EWC);

3.1.1 Estuarine Emergent Marsh EFH

EEM habitats occur within the Terminal site and the Pipeline right-of-way (*see* figure 4). EEM habitats provide nursery and foraging habitats supportive of a variety of economically important marine fishery species including gulf menhaden, spotted seatrout, red drum, lane snapper, gray snapper, striped mullet, Atlantic croaker, sand seatrout, southern flounder, brown shrimp, white shrimp, and blue crab (Louisiana Department of Wildlife and Fisheries [LDWF], 2014b). Some of these species serve as prey for other fish species managed by the Gulf of Mexico Fishery Management Council (GMFMC) under the MSA (e.g., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks). These habitats also produce nutrients and detritus that are important components of the aquatic food web which contributes to the overall productivity of the Calcasieu River estuary (NMFS- Protected Resources Division [PRD], 2017).

Commonwealth performed a wetland and waterbody delineation in September 2016 and February/March 2018. The Terminal site is composed of wetlands, cheniers, shoreline, developed land, and open water. The wetlands within the Terminal site were classified according to Cowardin et al. (1979) as EEM, estuarine scrub-shrub (ESS), and estuarine forested (EFO) wetlands. The Pipeline construction corridor runs through EEM wetlands. Within the surveyed areas, these habitats are generally disturbed due to anthropogenically altered hydrology (e.g., highway roadbed, ditches) and habitation by feral hogs.

Wetlands in the Louisiana Coastal Zone are further classified according to their tidal/salinity influence along a scale of increasing salinity according to the following categories:

- Fresh Marsh (FM);
- Intermediate Marsh (IM);
- Brackish Marsh (BM); and
- Saline Marsh (SM).

Classification according to this gradient may be challenging from remote sources, so Commonwealth relied upon "boots-on-the-ground" site visits, augmented by desktop analysis of site elevation and tidal influence.

3.1.1.1 Site Elevation and Tidal Influence

Commonwealth assessed the portion of the site with elevation that lies within ordinary tidal range (i.e., excluding storm surge and other extraordinary events). NMFS-HCD recommends against using light detection and ranging elevation surveys (e.g., NOAA OCM Partners, 2022); therefore, Commonwealth has, based the analysis of site elevation in this document on data from the physical topographic survey conducted by Lonnie Harper & Associates (2018), as recommended. The site elevations are shown in figure 5 as a black-white gradient. Lighter colors indicate higher elevation, with white indicating approximately +9′ North American Vertical Datum of 1988 (NAVD88) and above. To aid in visualization, the two-foot elevation contours are overlain on the gradient and labeled. The portion of the Terminal site containing BM has been shaded green.

Tidal range was based on averaged monthly data from the National Oceanic and Atmospheric Administration (NOAA) Tide Gauge No. 8768094, Calcasieu Pass, LA, from June 2016 through July 2021.[10] All elevations are referenced to the NAVD88. The mean high water (MHW) and mean low water (MLW) are shown below.

- MHW = +0.88′ NAVD88
- MLW = -0.32′ NAVD88.

The 0.88′ NAVD88 contour, which corresponds to MHW, is shown as a dark teal contour line. MLW is not shown on the figure; the entire site lies above MLW.

Commonwealth has taken a conservative approach to defining the tidal range by including elevations up to the +1.38′ NAVD88 contour, which corresponds to MHW plus one-half foot. The +1.38′ NAVD88 elevation is shown in figure 5 as an orange contour line. This conservative approach increased the estimate of tidal Intermediate Marsh EFH.

To expedite the EFH Assessment review process, this document incorporates NMFS-HCD's determination (p. 7, accession no. 20220523-5181) stating that the low area in the north portion of the Terminal site (abutting the south edge of the highway) has a hydrologic connection (e.g., culvert) to a tidal waterbody and that all marsh areas below +1.38′ NAVD88 should be quantified as EFH. Habitats within the orange contour line (figures 5 and 6[11]) are considered tidal marsh habitats.

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10 Note that NOAA Tide Gauge No. 8768094 (NOAA, 2022) indicates that MHW is at +0.30' NAVD 88 (https://tidesandcurrents.noaa.gov/datums.html?datum=NAVD88&units=0&epoch=0&id=8768094&name=Calcasieu+Pass&state=LA); however, this datum was based on the 19-year tidal epoch ending in 2001. Because the 2001 datum does not account for the rapid relative sea level rise at this location, the monthly MHW for the last five years was used instead. Use of this recent MHW datum results in an increase in the amount of the site lying within the tidal range. (Use of the 2001 datum indicates that none of the site is within the tidal range.)

11 Figure 6 has been revised per accession number 20220808-5179.

Note that the distinction between tidal and non-tidal IM is relevant only to the discussion of EFH impacts and mitigation and is not intended to recommend revisions of the final EIS impact tables for wetlands, land use, or other resources.

Marsh Vegetation Communities

Commonwealth conducted a north-south transect of the site on August 5, 2021, to record the dominant species by percent cover at each point, along with the habitat type, based on field observations. A memorandum summarizing the findings of this transect, the marsh habitats based on the dominant species at representative points along the transect, and a photolog including photographs in each cardinal direction at each point along the transect is provided in appendix A. The changes in vegetation, which correspond to the changes in marsh habitat, can be clearly observed in this photolog. NMFS has requested that Commonwealth use this habitat survey. We have incorporated this information in this EFH Assessment.

The OCM conducted their own field visit and determined that the majority of the Terminal site is Intermediate Marsh habitat. OCM representatives have confirmed that the boundaries of the Brackish/Intermediate marsh habitats in figure 6 accurately reflect the boundaries they observed in the field, based on their previous site visit, Biological Investigation report, local experience, review of these materials, and professional judgement. Their official summary of the Project's impact analysis by habitat type was posted to the Strategic Online Natural Resources Information System (SONRIS) on December 20, 2021[12].

The Cowardin et al. (1979) class of each wetland and the Brackish/Intermediate classification of the habitats on the Terminal site, as well as the Project's impact on each habitat type, including waterbodies, are shown in figure 6. The Project's impacts are discussed according to EFH type in section 3.3.

3.1.2 Estuarine Oyster Reef EFH

Oysters (*Crassostrea virginica*) are present on the portion of the riprap on the western shoreline of the Calcasieu Ship Channel that lies between the sediment surface and the upper tolerance boundary for air exposure of these species. Based on the physical topographic survey of the existing riprap conducted by Lonnie Harper & Associates (2021), the toe of the riprap (i.e., mudline) lies between -0.5' NAVD88 and -5.75' NAVD88. Although the upper tolerance boundary for air exposure of these species varies with the substrate surface, the angle of the surface toward the sun, and other factors, MHW plus one-half foot provides a very conservative estimate for this intertidal species. The area of oyster reef was estimated as the vertical distance between the sediment surface and MHW plus one-half foot times the horizontal distance in linear feet of the riprap to be removed during construction of the Commonwealth marine facilities.

Note that the Project would not impact state oyster leases. The nearest active oyster lease is off of Marsh Island approximately 85 miles east of the Project.[13]

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12 https://sonlite.dnr.state.la.us/sundown/cart_prod/cart_crm_view_cmnt?pcup_num=P20190900&pauthorization=N&psort=2

13 See communication with LDWF on 12/7/2021 in appendix A of accession no. 20211217-5015

3.1.3 Estuarine Mud/Soft Water Bottoms EFH and Estuarine Water Column EFH

The estuarine water column includes the open water from the surface to the bottom within the Calcasieu River and Calcasieu Ship Channel and the adjacent tidal creeks and sloughs. It also includes the habitats within the BUDM area (see Appendix A). These waterbodies are tidally influenced and affected by freshwater input from rainfall and from the Calcasieu River.

Estuarine mud/soft water bottoms include the substrate of the waterbodies that make up the estuarine water column. Species that use estuarine mud/soft water bottoms as EFH may burrow into it or simply live in close contact with it. In the turbid waters of the Calcasieu River, only very shallow water supports aquatic vegetation, and most of the water bottom is unvegetated fine-grained unconsolidated sediment.

The Calcasieu Ship Channel is a 68-mile-long navigation channel, extending from its northern end at Interstate 10, crossing over Lake Charles near Channel Mile 36.0 to its southern end at Channel Mile -32.0, where the approach channel opens into the Gulf of Mexico (COE, 2015). The Calcasieu Ship Channel was originally constructed in 1922 for commercial vessel navigation by COE to provide deep water passage for maritime commerce from the Gulf of Mexico to Lake Charles, Louisiana. The Calcasieu Ship Channel has since been deepened and widened several times over its lifespan, reaching its current dimensions in 1968. It has an authorized width of 400 feet and a depth of 40 feet, which are maintained by periodic dredging (Lake Charles Pilots, 2014).

Currently, over 1,000 ships per year use the Calcasieu Ship Channel, and this number may exceed 2,000 per year by the time the Project begins operation (Ausenco, 2018). LNG carriers calling on the proposed LNG Terminal would transit the Gulf of Mexico using existing offshore shipping routes.

3.2 FISHERIES CLASSIFICATION

Fishery classifications are broadly based on the salinity of the environment (freshwater, estuarine, and marine). Biotic and abiotic conditions such as water depth, vegetation, structure, and substrate composition also influence the fisheries classification. Specific habitat types and conditions can influence which species of fish are present.

The Gulf of Mexico is classified as a marine environment. The Calcasieu Ship Channel is classified as an estuarine environment to approximately Channel Mile 26.0. In addition, the brackish and intermediate marsh wetlands at the Terminal site and the brackish marsh along the Pipeline route are classified as estuarine habitat.

Designated uses of surface waters in Louisiana are assigned by the Louisiana Department of Environmental Quality (LDEQ) into one or more of seven designations: agriculture, drinking water supply, fish and wildlife propagation, outstanding natural resource waters, oyster propagation, primary contact recreation, and secondary contact recreation (Louisiana Administrative Code 33:IX.1, Chapter 11). The Calcasieu Ship Channel has three designated uses: primary contact recreation, secondary contact recreation, and fish and wildlife propagation (LDEQ, 2018).

Table 3.2-1 provides a list of marine and estuarine finfish, shellfish, and mussel species commonly found in the lower Calcasieu River estuary with the potential to occur in the waterbodies near the Terminal (LDWF, 2014a).

TABLE 3.2-1 **Lower Calcasieu River Estuary-Finfish, Shellfish, and Mussel Species**	
Common Name	**Scientific Name**
Atlantic croaker	*Micropogonias undulates*
Black drum	*Pogonias cromis*
Gafftopsail catfish	*Bagre marinus*
Gray snapper	*Lutjanus griseus*
Gulf killifish	*Fundulus grandis*
Gulf menhaden	*Brevoortia patronus*
Hardhead catfish	*Arius felis*
Hogchoker	*Trinectes maculates*
Killifish	*Fundulus* spp.
Ladyfish	*Elops saurus*
Mosquitofish	*Gambusia affinis*
Pinfish	*Lagodon rhomboids*
Puffer	*Sphoeroides parvus*
Red drum	*Sciaenops ocellatus*
Sand seatrout	*Cynoscion arenarius*
Sheepshead minnow	*Cyprindon variegates*
Silver perch	*Bairdiella chrysura*
Silverside	*Menidia bervllina*
Southern flounder	*Paralichthys lethostigma*
Spanish mackerel	*Scomberomorus maculates*
Spot	*Leiostomus xanthurus*
Spotted seatrout	*Cynoscion nebulosus*
Striped mullet	*Mugil cephalus*
Blue crab	*Callinectes sapidus*
Brown shrimp	*Farfantepenaeus aztecus*
Pink shrimp	*Farfantepenaeus duorarum*
White shrimp	*Litopenaeus setiferus*
Common rangia	*Rangia cuneata*
Eastern oyster	*Crassostrea virginica*
American eel	*Anguilla rostrata*

3.2.1 Essential Fish Habitat and Fisheries of Special Concern

Fisheries of special concern include fisheries with important recreational value, coldwater fisheries, fisheries subject to special state fishery management regulations, or habitat for species that are either federally or state-listed as threatened and endangered species. Additionally, if a waterbody has significant economic value due to fish-stocking programs, commercial fisheries, or tribal harvest, it is also considered a fishery of special concern.

The U.S. Fish and Wildlife Service and Louisiana National Heritage Program list only one protected fish species for Cameron Parish, the Gulf sturgeon (Gulf subspecies of the Atlantic Sturgeon, *Acipenser oxyrinchus desotoi*). NMFS-PRD additionally lists the giant manta ray (*Manta birostris*) and oceanic whitetip shark (*Carcharhinus longimanus*) throughout Louisiana's coast (NMFS-PRD, 2019). Habitat Areas of Particular Concern are identified by the Fishery Management Councils as high-priority areas for conservation, management, or research because they are rare or threatened by land development, or essential for the proper function of the ecosystem. There are no Habitat Areas of Particular Concern near the Project Site (NMFS-PRD, 2017).

The GMFMC has prepared fishery management plans for seven marine groups in the Gulf of Mexico and its estuaries: reef fish, migratory pelagic fish, red drum, shrimp, spiny lobster, stone crab, and corals. EFH for each of these groups was defined in 1998. The complete list of EFH was obtained from the GMFMC *Final Report 5-Year Review of Essential Fish Habitat Requirements Including Review of Habitat Areas of Particular Concern and Adverse Effects of Fishing and Non-Fishing in the Fishery Management Plans of the Gulf of Mexico* (GMFMC, 2016).

Table 3.2-2 provides a summary of the various life stages of fish species with EFH near the Project (GMFMC, 2016).

TABLE 3.2-2

Life Stage Occurrence for Species with EFH Designated Near the Project

Species	**Life Stage**	**Zone**	**EFH**	**Seasons**
Red drum (*Sciaenops ocellatus*)	Eggs	Marine	Coastal waters frequently near tidal inlets	August through October
	Larvae/ postlarvae	Estuarine	Emergent marsh, planktonic, sand/shell bottoms, submerged aquatic vegetation (SAV), soft bottoms, emergent marshes	October through January
	Juvenile	Estuarine/ Marine	0-16 feet; emergent marshes, SAV, soft bottoms, hard bottoms, sand/shell bottoms	Year Round
	Adult	Estuarine/ Marine	1-230 feet; hard bottoms, pelagic, emergent marshes, sand/shell bottoms, SAV, soft bottoms	Year Round
Red snapper (*Lutjanus campechanus*)	Eggs	Marine	Offshore; 59- 413 feet, water column-associated (WCA)	April through October
	Larvae	Marine	Offshore; 59-413 feet, WCA	July through November
	Juveniles	Estuarine/ Marine	Nearshore, offshore; 55-600 feet, reefs, hard bottom, banks/shoals, soft bottom, sand/shell habitats	July through November (Early Juveniles) Year Round (Late Juveniles)
	Adult	Estuarine/ Marine	Nearshore, offshore; 23-480 feet; reefs, hard bottom, and banks/ shoal habitats	Year round
Gray snapper (*Lutjanus griseus*)	Eggs	Marine	Offshore; 0-590 feet; WCA	June through September
	Larvae	Marine	Offshore, 0-590 feet; WCA	April through November; Peak: June through August
	Juvenile	Estuarine	3-10 feet; SAV, mangrove, emergent marsh	Year Round

TABLE 3.2-2 **Life Stage Occurrence for Species with EFH Designated Near the Project**				
Species	**Life Stage**	**Zone**	**EFH**	**Seasons**
	Adults	Estuarine/ Marine	0-590 feet; hard bottom, soft bottom, reef, sand/shell, bank/shoal, and emergent marsh habitats	Year Round
Lane snapper (*Lutjanus syngris*)	Eggs	Marine	Offshore, 13-433 feet; WCA	March through September, Peak: July through August
	Larvae	Estuarine/ Marine	0-150 feet, nearshore, pelagic, SAV	June-August
	Juveniles	Estuarine/ Marine	Nearshore, offshore, 0-80 feet, SAV, sand/shell, reefs, soft bottom, banks/shoals	Late summer through early fall
	Adults/ Spawning adults	Marine	Nearshore, offshore, 15-433 feet, sand/shell, hard bottom, reef, and bank/shoal	Year round. Spawning from May to August
Brown shrimp (*Penaeus aztecus*)	Eggs	Marine	59-360 feet; benthic, soft bottom, sand/shell	Fall and spring
	Larvae/ Neonate	Estuarine/ Marine	0-269 feet; planktonic, sand/shell/soft bottoms, SAV, emergent marsh, oyster reef	Year Round/October through July
	Juvenile	Estuarine	0-59 feet; sand/shell/soft bottoms, SAV, emergent marsh, oyster reef	March through July
	Sub-adults	Estuarine	3-60 feet; soft bottom, sand/shell	Spring through fall
	Adults	Marine	Offshore; 46-360 feet; soft bottom, sand/shell	Fall and spring
White shrimp (*Penaeus setiferus*)	Fertilized Eggs	Estuarine/ Marine	30-111 feet; nearshore, offshore, estuarine	Spring through fall

TABLE 3.2-2 **Life Stage Occurrence for Species with EFH Designated Near the Project**				
Species	**Life Stage**	**Zone**	**EFH**	**Seasons**
	Larvae / Neonate	Marine/ Estuarine	1-269 feet; soft bottoms, emergent marsh	Year Round/June through September
	Juvenile	Estuarine	1-98 feet; soft bottoms	September through June
	Adults	Estuarine/ Marine	Nearshore, offshore, estuarine; soft bottoms; less than 89 feet.	Late summer and fall
Spanish Mackerel (*Scomberomorus maculates*)	Eggs	Nearshore, Offshore	0-150 feet; WCA	Spring, Summer
	Larvae	Nearshore, Offshore	30-275 feet; WCA	May-Oct
	Early Juveniles	Estuarine, Nearshore	6-30 feet; WCA	Mar-Nov
	Late Juveniles	Estuarine, Nearshore, Offshore	6-150 feet; WCA	Mar-Nov
	Adults	Estuarine, Nearshore, Offshore	10-250 feet; WCA	Spring
	Spawning Adults	Nearshore, Offshore	<150 feet; WCA	May-Sep
Cobia (*Rachycentron canadum*)	Eggs	Estuarine, Nearshore	0-3 feet; pelagic WCA	Summer
	Larvae	Estuarine, Nearshore, Offshore	Near the surface of waters with depths of 10-1000 feet; WCA	May-Sep
	Early juvenile	Nearshore, Offshore	Surface waters above depths of 15-1000 feet; WCA	April-July
	Late juvenile	Nearshore, Offshore	Surface waters above depths of 15-1000 feet; WCA	May-Oct
	Adult	Nearshore, Offshore	3-230 feet; WCA, hard bottoms	Year Round
	Eggs	Marine	Pelagic WCA	Feb-May

TABLE 3.2-2

Life Stage Occurrence for Species with EFH Designated Near the Project

Species	Life Stage	Zone	EFH	Seasons
Greater amberjack (*Seriola dumerili*)	Larvae	Offshore	Pelagic WCA, *Sargassum* mats	Year round
	Early juvenile	Nearshore, Offshore	Pelagic WCA, *Sargassum* mats	Summer through fall
	Late juvenile	Nearshore, Offshore	10-613 feet; WCA, hard bottoms, and reefs	Summer through fall
	Adult	Nearshore, Offshore	10-613 feet; WCA, hard bottoms, and reefs	Year round
King mackerel (*Scomberomorus cavalla*)	Eggs	Offshore	150-590 feet; pelagic WCA	Spring and summer
	Larvae	Offshore	150-590 feet; WCA	May-Oct
	Juveniles	Nearshore	≤30 feet; WCA	May-Oct
	Adults	Nearshore, Offshore	0-650 feet; WCA, reefs	Year round
Scalloped hammerhead shark (*Sphyrna lewini*)	Neonate/ young-of-the-year	Estuarine / Marine	Shallow coastal bays and estuaries less than 16 feet deep	Year round
	Juvenile	Estuarine / Marine	Shallow coastal waters	Year round
	Adult	Estuarine / Marine	Coastal and estuarine waters	Year round
Blacktip shark (*Carcharhinus limbatus*)	Neonate/ young-of-the-year	Estuarine / Marine	6-20 feet; Estuarine muddy bottoms and seagrass beds	April to September
	Juvenile	Estuarine / Marine	Estuarine and nearshore waters	Year round
	Adult	Estuarine / Marine	Shallow coastal waters	Year-round
Atlantic sharpnose shark (*Rhizoprionodon terraenovae*)	Neonate/ young-of-the-year	Estuarine / Marine	Coastal and estuarine waters with mud, sand, seagrass habitats	Early June through early fall
	Juvenile	Estuarine / Marine	Coastal and estuarine waters with sand, seagrass, and mud	April through early fall

TABLE 3.2-2

Life Stage Occurrence for Species with EFH Designated Near the Project

Species	Life Stage	Zone	EFH	Seasons
	Adult	Estuarine / Marine	Coastal and estuarine waters	April through early fall
Sources: GMFMC, 2016; NMFS, 2009				

3.2.1.1 Species with EFH in the Project Area

Additional life history and EFH details are described below for species identified by NMFS as being relevant to the Project (NMFS-HCD, 2017; 2018).

Red Drum

Red drum live in varying habitats, ranging from 130-foot depths in offshore habitats to very shallow estuarine waters where they are extremely common in Gulf estuaries (GMFMC, 1998). Red drum can tolerate a wide range of salinities from freshwater to marine. Red drum spawn in deeper water near the mouths of bays and inlets and on the Gulf side of barrier islands (Perret et al., 1980). Eggs and larvae can be found in waters with salinities of greater than 25 parts per thousand (ppt) from September through February. Eggs hatch in the Gulf, and larvae are then transported into estuaries, where they reach maturity (Pattillo et al., 1997). Estuarine wetlands are especially important to all stages of red drum (Perret et al., 1980). Juveniles are found in quiet, shallow, protected waters with soft bottoms. Sub-adults and adults prefer shallow bay bottoms or oyster reefs (Miles, 1950).

Red Snapper

Red snapper use benthic habitats including reefs, hard bottom, soft bottom, and sand/shell across its range throughout the entire Gulf Coast of the U.S. Spawning occurs in offshore waters from May to October between depths of 18 to 37 meters over fine sand substrates. Eggs and postlarvae typically use offshore habitats, and early to late juveniles are often associated with shell and low-relief structures as well as barren sand and mud bottoms with salinities ranging between 30 and 35 ppt (GMFMC, 2016).

Gray Snapper

Juvenile gray snapper are found throughout the Gulf estuaries, but are observed most commonly in the shelf waters of the Gulf and are particularly abundant off south and southwest Florida (GMFMC, 1998). Juveniles occur in vegetated estuaries, specifically seagrass beds and mangroves (Bortone and Williams, 1986). The other life stages of the gray snapper (adult, spawning eggs, and larvae) are usually found offshore. The spawning season lasts from June through September. Post-larval gray snapper move into estuarine habitats and are found over dense seagrass beds where they feed primarily on amphipods (GMFMC, 1998). Juveniles forage in seagrass meadows and mangrove roots and around pilings (Bortone and Williams, 1986). Juvenile gray snapper are present in the Calcasieu River estuary most of the year.

Lane Snapper

Lane snapper spawn offshore in groups. The spawning season is from March through September, with activity peaking from June through August (Rodriguez-Pino, 1962; Manooch and Mason, 1984). Lane snapper eggs are pelagic. Juveniles mature in estuaries and prefer areas with seagrass beds, while adults are commonly found in coastal and offshore areas with varying substrate types (Bortone and Williams, 1986). Juveniles prefer estuary type salinities, generally less than 25 ppt, and most adults are found in offshore waters where salinity is greater than 25 ppt.

Brown Shrimp

Brown shrimp eggs are found offshore, near the seafloor, mostly during spring and fall (Lindner and Cook, 1970; Renfro and Brushner, 1982). Post-larval shrimp migrate to estuaries mainly from February through April. Post-larval and juvenile shrimp are common in northern Gulf estuaries in salinities from 0 to 25 ppt. They are strongly associated with shallow habitats with vegetation (Zimmerman et al., 1984), but are also found over silty sand and non-vegetated mud bottoms (Czapla et al., 1991; Minello and Webb, 1997; Fry, 2008). Juvenile and sub-adult stages of brown shrimp occur in secondary estuarine channels and out into the continental shelf; however, they prefer shallow estuarine waters. Adult brown shrimp prefer salty marine waters extending from mean low tide to the edge of the continental shelf.

White Shrimp

White shrimp eggs are demersal and their larval stages are planktonic. Both stages occur in nearshore Gulf waters (salinity greater than 25 ppt) from March through November. Post-larval shrimp migrate into estuaries from May through November, with peaks in early summer and early fall. The post-larval life stage transitions to a benthic lifestyle upon reaching nursery areas. The post-larval white shrimp prefer shallow water with mud and sand bottoms high in organic detritus or abundant marsh. The shrimp develop into juveniles in this habitat. Juveniles prefer lower salinities (less than 25 ppt) and are found in tidal rivers and tributaries in their range. Densities are high in marsh edge and SAV, followed by marsh ponds and channels, inner marsh, and oyster reefs (GMFMC, 1998). Toward adulthood, white shrimp migrate back toward the sea in late August and September. Adults are demersal and inhabit nearshore soft-bottom Gulf waters less than 100 feet deep (Pattillo et al., 1997). Adults are common year-round in waters with salinity greater than 5 ppt.

Spanish Mackerel

Spanish mackerel occur throughout the coastal zones of the western Atlantic from southern New England to the Florida Keys and throughout the Gulf. In the Gulf, their distribution is centered off of Florida. Adults are found in coastal waters and may enter estuaries in pursuit of baitfish. Migrations to the northern Gulf in the spring are temperature dependent, and the species is found in waters greater than 20°C, and out to depths of 275 feet at oceanic salinities. Adults spawn over the inner continental shelf from May to September, with the north-central and northeastern Gulf considered important spawning areas. Eggs occur over the inner continental shelf at depths less than 150 feet in spring and summer. Larvae occur over the inner continental shelf, principally in the northern Gulf (GMFMC, 2004).

Cobia

Cobia occur in coastal and offshore waters at depths of 3-230 feet. Cobia seasonally migrate. Adults are found in the northern Gulf from March to October and in the southern Gulf from November to March. Adults are water column associated and can be found on banks/shoals (hard bottom) habitats at temperatures of 23-28°C and salinities of 24.6-30.0 ppt. Spawning occurs from spring to late summer (April-September) at temperatures ranging from 23-28°C (GMFMC, 2016). Eggs and Larvae are found in estuarine, nearshore, and offshore waters in ecological region (ER) 2-5. Eggs occur in surface waters at temperatures of 28-30°C and salinities between 30.5 and 24.1 ppt. Larvae occur in surface waters at temperatures of 24-32°C and salinities between 18.9 and 37.7 ppt. Juveniles are found in nearshore and offshore surface waters in ER 3-5 in water temperatures from 16.8-25.2°C (GMFMC, 2016).

Greater Amberjack

Gulf Greater amberjack are mainly found offshore in depths of 10-613 feet (Burns et al., 2007; Reed et al., 2005). Late juveniles and adults use hardbottom habitats (Gledhill and David, 2004) and adults additionally can be found on banks and shoals (Kraus et al., 2006). Both post-larvae and juvenile Greater amberjack utilize *Sargassum* mats as habitat (Hoffmayer et al., 2004). Peak spawning season occurs from April-May (Harris et al., 2007). Reefs are identified as essential habitat for spawning purposes (Harris et al., 2007; Heyman and Kjerfve, 2008) and Greater amberjacks have been observed utilizing artificial reefs as spawning habitat as well, though artificial reefs are not designated as EFH (Dance et al., 2011; Patterson et al., 2014).

King Mackerel

King mackerel can be found throughout the Gulf and Caribbean Sea as well as in the western Atlantic from Maine to Brazil. In the Gulf, distributions are clustered in south Florida and Louisiana. Adult King mackerel are migratory. They are found in the northern Gulf in the spring and return to waters off of south Florida and Mexico in the fall. Spawning takes place in offshore waters in ER 3-5 in waters greater than 20°C from May to October. Juveniles can be found in nearshore waters in ER 3-5 in shallow depths (less than or equal to 30 feet). Juvenile seasonality is May through October with peaks occurring in July and October. Larvae are found in offshore waters at depths between 50 and 590 feet and are most abundant May through October. Eggs can be found in offshore waters of ER 3-5 and typically hatch in 18-21 hours at a temperature of 27°C (GMFMC, 2016).

Scalloped Hammerhead Shark

The Scalloped Hammerhead shark is a common schooling hammerhead of warm waters. It seasonally migrates from north to south along the eastern United States. Neonates can be found from the shoreline to 25 miles offshore off of South Carolina, Georgia, and Florida as well as in shallow coastal bays and estuaries less than 16 feet deep from Apalachee Bay to St. Andrews Bay, Florida. Juveniles can be found in all shallow coastal waters of the U.S. Atlantic seaboard in shallow coastal waters. In the Gulf, they can be found near Mobile Bay, Alabama and Gulf Islands National Seashore in all shallow coastal waters (NMFS, 2006).

Blacktip Shark

The Blacktip shark can be found in shallow coastal waters of the continental shelf from Virginia to Florida and the Gulf of Mexico. They can often be found forming large schools and migrate North to South along the coast. It is considered a primary species in the U.S. commercial fisheries. Neonates are found in shallow coastal areas from Georgia to the Carolinas and Bay Systems in the Gulf in depths between 6.5-16 feet. Neonate habitat includes muddy bottoms and seagrass beds in temperatures of 18.5°C to 33.6°C and salinities of 15.8 to 37.0 ppt (Castro, 1993; Carlson, 2002). Juveniles can be found in shallow coastal waters from North Carolina to Florida and in the Gulf. Adults can be found in shallow coastal waters from North Carolina's Outer Banks to North Florida and the west coast of Florida (NMFS 2006).

Atlantic Sharpnose Shark

The Atlantic sharpnose shark is a small coastal shark and common year-round resident on the coasts of South Carolina, Florida, and the Gulf. They migrate seasonally north to south and are found in abundance off the coast of Virginia in the summer (Castro, 1983). Neonates can be found in shallow coastal waters off the west coast of Florida from May to July in temperatures of 24.0°C to 33.7°C and salinities of 22.8 to 33.7 ppt. Juveniles can be found in shallow coastal waters from North Carolina to Florida and in the Gulf in temperatures from 17.2°C to 33.3°C (Cortes, 1995). Adults can be found from New Jersey to Florida and the Gulf in shallow coastal waters (NMFS, 2006).

3.2.2 Recreational and Commercial Fisheries

The LDWF manages the Calcasieu River for recreational and commercial fishing (LDWF, 2014b). The Terminal site is on the lower segment of the Calcasieu River, which supports both commercial and recreational fishing. Commercial fishing in this area takes place mainly in Calcasieu Lake and the southern end of the Calcasieu River near the Gulf of Mexico (LDWF, 2014b). Brown shrimp, white shrimp, blue crab, and eastern oysters are the species most commonly fished commercially. The commonly fished recreational species are spotted sea trout, southern flounder, and red drum. Red drum, white shrimp, and brown shrimp are managed by NMFS-HCD as fisheries of special concern.

Spawning may be influenced by changing environmental factors including water temperature, river stage, and duration and intensity of light. The sensitivities to these factors can differ greatly between species depending on their individual environmental preferences, methods of reproduction, and the condition of their environment before spawning. Based on species-specific life history and spawning data from the LDWF (2014c, 2015), Louisiana State University (LSU) Sea Grant Louisiana Extension Agents (2018), Gulf States Marine Fisheries Commission (Blanchet et al, 2001; Oyster Technical Task Force, 2012), peak spawning occurs in late spring through early fall for commercial and recreational species. After mature individuals appear during spawning season, there is a short lag of about a month before peak abundance of larval fish. The typical spawning periods of commercial and recreational fisheries in coastal Louisiana are presented in table 3.2-3.

TABLE 3.2-3

Typical Spawning Periods of Commercial and Recreational Fisheries

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Red Drum								X	X	X		
Red Snapper				X	X	X	X	X	X	x		
Gray Snapper						X	X	x	X			
Lane Snapper			X	X	X	X	X	X	X			
Brown Shrimp				X	X				X	X	X	
White Shrimp			X	X	X	X	X	X	X	X	X	
Spanish Mackerel					X	X	X	X	X			
Cobia							X	X	X			
Greater Amberjack				X	X	X	X	X	X			
King Mackerel				X	X	X	X	X	X			
Blue Crab				X	X	X	X	X	X			
Oysters			X	X	X	X	X	X	X	X	X	
Southern Flounder	X										X	X
Spotted Sea Trout				X	X	X	X	X	X	X		

Sources: Blanchet et al., 2001; Oyster Technical Task Force, 2012; LSU Sea Grant Louisiana Extension Agents, 2018; LDWF, 2014c, 2015; GMFMC, 2016.

3.3 CONSTRUCTION IMPACTS ON EFH

Impacts during construction would include loss of wetlands to fill; conversion of wetlands to open-water EFH through dredging; creation of deeper open water habitat through dredging; impacts on water quality in open-water EFH from turbidity during dredging or from stormwater runoff and hydrostatic test water discharge; disturbance of estuarine mud/soft water bottoms EFH within the dredged area; deposition of sediment at the BUDM area; construction and operation of a stormwater culvert and water control structure; and noise and activity from construction activities.

3.3.1 Estuarine Emergent Marsh EFH

The Terminal site would be cleared, graded, and filled to establish suitable and safe construction surfaces. Wetlands within the footprint of the Terminal would be permanently filled, converting this habitat to industrial land use. A small amount of wetlands would be converted to open water along the eastern edge of the Terminal site, which would decrease the amount of wetland habitat that supports various life stages of fish species with EFH in this area, converting it to estuarine water column EFH habitat.

During land disturbing activities, fine sediments could be released as turbidity and migrate into adjacent EEM wetlands during rain events, causing siltation and potentially smothering organisms or degrading habitat quality. The best management practices in the FERC *Plan* and Commonwealth's *Procedures* are designed to minimize the potential for turbidity and the release of sediment, and construction of the Terminal is not expected to affect EEM wetlands through turbidity and sedimentation.

The Terminal would include a stormwater culvert and water control structure to relocate the existing drainage that runs across the Terminal site to maintain the hydrologic connection between the EEM wetlands on the neighboring parcel to the west and the Calcasieu River, as well as to maintain appropriate water and salinity levels in the marsh complex. Based on the information provided in the *Hydraulic Impact Analysis Report* and a supplemental summary of Discharge Water Treatment and Routing an overview of how Commonwealth would manage rainfall within the Terminal walls),[14] OCM determined that the Project would have little or no negative impact on the local hydrology. No direct or indirect impacts on EFH are anticipated as a result of the stormwater culvert water control structure. As stated in the Hydraulic Impact Analysis Report, Commonwealth would coordinate with state and federal agencies, including NFMS, during the final design of the stormwater culvert and water control structure to solicit their recommendations on how to minimize potential impacts on EFH. Inspections and monitoring would be required per Commonwealth's Louisiana Pollutant Discharge Elimination System permit and as part of the facility's maintenance program. Construction of the Pipeline through the push-pull method would require temporary excavation of a pipeline trench, installation of the Pipeline, and backfill and restoration of the right-of-way. Waterbodies affected by the Project only include linear ditch features which do not support substantial fish and invertebrate populations. Therefore, Pipeline construction is not anticipated to affect biota within waterbodies. Commonwealth would adhere to the FERC *Plan* and Commonwealth's *Procedures* to minimize impacts during construction and to monitor success of restoration following completion of construction activities. To confirm that the Pipeline right-of-way is restored to pre-Project conditions, Commonwealth would follow the monitoring requirements of Commonwealth's *Workspace Restoration Plan*, Rev. 2. Because EEM wetland vegetation grows quickly and the growing season in southwest Louisiana is year-round, we have determined that impacts on EEM wetland EFH from Pipeline construction would be short-term and not significant.

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[14] See January 24, 2020 correspondence with OCM in appendix A of accession no: 20200225-5181.

Commonwealth would use the HDD method to construct the Pipeline under Highway 27/82 and waterbodies C01 and C02. An HDD crossing avoids impacts on surface features. As noted in section 4.4.2 of the final EIS, Commonwealth would implement procedures in its revised *HDD Contingency Plan* to minimize the risk and/or impacts of an inadvertent return of drilling fluid among EFH.

3.3.2 Estuarine Oyster Reef EFH

The riprap removed during construction of the Commonwealth marine facilities would be relocated to other portions of the existing riprap jetties, at locations to be determined by the COE at the time of construction, based on their determination of those areas in need of additional rock. Commonwealth notes that doing so would allow the riprap containing oyster reef to be placed in a subtidal environment that would allow the riprap to continue functioning as oyster reef habitat. However, the location on the jetties that the riprap would be placed is currently unknown, but it would not be estuarine and would expose the oysters to different environmental conditions than what currently exists in the protected environment inside the mouth of the Calcasieu River. Commonwealth would, however, create new potential estuarine oyster reef habitat in the form of the new riprap that Commonwealth would use to armor the shoreline of the marine facility. Although, the new riprap would not immediately function as estuarine oyster reef habitat, as a hard substrate in an estuarine environment, oyster settlement on the riprap would be expected to occur in time in the same fashion that it has occurred on the existing riprap.

3.3.3 Estuarine Mud/Soft Water Bottoms EFH

Over time, habitats that experience frequent disturbance, such as shallow (less than 66 feet) subtidal softbottom habitats that are affected by wave-, wind-, and current-induced disturbance (Hall, 1994), typically become inhabited by low-diversity assemblages of r-selected species (i.e., species with a high intrinsic growth rate, designated “r” in the Verhulst (1838) model of population growth) (Wilber and Clarke, 2007). The frequency and intensity of disturbance holds these communities in a relatively early stage of succession (i.e., dominated by organisms characterized as opportunistic, colonizing, or pioneer species), which allows them to recolonize quickly after disturbance (e.g., Pearson and Rosenburg, 1977).

Similarly, the benthic infaunal community of dredged navigation channels becomes adapted to the stresses associated with periodic dredging and frequent ship traffic (i.e., the species that are present are those able to persist under the extant conditions and the successional level of the species distribution reflects the long-term frequency and intensity of the disturbance). These estuarine benthic communities within ship channels generally experience relatively high degrees of environmental variability and disturbance from low dissolved oxygen, nutrient enrichment, sedimentation, freshwater input, pollutants, changes in temperature, and light availability (Pearson and Rosenburg, 1977). These habitats consequently support faunal communities composed of species that rapidly recolonize disturbed benthic habitats and are conditioned to periodic disturbance. Such species generally include polychaetes, amphipods, crustaceans, cumaceans, opportunistic burrowing bivalves, and echinoderms (Baustian, 2005).

The general succession following disturbance of benthic softbottom habitats exhibits an initial increase in “pioneer” or “opportunistic” species, such as small polychaetes, bivalves, and amphipods in relatively high abundance and low diversity. In frequently disturbed habitats, such as navigational channels, the community typically remains in this early successional stage. In stable habitats, longer-lived, slower-growing (and generally larger and deeper-burrowing) species become more prevalent as the community matures and approaches a climax or steady-state community (however, in these stable habitats, diversity may decrease as the community continues to mature and successional niches end, e.g., Paine, 1966).

Estuarine mud/soft water bottoms EFH in the areas to be dredged would be disturbed. Immediately following dredging, the abundance and diversity of the benthic assemblage is expected to drop significantly as new, uncolonized sediment surfaces are exposed. Recolonization of newly exposed sediments takes place by immigration through the sediment from adjacent communities or through the water column as upstream sediments and fauna are resuspended and redeposited (e.g., through the daily flushing of strong tidal currents), and through reproduction within the disturbed habitat. The benthic infaunal community recovers relatively quickly through these processes, as demonstrated through the following examples from estuaries within the U.S.

- Dauer (1984) observed that a population of polychaetes in Old Tampa Bay, Florida, reduced by 89 percent recovered to pre-disturbance abundance within one month.

- Clarke and Miller-Way (1992) observed recovery of the benthos of Mobile Bay, Alabama, within 12 weeks of dredging-related disturbance, with the detected differences in benthic communities attributed to wind-driven circulation and sediment resuspension.

- Recovery in the Dawho River estuary in South Carolina was observed within three months (Van Dolah, et al., 1984). This rapid recovery was attributed to immigration through sediment (containing benthic organisms) transport into the dredged area through slumping of the sideslopes.

- In Sewee Bay, South Carolina, Van Dolah, et al. (1979) observed species diversity increased following dredging (attributed to disruption of the pre-dredging dominant polychaete species, *Paraprionospio pinnata*) and a return to pre-dredge abundance, biomass, and species diversity within six months.

- Recovery in the Intracoastal Waterway in Georgia following complete displacement of the benthic community by dredging occurred within two months (Stickney and Perlmutter, 1975), and post-recovery diversity and species composition were similar to the reference site. Rapid recolonization likely occurred through migration of adults and input of sediment (and benthic organisms) through slumping of sidewalls and current-driven resuspension and subsequent resettlement of sediment and organisms.

- In Coos Bay, Oregon, Parr (1973) and McCauley, et al. (1977) observed recovery in four weeks, which the authors attributed to an infaunal community adapted to frequent disturbance from ship movements and other harbor activities.

- Application of sensitive multivariate analysis to a large-scale dredged material placement site in Corpus Christi Bay confirmed that differences between disturbed sites and pre-disturbance conditions, as well as differences between disturbed sites and reference sites persisted for less than one year (Wilber et al., 2008).

In these studies, most of which included a change in depth due to dredging, the definition of recovery was generally a return to pre-disturbance conditions. The composition of the benthic community in the Project's dredged areas would also be expected to return to pre-disturbance conditions, and the change in depth would be unlikely to significantly affect the post-dredging community structure.

The segment of the Calcasieu Ship Channel in which the new dredging would occur experiences strong riverine and tidal currents (COE, 2010), sufficient to resuspend and redistribute sediment and organisms. The hydrodynamic study Commonwealth performed as part of the included the measured flow rates during a representative tidal cycle in the inlet of Calcasieu Lake. Flow rates ranged from approximately 130 m^3 per second to the south during the ebb tide to 120 m^3 per second to the north during the flood tide. During this tidal cycle, tidal elevation ranged by 0.9 meter. The maximum flow velocity during the peak flood tide exceeded 1.0 meter per second, and the maximum flow velocity during the ebb tide was approximately 2.0 meters per second. Based on a wide review of relevant literature, Newell et al. (1998) found that communities in fine, mobile sediments are characterized by large populations of a limited number of species that are well-adapted to rapid recolonization of freshly deposited or disturbed sediments. Dredging activity is not anticipated to substantially alter benthic community structure. Therefore, we have determined that construction impacts on Estuarine Mud/Soft Water Bottoms EFH would be short term and not significant.

3.3.4 Estuarine Water Column EFH

3.3.4.1 Dredging

Dredging activities have the potential to adversely affect species with estuarine water column EFH through increased total suspended solids and turbidity, increased dissolved nutrient levels, and decreases in dissolved oxygen. The species with EFH designated within the Project area have at least one life stage which inhabits estuarine soft bottom habitats such as those found in Calcasieu Pass.

If these life stages are present during dredging activities, these species could be adversely affected by the dredging of the marine berth area; however, many of these life stages are mobile and could avoid the area for nearby suitable habitat during construction.

The marine berthing area to the west of the navigable channel would be dredged to allow LNG carriers to access the LNG loading facilities (Figure 2). Estuarine water column EFH in these areas would be made deeper, but this change would not significantly affect the function of the EFH.

3.3.4.2 Turbidity and Sedimentation During Dredging

The turbidity at the dredging site and sedimentation downstream of the dredging site were modeled using the DREDGE and STFATE modules of the Automated Dredging and Disposal Alternatives Modeling System (ADDAMS) distributed and supported by COE (Integral, 2021).

Under the range of conditions modeled in DREDGE for the Commonwealth LNG Project, the maximum cutterhead dredge sediment plume concentration was 128 mg/L for silt under the maximum water velocity condition. The plume rapidly dissipated with vertical and lateral distance from the dredge. Figure 7 presents the model-predicted extent of a 50 mg/L total suspended solids plume for this model run at the outer bounds of the proposed dredge area.

The modeled plume extends approximately 800 ft (250 m) downgradient, with the position and direction dependent on the location of the dredging operations within the Project at a given time and the tidal cycle.

Based on the results of the STFATE module, under the low-velocity condition, nearly all resuspended material was deposited in the vicinity of the cutterhead, with limited deposition further downgradient. Under the average and maximum water velocity conditions, no deposition was predicted as resuspended sands and fine sediments do not redeposit from the water column.

Deposition is expected to be minimal and temporary, given the high-energy nature of the system, cutterhead dredge efficiency, and the extent of the proposed dredge area. The model estimated up to 0.5 inch of deposition resulting from 1 hour of dredging during low water velocity; however, this value is likely an overestimate. The cutterhead dredge would remove material from the dredge template in multiple passes. STFATE model results predict that when material is redeposited, which was only observed under minimal flow velocity conditions, the majority (i.e., over 80 percent) would be redeposited within 200 feet of the dredge, which means that most of the resuspended material would be redeposited within the proposed dredge area and would then be dredged on subsequent passes of the cutterhead. Resuspended sediment that is redeposited outside the dredged area and is not subsequently dredged would be resuspended and washed away as water velocity increases.

The anticipated dredge volume (1.73 million cubic yards) and potentially resuspended sediment volume due to the construction of the Commonwealth Terminal is minor compared to other projects in this same portion of the Calcasieu Ship Channel. The Venture Global Calcasieu Pass Project, constructed on the eastern shore of the Calcasieu Ship Channel, across from the proposed Commonwealth LNG project, required 4.5 million cubic yards of dredging, more than 2.5 times the volume of the Commonwealth LNG project (FERC, 2018). More than 5 million cubic yards (i.e., approximately 3 times the volume of the Commonwealth LNG project) is dredged annually through agitation dredging (i.e., resuspension of sediments into the water column for transport outside the dredged area) from the Bar Channel, which extends 32 miles offshore from the Calcasieu Ship Channel into the Gulf of Mexico. If 1 percent of the dredged sediment from the proposed Commonwealth LNG project were resuspended to the water column, transported out of the Calcasieu Pass Channel and into the Bar Channel, it would represent 0.3 percent of the annual total volume of resuspended material due to ongoing maintenance dredging.

3.3.4.3 Hydrostatic Testing

Following installation of the modular LNG storage tanks, the tanks would be hydrostatically tested on their permanent foundations. Each tank would be tested separately. Once the test has been completed for one tank, the water used for that test would be transferred to the next adjacent tank for testing. This procedure would continue until all of the LNG storage tanks have undergone testing. Conducting the hydrostatic tests in this manner minimizes the volume of water necessary for the tests. Hydrostatic testing of the LNG storage tanks would require 9.9 million gallons of water.

The Calcasieu Ship Channel would be the source of the water to be used for the hydrostatic tests. The intake would be screened using small slot-sized wedgewire screens that promote low flow-through velocities that, combined with the relative strong currents in the channel, would mitigate the potential for impingement or entrainment of aquatic organisms. In addition, the volume of water required to perform the hydrostatic tests compared to the volumetric flow of the Calcasieu Ship Channel is insignificant. The water withdrawal for the hydrostatic testing is of short-term duration and infrequent occurrence. Impacts on aquatic resources from the withdrawal of water for hydrostatic testing from the Calcasieu Ship Channel are expected to be short-term and not significant.

Commonwealth does not anticipate that chemical additives such as corrosion inhibitors would be necessary. However, the river water would need to be treated with biocides, prior to being used for hydrostatic testing to ensure that there would not be any marine growth inside the LNG storage tanks. After the tests have been completed, the water used for the hydrostatic tests would be discharged to the facility stormwater retention pond. It would be allowed to rest and tested to ensure compliance with discharge permit limits prior to being discharged back into the Calcasieu Ship Channel. The discharge of the hydrostatic test water would require Commonwealth to obtain a Louisiana Pollutant Discharge Elimination System General Permit LAG670000 – Hydrostatic Test and Vessel Testing Wastewater authorization. Commonwealth would discharge the hydrostatic test water in accordance with the conditions of the approved permit, and minimal impacts on the estuarine water column EFH are anticipated.

Following construction, the Pipeline would also be hydrostatically tested to verify its integrity for the intended service and maximum allowable operating pressure. Water to conduct the test would be most likely be obtained from municipal water supply lines that cross or are adjacent to the Pipeline route. After the tests have been completed, the water used for the hydrostatic tests would be discharged to the facility stormwater retention pond and then to the Calcasieu Ship Channel, as described above. Hydrostatic testing of the Pipeline would require 1.2 million gallons of water.

Based on this analysis, we have determined that construction impacts on Estuarine Water Column EFH would be temporary and non-significant.

3.4 OPERATION IMPACTS ON EFH

3.4.1 Estuarine Emergent Marsh EFH

No EEM wetlands are anticipated to be affected by operation of the Terminal or Pipeline.

3.4.2 Estuarine Oyster Reef EFH

No EOR EFH would be affected by operation of the Terminal or Pipeline.

3.4.3 Estuarine Mud/Soft Water Bottoms EFH

Propeller wash from LNG carriers and tugboats has the potential to disturb mud substrates and generate turbidity within Calcasieu Pass. The risk of sediment resuspension due to LNG carriers assisted by tugboats is low in the deep waters of the Calcasieu Ship Channel. These impacts would be further attenuated by strong tidal currents through the Calcasieu Ship Channel. Additionally, the Project would increase marine traffic by only 7 percent over predicted marine traffic volumes at the time the Terminal would open to vessels. Therefore, propeller wash due to these vessels and associated tugboats is not expected to substantially alter water quality within Calcasieu Pass relative to the effects of ambient marine traffic and hydrological processes.

Propeller wash and wakes from LNG carriers and tugboats may cause coastal erosion. The effects of coastal erosion are limited along the Calcasieu Ship Channel from the Gulf of Mexico to the Terminal due to existing seawalls and bank armor. Tugboat assistance would be required as LNG carriers turn within the turning basin, reducing the effects of propeller wash directed at the bank of the Calcasieu Ship Channel. The Terminal would also use a combination of sheet piles and shoreline riprap within the LNG site for shoreline stabilization and erosion control. Therefore, the potential for shoreline erosion to result from the Project is low. Generally, the relatively small incremental increase in ship activity is not anticipated to have a significant impact on estuarine mud/soft water bottoms EFH.

The LNG carrier berthing area of the marine facility would require maintenance dredging, which would be expected to occur on a biennial basis. Commonwealth would transport dredged sediments to a BUDM as described above for construction dredging. Impacts on EFH related to maintenance dredging would be consistent with those described in section 3.3.3 for construction dredging.

3.4.4 Estuarine Water Column EFH

The Terminal stormwater system would discharge stormwater in accordance with the Terminal Louisiana Pollutant Discharge Elimination System permit. No impacts from this discharge are anticipated.

During operation, an average of up to three vessels per week (or 156 vessels per annum) would call on this Terminal. Over 1,000 ships per year use the Calcasieu Ship Channel, and this number may exceed 2,000 per year by the time the Project begins operation (Ausenco, 2018).

Potential impacts on EFH could result from changes in water quality due to ballast and cooling water discharges. The effects of ballast water discharge could include a temporary change in temperature, pH, salinity, and/or dissolved oxygen in the vicinity of the ship. Upon release, the discharged ballast water would mix with the surrounding water, aided by currents and tides, quickly becoming indistinguishable from ambient conditions. Although the discharge would occur an average of approximately once every 2.5 days, the discharged water would not remain significantly different from ambient water from day to day. Because estuarine and saltwater fish can tolerate variations in dissolved-oxygen concentrations (Fondriest, 2013), impacts on aquatic resources are not anticipated. USCG regulations require that ballast water is discharged during loading of LNG after treatment via a USCG-approved ballast water management system, in accordance with USCG regulations (33 CFR Part 151, subpart D and 46 CFR §162.060) and Navigation and Vessel Inspection Circular 01-18.

Ship engines cycle surface water for cooling main engines, generators, condensers, and other shipboard equipment, which increases the temperature of the discharged water. Ships would withdraw and discharge the cooling water along the vessel transit routes in the Gulf of Mexico and from the Calcasieu Ship Channel. Impacts on EFH from the withdrawal of water can result from the impingement and entrainment of aquatic resources. The Calcasieu Ship Channel may serve as nursery habitat for estuarine and saltwater early life stages (ichthyoplankton) and other small organisms. These small estuarine and saltwater organisms are susceptible to impingement and entrainment impacts. Although older LNG carriers used intake screens with a mesh size of 10 millimeters, newer LNG carriers have intake screens with a mesh size of 5 millimeters to minimize entrainment of organisms.

The typical volume of ballast water released by each ship would be up to 57,000 m^3 (15 million gallons) for the largest LNG carriers, and the typical volume of cooling water withdrawn and discharged would be up to 38,000 m^3 (10 million gallons) during a 20-hour loading period. Based on an estimated volume of over 86 million m^3 of water in the Calcasieu Ship Channel, the combined volume of ballast and cooling water for each LNG carrier is less than one-tenth of one percent of the volume of the Calcasieu Ship Channel.

Similarly, the Project's LNG carriers represent a small, incremental increase (approximately 7 percent) in the projected usage of the channel and is expected to represent a similarly small, incremental increase in cooling-water uptake and impingement/entrainment impacts on ichthyoplankton. The design of cooling-water intake structures on the global LNG carrier fleet is beyond the control of individual projects, and no mitigation is proposed for this small, incremental increase in ichthyoplankton mortality. Generally, the relatively small incremental increase in ship activity is not anticipated to have a significant impact on the estuarine water column.

As noted in section 3.4.3, maintenance dredging at the marine facility would be required on a biennial basis during operation. Again, impacts on estuarine water column EFH due to maintenance dredging would be consistent with impacts described for construction dredging.

4.0 CONCLUSIONS REGARDING THE EFFECTS OF THE ACTION ON EFH

4.1 IMPACTS ON EFH

The Project's impacts on EFH are summarized in table 4.2-1.

Table 4.2-1

Essential Fish Habitat Impacts (acres)

Facility Name	Tidal Brackish Marsh		Tidal Intermediate Marsh		Estuarine Soft Bottom / Estuarine Water Column		Estuarine Osyter Reef	
	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm
Terminal								
Liquefaction Facility	-	9.9	-	8.6	-	1.5	-	-
Construction & Laydown Area	-	-	-	-	-	-	-	-
Marine Facility (Excavated)	-	1.0	-	-	-	0.8	-	0.05
Marine Berth (Dredged)						47.0 a/		
Storm Water Culvert	-	0.7	-	0.1	-	0.4	-	-
Administration and Maintenance Buildings	-	-	-	-	-	-	-	-
Access Roads (outside surge wall)	-	0.3	-	0.5	-	0.1	-	-
Moran Towing	-	-	-	-	-	-	-	-
Terminal Total	-	11.9	-	9.2	-	2.8	-	0.05
Pipeline								
Right-of-Way	0.9	-	-	-	0.1	-	-	-
Temporary Workspace	30.0	-	-	-	3.5	-	-	-
Additional Temporary Workspace	11.5	-	-	-	1.2	-	-	-
Access Roads (Temporary)	0.9	-	-	-	-	-	-	-
Pig Launcher (MP 0.0)	0.1	0.1 b/	-	-	-	-	-	-
Meter Station (MP 0.8)	0.2	0.2 b/	-	-	-	-	-	-
Pig Receiver (MP 3.0) c/	-	-	-	-	-	-	-	-
Pipeline Total	43.6	-	-	-	4.8	-	-	-
BUDM								
BUDM Area	-	-	217.0	-	423.0	-	-	-
BUDM Slurry Pipeline	-	-	1.9	-	24.3	-	-	-
BUDM Total	-	-	218.9	-	447.3	-	-	-
Project Total d/	43.6	12.2	218.9	9.2	452.1	2.8	-	0.05

Note: All facilities are in Cameron Parish, Louisiana.

a/ The 47.0 acres dredged for the marine facility berth would remain the same habitat type but would be permanently converted from shallow water to deep water habitat.

Table 4.2-1 **Essential Fish Habitat Impacts (acres)**								
Facility Name	**Tidal Brackish Marsh**		**Tidal Intermediate Marsh**		**Estuarine Soft Bottom / Estuarine Water Column**		**Estuarine Osyter Reef**	
	Temp	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**
b/ These impacts differ from those presented in section 4.4.6.3 of the EIS because the 0.3 acre of impacts associated with the Pipeline aboveground facilities are from pilings, which the COE does not consider as fill in waterbodies of the U.S. and therefore does not require mitigation for the impacts. c/ Within the Terminal. d/ The numbers in this table have been rounded for presentation purposes. As a result, the totals may not reflect the sum of the addends.								

The Project's impacts on EFH during maintenance dredging are summarized in table 4.2-2.

TABLE 4.2-2 **Essential Fish Habitat Impacts from Maintenance Dredging (acres)**								
Facility Name	**Tidal Brackish Marsh**		**Tidal Intermediate Marsh**		**Estuarine Soft Bottom / Estuarine Water Column**		**Estuarine Osyter Reef**	
	Temp	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**
Marine Facility LNG Carrier Berthing Area	-	-	-	-	47.0	-	-	-
BUDM Area	-	-	217.0	-	423.0	-	-	-
BUDM Slurry Pipeline	-	-	1.9	-	24.3	-	-	-
Total	-	-	218.9	-	494.3	-	-	-
Note: Maintenance dredging is anticipated to occur every two years for the operational lifespan of the Project.								

4.2 PROPOSED EFH MITIGATION

Commonwealth is proposing compensatory mitigation that is commensurate with the amount and type of impact resulting from construction and operation of the Project as required by 33 CFR 332.3. Mitigation requirements for permanent impacts on the 21.1 acres of tidal brackish and intermediate marsh EFH within the Terminal footprint would be provided through purchase of compensatory mitigation credits from established mitigation banks at an amount approved by COE and OCM. Commonwealth would restore the full width of the Pipeline construction right-of-way to pre-construction conditions. Both COE and OCM include a permit condition requiring assessment of revegetation of temporarily impacted wetlands (including those classified as EFH) after one growing season and restoration or mitigation where revegetation is unsuccessful. Commonwealth is actively coordinating mitigation requirements with COE as part of the Section 404/10 permitting process and OCM as part of the Coastal Use Permit (CUP) process and would provide mitigation for permanent impacts on tidal brackish and intermediate marsh EFH based on the results of LRAM and WVA calculations, as recommended by NMFS.[15] For wetland impacts, LRAM and WVA use an algorithm based on habitat status, habitat and hydrologic condition, negative influences, impact type, and other factors, rather than simple ratios, to produce appropriate mitigation requirements. Because compensatory mitigation for Project impacts would be satisfied through purchase of credits at mitigation banks, no Permittee Responsible Mitigation and Monitoring Plan is proposed.

In addition, COE has determined that the 2.8 acres of estuarine mud/soft bottom EFH within the Terminal site qualify as Shoreline Mud Flats, which is a Special Aquatic Site. This Special Aquatic Site would be permanently impacted by construction of the Terminal. COE has informed Commonwealth that the Project BUDM site (without monitoring) would offset the impacts on this Special Aquatic Site.[16]

Table 5.0-1 summarizes the proposed compensatory mitigation, including the proposed mitigation banks from which it would be obtained.

15 See page 14 of accession no. 20220523-5181

16 See June 14, 2022 correspondence from the COE in appendix C of accession no. 20220624-5165.

TABLE 5.0-1

Summary of EFH Impacts and Commonwealth's Proposed Mitigation

Habitat Type	Impact Type	EFH Impact (Acres)	Mitigation Bank	Mitigation a/
Terminal				
Brackish Marsh, Tidal	Permanent	11.9	Rockefeller Refuge	20.8 BM Mitigation Credits
Intermediate Marsh, Tidal b/	Permanent	9.2	Bull Island	20.6 FM Mitigation Credits
Shoreline Mudflats Special Aquatic Site Estuarine Water Bottom/Estuarine Water Column	Permanent	2.8	n/a	BUDM
Marine Facility Berthing Area Estuarine Water Bottom/Estuarine Water Column	Permanent	47.0	n/a	BUDM
Pipeline				
Construction Right-of-Way Brackish Marsh, Tidal	Temporary	43.6	n/a	Right-of-Way Restoration
Construction Right-of-Way Estuarine Water Bottom/Estuarine Water Column	Temporary	4.8	n/a	Right-of-Way Restoration
Aboveground Facilities Brackish Marsh, Tidal	Permanent	0.3	n/a	n/a
BUDM Site				
Estuarine Water Bottom/Estuarine Water Column within BUDM and Slurry Pipeline area	Temporary	447.3	n/a	BUDM [d]
Tidal Intermediate Marsh within BUDM and Slurry Pipeline area	Temporary	218.9	n/a	BUDM [d]

a/ Mitigation credit requirements based on the greater of LRAM and WVA calculations. COE and OCM include a "growing season" condition for temporary impacts and require mitigation if recovery is insufficient.

b/ Includes Intermediate Marsh habitat along the north boundary of the terminal site, adjacent to Highway 27/82.

c/ COE does not require mitigation for impacts on EOR habitat.

d/ COE has determined that the Project BUDM (without monitoring) would offset the impacts on EWB/EWC and IM within the BUDM and Slurry Pipeline area.

BLH = Bottomland Hardwoods
BM = Brackish Marsh
EEM = Estuarine Emergent
EFO = Estuarine Forested
EOR = Estuarine Oyster Reef
ESS = Estuarine Scrub-Shrub
EWB = Estuarine Waterbottom
EWC = Estuarine Water Column
FM = Fresh Marsh

Commonwealth anticipates maintenance dredging would be necessary every two years for the operational lifespan of the Project. Table 5.0-2 summarizes Commonwealth's proposed mitigation, as required by the COE under section 404 of the CWA.

TABLE 5.0-2

Summary of Maintenance Dredging Impacts and Required Compensatory Wetland Mitigation

Habitat Type	Impact Type	Impact Acres	Mitigation Requirement [a]
EWB/EWC within the Marine Berth	Temporary	47.0	n/a
EWB/EWC within the BUDM and Slurry Pipeline area	Temporary	398.9	BUDM [b]
IM within the BUDM and Slurry Pipeline area	Temporary	189.3	BUDM [b]

a Mitigation requirements determined by COE.

b COE has informed Commonwealth that the Project BUDM (without monitoring) would offset the impacts on EWB/EWC and IM within the BUDM and Slurry Pipeline area.

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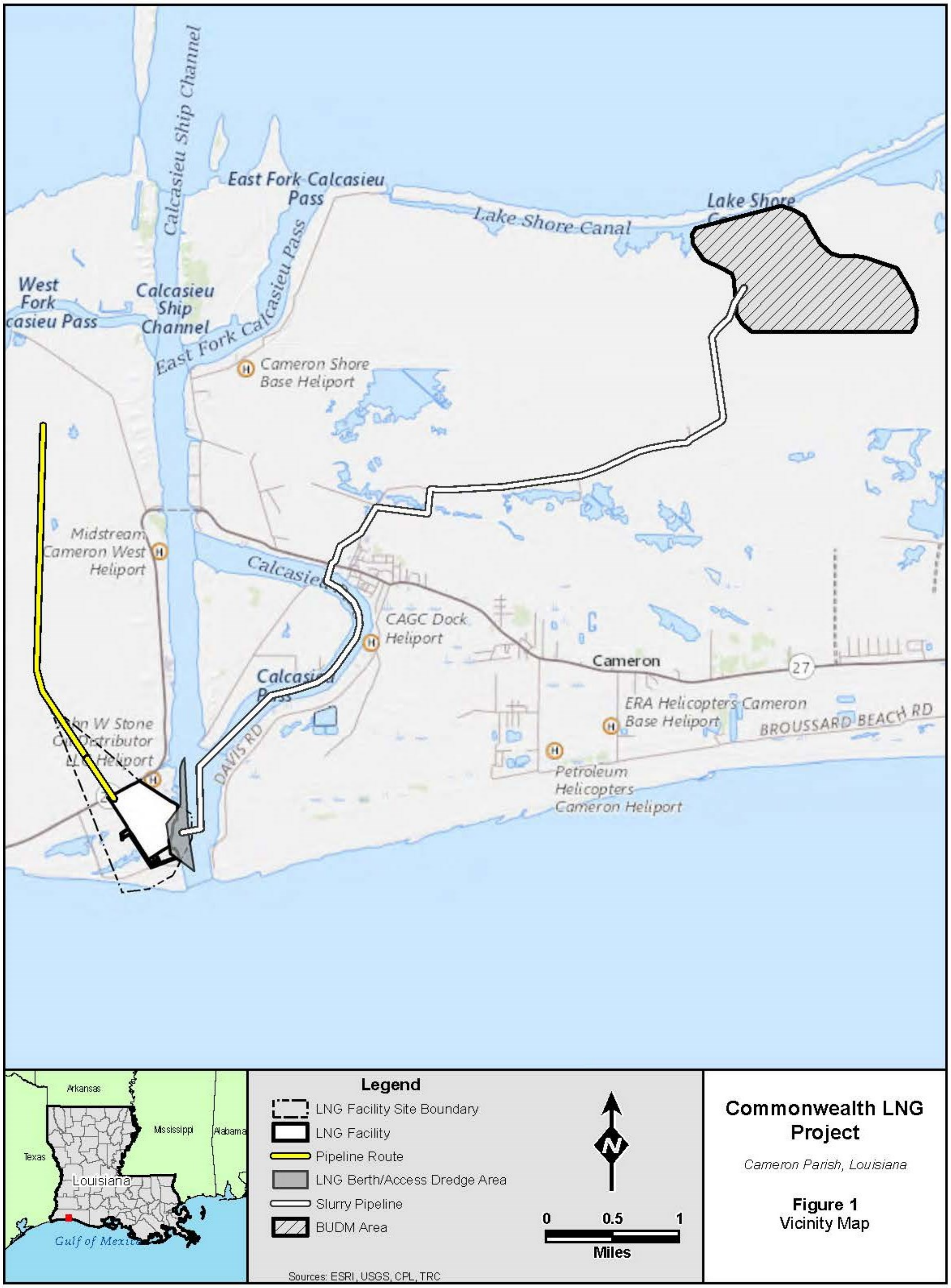
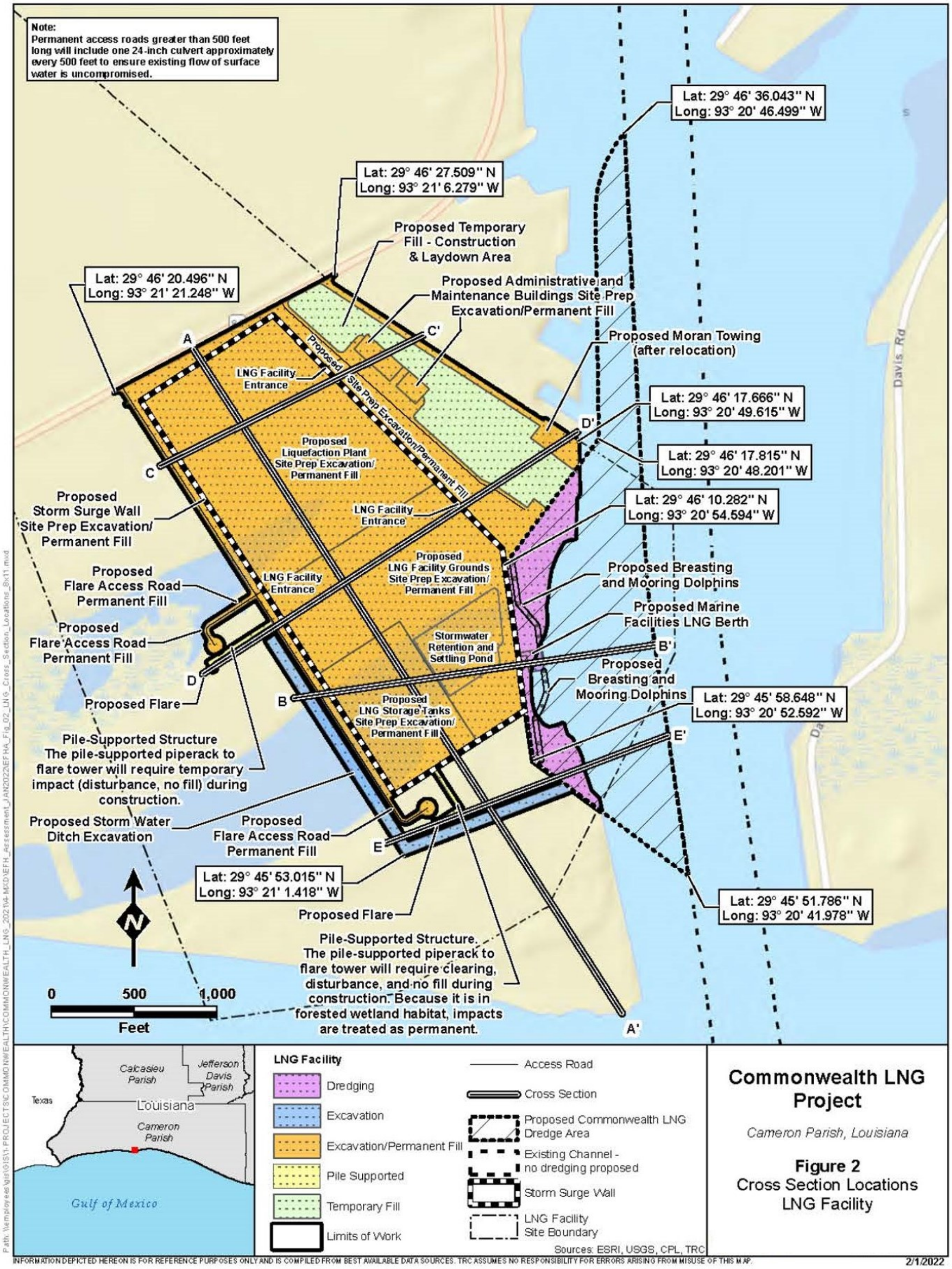
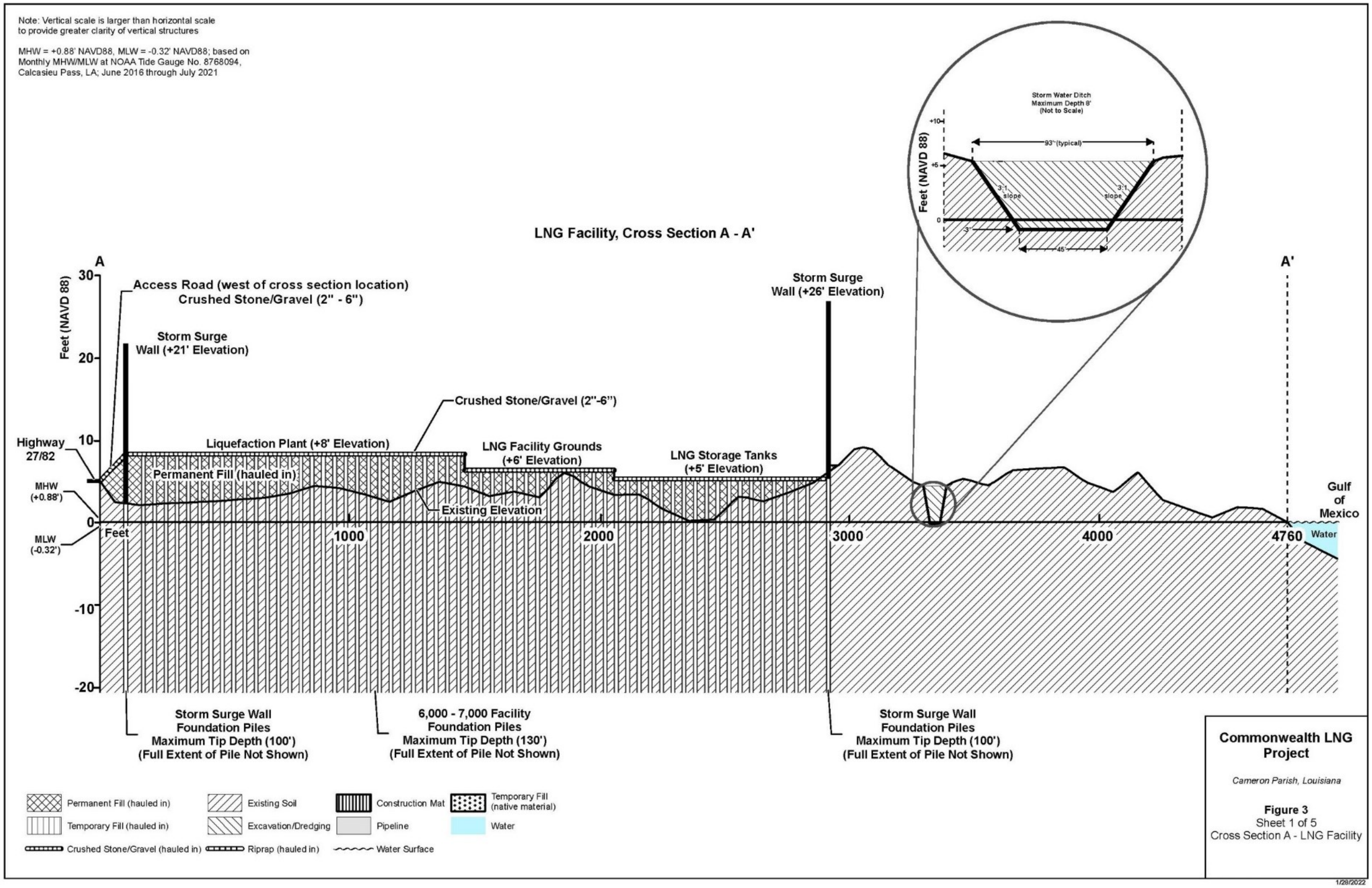
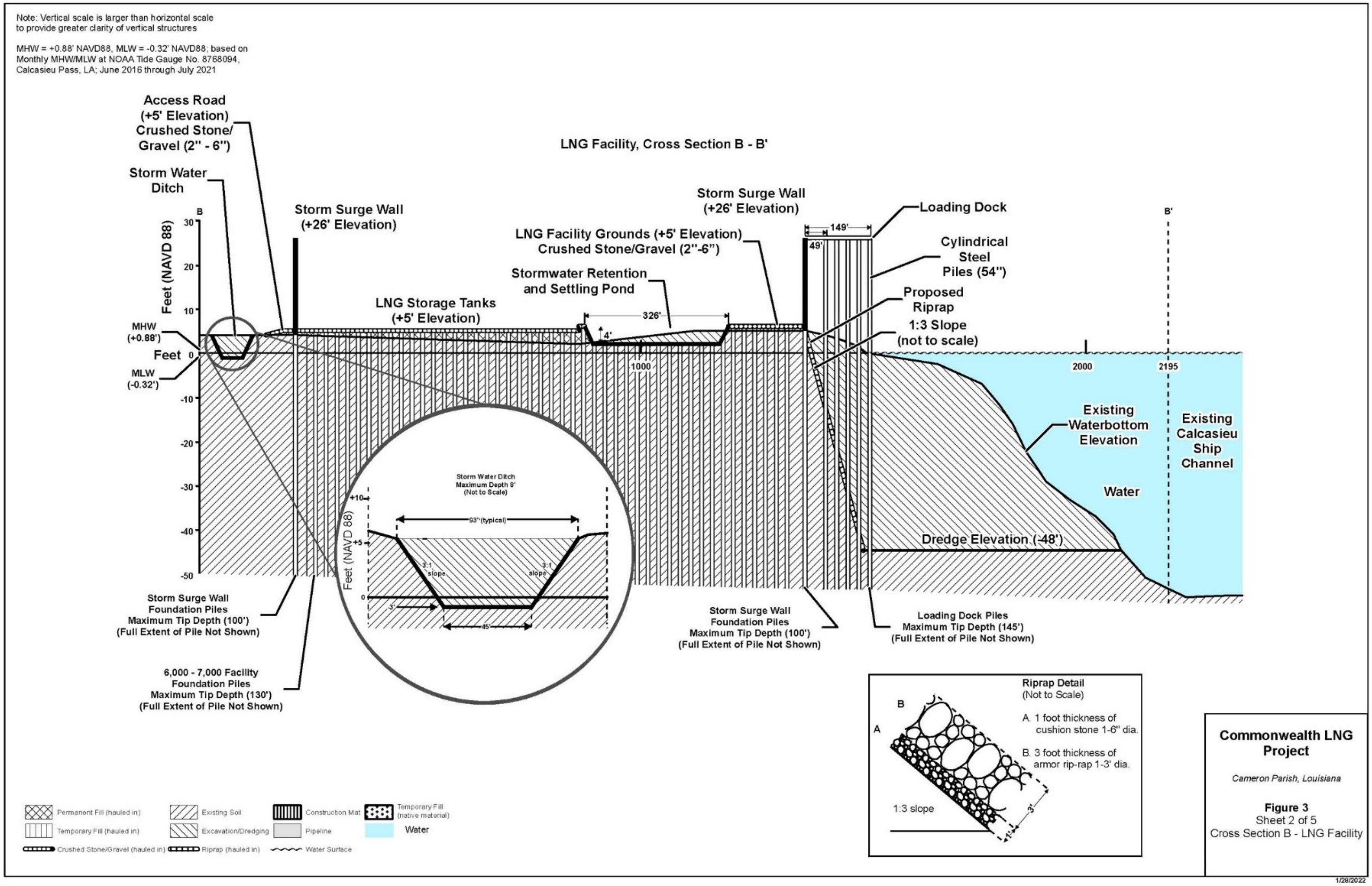
FIGURES


Calcasieu Ship Channel
East Fork Calcasieu Pass
Lake Shore Canal
Lake Shore
West Fork
casieu Pass
Calcasieu Ship Channel
East Fork Calcasieu Pass
Cameron Shore Base Heliport
Midstream Cameron West Heliport
Calcasieu
CAGC Dock Heliport
Cameron
27
Calcasieu Pass
DAVIS RD
ERA Helicopters Cameron Base Heliport
BROUSSARD BEACH RD
Petroleum Helicopters Cameron Heliport
Arkansas
Mississippi
Alabama
Texas
Louisiana
Gulf of Mexico
Legend
LNG Facility Site Boundary
LNG Facility
Pipeline Route
LNG Berth/Access Dredge Area
Slurry Pipeline
BUDM Area
N
0
0.5
1
Miles
Sources: ESRI, USGS, CPL, TRC
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 1
Vicinity Map

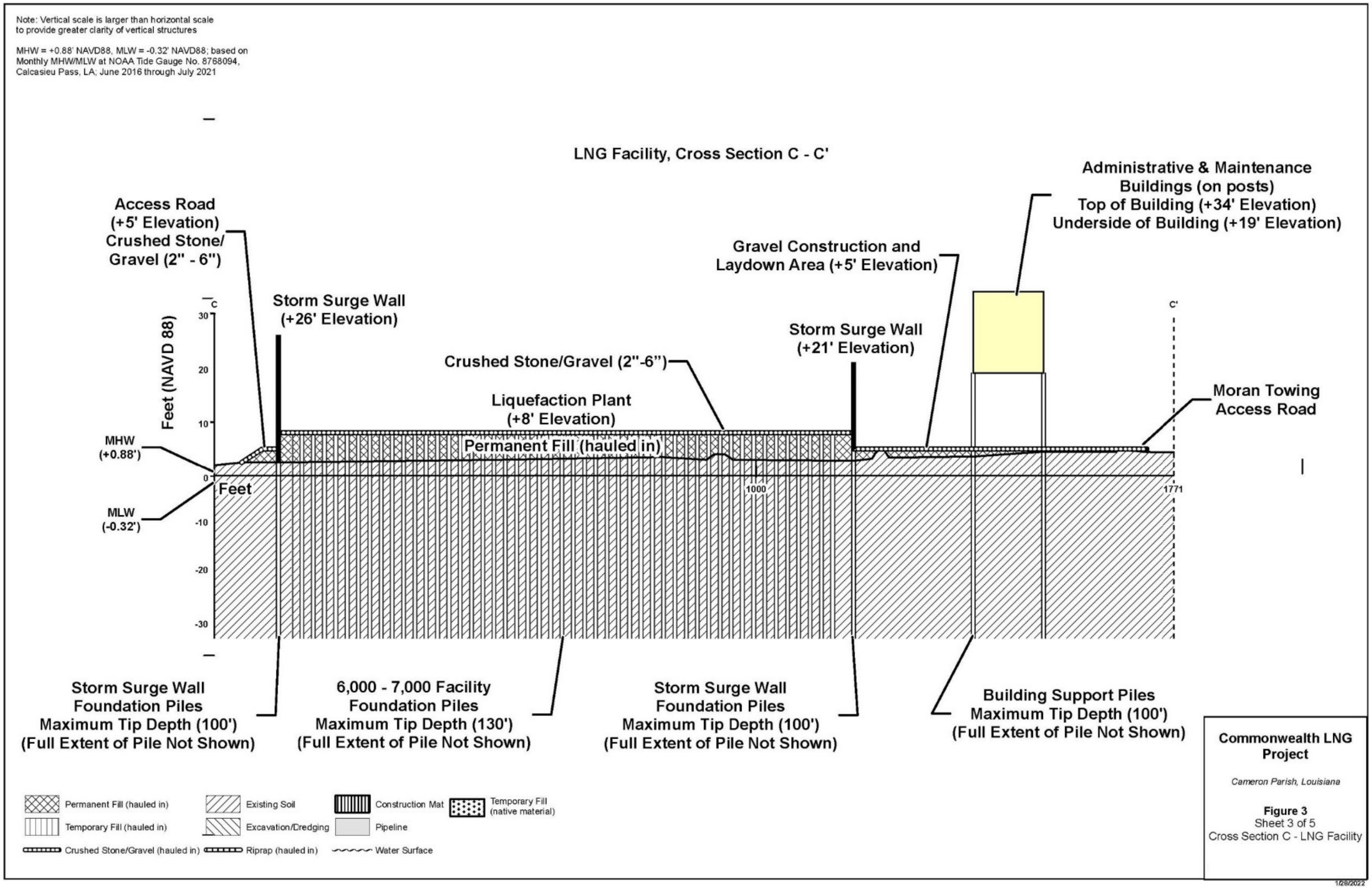

Note:
Permanent access roads greater than 500 feet long will include one 24-inch culvert approximately every 500 feet to ensure existing flow of surface water is uncompromised.
Lat: 29° 46' 36.043" N
Long: 93° 20' 46.499" W
Lat: 29° 46' 27.509" N
Long: 93° 21' 6.279" W
Proposed Temporary Fill - Construction & Laydown Area
Lat: 29° 46' 20.496" N
Long: 93° 21' 21.248" W
Proposed Administrative and Maintenance Buildings Site Prep Excavation/Permanent Fill
Proposed Moran Towing (after relocation)
A
C'
LNG Facility Entrance
Proposed Site Prep Excavation/Permanent Fill
Lat: 29° 46' 17.666" N
Long: 93° 20' 49.615" W
D'
Lat: 29° 46' 17.815" N
Long: 93° 20' 48.201" W
Proposed Liquefaction Plant Site Prep Excavation/ Permanent Fill
C
Lat: 29° 46' 10.282" N
Long: 93° 20' 54.594" W
Proposed Storm Surge Wall Site Prep Excavation/ Permanent Fill
LNG Facility Entrance
Proposed LNG Facility Grounds Site Prep Excavation/ Permanent Fill
Proposed Breasting and Mooring Dolphins
Proposed Flare Access Road Permanent Fill
LNG Facility Entrance
Proposed Marine Facilities LNG Berth
Proposed Flare Access Road Permanent Fill
Stormwater Retention and Settling Pond
B'
D
Proposed Breasting and Mooring Dolphins
Proposed Flare
B
Proposed LNG Storage Tanks Site Prep Excavation/ Permanent Fill
Lat: 29° 45' 58.648" N
Long: 93° 20' 52.592" W
Pile-Supported Structure
The pile-supported piperack to flare tower will require temporary impact (disturbance, no fill) during construction.
E'
Proposed Storm Water Ditch Excavation
Proposed Flare Access Road Permanent Fill
E
Lat: 29° 45' 53.015" N
Long: 93° 21' 1.418" W
Lat: 29° 45' 51.786" N
Long: 93° 20' 41.978" W
Proposed Flare
N
Pile-Supported Structure. The pile-supported piperack to flare tower will require clearing, disturbance, and no fill during construction. Because it is in forested wetland habitat, impacts are treated as permanent.
0
500
1,000
Feet
A'
Davis Rd
Calcasieu Parish
Jefferson Davis Parish
Texas
Louisiana
Cameron Parish
Gulf of Mexico
LNG Facility
Dredging
Excavation
Excavation/Permanent Fill
Pile Supported
Temporary Fill
Limits of Work
Access Road
Cross Section
Proposed Commonwealth LNG Dredge Area
Existing Channel - no dredging proposed
Storm Surge Wall
LNG Facility Site Boundary
Sources: ESRI, USGS, CPL, TRC
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 2
Cross Section Locations LNG Facility
INFORMATION DEPICTED HEREON IS FOR REFERENCE PURPOSES ONLY AND IS COMPILED FROM BEST AVAILABLE DATA SOURCES. TRC ASSUMES NO RESPONSIBILITY FOR ERRORS ARISING FROM MISUSE OF THIS MAP.
2/1/2022



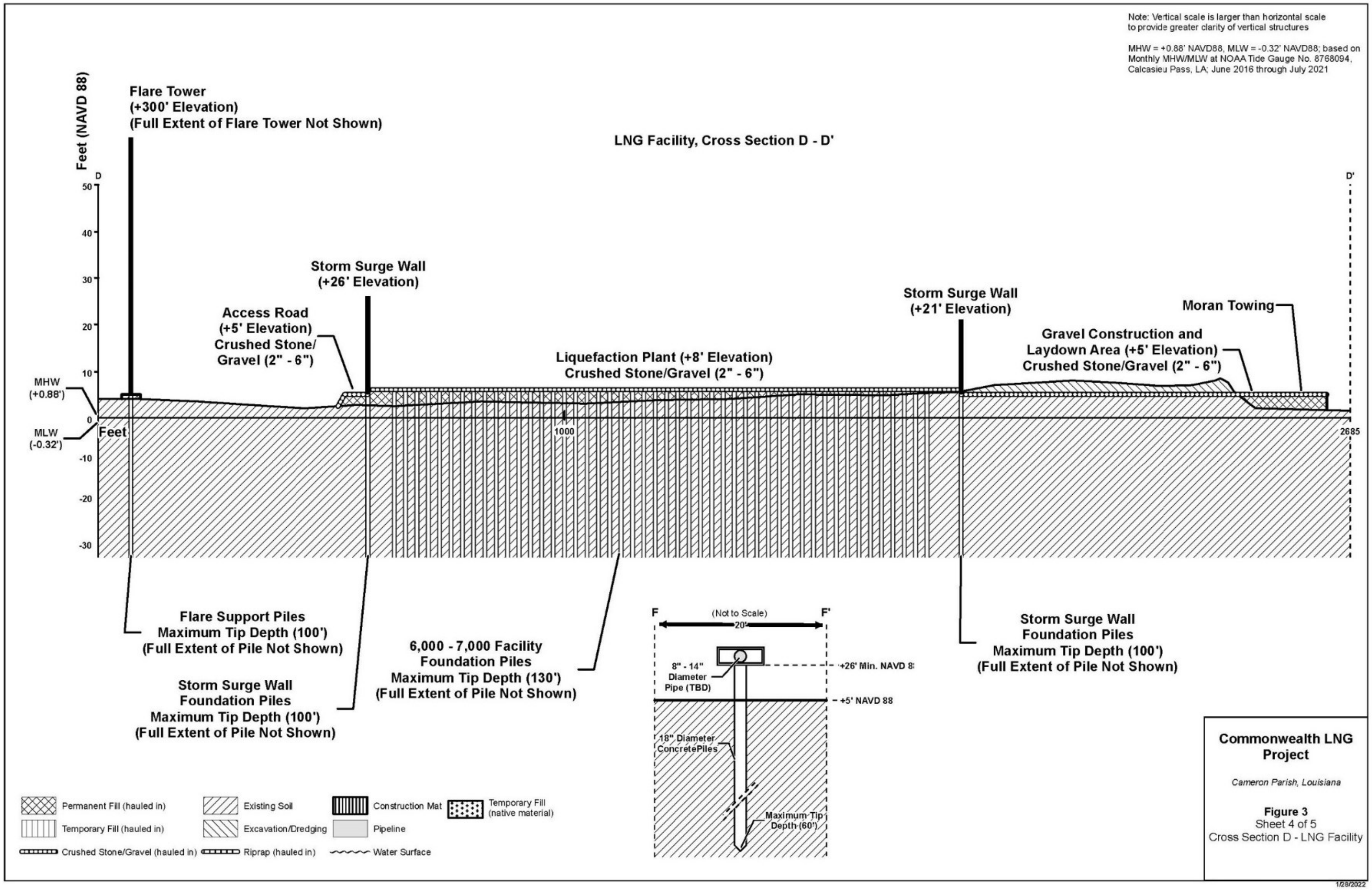
Note: Vertical scale is larger than horizontal scale
to provide greater clarity of vertical structures
MHW = +0.88' NAVD88, MLW = -0.32' NAVD88; based on
Monthly MHW/MLW at NOAA Tide Gauge No. 8768094,
Calcasieu Pass, LA; June 2016 through July 2021
Storm Water Ditch
Maximum Depth 8'
(Not to Scale)
Feet (NAVD 88)
+10
+5
0
93'' (typical)
3:1 slope
3:1 slope
-3'
45'
LNG Facility, Cross Section A - A'
A
A'
Feet (NAVD 88)
30
20
10
0
-10
-20
Access Road (west of cross section location)
Crushed Stone/Gravel (2" - 6")
Storm Surge
Wall (+21' Elevation)
Storm Surge
Wall (+26' Elevation)
Crushed Stone/Gravel (2"-6")
Highway
27/82
Liquefaction Plant (+8' Elevation)
LNG Facility Grounds
(+6' Elevation)
LNG Storage Tanks
(+5' Elevation)
Permanent Fill (hauled in)
Existing Elevation
MHW
(+0.88')
MLW
(-0.32')
Feet
1000
2000
3000
4000
4760
Gulf
of
Mexico
Water
Storm Surge Wall
Foundation Piles
Maximum Tip Depth (100')
(Full Extent of Pile Not Shown)
6,000 - 7,000 Facility
Foundation Piles
Maximum Tip Depth (130')
(Full Extent of Pile Not Shown)
Storm Surge Wall
Foundation Piles
Maximum Tip Depth (100')
(Full Extent of Pile Not Shown)
Permanent Fill (hauled in)
Temporary Fill (hauled in)
Existing Soil
Excavation/Dredging
Construction Mat
Pipeline
Temporary Fill
(native material)
Water
Crushed Stone/Gravel (hauled in)
Riprap (hauled in)
Water Surface
Commonwealth LNG
Project
Cameron Parish, Louisiana
Figure 3
Sheet 1 of 5
Cross Section A - LNG Facility
1/28/2022

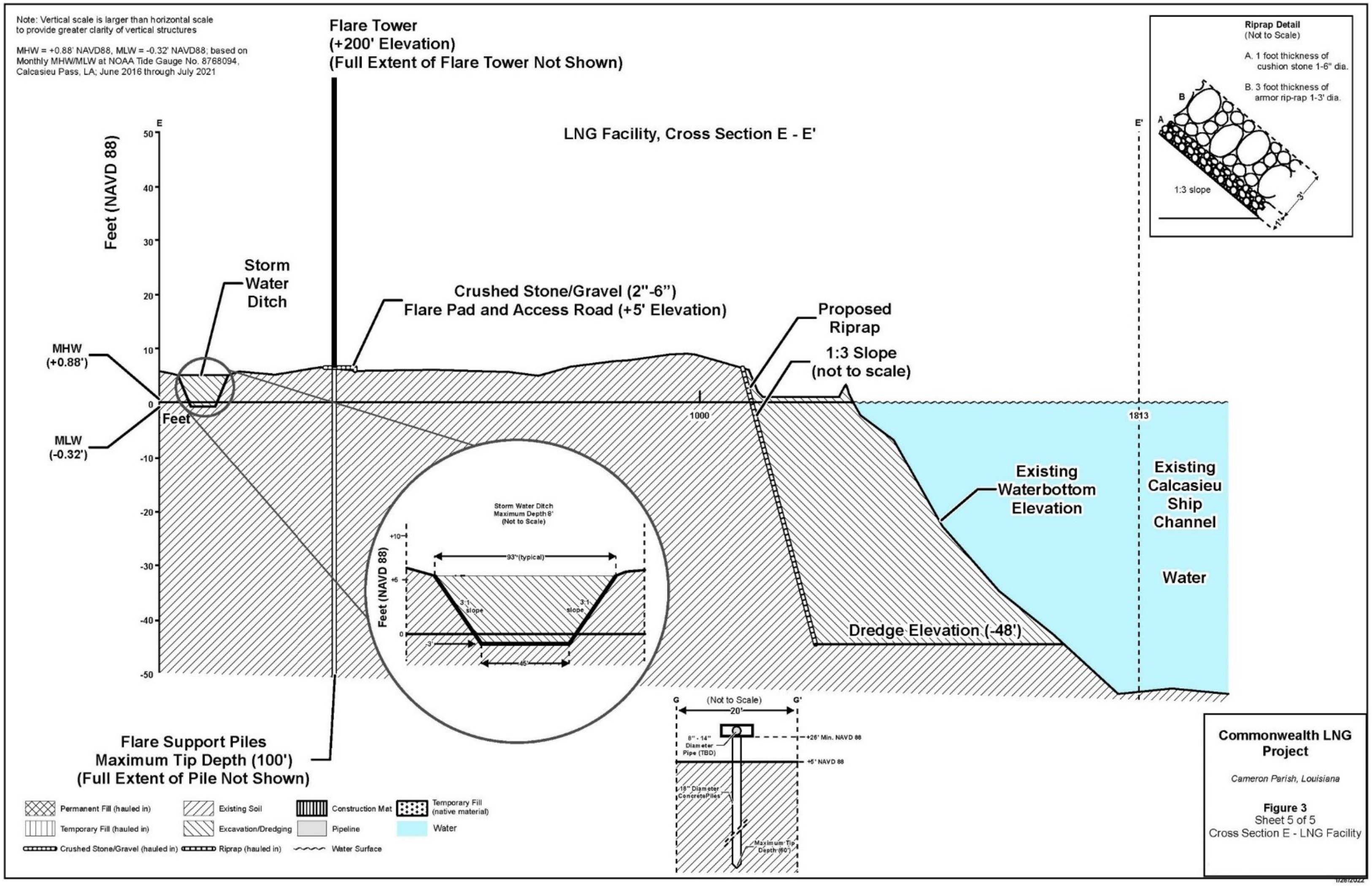


Note: Vertical scale is larger than horizontal scale to provide greater clarity of vertical structures
MHW = +0.88' NAVD88, MLW = -0.32' NAVD88; based on Monthly MHW/MLW at NOAA Tide Gauge No. 8768094, Calcasieu Pass, LA; June 2016 through July 2021
LNG Facility, Cross Section B - B'
Access Road (+5' Elevation) Crushed Stone/ Gravel (2" - 6")
Storm Water Ditch
Storm Surge Wall (+26' Elevation)
LNG Storage Tanks (+5' Elevation)
Stormwater Retention and Settling Pond
LNG Facility Grounds (+5' Elevation) Crushed Stone/Gravel (2"-6")
Storm Surge Wall (+26' Elevation)
Loading Dock
Cylindrical Steel Piles (54")
Proposed Riprap
1:3 Slope (not to scale)
Feet (NAVD 88)
MHW (+0.88')
MLW (-0.32')
Feet
326'
149'
49'
4'
1000
2000
2195
B
B'
Existing Waterbottom Elevation
Existing Calcasieu Ship Channel
Water
Dredge Elevation (-48')
Storm Surge Wall Foundation Piles Maximum Tip Depth (100') (Full Extent of Pile Not Shown)
6,000 - 7,000 Facility Foundation Piles Maximum Tip Depth (130') (Full Extent of Pile Not Shown)
Storm Surge Wall Foundation Piles Maximum Tip Depth (100') (Full Extent of Pile Not Shown)
Loading Dock Piles Maximum Tip Depth (145') (Full Extent of Pile Not Shown)
Storm Water Ditch Maximum Depth 8' (Not to Scale)
93' (typical)
3:1 slope
45'
Riprap Detail (Not to Scale)
A. 1 foot thickness of cushion stone 1-6" dia.
B. 3 foot thickness of armor rip-rap 1-3' dia.
1:3 slope
Permanent Fill (hauled in)
Temporary Fill (hauled in)
Existing Soil
Excavation/Dredging
Construction Mat
Pipeline
Temporary Fill (native material)
Water
Crushed Stone/Gravel (hauled in)
Riprap (hauled in)
Water Surface
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 3
Sheet 2 of 5
Cross Section B - LNG Facility
1/28/2022

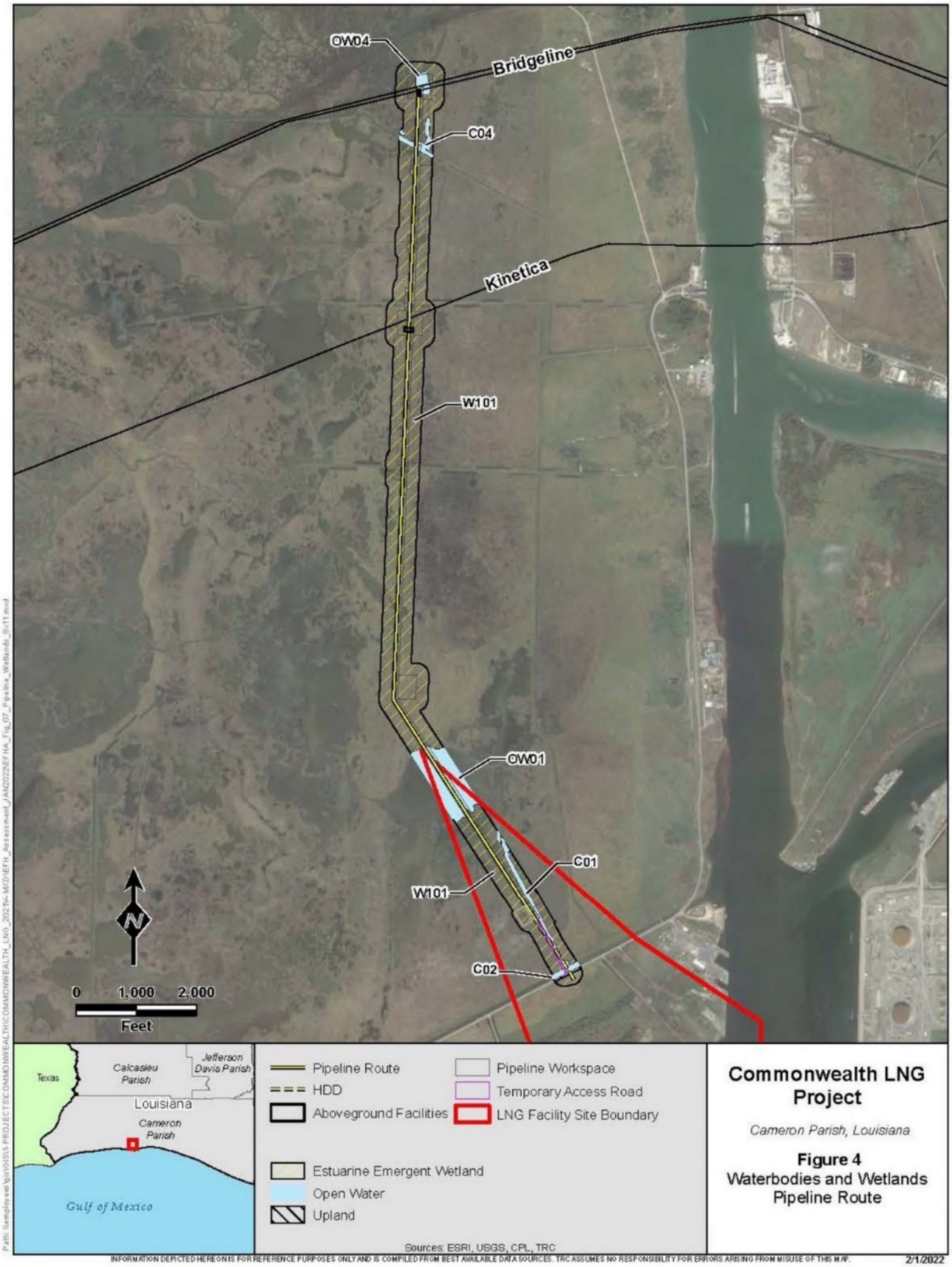


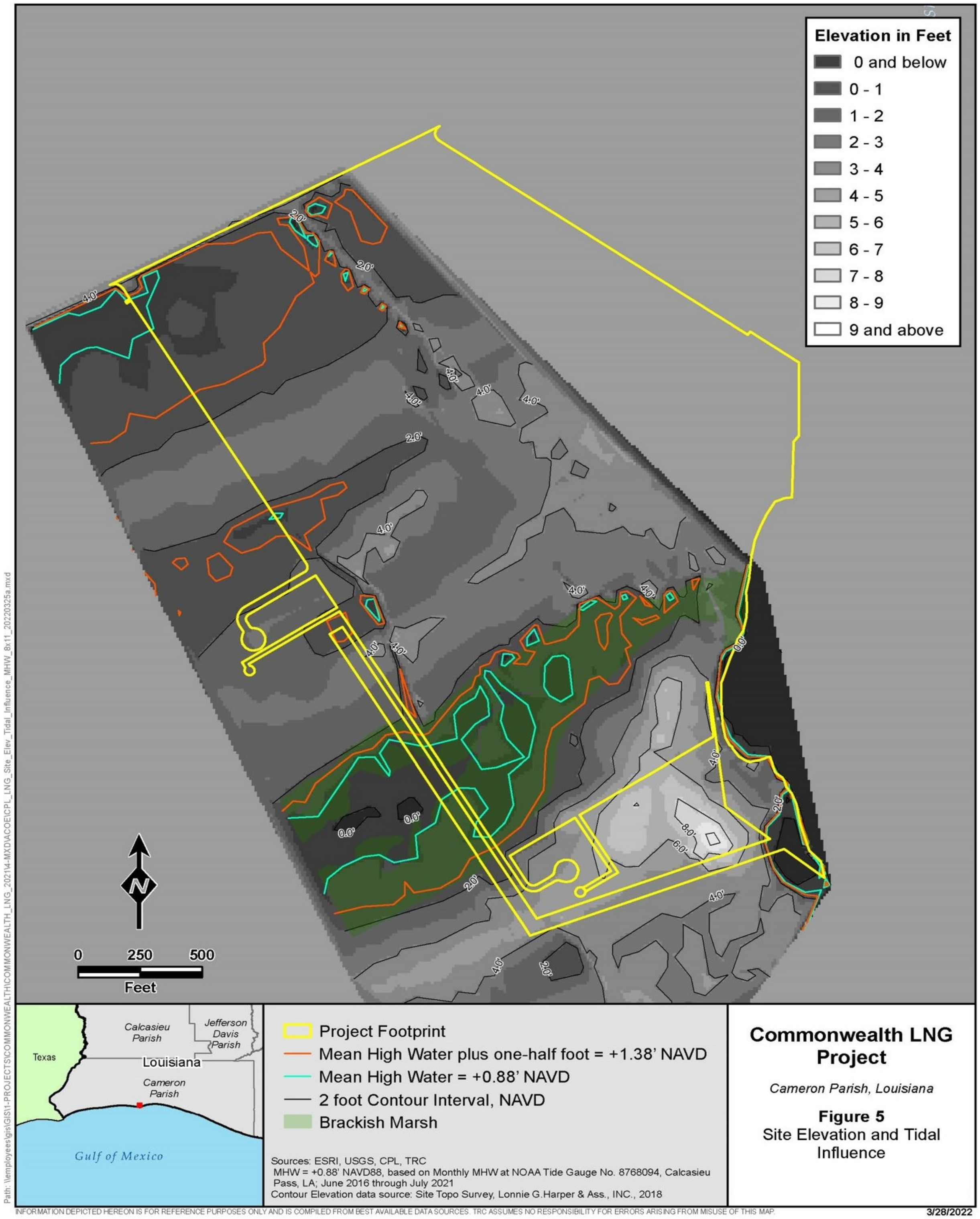
Note: Vertical scale is larger than horizontal scale
to provide greater clarity of vertical structures
MHW = +0.88' NAVD88, MLW = -0.32' NAVD88; based on
Monthly MHW/MLW at NOAA Tide Gauge No. 8768094,
Calcasieu Pass, LA; June 2016 through July 2021
LNG Facility, Cross Section C - C'
Access Road (+5' Elevation) Crushed Stone/ Gravel (2" - 6")
Storm Surge Wall (+26' Elevation)
Crushed Stone/Gravel (2"-6")
Liquefaction Plant (+8' Elevation)
Permanent Fill (hauled in)
Gravel Construction and Laydown Area (+5' Elevation)
Storm Surge Wall (+21' Elevation)
Administrative & Maintenance Buildings (on posts)
Top of Building (+34' Elevation)
Underside of Building (+19' Elevation)
Moran Towing Access Road
Feet (NAVD 88)
30
20
10
0
-10
-20
-30
MHW (+0.88')
MLW (-0.32')
Feet
1000
1771
C
C'
Storm Surge Wall Foundation Piles Maximum Tip Depth (100') (Full Extent of Pile Not Shown)
6,000 - 7,000 Facility Foundation Piles Maximum Tip Depth (130') (Full Extent of Pile Not Shown)
Storm Surge Wall Foundation Piles Maximum Tip Depth (100') (Full Extent of Pile Not Shown)
Building Support Piles Maximum Tip Depth (100') (Full Extent of Pile Not Shown)
Permanent Fill (hauled in)
Temporary Fill (hauled in)
Existing Soil
Excavation/Dredging
Construction Mat
Pipeline
Temporary Fill (native material)
Crushed Stone/Gravel (hauled in)
Riprap (hauled in)
Water Surface
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 3
Sheet 3 of 5
Cross Section C - LNG Facility
1/28/2022

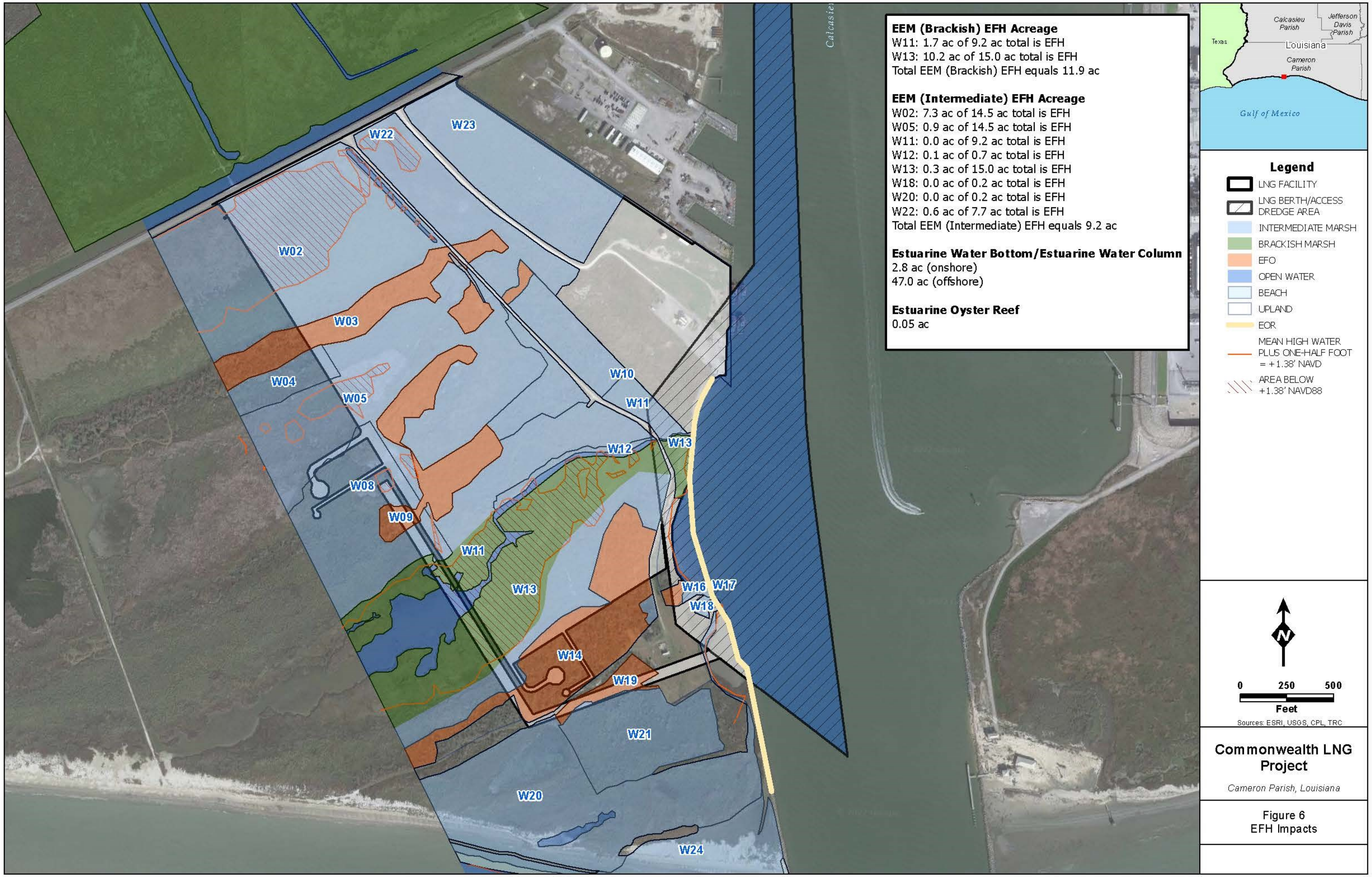

Note: Vertical scale is larger than horizontal scale to provide greater clarity of vertical structures
MHW = +0.88' NAVD88, MLW = -0.32' NAVD88; based on Monthly MHW/MLW at NOAA Tide Gauge No. 8768094, Calcasieu Pass, LA; June 2016 through July 2021
LNG Facility, Cross Section D - D'
Feet (NAVD 88)
Flare Tower (+300' Elevation) (Full Extent of Flare Tower Not Shown)
Storm Surge Wall (+26' Elevation)
Access Road (+5' Elevation) Crushed Stone/ Gravel (2" - 6")
Liquefaction Plant (+8' Elevation) Crushed Stone/Gravel (2" - 6")
Storm Surge Wall (+21' Elevation)
Moran Towing
Gravel Construction and Laydown Area (+5' Elevation) Crushed Stone/Gravel (2" - 6")
MHW (+0.88')
MLW (-0.32')
Feet
1000
2685
Flare Support Piles Maximum Tip Depth (100') (Full Extent of Pile Not Shown)
Storm Surge Wall Foundation Piles Maximum Tip Depth (100') (Full Extent of Pile Not Shown)
6,000 - 7,000 Facility Foundation Piles Maximum Tip Depth (130') (Full Extent of Pile Not Shown)
Storm Surge Wall Foundation Piles Maximum Tip Depth (100') (Full Extent of Pile Not Shown)
(Not to Scale)
20'
8" - 14" Diameter Pipe (TBD)
+26' Min. NAVD 88
+5' NAVD 88
18" Diameter Concrete Piles
Maximum Tip Depth (60')
Permanent Fill (hauled in)
Temporary Fill (hauled in)
Existing Soil
Excavation/Dredging
Construction Mat
Pipeline
Temporary Fill (native material)
Crushed Stone/Gravel (hauled in)
Riprap (hauled in)
Water Surface
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 3
Sheet 4 of 5
Cross Section D - LNG Facility
1/28/2022



Note: Vertical scale is larger than horizontal scale to provide greater clarity of vertical structures
MHW = +0.88' NAVD88, MLW = -0.32' NAVD88; based on Monthly MHW/MLW at NOAA Tide Gauge No. 8768094, Calcasieu Pass, LA; June 2016 through July 2021
Flare Tower
(+200' Elevation)
(Full Extent of Flare Tower Not Shown)
LNG Facility, Cross Section E - E'
Riprap Detail
(Not to Scale)
A. 1 foot thickness of cushion stone 1-6" dia.
B. 3 foot thickness of armor rip-rap 1-3' dia.
1:3 slope
Feet (NAVD 88)
Storm Water Ditch
Crushed Stone/Gravel (2"-6")
Flare Pad and Access Road (+5' Elevation)
Proposed Riprap
1:3 Slope
(not to scale)
MHW
(+0.88')
MLW
(-0.32')
Feet
1000
1813
Existing Waterbottom Elevation
Existing Calcasieu Ship Channel
Water
Storm Water Ditch
Maximum Depth 8'
(Not to Scale)
93' (typical)
3:1 slope
45'
Dredge Elevation (-48')
(Not to Scale)
20'
+26' Min. NAVD 88
+5' NAVD 88
Maximum Tip Depth (60')
Flare Support Piles
Maximum Tip Depth (100')
(Full Extent of Pile Not Shown)
Permanent Fill (hauled in)
Existing Soil
Construction Mat
Temporary Fill (native material)
Temporary Fill (hauled in)
Excavation/Dredging
Pipeline
Water
Crushed Stone/Gravel (hauled in)
Riprap (hauled in)
Water Surface
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 3
Sheet 5 of 5
Cross Section E - LNG Facility


OW04
Bridgeline
C04
Kinetica
W101
OW01
C01
W101
C02
0 1,000 2,000
Feet
Texas
Calcasieu Parish
Jefferson Davis Parish
Louisiana
Cameron Parish
Gulf of Mexico
Pipeline Route
HDD
Aboveground Facilities
Pipeline Workspace
Temporary Access Road
LNG Facility Site Boundary
Estuarine Emergent Wetland
Open Water
Upland
Sources: ESRI, USGS, CPL, TRC
INFORMATION DEPICTED HEREON IS FOR REFERENCE PURPOSES ONLY AND IS COMPILED FROM BEST AVAILABLE DATA SOURCES. TRC ASSUMES NO RESPONSIBILITY FOR ERRORS ARISING FROM MISUSE OF THIS MAP.
2/1/2022
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 4
Waterbodies and Wetlands
Pipeline Route


Elevation in Feet
0 and below
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
9 and above
0 250 500
Feet
Texas
Calcasieu Parish
Jefferson Davis Parish
Louisiana
Cameron Parish
Gulf of Mexico
Project Footprint
Mean High Water plus one-half foot = +1.38' NAVD
Mean High Water = +0.88' NAVD
2 foot Contour Interval, NAVD
Brackish Marsh
Sources: ESRI, USGS, CPL, TRC
MHW = +0.88' NAVD88, based on Monthly MHW at NOAA Tide Gauge No. 8768094, Calcasieu Pass, LA; June 2016 through July 2021
Contour Elevation data source: Site Topo Survey, Lonnie G.Harper & Ass., INC., 2018
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 5
Site Elevation and Tidal Influence
INFORMATION DEPICTED HEREON IS FOR REFERENCE PURPOSES ONLY AND IS COMPILED FROM BEST AVAILABLE DATA SOURCES. TRC ASSUMES NO RESPONSIBILITY FOR ERRORS ARISING FROM MISUSE OF THIS MAP.
3/28/2022


EEM (Brackish) EFH Acreage
W11: 1.7 ac of 9.2 ac total is EFH
W13: 10.2 ac of 15.0 ac total is EFH
Total EEM (Brackish) EFH equals 11.9 ac
EEM (Intermediate) EFH Acreage
W02: 7.3 ac of 14.5 ac total is EFH
W05: 0.9 ac of 14.5 ac total is EFH
W11: 0.0 ac of 9.2 ac total is EFH
W12: 0.1 ac of 0.7 ac total is EFH
W13: 0.3 ac of 15.0 ac total is EFH
W18: 0.0 ac of 0.2 ac total is EFH
W20: 0.0 ac of 0.2 ac total is EFH
W22: 0.6 ac of 7.7 ac total is EFH
Total EEM (Intermediate) EFH equals 9.2 ac
Estuarine Water Bottom/Estuarine Water Column
2.8 ac (onshore)
47.0 ac (offshore)
Estuarine Oyster Reef
0.05 ac
Calcasieu Parish
Jefferson Davis Parish
Texas
Louisiana
Cameron Parish
Gulf of Mexico
Legend
LNG FACILITY
LNG BERTH/ACCESS DREDGE AREA
INTERMEDIATE MARSH
BRACKISH MARSH
EFO
OPEN WATER
BEACH
UPLAND
EOR
MEAN HIGH WATER PLUS ONE-HALF FOOT = +1.38' NAVD
AREA BELOW +1.38' NAVD88
W02
W03
W04
W05
W08
W09
W10
W11
W12
W13
W14
W16
W17
W18
W19
W20
W21
W22
W23
W24
N
0 250 500
Feet
Sources: ESRI, USGS, CPL, TRC
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 6
EFH Impacts

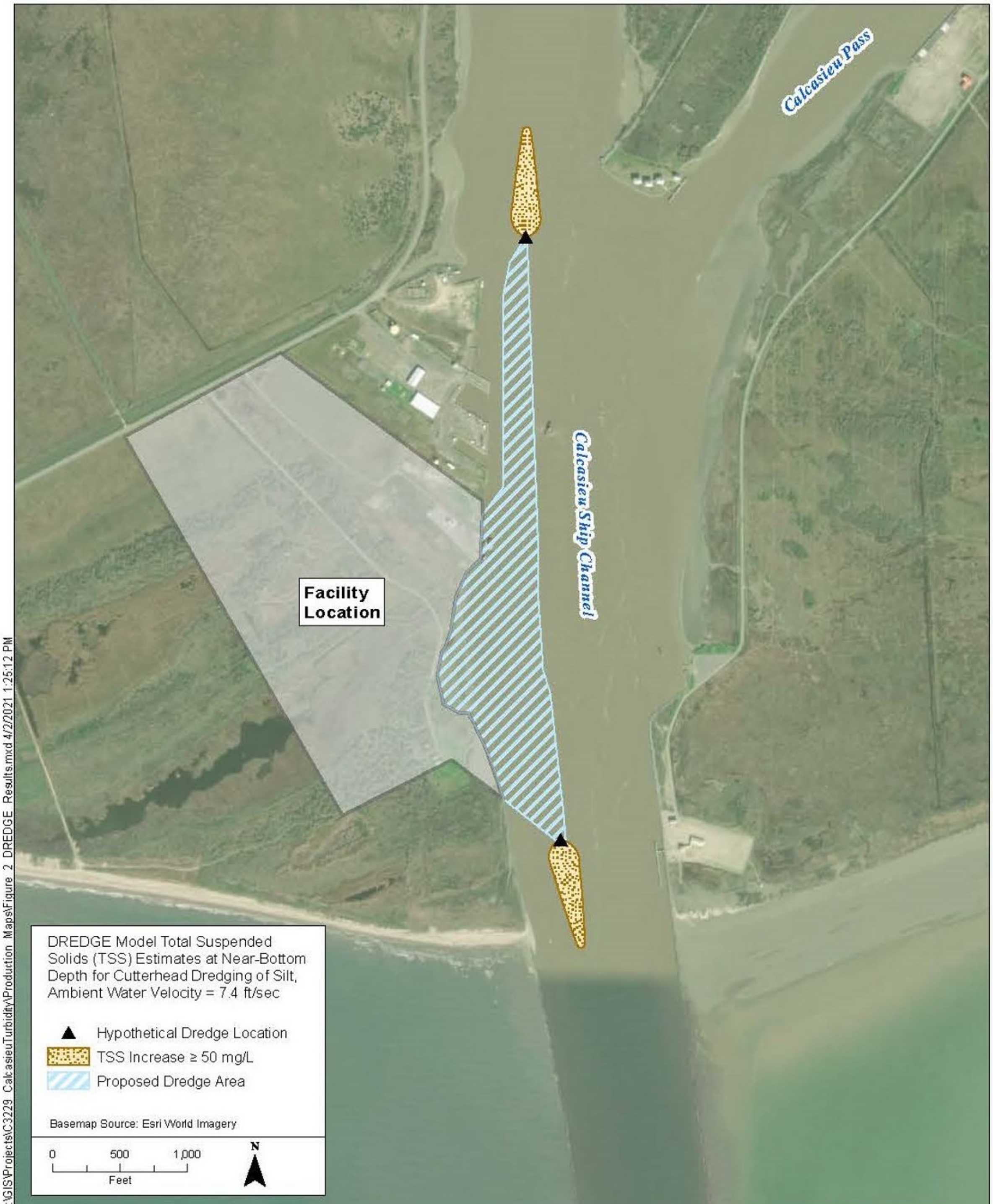
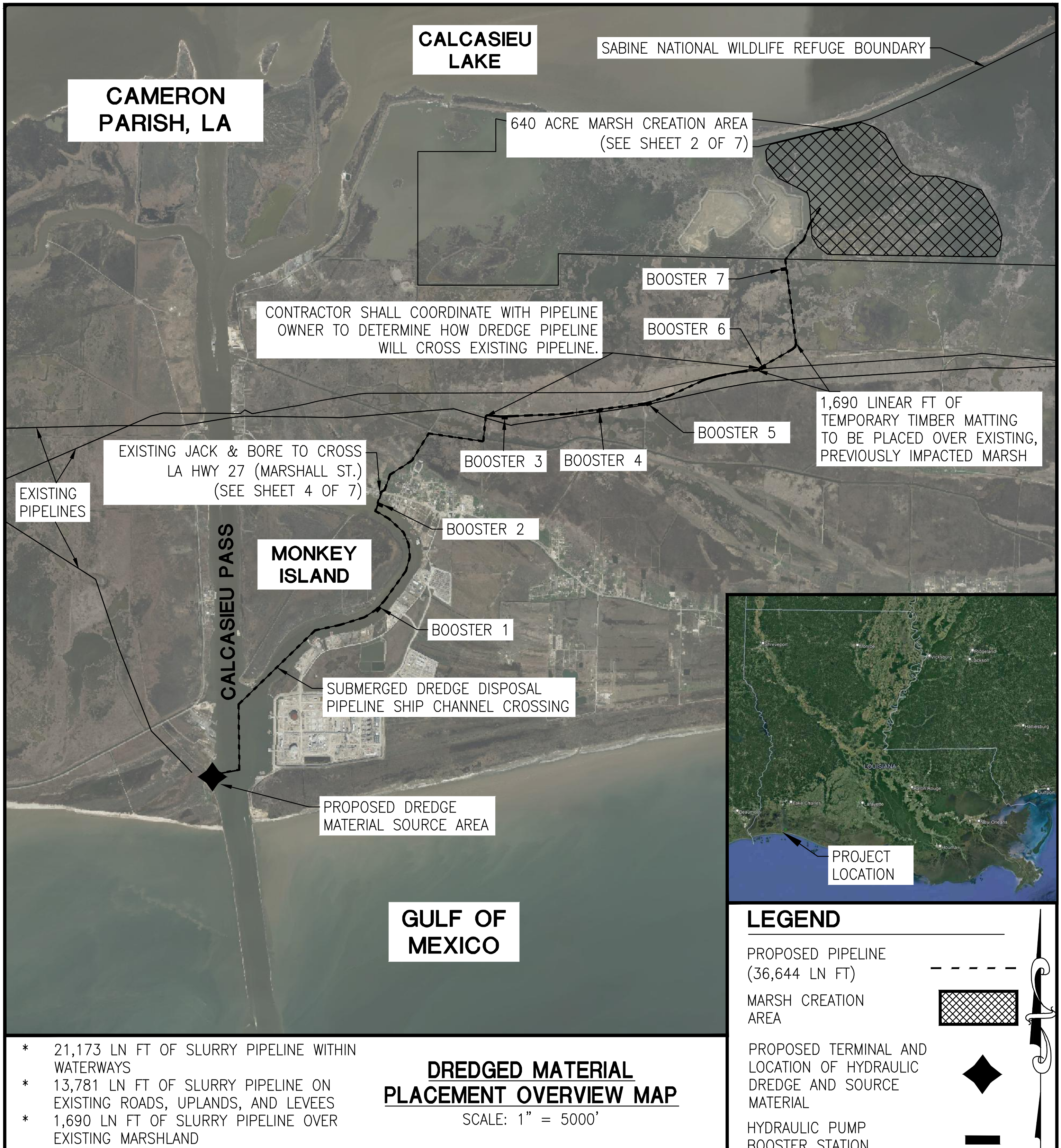


Figure 7.
DREDGE Model TSS Estimates at Near-Bottom Depth for Cutterhead Dredging of Silt under Maximum Velocity Conditions
Commonwealth LNG Marine Facility
Cameron Parish , Louisiana

Essential Fish Habitat Assessment

Appendix A

BUDM Figures

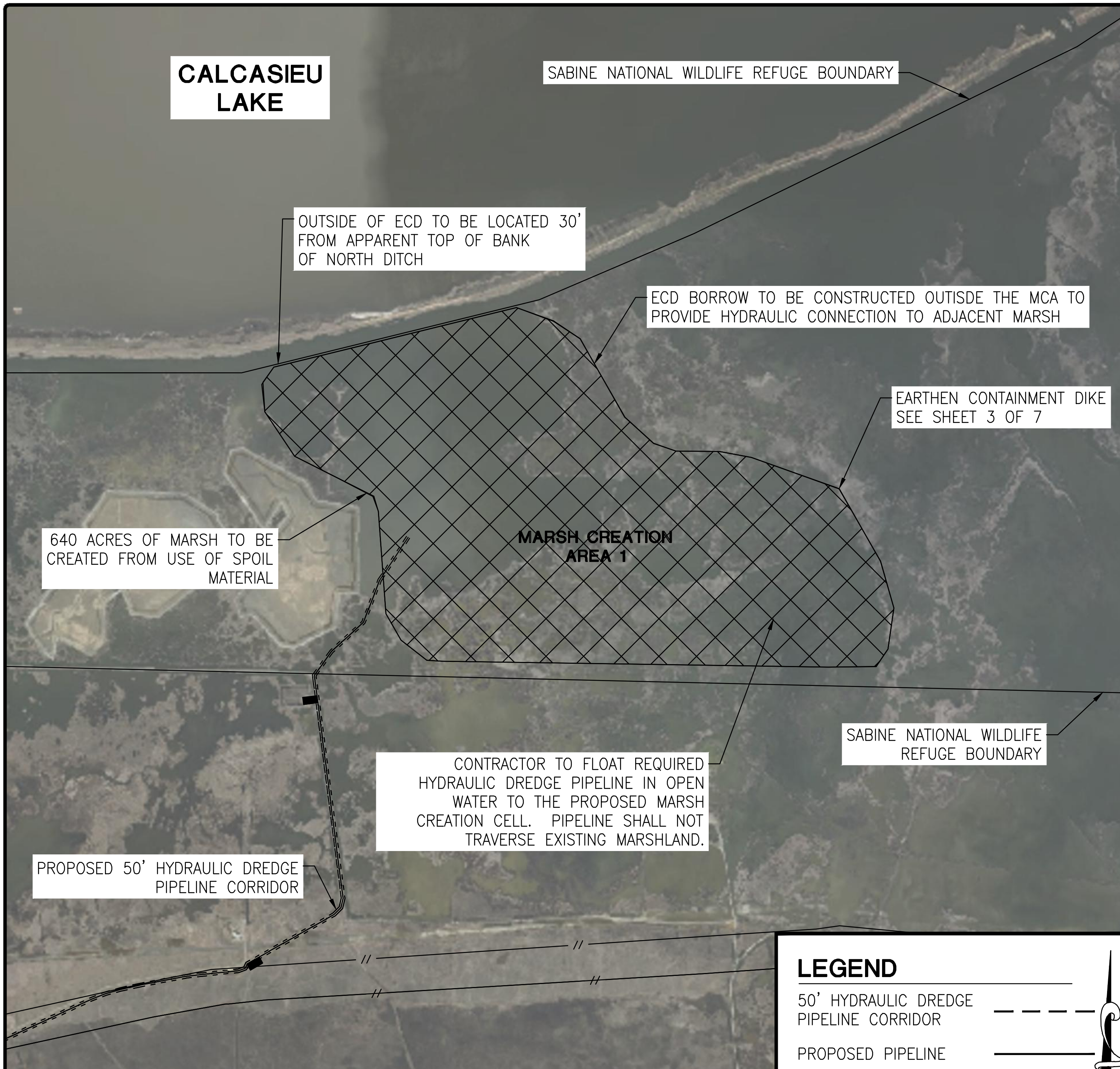


* 21,173 LN FT OF SLURRY PIPELINE WITHIN WATERWAYS
* 13,781 LN FT OF SLURRY PIPELINE ON EXISTING ROADS, UPLANDS, AND LEVEES
* 1,690 LN FT OF SLURRY PIPELINE OVER EXISTING MARSHLAND

DREDGED MATERIAL PLACEMENT OVERVIEW MAP

SCALE: 1" = 5000'

DREDGED MATERIAL PLACEMENT OVERVIEW MAP
COMMONWEALTH LNG BUDM MARSH CREATION PROJECT



LEGEND

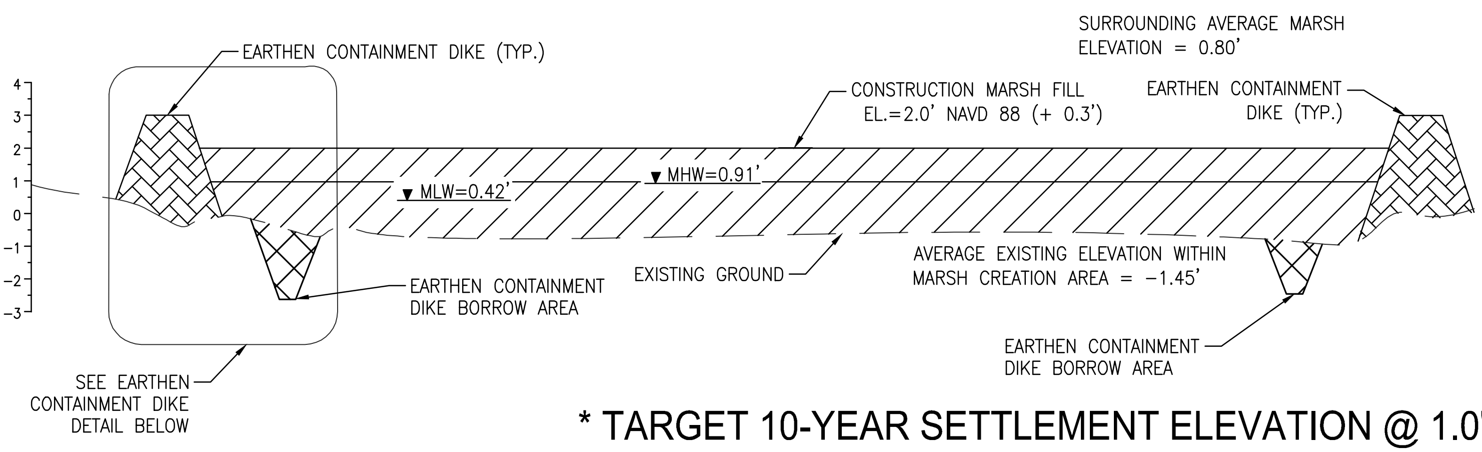
- 50' HYDRAULIC DREDGE PIPELINE CORRIDOR
- PROPOSED PIPELINE
- EXISTING PIPELINE
- MARSH CREATION AREA (MCA)
- HYDRAULIC PUMP BOOSTER STATION

* 640 ACRES OF TOTAL AREA TO BE FILLED
* 423 ACRES OF TOTAL AREA IS EXISTING OPEN WATER (66.10%)
* 217 ACRES OF TOTAL AREA IS EXISTING MARSH (33.90%)

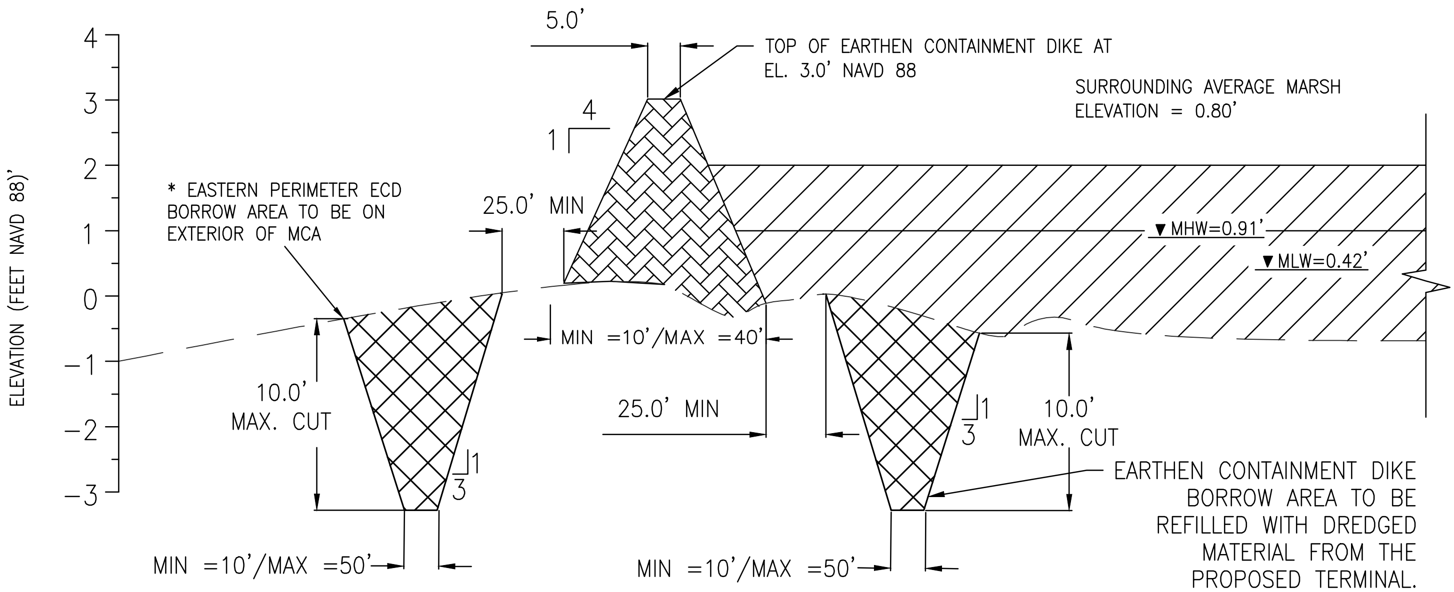
DREDGED MATERIAL PLACEMENT OVERVIEW MAP

SCALE: 1" = 2000'

DREDGED MATERIAL PLACEMENT SITE PLAN
COMMONWEALTH LNG BUDM MARSH CREATION PROJECT



* TARGET 10-YEAR SETTLEMENT ELEVATION @ 1.0'



* EARTHEN CONTAINMENT DIKES SHALL BE DEGRADED TO MARSH ELEVATION ONCE THE SEDIMENT HAS SETTLED, WITHIN 2 TO 4 YEARS POST–CONSTRUCTION. DEGRADED MATERIAL SHALL BE DISTRIBUTED EVENLY ACROSS SURROUNDING MARSH TO AVOID STACKING MORE THAN 12 INCHES OVER EXISTING MARSH ELEVATION.

LEGEND

EARTHEN CONTAINMENT DIKE

EARTHEN CONTAINMENT DIKE BORROW AREA

MARSH CREATION FILL

EXISTING GROUND

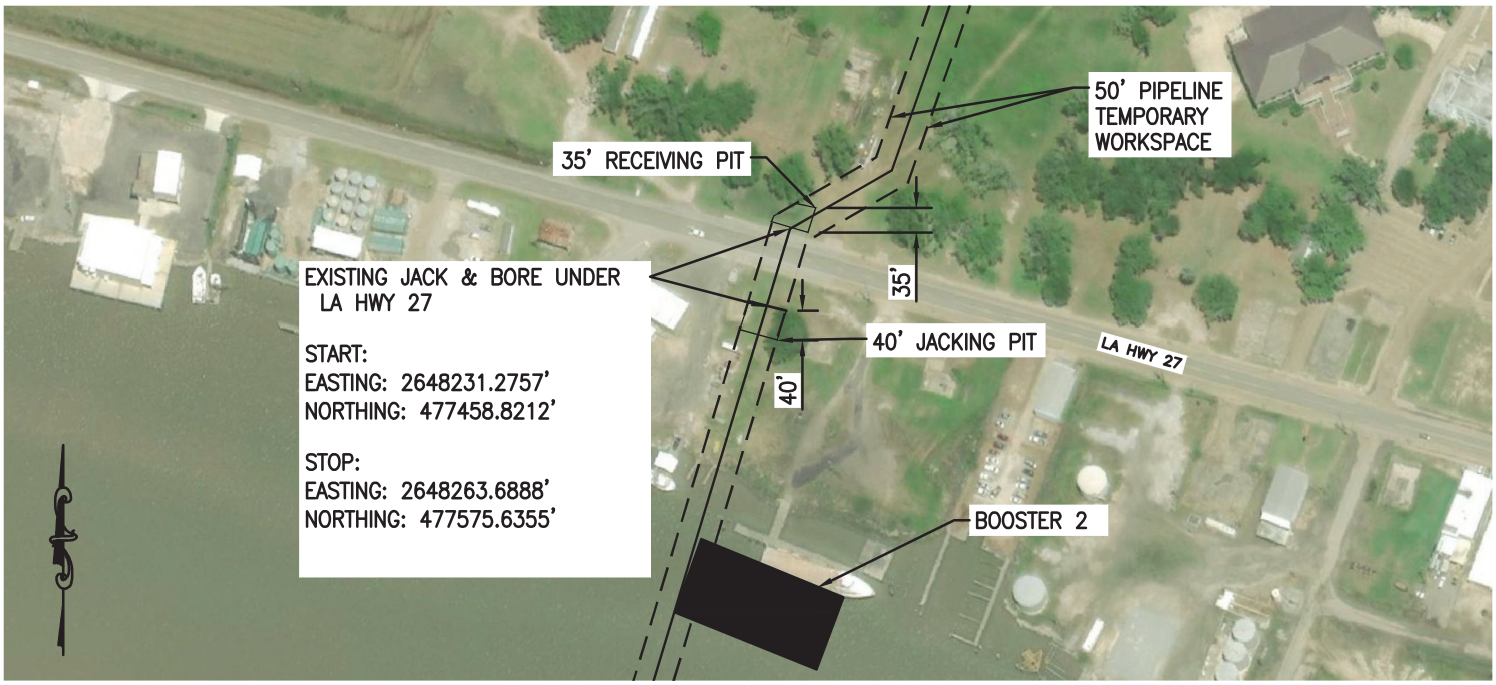
PROPOSED FILL ELEVATION

NEW MARSH CREATED = 640 ACRES

REQUIRED FILL MATERIAL FOR MARSH CREATION = 1.72M CY

* BOTTOM WIDTH OF CONTAINMENT DIKE AND TOP WIDTH OF BORROW AREA VARY WITH WATER DEPTH AND FINAL TARGET ELEVATION

MARSH CREATION SECTIONS
COMMONWEALTH LNG BUDM MARSH CREATION PROJECT



EXISTING PLAN VIEW
JACK & BORE

SCALE IN FEET

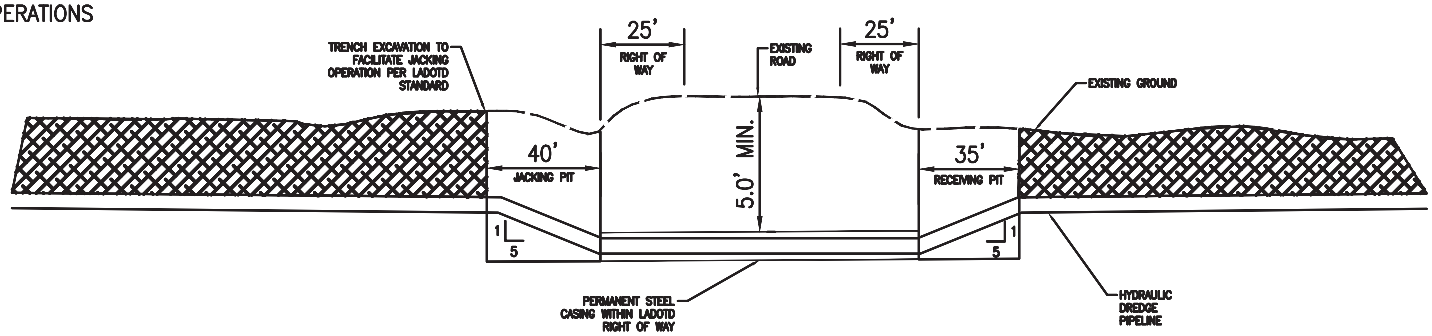
LEGEND

HYDRAULIC DREDGE PIPELINE

50' PIPELINE TEMPORARY WORKSPACE

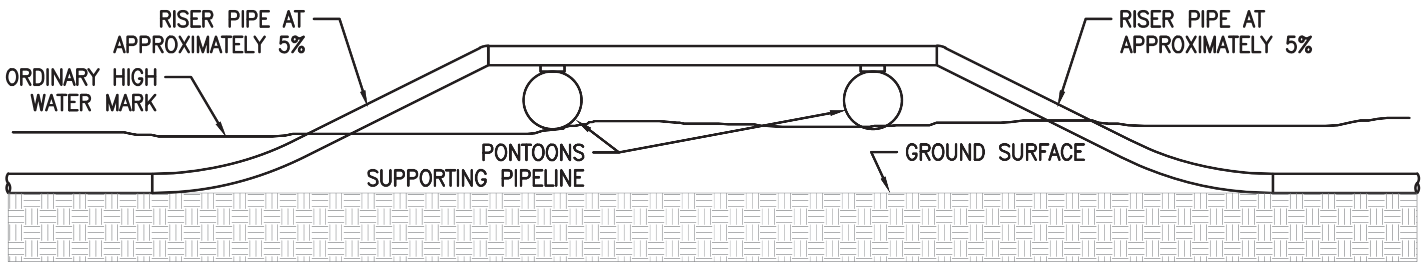
BOOSTER

NOTE:
JACK & BORE PITS TO CONFORM TO DOTD PERMIT. NO WETLANDS IMPACTS FROM JACK & BORE OPERATIONS

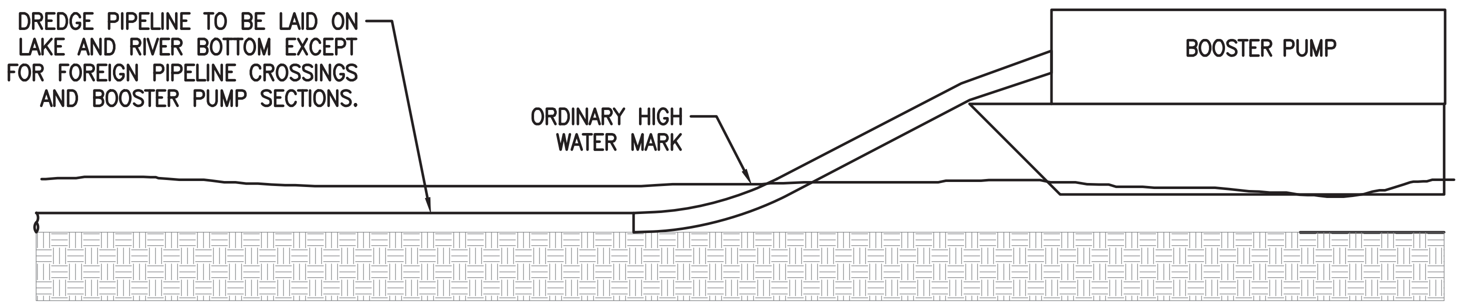


PROFILE VIEW
TYPICAL JACK & BORE SECTION
(NTS)

JACK & BORE DETAILS
COMMONWEALTH LNG BUDM MARSH CREATION PROJECT
PERMITTING ONLY – NOT FOR CONSTRUCTION

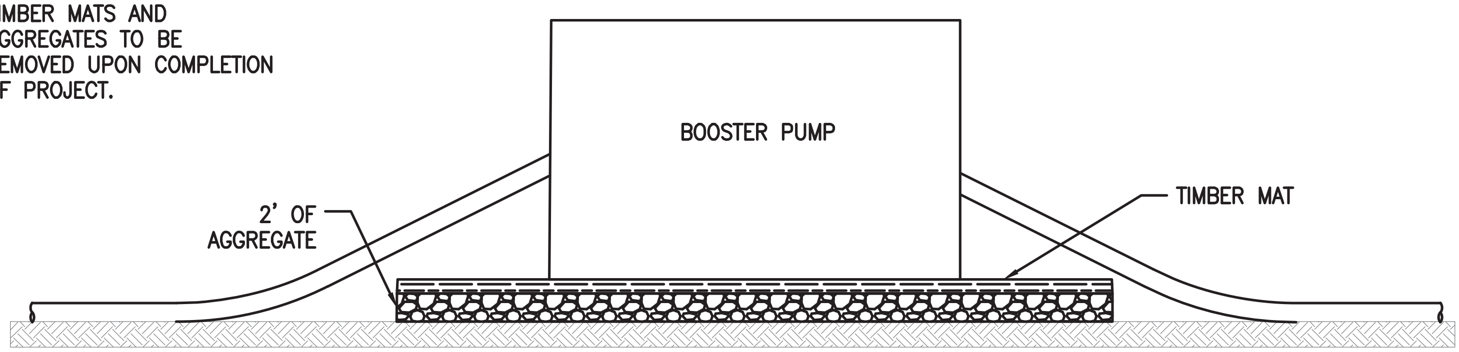


FLOATING PIPELINE
TYPICAL SECTION



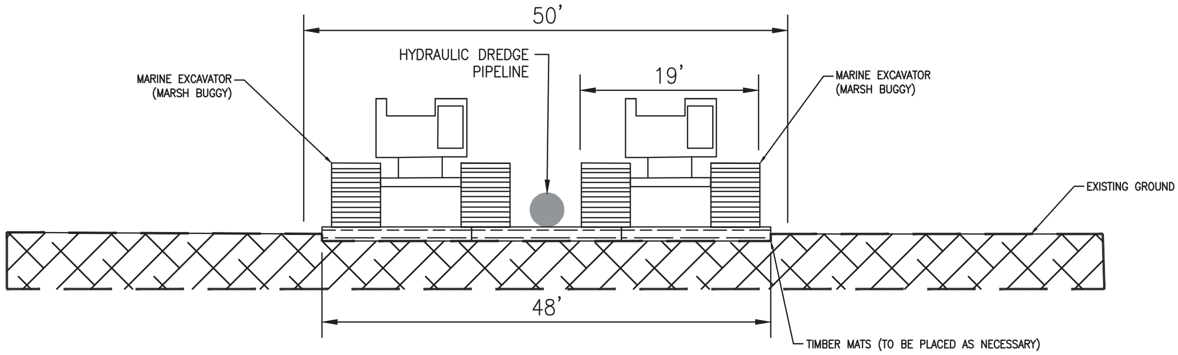
SUBMERGED DREDGE PIPELINE AND
BARGE TYPICAL SECTION

NOTE:
TIMBER MATS AND
AGGREGATES TO BE
REMOVED UPON COMPLETION
OF PROJECT.

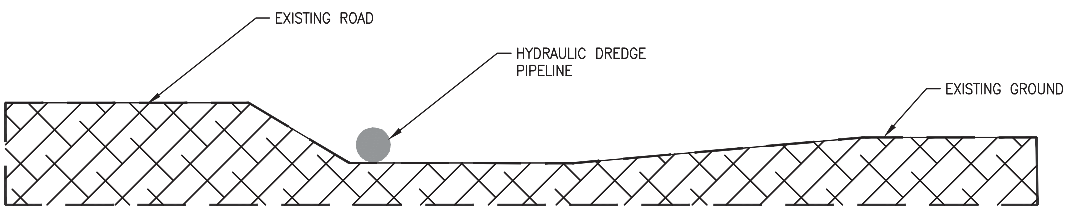


LAND BASED BOOSTER PUMP
TYPICAL SECTION

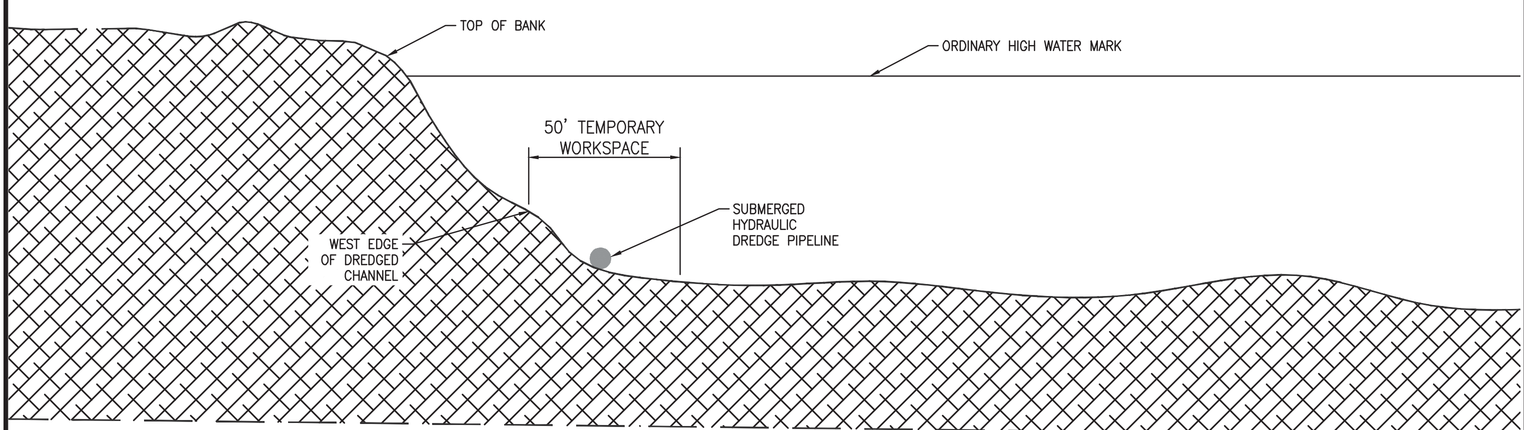
HYDRAULIC DREDGE PIPELINE DETAILS
COMMONWEALTH LNG BUDM MARSH CREATION
PROJECT
PERMITTING ONLY – NOT FOR CONSTRUCTION



50' TEMPORARY WORKSPACE TYPICAL SECTION N.T.S



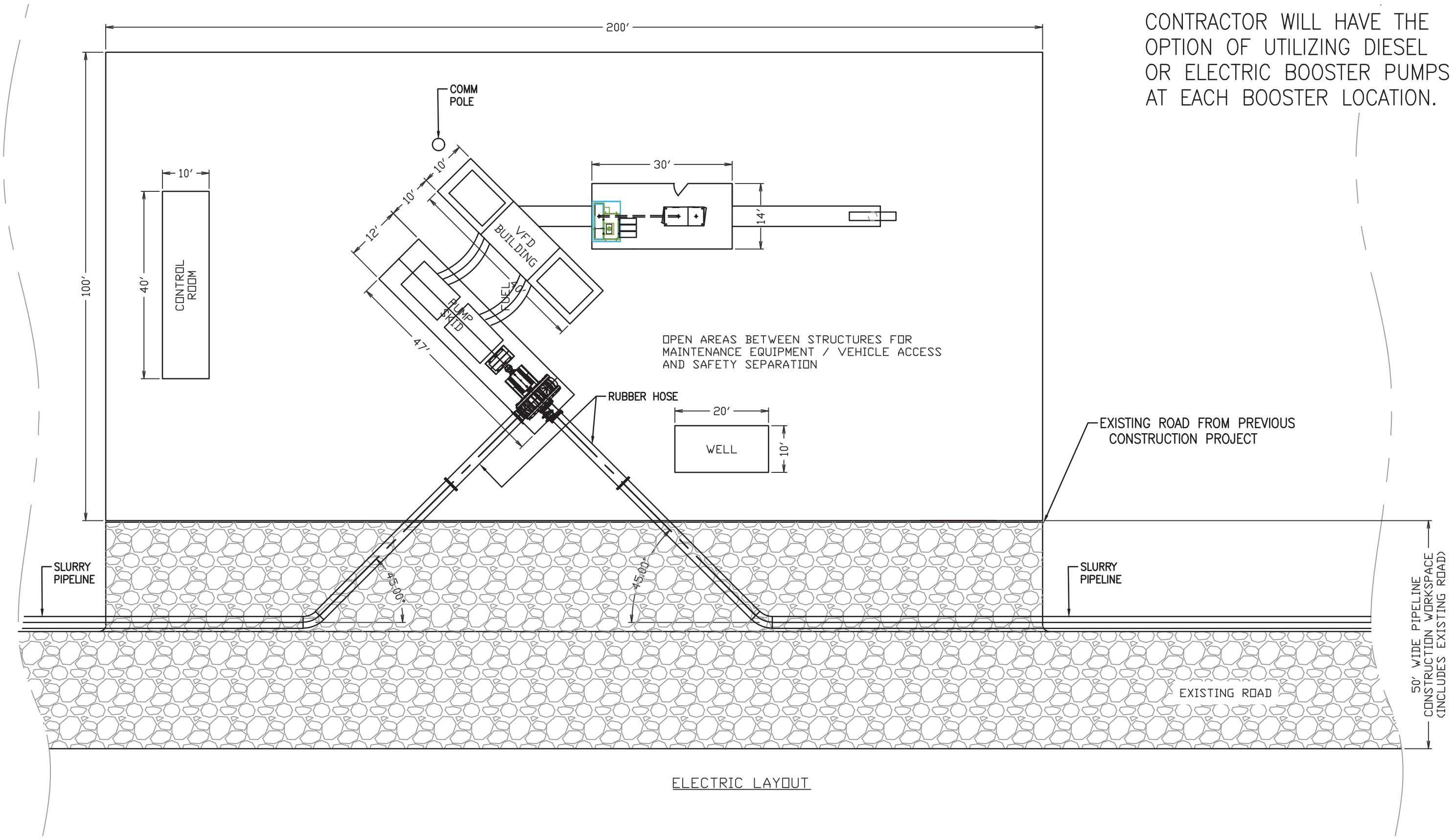
ROADSIDE PIPELINE CORRIDOR TYPICAL SECTION N.T.S



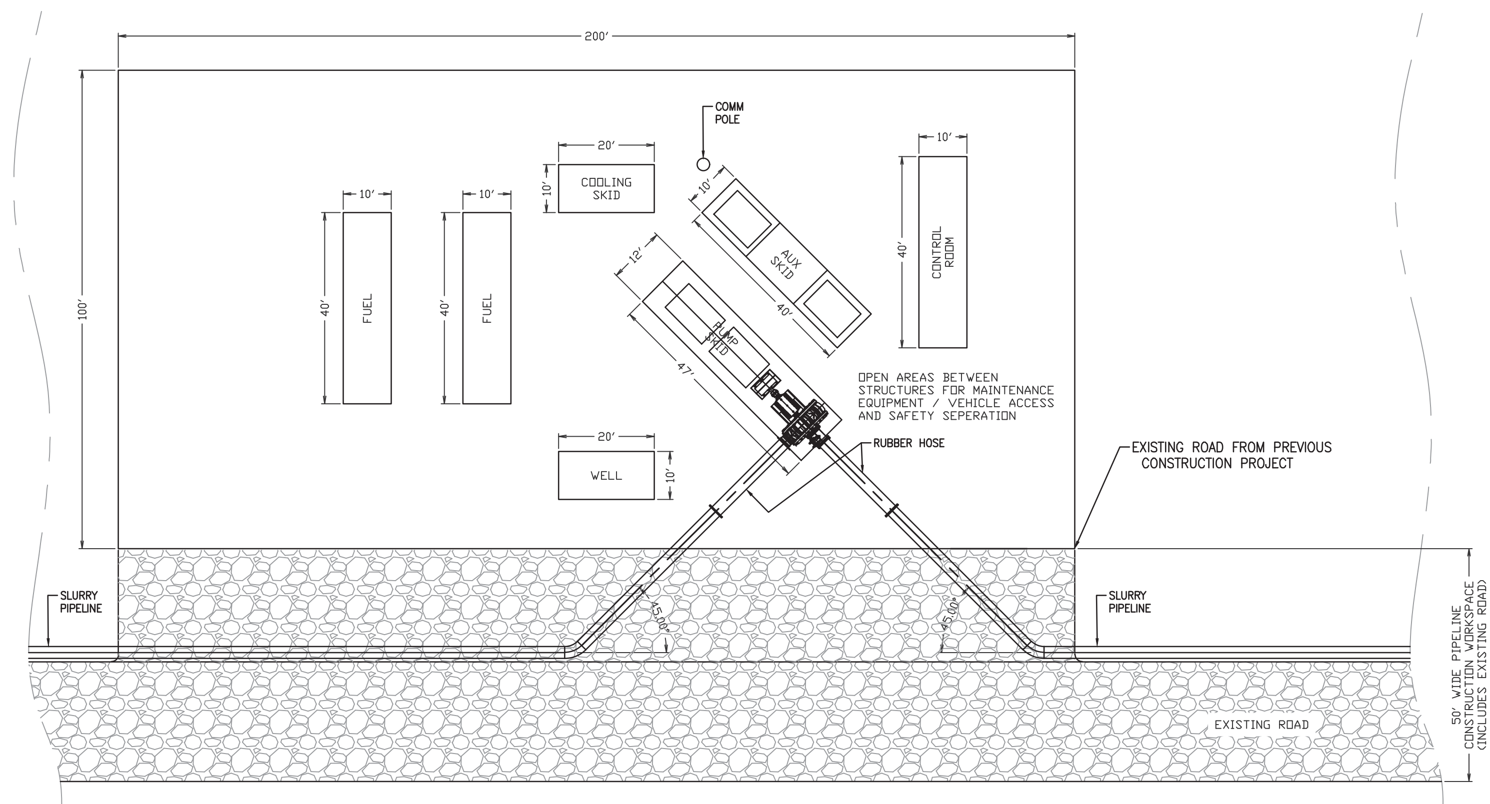
SUBMERGED HYDRAULIC DREDGE PIPELINE TYPICAL SECTION N.T.S

HYDRAULIC DREDGE PIPELINE CORRIDOR DETAILS
COMMONWEALTH LNG BUDM MARSH CREATION PROJECT
PERMITTING ONLY – NOT FOR CONSTRUCTION
DATE: 6-9-2022

CONTRACTOR WILL HAVE THE OPTION OF UTILIZING DIESEL OR ELECTRIC BOOSTER PUMPS AT EACH BOOSTER LOCATION.



ELECTRIC LAYOUT



DIESEL LAYOUT

BOOSTER PUMP SITE PLANS
COMMONWEALTH LNG BUDM MARSH CREATION PROJECT
PERMITTING ONLY– NOT FOR CONSTRUCTION
DATE: 6–9–2022

Essential Fish Habitat Assessment

Appendix B

Habitat Types, Commonwealth LNG Project

Memorandum

Project:	Commonwealth	Date:	February 8, 2022
Prepared By:	Keith Suderman		
To:	Mike Herrmann, USACE		
Notes:			

Commonwealth conducted a transect of the LNG Facility site on August 5, 2021, to record the dominant species by percent cover at each point, along with the habitat type, based on field observations (table provided below). The attached photolog includes photos in all four directions at each of the points (A through O), as depicted in the figure, below.

OCM reviewed and approved these determinations, based on their previous site visit, Biological Investigation report, local experience, review of these materials, and professional judgement. Their official approval of the Project's impact analysis by habitat type is posted to SONRIS.

Table 1. Habitat Types, Commonwealth LNG Project, Cameron Parish, Louisiana, August 5, 2021

Plot	Species	Percent Cover	Habitat Type
A	*Schoenoplectus americanus*	90	Intermediate marsh
	Spartina patens	10	
B	*Spartina patens*	60	Intermediate marsh
	Spartina spartinae	30	
	Cyperus articulatus	10	
	Sesbania herbacea	5	
C	*Phragmites australis*	60	Intermediate marsh swale
D	*Phragmites australis*	90	Intermediate marsh swale
E	*Iva frutescens*	40	ESS scrub
	Baccharis halimifolia	40	
	Spartina patens	30	
	Juncus roemerianus	10	
	Spartina spartinae	5	
	Borrichia frutescens	5	

Table 1. Habitat Types, Commonwealth LNG Project, Cameron Parish, Louisiana, August 5, 2021

Plot	Species	Percent Cover	Habitat Type
F	*Distichlis spicata*	60	Brackish marsh
	Schoenoplectus robustus	25	
	Spartina patens	15	
G	*Distichlis spicata*	60	Brackish marsh
	Schoenoplectus robustus	40	
H	*Distichlis spicata*	40	Brackish marsh
	Schoenoplectus robustus	30	
	Spartina patens	20	
	Borrichia frutescens	5	
I	*Phragmites australis*	95	High intermediate marsh
	Iva frutescens	5	
	Baccharis halimifolia	5	
	Spartina patens	5	
J	*Phragmites australis*	60	High intermediate marsh
	Ipomea sagittata	15	
	Spartina patens	10	
	Alternanthera philoxeroides	10	
K	*Typha latifolia*	50	Swale
L	*Phragmites australis*	90	Swale
M	*Spartina patens*	50	High intermediate Marsh
	Schoenoplectus americanus	40	
	Iva frutescens	20	
	Solidago sempervirens	5	
	Rosa bracteata	5	
	Borrichia frutescens	5	
N	*Phragmites australis*	50	Recovering Intermediate Marsh
O	*Phragmites australis*	50	Intermediate marsh
	Spartina patens	40	
	Iva frutescens	5	

Data Points	EFO
Brackish Marsh	ESS
Intermediate Marsh	Open Water
Beach	Slough
Ditch	Upland

Commonwealth LNG

Marsh Type Assessment

Cameron Parish, LA

Created : DRP
Approved : DEB
Date : 8/27/2021
Map No. :Figure 1

inputs are primarily overwash during severe storms and rainfall during all precipitation events. The species mix reflects the challenging nature of this determination as it dominated by *Spartina patens* (appears first in the species lists for both brackish and intermediate marsh types, LNHP, 2009) near the southern edge and *Schoenoplectus americanus* (a.k.a. *Scirpus olneyi*) (which appears in both lists as well) near the road. *Spartina spartinae* is present in this area and is indicative of intermediate marsh (LNHP, 2009). *Cyperus articulatus* and *Sesbania herbacea* are present but not listed in LNHP (2009). Wetland surveyors in 2016 and 2018 classified it as intermediate, as did OCM representatives.

Reference:

LNHP. (2009). The Natural Communities of Louisiana. Updated August 2009.

Additional Support for these determinations is provided from Soils and the dominant species of vegetation in each area.

Soils

The Soils Data from the Natural Resources Conservation Service (NRCS) soil type map for the site is included below (Figure labeled Soils). We recognize these remote sources are no substitute for boots-on-the-ground survey, but we note that the soil types lie in bands across the site – and that based on soil types, we would expect to see differences in marsh type in the different areas.

In particular, the soils north of the highway and in the central portion of the site south of the highway (i.e., the portion with the direct connection to the Calcasieu River) are **Creole Mucky Clay**. These clearly correspond to brackish marshes:

- **Creole** soils are on low Gulf Coastal brackish marshes at elevations of 2 feet or less. They are flooded with brackish water during storms and high tides. They are also flooded with fresh water from torrential rains.

The rest of the site contains **Mermentau Clay** (northern portion) or **Hackberry-Mermentau Complex**, Gently Undulating (everything else).

- **Mermentau** soils are on low ridges in the Gulf coast marshes at elevations of 2 to 4 feet above sea level.

- **Hackberry** soils are on low ridges generally parallel to the coast, at elevations of 4 to 7 feet above sea level. They formed in sandy and loamy beach deposits. Slopes range from 0 to 3 percent.

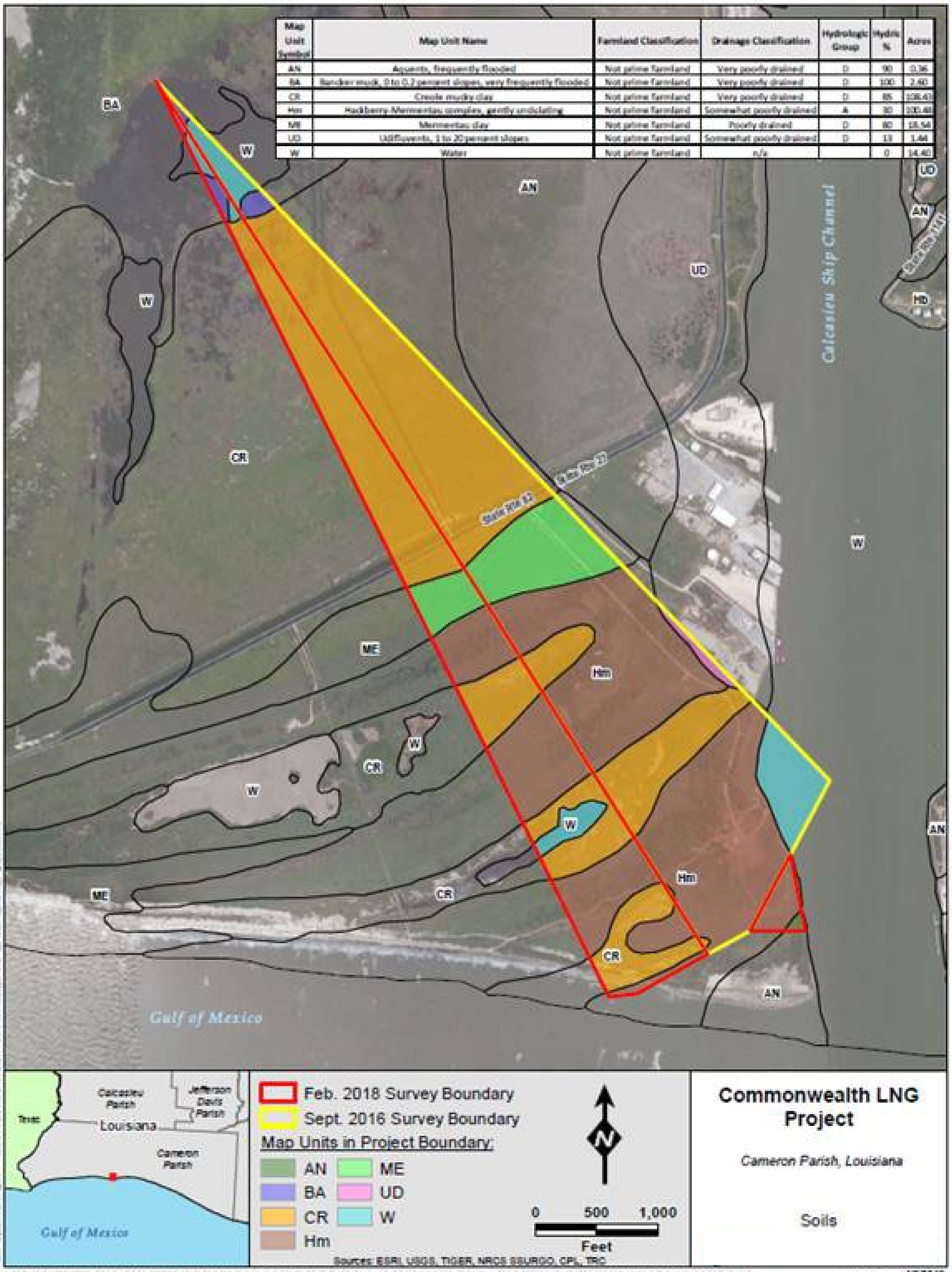
Mermentau and Hackberry/Mermentau soils lie above MHW on low ridges and hills, and the Hackberry soils support scrub-shrub and forested habitats.

Vegetation (see table above)

- The vegetation in the central portion of the site (i.e., Plots F, G, and H) is dominated by *Distichlis spicata* and *Schoenoplectus robustus* (a.k.a. *Scirpus robustus*) which are both indicative of brackish marsh, as described in The Natural Communities of Louisiana (LNHP, 2009), p. 9. This area is clearly brackish.

- The vegetation in the EEM within the Hackberry-Mermentau Complex is dominated by *Phragmites australis*, which is characteristic of intermediate marsh, as described in The Natural Communities of Louisiana (LNHP, 2009), p. 9. The areas within the Hackberry-Mermentau Complex are classified as intermediate (as shown in the table).

- The northern portion of the site is more challenging to assign to brackish or intermediate type. It is underlain by Mermentau soils, which are lower in elevation than Hackberry soils (i.e., Mermentau soils lie 2-4 feet above sea level). It has no direct connection to the Calcasieu River, so its water



Map Unit Symbol	Map Unit Name	Farmland Classification	Drainage Classification	Hydrologic Group	Hydric %	Acres
AN	Aquents, frequently flooded	Not prime farmland	Very poorly drained	D	90	0.36
BA	Bancker muck, 0 to 0.2 percent slopes, very frequently flooded	Not prime farmland	Very poorly drained	D	100	2.60
CR	Creole mucky clay	Not prime farmland	Very poorly drained	D	85	108.43
Hm	Hackberry-Mermentau complex, gently undulating	Not prime farmland	Somewhat poorly drained	A	30	100.48
ME	Mermentau clay	Not prime farmland	Poorly drained	D	80	18.54
UD	Udifluvents, 1 to 20 percent slopes	Not prime farmland	Somewhat poorly drained	D	13	1.44
W	Water	Not prime farmland	n/a		0	14.40

4/2/2018

Plot Photos

ID

Plot A

North

East

South

West

Plot Photos

ID

Plot B

North

East

South

West

Plot Photos

ID

Plot C

North

East

South

West

Plot Photos

ID

Plot D

North

East

South

West

Plot Photos

ID

Plot E

North

East

South

West

Plot Photos

ID

Plot F

North

East

Plot Photos

ID

Plot G

North

East

South

West

Plot Photos

ID

Plot H

North

East

South

West

Plot Photos

ID

Plot I

North

East

South

West

Plot Photos

ID

Plot J

North

East

South

West

Plot Photos

ID

Plot K

North

East

South

West

Plot Photos

ID

Plot L

North

East

South

West

Plot Photos

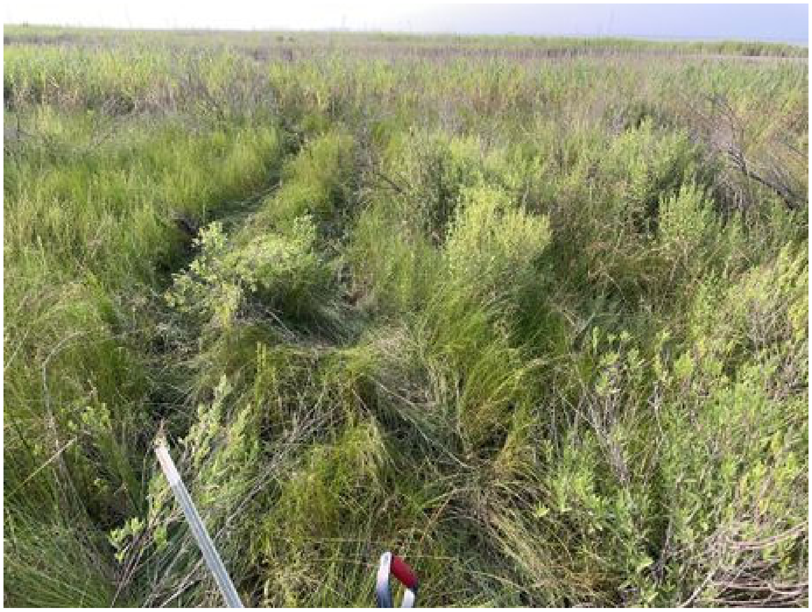
ID

Plot M

North

East

South



West

Plot Photos

ID

Plot N

North

East

South

West

Plot Photos

ID

Plot O

North

East

South

West

Appendix E

Visual Renderings of the Commonwealth LNG Terminal

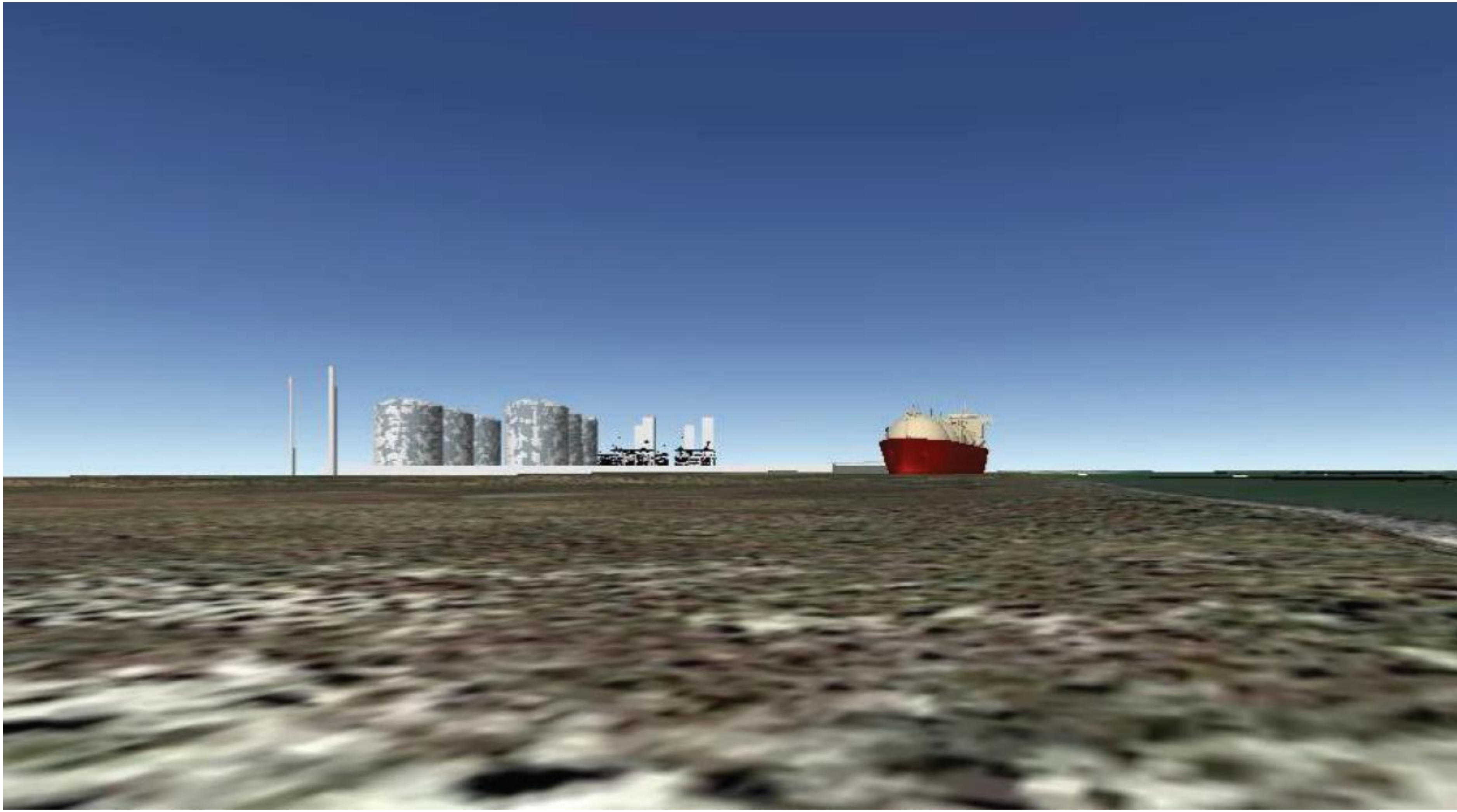


Figure E-1. Daytime rendering of the Commonwealth LNG Terminal viewed from Holly Beach due South of Terminal

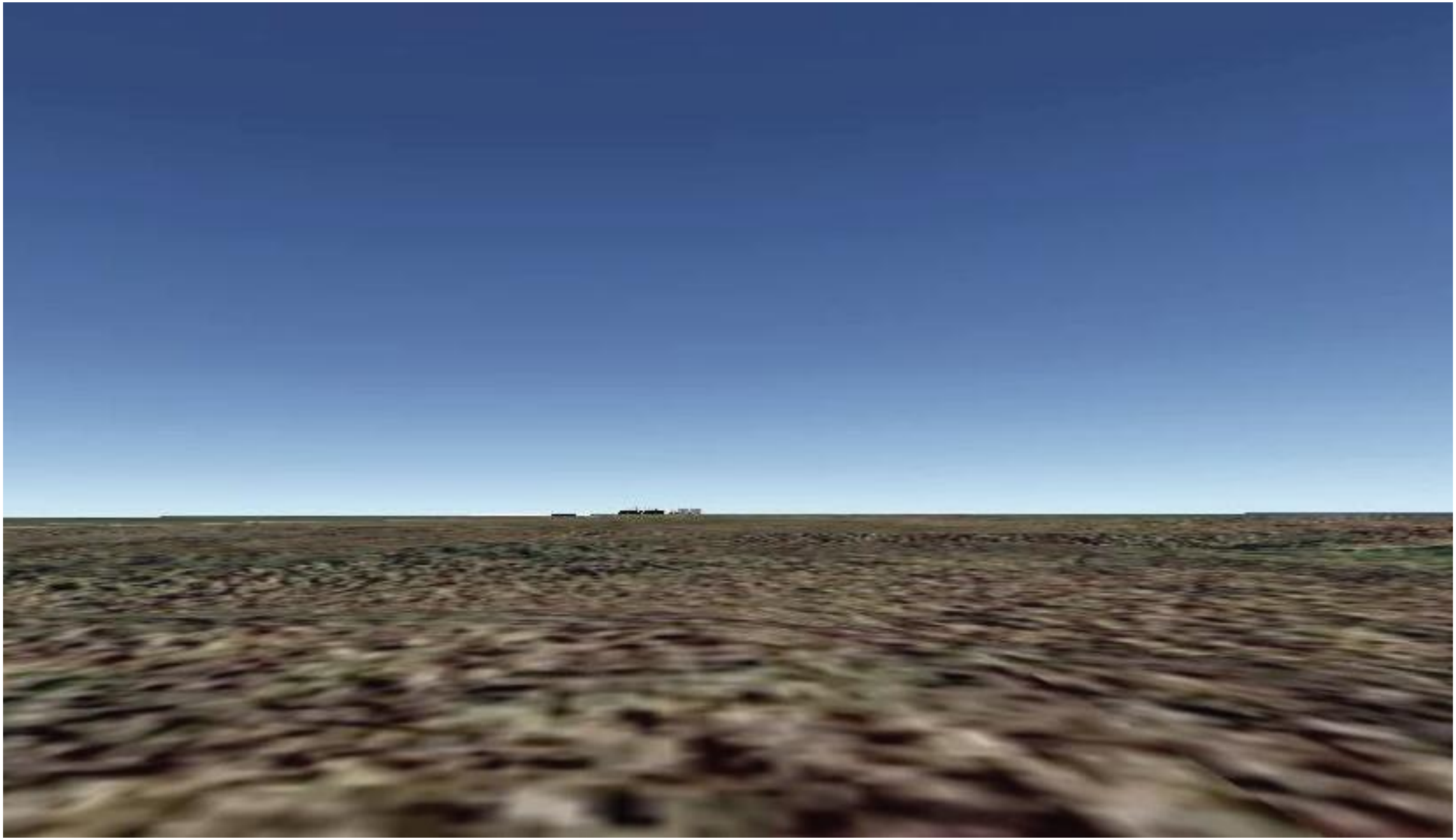


Figure E-2. Daytime rendering of the Commonwealth LNG Terminal viewed from a Holly Beach public access road, approximately 5 miles west of the Terminal

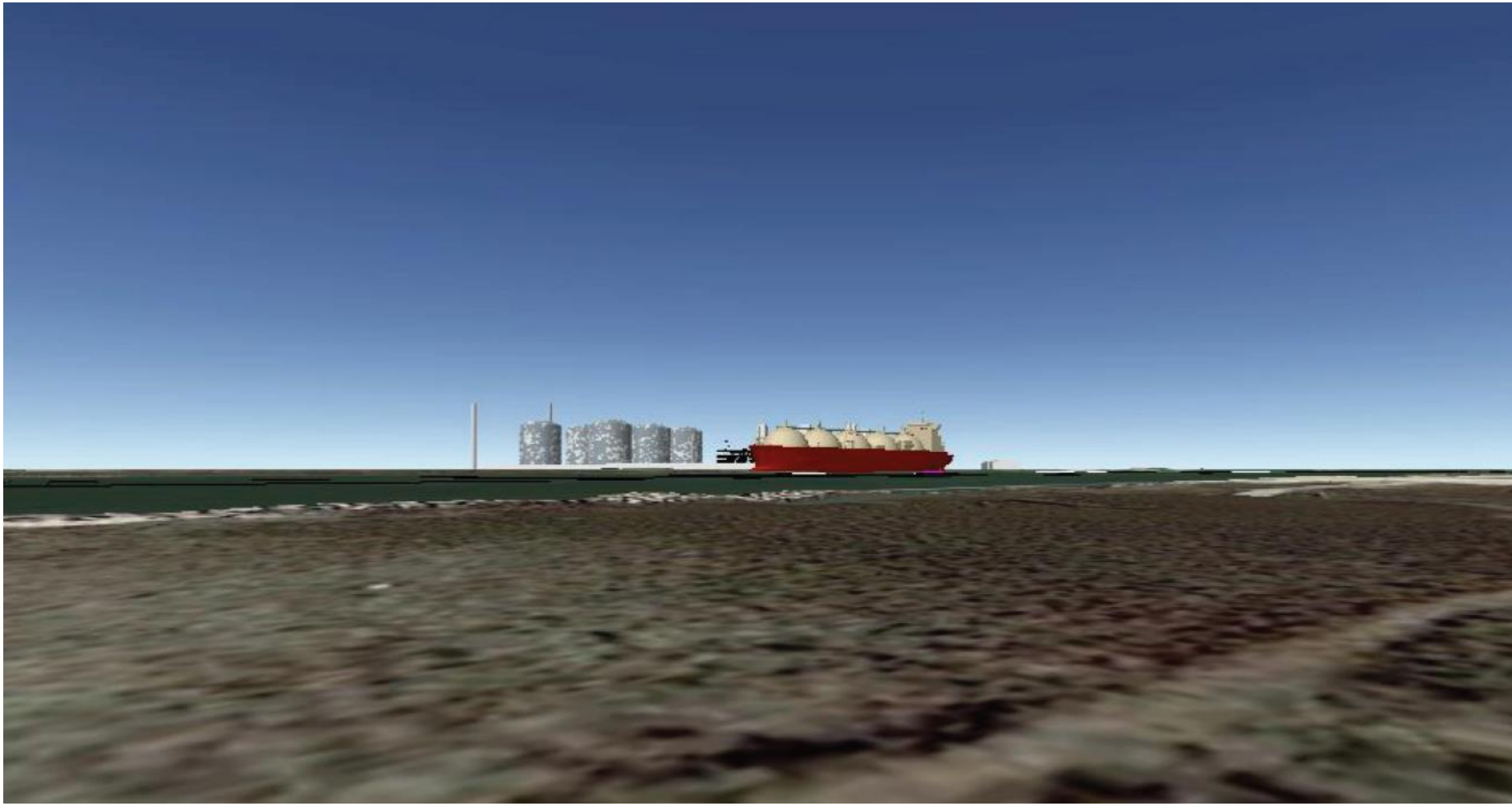


Figure E-3. Daytime rendering of the Commonwealth LNG Terminal viewed from Broussard Beach

Figure E-4. Daytime rendering of the Commonwealth LNG Terminal viewed from NSA 2.

Figure E-5. Nighttime rendering of the Commonwealth LNG Terminal viewed from NSA 2.

Figure E-6. Nighttime rendering of the Commonwealth LNG Terminal viewed from Holly Beach, approximately 5 miles west of the Terminal.

Figure E-7. Nighttime rendering of the Commonwealth LNG Terminal viewed from Broussard Beach.

Figure E-8. Nighttime rendering of the Commonwealth LNG Terminal viewed from the Creole Nature Trail (Highway 27/82), approximately 10 miles NW of the Terminal.

APPENDIX F

DEMOGRAPHIC COMPOSITION WITHIN THE PROJECT AREA

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										**LOW-INCOME COLUMN**
State and Parish/County	**White Alone, not Hispanic or Latino a/ (percent)**	**Black or African-American a/ (percent)**	**Asian a/ (percent)**	**American Indian and Alaska Native a/ (percent)**	**Native Hawaiian and Other Pacific Islander a/ (percent)**	**Some Other Race a/ (percent)**	**Two or More Races a/ (percent)**	**Hispanic or Latino (any race) a/ (percent)**	**Total Minority Population (percent) c/**	**Households Below Poverty Level (percent) b/**
Terminal, Meter Station, and Pipeline										
Louisiana	***58.7***	***32.2***	***1.7***	***0.5***	***0.03***	***1.4***	***2.0***	***5.1***	***41.3***	***18.8***
Cameron Parish	***88.3***	***3.4***	***0.5***	***0.5***	***0.0***	***1.3***	***1.4***	***5.9***	***11.7***	***10.9***
Census Tract 9702.01, Block Group 1	96.1	0.0	0.0	0.0	0.0	0.0	0.0	3.9	3.9	12.6
Census Tract 9702.01, Block Group 2 d/	97.9	0.0	2.1	0.0	0.0	0.0	0.0	0.0	2.1	0.0
Census Tract 9702.01, Block Group 3 e/	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.6
Census Tract 9701, Block Group 1 e/	51.2	48.8	0.0	0.0	0.0	0.0	0.0	0.0	48.8	0.0
Census Tract 9701, Block Group 2	78.6	4.6	1.4	1.3	0.0	0.0	3.4	10.6	21.4	12.6
Census Tract 9701, Block Group 3	95.7	0.0	0.0	0.0	0.0	0.0	4.3	0.0	4.3	0.0
Census Tract 9701, Block Group 4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Census Tract 9701, Block Group 5	94.8	0.0	0.0	0.0	0.0	5.2	0.0	5.2	5.2	12.2

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Calcasieu Parish	***67.4***	***24.9***	***1.4***	***0.3***	***0.01***	***1.01***	***2.4***	***3.6***	***32.6***	***16.0***
Census Tract 17, Block Group 4	62.5	21.9	0.0	0.0	0.0	7.1	2.9	12.7	37.5	21.5
Census Tract 18.01, Block Group 1	97.0	0.0	0.0	0.8	0.0	0.0	0.8	1.4	3.0	9.6
Census Tract 20, Block Group 4	82.6	15.1	0.0	0.0	0.0	0.0	1.0	1.3	17.4	16.1
Census Tract 34, Block Group 1	87.7	1.7	0.0	0.0	0.0	0.0	10.6	0.0	12.3	29.1
Census Tract 1, Block Group 1	43.6	49.2	0.8	1.4	0.0	0.0	1.7	3.3	56.4	40.2
Census Tract 1, Block Group 2	85.9	8.8	0.0	1.8	0.0	0.0	0.0	3.5	14.1	9.7
Census Tract 2, Block Group 1	2.6	89.3	0.0	0.6	0.0	1.5	1.3	4.6	97.4	26.9
Census Tract 4, Block Group 1	3.2	96.8	0.0	0.0	0.0	0.0	0.0	0.0	96.8	57.6
Census Tract 4, Block Group 2	4.0	95.8	0.0	0.0	0.0	0.0	0.2	0.0	96.0	34.9

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Census Tract 5, Block Group 1	95.1	0.9	0.0	0.0	0.0	1.1	0.0	2.9	4.9	9.5
Census Tract 5, Block Group 2	85.9	12.5	0.0	0.0	0.0	0.0	0.0	1.6	14.1	3.7
Census Tract 5, Block Group 3	92.1	1.0	0.0	0.0	0.0	0.0	6.0	1.0	7.9	2.9
Census Tract 5, Block Group 4	39.8	48.2	0.0	0.0	0.0	0.0	0.0	12.1	60.2	12.0
Census Tract 6, Block Group 1	23.6	57.8	0.0	0.0	0.0	0.0	0.0	18.6	76.4	28.9
Census Tract 6, Block Group 2	7.8	85.1	0.0	0.0	0.0	3.5	1.3	2.3	92.2	12.1
Census Tract 6, Block Group 3	19.6	72.1	0.0	0.0	0.0	0.0	0.0	8.2	80.4	19.8
Census Tract 6, Block Group 4	4.7	91.1	0.0	4.2	0.0	0.0	0.0	0.0	91.1	36.1
Census Tract 6, Block Group 5	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	53.9

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Census Tract 6, Block Group 6	4.6	94.2	0.0	0.0	0.0	0.0	0.0	1.2	95.4	28.1
Census Tract 6, Block Group 7	1.6	90.2	0.0	0.0	0.0	3.6	2.9	1.7	98.4	34.0
Census Tract 7, Block Group 1	28.1	54.5	0.0	0.0	0.0	0.0	0.0	17.4	71.9	17.4
Census Tract 7, Block Group 2	69.1	22.1	0.0	0.0	0.0	0.0	2.0	6.8	30.9	18.2
Census Tract 7, Block Group 3	52.7	38.3	0.0	0.0	0.0	0.0	0.0	9.0	47.3	24.4
Census Tract 7, Block Group 4	24.5	74.4	0.0	0.0	0.0	0.0	0.0	1.1	75.5	30.3
Census Tract 8, Block Group 1	24.7	75.3	0.0	0.0	0.0	0.0	0.0	0.0	75.3	38.9
Census Tract 8, Block Group 2	43.6	53.2	0.0	1.9	0.0	0.0	0.8	0.7	56.4	37.2
Census Tract 8, Block Group 3	62.7	30.9	1.7	4.7	0.0	0.0	0.0	0.0	37.3	23.3

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Census Tract 8, Block Group 4	48.7	46.2	0.0	1.0	0.0	0.0	0.0	4.1	51.3	12.0
Census Tract 9, Block Group 1	26.1	71.5	0.0	0.0	0.0	0.6	1.8	0.0	73.9	14.3
Census Tract 9, Block Group 2	5.5	94.5	0.0	0.0	0.0	0.0	0.0	0.0	94.5	1.8
Census Tract 9, Block Group 3	15.4	82.9	0.0	0.0	0.0	0.0	1.7	0.0	84.6	0.0
Census Tract 9, Block Group 4	25.2	73.9	0.0	0.0	0.0	0.0	0.9	0.0	74.8	11.0
Census Tract 10, Block Group 1	79.9	14.3	0.0	1.6	0.0	0.0	3.7	0.5	20.1	8.8
Census Tract 10, Block Group 2	94.0	5.9	0.0	0.0	0.0	0.0	0.2	0.0	6.0	7.1
Census Tract 10, Block Group 3	84.2	0.0	0.0	15.8	0.0	0.0	0.0	0.0	15.8	9.8
Census Tract 11, Block Group 1	74.1	18.1	0.0	0.0	0.0	0.0	4.0	3.8	25.9	29.9

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Census Tract 11, Block Group 2	49.5	27.2	13.1	0.0	0.0	0.0	7.8	2.4	50.5	21.0
Census Tract 11, Block Group 3	44.9	47.2	2.2	0.0	0.0	0.0	3.5	2.2	55.1	23.5
Census Tract 12.01, Block Group 1	13.6	71.2	0.0	0.0	0.0	0.0	3.8	11.4	86.4	25.0
Census Tract 12.01, Block Group 2	44.5	49.5	0.0	0.0	0.0	0.0	3.7	2.4	55.5	9.6
Census Tract 12.01, Block Group 3	24.6	61.1	4.2	0.0	0.0	0.0	8.8	1.3	75.4	8.3
Census Tract 12.02, Block Group 1	17.8	79.3	0.0	0.0	0.0	0.0	2.9	0.0	82.2	36.8
Census Tract 12.02, Block Group 2	3.2	84.5	0.0	5.5	0.0	0.0	1.0	5.9	96.8	37.3
Census Tract 13, Block Group 1	75.1	14.2	2.0	0.0	0.0	0.0	2.1	6.6	24.9	7.2
Census Tract 13, Block Group 2	92.0	6.7	1.3	0.0	0.0	0.0	0.0	0.0	8.0	0.0

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Census Tract 13, Block Group 3	83.0	8.0	1.4	0.0	0.0	0.0	7.5	0.0	17.0	9.9
Census Tract 13, Block Group 4	79.6	0.0	6.9	0.0	0.0	0.0	7.7	5.7	20.4	21.4
Census Tract 13, Block Group 5	91.1	6.0	0.0	0.0	0.0	0.0	0.0	2.9	8.9	15.5
Census Tract 15, Block Group 1	5.5	93.9	0.0	0.0	0.0	0.0	0.6	0.0	94.5	36.1
Census Tract 15, Block Group 2	10.7	83.1	0.0	0.0	0.0	0.0	3.3	2.8	89.3	25.8
Census Tract 16, Block Group 1	46.5	50.9	0.5	0.0	0.0	0.0	0.4	1.7	53.5	41.7
Census Tract 16, Block Group 2	1.1	89.7	0.0	2.2	0.0	0.6	5.1	1.2	98.9	25.7
Census Tract 16, Block Group 3	34.1	53.3	0.0	0.0	0.0	0.0	1.5	11.1	65.9	0.0
Census Tract 16, Block Group 4	23.7	67.1	0.0	0.0	0.0	0.0	9.2	0.0	76.3	29.2

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Census Tract 17, Block Group 1	45.4	26.3	1.2	2.8	0.0	1.4	3.3	19.7	54.6	12.4
Census Tract 17, Block Group 2	66.9	31.5	0.0	0.0	0.0	0.0	1.6	0.0	33.1	22.6
Census Tract 17, Block Group 3	68.4	27.3	0.0	4.5	0.0	0.0	3.2	5.3	31.6	28.4
Census Tract 18.01, Block Group 2	97.6	0.7	0.0	0.0	0.0	0.0	0.0	1.7	2.4	4.6
Census Tract 18.01, Block Group 3	69.9	8.0	0.0	12.4	0.0	0.0	7.1	2.4	30.1	12.6
Census Tract 18.01, Block Group 4	48.8	44.7	0.0	3.7	0.0	0.0	0.0	2.8	51.2	12.5
Census Tract 18.01, Block Group 5	89.5	0.0	0.0	0.0	0.0	0.0	6.0	4.5	10.5	1.9
Census Tract 19.01, Block Group 1	92.2	0.0	1.6	0.0	0.0	0.0	1.4	4.8	7.8	4.2
Census Tract 19.01, Block Group 2	94.7	1.6	2.0	0.5	0.0	0.7	0.0	0.4	5.3	4.5

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Census Tract 19.03, Block Group 1	67.5	10.1	9.0	0.0	0.0	0.0	5.9	7.6	32.5	11.0
Census Tract 19.03, Block Group 2	73.9	1.2	5.4	12.7	0.0	0.0	0.0	6.8	26.1	12.6
Census Tract 19.03, Block Group 3	88.2	5.1	2.7	0.0	0.0	0.0	0.7	3.2	11.8	4.0
Census Tract 19.04, Block Group 1	94.2	0.0	3.4	0.0	0.0	0.0	1.3	1.2	5.8	7.2
Census Tract 19.04, Block Group 2	56.3	22.8	6.1	0.0	0.0	0.0	0.6	14.2	43.8	8.3
Census Tract 19.04, Block Group 3	75.2	13.9	7.0	0.9	0.0	0.0	2.1	0.9	24.8	2.6
Census Tract 20, Block Group 1	66.2	32.6	0.0	0.0	0.0	0.0	0.0	1.2	33.8	0.0
Census Tract 26, Block Group 3	70.3	22.4	0.0	0.0	0.0	0.0	4.9	2.4	29.7	36.7
Census Tract 27, Block Group 1	83.5	9.0	0.0	0.6	0.0	0.0	0.8	6.0	16.5	6.9

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Census Tract 27, Block Group 2	93.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	43.3
Census Tract 27, Block Group 3	95.8	1.2	0.0	0.0	0.0	0.0	3.1	0.0	4.2	14.1
Census Tract 27, Block Group 4	89.4	4.9	0.0	0.0	0.0	0.0	3.2	2.4	10.6	22.7
Census Tract 28, Block Group 1	80.9	13.0	0.0	0.0	0.0	0.0	0.5	5.6	19.1	12.9
Census Tract 28, Block Group 2	98.1	0.0	0.0	0.0	0.0	0.0	0.0	1.9	1.9	13.0
Census Tract 28, Block Group 3	81.2	18.8	0.0	0.0	0.0	0.0	0.0	0.0	18.8	21.9
Census Tract 28, Block Group 4	84.3	7.2	0.0	0.0	0.0	0.0	8.5	0.0	15.7	38.0
Census Tract 29, Block Group 1	81.6	9.5	0.9	1.6	0.0	0.0	0.0	6.5	18.4	9.9
Census Tract 29, Block Group 2	90.3	1.1	0.0	0.0	0.0	0.0	0.0	8.6	9.7	10.8

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Census Tract 30, Block Group 1	27.8	21.8	0.8	0.0	0.0	0.0	0.8	48.8	72.2	44.7
Census Tract 30, Block Group 2	79.1	1.3	0.0	2.2	0.0	0.0	15.9	1.5	20.9	5.9
Census Tract 30, Block Group 3	87.9	7.7	0.8	0.0	0.0	0.0	1.9	1.7	12.1	6.5
Census Tract 30, Block Group 4	91.6	3.6	0.0	0.0	0.0	0.0	0.4	4.5	8.4	13.9
Census Tract 31.01, Block Group 1	91.5	8.5	0.0	0.0	0.0	0.0	0.0	0.0	8.5	5.3
Census Tract 31.01, Block Group 2	82.4	1.9	0.0	0.0	0.0	0.0	0.0	15.7	17.6	5.9
Census Tract 31.01, Block Group 3	90.0	1.1	4.5	0.0	0.0	0.0	1.7	2.8	10.0	0.0
Census Tract 31.02, Block Group 1	95.0	1.4	0.3	0.0	0.0	0.0	0.8	2.5	5.0	3.3
Census Tract 31.02, Block Group 2	79.0	10.1	0.0	0.0	0.0	0.0	0.8	10.2	21.0	25.3

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Census Tract 35, Block Group 1	70.0	12.3	12.1	1.9	0.0	0.0	3.6	0.0	30.0	18.1
Census Tract 35, Block Group 2	89.8	8.0	0.0	0.0	0.0	0.0	2.2	0.0	10.2	47.0
Census Tract 35, Block Group 3	82.0	10.0	0.0	0.0	0.0	0.0	1.5	6.4	18.0	8.0
Census Tract 35, Block Group 4	91.4	7.4	0.0	0.0	0.0	0.0	0.0	1.2	8.6	24.4
Census Tract 36, Block Group 2	96.8	0.3	0.9	0.0	0.0	0.0	0.0	2.0	3.2	3.7
Census Tract 36, Block Group 3	97.9	1.3	0.0	0.0	0.0	0.0	0.7	0.0	2.1	10.9
Census Tract 9800, Block Group 1 f/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Census Tract 9801, Block Group 1 f/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jefferson Davis Parish	***78.1***	***16.4***	***0.8***	***0.5***	***0.0***	***0.0***	***1.7***	***2.5***	***21.9***	***20.6***
Census Tract 2, Block Group 2	95.4	1.3	0.0	0.0	0.0	0.0	3.3	0.0	4.6	23.8

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Texas	***42.0***	***11.8***	***4.7***	***0.3***	***0.1***	***0.2***	***1.7***	***39.3***	***58.0***	***13.7***
Jefferson County	***40.6***	***33.5***	***3.7***	***0.2***	***0.1***	***0.1***	***1.2***	***20.7***	***59.4***	***16.7***
Census Tract 51, Block Group 1	3.9	96.1	0.0	0.0	0.0	0.0	0.0	0.0	96.1	19.9
Census Tract 66, Block Group 1	72.1	0.0	0.0	0.0	0.0	0.0	0.0	27.9	27.9	3.8
Census Tract 66, Block Group 2	8.8	60.9	10.0	0.0	0.0	0.0	0.0	20.3	91.2	47.2
Census Tract 116, Block Group 1	86.8	5.6	0.0	0.0	0.0	2.0	1.0	4.6	13.2	6.9
Orange County	***80.7***	***8.7***	***1.2***	***0.3***	***0.0***	***0.0***	***1.5***	***7.7***	***19.3***	***13.2***
Census Tract 202, Block Group 1	52.8	47.2	0.0	0.0	0.0	0.0	0.0	0.0	47.2	14.8
Census Tract 202, Block Group 2	12.3	87.7	0.0	0.0	0.0	0.0	0.0	0.0	87.7	25.3
Census Tract 202, Block Group 3	45.6	51.5	0.0	0.0	0.0	0.0	2.2	0.7	54.4	25.5

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Census Tract 202, Block Group 4	0.0	0.0	0.0	0.0	2.9	2.6	0.0	0.0	95.1	30.1
Census Tract 203, Block Group 1	2.5	0.0	0.0	0.0	2.2	7.5	2.5	0.0	25.3	24.8
Census Tract 203, Block Group 2	60.3	26.4	0.0	0.0	0.0	0.0	2.2	11.1	39.7	26.8
Census Tract 203, Block Group 3	55.6	17.7	0.0	0.0	0.0	0.0	0.0	26.6	44.4	34.9
Census Tract 205, Block Group 1	57.0	25.4	0.0	0.0	0.0	0.0	17.6	0.0	43.0	21.8
Census Tract 205, Block Group 2	28.2	0.0	0.0	0.0	0.0	0.0	0.0	71.8	71.8	36.7
Census Tract 205, Block Group 3	80.4	16.1	0.0	0.0	0.0	0.0	0.8	2.7	19.6	1.9
Census Tract 205, Block Group 4	58.8	31.2	0.0	0.0	0.0	0.0	0.0	10.0	41.2	6.1
Census Tract 208, Block Group 2	68.7	21.2	0.0	0.0	0.0	0.0	2.6	7.6	31.3	11.6

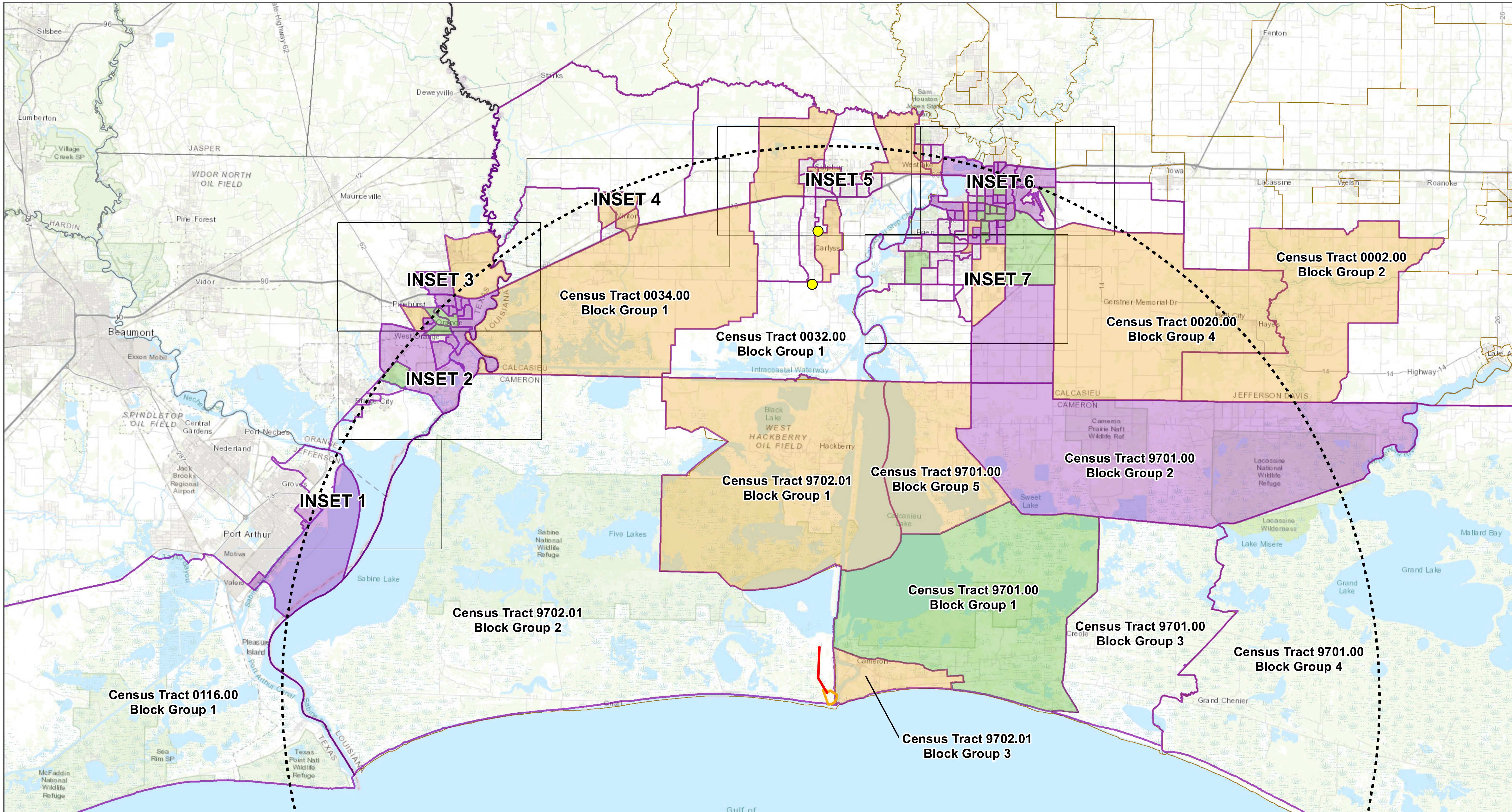
Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Census Tract 209, Block Group 1	44.1	41.8	4.9	0.0	0.0	0.0	0.0	9.3	55.9	24.0
Census Tract 209, Block Group 2	42.3	49.6	2.2	0.0	0.0	0.0	1.9	4.1	57.7	11.5
Census Tract 209, Block Group 3	28.5	54.0	0.0	0.0	0.0	0.0	0.0	17.5	71.5	19.1
Census Tract 209, Block Group 4	42.6	41.9	0.8	0.0	0.0	0.0	0.7	14.1	57.4	13.7
Census Tract 210, Block Group 1	86.2	2.1	0.0	2.3	0.0	0.0	0.9	8.6	13.8	15.0
Census Tract 224, Block Group 1	96.6	0.0	0.0	0.0	0.0	0.0	0.0	3.4	3.4	4.0
Census Tract 224, Block Group 2	96.4	2.1	0.0	0.0	0.0	0.0	0.7	0.7	3.6	4.9
Census Tract 224, Block Group 3	75.5	7.9	0.0	0.0	0.0	0.0	1.4	15.2	24.5	0.0
Census Tract 224, Block Group 5	95.1	1.2	1.1	0.0	0.0	0.0	0.0	2.6	4.9	7.1
Park and Ride										

Demographic Composition within the Project Area										
RACE AND ETHNICITY COLUMNS										LOW-INCOME COLUMN
State and Parish/County	White Alone, not Hispanic or Latino a/ (percent)	Black or African-American a/ (percent)	Asian a/ (percent)	American Indian and Alaska Native a/ (percent)	Native Hawaiian and Other Pacific Islander a/ (percent)	Some Other Race a/ (percent)	Two or More Races a/ (percent)	Hispanic or Latino (any race) a/ (percent)	Total Minority Population (percent) c/	Households Below Poverty Level (percent) b/
Calcasieu Parish	***67.4***	***24.9***	***1.4***	***0.3***	***0.01***	***1.01***	***2.4***	***3.6***	***32.6***	***16.0***
Census Tract 33, Block Group 1	96.9	0.0	0.0	0.0	0.0	0.0	0.8	2.3	3.1	8.7
Census Tract 33, Block Group 2	66.6	17.8	0.0	6.6	0.0	1.7	0.4	8.6	33.4	16.7
Census Tract 33, Block Group 3	89.1	5.1	0.0	0.0	0.0	0.0	5.0	3.6	10.9	1.1
Census Tract 32, Block Group 1	88.0	7.4	0.0	0.9	0.0	0.0	1.5	2.1	12.0	13.1
Census Tract 34, Block Group 2	91.0	6.9	0.0	0.0	0.0	0.0	0.0	2.1	9.0	6.0

a/ U.S. Census Bureau, 2019b
b/ U.S. Census Bureau, 2019c
c/ Total Minority Population is the percent of the population that is not categorized as "White Alone (not Hispanic or Latino)"
d/ Terminal and Pipeline Location
e/ Census Blocks within 1-mile of meter station
f/ Census Blocks 9800 and 9801 contain airports only and have populations of 0.
NOTE: Shading denotes environmental justice population.

APPENDIX G

LOW-INCOME AND MINORITY ENVIRONMENTAL JUSTICE COMMUNITIES WITHIN 54 KM OF THE PROJECT



This map and all data contained within are supplied as is with no warranty. Cardno Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

0 2 4 6 8 10 Miles

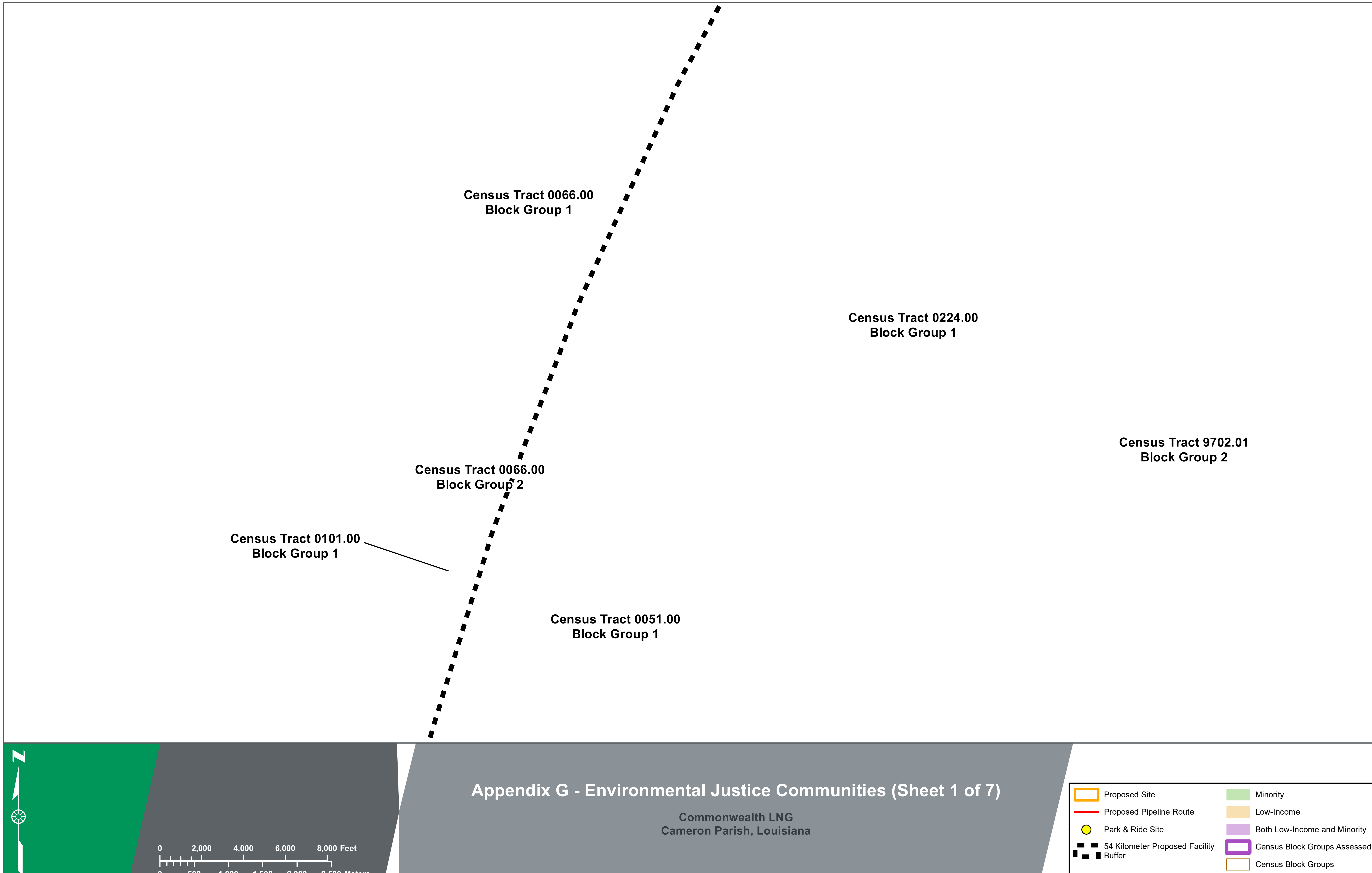
0 5 10 15 Kilometers

Appendix G - Environmental Justice Communities - Overview

Commonwealth LNG
Cameron Parish, Louisiana

Proposed Site
Proposed Pipeline Route
Park & Ride Site
54 Kilometer Proposed Facility Buffer
Minority
Low-Income
Both Low-Income and Minority
Census Block Groups Assessed
Census Block Groups

Date Created: 9/6/2022 Date Revised: 9/7/2022 File Path: S:\GIS\FERC\Commonwealth LNG\MXD\DEIS\Appendix G - Environmental Justice Communities - Overview.mxd
GIS Analyst: Peter.Marsey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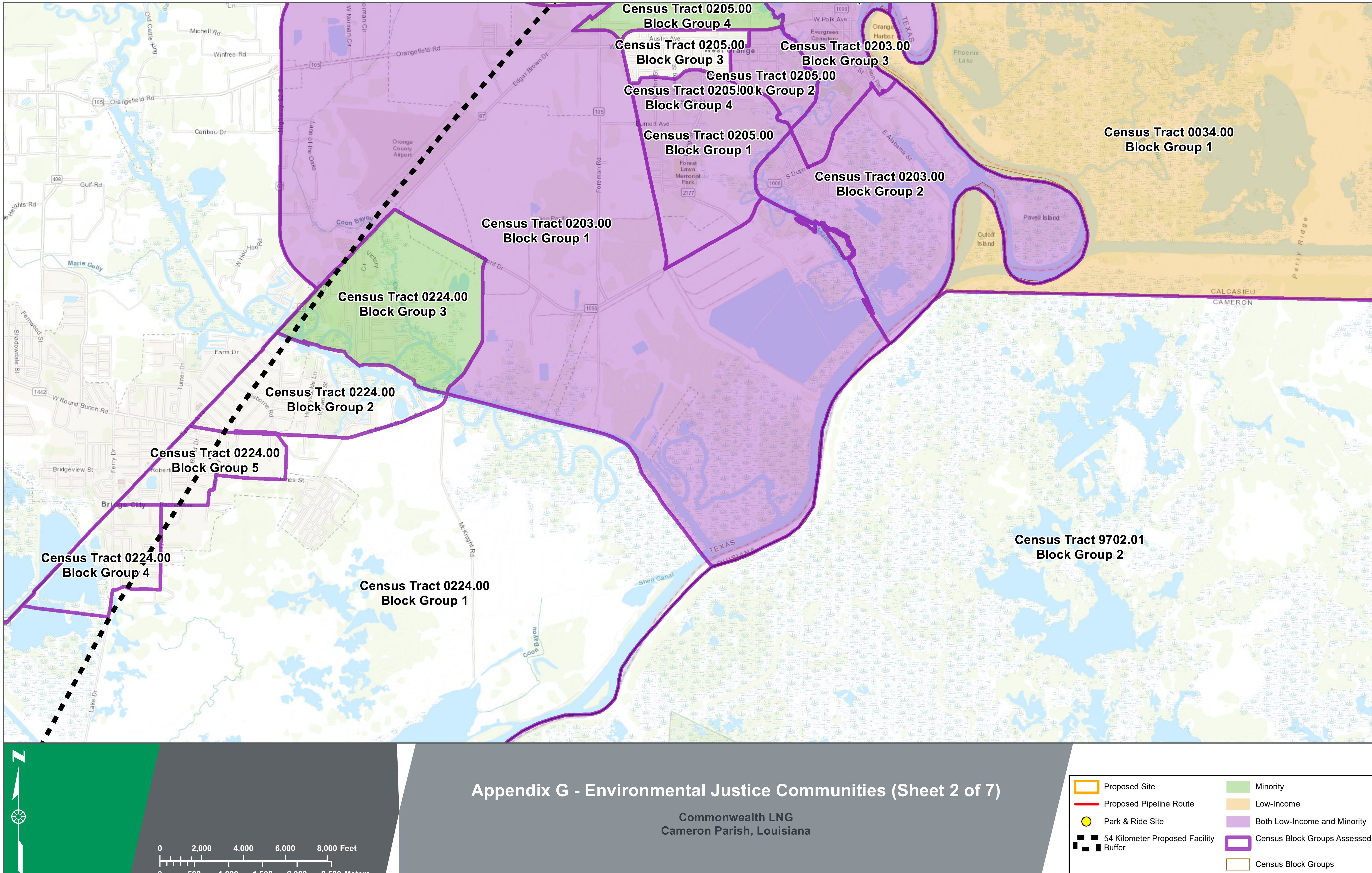
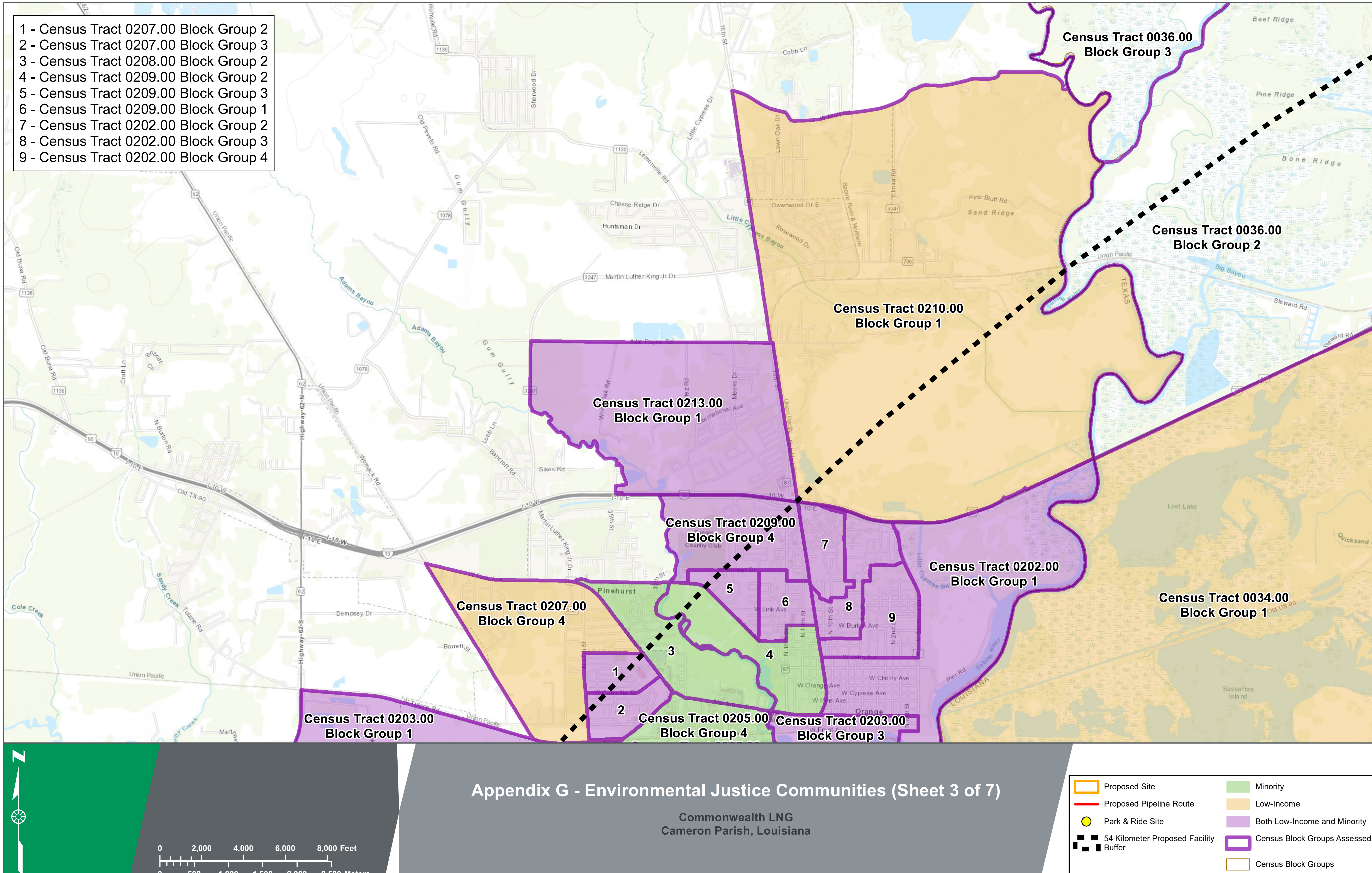
Block Group 1
Census Tract 0224.00
Block Group 1
Census Tract 9702.01
Block Group 2
Census Tract 0066.00
Block Group 2
Census Tract 0101.00
Block Group 1
Census Tract 0051.00
Block Group 1
N
0 2,000 4,000 6,000 8,000 Feet
0 500 1,000 1,500 2,000 2,500 Meters
Appendix G - Environmental Justice Communities (Sheet 1 of 7)
Commonwealth LNG
Cameron Parish, Louisiana
Proposed Site
Proposed Pipeline Route
Park & Ride Site
54 Kilometer Proposed Facility Buffer
Minority
Low-Income
Both Low-Income and Minority
Census Block Groups Assessed
Census Block Groups



Appendix G - Environmental Justice Communities (Sheet 2 of 7)

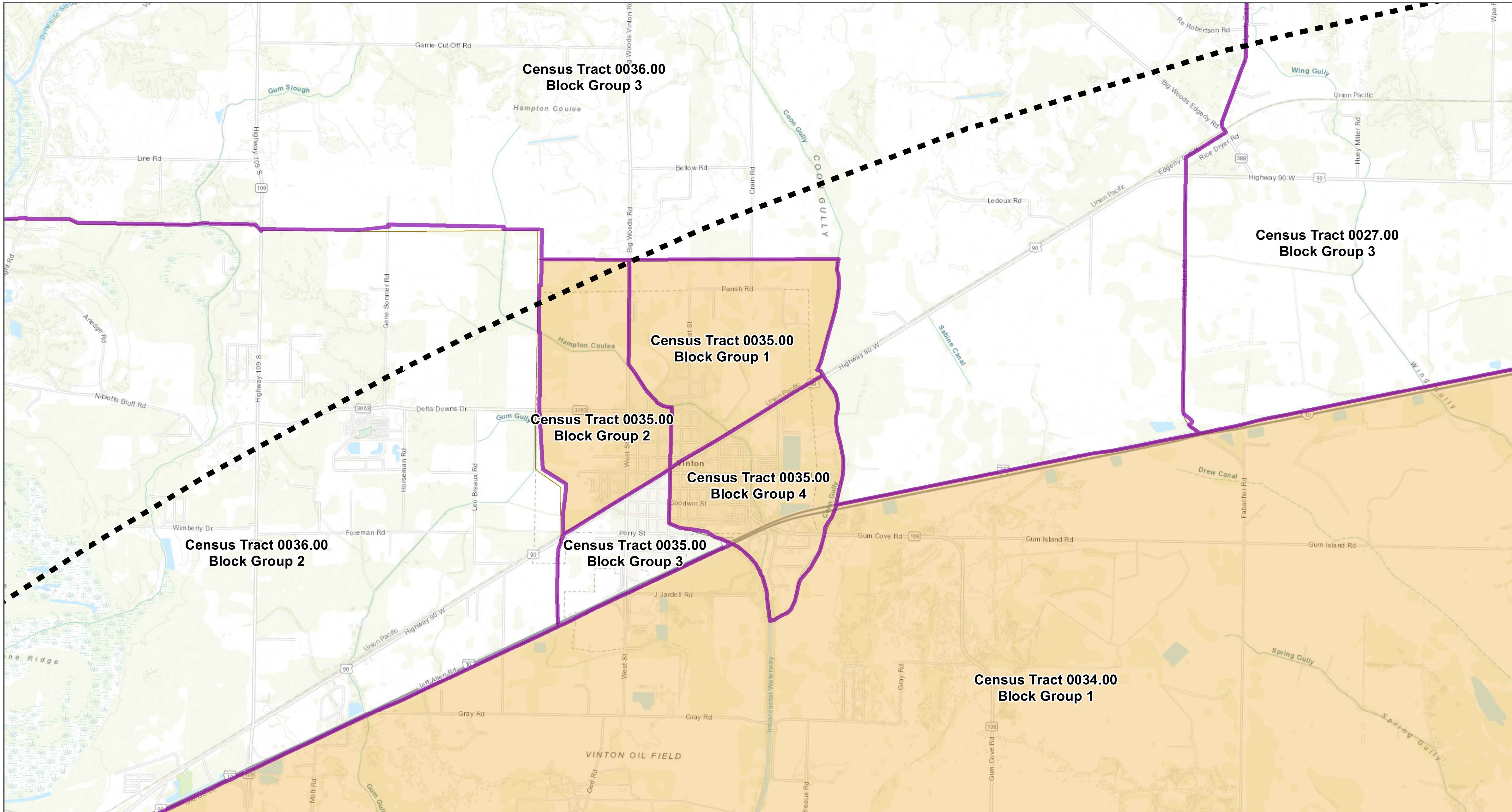
Commonwealth LNG
Cameron Parish, Louisiana

- Proposed Site
- Proposed Pipeline Route
- Park & Ride Site
- 54 Kilometer Proposed Facility Buffer
- Minority
- Low-Income
- Both Low-Income and Minority
- Census Block Groups Assessed
- Census Block Groups



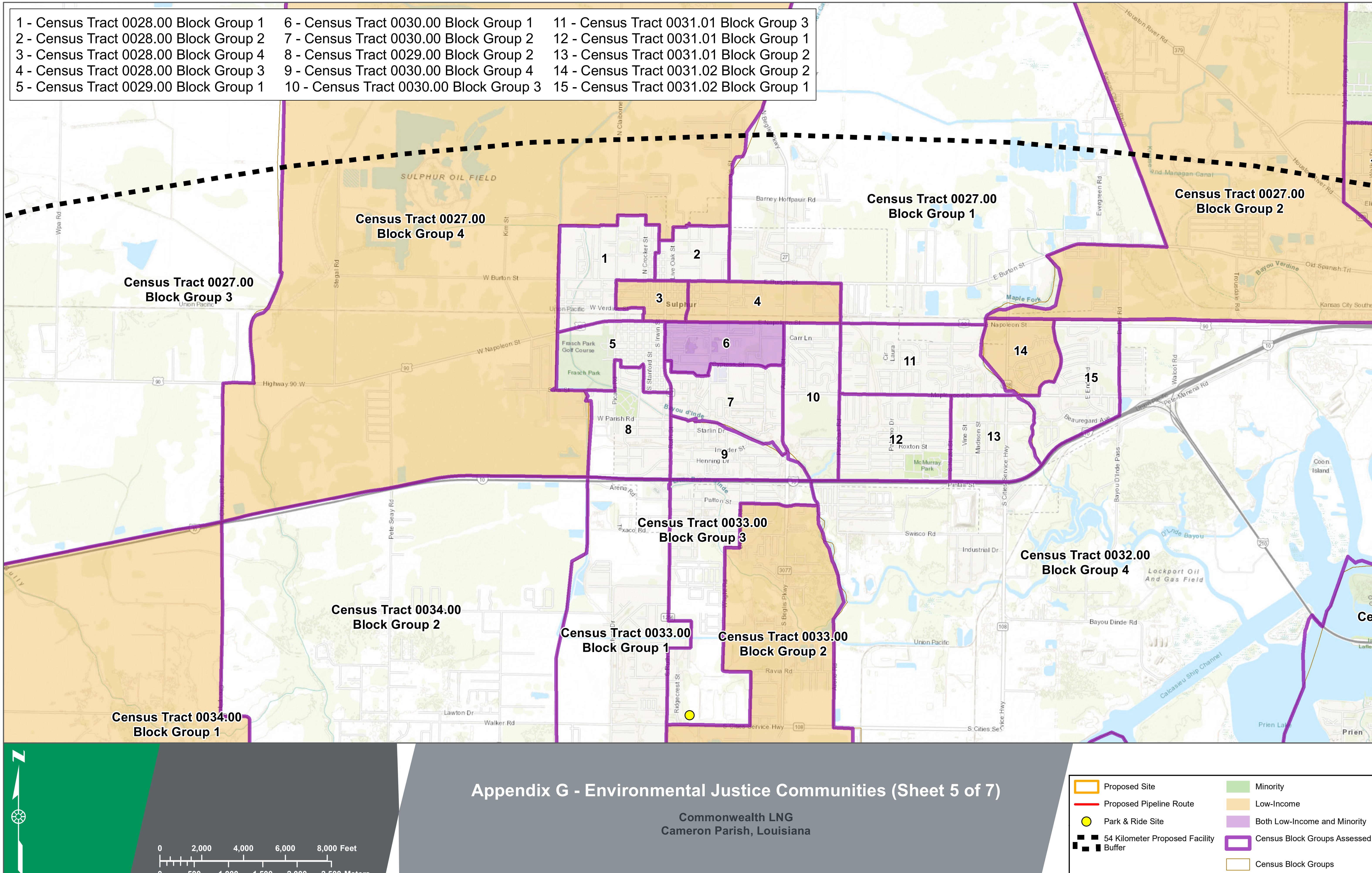
Appendix G - Environmental Justice Communities (Sheet 3 of 7)

Commonwealth LNG
Cameron Parish, Louisiana



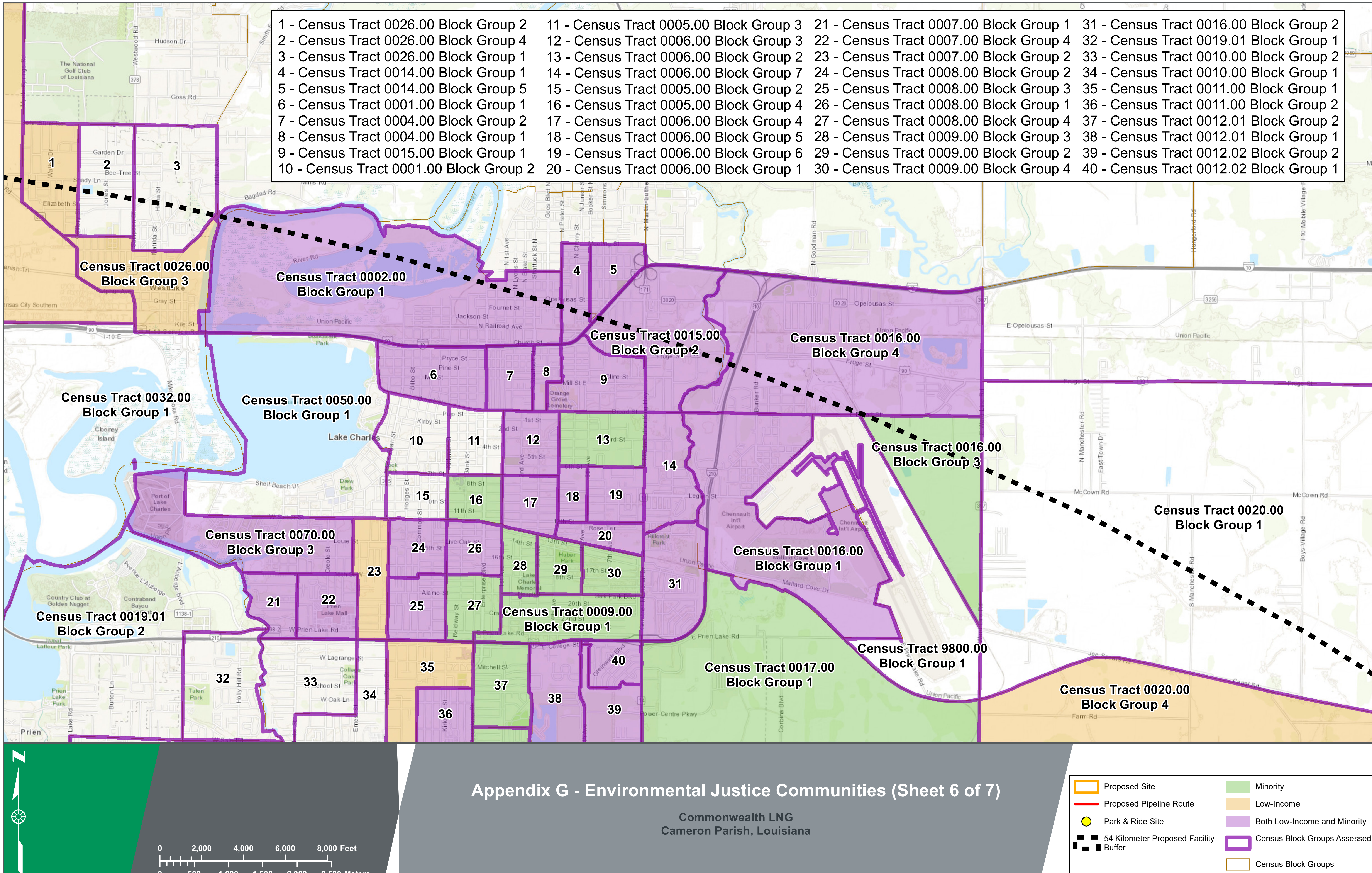
Appendix G - Environmental Justice Communities (Sheet 4 of 7)

Commonwealth LNG
Cameron Parish, Louisiana



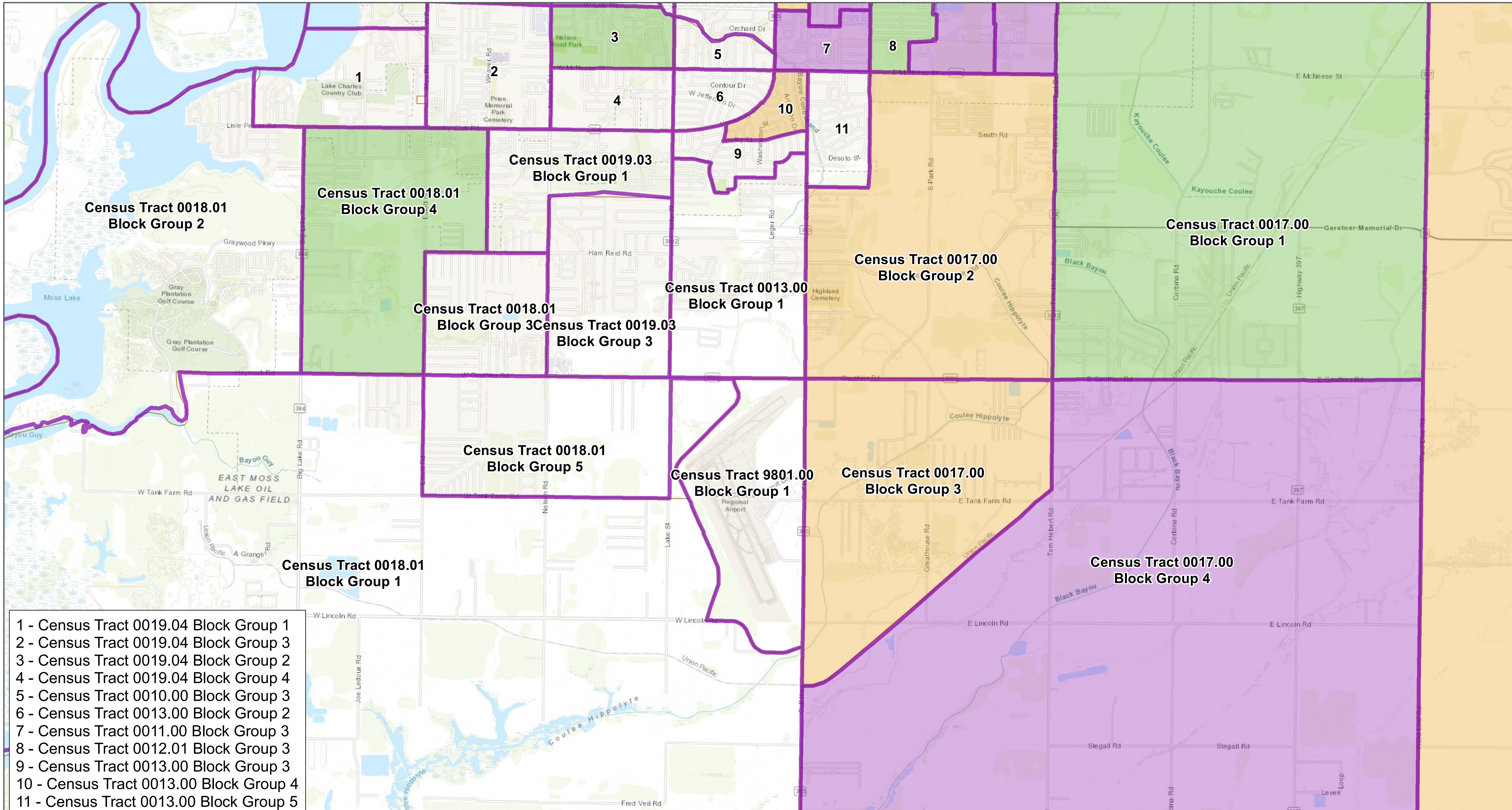
Appendix G - Environmental Justice Communities (Sheet 5 of 7)

Commonwealth LNG
Cameron Parish, Louisiana



Appendix G - Environmental Justice Communities (Sheet 6 of 7)

Commonwealth LNG
Cameron Parish, Louisiana



Appendix G - Environmental Justice Communities (Sheet 7 of 7)

Commonwealth LNG
Cameron Parish, Louisiana

0 2,000 4,000 6,000 8,000 Feet
0 500 1,000 1,500 2,000 2,500 Meters

Proposed Site
Proposed Pipeline Route
Park & Ride Site
54 Kilometer Proposed Facility Buffer
Minority
Low-Income
Both Low-Income and Minority
Census Block Groups Assessed
Census Block Groups

APPENDIX H

Predicted Cumulative Concentrations for NAAQS Exceedances Within 50km of the Commonwealth LNG Project

Table H-1.

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary Sources								
Pollutant Averaging Period		Location of NAAQS Exceedance a/ (x)	Location of NAAQS Exceedance a/ (y)	Modeled + Background Concentration (μg/m³)	NAAQS Standard (μg/m3)	Project Only Maximum Concentration Contribution to NAAQS Exceedance (μg/m³)	Project Contribution to the Cumulative Concentration (Percent)	Distance from the Project NAAQS Exceedance (km)
$PM_{2.5}$	24-hour	No NAAQS Exceedance	No NAAQS Exceedance	21.98	35	No NAAQS Exceedance	No NAAQS Exceedance	No NAAQS Exceedance
SO_2	1-hour	No NAAQS Exceedance	No NAAQS Exceedance	65.24	195	No NAAQS Exceedance	No NAAQS Exceedance	No NAAQS Exceedance
NO_2	Annual	No NAAQS Exceedance	No NAAQS Exceedance	10.96	100	No NAAQS Exceedance	No NAAQS Exceedance	No NAAQS Exceedance
NO_2	1-hour	452900.00	3296200.00	228.8	188.0	0.0004	0.0002%	13.2
NO_2	1-hour	458900.00	3318200.00	214.9	188.0	0.0027	0.0013%	26.0
NO_2	1-hour	451900.00	3324200.00	201.0	188.0	0.0307	0.0153%	34.0
NO_2	1-hour	468700.00	3295300.00	204.4	188.0	0.0049	0.0024%	3.7
NO_2	1-hour	466900.00	3321200.00	199.7	188.0	0.0281	0.0141%	28.1
NO_2	1-hour	450900.00	3323200.00	198.0	188.0	0.0283	0.0143%	33.6
NO_2	1-hour	466900.00	3320200.00	197.5	188.0	0.0299	0.0152%	27.1
NO_2	1-hour	450900.00	3326200.00	197.2	188.0	0.0356	0.0181%	36.3
NO_2	1-hour	451900.00	3323200.00	195.9	188.0	0.0452	0.0230%	33.1
NO_2	1-hour	449900.00	3327200.00	195.7	188.0	0.0298	0.0152%	37.6
NO_2	1-hour	450900.00	3325200.00	195.6	188.0	0.0440	0.0225%	35.4
NO_2	1-hour	450900.00	3324200.00	195.5	188.0	0.0556	0.0284%	34.5
NO_2	1-hour	449900.00	3326200.00	195.0	188.0	0.0390	0.0200%	36.7
NO_2	1-hour	466900.00	3322200.00	194.9	188.0	0.0304	0.0156%	29.1
NO_2	1-hour	448900.00	3325200.00	194.1	188.0	0.0293	0.0151%	36.3

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary Sources								
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (µg/m³)	NAAQS Standard (µg/m3)	Project Only Maximum Concentration Contribution to NAAQS Exceedance (µg/m³)	Project Contribution to the Cumulative Concentration (Percent)	Distance from the Project NAAQS Exceedance (km)
		(x)	(y)					
NO_2	1-hour	450900.00	3322200.00	193.9	188.0	0.0344	0.0177%	32.7
NO_2	1-hour	466900.00	3319200.00	193.8	188.0	0.0726	0.0375%	26.1
NO_2	1-hour	464900.00	3323200.00	193.7	188.0	0.0151	0.0078%	30.1
NO_2	1-hour	468600.00	3295400.00	193.1	188.0	0.0011	0.0005%	3.6
NO_2	1-hour	453900.00	3321200.00	193.0	188.0	0.0503	0.0261%	30.5
NO_2	1-hour	449900.00	3325200.00	192.9	188.0	0.0239	0.0124%	35.8
NO_2	1-hour	448900.00	3326200.00	192.7	188.0	0.0403	0.0209%	37.1
NO_2	1-hour	467900.00	3324200.00	192.7	188.0	0.0327	0.0170%	31.2
NO_2	1-hour	449900.00	3323200.00	192.2	188.0	0.0533	0.0277%	34.0
NO_2	1-hour	448900.00	3327200.00	192.2	188.0	0.0324	0.0169%	37.8
NO_2	1-hour	467900.00	3323200.00	191.8	188.0	0.0273	0.0142%	30.2
NO_2	1-hour	467900.00	3321200.00	191.8	188.0	0.0700	0.0365%	28.2
NO_2	1-hour	453900.00	3320200.00	191.6	188.0	0.0109	0.0057%	29.6
NO_2	1-hour	466900.00	3318200.00	191.4	188.0	0.0166	0.0087%	25.1
NO_2	1-hour	467900.00	3322200.00	191.3	188.0	0.0595	0.0311%	29.2
NO_2	1-hour	449900.00	3324200.00	191.1	188.0	0.0722	0.0378%	34.9
NO_2	1-hour	467900.00	3320200.00	190.8	188.0	0.0674	0.0353%	27.2
NO_2	1-hour	463900.00	3320200.00	190.7	188.0	0.0215	0.0113%	27.2
NO_2	1-hour	452900.00	3322200.00	190.5	188.0	0.0241	0.0126%	31.8
NO_2	1-hour	464900.00	3322200.00	190.3	188.0	0.0147	0.0077%	29.1
NO_2	1-hour	466900.00	3317200.00	190.3	188.0	0.0172	0.0090%	24.1

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary Sources								
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (µg/m³)	NAAQS Standard (µg/m3)	Project Only Maximum Concentration Contribution to NAAQS Exceedance (µg/m³)	Project Contribution to the Cumulative Concentration (Percent)	Distance from the Project NAAQS Exceedance (km)
		(x)	(y)					
NO_2	1-hour	456900.00	3319200.00	189.9	188.0	0.0116	0.0061%	27.6
NO_2	1-hour	452900.00	3320200.00	189.9	188.0	0.0163	0.0086%	30.0
NO_2	1-hour	452900.00	3323200.00	189.8	188.0	0.0554	0.0292%	32.7
NO_2	1-hour	468800.00	3295400.00	189.6	188.0	0.4282	0.2259%	3.8
NO_2	1-hour	451900.00	3321200.00	189.5	188.0	0.0176	0.0093%	31.3
NO_2	1-hour	452900.00	3319200.00	189.3	188.0	0.0137	0.0072%	29.1
NO_2	1-hour	452900.00	3321200.00	189.1	188.0	0.0204	0.0108%	30.9
NO_2	1-hour	468700.00	3295100.00	189.0	188.0	0.0678	0.0359%	3.5
NO_2	1-hour	459900.00	3319200.00	189.0	188.0	0.0545	0.0288%	26.7
NO_2	1-hour	466900.00	3316200.00	188.9	188.0	0.0282	0.0149%	23.1
NO_2	1-hour	467900.00	3319200.00	188.9	188.0	0.0646	0.0342%	26.2
NO_2	1-hour	451900.00	3319200.00	188.7	188.0	0.0117	0.0062%	29.5
NO_2	1-hour	451900.00	3317200.00	188.7	188.0	0.0285	0.0151%	27.8
NO_2	1-hour	457900.00	3316200.00	188.5	188.0	0.0078	0.0041%	24.4
NO_2	1-hour	461900.00	3316200.00	188.5	188.0	0.0038	0.0020%	23.4
NO_2	1-hour	452900.00	3318200.00	188.3	188.0	0.0027	0.0014%	28.2
NO_2	1-hour	462900.00	3317200.00	188.3	188.0	0.0085	0.0045%	24.3
NO_2	1-hour	468600.00	3295100.00	188.2	188.0	0.0003	0.0002%	3.5
NO_2	1-hour	465900.00	3315200.00	188.2	188.0	0.0105	0.0056%	22.1
NO_2	1-hour	463900.00	3319200.00	188.1	188.0	0.0083	0.0044%	26.2
NO_2	1-hour	462900.00	3315200.00	188.1	188.0	0.0160	0.0085%	22.3

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary Sources								
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (μg/m^3)	NAAQS Standard (μg/m3)	Project Only Maximum Concentration Contribution to NAAQS Exceedance (μg/m^3)	Project Contribution to the Cumulative Concentration (Percent)	Distance from the Project NAAQS Exceedance (km)
		(x)	(y)					
NO_2	1-hour	450900.00	3320200.00	188.0	188.0	0.0116	0.0062%	30.9

a/ UTM NAD83 Zone15N

Table H-2.

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary and Mobile Sources							
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (µg/m³)	NAAQS Standard (µg/m³)	Project Only Maximum Contribution to NAAQS Exceedance (µg/m³)	Project Contribution ot the Cumulative Concentration (percent)
		(x)	(y)				
NO_2	1-hour	468600.00	3295200.00	307.7	188.0	0.0055	0.0018%
NO_2	1-hour	431900.00	3328200.00	283.0	188.0	0.0049	0.0017%
NO_2	1-hour	468700.00	3295400.00	272.8	188.0	0.0107	0.0039%
NO_2	1-hour	465900.00	3333200.00	271.8	188.0	0.0573	0.0211%
NO_2	1-hour	431900.00	3324200.00	271.0	188.0	0.0024	0.0009%
NO_2	1-hour	464900.00	3334200.00	270.0	188.0	0.0491	0.0182%
NO_2	1-hour	464900.00	3332200.00	266.8	188.0	0.0416	0.0156%
NO_2	1-hour	464900.00	3333200.00	265.7	188.0	0.0402	0.0151%
NO_2	1-hour	468600.00	3295300.00	263.3	188.0	0.0086	0.0032%
NO_2	1-hour	432900.00	3326200.00	262.1	188.0	0.0115	0.0044%
NO_2	1-hour	432900.00	3327200.00	261.5	188.0	0.0105	0.0040%
NO_2	1-hour	432900.00	3325200.00	261.0	188.0	0.0027	0.0010%
NO_2	1-hour	468700.00	3295200.00	260.9	188.0	0.0077	0.0030%
NO_2	1-hour	432900.00	3324200.00	258.6	188.0	0.0038	0.0015%
NO_2	1-hour	467900.00	3334200.00	254.9	188.0	0.0520	0.0204%
NO_2	1-hour	468900.00	3333200.00	253.4	188.0	0.0422	0.0167%
NO_2	1-hour	463900.00	3332200.00	252.7	188.0	0.0347	0.0137%
NO_2	1-hour	465900.00	3332200.00	251.4	188.0	0.0530	0.0211%
NO_2	1-hour	463900.00	3331200.00	251.1	188.0	0.0306	0.0122%
NO_2	1-hour	416900.00	3289200.00	250.9	188.0	0.0026	0.0010%
NO_2	1-hour	431900.00	3323200.00	249.4	188.0	0.0026	0.0010%
NO_2	1-hour	464900.00	3331200.00	247.9	188.0	0.0444	0.0179%
NO_2	1-hour	463900.00	3330200.00	243.5	188.0	0.0475	0.0195%
NO_2	1-hour	433900.00	3324200.00	242.0	188.0	0.0018	0.0008%
NO_2	1-hour	468900.00	3334200.00	241.4	188.0	0.0341	0.0141%
NO_2	1-hour	433900.00	3326200.00	240.3	188.0	0.0040	0.0017%
NO_2	1-hour	466900.00	3332200.00	238.6	188.0	0.0436	0.0183%
NO_2	1-hour	432900.00	3323200.00	237.1	188.0	0.0271	0.0114%

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary and Mobile Sources							
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (µg/m³)	NAAQS Standard (µg/m³)	Project Only Maximum Contribution to NAAQS Exceedance (µg/m³)	Project Contribution ot the Cumulative Concentration (percent)
		(x)	(y)				
NO_2	1-hour	433900.00	3325200.00	235.4	188.0	0.0030	0.0013%
NO_2	1-hour	458900.00	3330200.00	235.0	188.0	0.0717	0.0305%
NO_2	1-hour	456900.00	3332200.00	234.6	188.0	0.0510	0.0217%
NO_2	1-hour	467900.00	3333200.00	232.0	188.0	0.0495	0.0213%
NO_2	1-hour	457900.00	3330200.00	231.4	188.0	0.0293	0.0126%
NO_2	1-hour	466900.00	3331200.00	231.2	188.0	0.0392	0.0169%
NO_2	1-hour	457900.00	3331200.00	230.4	188.0	0.0415	0.0180%
NO_2	1-hour	468900.00	3336200.00	229.8	188.0	0.0436	0.0190%
NO_2	1-hour	456900.00	3331200.00	229.8	188.0	0.0625	0.0272%
NO_2	1-hour	468900.00	3335200.00	229.6	188.0	0.0453	0.0197%
NO_2	1-hour	464900.00	3330200.00	229.6	188.0	0.0686	0.0299%
NO_2	1-hour	455900.00	3331200.00	229.5	188.0	0.0520	0.0227%
NO_2	1-hour	433900.00	3327200.00	228.9	188.0	0.0040	0.0017%
NO_2	1-hour	452900.00	3296200.00	228.8	188.0	0.0032	0.0014%
NO_2	1-hour	457900.00	3329200.00	228.8	188.0	0.0827	0.0361%
NO_2	1-hour	458900.00	3329200.00	227.9	188.0	0.0652	0.0286%
NO_2	1-hour	456900.00	3329200.00	225.2	188.0	0.0339	0.0151%
NO_2	1-hour	459900.00	3328200.00	224.6	188.0	0.0503	0.0224%
NO_2	1-hour	463900.00	3329200.00	223.9	188.0	0.0409	0.0183%
NO_2	1-hour	456900.00	3330200.00	223.4	188.0	0.0645	0.0289%
NO_2	1-hour	467900.00	3331200.00	223.2	188.0	0.0598	0.0268%
NO_2	1-hour	432900.00	3322200.00	222.2	188.0	0.0030	0.0013%
NO_2	1-hour	456900.00	3328200.00	221.4	188.0	0.0423	0.0191%
NO_2	1-hour	465900.00	3331200.00	221.1	188.0	0.0361	0.0163%
NO_2	1-hour	434900.00	3325200.00	220.6	188.0	0.0023	0.0010%
NO_2	1-hour	455900.00	3330200.00	220.4	188.0	0.0563	0.0256%
NO_2	1-hour	466900.00	3330200.00	220.3	188.0	0.0287	0.0130%
NO_2	1-hour	468900.00	3332200.00	220.2	188.0	0.0473	0.0215%
NO_2	1-hour	458900.00	3328200.00	220.2	188.0	0.0418	0.0190%

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary and Mobile Sources							
Pollutant Averaging Period		Location of NAAQS Exceedance a/ (x)	Location of NAAQS Exceedance a/ (y)	Modeled + Background Concentration (µg/m^3)	NAAQS Standard (µg/m^3)	Project Only Maximum Contribution to NAAQS Exceedance (µg/m^3)	Project Contribution ot the Cumulative Concentration (percent)
NO_2	1-hour	469900.00	3333200.00	219.7	188.0	0.0209	0.0095%
NO_2	1-hour	457900.00	3328200.00	219.7	188.0	0.0670	0.0305%
NO_2	1-hour	433900.00	3323200.00	219.3	188.0	0.0027	0.0012%
NO_2	1-hour	455900.00	3333200.00	218.7	188.0	0.0655	0.0299%
NO_2	1-hour	434900.00	3324200.00	218.6	188.0	0.0026	0.0012%
NO_2	1-hour	458900.00	3327200.00	218.2	188.0	0.0347	0.0159%
NO_2	1-hour	455900.00	3332200.00	217.6	188.0	0.0420	0.0193%
NO_2	1-hour	455900.00	3328200.00	217.5	188.0	0.0689	0.0317%
NO_2	1-hour	434900.00	3326200.00	217.1	188.0	0.0026	0.0012%
NO_2	1-hour	455900.00	3329200.00	217.0	188.0	0.0655	0.0302%
NO_2	1-hour	471900.00	3327200.00	216.6	188.0	0.0012	0.0006%
NO_2	1-hour	467900.00	3332200.00	216.5	188.0	0.0465	0.0215%
NO_2	1-hour	459900.00	3327200.00	216.4	188.0	0.0335	0.0155%
NO_2	1-hour	455900.00	3327200.00	215.5	188.0	0.0877	0.0407%
NO_2	1-hour	458900.00	3318200.00	214.9	188.0	0.0057	0.0026%
NO_2	1-hour	454900.00	3329200.00	214.7	188.0	0.0666	0.0310%
NO_2	1-hour	463900.00	3328200.00	214.7	188.0	0.0591	0.0275%
NO_2	1-hour	431900.00	3320200.00	214.3	188.0	0.0024	0.0011%
NO_2	1-hour	457900.00	3326200.00	213.8	188.0	0.0352	0.0164%
NO_2	1-hour	460900.00	3326200.00	213.8	188.0	0.0310	0.0145%
NO_2	1-hour	465900.00	3329200.00	213.5	188.0	0.0310	0.0145%
NO_2	1-hour	456900.00	3327200.00	213.2	188.0	0.0377	0.0177%
NO_2	1-hour	453900.00	3329200.00	213.1	188.0	0.0556	0.0261%
NO_2	1-hour	469900.00	3332200.00	212.5	188.0	0.0475	0.0224%
NO_2	1-hour	434900.00	3327200.00	212.5	188.0	0.0191	0.0090%
NO_2	1-hour	464900.00	3329200.00	212.3	188.0	0.0350	0.0165%
NO_2	1-hour	433900.00	3322200.00	212.1	188.0	0.0150	0.0071%
NO_2	1-hour	454900.00	3328200.00	211.8	188.0	0.0641	0.0302%
NO_2	1-hour	465900.00	3330200.00	211.8	188.0	0.0332	0.0157%

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary and Mobile Sources							
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (µg/m³)	NAAQS Standard (µg/m³)	Project Only Maximum Contribution to NAAQS Exceedance (µg/m³)	Project Contribution ot the Cumulative Concentration (percent)
		(x)	(y)				
NO_2	1-hour	454900.00	3327200.00	210.7	188.0	0.0311	0.0147%
NO_2	1-hour	468900.00	3331200.00	210.6	188.0	0.0520	0.0247%
NO_2	1-hour	457900.00	3327200.00	210.5	188.0	0.0442	0.0210%
NO_2	1-hour	466900.00	3329200.00	210.3	188.0	0.0288	0.0137%
NO_2	1-hour	465900.00	3328200.00	210.2	188.0	0.0344	0.0164%
NO_2	1-hour	458900.00	3326200.00	209.9	188.0	0.0551	0.0262%
NO_2	1-hour	435900.00	3326200.00	209.7	188.0	0.0025	0.0012%
NO_2	1-hour	452900.00	3329200.00	209.5	188.0	0.0470	0.0224%
NO_2	1-hour	459900.00	3325200.00	209.1	188.0	0.0247	0.0118%
NO_2	1-hour	459900.00	3326200.00	208.9	188.0	0.0337	0.0161%
NO_2	1-hour	460900.00	3325200.00	208.8	188.0	0.0461	0.0221%
NO_2	1-hour	465900.00	3327200.00	208.8	188.0	0.0377	0.0180%
NO_2	1-hour	453900.00	3328200.00	208.6	188.0	0.0415	0.0199%
NO_2	1-hour	467900.00	3330200.00	208.6	188.0	0.0371	0.0178%
NO_2	1-hour	454900.00	3326200.00	208.4	188.0	0.0429	0.0206%
NO_2	1-hour	429900.00	3318200.00	208.1	188.0	0.0010	0.0005%
NO_2	1-hour	427900.00	3296200.00	208.0	188.0	0.0160	0.0077%
NO_2	1-hour	434900.00	3323200.00	207.9	188.0	0.0025	0.0012%
NO_2	1-hour	456900.00	3325200.00	207.3	188.0	0.0691	0.0333%
NO_2	1-hour	462900.00	3327200.00	206.9	188.0	0.0327	0.0158%
NO_2	1-hour	453900.00	3327200.00	206.7	188.0	0.0678	0.0328%
NO_2	1-hour	432900.00	3321200.00	206.6	188.0	0.0037	0.0018%
NO_2	1-hour	453900.00	3326200.00	206.5	188.0	0.0397	0.0192%
NO_2	1-hour	467900.00	3329200.00	205.7	188.0	0.0378	0.0184%
NO_2	1-hour	435900.00	3325200.00	205.2	188.0	0.0090	0.0044%
NO_2	1-hour	452900.00	3328200.00	204.9	188.0	0.0503	0.0245%
NO_2	1-hour	468900.00	3330200.00	204.5	188.0	0.0709	0.0346%
NO_2	1-hour	466900.00	3328200.00	204.5	188.0	0.0203	0.0099%
NO_2	1-hour	468700.00	3295300.00	204.4	188.0	0.0174	0.0085%

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary and Mobile Sources							
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (μg/m³)	NAAQS Standard (μg/m³)	Project Only Maximum Contribution to NAAQS Exceedance (μg/m³)	Project Contribution ot the Cumulative Concentration (percent)
		(x)	(y)				
NO_2	1-hour	417900.00	3289200.00	204.4	188.0	0.0385	0.0188%
NO_2	1-hour	453900.00	3325200.00	204.1	188.0	0.0405	0.0198%
NO_2	1-hour	456900.00	3326200.00	204.1	188.0	0.0396	0.0194%
NO_2	1-hour	457900.00	3325200.00	204.0	188.0	0.0475	0.0233%
NO_2	1-hour	455900.00	3326200.00	203.8	188.0	0.0393	0.0193%
NO_2	1-hour	452900.00	3325200.00	203.6	188.0	0.0404	0.0198%
NO_2	1-hour	463900.00	3327200.00	203.0	188.0	0.0312	0.0153%
NO_2	1-hour	459900.00	3324200.00	202.7	188.0	0.0259	0.0128%
NO_2	1-hour	452900.00	3327200.00	202.7	188.0	0.0511	0.0252%
NO_2	1-hour	435900.00	3324200.00	202.5	188.0	0.0016	0.0008%
NO_2	1-hour	433900.00	3321200.00	202.3	188.0	0.0107	0.0053%
NO_2	1-hour	465900.00	3326200.00	202.3	188.0	0.0373	0.0184%
NO_2	1-hour	464900.00	3328200.00	202.2	188.0	0.0254	0.0125%
NO_2	1-hour	455900.00	3324200.00	202.2	188.0	0.0681	0.0337%
NO_2	1-hour	430900.00	3318200.00	202.1	188.0	0.0247	0.0122%
NO_2	1-hour	451900.00	3328200.00	202.0	188.0	0.0532	0.0263%
NO_2	1-hour	452900.00	3326200.00	201.9	188.0	0.0678	0.0336%
NO_2	1-hour	458900.00	3324200.00	201.9	188.0	0.0637	0.0316%
NO_2	1-hour	432900.00	3320200.00	201.8	188.0	0.0020	0.0010%
NO_2	1-hour	462900.00	3326200.00	201.7	188.0	0.0385	0.0191%
NO_2	1-hour	464900.00	3324200.00	201.6	188.0	0.0298	0.0148%
NO_2	1-hour	451900.00	3327200.00	201.3	188.0	0.0504	0.0250%
NO_2	1-hour	451900.00	3324200.00	201.0	188.0	0.0412	0.0205%
NO_2	1-hour	452900.00	3324200.00	200.8	188.0	0.0498	0.0248%
NO_2	1-hour	469900.00	3331200.00	200.4	188.0	0.0249	0.0124%
NO_2	1-hour	458900.00	3325200.00	200.3	188.0	0.0326	0.0163%
NO_2	1-hour	434900.00	3322200.00	200.2	188.0	0.0161	0.0080%
NO_2	1-hour	469900.00	3329200.00	200.2	188.0	0.0087	0.0044%
NO_2	1-hour	467900.00	3328200.00	200.1	188.0	0.0479	0.0239%

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary and Mobile Sources							
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (µg/m^3)	NAAQS Standard (µg/m^3)	Project Only Maximum Contribution to NAAQS Exceedance (µg/m^3)	Project Contribution ot the Cumulative Concentration (percent)
		(x)	(y)				
NO_2	1-hour	464900.00	3326200.00	199.9	188.0	0.0474	0.0237%
NO_2	1-hour	464900.00	3325200.00	199.8	188.0	0.0200	0.0100%
NO_2	1-hour	456900.00	3324200.00	199.7	188.0	0.0249	0.0124%
NO_2	1-hour	466900.00	3321200.00	199.7	188.0	0.0368	0.0184%
NO_2	1-hour	451900.00	3326200.00	199.5	188.0	0.0651	0.0326%
NO_2	1-hour	464900.00	3327200.00	199.0	188.0	0.0236	0.0118%
NO_2	1-hour	461900.00	3325200.00	198.9	188.0	0.0188	0.0095%
NO_2	1-hour	468900.00	3329200.00	198.7	188.0	0.0991	0.0499%
NO_2	1-hour	450900.00	3327200.00	198.6	188.0	0.0540	0.0272%
NO_2	1-hour	455900.00	3325200.00	198.4	188.0	0.0565	0.0285%
NO_2	1-hour	435900.00	3327200.00	198.3	188.0	0.0106	0.0053%
NO_2	1-hour	451900.00	3325200.00	198.2	188.0	0.0653	0.0329%
NO_2	1-hour	450900.00	3323200.00	198.0	188.0	0.0424	0.0214%
NO_2	1-hour	466900.00	3327200.00	198.0	188.0	0.0241	0.0122%
NO_2	1-hour	454900.00	3323200.00	197.9	188.0	0.0271	0.0137%
NO_2	1-hour	462900.00	3325200.00	197.8	188.0	0.0136	0.0069%
NO_2	1-hour	436900.00	3326200.00	197.5	188.0	0.0416	0.0211%
NO_2	1-hour	432900.00	3319200.00	197.5	188.0	0.0020	0.0010%
NO_2	1-hour	466900.00	3320200.00	197.5	188.0	0.0397	0.0201%
NO_2	1-hour	467900.00	3327200.00	197.5	188.0	0.0483	0.0245%
NO_2	1-hour	418900.00	3290200.00	197.4	188.0	0.0128	0.0065%
NO_2	1-hour	450900.00	3326200.00	197.2	188.0	0.0478	0.0242%
NO_2	1-hour	450900.00	3328200.00	197.2	188.0	0.0500	0.0254%
NO_2	1-hour	455900.00	3323200.00	197.0	188.0	0.0495	0.0251%
NO_2	1-hour	468900.00	3328200.00	196.9	188.0	0.0386	0.0196%
NO_2	1-hour	454900.00	3325200.00	196.9	188.0	0.0724	0.0368%
NO_2	1-hour	461900.00	3324200.00	196.7	188.0	0.0164	0.0083%
NO_2	1-hour	434900.00	3321200.00	196.4	188.0	0.0023	0.0011%
NO_2	1-hour	463900.00	3326200.00	196.1	188.0	0.0316	0.0161%

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary and Mobile Sources							
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (µg/m^3)	NAAQS Standard (µg/m^3)	Project Only Maximum Contribution to NAAQS Exceedance (µg/m^3)	Project Contribution ot the Cumulative Concentration (percent)
		(x)	(y)				
NO_2	1-hour	459900.00	3323200.00	196.1	188.0	0.0169	0.0086%
NO_2	1-hour	451900.00	3323200.00	195.9	188.0	0.0614	0.0314%
NO_2	1-hour	457900.00	3324200.00	195.7	188.0	0.0289	0.0148%
NO_2	1-hour	449900.00	3327200.00	195.7	188.0	0.0454	0.0232%
NO_2	1-hour	450900.00	3325200.00	195.6	188.0	0.0602	0.0308%
NO_2	1-hour	450900.00	3324200.00	195.6	188.0	0.0730	0.0373%
NO_2	1-hour	467900.00	3326200.00	195.5	188.0	0.0381	0.0195%
NO_2	1-hour	449900.00	3322200.00	195.4	188.0	0.0355	0.0182%
NO_2	1-hour	429900.00	3317200.00	195.2	188.0	0.0037	0.0019%
NO_2	1-hour	455900.00	3322200.00	195.2	188.0	0.0559	0.0287%
NO_2	1-hour	458900.00	3323200.00	195.1	188.0	0.0346	0.0177%
NO_2	1-hour	469900.00	3330200.00	195.0	188.0	0.0274	0.0141%
NO_2	1-hour	449900.00	3326200.00	195.0	188.0	0.0535	0.0275%
NO_2	1-hour	466900.00	3322200.00	194.9	188.0	0.0451	0.0231%
NO_2	1-hour	463900.00	3322200.00	194.5	188.0	0.0125	0.0064%
NO_2	1-hour	463900.00	3323200.00	194.5	188.0	0.0371	0.0191%
NO_2	1-hour	463900.00	3325200.00	194.5	188.0	0.0369	0.0190%
NO_2	1-hour	463900.00	3321200.00	194.4	188.0	0.0289	0.0149%
NO_2	1-hour	456900.00	3323200.00	194.4	188.0	0.0242	0.0125%
NO_2	1-hour	460900.00	3324200.00	194.3	188.0	0.0357	0.0184%
NO_2	1-hour	458900.00	3322200.00	194.2	188.0	0.1032	0.0531%
NO_2	1-hour	471900.00	3326200.00	194.2	188.0	0.0249	0.0128%
NO_2	1-hour	457900.00	3323200.00	194.2	188.0	0.0196	0.0101%
NO_2	1-hour	462900.00	3324200.00	194.1	188.0	0.0102	0.0053%
NO_2	1-hour	448900.00	3325200.00	194.1	188.0	0.0391	0.0201%
NO_2	1-hour	465900.00	3325200.00	194.1	188.0	0.0217	0.0112%
NO_2	1-hour	435900.00	3323200.00	194.0	188.0	0.0116	0.0060%
NO_2	1-hour	450900.00	3322200.00	193.9	188.0	0.0453	0.0234%
NO_2	1-hour	466900.00	3319200.00	193.8	188.0	0.0959	0.0495%

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary and Mobile Sources							
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (µg/m³)	NAAQS Standard (µg/m³)	Project Only Maximum Contribution to NAAQS Exceedance (µg/m³)	Project Contribution ot the Cumulative Concentration (percent)
		(x)	(y)				
NO_2	1-hour	464900.00	3323200.00	193.7	188.0	0.0215	0.0111%
NO_2	1-hour	436900.00	3325200.00	193.7	188.0	0.0402	0.0208%
NO_2	1-hour	454900.00	3322200.00	193.6	188.0	0.0466	0.0241%
NO_2	1-hour	461900.00	3323200.00	193.6	188.0	0.0168	0.0087%
NO_2	1-hour	467900.00	3325200.00	193.5	188.0	0.0353	0.0183%
NO_2	1-hour	454900.00	3324200.00	193.5	188.0	0.0556	0.0287%
NO_2	1-hour	448900.00	3321200.00	193.4	188.0	0.0360	0.0186%
NO_2	1-hour	454900.00	3321200.00	193.3	188.0	0.0244	0.0126%
NO_2	1-hour	453900.00	3322200.00	193.1	188.0	0.0289	0.0150%
NO_2	1-hour	460900.00	3323200.00	193.1	188.0	0.0274	0.0142%
NO_2	1-hour	468600.00	3295400.00	193.1	188.0	0.0070	0.0036%
NO_2	1-hour	468900.00	3327200.00	193.0	188.0	0.0532	0.0276%
NO_2	1-hour	453900.00	3321200.00	193.0	188.0	0.0676	0.0350%
NO_2	1-hour	449900.00	3325200.00	193.0	188.0	0.0317	0.0164%
NO_2	1-hour	453900.00	3324200.00	192.8	188.0	0.0746	0.0387%
NO_2	1-hour	448900.00	3326200.00	192.7	188.0	0.0543	0.0281%
NO_2	1-hour	467900.00	3324200.00	192.7	188.0	0.0430	0.0223%
NO_2	1-hour	466900.00	3326200.00	192.5	188.0	0.0206	0.0107%
NO_2	1-hour	457900.00	3322200.00	192.5	188.0	0.0398	0.0207%
NO_2	1-hour	447900.00	3326200.00	192.4	188.0	0.0593	0.0308%
NO_2	1-hour	436900.00	3327200.00	192.3	188.0	0.0443	0.0230%
NO_2	1-hour	449900.00	3323200.00	192.2	188.0	0.0729	0.0379%
NO_2	1-hour	449900.00	3331200.00	192.2	188.0	0.0447	0.0232%
NO_2	1-hour	448900.00	3327200.00	192.2	188.0	0.0426	0.0222%
NO_2	1-hour	447900.00	3324200.00	192.2	188.0	0.0466	0.0243%
NO_2	1-hour	463900.00	3324200.00	192.1	188.0	0.0130	0.0068%
NO_2	1-hour	468900.00	3326200.00	192.0	188.0	0.0315	0.0164%
NO_2	1-hour	432900.00	3318200.00	192.0	188.0	0.0029	0.0015%
NO_2	1-hour	467900.00	3323200.00	191.8	188.0	0.0489	0.0255%

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary and Mobile Sources							
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (µg/m³)	NAAQS Standard (µg/m³)	Project Only Maximum Contribution to NAAQS Exceedance (µg/m³)	Project Contribution ot the Cumulative Concentration (percent)
		(x)	(y)				
NO_2	1-hour	456900.00	3321200.00	191.8	188.0	0.0280	0.0146%
NO_2	1-hour	467900.00	3321200.00	191.8	188.0	0.0918	0.0479%
NO_2	1-hour	448900.00	3331200.00	191.8	188.0	0.0524	0.0273%
NO_2	1-hour	456900.00	3322200.00	191.8	188.0	0.0252	0.0131%
NO_2	1-hour	460900.00	3322200.00	191.7	188.0	0.0325	0.0170%
NO_2	1-hour	449900.00	3321200.00	191.7	188.0	0.0358	0.0187%
NO_2	1-hour	457900.00	3321200.00	191.7	188.0	0.0225	0.0117%
NO_2	1-hour	469900.00	3328200.00	191.6	188.0	0.0481	0.0251%
NO_2	1-hour	453900.00	3320200.00	191.6	188.0	0.0164	0.0085%
NO_2	1-hour	449900.00	3328200.00	191.6	188.0	0.0407	0.0212%
NO_2	1-hour	466900.00	3324200.00	191.5	188.0	0.0535	0.0279%
NO_2	1-hour	446900.00	3325200.00	191.5	188.0	0.0506	0.0264%
NO_2	1-hour	458900.00	3321200.00	191.5	188.0	0.0115	0.0060%
NO_2	1-hour	431900.00	3317200.00	191.4	188.0	0.0015	0.0008%
NO_2	1-hour	453900.00	3323200.00	191.4	188.0	0.0314	0.0164%
NO_2	1-hour	466900.00	3318200.00	191.4	188.0	0.0248	0.0130%
NO_2	1-hour	435900.00	3322200.00	191.4	188.0	0.0110	0.0058%
NO_2	1-hour	437900.00	3326200.00	191.3	188.0	0.0253	0.0132%
NO_2	1-hour	467900.00	3322200.00	191.3	188.0	0.0792	0.0414%
NO_2	1-hour	468800.00	3295400.00	191.2	188.0	2.7979	1.4635%
NO_2	1-hour	449900.00	3324200.00	191.1	188.0	0.0938	0.0491%
NO_2	1-hour	462900.00	3320200.00	191.0	188.0	0.0125	0.0066%
NO_2	1-hour	433900.00	3319200.00	191.0	188.0	0.0146	0.0076%
NO_2	1-hour	462900.00	3321200.00	190.9	188.0	0.0153	0.0080%
NO_2	1-hour	467900.00	3320200.00	190.8	188.0	0.0874	0.0458%
NO_2	1-hour	450900.00	3329200.00	190.8	188.0	0.0409	0.0214%
NO_2	1-hour	462900.00	3323200.00	190.7	188.0	0.0339	0.0178%
NO_2	1-hour	447900.00	3320200.00	190.7	188.0	0.0556	0.0292%
NO_2	1-hour	463900.00	3320200.00	190.7	188.0	0.0298	0.0156%

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary and Mobile Sources							
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (µg/m^3)	NAAQS Standard (µg/m^3)	Project Only Maximum Contribution to NAAQS Exceedance (µg/m^3)	Project Contribution ot the Cumulative Concentration (percent)
		(x)	(y)				
NO_2	1-hour	461900.00	3322200.00	190.7	188.0	0.0387	0.0203%
NO_2	1-hour	436900.00	3323200.00	190.6	188.0	0.0536	0.0281%
NO_2	1-hour	452900.00	3322200.00	190.5	188.0	0.0323	0.0170%
NO_2	1-hour	462900.00	3319200.00	190.5	188.0	0.0189	0.0099%
NO_2	1-hour	459900.00	3322200.00	190.5	188.0	0.0116	0.0061%
NO_2	1-hour	460900.00	3321200.00	190.5	188.0	0.0175	0.0092%
NO_2	1-hour	468900.00	3325200.00	190.4	188.0	0.0567	0.0298%
NO_2	1-hour	447900.00	3325200.00	190.4	188.0	0.0542	0.0285%
NO_2	1-hour	464900.00	3322200.00	190.4	188.0	0.0221	0.0116%
NO_2	1-hour	459900.00	3321200.00	190.3	188.0	0.0188	0.0099%
NO_2	1-hour	462900.00	3318200.00	190.3	188.0	0.0089	0.0047%
NO_2	1-hour	466900.00	3317200.00	190.3	188.0	0.0258	0.0136%
NO_2	1-hour	466900.00	3325200.00	190.2	188.0	0.0316	0.0166%
NO_2	1-hour	457900.00	3320200.00	190.1	188.0	0.0150	0.0079%
NO_2	1-hour	437900.00	3328200.00	190.1	188.0	0.0191	0.0100%
NO_2	1-hour	466900.00	3323200.00	190.0	188.0	0.0284	0.0150%
NO_2	1-hour	430900.00	3317200.00	190.0	188.0	0.0229	0.0120%
NO_2	1-hour	436900.00	3324200.00	190.0	188.0	0.0279	0.0147%
NO_2	1-hour	430900.00	3316200.00	190.0	188.0	0.0322	0.0169%
NO_2	1-hour	456900.00	3319200.00	189.9	188.0	0.0181	0.0095%
NO_2	1-hour	448900.00	3322200.00	189.9	188.0	0.0755	0.0398%
NO_2	1-hour	452900.00	3320200.00	189.9	188.0	0.0284	0.0150%
NO_2	1-hour	452900.00	3323200.00	189.8	188.0	0.0772	0.0407%
NO_2	1-hour	468900.00	3324200.00	189.7	188.0	0.0578	0.0305%
NO_2	1-hour	448900.00	3324200.00	189.7	188.0	0.0454	0.0239%
NO_2	1-hour	446900.00	3324200.00	189.6	188.0	0.0319	0.0168%
NO_2	1-hour	418900.00	3289200.00	189.6	188.0	0.0201	0.0106%
NO_2	1-hour	445900.00	3323200.00	189.5	188.0	0.0406	0.0214%
NO_2	1-hour	451900.00	3321200.00	189.5	188.0	0.0241	0.0127%

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary and Mobile Sources							
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (µg/m^3)	NAAQS Standard (µg/m^3)	Project Only Maximum Contribution to NAAQS Exceedance (µg/m^3)	Project Contribution ot the Cumulative Concentration (percent)
		(x)	(y)				
NO_2	1-hour	465900.00	3324200.00	189.4	188.0	0.0262	0.0138%
NO_2	1-hour	446900.00	3323200.00	189.4	188.0	0.0565	0.0298%
NO_2	1-hour	462900.00	3322200.00	189.3	188.0	0.0192	0.0102%
NO_2	1-hour	452900.00	3319200.00	189.3	188.0	0.0202	0.0107%
NO_2	1-hour	447900.00	3331200.00	189.2	188.0	0.0491	0.0259%
NO_2	1-hour	461900.00	3318200.00	189.2	188.0	0.0169	0.0089%
NO_2	1-hour	444900.00	3322200.00	189.1	188.0	0.0588	0.0311%
NO_2	1-hour	449900.00	3329200.00	189.1	188.0	0.0511	0.0270%
NO_2	1-hour	452900.00	3321200.00	189.1	188.0	0.0276	0.0146%
NO_2	1-hour	459900.00	3320200.00	189.0	188.0	0.0134	0.0071%
NO_2	1-hour	459900.00	3319200.00	189.0	188.0	0.0725	0.0383%
NO_2	1-hour	468700.00	3295100.00	189.0	188.0	0.0930	0.0492%
NO_2	1-hour	445900.00	3325200.00	188.9	188.0	0.0434	0.0230%
NO_2	1-hour	467900.00	3319200.00	188.9	188.0	0.0878	0.0465%
NO_2	1-hour	466900.00	3316200.00	188.9	188.0	0.0389	0.0206%
NO_2	1-hour	461900.00	3317200.00	188.8	188.0	0.0231	0.0122%
NO_2	1-hour	448900.00	3320200.00	188.8	188.0	0.0409	0.0216%
NO_2	1-hour	433900.00	3320200.00	188.8	188.0	0.0271	0.0144%
NO_2	1-hour	445900.00	3324200.00	188.7	188.0	0.0441	0.0234%
NO_2	1-hour	451900.00	3319200.00	188.7	188.0	0.0179	0.0095%
NO_2	1-hour	451900.00	3317200.00	188.7	188.0	0.0420	0.0223%
NO_2	1-hour	444900.00	3324200.00	188.7	188.0	0.0540	0.0286%
NO_2	1-hour	437900.00	3327200.00	188.6	188.0	0.0403	0.0214%
NO_2	1-hour	455900.00	3321200.00	188.6	188.0	0.0191	0.0101%
NO_2	1-hour	435900.00	3321200.00	188.5	188.0	0.0262	0.0139%
NO_2	1-hour	457900.00	3316200.00	188.5	188.0	0.0129	0.0069%
NO_2	1-hour	461900.00	3316200.00	188.5	188.0	0.0080	0.0042%
NO_2	1-hour	447900.00	3333200.00	188.5	188.0	0.0620	0.0329%
NO_2	1-hour	448900.00	3330200.00	188.4	188.0	0.0465	0.0247%

Predicted Cumulative Concentrations for NAAQS Exceedances at the Commonwealth LNG Project for LNG Stationary and Mobile Sources							
Pollutant Averaging Period		Location of NAAQS Exceedance a/		Modeled + Background Concentration (µg/m³)	NAAQS Standard (µg/m³)	Project Only Maximum Contribution to NAAQS Exceedance (µg/m³)	Project Contribution ot the Cumulative Concentration (percent)
		(x)	(y)				
NO_2	1-hour	461900.00	3319200.00	188.4	188.0	0.0083	0.0044%
NO_2	1-hour	452900.00	3318200.00	188.3	188.0	0.0095	0.0050%
NO_2	1-hour	433900.00	3318200.00	188.3	188.0	0.0017	0.0009%
NO_2	1-hour	448900.00	3323200.00	188.3	188.0	0.0445	0.0236%
NO_2	1-hour	462900.00	3317200.00	188.3	188.0	0.0135	0.0071%
NO_2	1-hour	465900.00	3315200.00	188.2	188.0	0.0254	0.0135%
NO_2	1-hour	468600.00	3295100.00	188.2	188.0	0.0031	0.0016%
NO_2	1-hour	468900.00	3323200.00	188.2	188.0	0.1269	0.0674%
NO_2	1-hour	448900.00	3332200.00	188.2	188.0	0.0516	0.0274%
NO_2	1-hour	460900.00	3320200.00	188.2	188.0	0.0078	0.0041%
NO_2	1-hour	463900.00	3319200.00	188.1	188.0	0.0133	0.0071%
NO_2	1-hour	446900.00	3319200.00	188.1	188.0	0.0489	0.0260%
NO_2	1-hour	462900.00	3315200.00	188.1	188.0	0.0223	0.0119%
NO_2	1-hour	461900.00	3321200.00	188.1	188.0	0.0106	0.0056%
NO_2	1-hour	450900.00	3320200.00	188.0	188.0	0.0281	0.0149%
NO_2	1-hour	438900.00	3326200.00	188.0	188.0	0.0220	0.0117%
NO_2	1-hour	456900.00	3318200.00	188.0	188.0	0.0120	0.0064%
NO_2	1-hour	451900.00	3320200.00	188.0	188.0	0.0194	0.0103%
NO_2	1-hour	458900.00	3320200.00	188.0	188.0	0.0043	0.0023%

a/ UTM NAD83 Zone 15N

APPENDIX I

Environmental Justice Communities and Predicted Project-Only and Cumulative Concentrations for SIL and NAAQS Exceedances of the Commonwealth LNG Project for LNG Stationary Sources

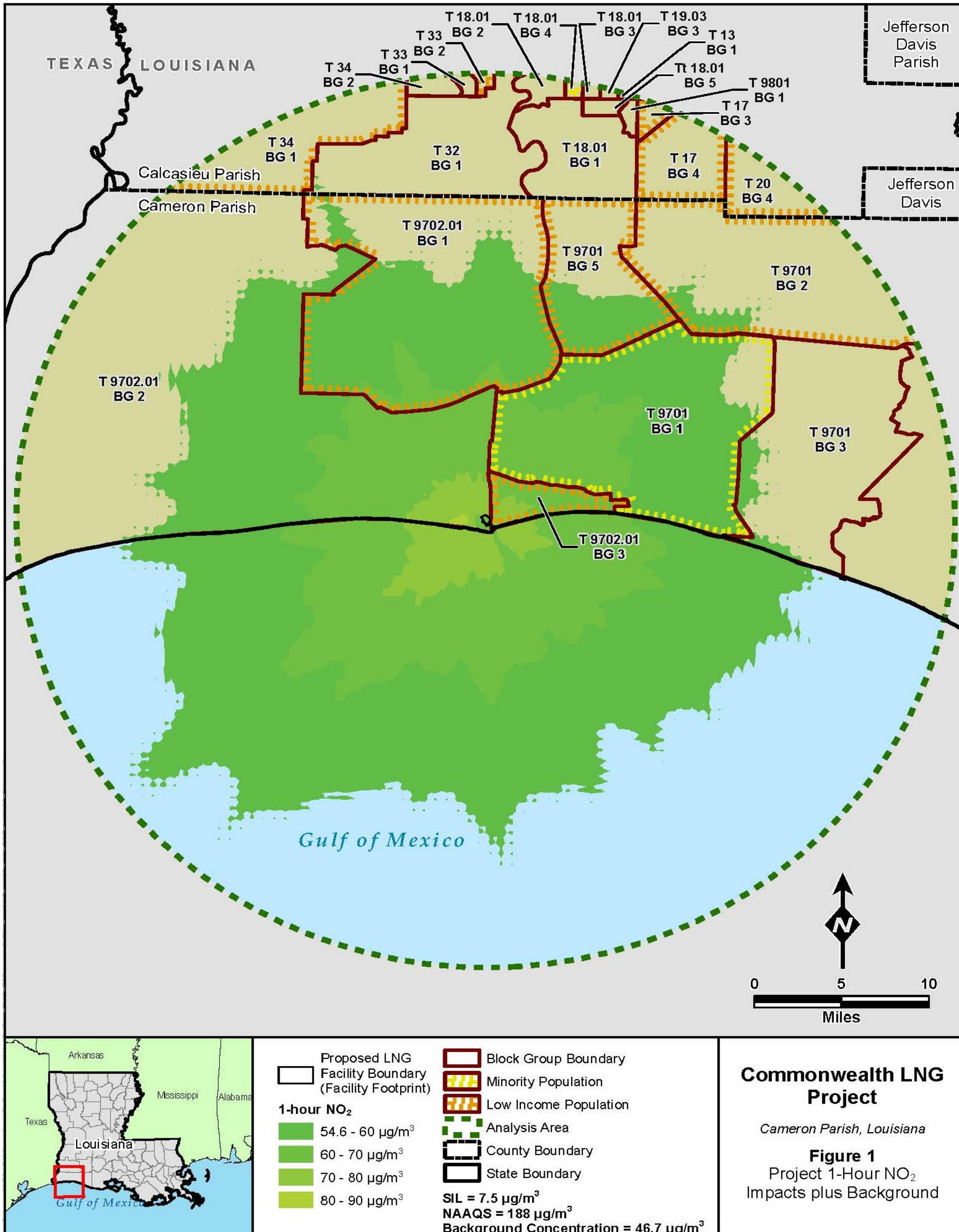
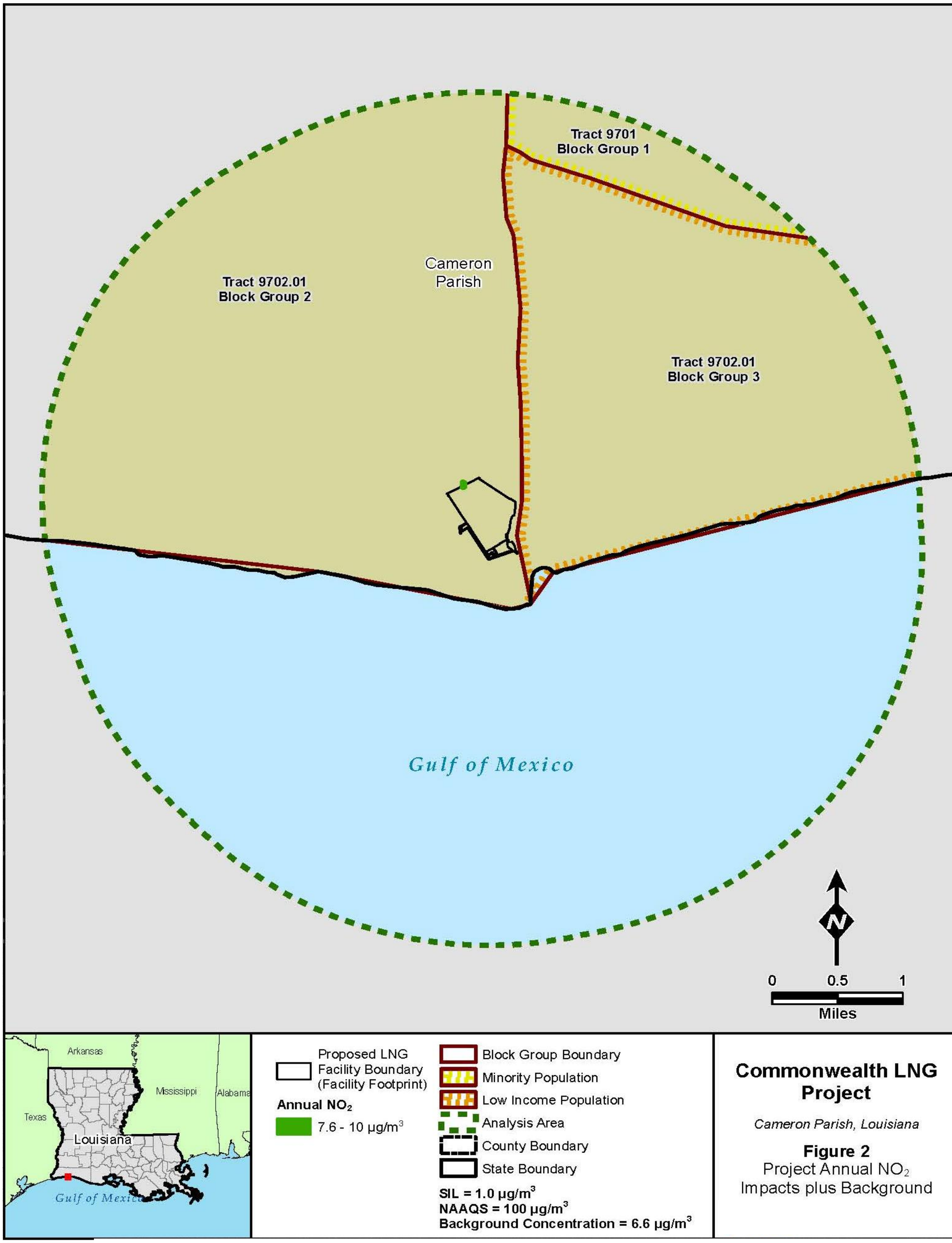
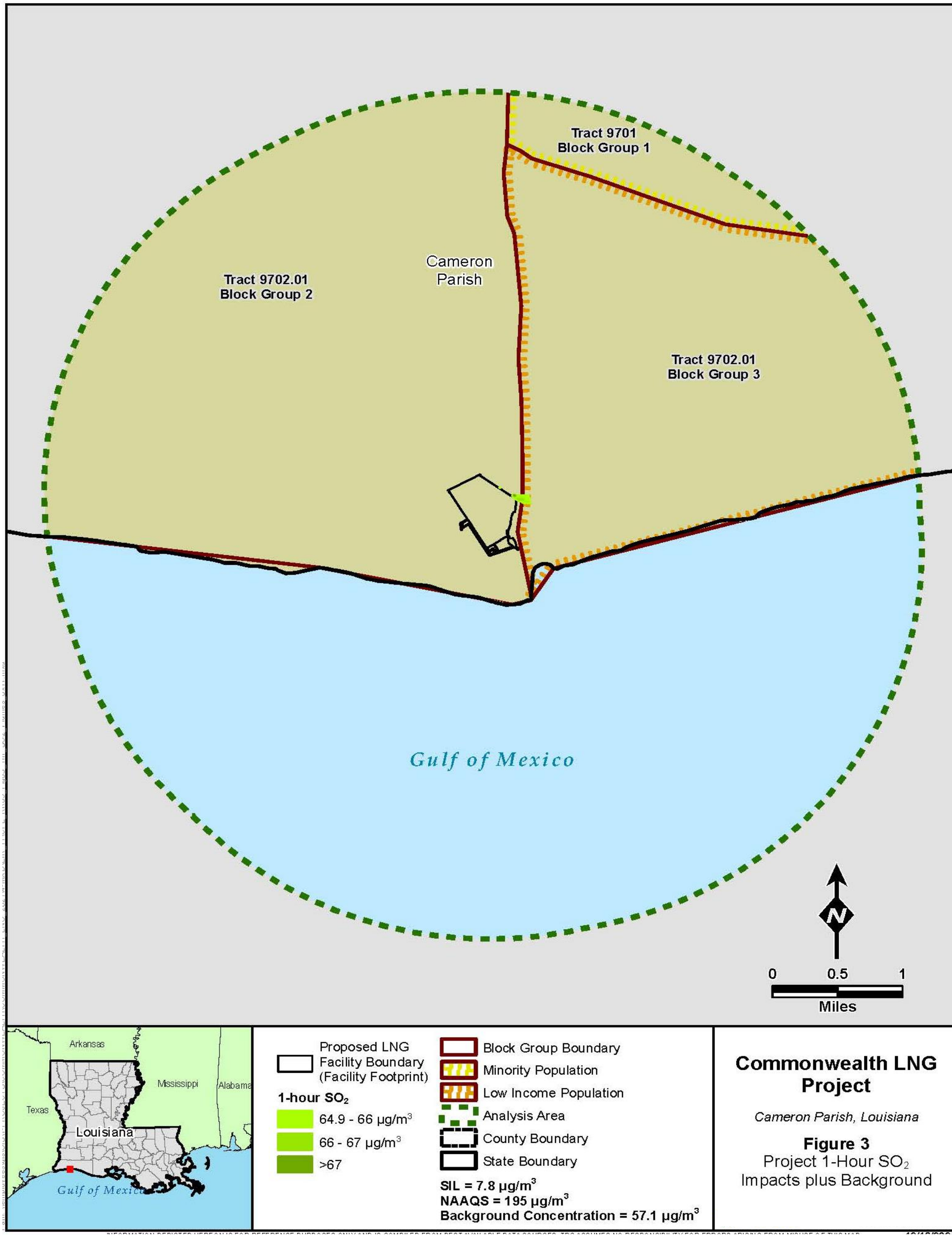
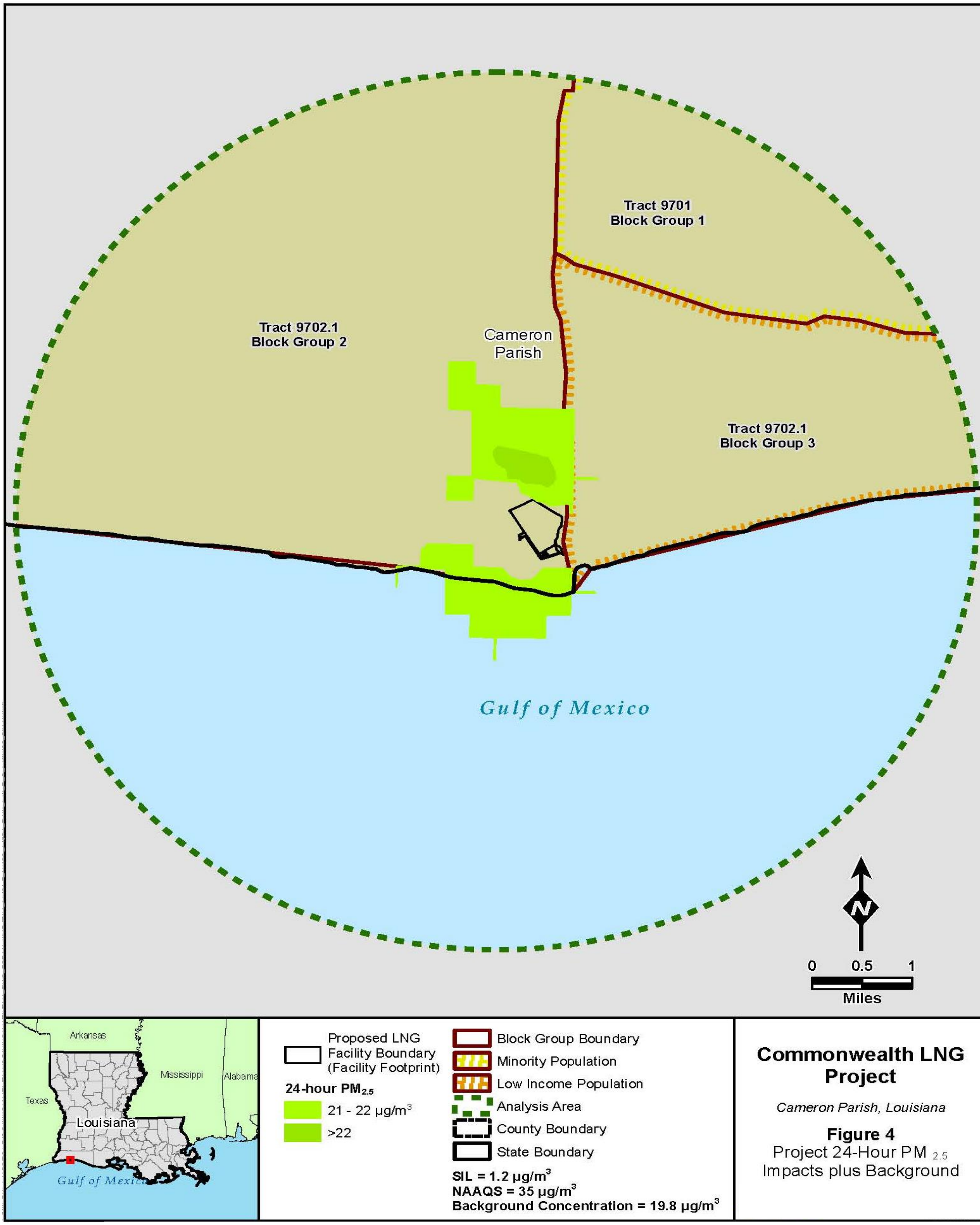


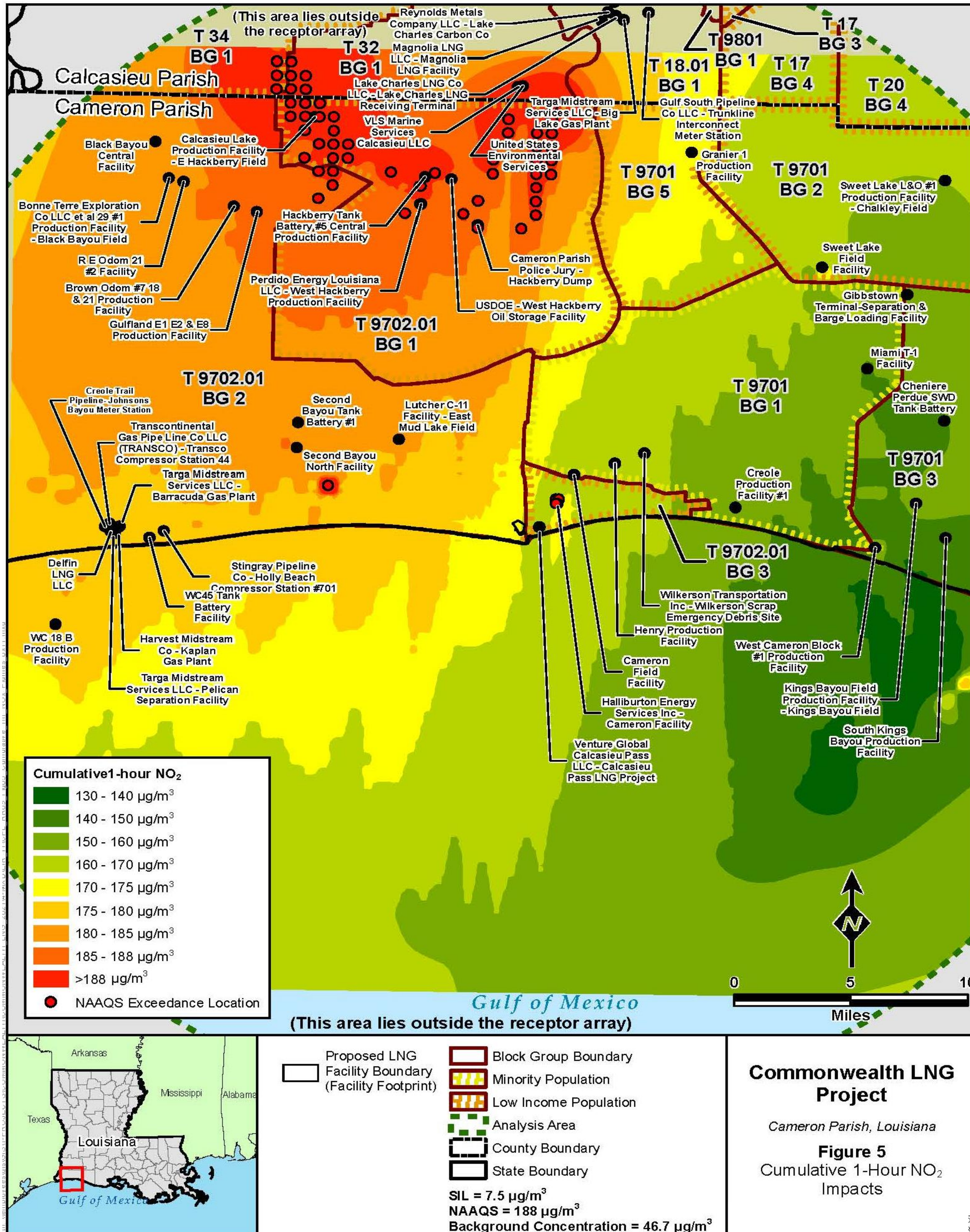
Figure 1
Project 1-Hour NO_2 Impacts plus Background



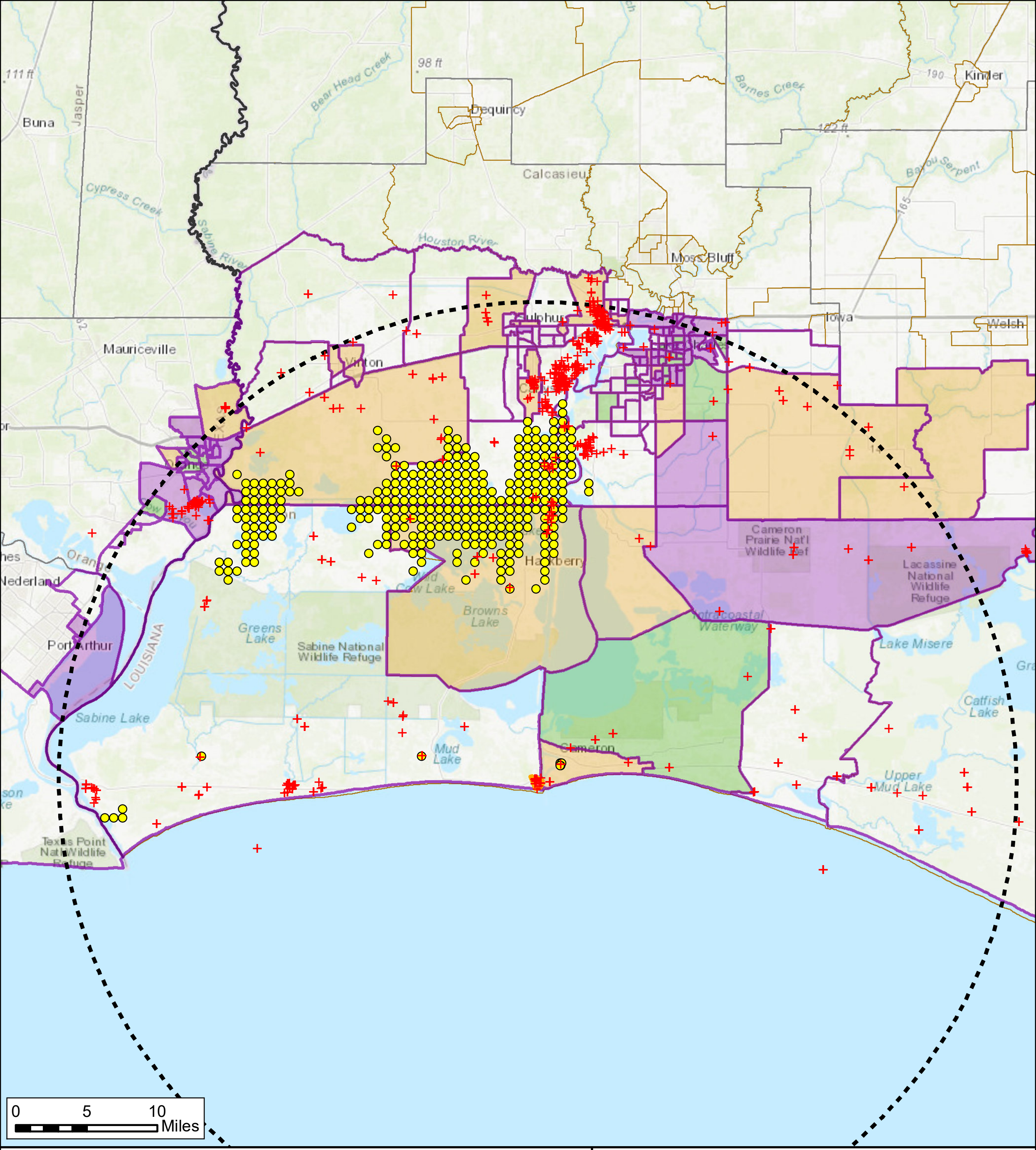
Tract 9701
Block Group 1
Cameron
Parish
Tract 9702.01
Block Group 2
Tract 9702.01
Block Group 3
Gulf of Mexico
N
0
0.5
1
Miles
Arkansas
Mississippi
Alabama
Texas
Louisiana
Gulf of Mexico
Proposed LNG Facility Boundary (Facility Footprint)
Annual NO_2
7.6 - 10 μg/m^3
Block Group Boundary
Minority Population
Low Income Population
Analysis Area
County Boundary
State Boundary
SIL = 1.0 μg/m^3
NAAQS = 100 μg/m^3
Background Concentration = 6.6 μg/m^3
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 2
Project Annual NO_2 Impacts plus Background


Tract 9701
Block Group 1
Cameron
Parish
Tract 9702.01
Block Group 2
Tract 9702.01
Block Group 3
Gulf of Mexico
N
0
0.5
1
Miles
Arkansas
Mississippi
Alabama
Texas
Louisiana
Gulf of Mexico
Proposed LNG Facility Boundary (Facility Footprint)
1-hour SO_2
64.9 - 66 µg/m^3
66 - 67 µg/m^3
>67
Block Group Boundary
Minority Population
Low Income Population
Analysis Area
County Boundary
State Boundary
SIL = 7.8 µg/m^3
NAAQS = 195 µg/m^3
Background Concentration = 57.1 µg/m^3
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 3
Project 1-Hour SO_2 Impacts plus Background


Tract 9701
Block Group 1
Tract 9702.1
Block Group 2
Cameron
Parish
Tract 9702.1
Block Group 3
Gulf of Mexico
N
0 0.5 1
Miles
Arkansas
Mississippi
Alabama
Texas
Louisiana
Gulf of Mexico
Proposed LNG Facility Boundary (Facility Footprint)
24-hour $PM_{2.5}$
21 - 22 μg/m³
>22
Block Group Boundary
Minority Population
Low Income Population
Analysis Area
County Boundary
State Boundary
SIL = 1.2 μg/m³
NAAQS = 35 μg/m³
Background Concentration = 19.8 μg/m³
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 4
Project 24-Hour $PM_{2.5}$ Impacts plus Background



(This area lies outside the receptor array)
Reynolds Metals Company LLC - Lake Charles Carbon Co
Magnolia LNG LLC - Magnolia LNG Facility
Lake Charles LNG Co LLC - Lake Charles LNG Receiving Terminal
VLS Marine Services Calcasieu LLC
Targa Midstream Services LLC - Big Lake Gas Plant
Gulf South Pipeline Co LLC - Trunkline Interconnect Meter Station
T 34 BG 1
T 32 BG 1
T 18.01 BG 1
T 9801 BG 1
T 17 BG 3
T 17 BG 4
T 20 BG 4
Calcasieu Parish
Cameron Parish
Black Bayou Central Facility
Calcasieu Lake Production Facility - E Hackberry Field
United States Environmental Services
Granier 1 Production Facility
T 9701 BG 5
T 9701 BG 2
Sweet Lake L&O #1 Production Facility - Chalkley Field
Bonne Terre Exploration Co LLC et al 29 #1 Production Facility - Black Bayou Field
Hackberry Tank Battery #5 Central Production Facility
R E Odom 21 #2 Facility
Cameron Parish Police Jury - Hackberry Dump
Sweet Lake Field Facility
Brown Odom #7 18 & 21 Production Facility
Perdido Energy Louisiana LLC - West Hackberry Production Facility
Gibbstown Terminal-Separation & Barge Loading Facility
USDOE - West Hackberry Oil Storage Facility
Gulfland E1 E2 & E8 Production Facility
T 9702.01 BG 1
Miami T-1 Facility
T 9702.01 BG 2
T 9701 BG 1
Cheniere Perdue SWD Tank Battery
Creole Trail Pipeline- Johnsons Bayou Meter Station
Second Bayou Tank Battery #1
Lutcher C-11 Facility - East Mud Lake Field
Transcontinental Gas Pipe Line Co LLC (TRANSCO) - Transco Compressor Station 44
Second Bayou North Facility
T 9701 BG 3
Targa Midstream Services LLC - Barracuda Gas Plant
Creole Production Facility #1
Delfin LNG LLC
Stingray Pipeline Co - Holly Beach Compressor Station #701
T 9702.01 BG 3
WC45 Tank Battery Facility
Wilkerson Transportation Inc - Wilkerson Scrap Emergency Debris Site
WC 18 B Production Facility
Henry Production Facility
Harvest Midstream Co - Kaplan Gas Plant
West Cameron Block #1 Production Facility
Cameron Field Facility
Targa Midstream Services LLC - Pelican Separation Facility
Kings Bayou Field Production Facility - Kings Bayou Field
Halliburton Energy Services Inc - Cameron Facility
South Kings Bayou Production Facility
Venture Global Calcasieu Pass LLC - Calcasieu Pass LNG Project
Cumulative 1-hour NO2
130 - 140 µg/m3
140 - 150 µg/m3
150 - 160 µg/m3
160 - 170 µg/m3
170 - 175 µg/m3
175 - 180 µg/m3
180 - 185 µg/m3
185 - 188 µg/m3
>188 µg/m3
NAAQS Exceedance Location
N
0 5 10
Miles
Gulf of Mexico
(This area lies outside the receptor array)
Arkansas
Mississippi
Alabama
Texas
Louisiana
Gulf of Mexico
Proposed LNG Facility Boundary (Facility Footprint)
Block Group Boundary
Minority Population
Low Income Population
Analysis Area
County Boundary
State Boundary
SIL = 7.5 µg/m3
NAAQS = 188 µg/m3
Background Concentration = 46.7 µg/m3
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 5
Cumulative 1-Hour NO2 Impacts



Proposed Site

Existing Facilities

Cumulative 1-Hour NO_2 NAAQS Exceedances

Census Block Groups

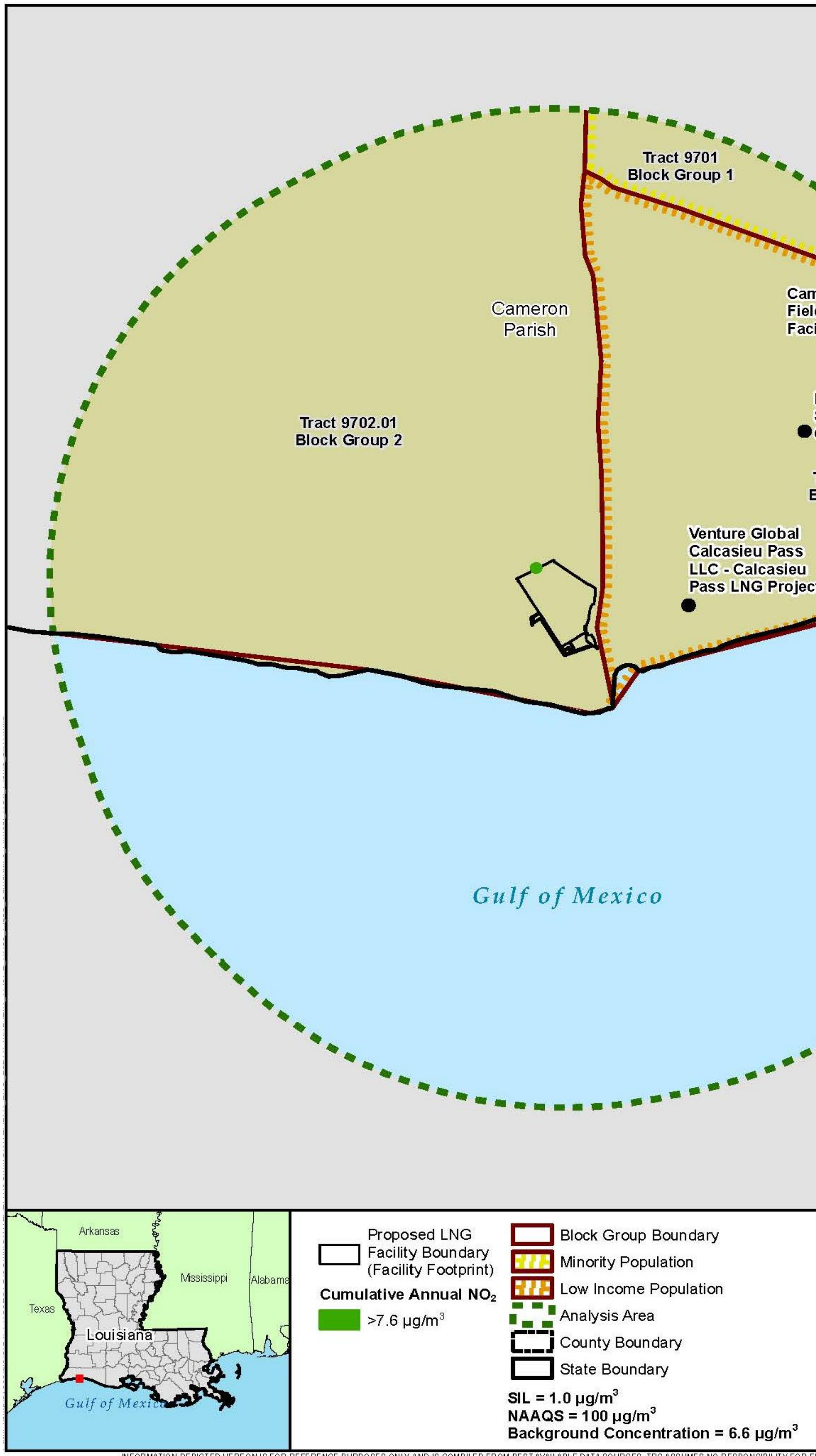
Census Block Groups Assessed

Commonwealth LNG Project

Cameron Parish, Louisiana

Figure 6

Cumulative 1-Hour NO_2 Stationary and Mobile Source Impacts

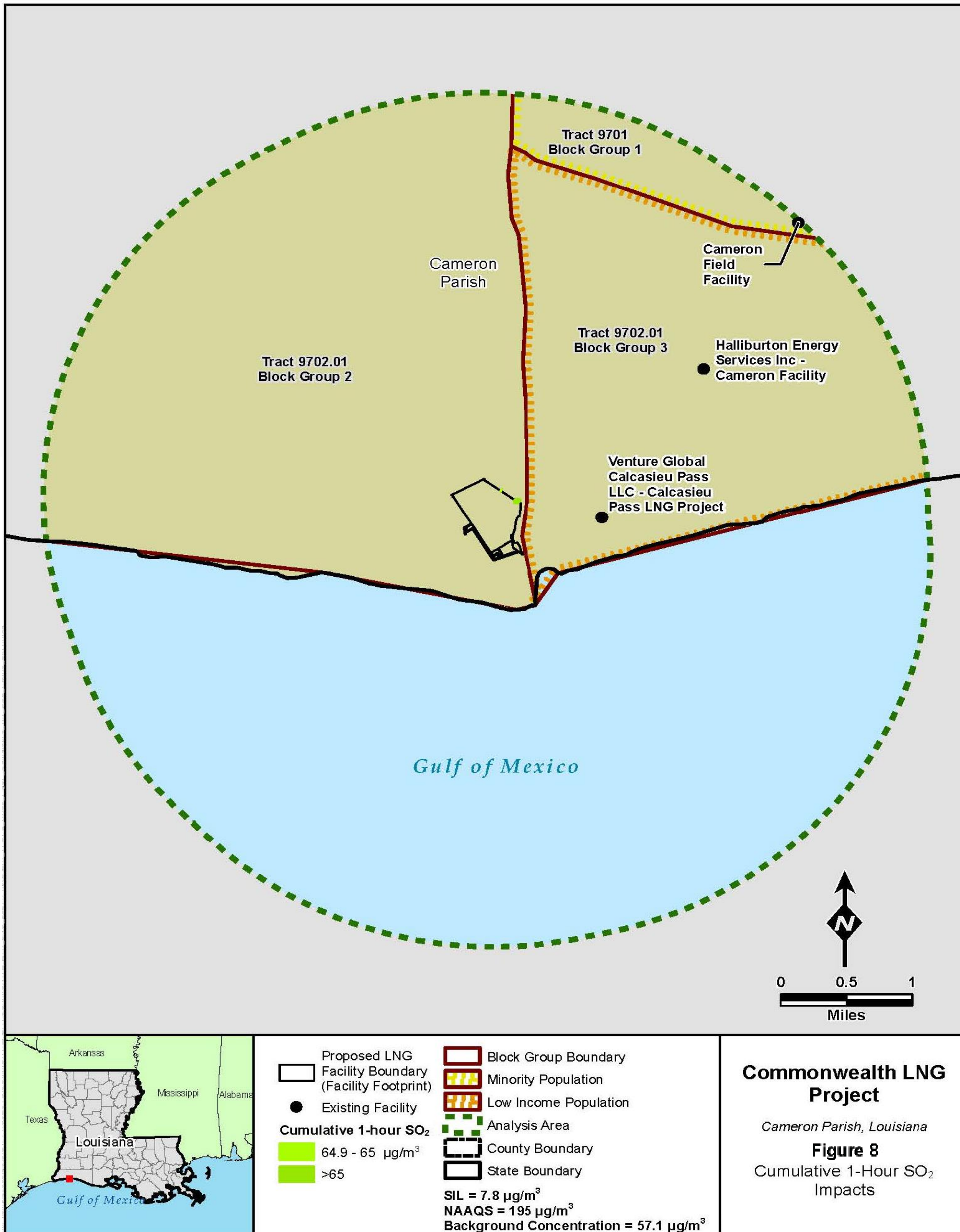


Commonwealth LNG Project

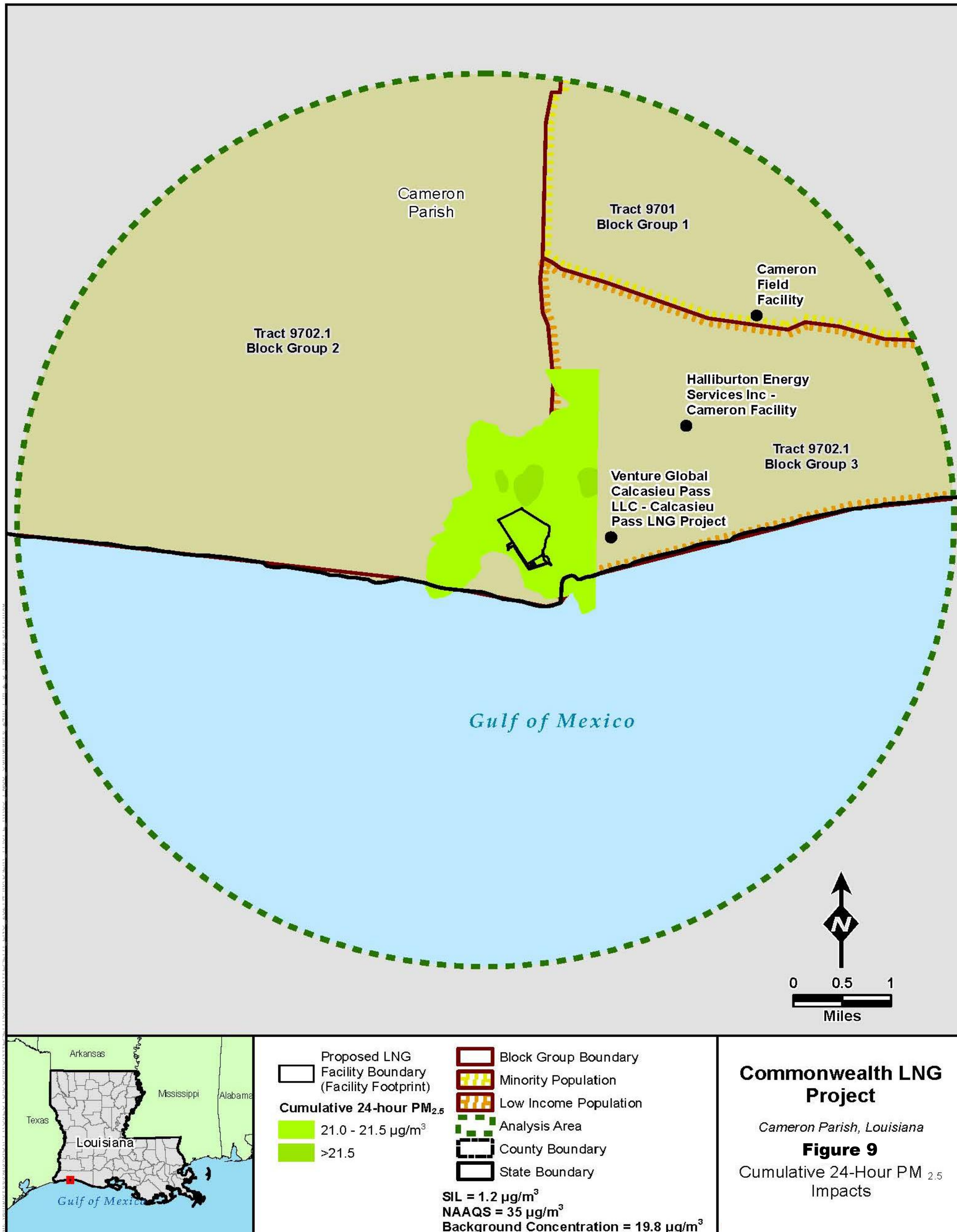
Cameron Parish, Louisiana

Figure 7

Cumulative Annual NO_2 Impacts



Tract 9701
Block Group 1
Cameron Parish
Cameron Field Facility
Tract 9702.01
Block Group 3
Halliburton Energy Services Inc - Cameron Facility
Tract 9702.01
Block Group 2
Venture Global Calcasieu Pass LLC - Calcasieu Pass LNG Project
Gulf of Mexico
N
0
0.5
1
Miles
Arkansas
Mississippi
Alabama
Texas
Louisiana
Gulf of Mexico
Proposed LNG Facility Boundary (Facility Footprint)
Existing Facility
Cumulative 1-hour SO_2
64.9 - 65 μg/m^3
>65
Block Group Boundary
Minority Population
Low Income Population
Analysis Area
County Boundary
State Boundary
SIL = 7.8 μg/m^3
NAAQS = 195 μg/m^3
Background Concentration = 57.1 μg/m^3
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 8
Cumulative 1-Hour SO_2 Impacts



Cameron Parish
Tract 9701 Block Group 1
Cameron Field Facility
Tract 9702.1 Block Group 2
Halliburton Energy Services Inc - Cameron Facility
Tract 9702.1 Block Group 3
Venture Global Calcasieu Pass LLC - Calcasieu Pass LNG Project
Gulf of Mexico
N
0 0.5 1
Miles
Arkansas
Mississippi
Alabama
Texas
Louisiana
Gulf of Mexico
Proposed LNG Facility Boundary (Facility Footprint)
Cumulative 24-hour $PM_{2.5}$
21.0 - 21.5 µg/m^3
>21.5
Block Group Boundary
Minority Population
Low Income Population
Analysis Area
County Boundary
State Boundary
SIL = 1.2 µg/m^3
NAAQS = 35 µg/m^3
Background Concentration = 19.8 µg/m^3
Commonwealth LNG Project
Cameron Parish, Louisiana
Figure 9
Cumulative 24-Hour $PM_{2.5}$ Impacts

APPENDIX J

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Cardno, 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(b)(4), third party contractors execute a disclosure statement specifying whether any financial or other interests in the outcome of the project exist. In accordance with Commission policies, these statements are reviewed to ensure no financial or other organizational conflicts of interest exist. 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.

APPENDIX K

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APPENDIX L

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