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

Magnolia LNG and Lake Charles Expansion Projects
Draft Environmental Impact Statement

Magnolia LNG, LLC and Kinder Morgan Louisiana Pipeline LLC

FERC Docket Nos. CP14-347-000 and CP14-511-000
DOE Docket Nos. 12-183-LNG, 13-131-LNG, and 13-132-LNG
FERC/EIS-0260D, DOE/EIS-0498

Cooperating Agencies:

U.S. Department of Energy
U.S. Coast Guard
U.S. Environmental Protection Agency
U.S. Army Corps of Engineers
U.S. Department of Transportation

Magnolia LNG and Lake Charles Expansion Projects
Draft Environmental Impact Statement

FERC/EIS-0260D

Docket Nos.
CP14-347-000
and CP14-511-000

July
2015

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas Branch 4
Magnolia LNG, LLC and Kinder
Morgan Louisiana Pipeline LLC
Docket Nos. CP14-347-000 and
CP14-511-000

FERC/EIS-0260D

TO THE PARTY ADDRESSED:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared a draft environmental impact statement (EIS) for the Magnolia LNG Project proposed by Magnolia LNG, LLC (Magnolia) and the Lake Charles Expansion Project proposed by Kinder Morgan Louisiana Pipeline LLC (Kinder Morgan) in the above-referenced dockets. The Magnolia LNG Project would include construction and operation of a liquefied natural gas (LNG) terminal that would include various liquefaction, LNG distribution, and appurtenant facilities. The Lake Charles Expansion Project would include reconfiguration of Kinder Morgan's existing pipeline system in order to accommodate Magnolia's request for natural gas service at the LNG terminal site. The projects would provide an LNG export capacity of 1.08 billion cubic feet per day of natural gas.

The draft EIS assesses the potential environmental effects of construction and operation of the Magnolia LNG and Lake Charles Expansion Projects in accordance with the requirements of the National Environmental Policy Act (NEPA). The FERC staff concludes that approval of the proposed projects would result in adverse environmental impacts; however, these impacts would be reduced to less-than-significant levels with the implementation of Magnolia's and Kinder Morgan's proposed mitigation and the additional measures recommended in the draft EIS.

The U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Department of Energy, U.S. Department of Transportation, and U.S. Environmental Protection Agency participated as cooperating agencies in the preparation of the draft EIS. Cooperating agencies have jurisdiction by law or special expertise with respect to resources potentially affected by a proposal and participate in the NEPA analysis. Although the cooperating agencies provided input on the conclusions and recommendations presented in the draft EIS, the agencies will present their own conclusions and recommendations in their respective records of decision or determinations for the projects.

The draft EIS addresses the potential environmental effects of the construction, modification, and operation of the following facilities associated with the two projects:

- a new LNG terminal that includes four liquefaction trains, two LNG storage tanks, liquefaction and refrigerant units, safety and control systems, and associated infrastructure;
- LNG truck loading facilities;
- LNG carrier and barge loading facilities;
- one new meter station;
- one new 32,000 horsepower compressor station;
- approximately 40 feet of 36-inch-diameter feed gas line to supply natural gas to the LNG terminal from Kinder Morgan's existing natural gas transmission pipeline;
- a new 1.2-mile-long, 36-inch-diameter low pressure natural gas header pipeline;
- a new 700-foot-long, 24-inch-diameter high pressure natural gas header pipeline;
- modifications at six existing meter stations; and
- construction of miscellaneous auxiliary and appurtenant facilities.

The FERC staff mailed copies of the draft EIS to federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners; other interested individuals and non-governmental organizations; newspapers and libraries in the project areas; and parties to these proceedings. Paper copy versions of this EIS were mailed to those specifically requesting them; all others received a compact disc version. In addition, the draft EIS is available for public viewing on the FERC's website (www.ferc.gov) using the eLibrary link. A limited number of hardcopies are available for distribution and public inspection at:

Federal Energy Regulatory Commission
Public Reference Room
888 First Street NE, Room 2A
Washington, DC 20426
(202) 502-8371

Any person wishing to comment on the draft EIS may do so. To ensure consideration of your comments on the proposals in the final EIS, it is important that the Commission receive your comments on or before **September 7, 2015**.

For your convenience, there are four methods you can use to submit your comments to the Commission. In all instances, please reference the project docket number(s) (CP14-347-000 and CP14-511-000) with your submission. The Commission encourages electronic filing of comments and has expert staff available to assist you at (202) 502-8258 or efiling@ferc.gov.

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

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

3) You can file a paper copy of your comments by mailing them to the following address:

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE, Room 1A
Washington, DC 20426

4) In lieu of sending written or electronic comments, the Commission invites you to attend a public comment meeting its staff will conduct in the project area to receive comments on the draft EIS. We encourage interested groups and individuals to attend and present oral comments on the draft EIS. A transcript of the meeting will be available for review in eLibrary under the project docket numbers. **The meeting will begin at 7:00 p.m. and is scheduled as follows**:

Date	Location
September 3, 2015	Historic Cash and Carry Building 801 Enterprise Boulevard Lake Charles, Louisiana 70601 (337) 310-0405

Any person seeking to become a party to the proceeding must file a motion to intervene pursuant to Rule 214 of the Commission's Rules of Practice and Procedures (Title 18 Code of Federal Regulations Part 385.214).[1] Only intervenors have the right to seek rehearing of the Commission's decision. The Commission grants affected landowners and others with environmental concerns intervenor status upon showing good cause by stating that they have a clear and direct interest in this proceeding that no other party can adequately represent. **Simply filing environmental comments will not give you intervenor status, but you do not need intervenor status to have your comments considered.**

Questions?

Additional information about the project is available from the Commission's Office of External Affairs, at **(866) 208-FERC,** or on the FERC website (www.ferc.gov) using the eLibrary link. Click on the eLibrary link, click on "General Search," and enter the docket number(s) excluding the last three digits in the Docket Number field (i.e., CP14-347 and CP14-511). 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; for TTY, contact (202) 502-8659. The eLibrary link also provides access to the texts of formal documents issued by the Commission, such as orders, notices, and rulemakings.

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

---

[1] See the previous discussion on the methods for filing comments.

TABLE OF CONTENTS

Magnolia LNG, LLC and Kinder Morgan Louisiana Pipeline LLC
Magnolia LNG and Lake Charles Expansion Projects

Draft Environmental Impact Statement

TABLE OF CONTENTS (cont'd)

Page

TABLE OF CONTENTS (cont'd)

TABLE OF CONTENTS (cont'd)

TABLE OF CONTENTS (cont'd)

Page

TABLE OF CONTENTS (cont'd)

Page

TABLE OF CONTENTS (cont'd)

Page

LIST OF TABLES

TABLES (cont'd)

TABLES (cont'd)

LIST OF FIGURES

FIGURES (cont'd)

LIST OF APPENDICES

TECHNICAL ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
ACHP	Advisory Council on Historic Preservation
Annova	Annova LNG Common Infrastructure, LLC, Annova LNG Brownsville A, LLC, Annova LNG Brownsville B, LLC, and Annova LNG Brownsville C, LLC
ANR	ANR Pipeline Company
ANSI	American National Standards Institute
APE	area of potential effects
AQCR	air quality control region
ASME	American Society of Mechanical Engineers
Authorization	Authorization To Export Natural Gas
BA	biological assessment
BACT	Best Available Control Technology
Barca	Barca LNG LLC
BCR	Bird Conservation Region
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practices
Bcf/d	billion cubic feet per day
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAA	Clean Air Act
Cameron LNG	Cameron LNG, LLC
CAM_x	Comprehensive Air Quality Model with Extensions
CB&I	Chicago Bridge & Iron Company
CDF	confined disposal facility
CE FLNG	CE FLNG, LLC
CEQ	Council on Environmental Quality
Certificate	Certification of Public Convenience and Necessity
CFR	Code of Federal Regulations
CGT	Columbia Gulf Transmission Company
CH_4	methane
CI ICE	compression ignition internal combustion engines
Cleco	Cleco Corporation
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
Coast Guard	U.S. Coast Guard
COE	U.S. Army Corps of Engineers
COI	Certificate of Inspection
Columbia Gulf	Columbia Gulf Transmission, LLC
Commission	Federal Energy Regulatory Commission
Corpus Christi	Corpus Christi Liquefaction, LLC
CWA	Clean Water Act
dB	decibels
dBA	decibels on the A-weighted scale
Delfin	Delfin LNG, LLC
DHS	U.S. Department of Homeland Security
DII	Dynamic Industries, Inc.
DOE	U.S. Department of Energy

DOT	U.S. Department of Transportation
DOTD	Department of Transportation and Development
DPS	distinct population segments
EEZ	U.S. Exclusive Economic Zone
EFH	essential fish habitat
EI	environmental inspector
EIS	environmental impact statement
ELS	Excelerate Liquefaction Solutions (Port Lavaca I), LLC, Excelerate Liquefaction Solutions (Port Lavaca 2), LLC, and Lavaca Bay Pipeline System, LLC
Entergy	Entergy Gulf States Louisiana, LLC
Eos	Eos LNG LLC
EPA	U.S. Environmental Protection Agency
EPAct 2005	Energy Policy Act of 2005
ESA	Endangered Species Act of 1973
FEED	Front End Engineering Design
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
Fisheries Research Center	Louisiana Marine Fisheries Enhancement, Research, and Science Center
FLEX	FLNG Expansion and FLNG Liquefaction, LLC
FLNGV	floating LNG vessel
FLSO	floating liquefaction, storage, and offloading
Freeport LNG	Freeport LNG Development, LP and FLNG Liquefaction, LLC
Freeport-McMoRan	Freeport-McMoRan Energy, LLC
FTA	Free Trade Agreement
FWS	U.S. Fish and Wildlife Service
G2 LNG	G2 LNG LLC
G2X Energy	G2X Energy, Inc.
Gasfin	Gasfin Development USA, LLC
GHG	greenhouse gas
GIS	geographic information systems
GMFMC	Gulf of Mexico Fishery Management Council
Golden Pass	Golden Pass Products, LLC
Gulf Coast	Gulf Coast LNG Export, LLC
Gulf LNG	Gulf LNG Liquefaction Company, LLC
GWP	global warming potential
HAP	hazardous air pollutant
HCA	high consequence area
hp	horsepower
IEA	International Energy Agency
IFG	IFG Port Holdings, LLC
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
KMLP	Kinder Morgan Louisiana Pipeline LLC
kV	kilovolt
LAC	Louisiana Administrative Code
Lake Charles LNG	Lake Charles LNG Export Company, LLC and Lake Charles LNG Company, LLC
lb/hr	pounds per hour

LDEQ	Louisiana Department of Environmental Quality
L_{dn}	day-night sound level
LDNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries
L_{eq}	equivalent sound level
Live Oak	Live Oak LNG, LLC
L_{max}	maximum sound level observed during a measurement period or noise event
LNG	liquefied natural gas
LNHP	Louisiana Natural Heritage Program
LOI	Letter of Intent
LOR	Letter of Recommendation
LOS	Levels of Service
Louisiana LNG	Louisiana LNG Energy LLC
LPDES	Louisiana Pollutant Discharge Elimination System
m^3	cubic meters
m^3/hr	cubic meters per hour
MACT	Maximum Achievable Control Technology
Magnolia	Magnolia LNG, LLC
MAOP	maximum allowable operating pressure
MARPOL	International Convention for the Prevention of Pollution from Ships
MBTA	Migratory Bird Treaty Act
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
MMBtu	million British thermal units
MMBtu/hr	million British thermal units per hour
MMPA	Marine Mammal Protection Act of 1972
MOU	Memorandum of Understanding
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MTPA	metric tonnes per annum
MW	megawatts
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAVD 88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act of 1969
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NGA	Natural Gas Act
NGL	natural gas liquids
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NOI for the Lake Charles Expansion Project	*Notice of Intent to Prepare an Environmental Impact Statement for the Proposed Lake Charles Expansion Project and Request for Comments on Environmental Issues*
NOI for the Magnolia LNG Project	*Notice of Intent to Prepare an Environmental Impact Statement for the Planned Magnolia Liquefied Natural Gas Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting*
NO_x	nitrogen oxide

NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	noise sensitive area
NSPS	New Source Performance Standards
NSR	New Source Review
NVIC	Navigation and Vessel Inspection Circular
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
OEP	Office of Energy Projects
OSH Act	Occupational Safety and Health Act of 1970
OSHA	Occupational Safety and Health Administration
OSMR®	Optimized Single Mixed Refrigerant
PGA	peak ground acceleration
PHMSA	Pipeline and Hazardous Materials Safety Administration
Pine Prairie	Pine Prairie Energy Center, LLC
Plan	*Upland Erosion Control, Revegetation, and Maintenance Plan*
PM_{10}	inhalable particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$	inhalable particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
Port Arthur	Port Arthur LNG, LLC and Port Arthur Pipeline, LLC
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
Procedures	*Wetland and Waterbody Construction and Mitigation Procedures*
PSD	Prevention of Significant Deterioration
psia	pounds per square inch absolute
psig	pounds per square inch gauge
PSM standard	*Process Safety Management of Highly Hazardous Chemicals* standard
RECAP	Risk Evaluation/Corrective Action Program
RHA	Rivers and Harbors Act
RICE	reciprocating internal combustion engines
Rio Bravo	Rio Grande LNG, LLC and Rio Bravo Pipeline Company, LLC
RMP	Risk Management Plans
RV	recreational vehicle
Sabine Pass LNG	Sabine Pass LNG, LP
Sasol	Sasol North America, Inc.
SCADA	Supervisory Control and Data Acquisition
SCT&E LNG	Southern California Telephone & Energy LNG, LLC
SHPO	State Historic Preservation Office
SIL	significant impact level
SO_2	sulfur dioxide
SOLAS	*International Convention for the Safety of Life at Sea*
SONRIS	Strategic Online Natural Resources Information System
SO_x	sulfur oxide
SPCC Plan	*Spill Prevention, Control, and Countermeasures Plan*
SSURGO	Soil Survey Geographic

SWLA Economic Development Alliance	Southwest Louisiana Economic Development Alliance
SWPPP	Stormwater Pollution Prevention Plan
TETCO	Texas Eastern Transmission, L.P.
Texas LNG	Texas LNG Brownsville LLC
TGT	Texas Gas Transmission, LLC
tpy	tons per year
TRANSCO	Transcontinental Gas Pipe Line Corporation
Trunkline	Trunkline Gas Company
USC	United States Code
USDA	U.S. Department of Agriculture
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
Venture Global	Venture Global Calcasieu Pass, LLC
VOC	volatile organic compound
WesPac	WesPac Midstream LLC
Westlake Chemical	Westlake Chemical Corporation
WSA	Waterway Suitability Assessment
yd^3	cubic yards
μPa	microPascal

EXECUTIVE SUMMARY

INTRODUCTION

On April 30, 2014, Magnolia LNG, LLC (Magnolia) filed an application with the Federal Energy Regulatory Commission (Commission or FERC) for authorization pursuant to section 3(a) of the Natural Gas Act (NGA) and Part 153 of the Commission's regulations. In Docket No. CP14-347-000, Magnolia requests authorization to site, construct, and operate facilities necessary to liquefy natural gas at a proposed site in Lake Charles, Calcasieu Parish, Louisiana. Magnolia's proposed project is referred to as the Magnolia LNG Project.

On June 30, 2014, Kinder Morgan Louisiana Pipeline LLC (KMLP) filed an application with the FERC for a Certificate of Public Convenience and Necessity (Certificate) pursuant to section 7(c) of the NGA and part 157 of the Commission's regulations. In Docket No. CP14-511-000, KMLP requests authorization to construct and operate system modifications that would allow the delivery of natural gas to Magnolia's proposed liquefied natural gas (LNG) terminal using a new north-to-south path on KMLP's system. The proposed system modifications would be within Acadia, Calcasieu, and Evangeline Parishes, Louisiana. KMLP's proposed project is referred to as the Lake Charles Expansion Project.

The purpose of the environmental impact statement (EIS) is to inform FERC decision-makers, the public, and the permitting agencies about the potential adverse and beneficial environmental impacts of the proposed projects and their alternatives, and recommend mitigation measures that would reduce adverse impacts to the extent practicable. We[1] prepared this EIS to assess the environmental impacts associated with construction and operation of the projects as required under the National Environmental Policy Act of 1969, as amended. Our analysis was based on information provided by Magnolia and KMLP, and further developed from data requests; field investigations; scoping; literature research; contacts with or comments from federal, state, and local agencies; and comments from individual members of the public.

The FERC is the lead agency for the preparation of the EIS. The U.S. Army Corps of Engineers (COE), U.S. Coast Guard (Coast Guard), U.S. Department of Energy, U.S. Department of Transportation (DOT), and U.S. Environmental Protection Agency (EPA) are participating in the National Environmental Policy Act review as cooperating agencies.[2]

PROPOSED ACTION

The Magnolia LNG and Lake Charles Expansion Projects consist of two main components: 1) the construction and operation of various liquefaction facilities, LNG storage tanks, LNG distribution facilities, LNG vessel berthing area, a meter station (Magnolia Meter Station) and appurtenant facilities within the boundaries of the site leased by Magnolia near Lake Charles, Louisiana; and 2) the reconfiguration of KMLP's existing pipeline system in order to accommodate Magnolia's request for natural gas service at the LNG terminal site (collectively referred to as the KMLP facilities), including a new compressor station (Compressor Station 760), new low and high pressure natural gas header pipelines that would be adjacent to the existing KMLP easement, and modifications at six existing meter stations.

Subject to the receipt of FERC authorization and all other applicable permits, authorizations, and approvals, Magnolia anticipates starting construction of the LNG terminal in early 2016, and placing the

---

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

2 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.

first liquefaction train into service in December 2018. The remaining three liquefaction trains would be commissioned at 3-month intervals after completion of the first liquefaction train, with full service anticipated after a total construction period of 45 months. KMLP would construct its proposed facilities over an 11-month period, which is tentatively scheduled to begin in January 2017; these facilities would be in-service prior to startup of the first liquefaction train.

The projects would serve the domestic and export markets for LNG, and the Magnolia LNG Project would have the capacity to export an LNG volume equivalent to 1.08 billion cubic feet per day.

PUBLIC INVOLVEMENT

On March 20, 2013, the FERC began its pre-filing review of the Magnolia LNG Project and established pre-filing Docket No. PF13-9-000 to place information related to the project into the public record. The cooperating agencies agreed to conduct their environmental reviews of the project in conjunction with the Commission's environmental review process.

On June 18, 2013, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Magnolia Liquefied Natural Gas Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting* (NOI for the Magnolia LNG Project). This notice was sent to about 540 interested parties including federal, state, and local officials; agency representatives; conservation organizations; Native American tribes; local libraries and newspapers; and property owners in the vicinity of planned project facilities. Publication of the NOI for the Magnolia LNG Project established a 30-day public comment period for the submission of comments, concerns, and issues related to the environmental aspects of the project.

Between May 1 and 3, 2013, the FERC met with representatives of the COE, Coast Guard, Louisiana Department of Environmental Quality, Louisiana Department of Natural Resources, Louisiana Department of Wildlife and Fisheries, and Magnolia to discuss coordination of agency review, permit requirements and status, and each agency's interest in participating in our environmental review as a cooperating agency. On July 11, 2013, the FERC conducted a public scoping meeting in Lake Charles, Louisiana to provide an opportunity for the public to learn more about the Magnolia LNG Project and to participate in our analysis by providing oral comments on environmental issues to be included in the EIS.

On August 11, 2014, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Proposed Lake Charles Expansion Project and Request for Comments on Environmental Issues* (NOI for the Lake Charles Expansion Project).

Substantive environmental issues identified through this public review process are addressed in this EIS. The transcripts of the public scoping meeting and all written comments are part of the FERC's public record for the projects and are available for viewing using the appropriate docket number.

ENVIRONMENTAL IMPACTS AND MITIGATION

We evaluated the potential impacts of construction and operation of the projects on geology; soils; water resources; wetlands; vegetation; wildlife and aquatic resources; threatened, endangered, and special status species; land use, recreation, and visual resources; socioeconomics; cultural resources; air quality and noise; reliability and safety; and cumulative impacts. Where necessary, we are recommending 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 LNG terminal and KMLP facilities would affect a total of 353.5 acres of land, including additional construction workspaces and access roads. During operation, 144.6 acres would be required for operation of the LNG terminal and new or expanded KMLP facilities, and 173.9 acres would be allowed to revert to the pre-construction land use type. The remaining 35.0 acres within the dredge material placement area would be converted from open water, industrial/commercial, and forest to open land, but would not be retained by Magnolia following construction.

Construction of the LNG terminal would affect a total of 277.7 acres of land, including open land, open water, forest, and industrial/commercial. Operation of the LNG terminal would result in permanent impacts on 123.8 acres of land and open water within the Industrial Canal. Over 99 percent of the area permanently affected by the LNG terminal is within areas that have been previously disturbed by commercial or industrial activities.

Construction of the KMLP facilities would affect about 76 acres of land. Because the activities involve modification or expansion of existing facilities, much of the land affected by the KMLP facilities would be adjacent to the permanent easement associated with KMLP's existing mainline or would be adjacent to or within existing meter station sites. The KMLP facilities would be constructed almost entirely within agricultural lands, although small areas of industrial/commercial and open lands would also be affected.

Important issues identified as a result of our analyses, scoping comments, and agency consultations include impacts on water quality, wetlands, wildlife and aquatic resources, threatened and endangered species, recreation, visual resources, socioeconomics, air quality and noise, safety and reliability, and the cumulative impacts of projects in the vicinity of the proposed Magnolia LNG and Lake Charles Expansion Projects.

Water Resources

The LNG terminal and KMLP facilities are underlain by the Chicot aquifer, which is an EPA-designated sole-source aquifer. In some areas, groundwater withdrawals from the Chicot aquifer are causing lowered water levels (drawdown) and saltwater encroachment. Construction of the LNG terminal would require approximately 2.5 million gallons of groundwater for construction worker sanitation, dust suppression, hydrostatic testing of plant piping at the LNG terminal, cleaning of the LNG storage tanks following hydrostatic testing, and other general utility uses over the 45-month construction period (the majority of which would take place during the first 36 months of construction). On average, approximately 1,800 gallons of groundwater would be required per day, although approximately 6,000 gallons of groundwater would be required per day during peak construction. Groundwater required during construction of the KMLP facilities would be limited to approximately 346,000 gallons of water, which would be used for hydrostatic testing.

Groundwater use associated with operation of the LNG terminal would increase overall withdrawal from the Chicot aquifer by up to 167,378 gallons per day for operation of the demineralized water treatment plant and use as service water. Magnolia conducted a drawdown analysis, which indicated that operation of the new on-site well within the 500-foot sand would result in drawdown of less than 1.5 feet at a distance of 1,500 feet from the point of withdrawal. No groundwater would be necessary for the operation of the KMLP facilities. We anticipate that construction and operation of the projects would have long-term, but minor impacts on the Chicot aquifer.

No private water wells are within 150 feet of the proposed LNG terminal site; two private water wells are within 150 feet of the KMLP facilities. KMLP would contact each affected landowner to confirm the locations of private wells within 150 feet and public wells within 400 feet of the construction workspace. To document impacts on water wells and verify that they are appropriately addressed, we are recommending that, within 30 days of placing facilities in service, KMLP file a report identifying all public or private water supply wells/systems damaged by construction and a description of how they were repaired. The report should also include a discussion of any other complaints concerning well yield or water quality and how each problem was resolved.

The Industrial Canal at the LNG terminal site is designated as essential fish habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act and a Navigable Waterway under section 10 of the Rivers and Harbors Act. The primary impacts on water quality within the canal during construction of the LNG terminal would be from dredging the berthing area for LNG vessels and the associated suspension of sediments in the water column. These effects would be minor since they would be temporary and limited to the immediate area. Magnolia's proposed use of a hydraulic dredge with a suction cutter head would minimize turbidity and surface water quality impacts. To further minimize these impacts, Magnolia would finalize and implement its *Dredging Water Quality Monitoring Plan*. However, because this plan has not been finalized, we are recommending that, prior to construction, Magnolia file its final *Dredging Water Quality Monitoring Plan*.

In-water construction associated with the LNG loading and ship berthing facilities, ground disturbance, filling of one intermittent waterbody that is not hydrologically connected to the Industrial Canal and one man-made waterbody, and general construction activities within the terminal site would result in localized, temporary increases in turbidity and suspended sediment levels. To minimize impacts on water quality, land disturbing activities would be conducted in compliance with the Louisiana Pollutant Discharge Elimination System General Permit; Magnolia would implement its project-specific *Construction Stormwater Pollution Prevention Plan*, *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan), and *Wetland and Waterbody Construction and Procedures* (Procedures); and KMLP would implement the FERC Plan and Procedures. As a result, impacts on surface water quality are expected to be temporary and limited to the area within and immediately adjacent to the proposed facilities.

During construction of the LNG terminal, 50 or fewer marine deliveries would supply large equipment and materials to the Dynamic Industries, Inc. construction yard. During operation, approximately 208 LNG vessels (104 LNG carriers and 104 LNG barges) would call on the LNG terminal per year. The construction and operational vessel traffic may increase shoreline erosion and temporarily increase turbidity levels within the Industrial Canal and along vessel transit routes. To provide protection from scour, Magnolia would install rock armoring both within and along the east and west ends of the recessed berthing area. The rock armoring would prevent erosion of the adjacent unprotected shoreline by wave activity from vessels maneuvering within the recessed berthing area.

LNG carriers serving the terminal would discharge between approximately 8,711,000 to 12,264,000 gallons of ballast water into the Industrial Canal during LNG loading. Ballast water discharges at the LNG terminal could impact water quality by changing the salinity, temperature, pH, and dissolved oxygen level of water within the Industrial Canal. The composition of ballast water in comparison to the water present within the Industrial Canal and Calcasieu River would vary depending on tidal and hydrologic conditions at the time of discharge. The primary potential impact on water quality due to ballast water discharge would be a temporary increase in salinity level. Because ballast water would be discharged near the bottom of the berthing area, and would comprise approximately 0.6 percent of the approximately 2 billion gallons of water within the Industrial Canal, we anticipate that natural flow and tidal exchange would dilute the ballast water discharge to salinity levels that typically occur within the Industrial Canal in the immediate vicinity of the LNG terminal and that increased salinity would represent a temporary and minor impact on water quality.

LNG carriers and LNG barges require water for cooling of the main engine/condenser, diesel generators, and fire main auxiliary and hotel services. Impacts on surface waters would be primarily limited to an increase in water temperature in the vicinity of the LNG vessel resulting from the discharge of water between 2.7 degrees Fahrenheit (°F) and 7.2 °F warmer than ambient water temperatures. Due to the limited temperature differences, relatively small volume of discharge compared to the total water within the canal, and location within an active port that is already subject to withdrawals and discharges of vessel engine cooling water, we have determined that cooling water discharges would have temporary and minor impacts on water quality.

A total of 10 waterbodies, including 3 intermittent waterbodies and 7 ephemeral ditches would be crossed or otherwise affected (e.g., culvert installation) by construction of the KMLP facilities. None of the waterbodies impacted by the KMLP facilities are listed as National Wild and Scenic Rivers, designated as Outstanding Natural Resource Waters, designated as EFH, or contain federally or state-listed species. KMLP would minimize potential impacts on surface waters by implementing the FERC Procedures and utilizing dry crossing construction techniques if flowing water is present within the waterbodies at the time of construction.

With implementation of the *Dredging Water Quality Monitoring Plan,* Magnolia's project-specific Procedures, Magnolia's and KMLP's other project-specific plans and proposed additional mitigation measures included in the EIS, and our recommendations, we conclude that impacts on water resources would be adequately minimized.

Wetlands

Construction of the LNG terminal would result in the permanent loss of approximately 16 acres of wetlands, including 8 acres of palustrine emergent wetlands, 7 acres of palustrine scrub-shrub wetland, 1 acre of estuarine emergent intertidal wetland, and less than 1 acre of palustrine forested/scrub-shrub wetland. Approximately 87 percent of the wetlands would be converted to upland industrial or open land within the LNG terminal site, 7 percent would be converted to an upland herbaceous community within the dredge material placement area, and the remaining 6 percent would be converted to open water within the recessed berthing area or filled for shoreline stabilization. To date, access has not been granted to conduct the necessary wetland surveys along the dredge material and effluent pipeline route or within the dredge material placement area. Therefore, we are recommending that Magnolia file the results of the wetland and waterbody surveys within areas associated with the transport and placement of dredge materials as soon as they are available and prior to the start of construction.

Because the *Compensatory Mitigation Plan* has not been finalized and approved by the COE, we are recommending that, prior to filing its Implementation Plan, Magnolia file with the Secretary its *Compensatory Mitigation Plan* and documentation of COE approval of the plan.

Construction and operation of the KMLP facilities would permanently convert 0.3 acre of palustrine emergent wetlands to upland industrial use. These impacts would primarily occur within the expanded Texas Gas Transmission, LLC Meter Station, but would also include very small areas at the Transcontinental Gas Pipe Line Corporation Meter Station and where connection of the high pressure header pipeline would require modifications of existing interconnect facilities adjacent to the Pine Prairie Meter Station. In its jurisdictional determinations for the KMLP facilities, the COE determined that wetlands present are not jurisdictional under section 404 of the Clean Water Act; therefore, compensatory mitigation for these wetland impacts would not be required. KMLP would still implement the mitigation measures described in our Procedures during construction and operation within these wetlands.

Our Procedures state that aboveground facilities should be located outside of wetlands, except where such siting would prohibit compliance with DOT regulations. Magnolia and KMLP have each proposed locating portions of aboveground facilities within wetlands. We have determined that these proposed deviations from our Procedures are reasonable.

With the implementation of Magnolia's and KMLP's project-specific plans, the proposed mitigation measures discussed in this EIS, and our recommendations, we conclude that impacts on wetlands due to construction and operation of the projects would be permanent but minor.

Wildlife and Aquatic Resources

The greatest impacts on terrestrial wildlife due to construction and operation of the projects would result from the permanent loss of forested and open lands within the LNG terminal site (approximately 34 and 31 acres, respectively), which would result in a permanent reduction in these habitat types in the general vicinity of the LNG terminal. However, due to the site's previous use as a dredge disposal site and the low diversity of vegetation species, the site's value as habitat for wildlife is limited. We expect impacts due to noise, light, and human activity during operation of the LNG terminal to be negligible because wildlife in the area are acclimated to similar effects from activities at the existing nearby industrial facilities along the Industrial Canal.

During construction and operation of the KMLP facilities, most impacts on wildlife would be short-term and limited to the construction period. With the implementation of our Plan and Procedures, and due to the fact that abundant similar habitat is available for wildlife adjacent to the affected areas, we conclude that construction and operation of the KMLP facilities would not have a significant impact on local wildlife populations or habitat.

The vegetation communities within the LNG terminal and KMLP facilities are previously disturbed, within or adjacent to existing facilities, and/or composed of agricultural land, all of which reduce bird nesting habitat value. To minimize impacts on migratory birds during construction, Magnolia would direct all nighttime lighting towards construction activity and use the minimum light level necessary to ensure site safety and security. Similarly, outdoor lighting at the KMLP aboveground facilities would be limited, shielded, and downward-facing to facilitate safe operations at night or during inclement weather. Perimeter lighting at aboveground KMLP facilities would be turned off at night and would only be used when necessary for work conducted at night. Magnolia has not developed its *Facility Lighting Plan* for operation; therefore, we are recommending that, prior to construction, Magnolia file its *Facility Lighting Plan* for operation of the LNG terminal that would include measures to minimize operational lighting impacts on birds.

Activities associated with construction and operation of the LNG terminal with the greatest potential to impact aquatic resources include dredging, pile driving, and vessel traffic. The proposed waterbody modifications, water withdrawals for hydrostatic testing, stormwater runoff, lighting, and inadvertent spills could also affect aquatic resources; however, with the implementation of the proposed mitigation measures, these impacts are expected to be minimal.

Construction of the recessed berthing area at the LNG terminal site would require dredging a 16.2-acre area in the Industrial Canal. Potential impacts on aquatic resources resulting from dredging activities include direct take and habitat modification as well as temporary increases in noise, turbidity, and suspended solid levels. Most fish species are highly mobile and would be expected to leave the area during dredging activities. Dredging would, however, result in direct mortality of benthic organisms (e.g., aquatic macroinvertebrates, mollusks, and crustaceans, which are important food sources for many species of fish) within the 9.8-acre portion of the dredge footprint that currently provides open water habitat. Impacts on aquatic resources due to increased turbidity and suspended solid levels would vary by species; however, the aquatic resources present within the project area are likely accustomed to regular fluctuations in noise and turbidity levels from industrial activity and maintenance dredging (which is scheduled to occur every other year) within the Industrial Canal. To minimize impacts on aquatic resources due to increased turbidity and suspended solid levels, Magnolia would use a hydraulic cutterhead suction dredge and would implement its *Dredging Water Quality Monitoring Plan*. With the implementation of these mitigation measures and our recommendation that Magnolia file its finalized *Dredging Water Quality Monitoring Plan*, we have determined that impacts on aquatic resources would be localized, temporary, and minor.

Construction of the LNG terminal would require the installation of approximately 5,000 piles over a 16-month period to support the proposed structures, including both in-water and onshore piles. The primary impacts on aquatic resources from pile driving activities would be avoidance of the area, stress, or injury due to the underwater sound pressure levels. Magnolia would perform hydro-acoustic monitoring during the initial pile testing to determine the sound pressure levels generated under site-specific conditions at the LNG terminal. Because pile driving plans have not been finalized and an estimate of underwater noise has not been provided, we are recommending that Magnolia file a *Pile Driving Noise Impact Mitigation Plan* prior to the end of the draft EIS comment period. This plan should describe the hydroacoustic monitoring methods that Magnolia would use to determine representative sound pressure levels associated with in-water pile driving as well as mitigation measures to be implemented to reduce sound pressure levels. With the implementation of hydroacoustic monitoring and mitigation measures, if needed, pile driving activities would minimize underwater noise levels to a level that would not cause significant impacts on aquatic resources.

During construction and operation of the LNG terminal, barges, support vessels, and LNG vessels would call on the LNG terminal, increasing ship traffic within the Industrial Canal, Calcasieu Ship Channel, Intracoastal Waterway, and Gulf of Mexico. The greatest potential impacts on aquatic resources resulting from increased vessel traffic include reduced dissolved oxygen levels due to ballast water discharges and increased water temperature due to cooling water discharges. Depending on the oxygen levels present in both the ballast and ambient water at the time of discharge, aquatic resources present in the vicinity of the discharge point could be exposed to dissolved oxygen levels considered unhealthy for aquatic life. However, resident species within the Industrial Canal are well adapted to natural variation in 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.

During operation, LNG carriers require water for cooling of the main engine/condenser, diesel generators, and fire main auxiliary and hotel services, which would be between 2.7 °F and 7.2 °F warmer than ambient water temperatures when discharged. Given the amount of ballast and cooling water discharged into the Industrial Canal during each LNG vessel visit to the LNG terminal in relation to the approximately 2 billion gallons of water within the Industrial Canal, we have determined that impacts on aquatic resources would be intermittent and minor.

Due to the relatively small area of EFH impacted within the Industrial Canal, the increase in the amount of estuarine water column habitat created during construction of the LNG vessel berthing area, Magnolia's proposed mitigation measures, and preliminary agency coordination, we have determined that the Magnolia LNG Project would not have a significant adverse impact on EFH. We are requesting that the National Marine Fisheries Service consider the EIS as our EFH Assessment.

Threatened and Endangered Species

Sixteen federally listed threatened, endangered, or candidate species may occur in parishes affected by the projects. Within these parishes, critical habitat has been designated for one species, the piping plover. We determined that the projects would have no effect on four federally listed species, are not likely to destroy or adversely modify designated critical habitat, and would not contribute to the trend toward federal listing for one candidate species.

Potentially suitable habitat for the remaining 11 federally listed species is not present within areas affected by construction or operation of the LNG terminal or KMLP facilities; however, potentially suitable habitat is present along the portion of the LNG vessel transit route in Cameron Parish and the Gulf of Mexico. Although rare, five species of sea turtles, five species of whales, and the West Indian manatee could occur along the LNG vessel transit route. Based on the species' characteristics and habitat requirements, and because Magnolia would provide LNG ship captains with the National Marine Fisheries Service-issued *Vessel Strike Avoidance Measures and Reporting for Mariners*, we have determined that the Magnolia LNG Project *may affect, but is not likely to adversely affect* these federally listed species.

As required by Section 7 of the Endangered Species Act, we request that the National Marine Fisheries Service accept the information provided in this EIS as the Biological Assessment for the projects. Further, we request concurrence with our findings of effect for federally listed species. The projects would have no effect on listed species under the jurisdiction of the U.S. Fish and Wildlife Service; therefore, preparation of a Biological Assessment and consultation between the FERC and U.S. Fish and Wildlife Service is not required by Section 7 of the Endangered Species Act.

Recreation

One designated recreational area, Calcasieu Point Landing, is within 1 mile of the proposed facilities. Calcasieu Point Landing is approximately 525 feet west of the LNG terminal site at the western end of Henry Pugh Boulevard. Recreational boating and fishing activities occurring within the Industrial Canal and near the Calcasieu Point Landing could be affected by construction and operation of the LNG terminal due to increased noise, delayed access to the landing, restrictions on fishing in the immediate vicinity of the LNG terminal, and vessel traffic. Increased noise associated with construction of the LNG terminal could deter recreational users from fishing in the immediate vicinity of project activities. In particular, dredging and pile driving activities, which would occur up to 7 days per week and 6 days per week, respectively, during the first 20 months of construction, could result in avoidance of the area by recreational users. As a result, we have determined that construction of the LNG terminal would result in temporary and moderate impacts on recreational use of Calcasieu Point Landing. During operation of the LNG terminal, delays to recreational users could occur due to the moving security zone around LNG vessels during transit to and from the LNG terminal; an impact that we expect would be intermittent and minor.

Visual Resources

The viewshed of the proposed LNG terminal includes a portion of the Creole Nature Trail Scenic Byway (Highway 27), which is approximately 2 miles west of the LNG terminal across the Calcasieu Ship Channel and as close as 0.3 mile west of the LNG vessel transit route along the Calcasieu Ship Channel; however, no other federally, state, or locally designated visual resources have been identified in the viewshed. Although not a designated visual resource, due to its proximity to the LNG terminal and lack of visual buffers, the LNG terminal would be prominent when viewed from Calcasieu Point Landing both during daytime hours and in the evening when the facilities would be illuminated in accordance with federal safety regulations. Activities associated with construction of the LNG terminal may be visible from residences to the south and southeast of the LNG terminal along Airhart and Joe Ledoux Roads.

The primary existing structures in the viewshed of the LNG terminal include the Trunkline LNG Terminal, Lake Charles Carbon Company, and other industrial properties adjacent to the Industrial Canal. The viewshed also includes the Industrial Canal to the north and west, the Intracoastal Waterway and Calcasieu Ship Channel to the south, and forest and wetlands to the northwest and south of the site. Because the site is slightly higher in elevation than the surrounding area due to the previous placement of dredge spoil at the site, and the topography of the surrounding area is fairly level, visibility would extend outward from the site except where buffered by vegetation or existing structures.

Permanent changes to the visual character of the area would result from operation of the LNG terminal due to the presence of aboveground structures that would modify the viewshed. The most prominent visual features at the terminal would be two LNG storage tanks and the flare stack. Magnolia anticipates that flaring would occur for approximately 5 days during startup of the LNG terminal. During operation of the terminal, use of the marine and emergency flares would only occur during process upset conditions. The new facilities would also require lighting for operations, safety, and to comply with Federal Aviation Administration requirements. To minimize visual impacts, lighting at the LNG terminal would be shielded and downcast to avoid interference with navigation; in addition, facilities within the LNG terminal site would be partially obscured by the proposed vapor barrier. To further minimize visual impacts, we are recommending that, prior to construction, Magnolia file its final *Facility Lighting Plan* for operation of the LNG terminal. Facilities associated with the LNG terminal would be consistent with the viewshed presented by other industrial features along this portion of the Industrial Canal. Therefore, we have determined that the LNG terminal would have a permanent and moderate impact on visual resources when viewed from the Calcasieu Point Landing and a permanent, but minor impact on visual resources when viewed from other vantage points.

Socioeconomics

Construction of the projects would have a minor to moderate impact on local populations, employment, housing, provision of community services, and property values. There would not be any disproportionately high or adverse environmental and human health impacts on low-income and minority populations from construction or operation of the projects. No residences or businesses would be displaced as a result of construction or operation of the LNG terminal or KMLP facilities. Construction and operation of the projects would result in minor 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.

During construction of the LNG terminal, traffic levels on area roadways would increase due to the presence of worker vehicles, construction vehicles, and trucks delivering concrete to the site. Due to its location immediately adjacent to the LNG terminal site, most materials would be delivered to the Dynamic Industries, Inc. construction yard via the Industrial Canal. Therefore, except for trucks delivering concrete to the site, minimal construction truck traffic is anticipated. Impacts on local users of the roadway network due to construction of the LNG terminal include potential delays due to increased traffic levels and diminished roadway capacity. With the implementation of the planned improvements at the intersections of Tank Farm and Big Lake Roads, Big Lake and Lincoln Roads, and Lincoln Road and Gulf Highway, we have determined that impacts from construction of the LNG terminal would have temporary and minor impacts on local users of the roadway network. Construction of the KMLP facilities would have minimal impact on traffic or roadways. Operation of the projects would not result in any significant impacts on traffic or roadways.

Air Quality and Noise

Air quality impacts due to construction of the projects would generally be temporary and localized, and are not expected to cause or contribute to a violation of applicable air quality standards. The LNG terminal and KMLP facilities would be located in areas currently classified as being in attainment for all criteria pollutant standards; however, because the area is vulnerable to being designated as non-attainment in the next few years, we are recommending that, prior to the end of the draft EIS comment period, Magnolia and KMLP file a *Fugitive Dust Control Plan* as well as further details regarding commitments to reduce pollutants from mobile and stationary construction equipment.

During operation, the LNG terminal would be a Prevention of Significant Deterioration major source for nitrogen oxides and carbon monoxide. In addition, it would be a Title V major source for inhalable particulate matter with an aerodynamic diameter less than or equal to 10 microns and less than or equal to 2.5 microns and would be considered a minor source of hazardous air pollutant emissions. KMLP's proposed Compressor Station 760 would be a Title V major source for carbon monoxide and would be considered a minor source of all other criteria pollutants, as well as hazardous air pollutant emissions. Magnolia and KMLP would minimize operational impacts on air quality by adhering to applicable federal and state regulations as described in their air permit applications to the Louisiana Department of Environmental Quality.

Based on the analyses conducted and mitigation measures proposed, we conclude that construction and operation of the projects would result in a moderate impact on air quality; however, given the mitigation measures proposed by Magnolia and KMLP, and air quality controls and monitoring requirements to be included in the Title V/Prevention of Significant Deterioration permits for the facilities, the projects would not result in a degradation of regional air quality.

Construction activities at the LNG terminal would generate temporary increases in sound levels over a total of 45 months. Construction activities would occur predominantly during the day, Monday through Saturday. However, certain activities would occur up to 24 hours per day, 7 days per week. In particular, dredging may occur up to 24 hours per day, 6 days per week and pile driving could occur up to 10 hours per day, 7 days per week.

The most prevalent sound-generating equipment and activity during construction of the projects is anticipated to be pile driving at the LNG terminal, although internal combustion engines associated with general construction equipment would also produce sound levels that would, at times, be perceptible at the nearest noise sensitive areas. Magnolia anticipates that impact-type pile drivers would be used during construction of the proposed facilities, which may be installed using both land-based and floating platforms. Based on the noise estimates provided by Magnolia and because of the 16-month duration of the pile driving activities, we have determined that sound levels may have an adverse impact at the nearest noise sensitive areas. Therefore, we are recommending that Magnolia include in its *Pile Driving Noise Impact Mitigation Plan* measures to reduce pile driving noise to no greater than 10 decibels on the A-weighted scale over ambient levels at the nearest noise sensitive areas (an increase of 10 decibels is perceived by the human ear as though the sound intensity has doubled).

Operation of the LNG terminal and Compressor Station 760 would produce noise on a continuous basis throughout the lifetime of the facilities. Modeling results indicate that, with the incorporation of proposed noise mitigation measures, the noise from operation of the LNG terminal and Compressor Station 760 would not exceed the threshold of 55 decibels on the A-weighted scale (the noise threshold established to protect the public from activity interference and annoyance outdoors in residential areas) at any of the noise sensitive areas. We are recommending that Magnolia and KMLP conduct post-construction noise surveys for the LNG terminal and Compressor Station 760 to ensure noise impacts resulting from the projects would not be significant.

Based on the analyses conducted, mitigation measures proposed, and with our additional recommendations, we conclude that the projects would not result in significant air or noise impacts on residents and the surrounding communities during construction and operation.

Safety and Reliability

We evaluated the safety of the proposed LNG terminal, including assessments of hazards, preliminary engineering design, siting, emergency response, and security systems. Based on our technical review of the preliminary engineering design, we conclude that, with the incorporation of our recommendations, the Front End Engineering Design presented by Magnolia would include acceptable layers of protection or safeguards to reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public.

We also analyzed whether the LNG terminal would be sited in accordance with federal regulations. Magnolia would be regulated by the FERC, DOT, Coast Guard, EPA, and Occupational Safety and Health Administration (OSHA). As a cooperating agency, the DOT assisted FERC staff in evaluating whether Magnolia's proposed design would meet the DOT siting requirements. In a September 17, 2014 letter to FERC staff, the DOT stated that it had no objection to Magnolia's methodology for determining a single accidental leakage source to establish the siting for its proposed LNG terminal. In addition, we are recommending that, prior to the end of the draft EIS comment period, Magnolia file concurrence from the DOT regarding the design spill selections. On January 13, 2015, the DOT determined Magnolia's proposal to comply with EPA's Risk Management Program and OSHA's Process Safety Management program would satisfy the siting requirements for the anhydrous ammonia refrigerant system. Magnolia has submitted a preliminary Risk Management Program as part of its application to satisfy these regulations. Magnolia would comply with the comprehensive EPA's Risk Management Program and OSHA Process Safety Management programs as well as DOT's requirements under Title 49 Code of Federal Regulations Part 193 (49 CFR 193) and National Fire Protection Association Standard 59A. By complying with EPA's Risk Management Program and OSHA Process Safety Management, Magnolia would comply with the same regulations as every other facility in the United States that uses the proposed quantities of ammonia. As a result, we conclude that potential hazards from the siting of the facility at this location would not have a significant impact on public safety.

In accordance with 33 CFR 127, the Coast Guard has reviewed the proposed LNG terminal. The Coast Guard issued its Letter of Recommendation on February 12, 2015. The Letter of Recommendation stated that the Calcasieu Ship Channel is considered suitable for LNG marine traffic in accordance with the guidance in the Coast Guard's Navigation and Vessel Inspection Circular 01-2011. The Waterway Suitability Assessment review focused on the navigation safety and maritime security aspects of LNG vessel transits along the affected waterway. Based on the results of the assessment of potential risks to navigation safety and maritime security associated with the proposed facility, the Coast Guard has determined that the Calcasieu Ship Channel would be suitable for accommodating the type and frequency of LNG marine traffic associated with this project.

KMLP would design, construct, operate, and maintain the proposed KMLP facilities in accordance with 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 pipelines from corrosion. We conclude that the proposed KMLP facilities would incrementally increase the risk of a pipeline accident; however, KMLP's compliance with the DOT's safety standards would ensure that KMLP's construction and operation of the facilities would not have a significant impact on public safety.

Based on our engineering design analysis and recommendations; the DOT siting requirements and recommendations; the Letter of Recommendation issued by the Coast Guard concluding the LNG vessel transit is suitable for LNG marine traffic; and the regulatory requirements for the design, construction, and operation of the pipeline and terminal; we conclude that the projects would not result in significantly increased public safety risks.

Cumulative Impacts

Our analysis of cumulative impacts includes other projects in the vicinity of the proposed Magnolia LNG and Lake Charles Expansion Projects that could affect the same resources in the same approximate time frame. We conclude that the proposed projects' contribution to cumulative impacts on resources affected by other projects occurring in the vicinity during the same time frame would not be significant. The proposed projects' contribution to cumulative impacts would be greatest on housing, public services, and transportation, which are discussed below.

The influx of non-local workers would affect the availability of housing in Southwest Louisiana, which may result in increased rental rates and housing shortages for lodging if all of the proposed and planned projects are implemented according to the expected timeframes. This would benefit the local housing market, but could adversely affect those seeking housing. Some members of the workforce may be forced to commute longer distances to obtain housing in adjacent parishes or Texas. To accommodate the anticipated influx of construction workers, two worker housing developments are expected to be available for up to 6,500 workers. In addition to worker housing developments, a number of residential housing developments are planned or under construction in the Lake Charles area. New housing units, which include single-family dwellings, multi-family dwellings, hotels, and various residential projects, could total 8,070 units if all publicly announced projects are permitted and constructed according to current plans. Therefore, we conclude that cumulative impacts on housing would be moderate.

Concurrent construction of the proposed projects and other projects in the area would result in increased workers in the area, which could increase the need for some public services. The need for these services would generally be spread throughout the parishes that house the workforce (Acadia, Calcasieu, Cameron, Evangeline, and Jefferson Davis Parishes), but there may be an increased need for medical and emergency services in Cameron and Calcasieu Parishes where the proposed project facilities and construction workers are expected to be concentrated. Magnolia would provide its own on-site security and the Calcasieu Parish Sheriff's Office indicated that it believes it has sufficient resources available to provide protection services by adjusting patrol schedules or hiring additional staff with revenues allocated by Calcasieu Parish. In addition, Magnolia is currently in discussions with the Lake Charles Fire Department to identify measures for providing fire protection at the LNG terminal site. Options include funding fire-fighting services either independently or by entering into a mutual aid agreement with future industrial neighbors for the purpose of employing an industrial firefighting team trained in fighting fires at industrial facilities. With the increase in local taxes and government revenue associated with the proposed projects, the overall cumulative impact on public services would be expected to be minor.

Construction of the proposed projects concurrent with construction and operation of the other projects in the area would also increase both roadway and marine traffic, which could result in delays for other users of local roadways and ship transit route, respectively. Between early 2016 and the end of 2017, construction of three facilities adjacent to and within the Industrial Canal would occur, including the proposed LNG terminal, Lake Charles Liquefaction Project, and G2X Energy Lake Charles gasoline facility. Magnolia, the Lake Charles LNG companies, and G2X Energy commissioned a *Traffic Impact Study* to assess potential impacts of vehicular traffic associated with both construction and operation of the three projects, and to develop measures to mitigate impacts on local users of area roadways. The *Traffic Impact Study* found that the existing roadway network does not have sufficient capacity to accommodate the expected peak hour traffic volumes associated with construction of the three facilities. To minimize impacts on local users of the roadways, the study recommended the use of off-site and temporary parking for construction workers as well as roadway improvements at several driveways and intersections near the Industrial Canal. Magnolia, the Lake Charles LNG companies, and G2X Energy have agreed to the recommended measures within the *Traffic Impact Study*. Therefore, we conclude that cumulative impacts on roadway traffic would be moderate.

Traffic within the Calcasieu Ship Channel is expected to markedly increase over the next 10 years. In 2018, traffic within the channel is expected to be 1,668 vessels per year; in 2023, traffic within the channel is expected to be 2,183 vessels per year, more than twice the 2013 level. During operation, approximately 208 LNG vessels would call on the LNG terminal per year. Due to the anticipated cumulative increase in vessel traffic, the Port of Lake Charles commissioned a simulation to investigate the impact of increased traffic on the operations of the channel and to assess the need for changes to channel infrastructure and regulations. Results of the study indicate that the median wait time is expected to increase by 2.3 hours per vessel, and notes that LNG carriers would experience the highest increase in median wait time (8.9 hours). The wait times are expected to vary seasonally, and would be higher during the winter months and lower during the summer months. Based on the Coast Guard's Letter of Recommendation for the Magnolia LNG Project and the expected increase in the median wait time by 2.3 hours per vessel, we have determined that operation of the LNG terminal would have a permanent and moderate increase in marine traffic within the Industrial Canal and Calcasieu Ship Channel.

ALTERNATIVES CONSIDERED

As alternatives to the proposed action, we evaluated the No-Action Alternative, system alternatives for the proposed LNG terminal and KMLP's pipeline system, alternatives sites for the proposed aboveground facilities, alternative liquefaction processes, and alternative power sources for the LNG terminal and Compressor Station 760. 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 LNG terminal included 7 operating LNG import terminals with approved, proposed, or planned expansions to provide liquefaction capabilities and 19 approved, proposed, or planned stand-alone liquefaction projects. All of these were eliminated from further consideration as viable alternatives for reasons that include insufficient capacity to meet Magnolia's customer commitments without constructing facilities beyond those currently approved, planned, or proposed; incompatible timeframes with in-service dates that would not meet Magnolia's customer commitments; and environmental impacts that were considered comparable to or greater than those of the proposed LNG terminal. We evaluated three system alternatives to KMLP's pipeline system. All three systems were eliminated from further consideration because they would require construction of additional pipeline looping or greenfield construction to provide the 1.4 billion cubic feet per day of natural gas required by the Magnolia LNG Project (the Magnolia LNG Project would have the capacity to export an LNG volume equivalent up to 1.08 billion cubic feet per day).

We evaluated the proposed site and four alternatives sites for the LNG terminal. We concluded that the proposed site represents an acceptable site for the proposed LNG terminal because it is currently zoned for heavy industrial use, sufficiently sized to allow optimal facility layout design, and avoids the need for off-site LNG piping. It is also geographically well separated from area residences, and contains the lowest acreage of wetlands of the alternatives considered. We did not identify any alternative configurations for the LNG terminal that would meet the design and configuration requirements of the DOT's regulations and other industry or engineering standards while avoiding or reducing the impacts associated with the proposed LNG terminal configuration. We also evaluated the proposed site and two alternative sites for Compressor Station 760. We concluded that the proposed site represents an acceptable site for a compressor station and find no environmental reason to recommend one of the alternate sites over the proposed site. We did not identify any environmental concerns that indicate a need to identify and evaluate alternative sites for the meter station modifications or header pipeline routes. These facilities would occur within and adjacent to existing facilities, which minimize the footprint and associated environmental impacts.

We evaluated the proposed site and three alternative sites for dredge material placement. We concluded that both the proposed site and one potential alternative, the Turner Bay site, represent acceptable sites for dredge material placement.

We evaluated a total of eight liquefaction technologies, which are currently available, including the proposed liquefaction process. The proposed OSMR® Process is based on the single mixed refrigerant process, but uses aero-derivative gas turbines, combined heat and power technology, and ammonia auxiliary refrigeration to increase efficiency and reduce air emissions by approximately 30 percent. The use of anhydrous ammonia includes safety hazards due to its toxicity and farther dispersion distances to irreversible effects. However, the hazards associated with anhydrous ammonia are well understood, can be mitigated to safe levels with additional mitigation measures, and would be subject to the regulation of a number of federal agencies. Therefore, while there would be viable liquefaction processes that provide inherently safer alternatives, there would not be a significant environmental or safety advantage in the selection of those liquefaction processes when considering the additional mitigation measures Magnolia would implement during operation of the terminal.

We evaluated and ruled out the use of electrically driven motors as an alternative to gas-fired turbines at the proposed LNG terminal due to the excessive amount of electrical power required. To use electric-powered motors, power would either have to be generated on site or imported from the municipal power grid, neither of which would be a feasible alternative supply source.

We performed an alternative review of four power sources for compression at Compressor Station 760, including gas-fired turbine driven (proposed), reciprocating gas-driven, electric motor-driven, and waste heat electric generation. The analysis concluded that the proposed power source for Compressor Station 760 is acceptable. The use of reciprocating gas-driven compressor units would result in a larger number of units being required to provide the same amount of power as the proposed gas-fired, turbine-driven compressor units, which would result in both higher costs and a larger facility footprint. The use of electric-motor driven compressors would require an electric load of a magnitude serviceable only by a high-voltage transmission system, which would require construction of two new 138-kilovolt cross-country transmission lines and a new electrical substation at the compressor station. KMLP has stated that Compressor Station 760 would likely not operate when the LNG terminal is not producing LNG, which could greatly reduce the economic feasibility of using waste heat electric generation.

CONCLUSIONS

We determined that construction and operation of the proposed projects would result in adverse environmental impacts, but impacts would be reduced to less-than-significant levels with the implementation of the applicants' proposed and our recommended mitigation measures. This determination is based on a review of the information provided by Magnolia and KMLP and further developed from data requests; field investigations; scoping; literature research; alternatives analysis; and contacts with federal, state, and local agencies as well as Indian tribes and individual members of the public.

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

- Over 99 percent of the area permanently affected by the LNG terminal is within areas that have been previously disturbed by commercial or industrial activities.
- The KMLP facilities would occur within and adjacent to existing facilities, which would minimize new disturbance.
- Magnolia would mitigate impacts on jurisdictional wetlands associated with the construction and operation of the proposed LNG terminal in accordance with Magnolia's project-specific *Compensatory Mitigation Plan.*
- The FERC staff would complete the process of complying with Section 7 of the Endangered Species Act prior to construction.
- The 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 projects.
- Magnolia and KMLP would comply with all applicable air and noise regulatory requirements during construction and operation of the projects.
- Magnolia and KMLP would minimize impacts on environmental resources during construction and operation of the projects by implementing, as applicable, their spill prevention plans; Magnolia's *Compensatory Mitigation Plan*; *Unanticipated Discovery Plans* (for cultural resources); and by implementing either the FERC's Plan and Procedures (KMLP) or the project-specific Plan and Procedures (Magnolia).
- 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 30 mitigation measures that Magnolia and KMLP should implement to further reduce the environmental impacts that would otherwise result from construction and operation of the projects; 75 measures the Magnolia should implement that are specific to engineering, vulnerability, or detailed design of the LNG terminal; and 4 measures relating to inspections, reporting, and notifications, and non-scheduled events that would apply throughout the life of the LNG terminal. We determined that these measures are necessary to reduce adverse impacts associated with the projects and, in part, are basing our conclusions on implementation of these measures. Therefore, we are recommending 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 draft EIS.

1.0 INTRODUCTION

On April 30, 2014, Magnolia LNG, LLC (Magnolia) filed an application with the Federal Energy Regulatory Commission (Commission or FERC) for authorization pursuant to section 3(a) of the Natural Gas Act (NGA) and part 153 of the Commission's regulations. In Docket No. CP14-347-000, Magnolia requests authorization to site, construct, and operate facilities necessary to liquefy natural gas at a proposed site in Lake Charles, Calcasieu Parish, Louisiana.

On June 30, 2014, Kinder Morgan Louisiana Pipeline LLC (KMLP) filed an application with the FERC for a Certificate of Public Convenience and Necessity (Certificate) pursuant to section 7(c) of the NGA and part 157 of the Commission's regulations. In Docket No. CP14-511-000, KMLP requests authorization to construct and operate system modifications that would allow the delivery of natural gas to Magnolia's proposed liquefied natural gas (LNG) terminal using a new north-to-south path on KMLP's existing system. The proposed system modifications would be located within Acadia, Evangeline, and Calcasieu Parishes, Louisiana.

As part of the Commission's consideration of these applications, we[1] prepared this draft environmental impact statement (EIS) to assess the potential environmental impacts resulting from construction and operation of the facilities proposed by Magnolia and KMLP as connected actions in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA).

Magnolia's proposal, referred to in this EIS as the Magnolia LNG Project, would be located on approximately 114 acres of a 115-acre parcel of land on the south shore of the Industrial Canal that is about 9 miles southwest of the city of Lake Charles, Louisiana. The Magnolia LNG Project, which is currently expected to begin operation at the end of 2018, would produce a nominal capacity of approximately 8.0 million (metric) tonnes per annum (MTPA) of LNG during the 30-year life of the project. The LNG terminal would receive natural gas via KMLP's existing interstate pipeline, which traverses the proposed terminal site. The natural gas would be liquefied using four liquefaction trains that each have a nominal capacity of 2.0 MTPA (total nominal capacity of approximately 8.0 MTPA), and stored onsite in two full containment LNG storage tanks with a capacity of approximately 160,000 cubic meters (m^3). The LNG would be loaded onto LNG carriers for export overseas; LNG carriers and LNG barges for domestic marine distribution and the possibility of LNG bunkering;[2] and LNG trucks for road distribution to LNG refueling stations in Louisiana and the surrounding states. During operation of the project, Magnolia anticipates that an average of 208 marine vessels would make port calls at the LNG terminal each year, including 104 LNG carriers and 104 LNG barges, and 52 LNG trucks would be loaded at the LNG terminal each year. Figure 1-1 provides the general location of the Magnolia LNG Project. More detailed information regarding specific facility components is provided in section 2.1.1.

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

[2] Bunkering is the transfer of LNG from a supply station (e.g., LNG barge) to a receiving ship for the sole purpose of use as propulsion fuel (U.S. Department of Transportation, Maritime Administration, 2014).

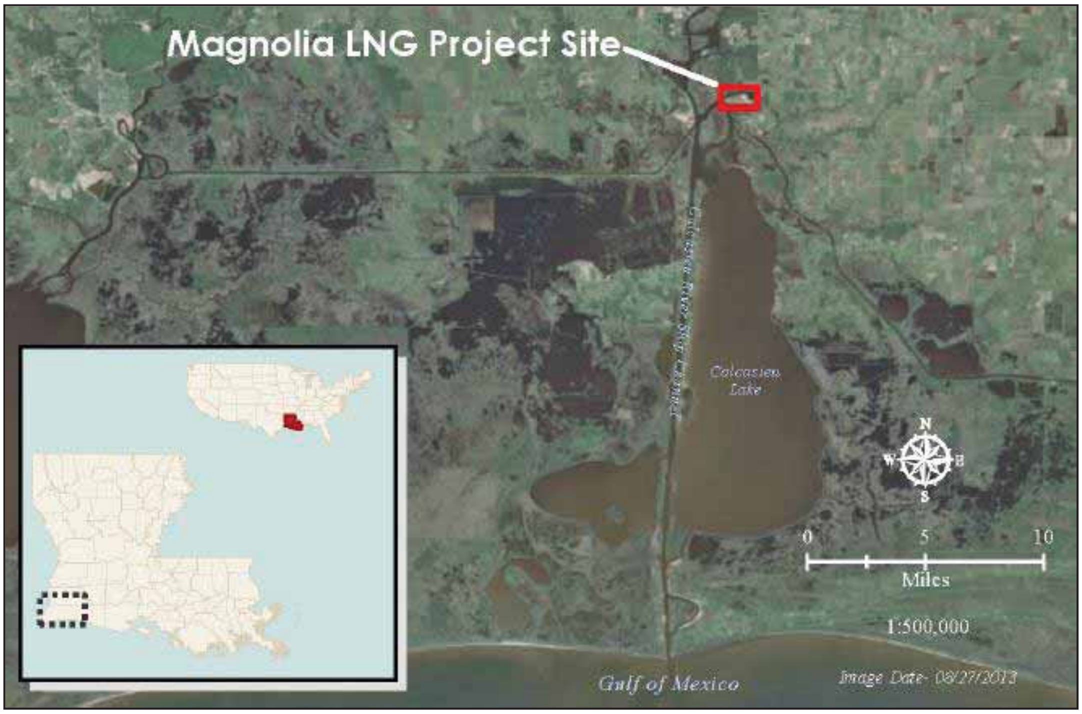


Figure 1-1 Magnolia LNG Project Location Map

KMLP operates a 133-mile-long natural gas pipeline system that originates at the Cheniere Sabine Pass LNG terminal in Cameron Parish, Louisiana and was designed to transport natural gas to various delivery points in Cameron, Calcasieu, Jefferson Davis, Acadia, and Evangeline Parishes. The KMLP pipeline was constructed to provide its two anchor shippers, Total Gas & Power North America and Chevron U.S.A. Inc., the means to import LNG into the United States using a south-to-north transportation path. KMLP's proposal, referred to in this EIS as the Lake Charles Expansion Project, would provide the Magnolia LNG Project with up to approximately 1,400,000 dekatherms per day of firm capacity on its system through a new north-to-south transportation path. In order to provide service to the Magnolia LNG Project prior to operation of the LNG terminal, the Lake Charles Expansion Project would begin operation in January 2018.

The Lake Charles Expansion Project includes the following:

- construction and operation of a new interconnect pipeline and meter station within Magnolia's LNG terminal site in Calcasieu Parish;
- a new compressor station in Acadia Parish;
- new low and high pressure natural gas header pipelines that would be located adjacent to the existing KMLP easement in Acadia Parish; and
- modifications at six existing meter stations in Acadia and Evangeline Parishes; of these, five would be modified to allow the bi-directional flow of natural gas and three would be connected to the new header pipelines (two meter stations would be both modified to allow the bi-directional flow of natural gas and interconnected to the new header pipelines).

Figure 1-2 provides an overview of the Lake Charles Expansion Project. More detailed information regarding specific components of this project is provided in sections 2.1.1.1 and 2.1.3.

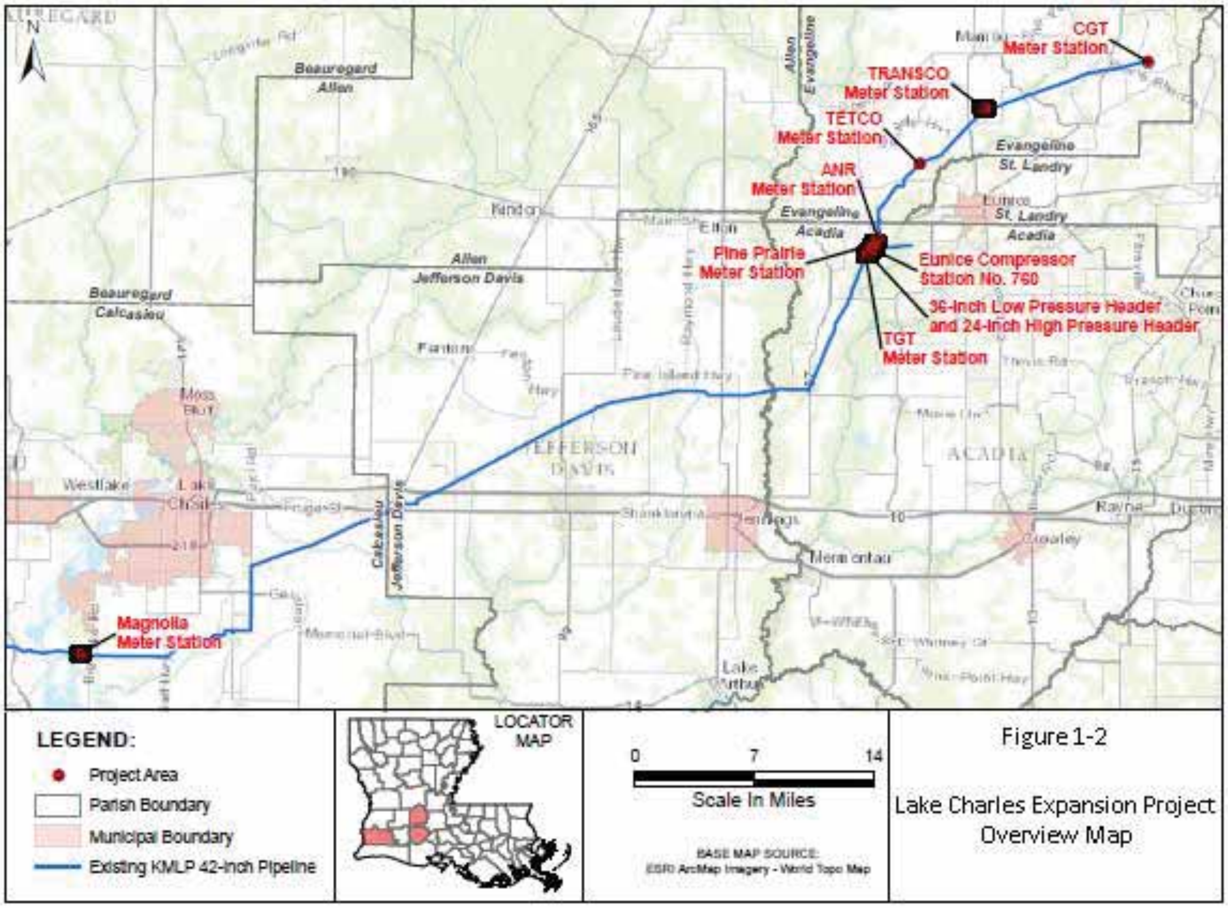


Figure 1-2 Lake Charles Expansion Project Overview Map

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

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

1.1 PURPOSE AND NEED

The purpose of the Magnolia LNG Project is to construct a terminal to serve the domestic and export markets for LNG. The purpose of the Lake Charles Expansion Project is to provide domestic feed gas to the Magnolia LNG Project. Magnolia and KMLP identify the following benefits of the combined projects:

- provide an outlet for domestic natural gas available in the marketplace;

- support export of LNG;
- support domestic waterway transportation of LNG for use as vessel fuel in shipping and the offshore oil and gas industry; and
- support domestic highway distribution of LNG in trucks to serve the emerging business of providing LNG as fuel for long-haul trucking and other emerging domestic uses of LNG.

To determine the level of interest for the project, KMLP conducted an open season from February 14 through March 7, 2014. KMLP received one conforming bid from Magnolia for the entire proposed capacity of the project, which resulted in the two companies entering into a binding Precedent Agreement. On January 28, 2015, Magnolia announced that it had executed a Gas Pipeline Interconnect Agreement with KMLP that sets out the technical scope and specifications for gas supply to the LNG terminal.

Magnolia entered into tolling agreements with four companies for the Magnolia LNG Project. Under these agreements, Magnolia would not take ownership of the natural gas feedstock after receiving it from KMLP, but would only provide services for natural gas pre-treatment, vaporization, LNG storage, and marine services, including loading of LNG carriers and barges. After loading, the LNG would enter into the owner's custody (one of the four companies Magnolia has entered into tolling agreements with).

1.2 PURPOSE AND SCOPE OF THIS STATEMENT

The principal purposes in preparing an EIS are to:

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

This EIS focuses on the facilities that are under the FERC's jurisdiction (that is, the facilities proposed by Magnolia and KMLP within the LNG terminal, and KMLP's proposed modifications to its existing pipeline system outside of the LNG terminal, collectively referred to as the KMLP facilities) and, to a lesser extent, the non-jurisdictional facilities that are integrally related to the development of the projects (i.e., potable water line, electric transmission lines, electric switching station, and LNG trucking and LNG bunkering activities beyond the boundaries of the proposed LNG terminal [see detailed discussion in section 1.4.1]).

This EIS describes the affected environment as it currently exists, discusses the potential environmental consequences of the proposed projects, and compares the projects' potential impact to that of alternatives. The topics addressed in this EIS include alternatives; geology; soils; water use and quality; wetlands; vegetation; wildlife; fisheries and essential fish habitat (EFH); threatened, endangered, and special status species; land use, recreation, and visual resources; socioeconomics; cultural resources;

air quality; noise; reliability and safety; and cumulative impacts. This EIS also presents our conclusions and recommended mitigation measures.

The Energy Policy Act of 2005 (EPAct 2005) provides that the FERC shall act as the lead agency for coordinating all applicable authorizations related to jurisdictional natural gas facilities and for purposes of complying with NEPA. The FERC, as the "lead federal agency," is responsible for preparation of this EIS. This effort was undertaken with the participation and assistance of the U.S. Army Corps of Engineers (COE), U.S. Coast Guard (Coast Guard), U.S. Department of Energy (DOE), U.S. Department of Transportation (DOT), and U.S. Environmental Protection Agency (EPA) as "cooperating agencies" under NEPA. Cooperating agencies have jurisdiction by law or provide special expertise with respect to environmental impacts involved with a proposal. The roles of the FERC, COE, Coast Guard, DOE, DOT, and EPA as cooperating agencies in the review and authorization process are described below. The EIS provides a basis for coordinated federal decision making in a single document, avoiding duplication among federal agencies in the NEPA environmental review processes. In addition to the lead and cooperating agencies, other federal, state, and local agencies may use this EIS in approving or issuing permits for all or part of the proposed projects. Federal, state, and local permits, approvals, and consultations for the proposed projects are discussed in section 1.5.

1.2.1 Federal Energy Regulatory Commission

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

As the lead federal agency for the projects, 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 (MSA); and Section 106 of the National Historic Preservation Act (NHPA). 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 impacts that could result if it issues an authorization to Magnolia under section 3(a) of the NGA and a Certificate to KMLP under section 7(c) of the NGA.

1.2.2 U.S. Army Corps of Engineers

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

The primary decisions to be addressed by the COE include:

- issuance of section 404 permits for wetland impacts associated with construction and operation of the projects, and

- issuance of a section 10 permit for construction activities within navigable waters of the United States associated with the Magnolia LNG Project.

This EIS contains information needed by the COE to reach decisions on these issues. Through the coordination of this document, the COE will obtain the views of the public and natural resource agencies prior to reaching its decisions on the projects.

As an element of its review, the COE must consider whether a proposed action avoids, minimizes, and compensates for impacts on existing aquatic resources, including wetlands, to strive to achieve a goal of no overall net loss of values and functions. The COE would issue a Record of Decision to formally document its decision on each of the proposed actions, including section 404(b)(1) analysis and required environmental mitigation commitments.

1.2.3 U.S. Coast Guard

The Coast Guard is the federal agency responsible for assessing the suitability of the Project Waterway (defined as the waterways that begin at the outer boundary of the navigable waters of the United States) for LNG marine traffic. The Coast Guard exercises regulatory authority over LNG facilities that affect the safety and security of port areas and navigable waterways under Executive Order 10173; the Magnuson Act (50 USC 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 Coast Guard is responsible for matters related to navigation safety, 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 LNG tanks. As appropriate, the Coast Guard (acting under the authority in 33 USC 1221 et seq.) also would inform the FERC of design- and construction-related issues identified as part of safety and security assessments. If the Magnolia LNG Project is approved, constructed, and operated, the Coast Guard would continue to exercise regulatory oversight of the safety and security of the LNG terminal facilities, in compliance with 33 CFR 127.

As required by its regulations, the Coast Guard is responsible for issuing a Letter of Recommendation (LOR) as to the suitability of the waterway for LNG marine traffic following a Waterway Suitability Assessment (WSA). The process of preparing the LOR begins when an applicant submits a Letter of Intent (LOI) to the local Captain of the Port. In a letter dated March 12, 2013, Magnolia submitted its LOI and preliminary WSA to the Coast Guard as required by 33 CFR 127.007. The Coast Guard requested additional information, and a follow-on WSA was submitted December 12, 2013. In a letter dated February 12, 2015, the Coast Guard issued the LOR for the project,[3] which stated that the Calcasieu Ship Channel is considered suitable for LNG marine traffic in accordance with the guidance in Coast Guard Navigation and Vessel Inspection Circular (NVIC) 01-2011.

---

3 Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number, excluding the last three digits, in the "Docket Number" field (i.e., CP14-347). The LOR for the project was filed with the FERC on March 2, 2015.

1.2.4 U.S. Department of Energy

The DOE, Office of Fossil Energy must meet its obligation under section 3 of the NGA to authorize the import and export of natural gas, including LNG, unless it finds that the import or export is not consistent with the public interest. On December 18, 2012 and October 15, 2013, Magnolia filed applications with the DOE (Fossil Energy Docket Nos. 12-183-LNG and 13-131-LNG, respectively) seeking authorization to export LNG to any nation with which the United States currently has, or in the future will have, a Free Trade Agreement (FTA) requiring national treatment for trade in natural gas (FTA countries), and which has or in the future develops the capacity to import LNG via ocean-going carrier. Each application requested authorization to export the equivalent of 0.54 billion cubic feet per day (Bcf/d) of domestically produced natural gas (equivalent to 4 MTPA of LNG) for a 25-year period,[4] commencing the earlier of the date of first export or 10 years from the date of issuance of the requested authorization.

Section 3(c) of the NGA, as amended by section 201 of the Energy Policy Act of 1992 (Public Law 102-486), requires that applications to the DOE requesting authorization of the import and export of natural gas, including LNG from and to FTA countries be deemed consistent with the public interest and granted without modification or delay. On February 27, 2013 (Fossil Energy Docket No. 12-183-LNG) and March 5, 2014 (Fossil Energy Docket No. 13-131-LNG), the DOE issued orders granting authorization to Magnolia to export LNG by vessel from the LNG terminal to FTA countries.

On October 15, 2013, the DOE received an application from Magnolia (Fossil Energy Docket No. 13-132-LNG) seeking authorization to export 1.08 Bcf/d of natural gas (equivalent to 8 MTPA of LNG) to any country with which the United States does not have a free trade agreement requiring national treatment for trade in natural gas and LNG (non-FTA countries). The DOE is currently conducting its review of Magnolia's application to export LNG to non-FTA countries. On August 15, 2014, the DOE's Office of Fossil Energy announced that it will act on applications to export LNG from the lower-48 states to non-FTA countries only after the review required by the NEPA has been completed.

1.2.5 U.S. Department of Transportation

The DOT has prescribed the minimum federal safety standards for LNG facilities in compliance with 49 USC 60101. Those standards are codified in 49 CFR 193 and apply to the siting, design, construction, operation, maintenance, and security of LNG facilities. The National Fire Protection Association (NFPA) Standard 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas*, is incorporated into these requirements by reference, with regulatory preemption in the event of conflict. In accordance with the 1985 Memorandum of Understanding on LNG facilities and the 2004 Interagency Agreement on the safety and security review of waterfront import/export LNG facilities,[5] the DOT participates as a cooperating agency and assists in assessing any mitigation measures that may become conditions of approval for any project.

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 sets and enforces national standards under a variety of environmental laws and

---

4 The proposed life of the Magnolia LNG Project is 30 years (see section 1.0). Magnolia requested authorization from the DOE to export domestically produced natural gas for a 25-year period. Therefore, if market conditions indicate that the export of natural gas from the LNG terminal is warranted beyond a 25-year period, Magnolia would be required to seek additional authorization from the DOE.

5 These documents can be viewed online at http://ferc.gov/industries/gas/indus-act/lng/1985-mou/1985-mou.pdf and http://www.ferc.gov/industries/gas/indus-act/lng/2004-interagency.asp, respectively.

regulations in consultation with state, tribal, and local governments. The EPA has delegated water quality certification (section 401 of the CWA) to the jurisdiction of individual state agencies; within Louisiana, jurisdictional authority under section 401 of the CWA has been delegated to the Louisiana Department of Environmental Quality (LDEQ). The EPA also oversees the issuance of a National Pollutant Discharge Elimination System (NPDES) permit by the LDEQ for point-source discharge of used water into waterbodies (section 402 of the CWA). The EPA shares responsibility for administering and enforcing section 404 of the CWA with the COE, and has authority to veto COE permit decisions.

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

- Title 1 Part A Section 111 – New Source Performance Standards (NSPS);
- Title 1 Part A Section 112 – National Emission Standards for Hazardous Air Pollutants (NESHAP);
- Title 1 Part C – Prevention of Significant Deterioration (PSD); and
- Title V – operating permits.

Title 1 Part A Section 112(r) of the CAA Amendments require the EPA to develop regulations and guidance for chemical accident prevention at facilities for substances that pose the greatest risk of harm from an accidental release. The regulation, which is referred to as the Risk Management Program (RMP), is codified in 40 CFR 68. This program has not been delegated to the LDEQ, and requires facilities to submit a RMP to the EPA prior to commencing operation; the RMP should subsequently be updated and resubmitted every 5 years. The information within the RMP is intended to assist fire, police, and emergency response personnel that are tasked with managing potential risks at the local level.

In addition to permitting oversight and management of air quality and emission limitations, 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 is responsible for implementing certain procedural provisions of NEPA (e.g., publishing the Notices of Availability of the draft and final EISs in the Federal Register) to establish statutory timeframes for the environmental review process.

1.3 PUBLIC REVIEW AND COMMENT

On March 12, 2013, Magnolia filed a request with the FERC to use our pre-filing review process. This request was approved on March 20, 2013, and pre-filing Docket No. PF13-9-000 was established in order to place information filed by Magnolia and related documents issued by the FERC into the public record. The pre-filing review process provides opportunities for interested stakeholders to become involved early in project planning, facilitates interagency cooperation, and assists in the identification and resolution of issues prior to a formal application being filed with the FERC.

Magnolia held an open house in Lake Charles, Louisiana on May 2, 2013, to provide information to the public about the Magnolia LNG Project. FERC staff participated in the meeting, describing the FERC process and providing those attending with information on how to file comments with the FERC.

Between May 1 and 3, 2013, we met with representatives of the COE, Coast Guard, LDEQ, Louisiana Department of Natural Resources (LDNR), Louisiana Department of Wildlife and Fisheries (LDWF), and Magnolia to discuss coordination of agency review, permit requirements and status, and each agency's interest in participating in our environmental review as a cooperating agency.

On June 18, 2013, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Magnolia Liquefied Natural Gas Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting* (NOI for the Magnolia LNG Project). This notice was sent to about 540 interested parties including federal, state, and local officials; agency representatives; conservation organizations; Native American tribes; local libraries and newspapers; and property owners in the vicinity of planned project facilities. Publication of the NOI for the Magnolia LNG Project established a 30-day public comment period for the submission of comments, concerns, and issues related to the environmental aspects of the project.

On July 11, 2013, the FERC conducted a public scoping meeting in Lake Charles to provide an opportunity for the public to learn more about the Magnolia LNG Project and to participate in our analysis by providing oral comments on environmental issues to be included in the EIS. Four individuals elected to present comments at the scoping meeting in support of the project. A transcript of these comments is part of the public record for the Magnolia LNG Project and is available for viewing on the FERC internet website (http://www.ferc.gov).[6]

We received comments from one federal agency, the EPA, in response to the NOI for the Magnolia LNG Project. The Commission also received written comments from elected officials, public officials, and non-governmental agencies.

On August 11, 2014, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Proposed Lake Charles Expansion Project and Request for Comments on Environmental Issues* (NOI for the Lake Charles Expansion Project). This notice was sent to about 398 interested parties including federal, state, and local officials; agency representatives; conservation organizations; Native American tribes; local libraries and newspapers; and property owners in the vicinity of proposed project facilities. Publication of the NOI for the Lake Charles Expansion Project established a 30-day public comment period for the submission of comments, concerns, and issues related to the environmental aspects of the project. No open houses or scoping meetings were held for the Lake Charles Expansion Project due to the limited nature of the proposal.

Issues identified after the initial open house and during and after public scoping are summarized in table 1.3-1 along with a listing of the EIS sections that address the comments. The most frequently received comments relate to LNG safety; ship traffic; cumulative impacts on air, traffic, and threatened and endangered species; and dredged material placement. Issues identified that are not considered environmental considerations or are outside the scope of the EIS process are summarized in table 1.3-2 and are not addressed further in this EIS. Appendix A provides the distribution list for the draft EIS.

[6] Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number, excluding the last three digits, in the "Docket Number" field (i.e., PF13-9-000). Be sure to select an appropriate date range.

TABLE 1.3-1

Key Environmental Concerns Identified During Scoping

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	
No-action alternative	3.1
Alternatives to LNG as a source of energy; energy conservation	3.2
System alternatives; expansion of existing LNG terminals or industrial facilities	3.2
Groundwater	
Impacts on groundwater, existing hydrology, and drinking water supply, including wellhead protection and public water supply areas	4.3.1
Water Resources	
Impacts on water quality from dredging, construction of in-water facilities, and ship transits	4.3.2.2
Impacts on surface water quality from discharges and stormwater pollution	4.3.2.2
Impacts on aquatic environment from contaminated sediments during construction and operation	4.3.2.2
Socioeconomics	
Impact on minority and low-income populations	4.9.7
Housing impacts on communities in the vicinity	4.9.4
Employment opportunities for local contractors and laborers, and increased tax revenues	4.9.2 and 4.9.3
Assessment of and impacts on community public safety resources	4.9.5
Air Quality and Noise	
Consistency with the emissions limits and standards	4.11.1.3
Emissions from the LNG terminal, Compressor Station 760, and marine vessels and mitigation measures	4.11.1.5
Impacts on local and global air quality and noise from the construction and operation of the LNG terminal and Compressor Station 760	4.11.1.5
Potential noise impacts resulting from construction activities and proposed mitigation measures to reduce impacts from Compressor Station 760	4.11.2.2
Reliability and Safety	
Navigation safety	4.12.7
Spills from hazardous materials maintained at the LNG terminal	4.12.5.2
Emergency response plans, evacuation plans, and coordination with community public safety services	4.12.6
Cumulative Impacts	
Analysis of cumulative impacts associated with multiple large-capital construction projects scheduled in the region	4.13.3

TABLE 1.3-2 **Issues Identified and Comments Received That Are Outside the Scope of the EIS**	
Issue/Specific Comment	Explanation
Environmental and economic consequences of any induced production, especially in shale gas plays, as a result of increased natural gas exports	Production and gathering activities, and the pipelines and facilities used for these activities, are not regulated by FERC, but are overseen by the affected region's state and local agencies with jurisdiction over the management and extraction of the shale gas resource. Determining the well and gathering line locations and their environmental impact is not feasible because the market and gas availability at any given time would determine the source of the natural gas. Therefore, it is outside of the scope of this EIS.
Effects on threatened and endangered species throughout the Gulf region	Effects on threatened and endangered species in the vicinity of the projects are discussed in section 4.7. Impacts beyond the general project area and not related to the projects are outside the scope of this EIS.
Effects of hydraulically fractured shale gas production	The development of natural gas in shale plays by hydraulic fracturing is not the subject of this EIS nor is the issue directly related to the proposed projects.
Effects of LNG combustion in end-use/importing markets	Review of the projects is limited to the economic and environmental impacts of the proposals before the Commission; therefore, the effects of LNG combustion in end-use/importing markets is outside of the scope of this EIS.
Consideration of other pending LNG export proposals before the DOE and FERC through the development of a programmatic EIS	The Commission does not intend to conduct a nation-wide analysis of proposed LNG export terminals. The DOE determines the public benefits of exporting LNG from terminals in the United States. The FERC's review and approval of individual projects under the NGA does not constitute a coordinated federal program.
Delay a decision on the application until comments are received on the DOE Office of Fossil Energy's economic study on impacts of LNG exports	The comment and reply comment periods closed in January and February 2013 for the DOE-commissioned study into the potential U.S. economic impacts of natural gas exports in the form of LNG. The 2012 study, which was completed by National Economic Research Associates (NERA) Economic Consulting, largely found that "LNG exports would be beneficial to the U.S. economy under the scenarios modeled." The DOE elected to prepare two additional reports of the environmental impacts of increased LNG exports. However, the reports are beyond the requirements of NEPA and, therefore, are outside of the scope of this EIS.
Impose monitoring conditions for economic disruptions caused by natural gas extraction and domestic increases in gas and electricity prices and resulting shifts to more polluting fuels	Review of the projects is limited to the economic and environmental impacts of the proposals before the Commission; therefore, economic impacts caused by natural gas extraction and domestic increases in gas and electricity prices and resulting shifts to more polluting fuels is outside of the scope of this EIS.

1.4 NON-JURISDICTIONAL FACILITIES

Under section 7 of the NGA, the FERC is required to consider, as part of a decision to authorize jurisdictional facilities, all facilities that are directly related to a proposed project where there is sufficient federal control and responsibility to warrant environmental analysis as part of the NEPA 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.

The following non-jurisdictional actions were identified in association with the projects:

- LNG trucking, domestic marine distribution, and LNG bunkering activities that would take place after the LNG truck or LNG vessel has departed from the LNG terminal;
- construction of a tie-in to Calcasieu Parish District 12 Water Works' potable water line within the LNG terminal site;

- construction of an electric transmission line and switching station to extend power from Entergy Gulf States Louisiana, LLC's (Entergy) existing system to the LNG terminal; and

- construction of an electric transmission line to extend power from Cleco Corporation's (Cleco) existing system to Compressor Station 760.

These facilities are described below and are also addressed in our cumulative impacts analysis in section 4.13 of this EIS.

1.4.1 LNG Trucking, Domestic Marine Distribution, and LNG Bunkering

The proposed LNG truck and LNG barge loading facilities at the LNG terminal are both jurisdictional facilities. However, Magnolia's proposed LNG trucking, domestic marine distribution of LNG, and LNG bunkering activities that would take place after the LNG truck or LNG vessel has departed from the LNG terminal do not fall under the jurisdiction of the FERC.

As a general rule, FERC jurisdiction over the transportation of natural gas in either gaseous or liquefied state in interstate commerce is limited to transportation by pipeline (i.e., FERC jurisdiction does not extend to deliveries of natural gas by truck, train, or barge).[7] Further, jurisdiction over LNG import/export facilities and services under section 3 of the NGA would not follow the LNG trucks after they exit the boundary of the LNG terminal, as the LNG would at that point be moving in either interstate or intrastate commerce, rather than in foreign commerce.

While Magnolia's LNG trucking and LNG bunkering operations fall outside of the Commission's jurisdiction once the truck or barge exits the terminal boundary, we address comments received on these project activities in our environmental analysis. Because these activities are not under the Commission's jurisdiction, we cannot require Magnolia to implement measures to mitigate environmental impacts. Therefore, the mitigation measures presented in this EIS, relative to LNG trucking and LNG bunkering, are only those proposed by Magnolia.

1.4.1.1 LNG Trucking

During operation of the Magnolia LNG Project, a portion of the LNG produced at the terminal would be loaded onto trucks for road distribution to refueling stations in Louisiana and the surrounding states. While no agreements have been executed for the transportation of LNG in trucks, Magnolia anticipates that, on average, one 12,500-gallon capacity LNG truck would be loaded per week at the terminal. LNG trucks calling on the terminal are expected to deliver the LNG to one of the nine LNG refueling stations currently in operation in Louisiana and Texas, or to additional LNG refueling stations currently under development.

In order to quantify potential risk to the public in the event of an unexpected shipping incident between the LNG terminal and the Interstate Highway System, Magnolia conducted a hazardous materials route analysis. The analysis assigned roadways along the potential LNG truck routes a risk category of Low, Medium, or High based on the number of households, schools, hospitals, churches, commercial parcels, and waterways, as well as the estimated population. The results of the analysis indicate that the lowest-risk route between the LNG terminal site and Interstate 10 travels from Henry Pugh Boulevard to Big Lake Road, Big Lake Road to Lincoln Road, Lincoln Road to Lake Street, Lake Street to Gauthier Road, Gauthier Road to Ward Line Road, and Ward Line road to Interstate 10 (see figure 1.4.1-1). Magnolia would request that motor carriers with hazardous materials (e.g., LNG) follow this route during transit from the LNG terminal to Interstate 10.

---

[7] See Exemption of Certain Transport and/or Sales of Liquefied Natural Gas from the Requirements of section 7(c) of the NGA, 49 FPC 1078, at 1079 (1973).

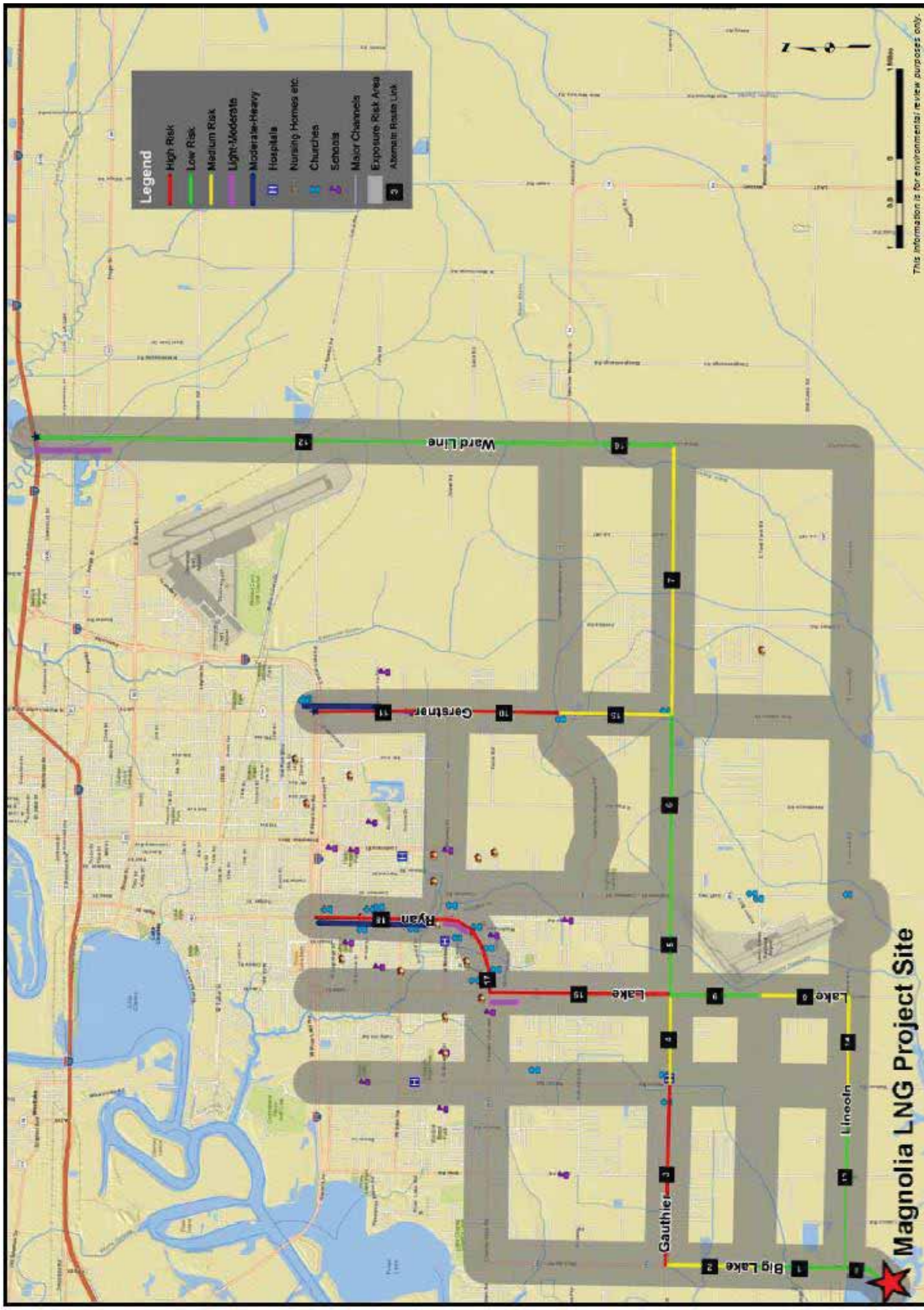


Figure 1.4.1-1
Hazardous Material Shipping Routes Analyzed Between the LNG Terminal and Interstate 10
Magnolia LNG and Lake Charles Expansion Projects
Calcasieu Parish, Louisiana

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\HazMat_Shipping\MLP_HazMat_Shp.mxd | REVISED: 04/06/2015

DRAWN BY: JSSuess

LNG trucking associated with the Magnolia LNG Project would be operated in compliance with 49 CFR 178.338 – Specification MC-338. Truck operators would be trained to satisfy the minimum requirements of 49 CFR 193 as well as the requirements of the Louisiana Department of Transportation and Development (DOTD) and the Calcasieu Parish Police Jury.

1.4.1.2 Domestic Marine Distribution and LNG Bunkering

Magnolia anticipates that LNG would be loaded onto one or two barges per week for domestic marine distribution and the possibility of LNG bunkering. As a result of the anticipated construction of new ships with LNG fuel systems, LNG barges loaded at the LNG terminal would be expected to make bulk deliveries to the ship fueling facilities and offshore support port areas in the region (ships and offshore supply vessels would not be directly fueled/bunkered at the LNG terminal site). Magnolia has indicated that major deep-draft port facilities along the central Gulf Coast that could be supplied by the Magnolia LNG Project include (see figure 1.4.1-2):

- Port of Lake Charles, Louisiana
- Port of New Orleans, Louisiana
- Port of South Louisiana, Louisiana
- Port of Baton Rouge, Louisiana
- Port of Port Arthur, Texas
- Ports of Houston/Galveston, Texas

LNG barges would also be capable of delivering LNG to offshore support port areas along the central Gulf Coast, including:

- Port Fourchon, Louisiana
- Port of Iberia, Louisiana
- Port of Morgan City, Louisiana
- Port of Galveston, Texas

As described above (section 1.2.3), the Coast Guard is the federal agency responsible for assessing the suitability of the Project Waterway for LNG marine traffic. The Coast Guard's Hazardous Materials Division (CG-ENG-5) is currently developing policy regarding the design of LNG barges.[8] According to the Coast Guard, the starting point for design of LNG barges is regulations in the International Gas Carrier (IGC) Code and 46 CFR 154 – Safety Standards for Self Propelled Vessels Carrying Bulk Liquefied Gases (Coast Guard, 2015a).

[8] Barges designed to carry LNG as cargo do not currently exist in the United States, although plans for these vessels are underway.

Figure 1.4.1-2
Potential Domestic Marine Distribution and LNG Bunkering Locations
Magnolia LNG
Calcasieu Parish, Louisiana

The Coast Guard is developing detailed policy guidance to clarify the applicability of existing regulations to the transfer of LNG for use as vessel fuel. The Coast Guard's Policy Letter No. 01-15, *Guidelines for Liquefied Natural Gas Fuel Transfer Operations and Training of Personnel on Vessels Using Natural Gas as Fuel*, as well as Policy Letter No. 02-15 *Guidance Related to Vessels and Waterfront Facilities Conducting Liquefied Natural Gas (LNG) Marine Fuel Transfer (Bunkering) Operations* (Coast Guard, 2015b; 2015c), are currently in draft form and were recently circulated to the public and marine industry for comment (79 Federal Register 7470). Magnolia filed comments with the Coast Guard on these policy letters on March 6, 2014. Once finalized, these policy letters will provide additional guidance to vessel and waterfront facility owner/operators on the safety, security, and training requirements for vessels and facilities transferring LNG for use as vessel fuel. Magnolia would implement the guidelines established by these two documents, as well as any applicable regulations (either current or potential future regulations) that should be promulgated by the Coast Guard prior to Magnolia's commissioning date.

1.4.2 Tie-in to Calcasieu Parish District 12 Water Works' Potable Water Line

The Calcasieu Parish District 12 Water Works would provide potable water for construction and operation of the Magnolia LNG Project. An existing 12-inch-diameter water pipeline runs along the entire length of the proposed LNG terminal site just north of Henry Pugh Boulevard. A permit is required for the tie-in to be completed. Magnolia would request permission to interconnect to the Calcasieu Parish District 12 Water Works, which would impact less than 0.1 acre of land within the LNG terminal site (see figure 1.4.2-1). This tie-in is not linked or connected to other projects and it would be under the review and approval of the Calcasieu Parish District 12 Water Works.

Figure 1.4.2-1 Tie-in to Existing Potable Water Line

1.4.3 Electric Transmission Line and Switching Station for the LNG Terminal

To provide electrical power to the LNG terminal, Entergy would build a 1.3-mile-long double-circuit 230 kilovolt (kV) electric transmission line connecting its existing Graywood substation to a new switching station at the LNG terminal site (see figure 1.4.3-1). Entergy would construct the transmission line for the use of the proposed Magnolia LNG Project. The transmission line would begin at the Graywood substation at the northeast corner of West Lincoln and Big Lake Roads where it would cross to the south side of West Lincoln Road and proceed west to the Big Lake Road intersection. At the intersection of Lincoln and Big Lake Roads, the transmission line would turn south and follow the existing road and utility rights-of-way along the east side of Big Lake Road. At the intersection of Henry Pugh Boulevard, the transmission line, following the existing rights-of-way, would cross Big Lake Road and follow the Henry Pugh Boulevard right-of-way on its south side and continue in a westerly direction past Calcasieu Parish District 12 Water Works. From a point on the east side of the LNG terminal site, the line would turn north, crossing over Henry Pugh Boulevard where it would terminate at the new 0.2 acre switching station within the LNG terminal.

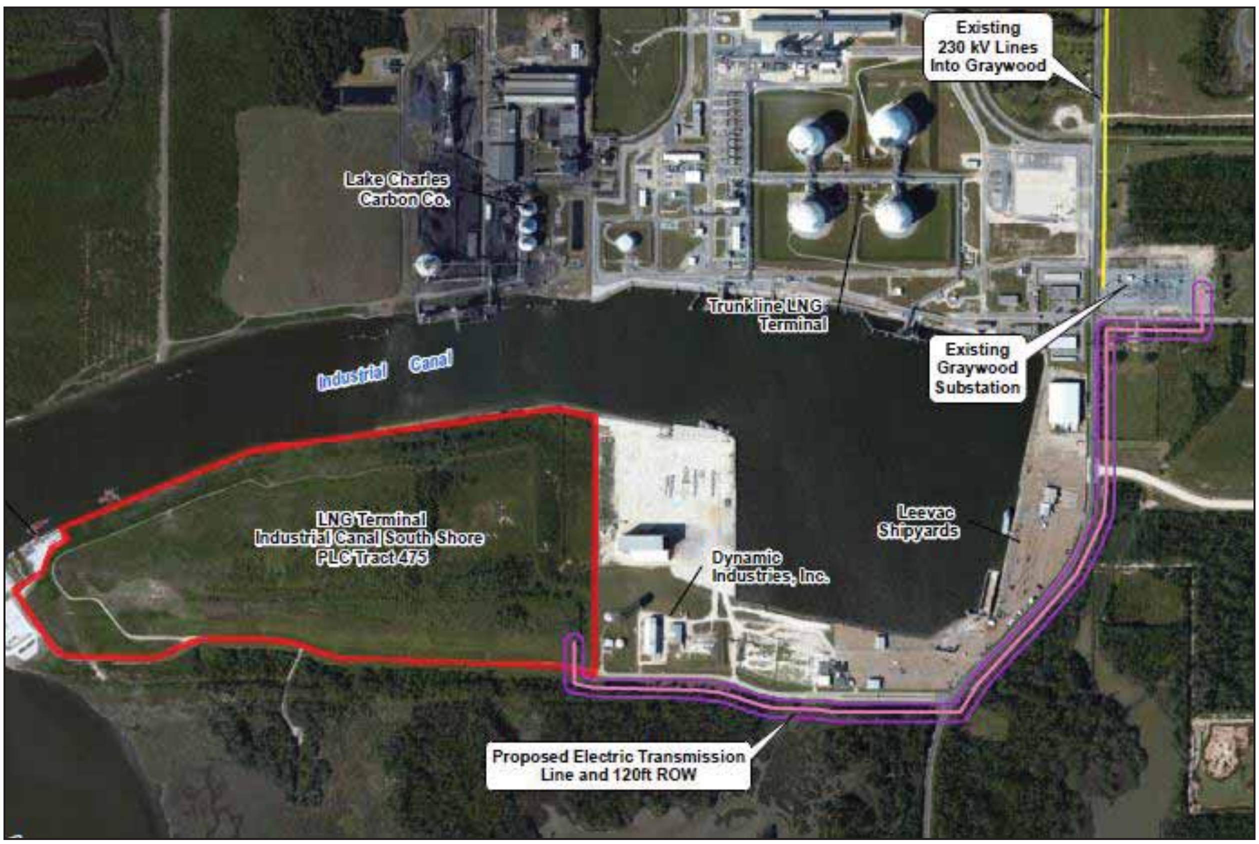


Figure 1.4.3-1 Electric Transmission Line from Entergy's Existing System to the LNG Terminal

Based on the initial design, the transmission line would be within a 170-foot-wide right-of-way, adjacent to or possibly overlapping with the existing road and utility rights-of-way on Lincoln and Big Lake Roads and Henry Pugh Boulevard. The transmission line right-of-way would occupy 26.1 acres of land, including 11.5 acres of open land, 10.4 acres of wetland (composed primarily of freshwater scrub-shrub and forested wetland, and with small areas of freshwater emergent wetland and estuarine and marine wetland), and 4.2 acres of upland forest. The majority of the impacts associated with construction and operation of the transmission line would result from the installation of 15 to 18 poles to support the power lines and the removal of trees within the right-of-way.

Entergy would conduct the necessary consultations and obtain applicable permits and approvals for the electric transmission line and switching station, including CWA authorization, threatened and endangered species consultation, and cultural resources consultation. Entergy would also submit a local construction permit to Calcasieu Parish after the final design is completed and conduct necessary coordination with the Louisiana DOTD regarding the transmission line crossings of Big Lake Road and Henry Pugh Boulevard. No permits have been applied for by Entergy at this time.

1.4.4 Electric Transmission Line for Compressor Station 760

To provide electrical power to Compressor Station 760, Cleco would build a 0.3-mile-long 34.5 kV electric transmission line from its existing 34.5 kV electric transmission line to the proposed compressor station (see figure 1.4.4-1). The transmission line would begin at the existing transmission line on the west side of Refinery Road and would proceed east across Refinery Road and agricultural land to the Compressor Station 760 site.

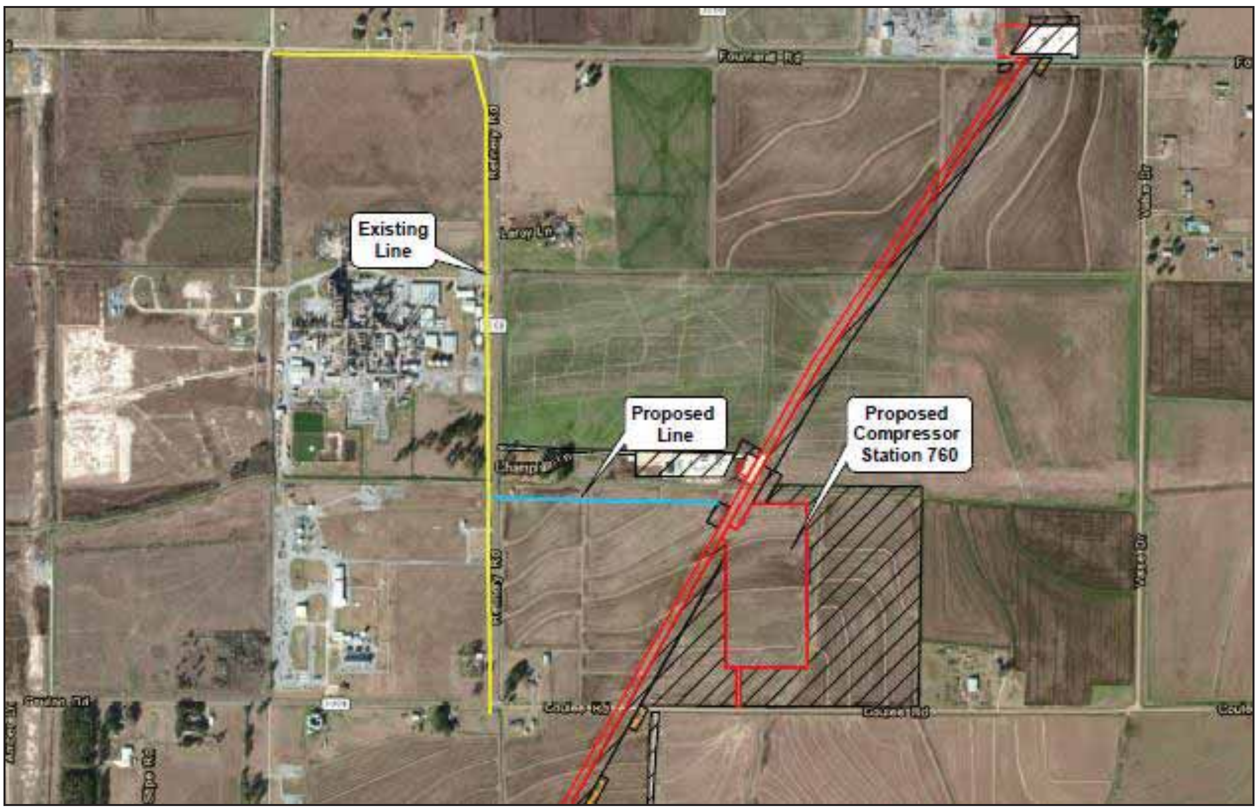


Figure 1.4.4-1 Electric Transmission Line from Cleco's Existing System to Compressor Station 760

Based on the initial design, the transmission line would be within a 20-foot-wide right-of-way, which would occupy 0.7 acre of agricultural land and less than 0.1 acre of existing road and utility rights-of-way. The poles supporting the transmission line wires are expected to be between 90 and 100 feet in height and spaced approximately 600 feet apart. Impacts associated with construction and operation of the transmission line would be due to the installation of poles to support the power line and a small transformer pad at the compressor station. Cleco has informed KMLP that no federal, state, or local permits/approvals would be required for the installation of the electrical utility line and transformer.

1.5 PERMITS, APPROVALS, AND REGULATORY REVIEWS

As the lead federal agency, the FERC is required to comply with Section 7 of the ESA, the MSA, Section 106 of the NHPA, EPAct 2005, and section 3 of the NGA. Each of these statutes has been taken into account in the preparation of this EIS. Table 1.5-1 lists the major federal, state, and local permits, approvals, and consultations identified for the construction and operation of the projects. Table 1.5-1 also identifies when Magnolia or KMLP commenced or anticipates commencing formal permit and consultation procedures.

Section 7 of the ESA states that any project authorized, funded, or conducted by any federal agency should not "…jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined…to be critical…" (16 USC 1536(a)(2)(1988)). To comply with Section 7, the FERC is required to determine whether any federally listed or proposed threatened or endangered species or their designated critical habitat occur in the vicinity of the proposed projects and conduct consultations with the U.S. Fish and Wildlife Service (FWS) and/or the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NOAA Fisheries), if necessary. If, upon review of existing data or data provided by Magnolia or KMLP, the FERC determines that these species or habitats may be affected by the projects, the FERC is required to prepare a biological assessment (BA) to identify the nature and extent of adverse impact, and to recommend measures that would avoid the habitat and/or species, or would reduce potential impact to acceptable levels. Section 4.7 provides information on the status of this review.

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal fisheries management plan. The MSA requires federal agencies to consult with NOAA Fisheries on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH (MSA section 305(b)(2)). Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidating EFH consultations with interagency coordination procedures required by other statues, such as NEPA, the Fish and Wildlife Coordination Act, or the ESA (50 CFR 600.920(e)), to reduce duplication and improve efficiency. Section 4.6 provides information on the status of this review.

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

EPAct 2005 and section 3 of the NGA require us to consult with the U.S. Department of Defense to determine if there would be any impacts associated with the Magnolia LNG Project on military training or activities on any military installations. In a letter dated December 11, 2014, the U.S. Department of Defense indicated that there would likely be no impacts from the proposed actions.

Besides the FERC, other federal agencies have responsibilities for issuing permits or approvals to comply with various federal laws and regulations. The Coast Guard exercises regulatory authority over the suitability of the Project Waterway for LNG marine traffic. As required by its regulations, the Coast Guard is responsible for issuing an LOR as to the suitability of the waterway for LNG marine traffic. The Coast Guard issued its LOR on February 12, 2015. Impacts on vessel traffic are summarized in section 4.9.6.1 of this EIS.

TABLE 1.5-1

Major Permits, Approvals, and Consultations Required for the Projects

Agency	Permit/Approval/Consultation	Status: Magnolia LNG Project	Status: Lake Charles Expansion Project
FEDERAL			
FERC	Authorization under Section 3(a) of the NGA	Application filed April 28, 2014	Not applicable
	Certification under Section 7(c) of the NGA	Not applicable	Application filed June 30, 2014
COE	Section 404, CWA Permit	• Application filed May 8, 2014 • Correction to application regarding acreage impacts submitted October 29, 2014 • Under COE review	• Application filed June 26, 2014 • Under COE review
	Section 10, RHA Permit	Section 10 authorization concurrent with COE section 404 permit	Not applicable
Coast Guard	LOR as to the suitability of the waterway for LNG marine transit	LOR issued February 12, 2015	Not applicable
DOE	Application for Long Term, Multi-Contract Authorization to Export Natural Gas to FTA Countries	• Authorization received February 26, 2013 to export 4 MTPA of LNG • Authorization received March 5, 2014 to export an additional 4 MTPA of LNG	Not applicable
	Application for Long Term, Multi-Contract Authorization to Export Natural Gas to Non-FTA Countries	• Application to export 8 MTPA of LNG received by DOE October 15, 2013 • Under DOE review	Not applicable
FWS	Section 7 ESA Consultation	No effect concurrence received September 27, 2013	No effect concurrence received July 25, 2014
	Migratory Bird Treaty Act Consultation	During a conference call February 3, 2014, the FWS indicated that impacts on migratory birds are not expected	Email dated April 24, 2015 stated that the FWS does not believe that the project would adversely affect migratory birds
NOAA Fisheries	Section 7 ESA Consultation Marine Mammal Protection Act Consultation	Conference calls held between Magnolia and NOAA Fisheries staff August 17 and October 17, 2013	Not applicable
	MSA Consultation	• Conference call held between Magnolia and NOAA Fisheries staff February 10, 2014 • Conference call held between FERC and NOAA Fisheries staff March 20, 2015	Not applicable
U.S. Department of Defense	Consultation regarding impacts on military operations	Letter stating that the Magnolia LNG Project would have minimal impact on military training and operations received December 11, 2014	Letter stating that the Lake Charles Expansion Project would have minimal impact on military training and operations received December 11, 2014

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations Required for the Projects

Agency	Permit/Approval/Consultation	Status: Magnolia LNG Project	Status: Lake Charles Expansion Project
STATE			
LDEQ – Water Quality Division	Section 401 Water Quality Certification	Section 401 certification concurrent with COE section 10/404 permit	Section 401 certification concurrent with COE section 404 permit
	Louisiana Pollutant Discharge Elimination System (LPDES) Permit for Discharge of Hydrostatic Test Water	Notice of Intent would be submitted at least 30 days prior to the discharge event	Notice of Intent would be submitted at least 30 days prior to the discharge event
	LPDES Permit for Industrial Operating Stormwater Permit	Submittal pending	Not applicable
LDEQ – Air Quality Division	Air Quality Permit Prevention of Significant Deterioration (PSD) and Title V Operating Permit	• Application filed June 23, 2014 • Public notice by LDEQ of an administratively complete application published in the Lake Charles American Press newspaper on July 9, 2014 • Revised Title V and PSD permit application along with Air Dispersion Modeling Protocol and Results filed January 27, 2015 • Under LDEQ review	• Application filed June 20, 2014 • Revised application filed October 7, 2014 [a] • Under LDEQ review
LDWF	Threatened and Endangered Species Consultation	Letter from the LDWF dated September 13, 2013 stating that no impacts on rare, threatened, or endangered species or critical habitat are anticipated	Letter from the LDWF dated March 26, 2014 stating that no impacts on rare, threatened, or endangered species or critical habitat are anticipated
Louisiana State Historic Preservation Office (SHPO)	Section 106, NHPA Consultation	• Letter from the SHPO dated October 28, 2013, indicating concurrence with the area of potential effect at the LNG terminal and no need for further investigation • Letter from the SHPO dated April 8, 2015, indicating concurrence with the area of potential effect along the dredge material and effluent pipeline routes and within the dredge material placement area and no need for further investigation • Letter from the SHPO dated May 12, 2015 providing concurrence that no historic properties would be impacted at the DII construction yard	• Letter from the SHPO dated May 21, 2014, providing concurrence that no historic properties would be impacted

[a] The U.S. Supreme Court issued a ruling regarding greenhouse gas emissions on June 23, 2014. Prior to the ruling, Compressor Station 760 would have been a major stationary source under the PSD requirements. However, based on the Supreme Court ruling and LDEQ's rule provisions for greenhouse gases, Compressor Station 760 facility is no longer required to obtain a PSD or Title V permit specifically for greenhouse gas emissions, as the EPA may no longer consider greenhouse gases as a pollutant for purposes of defining a "major emitting facility" in the PSD or Title V permitting context. See additional discussion in section 4.11.1.

The COE has responsibility for determining compliance with all regulatory requirements associated with section 404 of the CWA. The EPA also independently reviews section 404 applications for wetland dredge-and-fill applications for the COE and has section 404(c) veto power for wetland permits issued by the COE. The section 404 permitting process regulates dredging and/or filling waters of the United States. Before an individual section 404 permit can be issued, the CWA requires completion of a section 404(b)(1) guideline analysis. The section 401/404 applications for the projects were filed on May 8, 2014 and June 26, 2014, respectively. The FERC, in the NEPA review represented by this EIS, has analyzed all technical issues required for the section 404(b)(1) guideline analyses, including analysis of natural resources and cultural resources that would be affected by the projects, as well as analyses of alternatives. The results of our analysis of alternatives are provided in section 3.0 of this EIS; a summary of impacts on surface waters and wetlands are provided in sections 4.3.2 and 4.4.2, respectively, of this EIS.

In addition to CWA responsibilities, the COE has jurisdiction over section 10 of the RHA, which requires authorization for excavation, fill, or modification within or beneath navigable waterways. Magnolia's section 10 application was filed with its section 401/404 application on May 8, 2014. Impacts on section 10 waterbodies are summarized in section 4.3.2.2 of this EIS.

The CAA was enacted by the U.S. Congress to protect the health and welfare of the public from the adverse effects of air pollution. The CAA is the basic federal statute governing air pollution. Federal and state air quality regulations established as a result of the CAA include, but are not limited to, Title V operating permit requirements and PSD Review. The EPA is the federal agency responsible for regulating stationary sources of air pollutant emissions; however, the federal permitting process has been delegated to the LDEQ in Louisiana. A revised Title V and PSD permit application along with an Air Dispersion Modeling Protocol and Results for the Magnolia LNG Project was submitted to the LDEQ on January 27, 2015. KMLP submitted a Title V and PSD application to the LDEQ on June 20, 2014; however, on June 23, 2014, the U.S. Supreme Court issued a ruling that the EPA may no longer consider greenhouse gases as a pollutant for purposes of defining a "major emitting facility" in the PSD or Title V permitting context. Based on the Supreme Court ruling and LDEQ's rule provisions for greenhouse gases, KMLP submitted a revised application to the LDEQ on October 7, 2014, that does not include PSD Review. Air quality impacts that could occur as a result of construction and operation of the projects are evaluated in sections 4.11.1.4 and 4.11.1.5 of this EIS, respectively.

The proposed projects must comply with sections 401, 402, and 404 of the CWA. Water quality certification (section 401) has been delegated to the state agencies, with review by the EPA. Water used for hydrostatic testing that is point-source discharged into waterbodies would require a NPDES permit (section 402), which would be issued by the LDEQ. Potential impacts on water quality as a result of construction and operation of the projects is discussed in section 4.3.2.2 of this EIS.

Magnolia and KMLP are responsible for all permits and approvals required to implement the projects, respectively, regardless of whether they appear in table 1.5-1. However, any state or local permits issued with respect to jurisdictional facilities must be consistent with the conditions of any authorization the Commission may issue. Although the FERC encourages cooperation between applicants and state and local authorities, this does not mean that state and local agencies, through application of state and local laws, may prohibit or unreasonably delay the construction or operation of facilities approved by the FERC.[9]

---

9 See, e.g., Schneidewind v. ANR Pipeline Co., 485 U.S. 293 (1988); National Fuel Gas Supply v. Public Service Commission, 894 F.2d 571 (2d Cir. 1990); and Iroquois Gas Transmission System, L.P., et al., 52 FERC 61,091 (1990) and 59 FERC ¶ 61,094 (1992).

2.0 PROPOSED ACTION

2.1 PROPOSED FACILITIES

The Magnolia LNG and Lake Charles Expansion Projects consist of the LNG terminal and KMLP facilities. A description of these facilities is provided below.

- LNG Terminal: Construction and operation of various liquefaction, LNG distribution, and appurtenant facilities within the boundaries of the site leased by Magnolia near Lake Charles, Louisiana; components of the LNG terminal include:
    - Magnolia's facilities to treat and liquefy natural gas; store LNG; and load LNG onto LNG carriers, barges, and trucks for domestic distribution and export; and
    - KMLP's Magnolia Meter Station and interconnect pipeline.
- KMLP Facilities: Reconfiguration of KMLP's existing pipeline system in order to accommodate Magnolia's request for natural gas service at the LNG terminal site; components of the KMLP facilities include:
    - a new compressor station in Acadia Parish;
    - new low and high pressure natural gas header pipelines that would be located adjacent to the existing KMLP easement in Acadia Parish; and
    - modifications at six existing meter stations in Acadia and Evangeline Parishes (described in detail in section 2.1.3.3).

Figures 1-1 and 1-2 in section 1.0 provide the general location of the Magnolia LNG and Lake Charles Expansion Projects, respectively.

2.1.1 LNG Terminal

The LNG terminal would be located on the south shore of the Industrial Canal, approximately 9 miles southwest of the city of Lake Charles, Louisiana (see figure 2.1.1-1). The site, which is Port of Lake Charles property, is located off the main Calcasieu Ship Channel approximately 22 miles north of the Gulf of Mexico.

The LNG terminal would receive natural gas via a new interconnect pipeline and meter station (Magnolia Meter Station) to be constructed and owned by KMLP; the Magnolia Meter Station and interconnect pipeline would tie into KMLP's existing interstate pipeline system that traverses the southern side of the LNG terminal. The natural gas would then be treated, liquefied, and stored on site in two full-containment LNG storage tanks. The LNG would be loaded onto LNG carriers for export overseas, LNG carriers and LNG barges (collectively referred to as LNG vessels) for domestic marine distribution and the possibility of LNG bunkering,; and LNG trucks for road distribution to LNG refueling stations in Louisiana and the surrounding states. Additional information regarding the LNG terminal components is provided in the sections below.

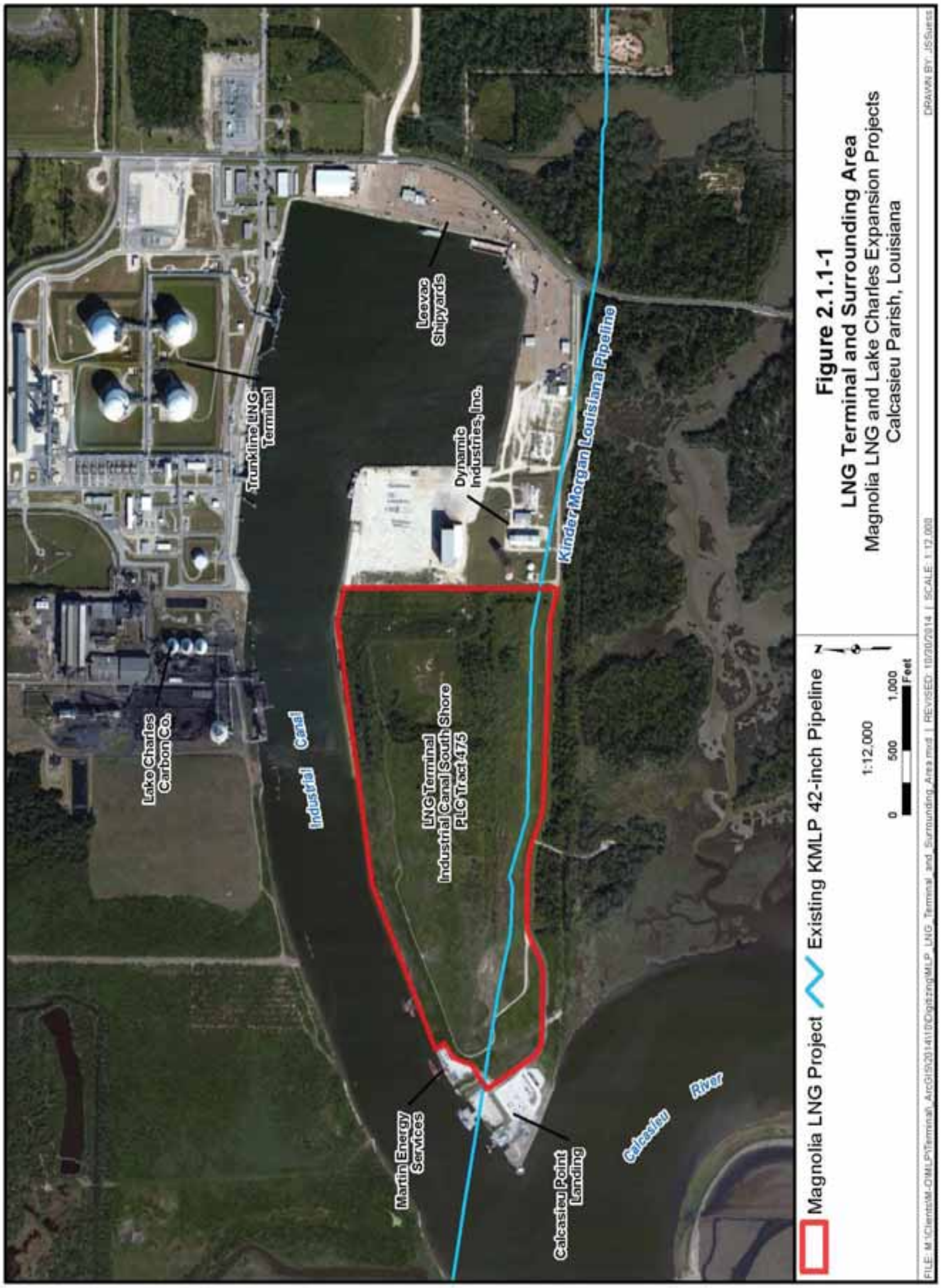


Figure 2.1.1-1
LNG Terminal and Surrounding Area
Magnolia LNG and Lake Charles Expansion Projects
Calcasieu Parish, Louisiana

2.1.1.1 Magnolia Meter Station and Interconnect Pipeline

Construction and operation of the Magnolia Meter Station would facilitate the transportation of up to 1.4 Bcf/d of natural gas (feed gas) from KMLP's existing interstate pipeline system to the LNG terminal. The Magnolia Meter Station would connect to KMLP's existing 42-inch-diameter pipeline using a 36-inch-diameter tap and about 40 feet of 36-inch-diameter pipeline riser (referred to as the interconnect pipeline). Both the Magnolia Meter Station and interconnect pipeline would be entirely within the LNG terminal (see figure 2.1.1-2). The meter station would include metering equipment, auxiliary equipment and controls, and one auxiliary building.

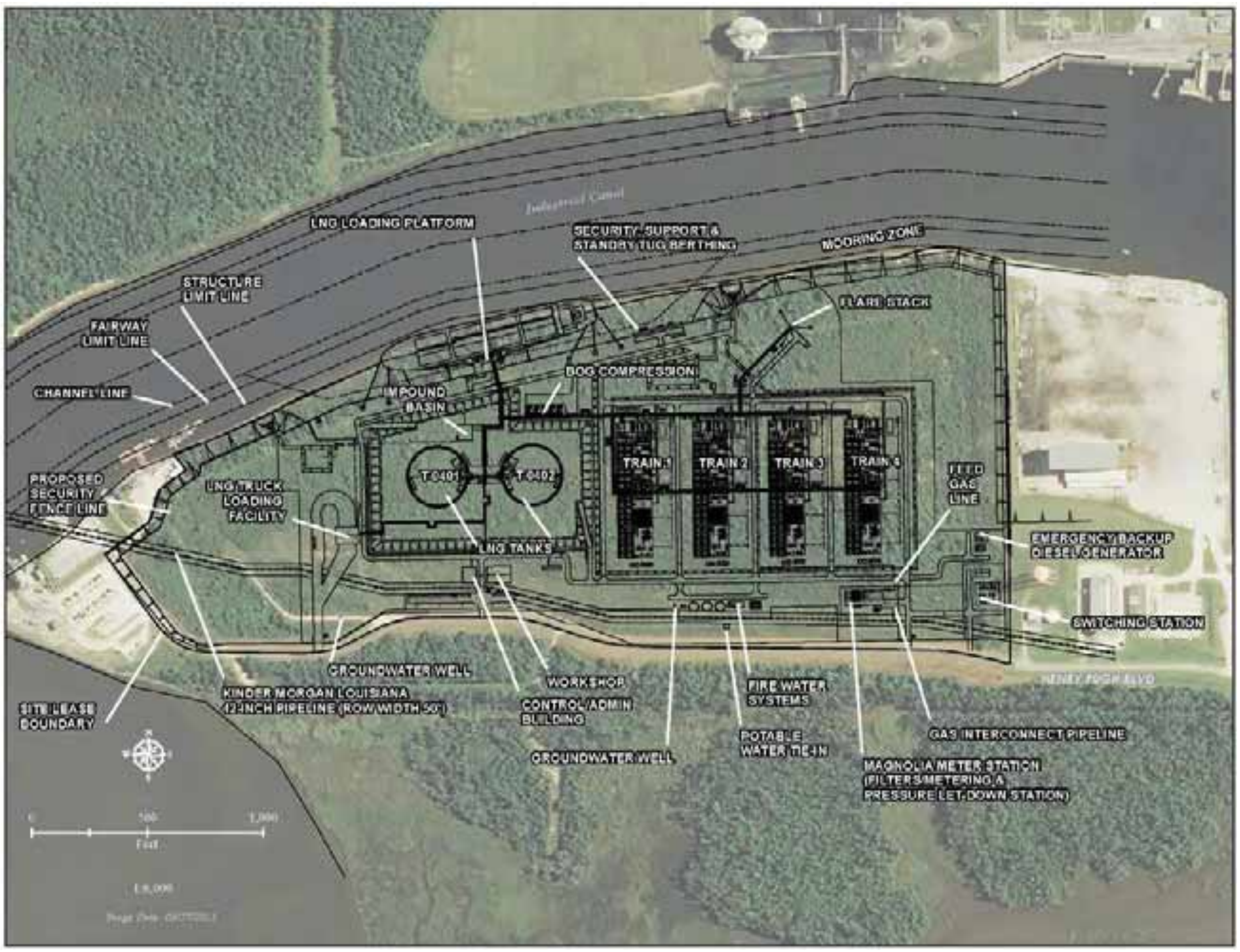


Figure 2.1.1-2 LNG Terminal Site Plan

As described above, although the Magnolia Meter Station and interconnect pipeline would be within the LNG terminal, these facilities would be owned and operated by KMLP. As such, the Magnolia Meter Station would be surrounded by a chain-link security fence and would have a separate access road originating from Henry Pugh Boulevard.

2.1.1.2 Liquefaction Trains

Four liquefaction trains would be constructed and operated at the LNG terminal, each with a guaranteed capacity of 1.7 MTPA and a nominal capacity of 2.0 MTPA of LNG, resulting in a total nominal capacity of 8.0 MTPA of LNG. Feed gas would be supplied to the liquefaction trains via a

36-inch-diameter feed gas line from the Magnolia Meter Station where it would be pre-treated and cooled into a liquid.

Gas Pre-treatment

Before liquefaction, feed gas would enter at the Magnolia Meter Station at a controlled pressure and would pass through an inlet filter to separate any liquids. The feed gas would then be pre-treated to remove components in the natural gas that would otherwise freeze solid or block the cold box exchangers at cryogenic temperatures (principally carbon dioxide (CO_2); water; mercury; heavy hydrocarbons; and small amounts of benzene, toluene, ethylbenzene, and xylenes [BTEX]).

CO_2 and trace amounts of hydrogen sulfide (H_2S) in the natural gas would be largely removed using an amine gas-sweetening unit, resulting in a CO_2 concentration of approximately 50 parts per million (ppm); the separated CO_2 and H_2S would flow through a H_2S scavenger unit to reduce the H_2S concentration to 0.1 ppm. The resulting waste stream would be routed to the thermal oxidizer before venting to the atmosphere (air emissions associated with operation of the LNG terminal are discussed in section 4.11.1.5). The water-saturated gas then would be cooled to about 59 degrees Fahrenheit (°F) (the hydrate point of gas is approximately 48 °F) using the auxiliary refrigeration system, passed through a knock-out separator to remove bulk water from the gas, and then routed through the molecular sieve bed dryers to remove most of the remaining water. The condensed water, along with trace amounts of amine removed from the cooled natural gas stream, would be recycled for use as makeup water. After this process, natural gas with a water content of about 20 pounds per million standard cubic feet would enter the dehydration plant, which would lower water content to less than 0.5 ppm. Any mercury in the natural gas would be removed in the mercury removal unit prior to entering the heavy hydrocarbon removal column. This column would remove the heavy hydrocarbons as well as small amounts of freezable aromatic compounds such as benzene and cyclohexane prior to entering the liquefaction unit. The removed heavy hydrocarbons would be vaporized and mixed with fuel gas powering the auxiliary boiler that supplements the steam demand in the plant. The auxiliary boiler would consist of a BTEX (heavy hydrocarbons) destruction burner to ensure air emissions are within acceptable limits.

Liquefaction and Boil-off Gas

Following pre-treatment and heavy hydrocarbon removal, the natural gas would be condensed into a liquid at close to atmospheric pressure by cooling it to –260 °F via Magnolia's Optimized Single Mixed Refrigerant (OSMR®) process. A schematic of the liquefaction process is shown on figure 2.1.1-3. Essentially, liquefaction of the pre-treated feed gas is achieved using a vapor compression cycle process. The mixed refrigerant used in the process would be comprised of nitrogen, methane, ethane, and n-butane. Two independent parallel refrigeration circuits would be provided, each consisting of a mixed refrigerant compressor and air cooler, core-in-kettle heat exchanger, and a main plate fin heat exchanger (cold box) and suction scrubber. After liquefaction, the LNG would split into two feed lines, entering each line at a pressure of 100 pounds per square inch gauge (psig) at about –260 °F, which would flow to the LNG storage tank.

The refrigerant compressor would be driven by aero-derivative gas turbines. Fuel for the gas turbines would be provided by molecular sieve regeneration gas and by a small quantity of makeup feed gas. Prior to entering the cold box, the mixed refrigerant would be cooled in the core-in-kettle heat exchanger using ammonia at a pressure of 44 psig and temperature of 30 °F.

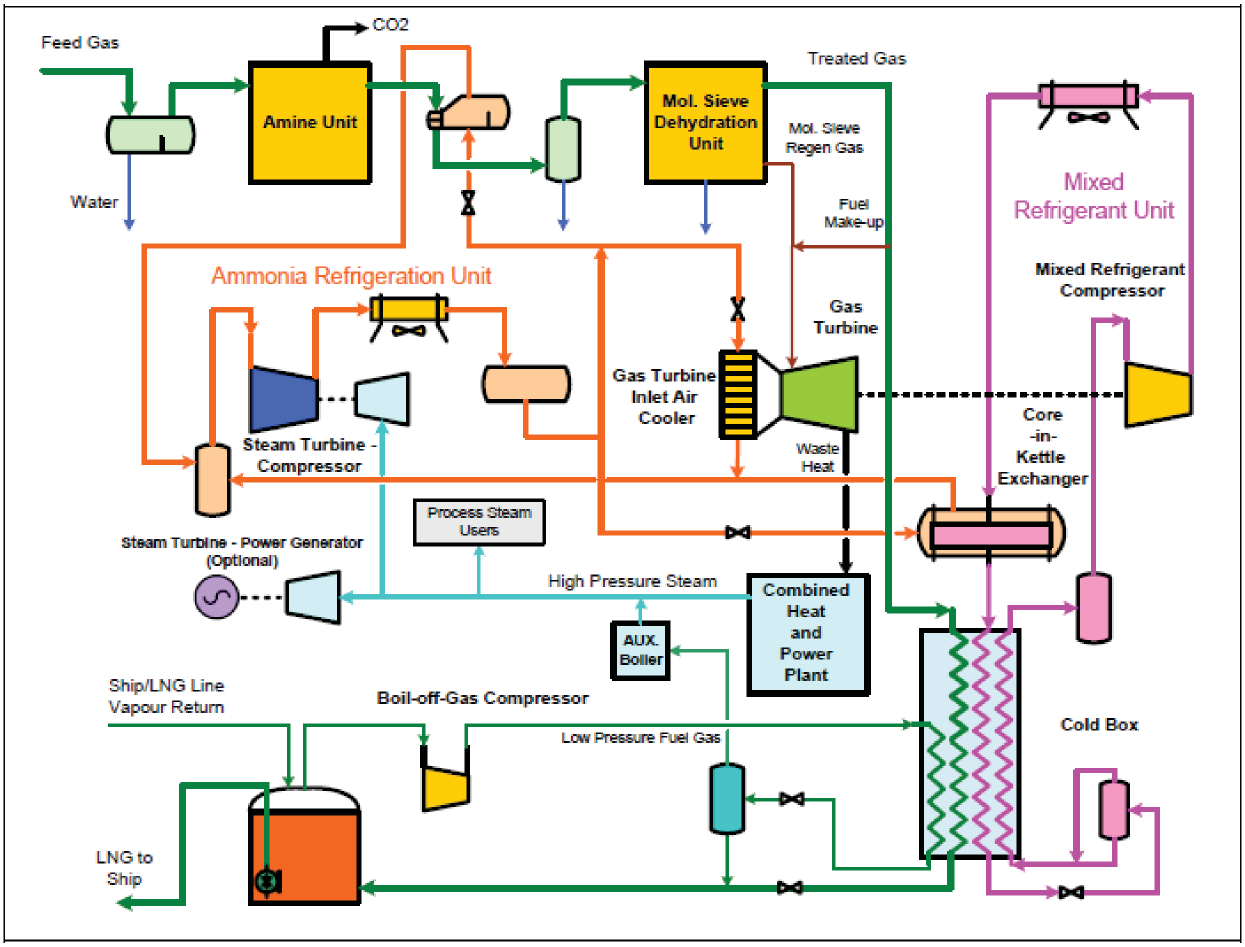


Figure 2.1.1-3 Schematic of OSMR® Process

The mixed refrigerant for each cold box would be compressed to 600 psig by a single-stage centrifugal compressor directly driven by a gas turbine. The high-pressure mixed refrigerant would then be fully liquefied in the cold box and expanded (partially flashed), using Joule-Thomson effect, thus providing the refrigeration for the system. The low pressure mixed refrigerant would provide the refrigeration in the cold box and cool mixed refrigerant vapor would return to the compressor via the suction scrubber. The partially flashed vapor and boil-off gas would be recovered by two boil-off gas compressors. Only one compressor would operate during normal operation; the second compressor would be used during LNG vessel loading. To maintain a constant vapor temperature entering the LNG storage tank and, therefore, constant suction and discharge temperature on the boil-off gas compressors, LNG would be sprayed into the vapor return line from the LNG vessel during loading.

The boil-off gas and flash vapor would be compressed to 100 pounds per square inch absolute (psia) and would return to the cold box where it would be substantially re-liquefied. The re-liquefied boil-off gas would be separated and liquid methane would return to the LNG storage tank.

Refrigeration Circuits

Refrigeration to liquefy the natural gas would be provided principally by the single mixed refrigerant supplemented by ammonia refrigeration at the warm end of the cycle. The ammonia refrigeration process would be comprised of steam turbine-driven centrifugal compressor, condensers, separator vessels, pumps, pipework, instrumentation, and a control system. The ammonia refrigerant would first be applied to cooling wet gas from the amine contactor then applied to cooling inlet air to the gas turbines to increase power; the remainder would be used in pre-cooling the mixed refrigerant.

Cold Box and Ammonia Pre-cooler

Each liquefaction train would contain two parallel cold box/ammonia pre-cooler assemblies, each with a conventional core-in-kettle heat exchanger mounted on a cold box. The ammonia would cool the high pressure mixed refrigerant stream before it enters the cold box, thereby ensuring that low temperature mixed refrigerant would return to the compressor suction.

Combined Heat and Power System

Combined heat and power technology would be employed to recover the waste heat from the gas turbines, which would be used to provide process heat and steam power for the plant, including steam power for the ammonia refrigeration system. Steam would be generated via once-through-steam-generators, which would generate high-pressure steam to power a single pressure steam turbine generator, as well as supply the required quality of steam to various process heat users. An auxiliary boiler fueled by lean flash gas produced from the boil-off gas system, feed gas, and condensate from the heavy hydrocarbon removal unit also would be used to supplement the steam production.

2.1.1.3 LNG Storage Tanks

Two LNG storage tanks, each with a net capacity of about 160,000 m^3, would store the LNG produced by the four liquefaction trains. The full-containment LNG storage tanks would be double-walled and designed to meet the requirements of the NFPA Standard 59A, regulations of the DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) at 49 CFR 193, and other applicable standards.

Each LNG storage tank would have the following features:

- an inner wall (primary containment) composed of low-temperature 9-percent nickel steel;
- an outer wall (secondary containment) composed of reinforced post-tensioned concrete with a steel liner;
- a reinforced concrete domed roof, supporting insulated deck, LNG pumps and tank top, and LNG and vapor pipework;
- an insulated aluminum deck, which would be located over the inner wall and suspended from the roof of the outer wall;
- submerged motor pumps contained in watertight chambers and supported by a structure attached to the roof and walls;
- a base heating system;
- pressure, level, and temperature instrumentation, including monitoring of tank cool-down;
- pressure and vacuum relief systems;
- nozzles and internal pipework, including a two-phase inlet and top cool-down spray;
- a nitrogen purge and gas detection system for wall and floor insulation space;

- roof platforms, walkways, and pipe supports; and
- external stairways, ladder, and pipe supports.

The LNG storage tanks would be designed and constructed so that the self-supporting 9-percent nickel steel primary containment and the concrete secondary containment would be capable of independently containing the LNG. The 9-percent nickel steel primary containment would contain the LNG under normal operating conditions. The concrete secondary containment is designed to be capable of containing 110 percent of the capacity of the inner tank. Furthermore, an earthen berm would be constructed around both of the LNG storage tanks and would have a minimum containment capacity equal to the gross volume of one LNG storage tank. A site plan showing the location of the proposed LNG storage tanks in relation to other project facilities is shown on figure 2.1.1-4.

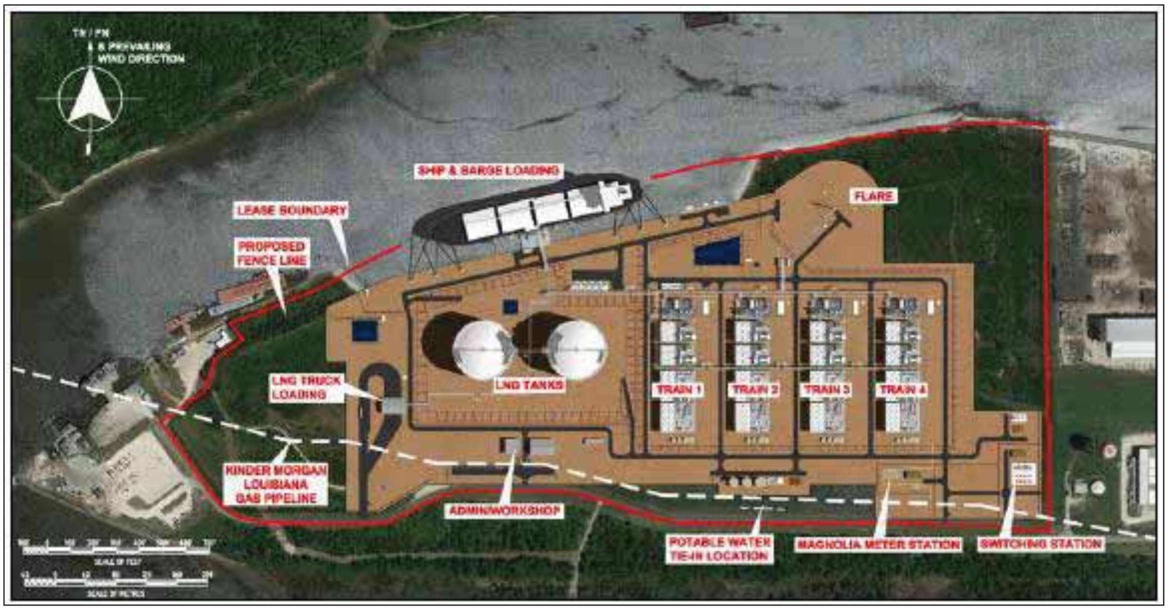


Figure 2.1.1-4 LNG Terminal Layout

2.1.1.4 LNG Loading and Ship Berthing Area

A single ship berthing area would be recessed into the northern boundary of the LNG terminal to accommodate LNG vessels (both LNG carriers and barges) (see figures 2.1.1-2 and 2.1.1-4). To achieve the proposed maximum loading rate for LNG vessels (10,000 cubic meters per hour [m^3/hr]), the main cryogenic LNG line from the LNG storage tanks to the loading platform would be nominally sized at 30 inches in diameter. The LNG loading platform would include three 16-inch-diameter LNG loading arms and one 16-inch-diameter vapor return arm. Each loading arm would be equipped with the following:

- a hydraulic quick connect/disconnect coupler;
- a hydraulic double-ball, valve-powered emergency release coupler;
- swivel joints with nitrogen purge;
- a mechanical locking device for arm stowing;
- nitrogen purge and drain connections; and
- breasting and mooring dolphins.

The layout would provide an additional breasting dolphin in front of the LNG loading platform to cover the LNG barges and ensure contact with the smaller vessels' flat panel when spotted across from the dedicated combination LNG loading arm and vapor return line. Magnolia would use a dedicated all-metal articulated 8-inch-diameter LNG loading arm with a 6-inch-diameter vapor return line mounted piggyback on the LNG loading arm for this service. Both the LNG loading arm and vapor return line would be equipped with a double-ball, valve-powered emergency release system to provide near dry break disconnection of the LNG loading arm and vapor return line from the LNG barge in the event of an emergency. Other operating and control equipment would be the same as that installed on the 16-inch-diameter LNG loading arms for the larger-capacity LNG carriers.

Initially, LNG carriers with capacity of up to 180,000 m^3 are expected to call on the LNG terminal; however, the proposed berthing area would be able to accommodate LNG carriers with capacities between 120,000 and 218,000 m^3 and LNG barges with capacities of about 15,000 m^3. When operating at full capacity, projections indicate that an average of one to two LNG carriers and an additional one to two LNG barges would make port calls at the LNG terminal per week. As determined by the Coast Guard (see section 1.2.3), the maximum number of LNG carrier and barge transits would be 208 vessels per year, including 104 LNG carriers and 104 LNG barges.

2.1.1.5 LNG Truck Loading

The LNG terminal would include facilities that allow LNG to be loaded onto LNG trucks for road distribution to LNG refueling stations in Louisiana and surrounding states. The LNG truck-loading area, which is depicted on figures 2.1.1-2 and 2.1.1-4, would include the following main facilities:

- cryogenic pipework (loading and vapor return) from the LNG storage tanks to the LNG truck-loading area;
- a truck loading vessel that provides a stable LNG flow to the LNG truck loading pumps;
- flexible cryogenic hoses (loading LNG and vapor return);
- control panel within a shelter; and
- a turning circle for LNG trucks.

The capacity of the LNG trucks would be about 12,500 gallons (47 m^3) with a loading flow rate of about 265 gallons per minute (60 m^3/hr). As a result, LNG loading would take less than 1 hour per truck. After LNG loading operations are complete, the LNG truck would follow the plant road in order to turn around and exit the LNG terminal site. Additional information on LNG truck transit is described in section 1.4.1.

Current projections indicate that, once more LNG fueling stations become operational in Louisiana and the neighboring states, an average of one truck would be loaded per week at the LNG terminal when operating at full capacity. Therefore, the anticipated volume of LNG to be delivered by truck would be about 650,000 gallons per year during operation of the LNG terminal.

2.1.1.6 Flare Stack

A flare stack is a gas combustion device primarily used for burning off flammable gas released by pressure relief valves. The purpose of a pressure relief and flare system is to safely and reliably protect plant systems from overpressure during start-up, shutdown, plant upsets, and emergency conditions.

Upset events that require flaring or depressurizing are not planned, and the control system is designed to prevent such events. Planned flaring is usually associated with system cool down and planned maintenance shutdown scenarios.

Two separate flares would be installed at the LNG terminal: a cold flare to handle cold relief fluids and a warm flare to handle wet/warm relief fluids. The flares would be adjacent to one another and would share a common flare-stack structure supported by a common guy-wire system. The stack supporting the two flares would be about 100 feet in height. During normal operation, no flaring would take place because boil-off gas would be recovered and utilized as fuel in the combined heat and power system's auxiliary boiler, which would then be used as steam power in the ammonia refrigeration system (see section 2.1.1.2).

The warm flare would be connected to the liquefaction trains and would only flare during plant start-up or process upset conditions. The cold flare would be connected to the vapor return line from vessel loading. The line would feed the LNG storage tank to maintain tank pressure during vessel loading. The flare would be ignited only when the over-pressure valve opens and when a flammable gas mixture is present at the flare tip. This is a safety overpressure system and is not designed for use during normal operations.

2.1.1.7 Utilities and Support Facilities

Demineralized Water Treatment Plant

Makeup water required by the liquefaction trains would be supplied by the demineralized water treatment plant. The water treatment system would be designed, supplied, installed, and monitored by a specialist from a water treatment company. The water treatment may include pre-filtering, reverse osmosis, electro-de-ionization, mixed resin bed, and chemical treatment. Water treatment option details would be determined during Front End Engineering Design (FEED).

Operation of the demineralized water treatment plant would require between 167,378 and 278,964 gallons of water per day. The majority of the water required for operation (between 130,090 and 167,378 gallons) would be obtained from an on-site water well (see section 4.3.1.4). The remaining water required for the operation of the demineralized water treatment plant (up to 126,802 gallons) would be condensed water produced by the liquefaction trains. Reject water (which is composed of dissolved solids and minerals removed from the water during the treatment process) from the demineralized water treatment plant would be drained to a holding basin and diluted with stormwater runoff prior to discharge to the Industrial Canal in accordance with LDEQ requirements.

Power Supply

The total power requirement for each liquefaction train is 72.5 megawatts (MW), of which 66 MW would be generated from the two 33 MW gas turbines driving the mixed refrigerant compressors. As depicted on figure 2.1.1-3, a combined heat and power system would recover the waste heat from the gas turbines to produce high-pressure steam. This steam would be used by steam turbines that would drive the ammonia refrigeration plant within each liquefaction train.

The remaining 6.5 MW required for each liquefaction train would be supplied by construction of a new switching station within the LNG terminal site and a new 1.3-mile-long 230-kV transmission line between the LNG terminal and Entergy's existing Graywood Substation. These facilities are discussed in detail in section 1.4.3.

Water Supply and Sewage Handling

Potable water required during construction and operation of the LNG terminal would be supplied by Calcasieu Parish District 12 Water Works' existing 12-inch-diameter water pipeline, which runs along the southern boundary of the LNG terminal just north of Henry Pugh Boulevard. The water, sourced from off-site groundwater wells, would be used for plant personnel in buildings, safety showers, and eyewash stations. Discussions with the Calcasieu Parish Engineer, Terry Frelot, confirmed that the existing water pipeline would be sufficient for the facility's operational potable water needs of 2,000 gallons per day, on average. No upgrades or improvements to the existing water pipeline would be required. The tie-in to the 12-inch-diameter water pipeline would take place within the LNG terminal site boundaries and is described in additional detail in section 1.4.2.

Two groundwater wells would be drilled on site for process, service, and plant fire water. The depth of the wells would be between 500 and 700 feet. Although two wells would be drilled, only one well would be used during general operation of the LNG terminal; the second well would be used only if the primary well were out of service.

Two screened water intakes would appropriate water from the Industrial Canal for operation of the LNG storage tank deluge system, which is a fire protection system that would distribute water over the roof and side walls of the LNG storage tank in the event of a fire emergency. The deluge system would be operated periodically for system maintenance, testing, and in the event of a fire emergency. When in operation, the system would appropriate water from the canal at a rate of approximately 6,300 gallons per minute.

Each liquefaction train would produce condensed water during operations, which would be reused by the demineralized water treatment plant within each train. In total, all four trains are expected to produce an average of 126,802 gallons per day of condensed water (an average of 31,700 gallons of water per day per liquefaction train). As described above, groundwater would be used to supply the balance of water required by the demineralized water treatment plant.

During construction of the LNG terminal, wastewater would be collected from construction facilities into holding tanks, the contents of which would be removed by licensed vendors via vacuum trucks for proper off-site disposal. In general, the workforce would be serviced by a certified portable toilet vendor with wastewater periodically removed via vacuum trucks for proper off-site disposal.

A self-contained, aboveground treatment plant would be developed to handle wastewater generated during operation of the LNG terminal. Magnolia would employ a third-party contractor to operate and maintain the treatment plant as an individual system, the Louisiana Administrative Code Title 51 (LAC 51).

Communication

The telecommunication system for the LNG terminal would include:

- telephone exchange;
- radio system;
- computer network;
- plant telecommunications network;
- electronic mail system for communication; and
- a closed-circuit television system.

Communication with the following locations would be required:

- LNG carrier or LNG tug/barge;
- local Programmable Logic Controller;
- natural gas provider;
- Entergy (local power provider);
- local emergency services; and
- company head office.

Marine band very-high-frequency radios would be provided for communication with the LNG vessels. Access to the control system would be provided to allow remote monitoring of LNG terminal operation by approved parties. The telecommunication systems would comply with applicable governmental rules and regulations.

Buildings and Access Roads

The LNG terminal would include an administration and control building, workshop, and smaller shelters. The ground level of the administration and control building would include offices for plant personnel and visitors, meeting room, open area for work stations, kitchen, and bathrooms. The control room would be located above the administration level to provide a view of the facility. It would include an open area with control and monitoring stations suitable for two operators. Separate rooms would be provided for instrument and electrical equipment and an uninterruptible power supply/battery. The LNG terminal would also include a workshop for the maintenance of plant equipment as well as smaller shelters and buildings.

Existing local roadways would be used to access the LNG terminal during construction and operation. Because there are no existing roads within the LNG terminal site, internal roads would be constructed within the site boundary, including a new heavy-haul road to transport marine deliveries and materials staged at the existing Dynamic Industries, Inc. (DII) construction yard to the LNG terminal (see additional discussion in sections 2.2.1 and 2.5.1.1). A perimeter road and site access roads would be constructed and maintained to provide access to and within the LNG terminal. The main LNG terminal access would be provided on the north side of Henry Pugh Boulevard. No new access roads or improvements to existing off-site roadways are proposed for construction and operation of the LNG terminal.

Facility Drainage and Containment

Drainage, containment, and treatment systems would be provided to ensure the proper disposal of effluents from process, service, and surface water streams, as well as domestic effluent from the LNG terminal, in accordance with LDEQ requirements. No operational process waters would be discharged directly to surface waterbodies.

Magnolia has designed and would implement its spill containment system within the LNG truck loading area, LNG storage tank area, and liquefaction area. This system would utilize curbed areas, troughs, open drains, and an impoundment basin to hold LNG as described in additional detail in section 4.12.5.

Magnolia would be required to implement a *Stormwater Pollution Prevention Plan* (SWPPP) during construction in accordance with the Louisiana Pollutant Discharge Elimination System (LPDES), General Permit for stormwater discharges. During operation of the LNG terminal, stormwater would be directed into two holding basins (east and west) for dilution and temperature adjustment to ambient before being discharged into the Industrial Canal.

2.1.2 LNG Transport Vessels

2.1.2.1 LNG Carriers

LNG could be shipped to a variety of locations, including domestic facilities in Puerto Rico, Florida, and potentially New York, as well as FTA-countries. In addition, Magnolia has submitted an application to the DOE seeking authorization to export to non-FTA countries, which is currently under review (see discussion in section 1.2.4). Although LNG carriers and their operation are directly related to the use of the proposed LNG terminal, they are not subject to the authorization under section 3(a) of the NGA sought by Magnolia's application with the Commission. As previously discussed, the Coast Guard is the federal agency responsible for determining the suitability of the waterway for LNG marine traffic associated with Magnolia LNG Project. As required by its regulations, the Coast Guard has completed its review of the WSA and issued an LOR as to the suitability of the Calcasieu Ship Channel for LNG marine traffic on February 12, 2015.[1]

The ships that transport LNG are specially designed and constructed to carry LNG for long distances. LNG carrier construction is highly regulated and consists of a combination of conventional ship design and equipment, with specialized materials and systems designed to safely contain liquids stored at a temperature of –260 °F.

The following sections present an overview of the main design and safety features of a typical LNG carrier that may transport LNG from the proposed terminal. Additional information on LNG carrier regulations and safety measures is presented in sections 4.12.6 and 4.12.7.

Profile

LNG carriers have a distinctive appearance compared with other transport ships. An LNG carrier has a high freeboard (i.e., that portion of the ship above water) when compared with vessels such as oil tankers because of the comparatively low density of the cargo. Because of the high freeboard, wind velocity can adversely affect the maneuverability of the ship, particularly at slow speeds.

Hull System

All LNG carriers are constructed with double hulls, which increase the structural integrity of the hull system and provide protection for the cargo tanks in case of an accident. The space between the inner and outer hulls is used for water ballast. The International Maritime Organization's (IMO) *Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* and Coast Guard regulations require that LNG carriers meet a Type IIG standard of subdivision, damage stability, and cargo tank location.

The Type IIG design ensures the LNG carrier could withstand flooding of any two adjacent compartments without any adverse effect upon the stability of the ship. Type IIG design also requires that the cargo tanks must be a minimum of 30 inches from the outer hull and a minimum distance above the bottom of the ship equal to the beam of the ship divided by 15, or 6.5 feet, whichever is less. This distance is intended to prevent damage to the cargo tanks in case of low energy-type accidents that might

[1] Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number, excluding the last three digits, in the "Docket Number" field (i.e., CP14-347). The LOR for the project was filed with the FERC on March 2, 2015.

occur in harbors and during docking. Most large LNG carriers are designed to have 10 to 15 feet between the outer hull and cargo tank.

Containment Systems

The LNG containment system on LNG carriers consists principally of the cargo tank (sometimes called a primary barrier), the secondary barrier, and insulation. The containment system also includes cargo monitoring and control and safety systems.

Three basic tank designs have been developed for LNG cargo containment: prismatic freestanding, spherical, and membrane. The earliest form of LNG containment is the prismatic freestanding tank. It consists of an aluminum alloy or 9 percent nickel steel, self-supporting tank that is supported and restrained by the hull structure. Insulation consists of reinforced polyurethane foam on the bottom and the sides, with fiberglass on the top. The spherical tank design, also known as the Moss design, uses an unstiffened, spherical, aluminum alloy tank that is supported at its equator by a vertical cylindrical skirt, with the bottom of the skirt integrally welded to the ship's structure. This freestanding tank is insulated with multi-layer close-cell polyurethane panels. In the membrane containment system, the ship's hull constitutes the outer tank wall, with an inner tank membrane separated by insulation. Two forms of membrane are commonly used: the Technigaz membrane using stainless steel and the Gas-Transport membrane using Invar.

LNG carriers are designed with double hulls regardless of the containment system used. A double bottom and double sides are provided for the full length of the cargo area and arranged as ballast tanks, independent of the cargo tanks. The double-hulled design provides greatly increased reliability of cargo containment in the event of grounding and collisions. Further, the segregated ballast tanks prevent ballast water from mixing with any residue in the cargo tanks.

Pressure/Temperature Control

A basic goal of all LNG containment systems is to maintain the LNG cargo at or near atmospheric pressure at the boiling temperature of the LNG (about –260 °F, the temperature at which LNG transitions from a liquid to a gas). This is accomplished using "auto-refrigeration," a phenomenon that results from the constant heat flow into the tank and the removal of the associated vapor. The vapor ranges from 0.15 to 0.25 percent (by volume) per day and is used to supplement the bunker fuel in the ship's boilers. Currently, all LNG carriers utilize this boil-off gas as fuel. The EPA does not permit routine venting of boil-off gas to the atmosphere in the United States (40 CFR 63). Thus, all LNG carriers that trade in the United States are fitted with an internalized combustion energy system that allows the ship's boiler to consume all of the boil-off gas to fuel the ship's steam propulsion system. As a result, LNG carriers have reduced emissions when compared with conventional oil-fired ships.

Ballast Tanks

Sufficient ballast water capacity must be provided to permit the ship safe transit under various sea conditions. LNG cargo tanks are not used as ballast tanks because these tanks must contain a minimal amount of LNG to remain at cryogenic temperatures. Consequently, LNG carriers must be designed to provide adequate ballast capacity in other locations.

Ballast water tanks are arranged within the LNG carrier's double hull. It is essential that ballast water not leak into the LNG containment system. To reduce the potential for leakage, the ballast tanks, cofferdams, and void spaces are typically coated to reduce corrosion. LNG carriers are also periodically inspected to examine the coating and to renew it as necessary.

A ballast control system, which permits simultaneous ballasting during cargo transfer operations, is also incorporated into each LNG carrier. This allows the LNG carrier to maintain a constant draft during all phases of its operation to enhance performance. Under normal operating conditions, ballast water would be discharged from the ship during LNG loading at the LNG terminal. A typical LNG carrier of the type in service today would discharge about 9 to 12 million gallons of ballast water into the Industrial Canal during loading operations (see ballast water discharge discussion in section 4.3.2.2).

Safety Systems

LNG carriers calling at the LNG terminal would have to comply with all federal and international standards regarding LNG shipping. As such, ships that transport LNG from the LNG terminal would be fitted with an array of cargo monitoring and control systems. These systems would automatically monitor key cargo parameters while the ship is at sea and during cargo operations at the unloading facilities.

The system includes provisions for pressure monitoring and control, temperature monitoring of the cargo tanks and surrounding ballast tanks, emergency shutdown of cargo pumps and closing of critical valves, monitoring of tank cargo levels, and gas and fire detection.

The ships transporting LNG from the terminal would be fitted with many navigation and communication systems, including:

- two marine radar systems, including automatic radar plotting and radio direction finders;
- LORAN-C receivers;
- echo depth finders; and
- a satellite navigation system.

All LNG carriers also have redundant, independent steering control systems that are operable from the bridge or steering gear room to maintain rudder movement in case of a steering system failure.

Fire Protection

All LNG carriers arriving at the terminal would be constructed according to structural fire protection standards contained in the *International Convention for the Safety of Life at Sea* (SOLAS). This would be done under the review and approval of the Coast Guard.

LNG carriers using the terminal would also be fitted with active fire protection systems that meet or exceed design parameters in Coast Guard regulations and international standards, such as the *Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* and SOLAS, including:

- a water spray (deluge) system that covers the accommodation house and central room, and all main cargo control valves;

- a traditional firewater system that provides water to fire monitors on deck and to fire stations found throughout the ship;

- a dry powder extinguishing system for LNG fires; and

- a CO_2 system for protecting the machinery, ballast pump room, emergency generators, cargo compressors, etc.

Crew Qualifications and Training

All officers and crews of the LNG carriers would comply with the *International Convention Standards of Training, Certification and Watch Keeping for Seafarers*. Key members of the crew must have specific training in the handling of LNG and the use of the safety equipment. Officers must receive simulator training in the handling of the ship and the cargo systems specific to the conditions at the LNG terminal. In addition, a local pilot from the Lake Charles Pilots Association would board each ship and guide it while transiting the Calcasieu Ship Channel and Industrial Canal.

LNG barge personnel would be required to complete familiarity training with vessel characteristics and basic safety training prior to assuming their duties and responsibilities, in accordance with 46 CFR 15.405 and 15.1105. The Coast Guard issued for comment its draft Policy Letter 01-15 *Guidance for Liquefied Natural Gas Fuel Transfer Operations and Training of Personnel on Vessels Using Natural Gas as Fuel* on February 23, 2015, which provides additional requirements for the training of personnel working on LNG barges. When, and if, ratified, Policy Letter 01-15 would require that each mariner meet operational and training provisions appropriate for the position they hold (i.e., basic safety crew, deck officers, and engineer officers). To ensure adequate training, drills would be conducted at regular intervals to confirm that personnel are trained to perform assigned duties during fueling and contingency response.

Ship Selection

The specific identity of LNG carriers that would load at the LNG terminal would depend on the commercial terms of the LNG purchase agreement(s). In accordance with the Coast Guard's LOR, the ship loading and berthing area would accommodate up to 104 LNG carriers per year with capacities ranging from 120,000 to 218,000 m^3. Ships using the LNG terminal would comply with the Coast Guard regulations for LNG carriers (46 CFR 154). This compliance is demonstrated by the operator of the LNG carrier having proper certificates authorizing the transport of LNG as follows:

- U.S. Flag LNG Ship: The Coast Guard Certificate of Inspection (COI) must be valid and endorsed for the ship to transport LNG. A COI is issued for a period of 5 years and retention of the COI depends upon the continued maintenance of the vessel in a safe operating condition and satisfactory completion of required annual inspections during the 5-year COI period.

- Foreign Flag LNG Ship: The ship must have a valid Certificate of Compliance issued by the Coast Guard. The certificate is issued after the ship has proved that it complies with the Coast Guard regulations and after it has been satisfactorily inspected by a Coast Guard Marine Sector Office. A Certificate of Compliance is valid for a 2-year period and remains valid pending satisfactory completion of an annual mid-period examination between Certificate of Compliance renewals.

Both U.S. and foreign flag ships must be annually inspected by the Coast Guard and the flag state. A Coast Guard COI is required every 2 years. Coast Guard officers from Marine Safety Unit Lake Charles may board the LNG ships arriving in the Calcasieu Ship Channel to ensure safety standards are met. Magnolia would continually monitor ship loading operations at the LNG terminal to ensure that the operations are occurring according to established procedures.

2.1.2.2 LNG Barges

Although LNG barges and their operation are directly related to the use of the proposed LNG terminal, they are not subject to the authorization under section 3(a) of the NGA sought by Magnolia's application with the Commission. As previously discussed, the Coast Guard is the federal agency responsible for determining the suitability of the waterway for LNG marine traffic. The Coast Guard has completed its review of the WSA and issued the LOR on February 12, 2015, which stated that the Calcasieu Ship Channel is considered suitable for LNG marine traffic.

Barges designed to carry LNG as cargo do not currently exist in the United States; however, the Coast Guard, Office of Hazardous Materials Division is currently developing policy regarding the design of LNG barges. The foundation for design of LNG barge requirements is being developed based on the International Gas Carrier Code and Title 46 CFR 154 – Safety Standards for Self Propelled Vessels Carrying Bulk Liquefied Gases, which is a long-established framework of regulatory requirements for self-propelled vessels carrying LNG as cargo (Coast Guard, 2014; Magnolia, 2014a). LNG barges, both domestic and foreign, would be required to comply with the Coast Guard regulations for LNG carriers as described above.

Magnolia would engage in commercial discussions with LNG barge operators as these vessels are constructed and enter the U.S. marketplace. Based on preliminary barge design specifications, LNG barges would be between 296 and 504 feet in overall length, between 52 and 78 feet in width, and design draft (the distance between the waterline and the bottom of the vessel) would be between 15 and 23 feet. The preliminary containment system design on LNG barges consists of full secondary barriers, where a second bottom and sides are provided for the full length of the cargo area. This secondary barrier design would provide increased reliability of cargo containment in the event of grounding or collision.

Fire protection and safety systems for LNG barges would be designed to comply with the Coast Guard International Gas Carrier Code regulations, which would require firefighting systems, cargo control/monitoring equipment, and gas detection system on LNG barges. The crew qualification and training requirements described above for LNG carriers are expected to also apply to LNG barges. Barge selection would be part of future commercial negotiations and contracts. Magnolia would require that all LNG barges calling at the LNG terminal comply with the Coast Guard international design, safety, and operational requirements applicable to the specific vessel type.

2.1.2.3 LNG Trucks

As stated in section 1.4.1, LNG trucking activities that take place outside the boundaries of the LNG terminal do not fall under the jurisdiction of the FERC. The DOT and Louisiana DOTD have jurisdiction over vehicle operation within the United States and the State of Louisiana, respectively. The trailers that transport LNG are specially designed and constructed to transport LNG for long distances in accordance with applicable DOT regulations as discussed below. The following discussion presents a brief overview of the main design and safety features of a typical LNG truck trailer that may transport LNG from the terminal. Additional information on LNG trucking is presented in section 4.13.

Typical LNG trucks loading at the LNG terminal would have a capacity of approximately 12,500 gallons (47 m^3). The trailer containing the LNG would be 60 feet long, 9 feet wide, and 12 feet high. The inner tank of the trailer would be composed of aluminum and constructed in accordance with applicable standards established by the American Society of Mechanical Engineers (ASME) and American National Standards Institute (ANSI) for pressure vessels and internal and external piping. The outer, structural frame would be composed of carbon steel and stainless steel jacket that would provide a vacuum insulation system to minimize heat loss (boil-off) of the LNG. The trailer would contain a pressure relief system to protect against overpressure, emergency shutoff switches, and the maximum allowable operating pressure would be approximately 79 psig. Design temperatures for the inner LNG container would be –320 °F to 100 °F.

LNG trucks would be required to comply with DOT regulations (49 CFR 178.338). Truck operators would be trained to satisfy the minimum requirements of 49 CFR 193, as well as the requirements of the DOT, Louisiana DOTD, and Calcasieu Parish Police Jury.

2.1.3 KMLP Facilities

In order to accommodate Magnolia's request for natural gas service at the LNG terminal, KMLP's existing pipeline system would require modifications at several locations. In addition to the facilities within the LNG terminal that would be owned and operated by KMLP (i.e., Magnolia Meter Station and interconnect pipeline), the Lake Charles Expansion Project includes the following components (collectively referred to as the KMLP facilities): a new compressor station; new low and high pressure header pipelines that would be located adjacent to the existing KMLP easement; and modifications at a total of six existing meter stations in Acadia and Evangeline Parishes. These facilities, which are shown on figure 2.1.3-1 and appendix B, would be constructed, owned, and operated by KMLP. The proposed facilities that would be located in close proximity to one another within Acadia Parish are shown in additional detail on figure 2.1.3-2. The proposed KMLP facilities are described in additional detail below.

2.1.3.1 Compressor Station 760

A new compressor station, Compressor Station 760, would be constructed about 6 miles southwest of Eunice in northern Acadia Parish, Louisiana. The compressor station would be adjacent to KMLP's existing pipeline easement, the Pine Prairie Energy Center, LLC (Pine Prairie) Meter Station, and the proposed low and high pressure header pipelines (see figures 2.1.3-1 and 2.1.3-2).

Compressor Station 760 would include two acoustically insulated compressor buildings, each containing two 16,000 horsepower (hp) gas turbine compressor units and turbine auxiliary equipment and controls; one auxiliary building containing emergency generation facilities and motor control equipment; one office/warehouse building with shop space, and a control building. In addition, the compressor station would include a 42-inch-diameter pig launcher and receiver, filter separators, gas coolers, a mainline valve, and other utilities. A new paved road originating from Coulee Road would provide access to Compressor Station 760 during construction and operation.

2.1.3.2 Header Pipelines

Low Pressure Header Pipeline

A new 1.2-mile-long (about 6,400-foot-long), 36-inch-diameter low pressure natural gas header pipeline would be collocated with and constructed adjacent to KMLP's existing 42-inch-diameter pipeline about 6 miles southwest of Eunice in northern Acadia Parish (see figures 2.1.3-1 and 2.1.3-2). The low pressure header pipeline would begin at the existing Texas Gas Transmission, LLC (TGT) Meter Station, connect to the proposed Compressor Station 760 and the existing Pine Prairie Meter Station, and extend to the existing ANR Pipeline Company (ANR) Meter Station. A pig receiving facility would be constructed within the permanent easement associated with the low pressure header pipeline west of the ANR Meter Station. The low pressure header pipeline would deliver natural gas to one of two suction headers at Compressor Station 760.

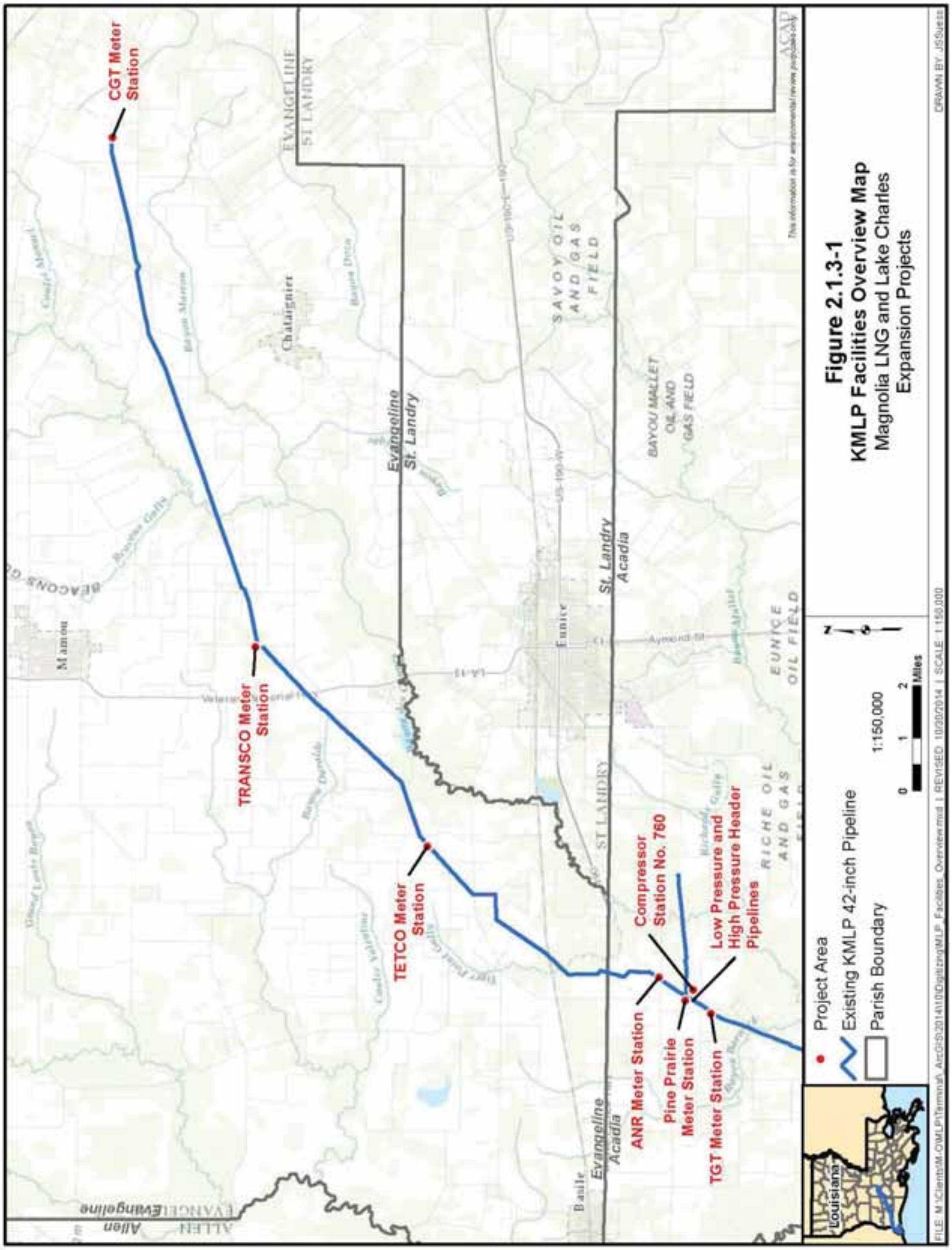


Figure 2.1.3-1
KMLP Facilities Overview Map
Magnolia LNG and Lake Charles Expansion Projects

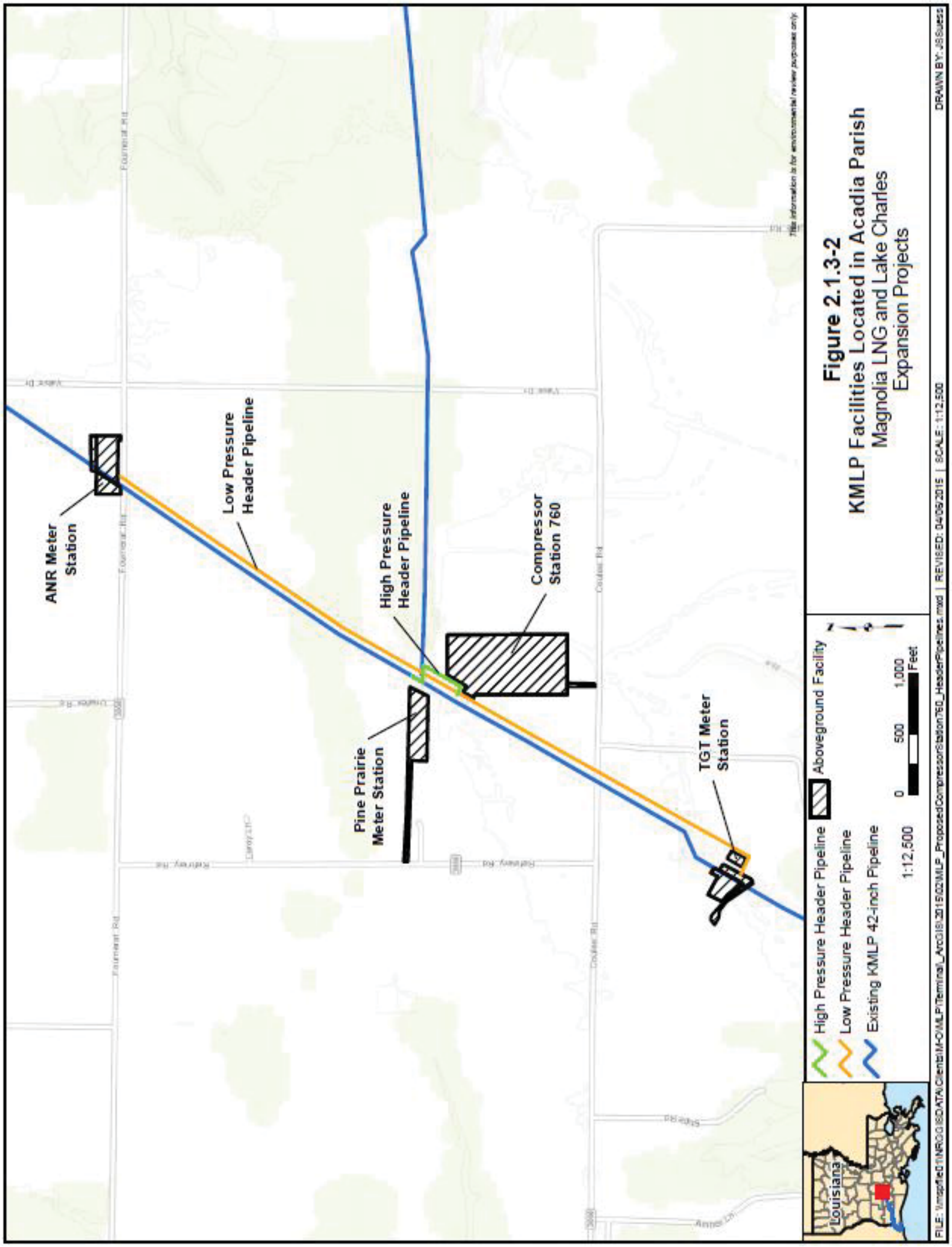


Figure 2.1.3-2
KMLP Facilities Located in Acadia Parish
Magnolia LNG and Lake Charles Expansion Projects

High Pressure Header Pipeline

A new 700-foot-long, 24-inch-diameter high pressure natural gas header pipeline would be constructed to access the Pine Prairie Meter Station. The high pressure header pipeline would also deliver discharged natural gas from Compressor Station 760 to KMLP's existing pipeline via a 24-inch-diameter tap within the compressor station site (see figures 2.1.3-1 and 2.1.3-2).

2.1.3.3 Modifications to Existing Meter Stations

Modifications would be required at the existing Columbia Gulf Transmission Company (CGT), Transcontinental Gas Pipe Line Corporation (TRANSCO), and Texas Eastern Transmission, L.P. (TETCO) Meter Stations, which are located in Evangeline Parish. Modifications at each of the meter stations would include installation of valves and piping to allow for the bi-directional measurement of gas flow (see figure 2.1.3-1 and appendix B).

The ANR, TGT, and Pine Prairie Meter Stations are existing meter stations along the high and low pressure header pipeline routes in Acadia Parish, Louisiana (see figures 2.1.3-1 and 2.1.3-2). Modifications to the ANR and TGT Meter Stations would include installation of valves and piping to allow for bi-directional measurement of gas flow and connection of each meter station to the proposed low pressure header pipeline. In addition, a pig launching facility would be constructed within the TGT Meter Station. Modification of the existing interconnection facilities located directly adjacent to the Pine Prairie Meter Station would facilitate the connection of the meter station to the pipeline headers, which would also connect to Compressor Station 760.

2.2 LAND REQUIREMENTS

Construction of the LNG terminal and KMLP facilities would require a total of 353.5 acres of land, including 277.7 acres associated with construction of the LNG terminal and 75.8 acres for the KMLP facilities not within the LNG terminal. Following construction, 144.6 acres of land would be permanently maintained for operation and maintenance of the proposed facilities, including 123.8 acres for the LNG terminal and 20.8 acres for the KMLP facilities.

Table 2.2-1 summarizes the land requirements for the Magnolia LNG and Lake Charles Expansion Projects. Section 4.8 provides a more detailed description and breakdown of land requirements and use.

2.2.1 LNG Terminal

Construction and operation of the LNG terminal, which includes KMLP's Magnolia Meter Station and interconnect pipeline, would require 114.0 acres of the 115.0-acre site. During operation, the LNG terminal would permanently occupy the entire 114.0 acres. In addition, the LNG loading and ship berthing area would require 9.8 acres of open water within the Industrial Canal.

Magnolia plans to use a 5.2-acre portion of the existing construction yard owned by DII for marine deliveries, materials staging and transport, and temporary parking by construction workers. The DII construction yard is immediately east of the proposed LNG terminal site on the Industrial Canal (see figure 2.2.1-1).

Figure 2.2.1-1
LNG Terminal Boundary Map in Relation to the DII Construction Yard
Magnolia LNG and Lake Charles Expansion Projects
Calcasieu Parish, Louisiana

TABLE 2.2-1

Land Requirements for the Magnolia LNG and Lake Charles Expansion Projects

Facility	Land Required for Construction (acres) [a]	Land Required for Operation (acres) [b]
LNG Terminal Facilities		
LNG terminal [c, d]	123.8	123.8
DII construction yard and parking area	5.2	0.0
Dredge material and effluent pipelines	6.9	0.0
Dredge material placement area	141.8	0.0
LNG Terminal Facilities Subtotal	**277.7**	**123.8**
KMLP Facilities		
Low pressure header pipeline	20.7	8.1
High pressure header pipeline	1.1	0.7
Compressor Station 760	40.6	11.2
CGT Meter Station	2.0	0.3
TRANSCO Meter Station	1.6	0.1
TETCO Meter Station	1.7	0.0
ANR Meter Station	1.7	0.0
Pine Prairie Meter Station	2.0	0.0
TGT Meter Station	1.3	0.4
Existing access roads	3.0	0.0
KMLP Facilities Subtotal	**75.8**	**20.8**
TOTAL LAND REQUIREMENTS	**353.5**	**144.6**

[a] Total land affected during construction includes construction workspaces and additional workspaces to be used during construction and new acreage to be maintained as the permanent facility footprint or permanent easement.

[b] Land permanently affected by operation includes only new permanent easement or facility footprint (i.e., pre-existing pipeline easement/aboveground facility acreages are not included).

[c] Magnolia would use 114.0 acres of the 115.0-acre site during construction and operation of the LNG terminal.

[d] KMLP's Magnolia Meter Station and interconnect pipeline, Entergy's switching station, and the tie-in to Calcasieu Parish District 12 Water Works' existing water line would be entirely within the boundaries of the tract of land being leased from the Port of Lake Charles by Magnolia. Therefore, acreage requirements for construction and operation of these facilities are already accounted for in the LNG terminal land requirements.

Magnolia proposes to transport the 862,550 cubic yards (yd^3) of material dredged from the recessed berthing area to a dredge material placement area approximately 8,000 feet east of the LNG terminal, across Big Lake Road. The site, which is owned by Prairie Land Company, is currently sub-leased to Chicago Bridge & Iron Company (CB&I) and is used for staging and laydown. Two collocated, 1-mile-long transport pipelines would be used to transfer dredge material to the placement area and return effluent produced by the settlement of dredge spoil back to the Industrial Canal, as depicted on figure 2.2.1-2. Dredge material transport and placement would require a total of 148.7 acres of land; of which 6.9 acres would be required for the transport pipelines and 141.8 acres would be required for the dredge material placement area.

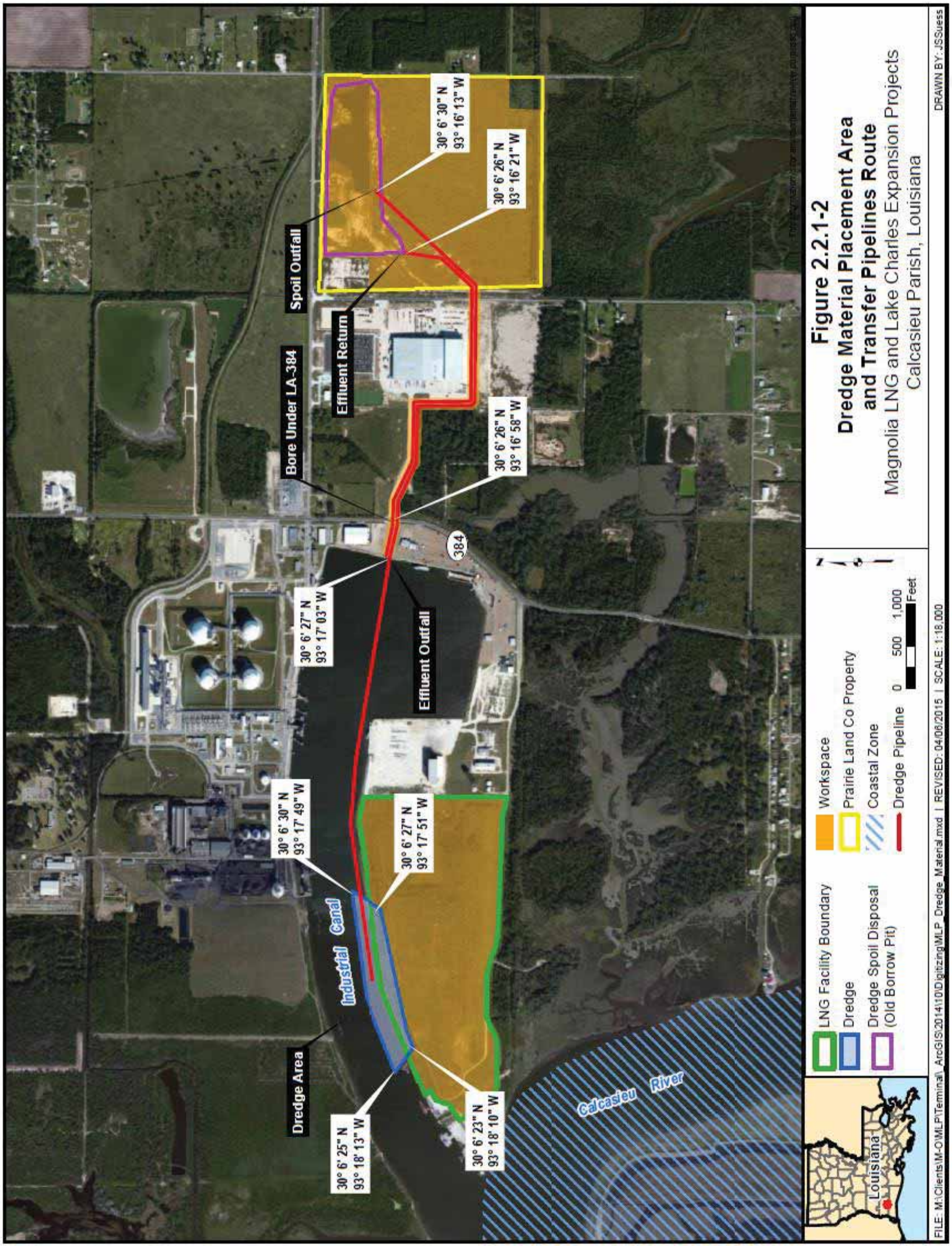


Figure 2.2.1-2
Dredge Material Placement Area and Transfer Pipelines Route
Magnolia LNG and Lake Charles Expansion Projects
Calcasieu Parish, Louisiana
Spoil Outfall
Effluent Return
Bore Under LA-384
Effluent Outfall
Dredge Area
Industrial Canal
Calcasieu River
384
30° 6' 30" N 93° 16' 13" W
30° 6' 26" N 93° 16' 21" W
30° 6' 26" N 93° 16' 58" W
30° 6' 27" N 93° 17' 03" W
30° 6' 30" N 93° 17' 49" W
30° 6' 27" N 93° 17' 51" W
30° 6' 25" N 93° 18' 13" W
30° 6' 23" N 93° 18' 10" W
Louisiana
LNG Facility Boundary
Dredge
Dredge Spoil Disposal (Old Borrow Pit)
Workspace
Praire Land Co Property
Coastal Zone
Dredge Pipeline
0 500 1,000 Feet
FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2014\10\Digitizing\MLP_Dredge_Material.mxd | REVISED: 04/06/2015 | SCALE: 1:18,000
DRAWN BY: JSSuess

2.2.2 KMLP Facilities

Construction of the KMLP facilities not within the LNG terminal would require a total of 75.8 acres of land. Of this, 20.8 acres would be retained for operation and maintenance of the facilities.

2.2.2.1 Compressor Station 760

Construction of Compressor Station 760 would impact 40.6 acres of land, of which 11.2 acres would be retained for use during operation of the facility. The compressor station would be sited within the eastern half of the site, partially overlapping the header pipeline rights-of-way. The 11.2-acre footprint of Compressor Station 760 would be surrounded by a chain-link security fence; the remainder of the 40.6-acre site would serve as a spatial and noise buffer and would be fenced.

2.2.2.2 Header Pipelines

Construction of the 1.2-mile-long low pressure header pipeline would affect a total of 20.7 acres of land. The 36-inch-diameter low pressure header pipeline, which would be collocated with KMLP's existing 42-inch-diameter pipeline for its entire length, would be constructed within a 125-foot-wide construction right-of-way. Additional construction workspaces would accommodate spoil, sensitive features, fence-line crossings, points of intersection, and road crossings. Following construction, a 50-foot-wide permanent easement would be retained during operation of the low pressure header pipeline, encompassing 8.1 acres of land and increasing KMLP's total permanent easement width to 100 feet along the low pressure header pipeline.

The 700-foot-long, 24-inch-diameter high pressure header pipeline, which would be collocated with the proposed low pressure header pipeline as well as KMLP's existing 42-inch-diameter pipeline, would be constructed within a 125-foot-wide construction right-of-way, affecting 1.1 acres of land. Following construction, a 50-foot-wide permanent easement would be retained during operation of the low pressure header pipeline, encompassing about 0.7 acre of land and increasing KMLP's total permanent easement width to 150 feet along the approximately 450-foot-long section of the high pressure header pipeline that would parallel KMLP's proposed low pressure header pipeline and existing mainline (see appendix B).

2.2.2.3 Modifications to Existing Meter Stations

Construction of the proposed meter station modifications would affect a total of 10.4 acres of land. A total of 0.8 acre would be required for operation of the expanded facilities at the CGT, TRANSCO, and TGT Meter Stations. No additional land would be required for operation of the modified facilities within the TETCO, ANR, and Pine Prairie Meter Stations.

The remaining land requirements include 7.6 acres within the existing meter stations and 2.0 acres of construction workspace. These temporary construction areas would be restored and allowed to revert to pre-construction condition and use.

2.2.2.4 Access Roads

To the extent feasible, KMLP would use existing public and private road crossings and its existing permanent easement as the primary means of accessing the KMLP facilities during construction. In addition, KMLP would utilize three existing access roads and would construct one permanent access road (see table 2.2.2-1).

TABLE 2.2.2-1

Access Roads Associated with the KMLP Facilities

Facility/Access Point	Surface Type	Road Length (feet)	Road Width (feet)	Acreage of Disturbance
Existing Access Roads				
TETCO Meter Station access from Ashford Cemetery Road	Limestone	789	20	0.5 [a]
Pine Prairie Meter Station access from Refinery Road	Limestone	845	20	0.4 [a]
TGT Meter Station access from Erick Lane	Limestone	3,274	20	2.1 [a]
Permanent Access Road				
Compressor Station 760 access from Coulee Road	Paved	230	20	0.1

[a] Access roads would not require widening beyond the original road footprint. However, modifications or improvements such as grading and/or the addition of crushed limestone may be required to safely support the anticipated sizes and loads of equipment and materials.

In order to safely support construction equipment and material movement, the existing access roads may require modifications or improvements (e.g., grading and/or addition of crushed limestone). However, modifications would not expand the original footprint of the access roads. After construction is complete, the existing access roads would be returned to pre-construction or better condition. A paved road would be constructed to provide permanent access from Coulee Road to Compressor Station 760.

2.3 CONSTRUCTION SCHEDULE AND WORKFORCE

Assuming receipt of all certifications, authorizations, and necessary permits, Magnolia anticipates starting construction of the LNG terminal in January 2016 and placing the first liquefaction train into service 36 months later, at the end of December 2018. However, based on the Notice of Schedule issued on April 30, 2015, we acknowledge that this schedule is no longer feasible. In any event, the remaining three liquefaction trains would be commissioned at 3-month intervals after completion of the first liquefaction train, with full service anticipated after a total construction period of 45 months. Construction of the Magnolia Meter Station, interconnect pipeline, and KMLP facilities would occur over an 11-month period, which is tentatively scheduled to begin in January 2017. The Magnolia Meter Station, interconnect pipeline, and KMLP facilities are expected to begin service prior to, but generally concurrent with, the Magnolia LNG Project going into service.

In total, a maximum of 781 workers would be employed during construction of the LNG terminal and KMLP facilities. This includes an average of 355 workers employed at the LNG terminal, which would increase to 542 workers during peak construction. Magnolia estimates that 60 percent of the construction workforce would be hired locally (see section 4.9.1.1). KMLP anticipates that an average of 60 to 75 workers would be employed during construction of the KMLP facilities. During a 3-month period when construction activities would occur at each of the KMLP facilities (Compressor Station 760, the header pipelines, and meter station modifications), up to 270 workers would be employed, 40 percent of which would be hired locally (see section 4.9.1.2).

2.4 ENVIRONMENTAL COMPLIANCE

The FERC may impose conditions on any Certificate or authorization it grants for the Magnolia LNG and Lake Charles Expansion Projects. 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 LNG terminal and KMLP facilities (see sections 4 and 5). We will recommend that these additional requirements and mitigation measures (bold type in the text of the EIS) be included as specific conditions to any approving Certificate or authorization issued for the Magnolia LNG and Lake Charles Expansion Projects. We will also recommend to the Commission that Magnolia and KMLP be required to implement the mitigation measures proposed as part of the projects unless specifically modified by other Certificate or authorization conditions. Magnolia and KMLP would be required to incorporate all environmental conditions and requirements of the FERC Certificate, authorization, and associated construction permits into the construction documents for the projects.

Magnolia would employ at least one environmental inspector (EI) to monitor construction activities at the LNG terminal, and KMLP would employ one EI to monitor construction activities at the KMLP facilities during all phases of construction, including clean up and restoration. The responsibilities of the EI(s) employed by Magnolia are described in Magnolia's project-specific *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures). Magnolia's project-specific Plan and Procedures are based on the 2013 FERC Plan and Procedures, [2] which are a set of construction and mitigation measures developed in collaboration with other federal and state agencies and the natural gas pipeline industry to minimize the potential environmental impacts of the construction of pipeline projects in general. The EI employed by KMLP would monitor activities as described in the 2013 FERC Plan and Procedures.

The EIs' responsibilities would include verifying that environmental obligations, conditions, and other requirements of permits and authorizations are met. Both Magnolia and KMLP have requested deviations from the Procedures, as described in detail in section 4.4.3. Although adequate justification has been provided for these alternative measures, Magnolia and KMLP would be required to otherwise comply with the requirements of the Procedures. The EIs would inspect construction and mitigation activities to verify environmental compliance.

Magnolia and KMLP would conduct environmental training for each of their EIs to familiarize them with project-specific issues and requirements. Magnolia and KMLP would also incorporate environmental requirements and specifications in contractor bid documents; provide the contractors with copies of environmental permits, certificates, and clearances; and conduct environmental training for contractor personnel prior to and during construction, as needed, to make them aware of the environmental requirements at each facility.

In addition to Magnolia's and KMLP's environmental compliance activities, FERC staff would conduct field inspections during construction. Other federal and state agencies may also conduct oversight or inspections to the extent determined necessary by the individual agency. After construction is completed, FERC staff would continue to monitor affected areas during operation to verify successful restoration. Additionally, FERC staff would conduct annual engineering safety inspections of the LNG terminal throughout the life of the facility.

---

[2] The FERC Plan and Procedures can be viewed on the FERC website at http://www.ferc.gov/industries/gas/enviro/plan.pdf and http://www.ferc.gov/industries/gas/enviro/procedures.pdf, respectively.

2.5 CONSTRUCTION PROCEDURES

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

Under the provisions of the Natural Gas Pipeline Safety Act of 1968, as amended, the proposed LNG terminal would be designed, constructed, operated, and maintained in accordance with the DOT's *Liquefied Natural Gas Facilities: Federal Safety Standards* (49 CFR 193) and the NFPA's *Standards for the Production, Storage, and Handling of LNG* (NFPA 59A). These standards specify siting, design, construction, equipment, and fire protection requirements for new LNG facilities. The LNG ship loading facilities and any appurtenances located between the LNG ships and the last valve immediately before the LNG storage tanks would comply with applicable sections of the Coast Guard regulations in *Waterfront Facilities Handling Liquefied Natural Gas* (33 CFR 127) and Executive Order 10173.

The proposed pipeline facilities would be designed, constructed, operated, and maintained in accordance with DOT regulations 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.

Magnolia and KMLP would be required to implement all conditions in the Certificate or authorization issued by the Commission for the Magnolia LNG and Lake Charles Expansion Projects, respectively. Magnolia would implement its project-specific Plan and Procedures, which are based on the 2013 FERC Plan and Procedures. We have reviewed Magnolia's project-specific Plan and Procedures and found them to be acceptable. KMLP would implement the 2013 FERC Plan and Procedures. Both Magnolia and KMLP have requested deviations or variances from the FERC Procedures. Detailed information regarding these deviations is provided in section 4.4.3.

To prevent contamination of soils within nearby wetlands, waterbodies, and other sensitive resources during construction, Magnolia and KMLP would develop and implement project-specific spill prevention and response procedures in accordance with the requirements of 40 CFR 112. Magnolia would implement its project-specific *Spill Prevention Plan* during construction and its *Spill Prevention, Control, and Countermeasures Plan* (SPCC Plan) during operation of the LNG terminal. Similarly, KMLP would implement its SPCC Plan during construction and operation of the KMLP facilities. These plans would outline potential sources of releases at the sites, measures to prevent a release to the environment, and initial responses in the event of a spill. As discussed in additional detail in section 4.2.3, at the time of this writing, Magnolia has not provided a *Spill Prevention Plan* for construction or finalized its SPCC Plan for operation of the LNG terminal. We have reviewed KMLP's SPCC Plan for construction and operation and found it to be acceptable.

Magnolia and KMLP would also implement conditions resulting from other permit requirements and their respective project-specific plans and measures developed to avoid or minimize environmental impacts during construction, which are discussed throughout this EIS.

2.5.1 LNG Terminal

2.5.1.1 Site Preparation

The existing grade at the site generally varies between 28 and 32 feet above North American Vertical Datum of 1988 (NAVD 88),[3] although the margins of the site along the Industrial Canal and the eastern and western boundaries have elevations as low as 0 feet NAVD 88. During site preparation, the site would be graded to a standard elevation of 28 feet above NAVD 88. The liquefaction trains would have a base elevation of 24 feet above NAVD 88. The LNG storage tanks would have a base elevation of 17 feet above NAVD 88, but would have a secondary containment wall with a standard top elevation of 30 feet above NAVD 88.

The property lines, pipelines, and other features at the LNG terminal site would be surveyed, as appropriate, prior to the start of construction activities. In accordance with its project-specific Plan and Procedures, Magnolia would install temporary erosion controls along the property line and at existing primary property outfalls.

Site clearing would start at the southwestern property line, moving in a west-to-east direction in a north-south pattern. After clearing operations are complete, the topsoil would be stripped/grubbed and stockpiled on the western end of the property for reuse on site, as needed. Debris and grubbed material that is not reused on site would be collected and disposed of at an approved off-site disposal facility in compliance with local requirements.

Cut, fill, and rough grading operations would commence in the east-central portion of the site, which has the highest elevation. Fill would be moved to lower areas, the most significant of which are located in the northeast and southwest portions of the LNG terminal site. At this time, drainage swales would also be installed and erosion control measures would be installed and maintained as needed.

In parallel with the cut, fill, and rough grading operations, work on the LNG truck and heavy-haul roads would begin. Work on the remaining plant roads, drainage system, parking lots, and temporary facilities would continue as the cut, fill, and rough grading operations are completed. In order to increase the load-bearing capacity of the soil, Magnolia would introduce an engineered grout into the ground to modify the physical characteristics of the soil along the heavy haul road, resulting in the surface property being similar to that of a soft rock (see section 4.2.3.1). The other roads at the LNG terminal would be composed of a limestone cover, an asphalt cover over a limestone base, or equivalent composition.

2.5.1.2 Materials and Equipment Delivery and Off-site Concrete Batch Plant

Due to the DII construction yard's location immediately adjacent to the LNG terminal site, the majority of the materials required during construction of the LNG terminal (including the liquefaction train modules, LNG storage tank inner walls, concrete and steel pilings, sheet piling, rock armoring, specialized mooring equipment, and miscellaneous construction materials) would be delivered to the yard via barge. Water access to the DII construction yard would be via the Intracoastal Waterway, the Calcasieu River, and the Industrial Canal. From the construction yard, materials would be offloaded and delivered to the LNG terminal site using the heavy haul road.

---

[3] A vertical datum is an elevation of "0 feet" that is used as a reference point so that heights of other points can be assigned using a consistent system of measurement. NAVD 88 is the official vertical datum for the conterminous United States and Alaska (National Geodetic Survey, 2014).

Deliveries of construction materials to the site by truck are expected to be primarily limited to concrete trucks. Concrete required for construction of the LNG terminal would be provided during the first 19 months of construction by an existing, off-site concrete batch plant located within a 3- to 5-mile radius of the LNG terminal. Roadway and marine transportation of materials to the site during construction are discussed in additional detail in section 4.9.6.1.

2.5.1.3 Facility Foundations

Magnolia would support the structures at the LNG terminal site using deep foundations consisting of either 24-inch-diameter pre-stressed concrete piles or open-ended steel pipe piles. Most structures (e.g., liquefaction trains, LNG storage tanks, control/admin building) would be supported by 24-inch-diameter precast concrete piles; the LNG loading platform, breasting dolphins, and mooring dolphins would be supported by open-ended steel pipe piles with 48-, 96-, and 54-inch diameters, respectively.

A total of approximately 5,000 pre-stressed concrete pilings would be required to create the foundations for the LNG storage tanks and other process equipment foundations and structures. The proposed foundation arrangement for each LNG storage tank includes the use of 1,508 pre-stressed 70-foot-long concrete piles, resulting in a combined total of 3,016 piles.

Pile driving activities would occur 10 hours per day, up to 7 days per week; however, due to pre-work coordination and start-up activities, actual pile driving operations (hammering) are expected to occur for only about 8 hours per day. Onshore piles would be driven by seven or eight hydraulic piling rigs. Marine piles would be driven by between two and four hydraulic pile rigs, which may include both land-based and floating rigs. As indicated in table 2.5.1-1, pile driving operations would take place over a total of about 16 months during the first 2 years of construction.

TABLE 2.5.1-1

Pile Driving Activities Associated with Construction of the LNG Terminal

Facility Component	Number of Pile Driving Rigs	Duration	Year 1				Year 2		
			1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter
Onshore Pile Driving Activities	7 to 8								
LNG storage tanks		120 days							
Liquefaction trains		180 days							
Marine Pile Driving Activities	2 to 4								
LNG loading and ship berthing area		180 days							

Magnolia has stated that it would perform hydro-acoustic monitoring during the initial pile testing to determine the actual sound pressure levels generated by pile driving activities. If monitoring indicates that sound pressures would be above acceptable thresholds (detailed discussions of acceptable thresholds for aquatic resources and nearby noise sensitive areas are provided in sections 4.6.2.1 and 4.11.2.2, respectively), mitigation measures would be considered and implemented. Magnolia has stated that the following mitigation measures would be considered:

- minimizing impact energy to the lowest practical level to reduce the resulting noise generated by driving the pile;

- implementing soft starts (an initial series of low energy impacts on the pile) to allow aquatic resources an opportunity to leave the area;

- placing cushion blocks consisting of wood, nylon, or micarta between the pile and hammer to minimize the noise generated while driving the pile;

- using bubble curtains around the pile to reduce noise levels; and

- using vibratory pile driving, which generates lower sound pressure levels.

2.5.1.4 LNG Loading and Ship Berthing Facilities

Construction of the LNG loading and ship berthing facilities includes the following primary tasks, which are described in the following sections:

- dredging of the ship berthing area;
- placement of sheet pile bulkhead and rock armoring;
- construction of the jetty platform and the breasting and mooring structures; and
- construction of the aids to navigation structures.

Dredging of the Ship Berthing Area

Magnolia would dredge the ship berthing area to an elevation of 44 feet below NAVD 88, which includes 2 feet of advanced maintenance and overdredge allowance.[4] The sides of the berthing area would be contoured at a 3:1 slope. Magnolia would install rock armoring to provide scour protection from propeller wash on the slope parallel to the shoreline. A combination of onshore excavation and dredging would be used to remove a total of 993,750 yd^3 of sediments and soils from the ship berthing area, which would be recessed into the northern boundary of the LNG terminal site. Based on a proposed final grade elevation for the LNG terminal site of 28 feet above NAVD 88, the site would require approximately 131,200 yd^3 of upland soils to be excavated and relocated on the terminal site using backhoes, front-end loaders, bulldozers, and similar equipment. Following the excavation and relocation of upland soils, approximately 862,550 yd^3 of sediment and soil would be removed from the 16.2-acre ship berthing area (of which 6.4 acres are existing wetlands or uplands within the LNG terminal site and 9.8 acres are existing water bottoms or submerged areas) using a hydraulic cutterhead dredge. The dredge would swing back and forth to slowly cut away the nearshore sediments and shoreline to establish the specified dimensions and depths of the berthing area.

Magnolia proposes to deposit 862,550 yd^3 of material dredged from the ship berthing area within the dredge material placement area depicted on figure 2.2.1-2. Between 2010 and 2013, CB&I excavated a 1,000-foot-long by 2,000-foot-wide borrow pit at the north end of the site, which is expected to have a potential capacity to contain approximately 300,000 to 350,000 yd^3 of dredge spoil, once dewatered (as described in section 4.3.2.2). Because the anticipated 862,550 yd^3 of dredge materials would not be contained within the borrow pit and would require the use of the larger 141.8-acre site, Magnolia would construct approximately 10,000 linear feet of 5- to 10-foot-high earthen dikes along the perimeter of the area in order to contain the dredge material during deposition. Once the dredge material has dewatered and settled, Magnolia would level the earthen dikes on the site. It is estimated that deposition of 862,550 yd^3 of dredge material, given the minimal available capacity of the borrow pit (300,000 yd^3),

[4] In order to accommodate fully loaded LNG carriers and provide clearance during low tide, the design depth of the recessed berthing area is 42 feet below NAVD 88.

would permanently raise the 141.8-acre area approximately 3 feet above the current grade. A detailed discussion of dredge material placement alternatives considered is presented in section 3.3.4.

Dredge material would be transferred to the placement area via a 1-mile-long, 24-inch-diameter steel pipeline. The 252 million gallons of effluent produced by the settlement of dredge spoil within the placement area would be pumped back to the Turning Basin at the eastern end of the Industrial Canal using an effluent pipeline, where it would be discharged in accordance with federal and state permit requirements.

The dredge material and effluent pipeline routes are illustrated on figure 2.2.1-2 and appendix B. Within the Industrial Canal, the dredge material pipeline would be temporarily floated between dredging operations within the recessed berthing area and the eastern end of the canal. Aboveground portions of the dredge material and effluent pipelines would be temporarily installed using interlocking sections of pipe. The two pipelines would be constructed with a 20-foot offset within a 75-foot-wide pipeline right-of-way. Land along the dredged material and effluent pipeline routes has been graded and graveled; therefore, no clearing or grading would be required.

The pipe would be delivered to the construction area in straight sections and bent to conform to changes in the direction of the pipeline alignment and natural ground contours. Individual joints of pipe would be bent to the desired angle in the field using a track-mounted, hydraulic pipe-bending machine. Alternatively, pre-fabricated fittings may be used. Side boom tractors would be used to place the pipe on the right-of-way.

The crossing of Big Lake Road would be conventionally bored per local or state permit requirements. To complete the horizontal bore of Big Lake Road, pits would be excavated on the east and west sides of the road (see appendix B). A boring machine would be lowered into one pit, and a horizontal hole would be bored to a diameter equal to the diameter of the pipe (or casing, if required) at the depth of the pipeline installation. The pipeline section would be pushed through the bore to the opposite pit. If additional pipeline sections are required to span the length of the bore, they would be welded to the first section of the pipeline in the bore pit before being pushed through the bore. After the pipe is lowered into the trench, the trench would be backfilled, normally using a bulldozer or tracked backhoe. Backfill usually consists of the material originally excavated from the trench. Any excess excavated materials or materials unsuitable for backfill would be disposed of in accordance with applicable regulations. During backfilling, special care would be taken to minimize erosion, restore the natural contour of the ground, and restore surface drainage patterns as close to pre-construction conditions as practicable.

Prior to initiating dredging operations, the dredge material and effluent pipelines would be hydrostatically tested using approximately 1 million gallons of water from the Industrial Canal. After the hydrostatic test is completed, the water would be tested and treated (if necessary), and discharged back to the Industrial Canal.

Upon completion of dredging and dewatering activities, Magnolia plans to grade the earthen dams and interior of the dredge material placement area and reseed in order to facilitate drainage and minimize erosion, returning the site to upland meadow or pasture. Additional information regarding revegetation is included in section 4.5.2.1. The dredge material and effluent pipelines would be removed, with the exception of the 250-foot segment of each pipeline beneath Big Lake Road. This segment of the pipelines would be grouted and left in place in accordance with Louisiana DOTD and Calcasieu Parish Police Jury permits.

Placement of Sheet Piling and Rock Armoring

The LNG loading facility would be constructed using a combination of 2,005 feet of steel sheet pile bulkhead, which is expected to be installed using a hydraulic pile driver. Rock armoring would be installed at the base of the steel sheet pile bulkhead, along the east and west ends of the marine basin, and around the base of the LNG loading platform and breasting dolphin piles to provide protection to the bulkhead and shoreline from erosion caused by scour from the LNG vessels. The rock armoring would be delivered to the DII construction yard by barge, transported to the berthing area using the heavy haul road, and installed by crane or long-reach backhoe placement of the rocks into the water. Magnolia estimates that shoreline protection at the base of the sheet pile wall around the basin would consist of an about 2-foot-thick bedding stone layer with a 3-foot-thick armor stone layer.

Construction of the Jetty Platform and the Breasting and Mooring Structures

The 128-foot-long by 70-foot-wide LNG loading platform would be constructed of reinforced concrete (see figure 2.5.1-1). The LNG loading platform would be supported by 24 concrete cylinder piles driven into the bed of the Industrial Canal and by the sheet pile bulkhead. Based on preliminary information, the tip of these piles would be installed to a depth of 110 feet below NAVD 88 using a hydraulic pile driver. Installation of the sheet pile is described above.

Four primary breasting dolphins, plus one center protective breasting dolphin with a bumper panel only (see figure 2.5.1-1), would be constructed by installing 96-inch-diameter steel pilings in the water adjacent to the terminal jetty using a hydraulic pile driver. The piles would provide support for the fendering system (bumpers designed to prevent damage to boats and the berthing structures during docking) and equipment required to moor both LNG carriers and barges. Six mooring points would be constructed on shore, landward of the steel sheet pile bulkhead, to provide additional mooring leads for the design range of LNG vessels.

The LNG loading platform would support three 16-inch-diameter LNG loading arms and one 16-inch-diameter vapor return arm for loading the LNG carriers, and one 8-inch-diameter LNG loading arm with a piggyback mounted 6-inch-diameter vapor return arm for loading LNG barges. Additional equipment installed on the LNG loading platform would include three elevated firewater monitor towers, platform-level firewater monitors, a dry chemical system, a marine gangway, LNG process piping, and utilities. All marine structures would be connected by walkways extending east and west to the breasting dolphins. A 26-foot-wide by 128-foot-long combination pipe and roadway trestle located landward of the sheet pile bulkhead would connect the LNG loading platform to the onshore LNG terminal, as depicted in figure 2.5.1-1.

2.5.1.5 Liquefaction Trains

The liquefaction trains would be designed, constructed, operated, and maintained in accordance with the DOT Federal Safety Standards for Liquefied Natural Gas Facilities at 49 CFR 193 and would meet the LNG Standards under NFPA 59A. Each liquefaction train would be broken down into five main process modules, which would be fabricated off site at existing fabrication yards and transported to the DII construction yard via barge in a specific sequence to allow efficient assembly of the liquefaction trains. As described in section 2.5.1.2, the barges would deliver the LNG process modules and other equipment to the existing dock at the DII construction yard located immediately east of the LNG terminal site. The modules would be transferred from the barge and into final position using self-propelled modular transporters. The self-propelled modular transporters would wheel each process module sequentially into position and then lower each module onto piled supports. Smaller modules would be lifted into position by a crane(s), as necessary.

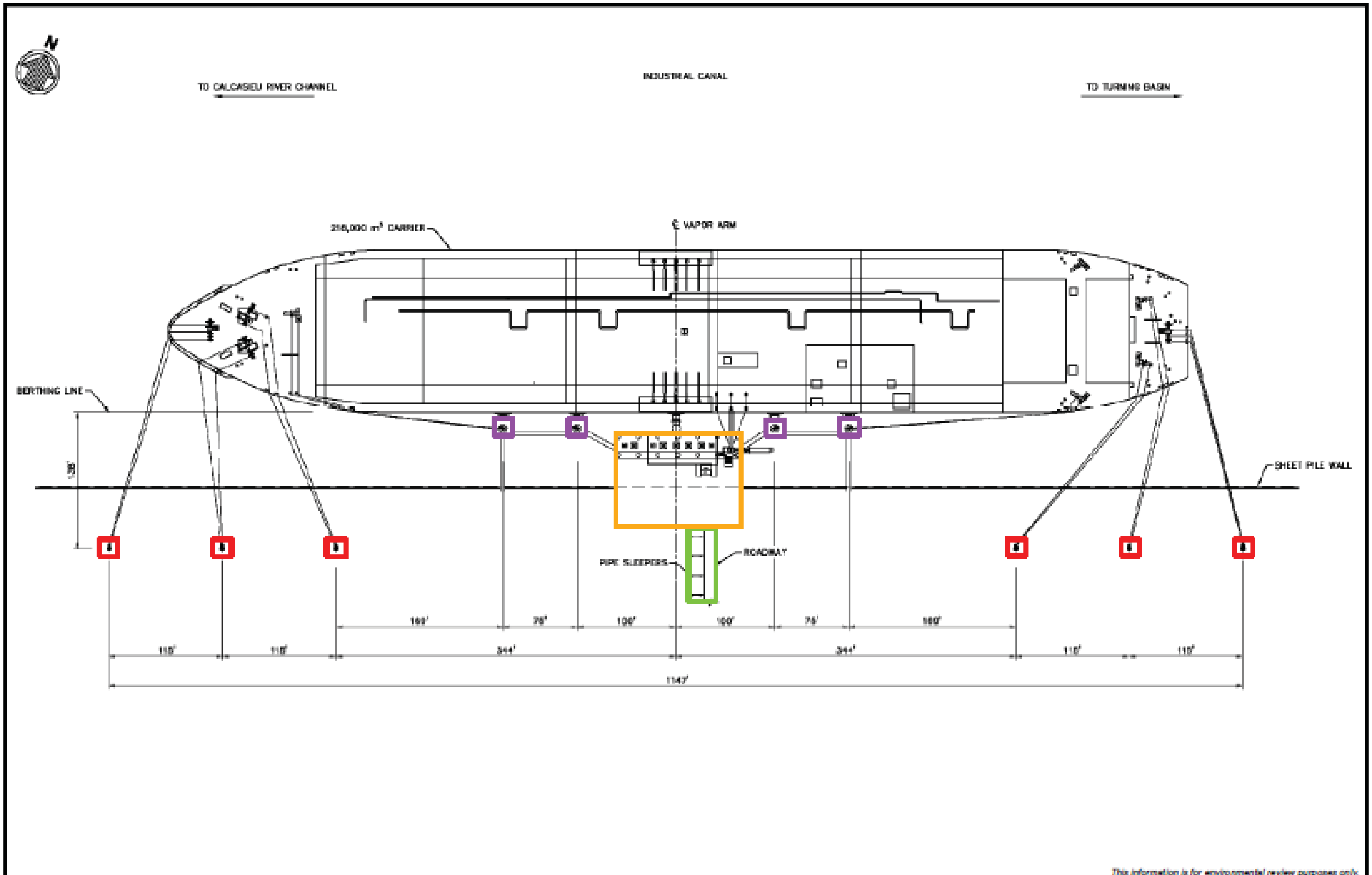


Figure 2.5.1-1
LNG Loading and Ship Berthing Facilities
Magnolia LNG and Lake Charles Expansion Projects
Calcasieu Parish, Louisiana

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\02\Plot_Plan\MLP_CarrierDock_PlotPlan.mxd | REVISED: 04/06/2015
DRAWN BY: JSSuess

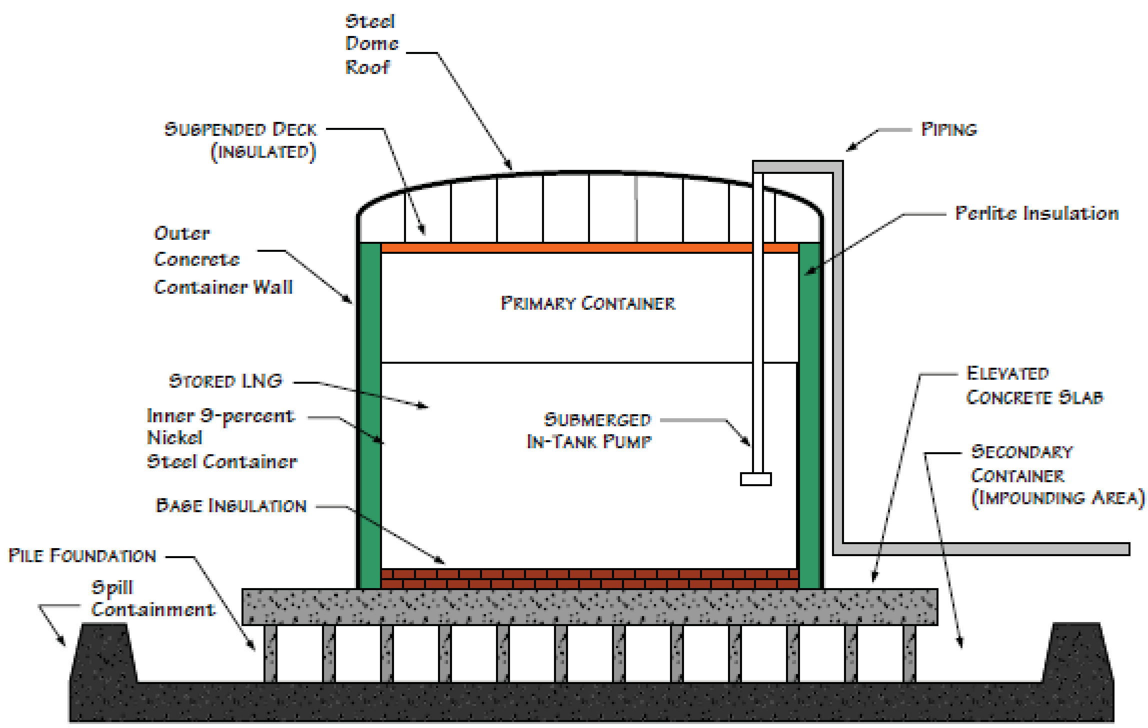
2.5.1.6 LNG Storage and Processing Facilities

One of the more labor-intensive and time-consuming activities would be the construction of the two LNG storage tanks. After site preparation, the LNG storage tanks would be erected on site using conventional construction techniques. Figure 2.5.1-2 depicts the design of a typical LNG storage tank. The proposed foundation arrangement for each of the two LNG storage tanks includes 1,508 70-foot-long pre-stressed concrete piles (3,016 total piles). Installation of the piles is described in section 2.5.1.3. Following the installation of the foundation, construction of the tank base and post-tensioning of the outer concrete container wall would occur. In parallel to construction of the outer concrete container wall, the steel dome roof and suspended deck would be constructed on temporary supports inside the outer container of each storage tank, to be later air-raised into position. The bottom carbon steel vapor liner would then be installed. On top of the outer concrete container wall, the steel dome roof compression ring would be cast into the concrete and then the steel dome roof would be air-raised into position and secured to the compression ring.

Roof nozzles, penetrations, and studs would be installed, and steel reinforcement and concrete covering of the steel dome roof would occur. Concurrent with the installation of roof nozzles and penetrations, work would begin on the inner 9-percent nickel steel container, including the secondary bottom, bottom corner protection, and inner container annular and bottom plates. The inner 9-percent nickel steel container would be erected. Internal accessories such as pump columns, bottom and top fill, instrument wells, and purge and cool-down piping would be installed, followed by installation of roof platforms, walkways, pipework, and pipe supports.

To ensure that the tanks are capable of operating at the design pressure, testing of the outer and inner tanks would be completed in accordance with the American Petroleum Institute Standard 620. The integrity of the outer tanks would pneumatically tested, and process piping would be installed from the tank top down to grade. The inner 9-percent nickel steel container of the two LNG storage tanks would be hydrostatically tested using water from the Industrial Canal. The total duration of the hydrostatic test from start of filling to emptying is expected to be approximately 4 weeks. It is anticipated that each 246-foot-diameter inner tank would be filled to a height of 73.5 feet, requiring a volume of approximately 26.2 million gallons of water to be appropriated from the Industrial Canal. Hydrostatic testing of the LNG storage tanks is anticipated to be conducted one at a time, allowing the water to be reused. After the hydrostatic test is completed for the second LNG storage tank, the water would be pumped out of the tank, tested and treated (if necessary), and discharged back to the Industrial Canal.

Because water from the nearby Industrial Canal would be used to perform the hydrostatic testing of the LNG storage tanks, the inside of the tank walls would be power washed using approximately 27,000 gallons of potable water from the tie-in to the Calcasieu Parish District No. 12 Water Works line in order to remove any silt particles that may adhere to the inner tank walls. Typically, a small boat would be installed in the tank's interior prior to the start of the hydrostatic test. The small boat floats up with the rising water level and, when the tank is about to be emptied, an operator gets into the boat and power washes the sides of the tank as the water level recedes. Magnolia does not anticipate the use of any biocides or additives in the hydrostatic test water. Following the discharge of hydrostatic and power wash water, a resilient blanket would be installed on the outside of the inner tank shell. The required instrumentation would then be installed inside the tank and annular space. Perlite insulation would be expanded into the tank annular space using vibration methods, and the suspended deck blanket insulation and external piping insulation would be installed. A visual inspection would be completed. The LNG pumps would then be installed, and the storage tanks would be purged with nitrogen to a positive gauge pressure, followed by the purge and cool-down.



For environmental review purposes only.

Figure 2.5.1-2
Typical LNG Storage Tank Design
Magnolia LNG and Lake Charles Expansion Projects

2.5.1.7 LNG Truck Loading Facilities

After site preparation, Magnolia would install piling and foundations for the pipe rack, truck loading shelter, loading area, weigh scale, and associated equipment. Figures 2.1.1-2 and 2.1.1-4 depict the basic layout of the LNG truck loading facilities. The LNG spill containment system and truck loading pipe racks and shelter would then be installed. Once these components are set in place and secured on the foundations, piping from the LNG storage tank area to the LNG truck loading area; metering equipment; loading arms; and electrical, instrument, and gas detection systems would be installed. Concurrently, fire protection, including a high-expansion foam system and firewater system, would be installed in the LNG truck loading area (see discussion in section 2.7.1).

LNG truck loading systems and controls would be verified and tested for proper functioning before being placed into service, in accordance with ASME standards. All valves would be aligned in accordance with the facility commissioning procedures, including installation of car seals (valve locks) where necessary. LNG piping systems would be purged with nitrogen and dried out in accordance with the facility dry-out procedures, followed by the facility cool-down phase.

2.5.1.8 Magnolia Meter Station and Interconnect Pipeline

As described in section 2.0, KMLP would construct and operate its Magnolia Meter Station and interconnect pipeline within the boundaries of the LNG terminal site. Construction of this meter station would not commence until site preparation (e.g., clearing, grading, and compacting) is completed by Magnolia (see section 2.5.1.1). Excavation would be performed to accommodate the reinforced concrete foundations required for the metering equipment, pigging equipment,[5] and buildings. Forms would be set, rebar installed, and concrete poured and cured in accordance with applicable standards. Removed spoil would be backfilled into the excavation and compacted in place. Excess spoil would be distributed across the meter station site or used as backfill elsewhere within the KMLP facilities.

Measurement equipment typically would be delivered to the meter station site via trucks (up to 12 truck deliveries are anticipated per day). The measurement buildings would be offloaded and stored on site. The buildings would then be positioned on the foundation, leveled, grouted, and secured. Meter station piping connections would be flanged, screwed, or welded. Welded connections would be inspected visually, radiographically, or by some other nondestructive testing method. Welding activities would comply with the DOT minimum safety requirements at 49 CFR 192 and the requirements of the latest edition of the American Petroleum Institute Standard 1104. After welding, the pipe joints would be coated; the pipe coating would be inspected for defects, with special attention given to all field-applied coatings, and any damage would be repaired.

Hydrostatic testing of piping and related components would be conducted using water from the City of Lake Charles in accordance with the DOT safety standards at 49 CFR 192 and applicable permit conditions to verify the pipe integrity and ensure its ability to withstand the maximum allowable operating pressure (MAOP). Before being placed into service, all controls and safety equipment would be checked and tested for proper functioning.

General construction activities and storage of construction materials, equipment, and spoil would be confined to the Magnolia Meter Station and interconnect pipeline footprints. Debris and wastes generated during construction would be disposed at a licensed commercial disposal facility in accordance with applicable regulations. All construction workspaces associated with the Magnolia Meter Station

---

[5] A pipeline "pig" is a device used to clean or inspect the pipeline. A pig launcher/receiver is an aboveground facility where pigs are inserted or retrieved from the pipeline.

would be restored and stabilization measures installed in a timely manner in accordance with the FERC Plan and Procedures.

2.5.1.9 Site Restoration

Following construction, the LNG terminal site would be restored in accordance with Magnolia's project-specific Plan and Procedures. Because the entire 114.0-acre site would be used during operation of the LNG terminal, no planting of native trees or restoration of the site to original grade or vegetation communities is proposed. However, the 33.7 acres of the site not occupied by buildings, roads, compacted aggregate, or the recessed berthing area would be restored with native vegetation recommended by the U.S. Department of Agriculture's (USDA), Natural Resources Conservation Service (NRCS) and maintained as open upland (e.g., upland meadow). Weather and soil conditions permitting, these areas would be seeded within 6 working days after final grading is complete. Seeding permanent vegetation is expected to occur during the growing season; however, if seeding occurs outside the growing season, temporary erosion control measures would be left in place until the next growing season, when reseeding efforts would take place. Revegetated areas would be monitored following construction for the first and second (as necessary) growing seasons.

2.5.2 KMLP Facilities

2.5.2.1 Header Pipelines

Site Preparation

Prior to the start of construction, KMLP would survey and mark the boundaries of the construction workspaces. Avoidance areas (e.g., wetland boundaries) would be marked or flagged and appropriate fencing would be installed around the perimeter as required. As required by the FERC Plan and Procedures, temporary erosion controls would be installed after initial soil disturbance, where necessary, to minimize erosion and would be maintained throughout construction as needed.

Clearing, Grading, and Fencing

The construction workspace would be cleared and graded to remove brush, trees, roots, and other obstructions, such as large rocks and stumps. To minimize soil erosion, vegetation within some portions of the construction workspace would be left in place, and some non-woody vegetation would be mowed. Where necessary, the construction workspace would be graded to create a safe work area, accommodate pipe-bending equipment, and provide sufficient space to accommodate working and passage of heavy construction equipment. Pre-construction contours and drainage patterns would be maintained to the extent practicable.

A fence installation crew, typically operating in conjunction with the clearing crews, would cut and brace fences along the proposed high and low pressure header routes where necessary and temporarily fence off avoidance areas. Temporary gates would be installed to control livestock and limit public access, where necessary.

Although no forested land occurs within the construction workspaces, any trees present would be removed from the construction workspaces only where necessary for construction purposes. Trees and other vegetation debris would be chipped, burned, or disposed of according to applicable regulations. Burning, if used, would be conducted in a manner to minimize fire hazard, prevent heat damage to surrounding vegetation, and in accordance with state and local burn permits and regulations. Stumps would be buried only in non-tilled land and with the agreement of the landowner. Off-site disposal of materials would be at commercial facilities or at other approved locations in accordance with applicable laws and regulations.

Grading would occur after the construction workspace has been cleared and any stumps have been removed; however, KMLP expects that minimal grading would be required at most facility locations. In annually cultivated agricultural areas (or where crops are rotated), KMLP would strip and segregate up to 12 inches of topsoil; if the topsoil is less than 12 inches in depth, the actual depth of the topsoil would be removed and segregated. In non-agricultural areas, if requested by a land management agency or landowner, KMLP would strip and segregate up to 12 inches of topsoil, unless topsoil replacement is deemed more efficient by the contractor or more desirable by the landowner. Along the header pipelines, excavated materials would typically be stored on the non-working side of the construction workspace; however, site-specific conditions may require that the topsoil be stored or placed on the working side adjacent to the trench or at the edge of the construction workspace.

Trenching

Rotary wheel ditching machines, backhoes, or rippers would be used to excavate the header pipeline trenches to a depth sufficient to allow approximately 5 feet of coverage of the header pipelines, which would be in accordance with the DOT standards at 49 CFR 192; the trench depth could be up to 15 feet to facilitate construction under existing drainage canals. Before construction begins, KMLP would contact the Louisiana one-call service to identify and flag existing buried utilities to ensure the header pipelines would be constructed so as not to interfere with existing utilities. Specific procedures for crossing utility lines as well as agricultural areas are discussed in the *Special Construction Procedures* section below. All existing permanent survey and reference monuments within the construction workspace would be protected during construction.

KMLP would install erosion controls in accordance with the FERC Plan and Procedures to minimize erosion during construction. In addition, measures would be taken to minimize the flow of water into and/or through the trench and into wetlands and waterbodies. KMLP's proposed pipeline installation across wetlands and waterbodies, as well as other specialized construction procedures, are described below (see *Special Construction Procedures*).

Pipe Stringing, Bending, Welding, and Lowering-In

Prior to header pipeline construction, the pipe would be moved into the area by rail or truck. The pipe segments (or joints) would be positioned along the construction right-of-way parallel to the centerline of the trench so they are easily accessible to construction personnel. The joints are typically strung on the working side of the trench for bending, welding, coating, and lowering-in operations and the associated inspection activities.

Track-mounted hydraulic pipe-bending machines would be used to bend the pipe in the field to the required alignment and to match the existing natural ground contours. Following bending, the ends of the pipe sections would be aligned and welded together, typically with the use of external line-up clamps or internal traveling line-up clamps. As each weld is completed, the pipe would be placed on supports adjacent to the trench. Each weld would be inspected visually, radiographically, or by some other nondestructive testing method. Bending, welding, and coating activities would comply with the DOT minimum safety requirements at 49 CFR 192 and the requirements of the latest edition of the American Petroleum Institute Standard 1104.

Prior to shipment to the site, an external protective coating is applied to the pipe to prevent corrosion, except a small area at the end of the pipe joint. After welding, the pipe joints would be coated with similar or compatible materials. The pipe coating would be inspected for defects, with special attention given to all field-applied coatings, and any damage would be repaired prior to lowering the pipe into the trench.

In some locations, such as within wetlands, it may be necessary to provide negative buoyancy to the pipe by means of set-on concrete weights, concrete coating, pipe sacks, and/or soil anchors. Set-on weights and concrete coating may be fabricated or purchased off site and installed. No concrete-coating activities would occur within 100 feet of waterbodies or wetlands.

Side-boom tractors would be used to lower the pipe into the trench. The trench would be cleared of any debris or foreign material. If the trench bottom is rocky, sandbags, support pillows, or other acceptable pipe padding material would be used to protect the pipe coating and, in areas where the excavated trench material may damage the pipe, the pipe would be protected with a protective wrap of rock shield. Topsoil would not be used to pad the pipe. The pipe would be carefully placed in the trench to ensure proper alignment and to prevent damage to the pipe coating. Trench dewatering may be required in certain locations in order to prevent the pipe from floating and to allow certain limited activities in the trench. If required, trench dewatering would be performed in accordance with the FERC Plan and Procedures.

Backfilling

After the pipeline is lowered into the trench and adequately protected, the trench would be backfilled using a bulldozer, backhoe, auger-type backfilling machine, or other suitable equipment. Backfill typically consists of the material originally excavated from the trench. In areas where topsoil has been segregated, the subsoil would be placed in the trench first and then the topsoil would be placed over the subsoil. Backfilling would occur to grade or higher, with use of excess material, to accommodate any future soil settlement. Any material unsuitable for backfill would be disposed of in accordance with applicable regulations. Subsoil and topsoil tilling would be done at the request of the landowner.

During backfilling, special care would be taken to minimize erosion potential by restoring the natural contour of the ground and surface drainage patterns as close to pre-construction conditions as practicable. In order to minimize the possibility of subsurface water flow into the trench due to local topography, sand bags or foam-type trench breakers would be installed where necessary. In other areas (e.g., ditch and stream crossings), the trench backfill would be solidly compacted. Where the header pipelines cross streams, wetlands, or groundwater, permanent trench plugs may be installed as appropriate to minimize the flow of water from the intersected body to and from the trench.

Testing

Once pipeline installation and backfilling are completed, the header pipelines would be cleaned using a cleaning pig and hydrostatically tested in accordance with the DOT safety standards at 49 CFR 192 and applicable permit conditions to verify its integrity and ensure its ability to withstand the MAOP. Hydrostatic testing of the header pipelines would be conducted in segments, using a total of approximately 336,000 gallons of water obtained from the City of Eunice. 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. After testing is completed, the line would be depressurized and the water discharged by means of displacement pigs.

Hydrostatic test water discharges would be performed in accordance with all applicable state water regulations and federal and state discharge requirements. The water would be discharged over land into a well-vegetated upland area using energy dissipation devices as needed to minimize erosion and sedimentation. No chemicals would be added to the pipeline test water, nor would they be used to dry the pipeline after the testing. Section 4.3.2.2 provides additional information on hydrostatic testing and test water discharge.

Cleanup and Restoration

After the trench is backfilled, KMLP would remove all remaining debris, surplus materials, and temporary structures and dispose of them in accordance with applicable federal, state, and local regulations. In accordance with the FERC Plan, KMLP would finish grade and restore all disturbed areas as closely as practicable to pre-construction contours. Site contouring would be accomplished using acceptable excess soil from construction. Within agricultural lands, restoration and revegetation would be conducted in accordance with the FERC Plan and landowner requirements. Non-agricultural land would be revegetated in compliance with seed, fertilizer, and soil additive recommendations obtained from the local soil conservation authority.

Special Construction Procedures

<u>Agricultural Areas</u>

As discussed in detail in section 4.8.1, the majority of the land affected by the header pipelines (96 percent) would be within agricultural lands. KMLP would construct through agricultural areas in accordance with the FERC Plan to minimize impacts on current agricultural uses. Prior to construction through these areas, KMLP would consult with landowners to attempt to locate existing drain tiles.

In agricultural lands that are annually cultivated or have rotated crops, KMLP would remove the topsoil to its actual depth, up to a maximum of 12 inches, and stockpile it separately from the subsoil excavated from the pipeline trench. During construction, KMLP would maintain the natural flow patterns of all fields by providing breaks in the stockpiles of topsoil and subsoil. In addition, flow would be maintained in drainage systems during construction to prevent ponding in adjacent non-disturbed areas.

Following installation of the header pipelines, agricultural areas would be restored in accordance with the FERC Plan. If drain tiles are exposed or damaged during construction activities, KMLP would implement measures to repair/replace them after communication with the landowner and in accordance with applicable regulatory guidelines.

<u>Road and Utility Line Crossings</u>

The low pressure header pipeline would cross one paved road (Fournerat Road) and one gravel road (Coulee Road). At both road crossings, the header pipeline would be installed using the conventional bore method. The conventional bore method involves excavating a pit on each side of the feature, boring a hole under the road at least equal to the diameter of the pipe, and pulling a prefabricated pipe section through the borehole.

The header pipeline would be installed at a minimum depth of 5 feet below the center of the road, or as required by applicable road crossing permits and approvals, and would be designed to withstand anticipated external loadings. KMLP would implement procedures to protect workers and the public during road crossing activities; traffic warning signs, detour signs, and other traffic control devices would be used as required by federal, state, and local departments of transportation and other regulating bodies.

Where existing underground utilities are crossed, the header pipeline would be installed at an appropriate depth, either over or under the existing utility, to meet depth of cover and utility separation requirements in accordance with 49 CFR 192 and in compliance with pipeline crossing agreements negotiated with the existing pipeline operators. At least 12 inches of separation between the header pipeline(s) and the existing utility line would be maintained, where feasible.

Wetland Crossings

As discussed in section 4.4.2.1, less than 1 percent of the land affected by construction of the low and high pressure header pipelines would be within wetlands. Wetland impacts would be limited to a 0.1 acre area along the high pressure header pipeline route. Within this wetland, KMLP would construct the high pressure header pipeline in accordance with applicable federal and state permits and the FERC Procedures. Overall, the wetland crossing methods and mitigation measures identified in the FERC Procedures are designed to minimize the extent and duration of construction-related disturbance within wetlands.

In wetlands, vegetation would be cut just above ground level, leaving existing root systems intact. Immediately after initial ground disturbance, erosion control devices would be installed at the edges of the construction workspaces in wetlands where there is a possibility for spoil to flow into undisturbed areas of the wetlands. Up to 12 inches of topsoil would be stripped and segregated from the area disturbed by trenching, except in areas with standing water or saturated soils. If the trench contains water at the time of crossing, trench plugs would be installed to minimize sediment discharges into the wetland from the open trench.

After the pipeline is lowered into the trench and backfilled, the disturbed areas would be graded to pre-construction contours and trench plugs may be installed as appropriate to minimize the flow of water from the intersected body to and from the trench. Restoration would be in accordance with the FERC Procedures and monitored until revegetation is successful.

Waterbody Crossings

Seven waterbodies (two intermittent and five ephemeral) would be affected by construction and operation of the low pressure and high pressure header pipelines. The FERC defines a waterbody as any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes. KMLP would implement the measures in the FERC Procedures and appropriate best management practices (BMP) to minimize the extent and duration of construction disturbance of waterbodies.

In general, KMLP would construct the header pipelines across waterbodies using a 75-foot-wide construction right-of-way. KMLP would cross all streams that have perceivable flow at the time of crossing using a dry crossing method (flume or dam-and-pump). The open-cut crossing method would be used to cross ephemeral streams and ditches with no perceptible flow at the time of crossing. The equipment required to complete a dry crossing would be on site as a contingency in case flow should begin in ephemeral streams during construction. KMLP would obtain all necessary waterbody crossing permits from federal, state, and local agencies.

Temporary equipment bridges would be placed across waterbodies to allow construction equipment to cross with minimal impact on the waterbody. Temporary equipment bridges may consist of prefabricated construction mats, rail flat cars, flexi-float or other temporary bridges (Bailey bridges), or flume installations. Flume installations include suitably sized flumes and a travel surface consisting of rock fill, sand bags, timber mats, or timber riprap. At all temporary equipment bridge locations, care would be taken to minimize disturbance of the waterbody bank and bottom.

KMLP would place the pipeline a minimum depth of 5 feet below the bottom of the channel. Material excavated from the trench would be stockpiled at least 10 feet from the water’s edge and generally used as backfill, except where the adjacent upland consists of actively cultivated or rotated cropland, or federal or state permits specify differently.

In order to limit the time required for construction of a stream crossing, the right-of-way would be prepared on either side of the stream prior to the construction of the actual crossing. If grading is required, it would be directed away from the waterbody to reduce the possibility of disturbed soils being transported into the waterbody.

At small streams along the pipeline headers, a backhoe, clam-dredge, dragline, or other similar equipment would be used to excavate the trench. In accordance with the FERC Procedures, instream construction activities associated with minor waterbody crossings would be completed within 24 hours, unless blasting or other rock breaking measures are required. Sediment barriers (silt fence and/or straw bales) would be installed at the waterbody crossing to minimize sedimentation into the waterbody from disturbed upland areas.

Dam-and-Pump Crossing Method

The dam-and-pump crossing method involves installation of temporary dams upstream and downstream of the waterbody crossing location. For the Lake Charles Expansion Project, the temporary dams typically would be constructed using sandbags and plastic sheeting. Following dam installation, appropriately sized pumps would be used to dewater the upstream impoundment and transport the stream flow around the construction work area and trench to the downstream side. Intake screens would be installed at the pump inlets to prevent entrainment of aquatic life, and energy dissipating devices would be installed at the pump discharge point to minimize erosion and streambed scour. Trench excavation and pipeline installation would then commence through the dewatered portion of the waterbody channel. Following completion of pipeline installation, backfill of the trench, and restoration of stream banks, the temporary dams would be removed and flow through the construction work area would be restored.

Flume Crossing Method

The flume crossing method consists of temporarily directing the flow of water through one or more flume pipes over the area to be excavated. This method allows excavation of the pipe trench across the waterbody underneath the flume pipes without disruption of water flow in the stream. KMLP would divert the stream flow through the flumes by constructing two bulkheads, using sand bags or plastic dams, to direct the flow through the flume pipes. The bulkheads and flume pipes would be removed following completion of pipeline installation, backfill of the trench, and restoration of stream banks.

2.5.2.2 Aboveground Facility Construction Procedures

Construction of Compressor Station 760 and the meter station modifications would adhere to the same safety standards and regulations required for pipeline construction. General construction activities and storage of construction materials, equipment, and spoil would be confined to the approved construction workspaces, which would be primarily within the existing meter stations on concrete- and gravel-covered ground surfaces.

Excavation would be performed as needed to install the reinforced concrete foundations required for the compression equipment, additional metering equipment, pigging equipment, and buildings. Forms would be set, rebar installed, and concrete poured and cured in accordance with applicable standards. Removed spoil would be backfilled into the excavation and compacted in place. KMLP would distribute the excess spoil across the compressor or meter station sites, or use it as backfill along the header pipelines. Debris and wastes generated during construction would be disposed at a licensed commercial disposal facility in accordance with applicable regulations.

As described in section 2.5.1.8 for the Magnolia Meter Station, measurement equipment typically would be delivered to the sites via trucks. The measurement buildings would be positioned on the foundation, leveled, grouted, and secured. Piping connections would be flanged, screwed, or welded. Welded connections would be inspected visually, radiographically, or by some other nondestructive testing method. Welding activities would comply with the DOT minimum safety requirements at 49 CFR 192 and the requirements of the latest edition of the American Petroleum Institute Standard 1104. After welding, the pipe joints would be coated; the pipe coating would be inspected for defects, with special attention given to all field-applied coatings, and any damage would be repaired.

Hydrostatic testing of piping and related components would be conducted using approximately 10,000 gallons of municipal water from the City of Eunice in accordance with the DOT safety standards at 49 CFR 192 and applicable permit conditions to verify the pipe integrity and ensure its ability to withstand the MAOP. Before being placed into service, all controls and safety equipment would be checked and tested for proper functioning.

All disturbed surface areas would be restored and stabilization measures installed in a timely manner in accordance with the FERC Plan and Procedures. To allow for visual screening, KMLP is planning to plant shrubbery along the west, north, and east sides of Compressor Station 760 (see additional discussion in section 4.8.5.2).

KMLP would install chain-link security fence around the perimeter of Compressor Station 760 as well as a barbed-wire fence around the perimeter of the larger 40.6-acre property. KMLP would install a chain-link fence around the Magnolia Meter Station and would also replace portions of the existing security fence at the CGT, TRANSCO, and TGT Meter Stations so as to surround the proposed permanent facilities associated with the meter station modifications.

2.6 OPERATION AND MAINTENANCE PROCEDURES

2.6.1 LNG Marine Traffic along the Waterway

Although LNG carriers and their operation are directly related to the use of the proposed LNG terminal, they are not subject to the section 3 authorization sought in this application. The LNG carriers arriving at the LNG terminal must comply with all federal and international standards regarding LNG shipping. A detailed discussion of design and safety features of LNG carriers is presented in sections 2.1.2.1 and 4.12.6.

Inbound LNG vessels would embark either one or two Lake Charles Pilots at the Calcasieu "CC" buoy. During daytime hours, all LNG carriers transiting the Calcasieu Ship Channel with a capacity less than 150,000 m^3 are required to embark one pilot; LNG carriers transiting during nighttime hours or with a capacity greater than 150,000 m^3 are required to embark two pilots. Seagoing LNG barges would be required to embark one pilot; inland LNG barges would not be required to transit under the control of a pilot.

From the CC buoy, LNG carriers and seagoing LNG barges would transit under command of the pilot(s). LNG carriers and seagoing barges would transit approximately 28 nautical miles to the Cameron jetties (River Mile 0) and would then continue northbound in the Calcasieu Ship Channel to the channel's intersection with the Intracoastal Waterway at "Devil's Elbow." At this intersection, inbound LNG vessels would make a turn to the northeast and proceed into the Industrial Canal where tugs would maneuver the vessel within the berthing area. The pilot(s) would direct the securing of the lines and would turn navigational control back to the captain when the carrier is fastened. Following loading at the LNG terminal, the pilot(s) would resume navigational control of the vessel when the mooring lines are let go. Loaded LNG carriers would transit outbound along the reverse route described for inbound LNG carriers.

LNG vessels transiting the Calcasieu River and Ship Channel are typically designated to have a moving security zone during transit per Coast Guard regulations at 33 CFR 165.805(a)(2). While in transit, LNG vessels are accompanied by a moving security zone that extends 2 miles ahead, 1 mile astern, and from shoreline to shoreline on the Calcasieu River (and from channel edge to channel edge in the offshore waters of the Calcasieu Ship Channel). As a safety and security precaution, no vessels are allowed to meet, cross, or overtake LNG ships in transit or otherwise enter the security zone without the express permission of the Coast Guard. At its discretion, the Coast Guard may elect to provide escort boats during LNG carrier transits to enforce the moving security zone.

The Coast Guard issued the LOR for the Magnolia LNG Project on February 12, 2015, which stated that the Calcasieu Ship Channel is considered suitable for LNG marine traffic   The LOR outlines conditions for LNG marine traffic in the waterway, including additional resources or assets that would be required prior to allowing LNG carriers to transit up the Calcasieu Ship Channel to the LNG terminal.

The COE is responsible for maintenance dredging of the Calcasieu Ship Channel and Industrial Canal. Magnolia would be responsible for maintenance dredging of its berthing area. Based on estimated shoaling rates in the area, Magnolia estimates that approximately 65,000 yd^3 of material would be removed from the berthing area every 4 to 5 years based on past shoaling rates within the Industrial Canal. Magnolia is working with the Port of Lake Charles to determine maintenance dredging requirements and to obtain long-term maintenance dredging capacity.

2.6.2 LNG Terminal

Magnolia would operate and maintain its facilities in compliance with 49 CFR 193, 33 CFR 127, 40 CFR 68, NFPA 59A, and other applicable federal and state regulations. Before commencing operation of the LNG terminal, Magnolia would prepare and submit to FERC for approval operation and maintenance manuals that address specific procedures for the safe operation and maintenance of the LNG storage and processing facilities. Magnolia would also prepare an operations manual that addresses specific procedures for the safe operation of the ship loading facilities in accordance with 33 CFR 127.305. Operating procedures are required to address normal operations as well as safe startup, shutdown, and emergency conditions.

The estimated 67 personnel employed during operation of the LNG terminal would be trained to properly and safely perform their assigned duties. Operators would be trained in the handling of potential hazards associated with LNG, cryogenic operations, and the proper operation of all the equipment. The operators would meet all the training requirements of the Coast Guard, DOT, Louisiana State Fire Marshall, and other regulatory entities.

The LNG terminal's full-time maintenance staff would conduct routine maintenance and minor overhauls. Major overhauls and other major maintenance would be handled by outside maintenance contractors specifically trained to perform the required services. All scheduled and unscheduled maintenance would be entered into a computerized maintenance management system.

2.6.3 Magnolia Meter Station, Interconnect Pipeline, and KMLP Facilities

KMLP would operate and maintain its facilities in compliance with the DOT regulations at 49 CFR 192; the FERC Plan and Procedures (except where deviations are justified; see section 4.4.3.2); FERC Certificate conditions; and applicable federal, state, and local regulations. Facilities would be periodically inspected and maintained as required by applicable regulations.

Operation of the facilities would be monitored electronically on a continuous basis, and an emergency shutdown system would be installed. In the event of an incident along the pipeline headers, at a meter station, or at Compressor Station 760, one of the four permanent employees at Compressor Station 760 or one of the KMLP field operations personnel in the vicinity would respond to the event. KMLP field operations personnel would be available to be dispatched at any time by KMLP's Gas Control Center via cell phone and pager communications.

In accordance PHMSA regulations (49 CFR 192.615), KMLP would be required to update its *Emergency Response Plan* to include the new and modified facilities associated with the Lake Charles Expansion Project, and would develop a detailed Operations, Maintenance, and Inspection Manual. The *Emergency Response Plan* would incorporate procedures for identifying an emergency event and establishing communication with local fire, police, and public officials. KMLP would participate in a One Call program for the proposed facilities and has a public awareness program for its natural gas facilities.

Operations activities associated with the header pipelines would be limited primarily to maintenance of the permanent easement and inspection, repair, and cleaning of the pipelines. KMLP would maintain vegetation on the permanent easement in upland areas by mowing, cutting, and trimming, except in areas of actively cultivated cropland and in accordance with the FERC Plan and Procedures. The entire construction right-of-way would be allowed to revegetate; however, large brush and trees within 15 feet of the pipeline with roots that could compromise the integrity of the pipeline coating would be selectively cut and removed from the permanent easement. Pipeline inspection would be accomplished by means identified in the pipeline integrity management program in accordance with applicable laws and regulations.

2.7 SAFETY AND SECURITY PROCEDURES

2.7.1 LNG Terminal

Spill Containment System

The LNG and mixed refrigerant spill containment systems for the LNG terminal would be designed and constructed to comply with the DOT regulations at 49 CFR 193, the Coast Guard regulations at 33 CFR 127, and all other applicable federal and state regulations. These regulations require that each LNG container and each LNG transfer system be provided with a means of secondary containment sized to hold the quantity of LNG that could be released as a result of the design spill appropriate for the area and LNG equipment. The regulations also require transfer and storage areas for flammable refrigerants and flammable liquids be graded, drained, or provided with impoundment in a manner that minimizes the possibility of accidental spills and leaks that could endanger important structures, equipment, or adjoining property or that could reach waterways.

Magnolia would construct insulated concrete spill containment basins for the LNG truck loading area, LNG storage tank area, and liquefaction area. Materials would flow into the spill containment basins via insulated concrete troughs that would be alongside or beneath LNG pipelines and equipment. The troughs would be designed and sized to minimize vapor formation during LNG spills. Additional information regarding spill containment system operation, maintenance, and safety information is presented in section 4.12.5.

Thermal Exclusion and Vapor Dispersion Zones

The LNG storage tanks would comply with the DOT's siting requirements at 49 CFR 193, subpart B, which incorporates the 2001 edition of the NFPA 59A. As specified in 49 CFR 193.2057, thermal radiation protection requires that each LNG container and LNG transfer system have thermal exclusion zones based on three radiation flux levels in accordance with section 2.2.3.2 of NFPA 59A. The thermal exclusion zones are designed to protect people and property in the event of an accident and fire at an LNG facility. More specific information regarding vapor dispersion zones and thermal radiation is provided in sections 4.12.5.3 and 4.12.5.5, respectively.

Hazard Detection System

Hazard detectors for the LNG terminal would be installed throughout the facilities to give operations personnel a means for early detection and location of released flammable gases and fires. The hazard detection system would be designed in accordance with NFPA requirements and other applicable standards. The hazard detection system would include detectors/sensors for:

- flammable gas;
- fire and flame;
- leak detection;
- high temperature;
- low temperature;
- smoke; and
- toxic gas.

Additional detail regarding the hazard detection system is provided in section 4.12.2.

Firewater System

The LNG terminal would include firewater supply and distribution systems for extinguishing fires, cooling structures and equipment exposed to thermal radiation, and dispersing flammable vapors. Additionally, hydrants, hose reel, and fixed monitors would be strategically located throughout the LNG terminal.

The firewater system would be designed in accordance with NFPA requirements. As described in section 2.1.1.7, the proposed source of water supply for the firewater system would be from groundwater stored in the on-site aboveground tanks. The deluge system for the LNG storage tanks would use water from the Industrial Canal.

High-Expansion Foam System

High-expansion foam concentrate would be metered or proportioned into the firewater system by means of a typical balanced pressure foam proportioning system. The resulting foam solution would be delivered via underground piping to the high-expansion foam generator installed in the LNG spill impoundment sump. The high-expansion foam generator would be water-motor powered, thus, no electrical power would be required. The foam generator would produce a high-expansion foam (i.e., a nominal 500 parts air for every 1 part foam solution). This foam would be applied to LNG spills, whether ignited or un-ignited. Applied to ignited spills, the foam would control the fire, greatly reducing the level of radiant heat to the surroundings. The high-expansion foam systems would be designed in accordance with NFPA 11A.

Fail Safe Shutdown System

The LNG terminal would have an emergency shutdown system with shutdown sequences and control devices designed to leave the facilities in a safe state. The emergency shutdown system would be used for major incidents and would result in either total plant shutdown or shutdown of processes and/or individual pieces of equipment, depending on the type of incident.

Security

The LNG terminal would be subject to facility security regulations under the Coast Guard Maritime Transportation Security Act (33 CFR 105) and would have a facility security plan approved by the Coast Guard. The LNG terminal would meet all necessary security measures required under those regulations including security fencing, lighting, access control, and closed-circuit television. In addition, DOT regulations concerning transportation of hazardous materials would be evaluated and any applicable DOT security requirements, not otherwise covered by the Coast Guard-approved *Facility Security Plan*, would be implemented.

The LNG terminal would include sirens that would be audible in all locations per the Coast Guard LNG facility regulations at 33 CFR 127. The sirens would have a distinctive tone for easy recognition between alarms and emergency events.

Plant security would include a perimeter fence consistent with established port protocol. Access through the plant gate and buildings would be consistent with the requirements of the Coast Guard-approved *Facility Security Plan*. Closed-circuit television cameras would facilitate viewing of the entrance area and other locations around and within the facility including tank top and the LNG vessel loading platform. In addition, guard houses would be strategically located along Henry Pugh Boulevard to monitor activities. More detailed information regarding safety and security procedures is provided in section 4.12.3.

2.7.2 Magnolia Meter Station, Interconnect Pipeline, and KMLP Facilities

The KMLP facilities would be designed in accordance with the DOT regulations at 49 CFR 192 for material selection and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion. The regulations also define four area classifications, based on population density in the vicinity of the proposed pipeline, for the purpose of ensuring more rigorous safety requirements for populated areas. Class locations are used to determine pipe wall thickness, hydrostatic test pressures, weld inspection and testing requirements, spacing of mainline valves, depth of cover, and frequency of pipeline patrols and leak surveys.

To protect the public, company personnel, and property, Compressor Station 760 would be equipped with several safety devices. One of these safety systems is an emergency shutdown system. When activated, the emergency shutdown system would stop the gas turbine compressors, isolate and vent the compressor piping, and route the gas away from the station. During the venting process, natural gas would be released through a stack. The emergency shutdown system would react if it senses preset or predetermined high operating temperatures, high natural gas pressures, high flow rate, and low flow rate. The system would also react if fire or gas is detected within the compressor building or facility area. Additional detail regarding the emergency shutdown system is provided in section 4.12.9. Aboveground facilities would be monitored electronically on a continuous basis and would be surrounded by chain-link security fence.

KMLP would install pipeline identification markers at line-of-sight intervals and at crossings of roads, railroads, waterbodies, and other key points in accordance with DOT regulations. The markers would clearly indicate the presence of the pipeline, identify KMLP as the pipeline operator, and provide telephone numbers where a KMLP representative could be reached in the event of an emergency or prior to any excavation in the area by a third party.

3.0 ALTERNATIVES

As required by NEPA and FERC policy, we evaluated alternatives to the Magnolia LNG and Lake Charles Expansion Projects to determine whether any such alternatives would be reasonable and have significant environmental advantages compared with the proposed action. The range of alternatives analyzed include the No-Action Alternative, system alternatives, site alternatives, process alternatives, and power source alternatives for the LNG terminal and Compressor Station 760.

As part of the No-Action Alternative, we considered the effects and actions that could conceivably result if the proposed Magnolia LNG and Lake Charles Expansion Projects were not constructed. Under the analysis of system alternatives, we evaluated the ability of other existing, planned, or proposed (new or expanded) LNG export terminals and pipeline systems to meet the proposed projects' objectives. Our evaluation of alternative sites focused on the LNG terminal and Compressor Station 760 because the other aboveground facility components would be located within or adjacent to existing facilities. Our analysis of alternative liquefaction processes evaluated the potential for another liquefaction process to meet the proposed projects' objectives with similar or less environmental impact. Our analysis of alternative power sources for the LNG terminal and Compressor Station 760 evaluated the potential for other sources (e.g., obtaining power from Entergy's existing electric transmission system, generating power on site, using different types of compressors, generating electricity using waste heat) to meet the power requirements at the terminal and compressor station.

The evaluation criteria for selecting potentially reasonable and environmentally preferable alternatives include whether they:

- are technically and economically feasible and practical;
- offer significant environmental advantage over the proposed projects or segments of either project; and
- meet the projects' objectives of constructing and operating a terminal to serve the domestic and export markets for LNG, including:
    - export of LNG via large LNG carriers to foreign markets;
    - domestic waterway transportation of LNG for use as vessel fuel in shipping and the offshore oil and gas industry; and
    - distribution of LNG in trucks for use as a fuel for long-haul trucking and other emerging domestic uses of LNG.

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

3.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, the Magnolia LNG and Lake Charles Expansion Projects would not be constructed and Magnolia's and KMLP's objective of providing the proposed liquefaction and transportation capacity for domestic and export markets of LNG would not be realized. In addition, the potential adverse and beneficial environmental impacts discussed in section 4.0 of this EIS would not occur.

The development and production of gas supplies from conventional and unconventional gas formations has increased in recent years throughout many areas of the United States. With or without the No-Action Alternative, other LNG export projects could be developed in the Gulf Coast region or elsewhere in the United States, resulting in both adverse and beneficial environmental impacts. LNG terminal developments and pipeline system expansions of similar scope and magnitude to the proposed projects would likely result in environmental impacts of comparable significance, especially those projects in a similar regional setting.

The No-Action Alternative could require that potential end users make different arrangements to obtain LNG from other sources, use other fossil fuel energy sources (e.g., coal or fuel oil), or possibly use traditional long-term energy sources (e.g., nuclear power) and/or renewable energy sources (e.g., solar power) to compensate for the lack of natural gas that would otherwise be supplied by the Magnolia LNG and Lake Charles Expansion Projects. Although the No-Action Alternative could also be aligned with a drive to promote international energy conservation, this sphere of discussion lies beyond our analytical scope.

As noted above, implementing the No-Action Alternative could force potential natural gas customers to seek other forms of energy. Traditional energy alternatives to natural gas include coal, oil, hydroelectric, and nuclear power. Renewable energy resources such as solar, ocean energy, biomass, wind, landfill gas, and municipal solid waste represent more recent, advanced energy alternatives. Conceivably, each of these energy alternatives could support the generation of electric power, which, along with residential heating, commercial, and industrial uses, is a major consumer of natural gas.

The International Energy Agency (IEA) (2014b) indicates that the global market for coal remains buoyant, although it will increasingly be replaced by natural gas and low-carbon fuels in the energy mix. Demand for coal will decrease in China and all countries in the Organization for Economic Co-operation and Development, including the United States, due to new air pollution and climate policies. However, demand will continue to grow rapidly in India for an overall demand growth for coal of 0.5 percent per year. In the United States, several new coal export projects have been proposed recently, suggesting that coal will remain competitive with natural gas as an international commodity in the foreseeable future, despite coal's greater air emissions. Similarly, fuel oil, which also produces greater emissions, is commonly used for power generation in many countries and will continue to compete with natural gas as a fuel source. The EPA (2013a) states that natural gas-fired electric generation, compared with the average air emissions from coal-fired electric generation, produces half as much CO_2, less than a third as much nitrogen oxides (NO_x), and 1 percent as much sulfur oxides (SO_x). In addition, combustion of natural gas is not a significant source of mercury emissions (EPA, 2015b), particularly when compared to potential emissions of mercury from coal combustion, which are the largest human-caused source of air emissions in the United States (EPA, 2005). In addition to power generation, fuel oil is used in the shipping industry. New legislation will limit sulfur content of marine fuels. Specifically, the International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. Annex VI of MARPOL establishes limits on NO_x emissions and the sulfur content of marine fuels. By 2020, Annex VI will require the reduction of sulfur content of marine fuels to

0.5 percent on a global basis. In order to comply with this requirement, ship operators will be required to install SO_x emission reduction equipment or switch to low sulfur fuels, such as LNG.

If the No-Action Alternative is selected, it could result in the continued use of less clean-burning fossil fuels at levels that might otherwise have been reduced through replacement with LNG produced by the proposed projects; it could also result in the increased consumption of other fossil fuels to satisfy any future growth in demand that might otherwise be addressed in whole or part by LNG. Consequently, the more severe air emissions and other adverse environmental impacts associated with the use of less clean-burning fossil fuels would not be reduced and may increase if the No-Action Alternative were to be adopted, irrespective of the fact that many countries are cognizant of the environmental impacts of these fuels and prefer to use natural gas as an energy source.

There has been a recent renewed interest in nuclear fuel as a source of electric power generation, although the U.S. Energy Information Administration (2014a) estimates the proportion of electricity generated in the United States by nuclear power will decrease from 19 to 16 percent by 2040, with actual nuclear generating capacity remaining fairly static over the long term. Whereas global nuclear capacity is still projected to rise, led by China, India, Korea, and Russia (IEA, 2012a, 2014b), regulatory hurdles, public concerns over facility safety and nuclear waste disposal, project costs, and plant construction lead times make it unlikely that sufficient nuclear capacity could be available to serve all the markets targeted by the Magnolia LNG and Lake Charles Expansion Projects on a compatible timeline. Further, plans for nuclear power generation have been scaled back in some countries, reflecting policy reconsideration following the 2011 accident at the Fukushima Daiichi nuclear power plant near Fukushima, Japan (IEA, 2012a).

Renewable sources may become an increasingly significant factor in meeting future energy demands worldwide. Hydropower is the predominant renewable source for electric power generation, which contributes to more than 16 percent of electricity generation worldwide and about 85 percent of global renewable electricity (IEA, 2014a). The IEA expects hydropower to remain as the predominant renewable energy source through 2035 (IEA, 2012a, 2012b). However, as with nuclear power generation, there are high costs associated with developing substantial hydropower projects and a long development time between project conception and operation. Other promising renewable energy resources include solar, ocean energy, biomass, and wind, as discussed in more detail below.

With respect to solar energy, photovoltaic production is increasing as the cost of photovoltaic systems decreases. Photovoltaic cells have the potential to supplement electric power generation resources. In 2012, solar energy accounted for 2.2 percent of global electricity production (Observ'ER, 2013).

Ocean energy is a largely unexplored renewable resource. Technologies to capture ocean energy are in their infancy, and environmental and engineering considerations are being studied to better understand the implications of placing power-generating facilities in the ocean. In 2012, ocean energy accounted for 0.01 percent of global electricity production (Observ'ER, 2013).

Biomass categories for electric power generation include solid biomass, liquid biomass, biogas, and renewable household waste. Like ocean energy, this is an emerging area of study and biomass research covers diverse applications. For example, researchers are working to accelerate the development of applications that use algal biomass as a fuel source. Burning of wood pellets in Europe for power generation is increasing, and wood pellet exports from the United States to Europe increased to over 3 million short tons per year in 2013 (Energy Information Administration, 2014b). In 2012, biomass sources accounted for 1.4 percent of global electricity production (Observ'ER, 2013). The IEA (2012a) projects a four-fold increase in biomass consumption for electric power generation through 2035.

Further growth of wind-generated electric power requires construction of new wind turbines and transmission lines. Although this is likely to occur in many parts of the world, it is also likely that such development will be slow-paced in most countries due to the high cost of construction. In addition, wind power cannot be used for constant and reliable electricity production because of its inherent variability, and back-up modes of power generation are commonly required. In 2012, wind power accounted for 2.4 percent of global electricity production (Observ'ER, 2013).

In 2012, renewable energy sources accounted for 20 percent of global electricity production (Observ'ER, 2013). Renewables are projected to become the world's second-largest source of power generation in the next couple of years, and are expected to surpass coal as the primary source by 2040, when they will fuel 33 percent of global electricity production (IEA, 2014b). However, compared with natural gas-fired power generation, the cost of renewable energy projects per energy output unit is currently high and any significant increase in their relative contribution to global electric power generation hinges critically on continued subsidies. In 2013 these subsidies amounted to $121 billion, but to reach the projection noted above, the subsidies would need to increase to $230 billion by 2030, before falling to $205 billion in 2040 due to support commitment and capacity schedules (IEA, 2014b).

Natural gas is often considered a "bridge fuel," meaning a fuel that bridges the timespan between the dominant use of fossil fuels today and the greater use of renewable energy sources in the future. Natural gas is cleaner burning than other fossil fuels and can also serve as a reliable backup fuel to renewable energy facilities, which characteristically provide power on an intermittent basis.

There is currently considerable momentum behind advancing renewable energy technologies and moving towards more diversified energy sources. These advanced technologies, either individually or in combination, will likely be important in addressing future energy demands. Although renewables are forecast to gain increasing global prominence as energy sources for electric power generation over the next two decades, this trend does not reflect any corresponding decrease in natural gas demand; rather, an increase of more than 50 percent in worldwide gas demand is predicted over the same timespan (IEA, 2014b). Based on this forecast, the increased use of renewable energy sources does not constitute a reasonable alternative to the Magnolia LNG and Lake Charles Expansion Projects.

Although it is speculative and beyond the scope of this analysis to predict what actions might be taken by policymakers or end users in response to the No-Action Alternative, it is possible that the energy needs to be satisfied by the proposed projects would be met largely by other fossil fuel energy sources, such as coal and oil, resulting in more air emissions and greater environmental impacts. Renewable sources are not always reliable or available in sufficient quantities to support most market requirements and would not necessarily be appropriate substitutes for natural gas in all applications. Similarly, the use of nuclear power in lieu of natural gas would depend on geographic availability and could be especially problematic from the perspective of negative public perception.

Based on our consideration of environmental impacts and the evident lack of viable energy source alternatives, we have dismissed the No-Action Alternative as a reasonable alternative to meet the objectives of the Magnolia LNG and Lake Charles Expansion Projects. Because the purpose of the projects is to construct and operate a terminal to serve the domestic and export markets for LNG, the development or use of renewable energy technology would not be a reasonable alternative to the proposed action.

3.2 SYSTEM ALTERNATIVES

We reviewed system alternatives to evaluate the ability of other existing, modified, planned, or proposed facilities to meet the stated objectives of the Magnolia LNG and Lake Charles Expansion Projects and to determine if a system alternative exists that would have less significant adverse environmental impacts than those associated with the proposed projects.[1] Our analyses of system alternatives for the Magnolia LNG Project and Lake Charles Expansion Project are presented in sections 3.2.1 and 3.2.2, respectively. 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.

3.2.1 LNG Terminal Alternatives

For a system alternative to be viable, it must be technically and economically feasible, as well as offer a significant environmental advantage over the proposed projects. In the case of the Magnolia LNG Project, it must also be compatible with Magnolia's purpose and objectives to construct a terminal to serve the domestic and export markets for LNG.

Magnolia is proposing to export LNG to FTA and non-FTA countries. The volume of gas for FTA countries has already been approved by the DOE and the determination of non-FTA would be subject to DOE approval. For Magnolia to obtain LNG from other facilities that have DOE approval for export, those facilities would need to have additional, unsubscribed LNG production capacity.

In addition to LNG export, Magnolia is proposing to load LNG onto LNG barges for domestic marine distribution off the coasts of Louisiana and Texas as well as onto LNG trucks for road distribution to refueling stations in Louisiana and the surrounding states. Therefore, obtaining LNG from other facilities would require those facilities to be located in the Gulf region.

An expansion of existing facilities would need a similar scope of pre-treatment and liquefaction facilities and possibly additional storage, LNG truck loading, and marine transfer facilities, while any new facility would need a similar scope of pre-treatment, liquefaction, storage, truck loading, and marine transfer facilities. These additional facilities would result in environmental impacts that are less than, equal to, or greater than the environmental impacts of the proposed facility and may not provide a significant environmental advantage over the LNG terminal. Each of the planned, proposed, or authorized projects described in sections 3.2.1.1 and 3.2.1.2 was considered as a potential system alternative (see section 4.13 for additional information on project locations). 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, future Commission review and market forces will ultimately decide which and how many of these facilities are built.

[1] Proposed projects are those for which the proponent has submitted a formal application to the FERC; planned projects are those that are either in pre-filing or have been announced, but have not been formally proposed.

3.2.1.1 Existing LNG Import Terminals with Approved, Proposed, or Planned Liquefaction Projects

Following are the approved, proposed, and/or planned expansions in the Gulf region to provide liquefaction capabilities:

Approved

- Cameron LNG, LLC (Cameron LNG) – Cameron Liquefaction Project
- Freeport LNG Development, LP (Freeport LNG) – Freeport Liquefaction Project
- Sabine Pass LNG, LP (Sabine Pass LNG) – Sabine Pass Liquefaction Project and Sabine Pass Liquefaction Expansion Project

Proposed

- Golden Pass Products LLC (Golden Pass) – Golden Pass Products LNG Export Project
- Gulf LNG Liquefaction Company, LLC (Gulf LNG) – Gulf LNG Liquefaction Project
- Lake Charles LNG Company, LLC (Lake Charles LNG) – Lake Charles Liquefaction Project

Planned

- Cameron LNG – Cameron Expansion Project
- Freeport-McMoRan Energy, LLC (Freeport-McMoRan) – Main Pass Energy Hub Project
- Freeport LNG – Freeport LNG Liquefaction Expansion Project

Liquefaction and export facilities are under construction at the Cameron, Freeport, and Sabine Pass LNG Terminals; facilities may be constructed at each of the other import terminals pending completion of regulatory review and permitting. Each of the projects was evaluated as a potential system alternative to the Magnolia LNG Project.

Cameron LNG Terminal

The Cameron LNG Terminal is located on the Calcasieu Ship Channel, near Hackberry, Louisiana, about 5 miles south-southwest of Magnolia's proposed LNG terminal. The Cameron site started operation as an LNG import terminal in 2009 and received authorization in 2010 to re-export foreign-sourced LNG. The existing facilities include vaporization units and three 160,000-m^3 LNG storage tanks with a sustained send-out capacity of 1.8 Bcf/d and maximum send-out capacity of 2.1 Bcf/d. There are two LNG carrier berths, each capable of loading/unloading vessels ranging from 125,000 to 217,000 m^3 in size.

<u>Approved</u>

On January 17, 2012, Cameron LNG was granted DOE authorization to export up to 12.0 MTPA of LNG (equivalent to 1.7 Bcf/d of vaporized natural gas) over 20 years to FTA countries. On September 10, 2014, Cameron LNG received approval from the DOE to export LNG over 20 years to non-FTA countries. On May 9, 2012, Cameron LNG and Cameron Interstate received approval to enter our pre-filing process[2] for adding liquefaction and export facilities to the existing terminal (referred to as the Cameron Liquefaction and Pipeline Expansion Projects). The formal application for the Cameron

[2] Docket Nos. PF12-12-000 and PF12-13-000

Liquefaction Project and Cameron Pipeline Expansion Project was filed with the Commission on December 7, 2012[3] and December 14, 2012,[4] respectively. The final EIS for the projects was issued on April 30, 2014. The FERC issued the Order for the projects on June 19, 2014. The Cameron Liquefaction Project, which is currently under construction, includes three liquefaction trains (Trains 1 through 3), each capable of producing approximately 5 MTPA of LNG; one 160,000-m^3 LNG storage tank (Tank 4); and additional facilities on 502 acres of land, consisting of 70 acres within the existing terminal fenceline and 432 contiguous acres adjacent to the terminal. The project has an in-service target date of early 2018 for the first train, mid-2018 for the second train, and the end of 2018 for the third train. Concurrent with the terminal expansion, construction of the Cameron Pipeline Expansion Project would include a new 56,820 hp compressor station, 21 miles of 42-inch-diameter natural gas pipeline, and associated facilities to supply the natural gas for liquefaction at the Cameron LNG Terminal.

As Cameron LNG has already been approved to export to FTA and non-FTA countries, Cameron LNG would require additional facilities similar to those of the Magnolia LNG Project to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. In addition, Magnolia has an agreement in place with KMLP to provide natural gas to its proposed terminal. Transporting natural gas to the Cameron LNG Terminal would require constructing at least 5 miles of additional pipeline from KMLP's existing system or utilizing a different pipeline system, which would likely require additional facilities. Therefore, the Cameron Liquefaction Project was not considered to be a reasonable alternative and was removed from consideration.

Planned

On April 9, 2015, Cameron LNG was granted DOE authorization to export an additional 3.0 MTPA of LNG (equivalent to 0.4 Bcf/d of vaporized natural gas) over 20 years to FTA countries. Cameron LNG's Cameron Expansion Project would include two additional liquefaction trains (Trains 4 and 5) each with a capacity of about 5 MTPA and one additional 160,000-m^3 LNG storage tank (Tank 5). On March 2, 2015, the FERC initiated its pre-filing process for this expansion.[5]

The environmental impacts of constructing and operating the facilities needed to expand beyond the planned capacity would likely be similar to those described above for the Cameron Liquefaction Project. Therefore, the Cameron Expansion Project was not evaluated further.

Freeport LNG Terminal

The Freeport LNG Terminal is located on Quintana Island in Brazoria County, Texas, about 146 miles southwest of Magnolia's proposed LNG terminal. The Freeport import terminal, which started operations in 2008, includes two 160,000-m^3 LNG storage tanks, vaporization units, and a single berth capable of handling LNG carriers with a capacity in excess of 200,000 m^3. It has a peak natural gas send-out capability of about 1.5 Bcf/d. Authorization to re-export foreign-sourced LNG was received in 2009.

Approved

Freeport LNG and FLNG Liquefaction, LLC (collectively, Freeport LNG) are currently constructing liquefaction, storage, and export facilities at the existing terminal to provide LNG export capacity of about 13 MTPA (equivalent to 1.8 Bcf/d of vaporized natural gas). This project requires

3 Docket No. CP13-25-000

4 Docket No. CP13-27-000

5 Docket No. PF15-13-000

approximately 105 acres for three liquefaction trains (each with a nominal capacity of 4.4 MTPA) and ancillary facilities; one 160,000-m^3 LNG storage tank; a marine berthing dock; transfer facility; and an access road system. An off-site pre-treatment plant and interconnecting pipeline/utility line system is also under construction.

FLNG Expansion and FLNG Liquefaction, LLC (collectively, FLEX) filed two separate applications with the DOE, each to export up to 9.0 MTPA of LNG (equivalent to 1.4 Bcf/d of vaporized natural gas) over 25 years to FTA countries. The DOE approved the applications in February 2011 and February 2012. On December 17, 2010, FLEX submitted an application to the DOE to export 9.0 MTPA of LNG (equivalent to 1.4 Bcf/d of vaporized natural gas) over 25 years to non-FTA countries. On December 19, 2011, FLEX submitted a second application to export an additional 1.4 Bcf/d to non-FTA countries. FLEX received final DOE approval for a total of 1.8 Bcf/d on November 14, 2014. On January 5, 2011, Freeport LNG received authorization to use the FERC pre-filing process and filed its formal application with the Commission on August 31, 2012.[6] The FERC issued an Order for the project on July 30, 2014.[7]

On July 31, 2012, Freeport LNG Expansion announced a 20-year agreement with Osaka Gas and Chubu Electric for the liquefaction capacity (4.4 MTPA) of the first train. On February 11, 2013, Freeport LNG Expansion announced a 20-year agreement with BP for the liquefaction capacity (4.4 MTPA) of the second train. On September 9, 2013, Freeport LNG Expansion announced separate 20-year agreements with Toshiba and SK E&S for the liquefaction capacity (4.4 MTPA) of the third train, split equally between the two companies. Freeport LNG anticipates that the first liquefaction train will enter service in 2018 and the remaining two trains will enter service in 2019.

As Freeport LNG has already been approved to export to FTA and non-FTA countries, Freeport LNG would require additional facilities similar to those of the Magnolia LNG Project to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, this system alternative was not evaluated further.

Planned

On June 3, 2015, Freeport LNG entered into the FERC's pre-filing process for the proposed Freeport LNG Liquefaction Expansion Project.[8] The project would include one additional liquefaction train (Train 4) with a capacity of about 5.1 MTPA and supporting utility and auxiliary facilities and infrastructure. If approved, Freeport Development anticipates the project would enter service in 2020.

Freeport LNG would need to be approved to export to FTA countries and non-FTA countries, which would require review of the facilities and would not likely result in a significant environmental advantage. Further, although some of the proposed liquefaction capacity (5.1 MTPA) may remain unsubscribed, with a 2.9 MTPA differential, the Freeport LNG Liquefaction Expansion Project would require the construction of an additional liquefaction train to meet Magnolia's customer commitments, assuming Freeport Development's proposed 5.1 MTPA could also be utilized for this purpose. Therefore, this system alternative was not considered further.

6 Docket Nos. PF11-2-000 and CP12-509-000

7 Docket Nos. CP12-509-000 and CP12-29-000

8 Docket No. PF15-25-000

Golden Pass LNG Terminal

The Golden Pass LNG Terminal is located near the town of Sabine Pass, Texas, on the western shore of the Sabine Pass Channel, about 44 miles southwest of Magnolia's proposed LNG terminal. The Golden Pass import terminal occupies an approximately 477-acre site and includes five 155,000-m^3 LNG storage tanks and two LNG carrier berths. It has a maximum send-out capacity of 2.5 Bcf/d and became operational in 2010. Natural gas is sent out from the Golden Pass LNG Terminal via the Golden Pass Pipeline, which connects to five interstate and four intrastate pipelines providing access to major markets on the Gulf Coast and across the midwestern and northeastern United States.

<u>Proposed</u>

Golden Pass is proposing to construct liquefaction and LNG export facilities at its existing LNG terminal. The proposed export facility would include three 5.2 MTPA liquefaction trains, providing a total LNG send-out capacity of 15.6 MTPA. It would also require 2.6 miles of 24-inch-diameter pipeline, compression facilities totaling 121,750 hp at three new compressor stations, and modification of certain existing interconnect facilities to provide for bi-directional transportation to deliver 2.6 Bcf/d of natural gas for liquefaction.

On September 27, 2012, Golden Pass received approval from the DOE to export 15.6 MTPA of LNG (equivalent to approximately 2 Bcf/d of vaporized natural gas) over 25 years to FTA countries. On October 26, 2012, Golden Pass submitted an application, for which authorization is currently pending, to export LNG over the same period to non-FTA countries. On May 30, 2013, Golden Pass received authorization to use the FERC pre-filing process, and subsequently filed its application with the Commission on July 7, 2014.[9] Golden Pass anticipates the first liquefaction train would enter service in 2019, and the remaining two trains would enter service in 2020.

As Golden Pass has already been approved to export to FTA countries, Golden Pass would require additional facilities similar to those of the Magnolia LNG Project to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, the Golden Pass system alternative was not evaluated further.

Gulf LNG Terminal

The Gulf LNG Terminal is located on a 40-acre site in Pascagoula, Mississippi, about 286 miles east of Magnolia's proposed LNG terminal. The Gulf LNG import terminal began operations in October 2011 and has a natural gas send-out capacity of 1.3 Bcf/d. It includes two 160,000-m^3 LNG storage tanks and a single LNG carrier berth designed to receive vessels up to 250,000 m^3 in capacity. The terminal is connected to the Mobile Bay Lateral pipeline through a 15.5-mile-long, 26-inch-diameter pipeline. The Mobile Bay Lateral pipeline provides interconnects with Florida Gas Transmission Company, LLC and TRANSCO pipelines.

<u>Proposed</u>

Gulf LNG is proposing to construct liquefaction facilities at its existing terminal, with plans to export up to 10.0 MTPA of LNG. The expansion would include two 5.0 MTPA liquefaction trains, providing a total liquefaction capacity of 10.0 MTPA. It would also include a new natural gas liquids and refrigerant storage area, a new truck loading/unloading facility, and a new dock designed to receive

---

9 Docket Nos. PF13-14-000, CP14-517-000, and CP14-518-000

barges transporting large equipment during construction. Gulf LNG anticipates the first liquefaction train would enter service in the third quarter of 2019, and second train would enter service in 2020.

On June 15, 2012, Gulf LNG received DOE authorization to export 11.5 MTPA[10] of LNG (equivalent to 1.5 Bcf/d of vaporized natural gas) to FTA countries over 25 years; on August 31, 2012, Gulf LNG filed an application, for which authorization is currently pending, to export the same volume of LNG to non-FTA countries over the same period. On May 21, 2014, Gulf LNG received authorization to use the FERC pre-filing process and subsequently filed its formal application with the Commission on June 19, 2015 for this expansion.[11]

As Gulf LNG has already been approved to export to FTA countries, Gulf LNG would require additional facilities similar to those of the Magnolia LNG Project to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, the Gulf LNG Terminal system alternative was not evaluated further.

Main Pass Energy Hub Deepwater Port

The Main Pass Energy Hub Deepwater Port is located in federal waters in Main Pass Block 299, 16 miles offshore from southeastern Louisiana and about 272 miles east-southeast of Magnolia's proposed LNG terminal. The existing infrastructure includes eight platforms.

<u>Planned</u>

Freeport-McMoRan plans to export LNG from existing and new facilities at its existing deepwater port in the Gulf of Mexico. The planned project would include delivery of natural gas via pipeline; storage of natural gas in new underground salt dome storage caverns; liquefaction of natural gas using six new floating liquefaction, storage, and offloading (FLSO) units; and transfer of LNG to carriers for export. Each FLSO unit would have a liquefaction capacity of 4.0 MTPA and an LNG storage capacity of 200,000 m^3, providing a collective liquefaction capacity of 24 MTPA and storage capacity of 1,200,000 m^3.

On May 24, 2013, Freeport-McMoRan received approval from the DOE to export 24.0 MTPA of LNG (equivalent to 3.22 Bcf/d of vaporized natural gas) to FTA countries over 30 years; a corresponding application for export to non-FTA countries is currently under DOE review. The facility would qualify as a "deepwater port" under the Deepwater Port Act and, as such, would require a license from MARAD and the Coast Guard. At the time of this writing, Freeport-McMoRan has not filed an application with MARAD.

On April 24, 2013, it was announced that Petronet LNG Limited committed to 4.0 MTPA of the total LNG output of 24 MTPA from the Main Pass Energy Hub Deepwater Port. Freeport-McMoRan would require additional facilities to meet the Magnolia LNG Project's objectives, which may result in similar or additional environmental impacts. In addition, as an offshore ocean facility, the Main Pass Energy Hub Deep Water Port would not be able to meet the project purpose of supporting the domestic use of LNG in long-haul trucking. Therefore, this system alternative was not considered further.

[10] Current project design under FERC review includes export of approximately 10.0 MTPA.

[11] Docket Nos. PF13-4-000 and CP15-521-000

Sabine Pass LNG Terminal

The Sabine Pass LNG Terminal is located on the eastern shore of the Sabine Pass Channel in Cameron Parish, Louisiana, about 42 miles west of Magnolia's proposed LNG terminal. The Sabine Pass terminal occupies an approximately 853-acre site and includes five LNG storage tanks with a total storage capacity of 16.9 billion cubic feet and two LNG carrier berths. The facility has a natural gas send-out capacity of 4.0 Bcf/d. The terminal became operational as an LNG import facility in 2008 and received authorization for the re-export of foreign-sourced LNG in 2009.

Approved

On September 7, 2010, Sabine Pass LNG received approval from the DOE to export 16.0 MTPA of LNG (equivalent to 2.2 Bcf/d of vaporized natural gas) to FTA countries over 30 years; on August 7, 2012, Sabine Pass LNG received approval from the DOE to export the same volume of LNG to non-FTA countries over the same period. On July 11 and 12, 2013, Sabine Pass LNG received DOE approval for LNG exports equating to 0.28 Bcf/d and 0.24 Bcf/d of vaporized natural gas, respectively. On January 22, 2014, Sabine Pass LNG received DOE approval to export surplus LNG equating to an additional 0.86 Bcf/d of vaporized natural gas. DOE approvals for comparable non-FTA applications in 2013/2014 are pending.

On April 16, 2012, the FERC authorized the Sabine Pass Liquefaction Project,[12] which will allow Sabine Pass LNG to receive, process, and export 16.0 MTPA of domestically originated LNG. The project will include four 4.0 MTPA liquefaction trains (Trains 1 through 4). On February 20, 2014,[13] the FERC authorized an increase in LNG production for Trains 1 through 4 from 16.0 to 20.0 MTPA to reflect a higher production capability due to certain approved design changes. The authorized project is currently under construction and will involve the permanent use of about 191 acres and temporary disturbance of about 97 acres, all 288 acres of which would be within the existing terminal site. Sabine Pass LNG anticipates that Trains 1 and 2 will be placed in service in 2016 and Trains 3 and 4 will be placed in service in 2017.

Currently, two interstate natural gas pipelines, the Creole Trail Pipeline and KMLP, interconnect with the Sabine Pass LNG Terminal. A third pipeline, owned by Natural Gas Pipeline Company of America, crosses the terminal site but does not directly interconnect. Sabine Pass LNG indicates that the 2.2 Bcf/d of natural gas needed for the liquefaction facilities would be supplied via the Creole Trail Pipeline. Creole Trail Pipeline filed an application and subsequently received FERC authorization on February 21, 2013 to add a 53,125 hp compressor station to provide 1.5 Bcf/d of reverse flow capacity on its system.[14] The compressor station is currently under construction.

As Sabine Pass LNG has already been approved to export to FTA and non-FTA countries, Sabine Pass LNG would require additional facilities similar to those of the Magnolia LNG Project to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, further consideration of the Sabine Pass Liquefaction Project as a system alternative is precluded.

On April 6, 2015, the FERC authorized the Sabine Pass Liquefaction Expansion Project and Cheniere Creole Trail Pipeline Expansion Project.[15] The projects will result in expansion of the

---

12 Docket No. CP11-72-000

13 Docket No. CP14-12-000

14 Docket No. CP12-351-000

15 Docket Nos. CP13-552-000 and CP13-553-000

liquefaction facilities within the Sabine Pass LNG Terminal and the Creole Trail Pipeline system, which would involve the addition of two liquefaction trains (Trains 5 and 6), about 104 miles of new pipeline, one new compressor station, and four new meter stations. Operation of Trains 5 and 6 will add 9.0 MTPA (equivalent to 1.4 Bcf/d of vaporized natural gas) to the 20.0 MTPA already authorized for Trains 1 through 4. Sabine Pass LNG anticipates that Train 5 will be placed into service in 2019 and Train 6 at a later date when commercially feasible.

Sabine Pass LNG announced in March 2013 that Total and UK-based Centrica had collectively committed to 3.75 MTPA of liquefaction capacity associated with the Sabine Pass Liquefaction Expansion Project. Although some liquefaction capacity (5.25 MTPA) does remain unsubscribed on the two trains, the unsubscribed capacity is insufficient to meet Magnolia's delivery requirements. Furthermore, because this capacity was approved by the DOE in its public interest determination process, we will not assume that any such capacity is "excess" and would remain unutilized throughout the lifetime of the Sabine Pass Liquefaction Expansion Project and, therefore, available to meet Magnolia's project purpose. In addition, construction and operation of the facilities needed to expand beyond the planned capacity would have environmental impacts, which would likely be similar to those associated with the Magnolia LNG Project. As a result, the Sabine Pass Liquefaction Expansion Project was not considered to be environmentally advantageous or a reasonable system alternative to the Magnolia LNG Project and was not evaluated further.

Trunkline LNG Terminal

The Trunkline LNG Terminal is located in Calcasieu Parish, Louisiana, approximately 1,000 feet northeast of Magnolia's proposed LNG terminal site on the north side of the Industrial Canal. Trunkline's existing import terminal includes vaporization units, four aboveground LNG storage tanks, and a berthing dock that can accommodate two LNG carriers on an approximately 125-acre site.

Proposed

In March 2014, Trunkline LNG Export, LLC and Trunkline LNG Company, LLC submitted an application to the FERC to construct and operate the Lake Charles Liquefaction Project immediately north of and directly adjacent to the existing Trunkline LNG Terminal.[16] On September 19, 2014, both companies amended their Certificates of Formation with the state of Delaware, amending their names to Lake Charles LNG Export Company, LLC and Lake Charles LNG Company, LLC, respectively (collectively, Lake Charles LNG). The proposed facility would include three liquefaction trains with a design production capacity of 16.5 MTPA (equivalent to 2.2 Bcf/d of vaporized natural gas). Feed gas would be delivered to the Trunkline LNG Terminal via the existing Trunkline Gas Company (Trunkline) pipeline facilities that connect the terminal with various existing interstate pipeline systems, and/or by new pipeline facilities that have been proposed by Trunkline. Subject to the receipt of FERC authorization and other applicable permits, authorizations, and approvals, Lake Charles LNG anticipates that construction of the Lake Charles Liquefaction Project and associated modifications at the Trunkline LNG Terminal would commence in 2015 and the in-service date of the first liquefaction train would be in the second quarter of 2019. The second and third liquefaction trains would be scheduled to be placed into service in the fourth quarter of 2019 and the second quarter of 2020, respectively.

As Lake Charles LNG has already been approved to export to FTA countries, Lake Charles LNG would require additional facilities similar to those of the Magnolia LNG Project to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, this project

16 Docket Nos. CP14-119-000, CP14-120-000, and CP14-122-000

would not provide a significant environmental advantage to the Magnolia LNG Project and was not considered further.

3.2.1.2 Approved, Proposed, and Planned Greenfield Liquefaction Projects

In addition to the liquefaction projects proposed or planned at existing LNG terminals described in section 3.2.1.1, there are currently 19 approved, proposed, and planned "greenfield" liquefaction projects located along the Gulf Coast in the southern United States. These greenfield projects are not associated with existing LNG import terminals, but are considered potential system alternatives, as identified below.

Approved

- Corpus Christi Liquefaction Project

Proposed

- Lavaca Bay LNG Project

Planned

- Annova LNG Brownsville Project
- Calcasieu Pass Project
- CE FLNG LNG Project
- Corpus Christi Stage 3 Project
- Delfin LNG Project
- Eos LNG Project
- G2 LNG Project
- Gasfin LNG Project
- Gulf Coast Liquefaction Project
- Live Oak LNG Project
- Louisiana LNG Project
- Port Arthur Liquefaction Project
- Rio Grande Project
- SCT&E LNG Project
- Texas LNG Project
- Waller Point LNG Project
- WesPac LNG Project

Construction activities associated with the Corpus Christi Liquefaction Project commenced in February 2015; facilities may be constructed at each of the other locations pending completion of regulatory review and permitting. Each of the projects was evaluated as a potential system alternative to the Magnolia LNG Project, as described below.

Approved

<u>Corpus Christi Liquefaction Project</u>

Corpus Christi Liquefaction, LLC (Corpus Christi) is constructing a liquefaction and LNG export terminal about 285 miles southwest of Magnolia's proposed LNG terminal, on the northeast side of Corpus Christi Bay in San Patricio County, Texas. Corpus Christi's proposed site was originally authorized for the Corpus Christi LNG Import Terminal, which was not constructed due to market changes.[17] The liquefaction and LNG export terminal includes three liquefaction trains, each with a capacity of approximately 5 MTPA, for a total send-out capacity of 13.5 MTPA, three 160,000-m^3 LNG storage tanks, and two LNG berthing docks. The project also includes an approximately 23-mile-long, 48-inch-diameter pipeline, which will connect the Corpus Christi LNG Terminal with five interstate and intrastate natural gas transmission pipelines in south Texas, as well as two new compressor stations. In total, about 1,000 acres of construction workspace would be required.

On October 16, 2012, Corpus Christi (through Cheniere Marketing, LLC) received DOE authorization to export 13.5 MTPA of LNG (equivalent to 2.1 Bcf/d of vaporized natural gas) to FTA countries over 25 years; on August 31, 2012, Corpus Christi (through Cheniere Marketing, LLC) applied to the DOE to export the same volume of LNG to non-FTA countries over 22 years. On May 12, 2015, the DOE authorized export of 13.5 MTPA of LNG to non-FTA countries over 20 years (not the 22-year term requested).

Corpus Christi received authorization to use the FERC pre-filing process on December 22, 2011 and submitted its application on August 31, 2012.[18] On December 30, 2014, the FERC issued an Order authorizing the project, which began construction in February 2015.

As Corpus Christi has already been approved to export to FTA countries, Corpus Christi would require additional facilities similar to those of the Magnolia LNG Project to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, it was not evaluated further as a system alternative.

Proposed

Lavaca Bay LNG Project

Excelerate Liquefaction Solutions (Port Lavaca I), LLC, Excelerate Liquefaction Solutions (Port Lavaca 2), LLC, and Lavaca Bay Pipeline System, LLC (collectively, ELS) is proposing to develop a liquefaction and LNG export facility at Port Lavaca in Calhoun County, Texas, about 222 miles southwest of Magnolia's proposed LNG terminal. ELS' proposed terminal includes two FLSO units that would manufacture LNG from domestically produced natural gas, two marine berths, and onshore pretreatment facilities and infrastructure associated with the FLSO units. The project would include a total of eight liquefaction trains, four on each of the two FLSO units. It would have an LNG storage capacity of up to 502,000 m^3, and a peak LNG send-out capacity of 10.0 MTPA. The project would also include a 29.5-mile-long, 42-inch-diameter natural gas delivery pipeline and compression, metering, and appurtenant facilities.

On August 9, 2012, ELS received DOE authorization to export 10.0 MTPA of LNG (equivalent to 1.38 Bcf/d of vaporized natural gas) to FTA countries over 20 years; an application to export 1.38 Bcf/d to non-FTA countries over the same period is pending approval. On November 12, 2012, ELS received authorization to use the FERC pre-filing process and filed its formal application with the Commission on February 6, 2014.[19,20] In a letter dated March 31, 2015, ELS requested that the FERC place the project on hold until September 1, 2015 while it reevaluates the economics of the Lavaca Bay LNG Project.

17 Docket No. CP04-37-000

18 Docket Nos. PF12-3-000 and CP12-507-000

19 Docket No. PF13-1-000

20 Docket Nos. CP14-71-000, CP14-72-000, and CP14-73-000

As Lavaca Bay has already been approved to export to FTA countries, Lavaca Bay would require additional facilities to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. In addition, the Lavaca Bay LNG Project is on hold, and the timelines for permitting, construction, and operational start-up are uncertain. Therefore, this system alternative was not evaluated further.

Planned

Annova LNG Brownsville Project

Annova LNG Common Infrastructure, LLC, Annova LNG Brownsville A, LLC, Annova LNG Brownsville B, LLC, and Annova LNG Brownsville C, LLC (collectively, Annova) is planning a liquefaction and LNG export terminal on a 650-acre site on the Brownsville Ship Channel in Cameron County, Texas. Annova's proposed project would be located about 375 miles southwest of Magnolia's proposed LNG terminal and would include six liquefaction trains with an overall LNG capacity of approximately 7 MTPA, two 160,000-m^3 LNG storage tanks, and a marine berth for one LNG carrier. The planned terminal would receive domestic feed gas from the Isla Grande Pipeline through a new, intrastate natural gas header pipeline.

On February 20, 2014, Annova received DOE authorization to export 7.0 MTPA of LNG (equivalent to 0.94 Bcf/d of vaporized natural gas) to FTA countries over 30 years;[21] a corresponding application for LNG export to non-FTA countries is not anticipated. The FERC approved Annova LNG's request to enter the FERC pre-filing process on March 27, 2015.[22] If approved, Annova anticipates an in-service date of December 2019.

As Annova has already been approved to export to FTA countries, Annova would require additional facilities to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

Calcasieu Pass Project

Venture Global Calcasieu Pass, LLC (Venture Global) is planning a liquefaction and LNG export facility on a 203-acre site on the east side of the Calcasieu Ship Channel near the Gulf of Mexico, about 23 miles south of Magnolia's proposed LNG terminal, in Cameron Parish, Louisiana. Venture Global's proposed project would consist of 10 liquefaction trains capable of producing a total of 10.0 MTPA of LNG, two 200,000-m^3 LNG storage tanks, two LNG berthing docks that would accommodate vessels up to 185,000 m^3 in size. The project would also include construction of two new natural gas lateral pipelines, one 19 miles long and the other 24 miles long, that would connect to the existing natural gas pipeline grid in southern Louisiana.

On September 27, 2013, Venture Global received approval from the DOE to export up to 5.0 MTPA (equivalent to 0.67 Bcf/d) of LNG to FTA countries over 25 years; an application for DOE approval to export 5.0 MTPA of LNG to non-FTA countries is pending. On May 13, 2014, Venture Global submitted a second application to the DOE to export another 5.0 MTPA of LNG to both FTA and non-FTA countries. On October 10, 2014, Venture Global received approval from the DOE to export up to 5.0 MTPA (equivalent to 0.67 Bcf/d) of LNG to FTA countries over 25 years. An application for DOE approval to export 5.0 MTPA of LNG to non-FTA countries is pending. Additionally, on

[21] On July 17, 2014, the DOE authorized the transfer of Annova LNG, LLC's FTA authorization to Annova LNG Common Infrastructure, LLC.

[22] Docket No. PF15-15-000

February 9, 2015 Venture Global submitted a third application to the DOE to export another 2.0 MTPA of LNG to both FTA and non-FTA countries. The FERC approved Venture Global's request to enter the FERC pre-filing process on October 10, 2014.[23] According to its pre-filing request letter, Venture Global anticipates an in-service date of December 2019.

As Venture Global has already been approved to export to FTA countries, Venture Global would require additional facilities to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

CE FLNG LNG Project

CE FLNG, LLC (CE FLNG) has announced the planned development of a floating liquefaction and LNG export facility on the east bank of the Mississippi River in Plaquemines Parish, Louisiana, about 250 miles east-southeast of Magnolia's proposed LNG terminal. CE FLNG's facilities would be located on approximately 400 acres adjacent to and within the Mississippi River, and would include two FLSO units with a total output of 8 MTPA and storage capacity of 500,000 m^3. Each FLSO would have four liquefaction trains capable of producing up to 4 MTPA of LNG and five LNG storage tanks with a total storage of 250,000-m^3 of LNG. LNG carriers would berth next to the FLSO units to receive LNG. The project would also include a 45-mile-long, 42-inch-diameter natural gas pipeline to connect the facility with the existing natural gas pipeline grid.

On November 21, 2012, CE FLNG received DOE approval to export 8.0 MTPA of LNG (equivalent to 1.08 Bcf/d of vaporized natural gas) to FTA countries over 30 years; a September 21, 2012 application to export 8.0 MTPA of LNG to non-FTA countries over the same period is pending. On April 16, 2013, FERC initiated the pre-filing process;[24] at the time of this writing, an application had not been filed. As of March 31, 2015, CE FLNG anticipates submitting its application in the first quarter of 2016. If authorized, the project would commence operation during the third quarter of 2019.

As CE FLNG has already been approved to export to FTA countries, CE FLNG would require additional facilities to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

Corpus Christi Stage 3 Project

On June 9, 2015, Cheniere Corpus Christi Liquefaction, LLC and Cheniere Corpus Christi Pipeline, LP (collectively, Cheniere Corpus Christi) entered into the FERC's pre-filing process for the proposed Stage 3 Project.[25] The project would be located immediately north of the Corpus Christi Liquefaction Project site (described above), which is currently under construction. The Stage 3 Project would include two additional liquefaction trains (Trains 4 and 5) capable of producing a total of 10 MTPA of LNG, one additional LNG storage tank (Tank 4) with a capacity of 160,000 m^3, new 22-mile-long natural gas pipeline, additional compression at one compressor station, and appurtenant facilities. If approved, Cheniere Corpus Christi anticipates the project would enter service in 2021.

Cheniere Corpus Christi would need to be approved to export to FTA countries and non-FTA countries, which would require review of the facilities and would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

---

[23] Docket No. PF15-2-000

[24] Docket No. PF13-11-000

[25] Docket No. PF15-26-000

Delfin LNG Project

Delfin LNG, LLC (Delfin) is planning to construct and operate a deepwater port, which would include four floating LNG vessels (FLNGV), which would be moored in the Gulf of Mexico, about 50 miles offshore from Cameron Parish, Louisiana and 74 miles south of Magnolia's proposed LNG terminal. Delfin's project would qualify as a "deepwater port" under the Deepwater Port Act and, as such, would require a license from MARAD in conjunction with the Coast Guard. Feed gas would be supplied to each of the FLNGVs through one of four new pipeline laterals connected to two existing natural gas pipelines. The FLNGVs would then liquefy the gas, which would be stored in LNG storage tanks aboard each of the FLNGVs. Each vessel would have a total LNG storage capacity of 165,000 cubic meters (m^3). In total, the Delfin LNG Project would be capable of exporting up to 9.2 MTPA (equivalent to 1.2 Bcf/d of natural gas).

On February 20, 2014, Delfin received DOE approval to export 13 MTPA of LNG (equivalent to 1.8 Bcf/d of vaporized natural gas) to FTA countries over 20 years; a November 12, 2013 application to export 13 MTPA of LNG to non-FTA countries over the same period is pending. On May 8, 2015, Delfin filed its deepwater port application with MARAD as well as its abbreviated application for onshore facilities with the FERC.[26] If authorized, the onshore project components would commence operation in 2018 and the deepwater port would begin operation in 2019.

As Delfin has already been approved to export to FTA countries, Delfin would require additional facilities to export the additional volume approved by the DOE for Magnolia to export to FTA countries. In addition, as an offshore ocean facility, the Delfin LNG Project would not be able to meet the project purpose of supporting the domestic use of LNG in long-haul trucking. Therefore, the Delfin LNG Project was not evaluated further as a system alternative.

Eos LNG Project

Eos LNG LLC (Eos) and Barca LNG LLC (Barca) are planning to develop a liquefaction and LNG export facility at the Port of Brownsville in Brownsville, Texas, approximately 375 miles southwest of Magnolia's proposed LNG terminal. Eos/Barca's facility is being designed and permitted for up to six FLSO units with aggregate peak capacity of up to 12.0 MTPA. It would include up to six 35,000-m^3 full containment storage tanks and up to six LNG carrier docks. Each floating liquefaction barge would be moored alongside an LNG carrier that would be utilized solely for storage. LNG would be transferred to and exported by a second carrier, moored alongside the barge and storage carrier. The project would not require land-based liquefaction or storage facilities. Feed gas would be sourced from local pipeline interconnects.

On November 26, 2013, both Eos and Barca received DOE authorization to export a total of 12 MTPA of LNG (equivalent to 1.6 Bcf/d of vaporized natural gas) to FTA countries over 25 years; applications were also filed on August 23, 2013 to export 12 MTPA to non-FTA countries over the same period, which are pending approval. At the time of this writing, initiation of the FERC pre-filing process has not been requested.

As Eos and Barca have already been approved to export to FTA countries, Eos and Barca would require additional facilities to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. In addition, as an offshore ocean facility, the Eos LNG Project would not be able to meet the project purpose of supporting the domestic use of LNG in long-haul trucking. Therefore, this system alternative was not considered further.

---

[26] Docket No. CP15-490-000

G2 LNG Project

G2 LNG LLC (G2 LNG) is planning to develop a liquefaction and LNG export facility within a 500-acre site on the Calcasieu Ship Channel in Cameron Parish, Louisiana, about 20 miles south of Magnolia's proposed LNG terminal. G2 LNG's project would be located on a 500-acre site and would include two liquefaction trains each capable of producing 7 MTPA of LNG (14 MTPA total), an unspecified number of LNG storage tanks, and a marine berth. G2 LNG has stated that, if approved, it anticipates that operation of the G2 LNG Project would begin in 2019.

On March 19, 2015, G2 LNG requested DOE authorization to export 14 MTPA of LNG (equivalent to 3.8 Bcf/d of vaporized natural gas) to FTA countries over 30 years and authorization to export the same volume of LNG to non-FTA countries over the same period. Both applications are pending approval. At the time of this writing, initiation of the FERC pre-filing process has not been requested by G2 LNG.

G2 LNG would need to be approved to export to FTA countries and non-FTA countries, which would require review of the facilities and would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

Gasfin LNG Project

Gasfin Development USA, LLC (Gasfin) is planning to develop a liquefaction and LNG export facility on the east side of the Calcasieu Ship Channel in Cameron Parish, Louisiana, approximately 23 miles south of Magnolia's proposed LNG terminal. Gasfin's project would have an overall LNG storage capacity of 100,000 m^3 and LNG export capacity of 1.5 MTPA. Onshore facilities would be constructed on a 35-acre site and the project would also include one LNG carrier berth that could accommodate LNG carriers with a capacity between 10,000 and 35,000 m^3.

On March 7, 2013, Gasfin received DOE authorization to export 1.5 MTPA of LNG (equivalent to 0.2 Bcf/d of vaporized natural gas) to FTA countries over 25 years; a December 24, 2013 application to export 1.5 Bcf/d to non-FTA countries over 20 years is pending approval. The project is in the initial development phase and an anticipated schedule has not yet been released. At the time of this writing, initiation of the FERC pre-filing process has not been requested by Gasfin.

As Gasfin has already been approved to export to FTA countries, Gasfin would require additional facilities to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

Gulf Coast Liquefaction Project

Gulf Coast LNG Export, LLC (Gulf Coast) is planning to develop a liquefaction and LNG export facility at the Port of Brownsville in Brownsville, Texas, about 374 miles southwest of Magnolia's proposed LNG terminal. Gulf Coast's project would be located on a 500-acre site and would include four liquefaction trains each capable of producing 4.5 MTPA of LNG (18.0 MTPA total), an unspecified number of LNG storage tanks, a marine berth, and an interconnection with an existing natural gas pipeline.

On October 16, 2012, Gulf Coast received DOE authorization to export 18.0 MTPA of LNG (equivalent to 2.8 Bcf/d of vaporized natural gas) to FTA countries over 25 years; an application to export 2.8 Bcf/d to non-FTA countries over the same period is pending approval. At the time of this writing, initiation of the FERC pre-filing process has not been requested by Gulf Coast.

As Gulf Coast has already been approved to export to FTA countries, Gulf Coast would require additional facilities to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

Live Oak LNG Project

Live Oak LNG, LLC (Live Oak) has announced plans for a liquefaction and LNG export facility in Calcasieu Parish, approximately 2 miles west of Magnolia's proposed LNG terminal on the west side of the Calcasieu Ship Channel. Live Oak's project would include eight liquefaction units capable of producing a nominal capacity of 5.2 MTPA of LNG, two 130,000-m^3 LNG storage tanks, a marine berth accommodating an LNG vessel with cargo capacity of up to 175,000 m^3, and an interconnection with the KMLP and the Creole Trail Pipeline systems. The project is in the initial development phase and, if authorized, is expected to begin export of up to 5 MTPA of LNG at the end of 2019.

At the time of this writing, Live Oak has not requested initiation of the FERC pre-filing process, nor has it submitted an application to the DOE for authorization to export LNG.

Live Oak would need to be approved to export to FTA countries and non-FTA countries, which would require review of the facilities and would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

Louisiana LNG Project

Louisiana LNG Energy LLC (Louisiana LNG) is planning a liquefaction and LNG export facility on a 200-acre site on the east bank of the Mississippi River downstream from the Port of New Orleans in Plaquemines Parish, Louisiana, about 216 miles east-southeast of Magnolia's proposed LNG terminal. Louisiana LNG's project would include four liquefaction trains each capable of producing 0.5 MTPA of LNG for a total capacity of 2.0 MTPA, two 100,000-m^3 LNG storage tanks, a marine berth accommodating an LNG vessel with cargo capacity of up to 175,000 m^3, LNG truck loading facilities, electric power generation facilities, a compressor station, and two header pipelines connecting the facility to existing natural gas pipeline system infrastructure.

On February 5, 2014, Louisiana LNG applied for DOE authorization to export 2.0 MTPA of LNG (equivalent to 0.27 Bcf/d of vaporized natural gas) to FTA countries over 25 years; a corresponding application for export of 2.0 MTPA of LNG to non-FTA countries over the same period was submitted on February 18, 2014. On August 28, 2014, Louisiana LNG received DOE authorization to export 2.0 MTPA of LNG to FTA countries over 25 years; its application to export to non-FTA countries over the same period is pending approval. Louisiana LNG received authorization to use the FERC pre-filing process on July 18, 2014.[27]

As Louisiana LNG has already been approved to export to FTA countries, Louisiana LNG would require additional facilities to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

Port Arthur Liquefaction Project

Port Arthur LNG, LLC and Port Arthur Pipeline, LLC (collectively, Port Arthur) is planning a liquefaction and LNG export facility on the west side of the Sabine-Neches Waterway near Port Arthur,

---

[27] Docket No. PF14-17-000

Texas, which is approximately 45 miles southwest of Magnolia's proposed LNG terminal. Port Arthur's facility would include two 5.0 MTPA liquefaction trains (providing a total liquefaction capacity of 10.0 MTPA), two 160,000-m^3 capacity LNG storage tanks, a natural gas liquids and refrigerant storage area, a truck loading/unloading facility, and two LNG carrier berths. To supply natural gas required for the terminal, construction of two 42-inch-diameter natural gas pipelines (one 7 miles in length and one 27 miles in length), two compressor stations, metering stations, and appurtenant facilities would be required. If approved, the Port Arthur Liquefaction Project would begin operations in the first quarter of 2021.

On March 20, 2015, Port Arthur submitted an application to the DOE for authorization to export 10 MTPA of LNG (equivalent to approximately 1.4 Bcf/d of vaporized natural gas) to FTA countries over 25 years. The FERC approved Port Arthur's request to enter the FERC pre-filing process on March 31, 2015.[28]

Port Arthur would need to be approved to export to FTA countries and non-FTA countries, which would require review of the facilities and would not likely result in a significant environmental advantage. Therefore, this system alternative was not evaluated further.

<u>Rio Grande Project</u>

Rio Grande LNG, LLC and Rio Bravo Pipeline Company, LLC (collectively, Rio Bravo) is planning a liquefaction and LNG export terminal on a 1,000-acre site on northern shore of the Brownsville Ship Channel in Cameron County, Texas. Rio Bravo's proposed project would be located about 375 miles southwest of Magnolia's proposed LNG terminal and would include six liquefaction trains with an overall LNG capacity of approximately 27 MTPA, four 180,000-m^3 LNG storage tanks, two marine berths, and on-site power generation. To supply natural gas required for the terminal, construction of two parallel, 130-mile-long, 42-inch-diameter natural gas pipelines, three compressor stations, and appurtenant facilities would be required. If approved, Rio Bravo anticipates commencing operation during the fourth quarter of 2020.

At the time of this writing, Rio Bravo has not submitted an application to the DOE requesting authorization to export LNG. The FERC approved Rio Bravo's request to enter the FERC pre-filing process on April 13, 2015.[29]

Rio Bravo would need to be approved to export to FTA countries and non-FTA countries, which would require review of the facilities and would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

<u>SCT&E LNG Project</u>

Southern California Telephone & Energy LNG, LLC (SCT&E LNG) is planning a liquefaction and LNG export facility on Monkey Island in Cameron Parish, Louisiana, which is approximately 22 miles south of Magnolia's proposed LNG terminal. SCT&E's facility would include six LNG trains with an overall capacity of 12.0 MTPA of LNG, multiple 160,000-m^3 capacity LNG storage tanks, and may include an interconnect with an existing natural gas pipeline system.

On July 9, 2014, SCT&E LNG submitted an application to the DOE for authorization to export 12.0 MTPA (equivalent of 1.6 Bcf/d of natural gas) of LNG to FTA countries over 30 years. SCT&E LNG received authorization to export to FTA countries on December 15, 2014. On July 24, 2014,

---

[28] Docket Nos. PF15-18-000 and PF15-19-000

[29] Docket No. PF15-20-000

SCT&E LNG also submitted an application to the DOE for authorization to export 12.0 MTPA of LNG to non-FTA countries, which is currently pending approval. At the time of this writing, SCT&E LNG has not yet requested initiation of the FERC pre-filing process.

As SCT&E LNG has already been approved to export to FTA countries, SCT&E LNG would require additional facilities to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

Texas LNG Project

Texas LNG Brownsville LLC (Texas LNG) is planning a liquefaction and LNG export terminal on a 625-acre site on the Brownsville Ship Channel in Cameron County, Texas. Texas LNG's proposed project would be located about 375 miles southwest of Magnolia's proposed LNG terminal and would include two liquefaction trains with an overall LNG capacity of approximately 4.0 MTPA, two 210,000-m^3 LNG storage tanks, and a marine berth for one LNG carrier. The planned terminal would receive domestic feed gas from the Agua Dulce natural gas hub through a new, 150-mile-long intrastate natural gas header pipeline. If approved, Texas LNG anticipates commencing operation in 2020.

On June 11, 2014, Texas LNG received DOE authorization to export 2.0 MTPA of LNG (equivalent to 0.27 Bcf/d of vaporized natural gas) to FTA countries over 25 years; an application to export the same volume to non-FTA countries over the same period is pending approval. Texas LNG indicates that it plans on placing the facilities in service in early 2020. The FERC approved Texas LNG's request to enter the FERC pre-filing process on April 14, 2015.[30]

As Texas LNG has already been approved to export to FTA countries, Texas LNG would require additional facilities to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

Waller Point LNG Project

Waller Point LNG is planning a liquefaction and LNG export facility on Monkey Island in Cameron Parish, Louisiana, which is approximately 22 miles south of Magnolia's proposed LNG terminal. Waller Point LNG's project would include small-scale liquefaction trains with a total LNG export capacity of about 1.5 MTPA, LNG storage capacity of 30,000 m^3, and berthing facilities for LNG barges.

On December 20, 2012, Waller Point LNG received DOE authorization to export 1.3 MTPA of LNG (equivalent to approximately 0.2 Bcf/d of vaporized natural gas) to FTA countries over 25 years; a November 26, 2013 application to export 1.5 MTPA of LNG (equivalent to approximately 0.2 Bcf/d of vaporized natural gas) to non-FTA countries over the same period is pending approval. The project is in the initial development phase and Waller Point LNG has not announced a planned schedule. Furthermore, at the time of this writing, initiation of the FERC pre-filing process has not been requested.

As Waller Point LNG has already been approved to export to FTA countries, Waller Point LNG would require additional facilities to export the additional volume approved by the DOE for Magnolia to export to FTA countries. Any such project would need to be evaluated, but would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

[30] Docket No. PF15-14-000

WesPac LNG Project

WesPac Midstream LLC (WesPac) is planning an LNG liquefaction and export facility on 40 acres of land located on the Sabine-Neches Waterway near Port Arthur, Texas, which is approximately 45 miles southwest of Magnolia's proposed LNG terminal.

On April 18, 2014, Alturas LLC, a subsidiary of WesPac, submitted an application to the DOE for authorization to export 1.5 MTPA of LNG (equivalent to approximately 0.2 Bcf/d of vaporized natural gas) to FTA countries over 20 years. As of this writing, the DOE application is still pending and the initiation of the FERC pre-filing process has not been requested.

WesPac would need to be approved to export to FTA countries and non-FTA countries, which would require review of the facilities and would not likely result in a significant environmental advantage. Therefore, this system alternative was not considered further.

3.2.2 Pipeline System Alternatives

To serve as a viable system alternative to the Lake Charles Expansion Project, the system would have to: (1) transport all or a part of the volume of natural gas required for liquefaction at the LNG terminal, and (2) cause significantly less impact on the environment than the proposed pipeline expansion.

There are three major natural gas pipeline systems within 3 miles of the LNG terminal site that we evaluated as alternatives to the Kinder Morgan Louisiana Pipeline, as follows:

- Trunkline Pipeline – The Trunkline Pipeline system includes approximately 3,000 miles of pipeline and has a capacity of 1.7 Bcf/d. The Trunkline system consists of two large-diameter pipelines extending approximately 1,400 miles from the Gulf Coast areas of Texas and Louisiana through Arkansas, Mississippi, Tennessee, Kentucky, Illinois, Indiana and to Michigan. The Trunkline Pipeline system is proposed to supply natural gas for the Lake Charles Liquefaction Project, located across the Industrial Canal from Magnolia's proposed LNG terminal (see additional discussion in section 4.13.2). The pipeline Magnolia considered is a 30-inch-diameter pipeline located 1.4 miles from the LNG terminal site. Magnolia stated that the Trunkline Pipeline could not supply the full capacity of natural gas required by the Magnolia LNG Project. In addition, the selection of this pipeline system would require construction of at least 1.4 miles of new pipeline to connect with the proposed LNG terminal.

- Gulf South Pipeline – The Gulf South Pipeline system includes approximately 7,400 miles of pipeline and has a capacity of approximately 6.9 Bcf/d. Markets served in Louisiana include local distribution companies, municipalities, power plants, and industrial end-users; off-system markets are served in the northeastern, mid-western, and southeastern United States through interconnections with third-party pipelines. The pipeline Magnolia considered is a 20-inch-diameter pipeline located 1.4 miles from the LNG terminal site. Magnolia stated that the Gulf South Pipeline could not supply the full capacity of natural gas required by the Magnolia LNG Project without significant capital investment to increase capacity. Furthermore, the selection of this pipeline system would require construction of at least 1.4 miles of new pipeline to connect with the proposed LNG terminal.

- <u>Chevron Sabine Pipeline</u> – The Chevron Sabine Pipeline system includes 131 miles of pipeline used to transport natural gas between Erath, Louisiana and Port Arthur, Texas. The pipeline system crosses the western portion of the proposed LNG terminal site and is 6 inches in diameter. Magnolia stated that the Chevron Sabine Pipeline could not supply the full capacity of natural gas required by the Magnolia LNG Project without significant upgrading in size and capacity.

The KMLP traverses the LNG terminal site and can supply the required volume of natural gas via a new meter station and a 40-foot-long interconnect pipeline that would be within the LNG terminal site. Although reconfiguration of portions of the Kinder Morgan Louisiana Pipeline system would be required in order to accommodate Magnolia's request for natural gas service at the LNG terminal (see section 2.1.3), we have determined that Trunkline Pipeline, Gulf South Pipeline, and Chevron Sabine Pipeline would not provide any environmental advantages over the proposed reconfigurations. Therefore, these pipeline system alternatives were not considered further.

3.3 SITE ALTERNATIVES

3.3.1 LNG Terminal Site Alternatives

Based in part on the information provided by Magnolia, we evaluated site alternatives in the general area of the proposed LNG terminal site. In order to meet the stated objectives of the Magnolia LNG Project, we applied screening criteria to identify sites that would be reasonable and most likely to provide some environmental advantage over the proposed terminal site. The screening criteria included:

- <u>Waterfront Access</u> – Given the need to support LNG carriers and domestic waterway transportation of LNG, a location on waterfront property providing direct access to deep-draft shipping channels (water depths greater than 40 feet below mean sea level) was considered preferable to minimize or avoid dredging.

- <u>Property Size</u> – Based on the proposed design, a waterfront site of at least 100 acres would be preferable to accommodate the proposed configuration of the liquefaction trains, storage tanks, and vessel and truck loading facilities.

- <u>Existing Land Use</u> – We considered areas previously disturbed or cleared (brownfield sites) preferable to undisturbed areas (greenfield sites). Additionally, sites that avoid or minimize wetland impacts and are zoned for industrial or commercial use were considered preferable.

- <u>Site Availability</u> – One significant challenge of siting an LNG facility is finding suitable property that is available for industrial development. Availability is critical since section 3 of the NGA does not provide the project proponent the authority of eminent domain in acquiring the property for the LNG terminal. In some cases, a site may possess the available land required for an LNG terminal but the owner is unwilling to sell or lease the property.

- <u>Natural Gas Pipelines and Transmission Lines</u> – Sites proximate to existing interstate pipeline systems and high voltage transmission lines were considered preferable in order to provide natural gas and power to the LNG terminal site.

- Population Centers/Residences – Sites that are not in close proximity to population centers or residences were considered preferable in order to meet the regulatory requirement for LNG vapor dispersion and thermal radiation exclusion zones.

- Distance to an Interstate Highway – Sites proximate to existing interstate highway(s) were considered preferable in order to support LNG trucking.

- Wetlands – Sites that do not contain wetlands (as indicated by the FWS's NWI database) were considered preferable.

Using the screening criteria described above, we evaluated four alternative sites for the LNG terminal (i.e., Industrial Canal – North, Westlake, Corpus Christi, and Morgan's Pointe). The general locations of the four site alternatives along with the proposed site are shown on figure 3.3.1-1. A comparison of each alternative site to the proposed site is presented in table 3.3.1-1 and discussed below.

TABLE 3.3.1-1

Comparison of Alternative Sites for the LNG Terminal

	Westlake	Corpus Christi	Morgan's Point	Industrial Canal – North	Proposed Site
Screening Criteria					
Waterfront access	Shallow waterway	Deep draft	Deep draft	No	Deep draft
Property size (acres)	100	450	200	90	115
Existing land use	Brownfield	Mixed	Brownfield	Greenfield	Greenfield
Site availability	Available	Not available	Not available	Available	Available
Distance to ≥ 30-inch-diameter natural gas pipeline (miles)	7.8	14.5	2.5	0.8	0.0
Distance to ≥ 230 kV electric transmission line (miles)	0.6	12	2.5	0.9	0.6
Distance to nearest residence (miles)	0.4	0.3	0.1	0.6	0.6
Distance to interstate highway (miles)	2.4	22.4	14.3	7.5	8.5
NWI wetlands within site (acres)	2	16	23	10	1
Land Use Within 3 Miles					
Number of residences	9,759	2,695	6,084	2,118	1,265
Industrial/commercial (acres [percent])	4,159 (19)	0 (0)	0 (0)	1,694 (8)	1,345 (6)
Industrial/commercial and high-density residential (acres [percent])	138 (1)	432 (2)	601 (3)	12 (<1)	10 (<1)
Residential (acres [percent])	7,246 (33)	1,484 (6)	3,399 (14)	3,955 (19)	3,469 (16)
Undeveloped (acres [percent])	6,331 (29)	7,613 (29)	3,296 (14)	9,686 (46)	10,367 (47)
Developed open space (acres [percent])	446 (2)	855 (3)	2,199 (9)	387 (1)	325 (2)
Agriculture and/or open water (acres [percent])	3,493 (16)	15,519 (60)	14,089 (60)	5,514 (26)	6,342 (29)

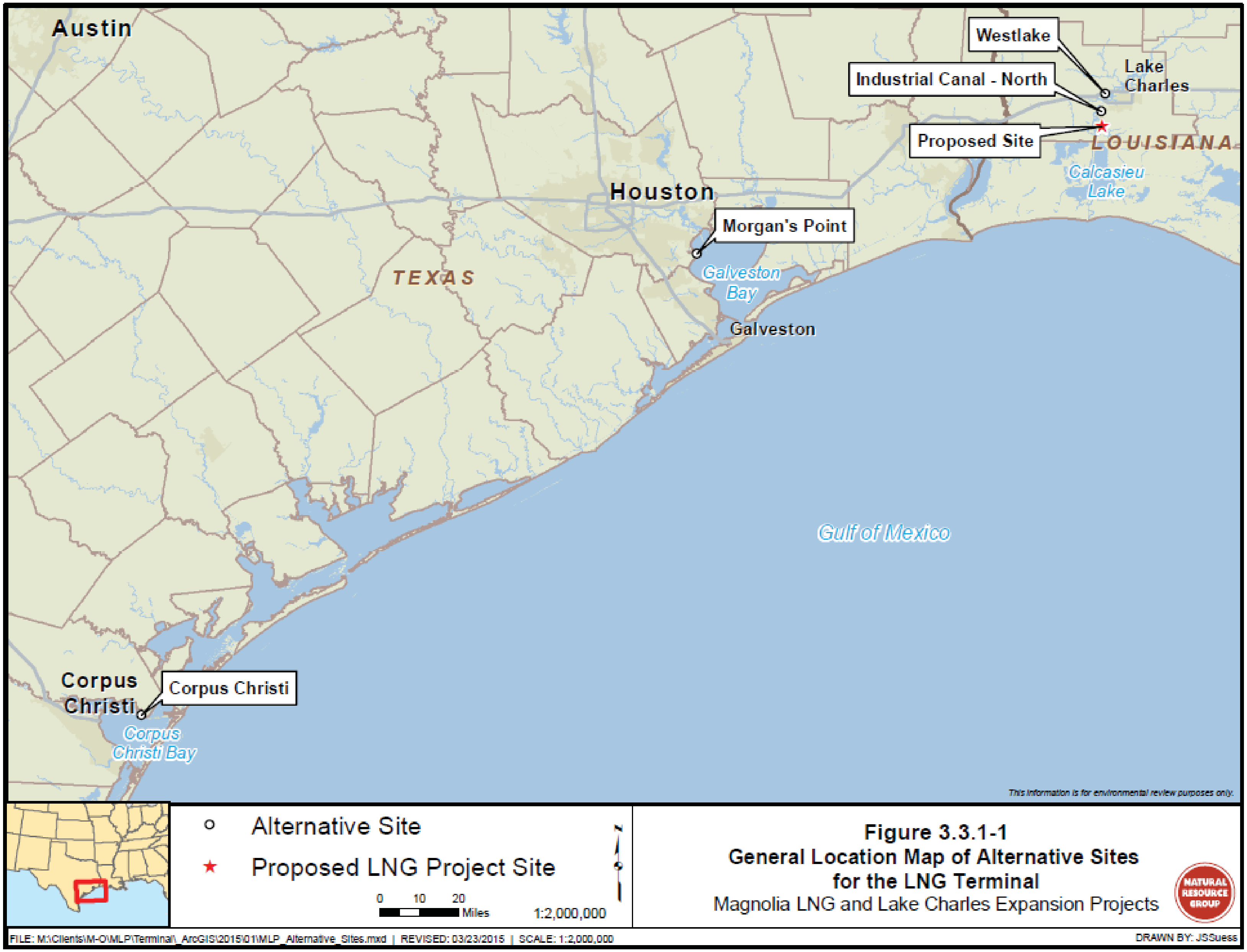


Figure 3.3.1-1
General Location Map of Alternative Sites for the LNG Terminal
Magnolia LNG and Lake Charles Expansion Projects

Proposed Site

The proposed site is located in the Port of Lake Charles, Louisiana on a 115-acre site owned by the Port of Lake Charles. The site was previously used for dredge material disposal by the COE and is bordered to the north by the Industrial Canal, to the west by Calcasieu Point Landing, to the east by commercial and industrial development, and to the south by undeveloped land that is the planned location for the Louisiana Marine Fisheries Enhancement, Research, and Science Center (see sections 4.8.3 and 4.13.1.4).

The proposed site meets the screening requirements of existing deep-draft waterfront access at least 100 acres in size that is currently available. Furthermore, the site has the shortest distance of the alternatives considered to electric power and natural gas pipeline systems. As described in section 2.1.1.1, KMLP's existing 42-inch-diameter pipeline is located along the southern boundary of the LNG terminal site; approximately 40 feet of interconnect pipeline would facilitate the transportation of natural gas required by the Magnolia LNG Project.

Westlake Site

The Westlake site is located in the Port of Lake Charles on a 100-acre parcel that was previously occupied by the Lyondell Chemical plant. The brownfield site is bordered to the north, west, and east by commercial and industrial development and to the south by undeveloped land and the Calcasieu River.

The Westlake site is on a waterway adjacent to the Calcasieu River and is of sufficient size to allow development of an LNG terminal. The Westlake site is about 0.4 mile from the nearest residence and has about 9,759 residences within 3 miles. In contrast, there are 1,265 residences within 3 miles of the proposed site. In addition, the Westlake site has more NWI-mapped wetlands (2 acres) than the proposed site (1 acre). The closest natural gas pipeline system to the Westlake site is the Tennessee Gas Pipeline located 7.8 miles north of the site. Construction of the additional length of pipeline would increase the amount of land disturbance and would be extremely challenging given the dense development surrounding the Westlake site. For these reasons, we do not consider the Westlake site preferable to the proposed site.

Corpus Christi Site

The Corpus Christi site is located adjacent to the Corpus Christi Ship Canal in Corpus Christi, Texas on the former 450-acre Naval Station Ingleside site. The naval base was built in 1988, and was decommissioned and returned to the ownership of the Port of Corpus Christi in 2010. The site, which is considered a mixture of brownfield and greenfield, is bordered to the north and west by undeveloped land, to the east by commercial and industrial development, and to the south by Corpus Christi Bay.

The Corpus Christi site meets the screening criteria for waterfront access and size. However, the site is about 0.3 mile from the nearest residence and contains 16 acres of wetlands. In addition, of the alternatives considered, the Corpus Christi site is the greatest distance from electrical power, a suitable natural gas pipeline system, and interstate highway. Magnolia indicated that the Corpus Christi site was sold in November 2012 and, therefore, is no longer available for long-term lease or purchase. For these reasons, we do not consider the Corpus Christi site preferable to the proposed site.

Morgan's Point Site

The Morgan's Point site is located adjacent to Galveston Bay and the Bayport Ship Channel in Morgan's Point, Texas on a 200-acre brownfield site. The site is bordered to the north by the Bayport Ship Channel, to the east by the Bayport Cruise Terminal and Galveston Bay, to the west by industrial and commercial development, and to the south by residential development.

The Morgan's Point site meets the screening criteria for waterfront access, size, and existing land use; however, the site would require constructing an additional 2.5 miles of natural gas pipeline and 1.9 miles of electric transmission line. The site is also over 14 miles from the nearest interstate highway system and contains 23 acres of wetlands. The biggest disadvantage of the Morgan's Point site is that it is located 0.1 mile north of an existing residential community. Therefore, we do not consider the Morgan's Point site preferable to the proposed site.

Industrial Canal – North Site

The Industrial Canal – North site is located in the Port of Lake Charles, Louisiana on a 90-acre greenfield site owned by the Port of Lake Charles. The site is primarily forested and is bordered to the north, west, and south by undeveloped land and to the east by commercial and industrial development.

The Industrial Canal – North site is similar to the proposed site with respect to parcel availability, interstate access, and location relative to electrical power and a natural gas pipeline system. The primary differences between the sites are that the Industrial Canal – North site does not meet the minimum acreage requirement needed for LNG terminal site development and it is not located adjacent to a deep-draft shipping channel. Development of the site would require modifying the facility layout to fit within the 90-acre site and would require obtaining an easement across the adjacent undeveloped property to the south to access the Industrial Canal. In addition, dredging would be required adjacent to the Industrial Canal to create a recessed berthing area to safely moor LNG vessels. The Industrial Canal – North site is also a greenfield site, which is likely to have increased environmental impacts over the brownfield sites under consideration, including 10 acres of NWI-mapped wetlands. For these reasons, we do not consider the Industrial Canal – North site preferable to the proposed site.

Conclusion

We conclude that the proposed site represents an acceptable site for the proposed LNG terminal. The proposed site is currently zoned for heavy industrial use, sufficiently sized to allow optimal facility layout design, and avoids the need for off-site LNG piping. It is also geographically well separated from area residences, the closest of which are more than 0.6 mile distant. The proposed site contains the lowest acreage of NWI-mapped wetlands of the alternatives considered; therefore, the loss of habitat diversity and function resulting from facility development would be generally less than that anticipated at the other sites. From a visual impact perspective, the new LNG terminal would be consistent with the existing industrial development along the Industrial Canal.

3.3.2 Compressor and Meter Station Site Alternatives

KMLP indicated that siting Compressor Station 760 adjacent to the Pine Prairie Meter Station would reduce the construction and operational footprint, provide the most flexibility to shippers, and minimize costs. Other compressor station locations and configurations evaluated required constructing two to four compressor stations at the various receipt points, which would require an additional 44,800 to 108,800 hp of compression, respectively. An analysis of the compressor station and meter station site alternatives is provided below.

Compressor Station 760

We evaluated two alternative sites for the compressor station in Acadia Parish, Louisiana (see figure 3.3.2-1). KMLP indicated that the location of the proposed site offers engineering and hydraulic benefits and would limit the amount of new facilities required to meet the stated purpose of the project. As a result, we limited our review of alternatives to sites located in close proximity to the proposed site. Each site was evaluated to determine if it would be feasible and environmentally prefereable to the proposed site. All three sites are located on agricultural land, which is enitrely designated as prime farmland by the NRCS; no NWI-mapped wetlands are present within any of the sites. Other environmental features associated with the Fournerat Road site, Refinery Road site, and proposed site are compared in table 3.3.2-1. A description and brief environmental analysis of each site compared to the proposed site is presented below.

Figure 3.3.2-1 Alternative Sites for Compressor Station 760

TABLE 3.3.2-1

Comparison of Alternative Sites for the Compressor Station

Environmental Factor	Fournerat Road	Refinery Road	Proposed Site
Size (acres)	75	65	75
Land use	Agriculture	Agriculture	Agriculture
Number of pipelines	10	11	7
Number of residences within 1,200 feet	12	3	7
Number of waterbodies	0	1	1

Proposed Site

The proposed site is within agricultural land and contains one residence on the southwestern corner of the property. The site is bordered to the west by Refinery Road, one residence, and a Texas Gas Compressor Station; to the north by a residence, the Pine Prairie Meter Station, and agricultural land; to the east by one residence and agricultural land; and to the south by Coulee Road, three residences, and agricultural land.

KMLP has indicated that this site is the preferred location for the compressor station due to having the lowest number of natural gas and crude oil pipelines (7) located within or crossing the site. Seven residences are within 1,200 feet of the proposed site, six of which are on the western side of the site. However, KMLP has proposed to place the compressor station within the eastern half of the parcel to increase the distance between the compressor station and the nearest residence. We conclude that the Coulee Road site is an acceptable location for Compressor Station 760 and find no environmental reason to recommend one of the alternate sites over the proposed site.

Fournerat Road Site

The Fournerat Road site is located on agricultural land and is bordered to the north by Fournerat Road, a TransCanada Compressor Station, and ANR Meter Station; to the east by Valse Drive and residential development; to the south by agricultural land; and to the west by agricultural land and two residences.

Of the three sites considered, the Fournerat Road location has the highest number of residences (12) within 1,200 feet of the site. In addition, this site has developmental contraints associated with the presence of 10 natural gas and oil pipelines that cross the property, including KMLP. For these reasons, the Fournerat Road site was eliminated from further consideration.

Refinery Road Site

The Refinery Road site is located on agricultural land and is bordered to the west by Refinery Road and the Basile Gas Processing Plant; to the north by two residences and agricultural land; to the east by agricultural land; and to the south by a residence, the Pine Prairie Meter Station, and agricultural land.

Of the three sites considered, the Refinery Road location has the highest number of natural gas and crude oil pipelines (11) within or crossing the site, which would preclude development of a compressor station at this location. Because of this, the Refinery Road site was eliminated from further consideration.

Meter Stations

KMLP is proposing to modify five existing meter stations in Evangeline and Acadia Parishes, Louisiana to allow bi-directional flow, and to construct and operate a new meter station within the LNG terminal site. The proposed meter station modifications would occur adjacent to existing facilities, which would minimize the footprint and associated environmental impacts. The new meter station would be constructed within the LNG terminal site in a location designed to minimize the length of interconnect pipeline. No other locations within the LNG terminal site would offer any environmental benefit. We did not identify any environmental concerns that require the need to identify and evaluate alternative meter station sites or configurations, nor were any alternatives suggested during the public scoping period.

3.3.3 Header Pipeline Route Alternatives

The Lake Charles Expansion Project would include two new header pipelines: a 1.2-mile-long, 36-inch-diameter low pressure header pipeline and a 700-foot-long, 24-inch-diameter high pressure header pipeline. Because the header pipelines would be wholly collocated with KMLP's existing 42-inch-diameter mainline, we did not identify any environmental concerns that require the need to identify and evaluate route alternatives, nor were any route alternatives suggested during the public scoping period.

3.3.4 Dredge Material Placement Alternatives

Magnolia evaluated three alternative sites for dredge material placement in addition to the proposed site (see figure 3.3.4-1). Two of the alternate sites considered (as well as the proposed site) are upland placement sites; the other is a beneficial use site, which is the use of dredged sediments as resource materials in productive ways that provide environmental, economic, or social benefit. A description and comparison of each of the sites is provided below.

3.3.4.1 Proposed Site

The proposed dredge material placement area would be located on approximately 142 acres of land owned by Prairie Land Company and is currently leased to CB&I for staging and laydown. The proposed site is located approximately 8,000 feet east of the proposed LNG terminal site across Big Lake Road, is zoned for heavy industrial use, and is outside of the 2012 Louisiana Coastal Zone.

Between 2010 and 2013, CB&I excavated a 35-acre borrow pit at the north end of the site to provide material for a recent construction project. As described in section 2.5.1.4, dredge material would be transported to the site by pipeline. To retain dredge material during deposition, approximately 10,000 linear feet of 5- to 10-foot earthen dikes would be constructed along the perimeter of the settlement basin, which would be created from material on site. The potential capacity of the borrow pit, once dewatered, is between 300,000 and 350,000 yd^3. Magnolia estimates that deposition of dredge materials would raise the elevation of the placement area by between 2.5 and 3.2 feet once material has settled and confinement dikes are leveled on the site. Based on our review, the proposed site is an acceptable location for dredge material placement and we find no environmental reason to recommend one of the alternate sites over the proposed site.

3.3.4.2 Confined Disposal Facility 13

An upland confined disposal facility (CDF) is an engineered structure built for the containment of dredged material. CDFs are bounded by confinement dikes or structures, thereby isolating the dredged material from its surrounding environment. CDF 13 occupies over 500 acres of land on Choupique Island, which is located approximately 4,000 feet southwest of the proposed LNG terminal. CDF 13 is zoned for heavy industrial use and is within the 2012 Louisiana Coastal Zone.

Pine Island Oil Company owns CDF 13, a 460-acre portion of which was considered for the placement of dredge material removed from the recessed berthing area (identified in yellow as the PI CDF on figure 3.3.4-1). Dredge material would be placed onto CDF 13 either hydraulically or mechanically, where it would be allowed to drain, dry, and consolidate. To retain dredge material during deposition, approximately 22,000 linear feet of 5- to 10-foot earthen dikes would be constructed along the perimeter of the 460-acre workspace, which would be created from material on site. Portions of existing CDF 13 berms may be used, if the berm elevation would effectively contain dredge material during placement and settling. Magnolia estimates that deposition of dredge materials would raise the elevation within the placement area by between 1.0 and 1.2 feet once material has settled and confinement dikes are leveled on the site.

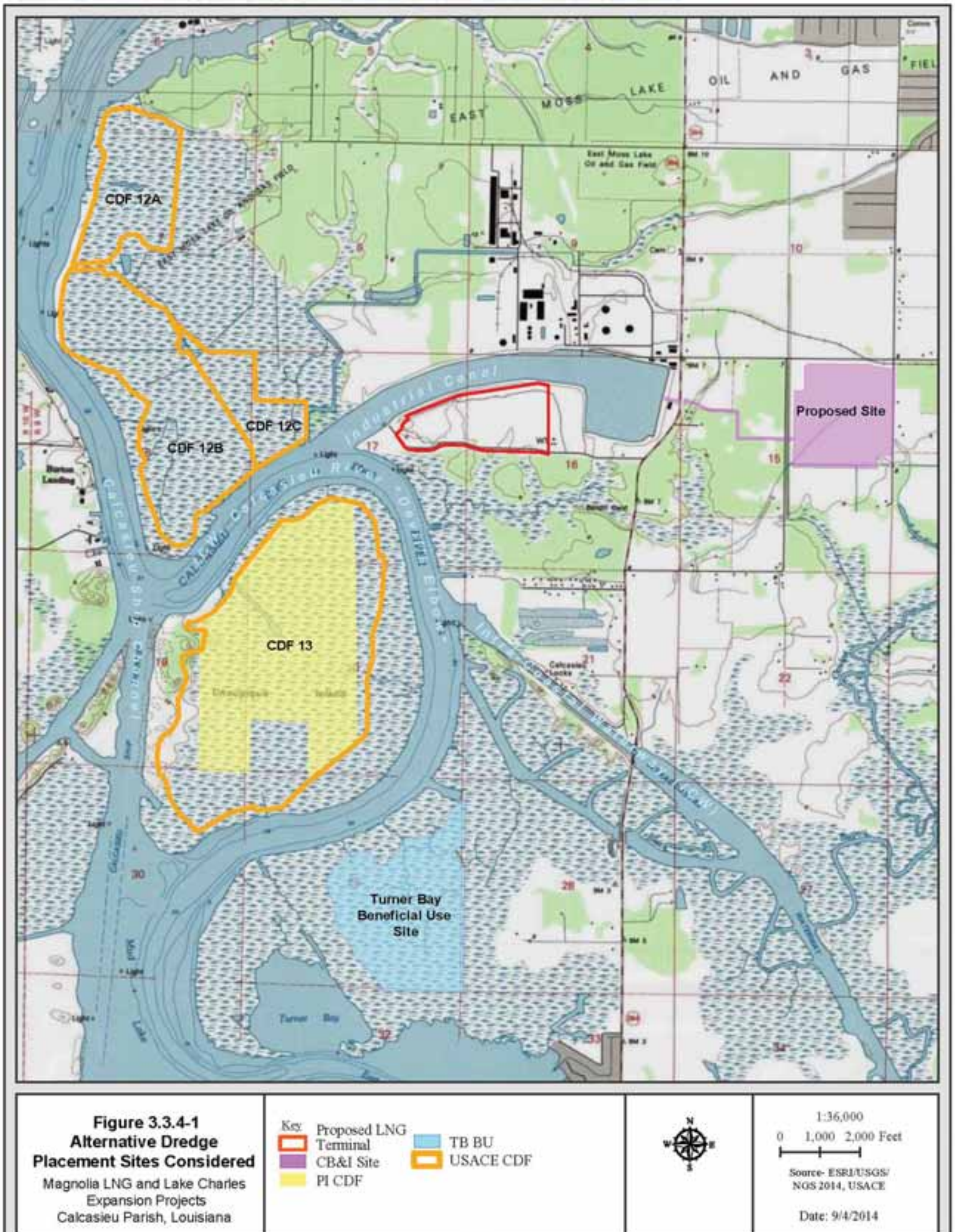


Figure 3.3.4-1
Alternative Dredge Placement Sites Considered
Magnolia LNG and Lake Charles Expansion Projects
Calcasieu Parish, Louisiana

CDF 13 is managed by the COE, New Orleans District in coordination with the Port of Lake Charles. Due to ongoing dredging within the Calcasieu Ship Channel and Industrial Canal, Magnolia indicated that the COE and Port of Lake Charles would require Magnolia to raise the existing dikes at CDF 13 by 10 feet and provide replacement dredge material disposal capacity if CDF 13 is selected for dredge material placement. In addition, because the site is located within the 2012 Louisiana Coastal Zone, Magnolia would be required to obtain a Special Coastal Use Permit from the LDNR if CDF 13 is selected. For these reasons, Magnolia determined that CDF 13 was not the preferred location for dredge material placement during construction of the LNG terminal. However, Magnolia has stated that it would continue to coordinate with Pine Island Oil Company, the COE, and the Port of Lake Charles to determine if CDF 13 may be used for maintenance dredging of the recessed berthing area.

3.3.4.3 Confined Disposal Facilities 12A, 12B, and 12C

CDFs 12A, 12B and 12C are existing CDFs created and managed by the COE, New Orleans District in coordination with the Port of Lake Charles for disposal of the dredged material from maintenance of navigable waterways (primarily the Calcasieu Ship Channel and Industrial Canal). CDFs 12A, 12B, and 12C are adjacent to the northern shore of the Industrial Canal and the eastern shore of the Calcasieu River. In relation to the proposed LNG terminal, CDF 12A is approximately 8,500 feet to the northwest, 12B is located approximately 6,500 feet to the west, and 12C is approximately 4,400 feet to the west. All three CDFs are zoned for heavy industrial use and are outside of the 2012 Louisiana Coastal Zone.

Magnolia has stated that, if utilization of one or more of these CDFs is selected, it would be required to raise the existing containment dikes at CDFs 12A and 12B by an additional 8 feet and to provide replacement dredge material disposal capacity. For these reasons, Magnolia determined that CDFs 12A, 12B, and 12C were not the preferred location for dredge material placement during construction of the LNG terminal.

3.3.4.4 Turner Bay Beneficial Use Site

The Turner Bay beneficial use site is located on over 300 acres of land between the Calcasieu River and Calcasieu Lake, approximately 2 miles south of the proposed LNG terminal site. The site, which is within the 2012 Coastal Zone, is zoned for agricultural use.

Magnolia considered a 260-acre portion of the Turner Bay beneficial use site for the placement of dredge material removed from the recessed berthing area (identified in blue on figure 3.3.4-1). This area is currently shallow, open water with an average depth of 18 to 24 inches. No submerged aquatic vegetation is present over the entire site. Magnolia considered the following options for dredge material placement within the site:

- conversion of the existing shallow, open water area to emergent wetland habitat, thus enhancing fish and wildlife nourishment as well as supplying additional storm buffering capacity to the area;

- creation of shallow retainment structures to prevent erosion; and

- creation of shallow rises within the site to function as nesting areas for mottled ducks (*Anas fulvigula*) and similar species that nest within formations of mature woodlands that occupy isolated elevated areas within otherwise flat marshes adjacent to open water habitat (known as chenieres).

To retain dredge material during deposition, approximately 15,500 feet of 5-foot earthen dikes would be constructed along the perimeter of the 260-acre workspace from material obtained from the interior of the settling basin to form a substrate for the emergent wetland. Also, four 36-inch weir board structures would be installed, which would help control water exchange during construction. Magnolia estimates that deposition of dredge materials would raise the elevation within the placement area by between 1.8 and 2.1 feet once material has settled and would provide sufficient material to create protection structures and nesting habitats in addition to emergent wetland creation.

Selection of the Turner Bay beneficial use site would involve coordination under the Coastal Wetlands Planning, Protection and Restoration Act Program and the Louisiana Coastal Protection and Restoration Authority. Magnolia would coordinate with staff from the COE, New Orleans District; EPA, Water Quality Protection Division; FWS, Louisiana Ecological Services Field Office; USDA, NRCS; and NOAA Fisheries, Restoration Center in the development of final plans for the site. In addition, Magnolia would be required to modify its section 404/10 permit application, which is currently under review by the COE, New Orleans District, obtain a multi-sector general discharge permit from the LDEQ, and could be required to obtain a Special Coastal Use Permit from the LDNR. Based on our review, the Turner Bay site is an acceptable location for dredge material placement. However, the site does not present significant environmental advantages over the proposed site due to the larger area of disturbance and greater wetland impacts. Therefore, we find no environmental reason to recommend the Turner Bay site over the proposed site.

3.4 PROCESS ALTERNATIVES

There are currently several liquefaction technologies available for project proponents to choose from, including the following:

- Optimized Cascade® Process – ConocoPhillips
- PRICO® – Black & Veatch
- C3-MR Process – Air Products
- AP-X™ Process – Air Products
- DMR Process – Shell
- Parallel Mixed Refrigerant Process – Shell
- Nitrogen Expansion – Hamworthy
- OSMR® – LNG Technology

The Optimized Cascade® Process was originally developed by ConocoPhillips in the 1960s but has been improved upon based on more than 40 years' operating experience with the Kenai LNG Plant. Propane, ethelyne, and methane refrigerants are utilized within a series of heat exchangers to cool the pretreated natural gas (ConocoPhillips, 2014a, 2014b). This process is commonly used in large-scale LNG facilities.

The PRICO® Process is a single mixed refrigerant process that was developed by Black & Veatch in the early 1970's and uses a mixed component refrigerant and coil wound heat exchanger (Roberts et al., 2002). This process is commonly used in small-scale LNG facilities.

The C_3-MR Process was developed by Air Products to improve upon the single mixed refrigerant process by adding a simple propane refrigeration loop for pre-cooling (Black & Veatch, 2015; Roberts et al., 2002). The C_3-MR Process is currently the industry standard. The AP-X™ Process was developed to improve the C_3-MR Process by utilizing a simple nitrogen expander loop instead of a mixed refrigerant for precooling (Roberts et al., 2002). Both processes are utilized in large-scale LNG facilities.

The DMR Process was developed by Shell and uses dual mixed refrigerant cycles: an ethane and propane mixed coolant and nitrogen-methane, ethane, and propane mixed coolant. The DMR Process has more flexibility than the C_3-MR Process, and overcomes the inherent limitations of using a single component refrigerant in precooling as in the C_3-MR design (Bosma and Nagelvoort, 2009). The Parallel Mixed Refrigerant Process was developed by Shell to meet the current challenge of the industry for larger train sizes. The Parallel Mixed Refrigerant Process achieves high liquefaction efficiency through the use of a single pre-cooling cycle and two very efficient mixed refrigerant cycles. The process can either use propane or a mixed refrigerant in precooling (Bosma and Nagelvoort, 2009). With the Parallel Mixed Refrigerant Process, gas flows through two simultaneous, parallel cooling cycles that can boost the maximum capacity of a single processing unit up to 11 MTPA depending on the gas turbine drivers (Bradley et al., 2009). The Nitrogen Expansion Process is simple and often used for small- and mid-scale LNG facilities. However, the process is less efficient than the mixed refrigerant processes. As a result, access to inexpensive natural gas is required to make this process economically viable.

The proposed OSMR® Process is based on the single mixed refrigerant process, but uses aero-derivative gas turbines, combined heat and power technology, and ammonia auxiliary refrigeration to increase efficiency and reduce air emissions by approximately 30 percent. The use of anhydrous ammonia includes safety hazards due to its toxicity and farther dispersion distances to irreversible effects. However, the hazards associated with anhydrous ammonia are well understood, can be mitigated to safe levels with additional mitigation measures, and would be subject to the regulation of a number of federal agencies. Therefore, while there would be viable liquefaction processes that provide inherently safer alternatives, there would not be a significant environmental or safety advantage in the selection of those liquefaction processes when considering the additional mitigation measures proposed in section 4.12.5.

3.5 POWER SOURCE ALTERNATIVES

3.5.1 LNG Terminal Alternatives

Entergy operates an existing substation and 230-kV transmission line that are located approximately 1.3 miles from the proposed LNG terminal site. During preliminary project design, Magnolia indicated that it considered two power source alternatives, including obtaining all electrical power from Entergy and not obtaining any electrical power from Entergy. These two alternatives are described and compared to the proposed power sources below.

Proposed Power Sources

Magnolia proposes to obtain a portion of the power required for operation of the LNG terminal from Entergy and to generate the remaining power requirement from gas turbines. The total power requirement for each liquefaction train is 72.5 MW, of which 6.5 MW would be electric power provided by Entergy. The remaining 66 MW would be generated by two 33 MW gas turbines. The terminal would require an additional 5 MW of electric power during loading of LNG carriers, therefore, the maximum load provided by electrical power would be 31 MW (6.5 MW for each of the four liquefaction trains and an additional 5 MW during LNG carrier loading).

By using a combination of power sources, the single mixed refrigerant liquefaction process would be enhanced by the use of aero-derivative gas turbines, combined heat and power technology, and ammonia auxiliary refrigeration to increase efficiency by 30 percent and thereby decrease air emissions by 30 percent; the integration of these technologies to enhance the single mixed refrigerant process is referred to as Magnolia's OSMR® process.

All Electrical Power from Entergy

The option of using all electrical power from Entergy would result in the LNG terminal replacing the proposed gas-fired turbines for liquefaction with electric motors. By using electric motors, there would be no recoverable waste heat, as would be generated through the use of gas-fired turbines. Magnolia proposes to use the recoverable waste heat to drive the ammonia compressors within each liquefaction train, which is required as part of its OSMR® liquefaction process (see additional discussion in section 2.1.1.2). Magnolia has indicated that its OSMR® liquefaction process would result in a 30 percent increase in efficiency and corresponding 30 percent reduction in air emissions over the traditional single mixed refrigerant liquefaction process. Therefore, the use of electric motors for the liquefaction trains was ruled out in the design of the Magnolia LNG Project.

No Electrical Power from Entergy

The option of not using electrical power from Entergy would require that all electrical power requirements for the LNG terminal be produced from within the terminal. To achieve this self-sustaining option, some of the recoverable waste heat (high-pressure steam) produced by the gas-fired turbines would be used to power a steam turbine generator within each liquefaction train. This steam turbine generator would then meet all electrical requirements within the liquefaction train and also around the site.

Magnolia has indicated that essentially all of the waste heat from the gas turbines would be needed to achieve a liquefaction capacity of 2.0 MTPA per liquefaction train. By using the recoverable waste heat to power a steam turbine generator to provide electric requirements, it would not be available to drive the ammonia compressors in the ammonia auxiliary refrigeration plant. As with the alternative of obtaining all electrical power from Entergy, this alternative would preclude the use of Magnolia's OSMR® liquefaction process. Therefore, on-site electrical power generation was ruled out in the design of the Magnolia LNG Project.

3.5.2 Compressor Station 760

Prior to selecting gas-fired, turbine-driven (i.e., jet engine) compressors at Compressor Station 760, KMLP evaluated reciprocating gas-driven (i.e., piston engine) and electric motor-driven compressors. In addition, KMLP evaluated waste heat electric generation (cogeneration) as a power source for Compressor Station 760. An evaluation of these alternatives is provided below.

When comparing reciprocating gas-driven compressor units, it was determined that the horsepower limitations of reciprocating gas-driven compressor units would result in a larger number of units being required to provide the same amount of power as the proposed gas-fired, turbine-driven compressor units. For example, if reciprocating gas-driven compressor units were selected, seven compressor units would be required instead of the four proposed gas-fired, turbine-driven compressor units. Additional compressor units would add both to the cost of the compressor station and its footprint. KMLP also indicated that down time during repair of reciprocating gas-driven compressor units would be longer than that of gas-fired, turbine-driven compressor units. Because the use of reciprocating gas-driven compression units would likely result in increased environmental impacts due to the larger facility footprint and increased emissions, we did not evaluate this option further.

Electric-driven motors were also considered for Compressor Station 760. However, KMLP indicated that there is an increased risk of long-term outages associated with an electric-driven system. Replacements for damaged electric motors, transformers, and drives can take months to obtain, whereas replacement for a gas-fired, turbine-driven compressor unit can be done relatively quickly because replacement turbines are typically stocked by KMLP's supplier. In addition, the installation of electric motor-driven compressor units would require 48 MW of installed electric capacity. In order to provide this level of service, two new 138 kV cross-country transmission lines and a new electrical substation located at Compressor Station 760 would be required, which would affect more land during construction and operation. For these reasons, electric-driven motors were not evaluated further.

KMLP also considered waste heat electric generation (cogeneration) as a power source for Compressor Station 760. KMLP has stated that Compressor Station 760 would likely not operate when the LNG terminal is not producing LNG, which could greatly reduce the economic feasibility of cogeneration. Furthermore, the construction and operation of a cogeneration facility would require the installation of additional equipment, a new 138 kV or 230 kV electric distribution line, and a new substation at the compressor station site. Due to the increased land disturbance and the intermittent operation of the compressor station, we did not evaluate cogeneration further.

4.0 ENVIRONMENTAL ANALYSIS

The environmental consequences of constructing and operating the proposed projects would vary in duration and significance. Four levels of impact duration were considered: temporary, short term, long term, and permanent. Temporary impacts generally occur during construction with the resource returning to pre-construction condition almost immediately afterward. Short-term impacts could continue for up to 3 years following construction. Impacts were considered long term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of any activity that modified a resource to the extent that it would not return to pre-construction conditions during the 30-year life of the projects, such as the construction of an aboveground facility. We considered an impact to be significant if it would result in a substantial adverse change in the physical environment.

In this section, we discuss the affected environment, general construction and operational impact, and proposed mitigation for each resource. Magnolia and KMLP, as part of their proposals, agreed to implement certain measures to reduce impacts. We evaluated the proposed mitigation measures to determine whether additional measures are necessary to reduce impacts. These additional measures appear as bulleted, boldfaced paragraphs in the text. We will recommend that these measures be included as specific conditions to any authorization that the Commission may issue.

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

- Magnolia and KMLP would comply with all laws and regulations;
- the proposed facilities would be constructed as described in section 2.0 of this document; and
- Magnolia and KMLP would implement the mitigation measures included in its applications and supplemental filings to FERC.

4.1 GEOLOGIC CONDITIONS, RESOURCES, HAZARDS, AND MITIGATION DESIGN MEASURES

4.1.1 Geologic Setting

The projects would be in the West Gulf section of the Coastal Plain physiographic province. The Coastal Plain lies along the Atlantic Seaboard and Gulf Coast, stretching 100 to 200 miles inland and 100 to 200 miles offshore to the edge of the Continental Shelf. It comprises an elevated sea bottom with low topographic relief and extensive marsh lands, dipping gently seaward from its highest elevations of about 500 feet. The surface materials of the region are mainly Quaternary-age unconsolidated sands and clays, with scattered salt domes and sulfur deposits (Hunt, 1967).

Geologic formations underlying the LNG terminal, which includes KMLP's Magnolia Meter Station and interconnect pipeline, consist mainly of unconsolidated alluvial, coastal marsh, and terrace deposits that resulted from fluvial, tidal, littoral (beach or shoreline), and deltaic processes during the Pleistocene and Holocene epochs (Louisiana Geological Survey, 2002a; Stoeser et al., 2005). Elevations in the vicinity of the LNG terminal site typically range from 0 to 20 feet above mean sea level. However, the terminal site would be built upon dredge spoils deposited during construction and maintenance of the industrial canals in the area. The site is referred to by the COE as CDF-A, and was in operation from 1975 to 1984. The resulting elevations throughout the majority of the proposed terminal site range from 28 to 32 feet above NAVD 88 (see figure 4.1.1-1).

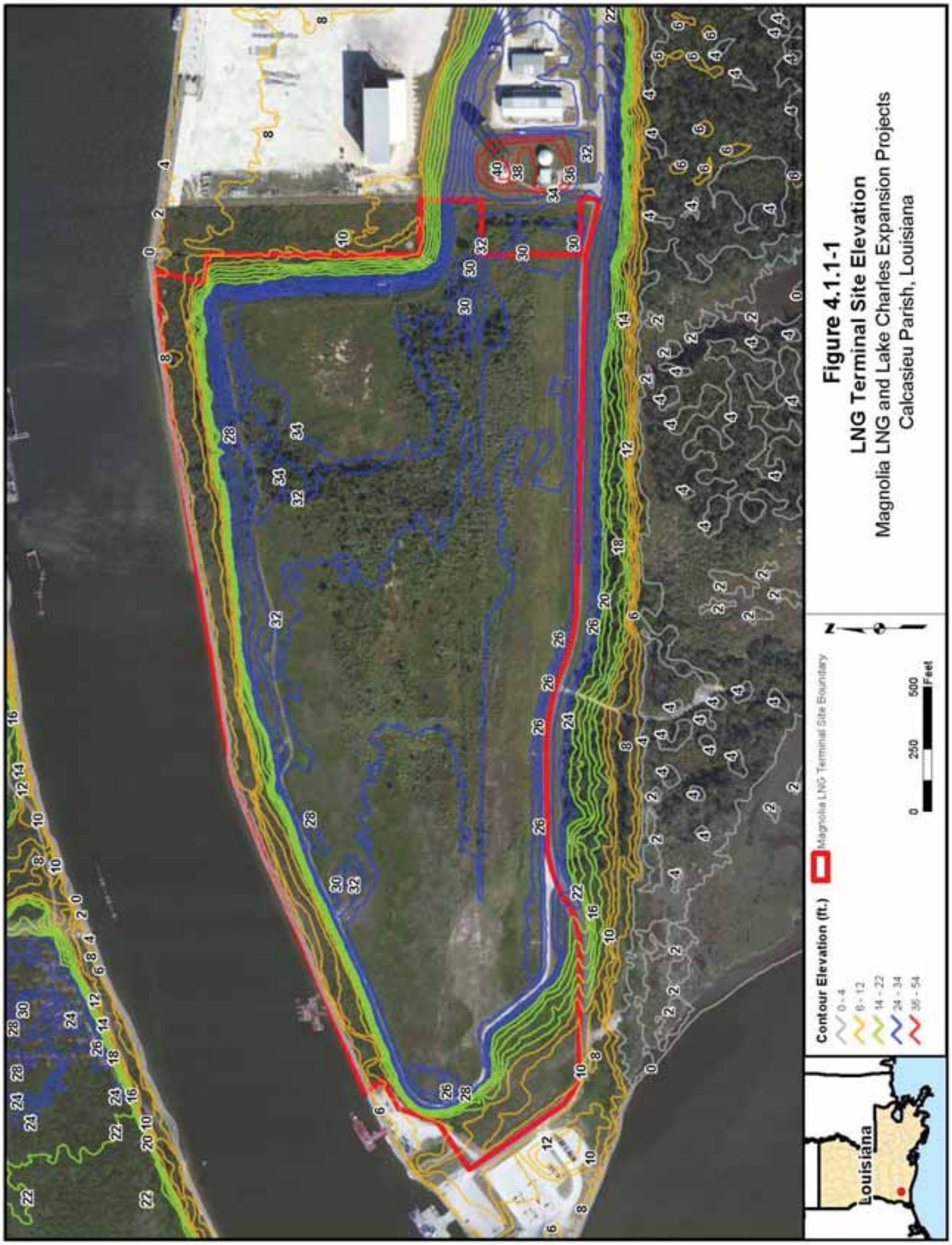


Figure 4.1.1-1
LNG Terminal Site Elevation
Magnolia LNG and Lake Charles Expansion Projects
Calcasieu Parish, Louisiana

Magnolia performed geotechnical studies to evaluate subsurface soil and groundwater conditions within the site, including:

- 14 geotechnical borings ranging in depth from 50 to 300 feet;
- 14 cone penetration tests ranging in depth from 100 to 150 feet;
- three seismic cone penetration tests, each to a depth of 150 feet; and
- an analysis of boring logs from a previous geotechnical investigation performed at the site in 2006.

The investigations at the LNG terminal indicated that the materials within approximately 30 feet of the surface consist of the clay, silt, and sandy clay dredge materials deposited over 25 years ago; from approximately 30 to 200 feet below the surface, the materials are predominately clays with silty sand pockets (the southwest portion of the site featured a 14-foot-thick layer of loose sand); and the materials from approximately 200 to 300 feet below the surface consist of very dense sand (Fugro, 2014a, 2015).

The KMLP facilities in Acadia and Evangeline Parishes are underlain by Pleistocene-aged terrace deposits that consist of clay, sandy clay, silt, sand, and gravels deposited by alluvial processes (Louisiana Geological Survey, 2002b, 2003; Stoeser et al., 2005). Elevations range from approximately 35 feet at the TGT Meter Station, to approximately 60 feet at the CGT Meter Station. KMLP performed geotechnical investigations to evaluate subsurface soil and groundwater conditions at the proposed Compressor Station 760 site. This investigation indicated that materials consisted of medium stiff to stiff clays and clayey silt to a depth of 100 feet. Groundwater saturation occurred between 3 and 4 feet at the time of sampling (February 2015) (Terracon, 2015).

4.1.2 Mineral Resources

Nonfuel mineral resources proximate to the LNG terminal and KMLP facilities consist mainly of salt, construction sand, and gravel (USGS, 2009a, 2009b). Based on a review of the USGS topographical maps, recent aerial imagery, and available databases from the USGS, no active mining or nonfuel mineral resources are within 1 mile of the proposed facilities (USGS, 2013a; 2013b).

Oil and gas production is prevalent throughout Louisiana and the surrounding region. The LNG terminal would be proximate to various oil and gas fields, including the East Moss Lake oil and gas field, which underlies the LNG terminal (LDNR, 2014a). Active and producing wells drilled in the East Moss Lake oil and gas field have depths ranging from 9,160 to 11,160 feet. Based on a review of the LDNR's Strategic Online Natural Resources Information System (SONRIS), there are no active or plugged and abandoned oil, gas, or injection wells within 0.25 mile of the proposed LNG terminal (LDNR, 2014b). The closest active well identified is 0.7 mile northeast of the LNG terminal site across the Industrial Canal (LDNR, 2014b).

The KMLP facilities are located in close proximity to several oil and gas fields, including the Basile, Teptate, Richie, Fenris, Eunice, and East Point Blue fields (LDNR, 2014a). Thirty-one oil and gas wells were identified within 0.25 mile of the proposed header pipelines; Compressor Station 760; and/or the TETCO, Pine Prairie, and TGT Meter Stations (LDNR, 2014b). Twenty-seven wells are listed as abandoned, two wells are listed as active producers, and two wells are listed as shut-in for future use. One of the active wells is approximately 150 feet west of the TGT Meter Station and southern origin of the low pressure header pipeline. The other active well and two shut-in wells are between 600 and 1,200 feet east of the southern origin of the low pressure header pipeline and TGT Meter Station, and between 1,000 to 2,000 feet south of Compressor Station 760 (see figure 4.1.2-1).

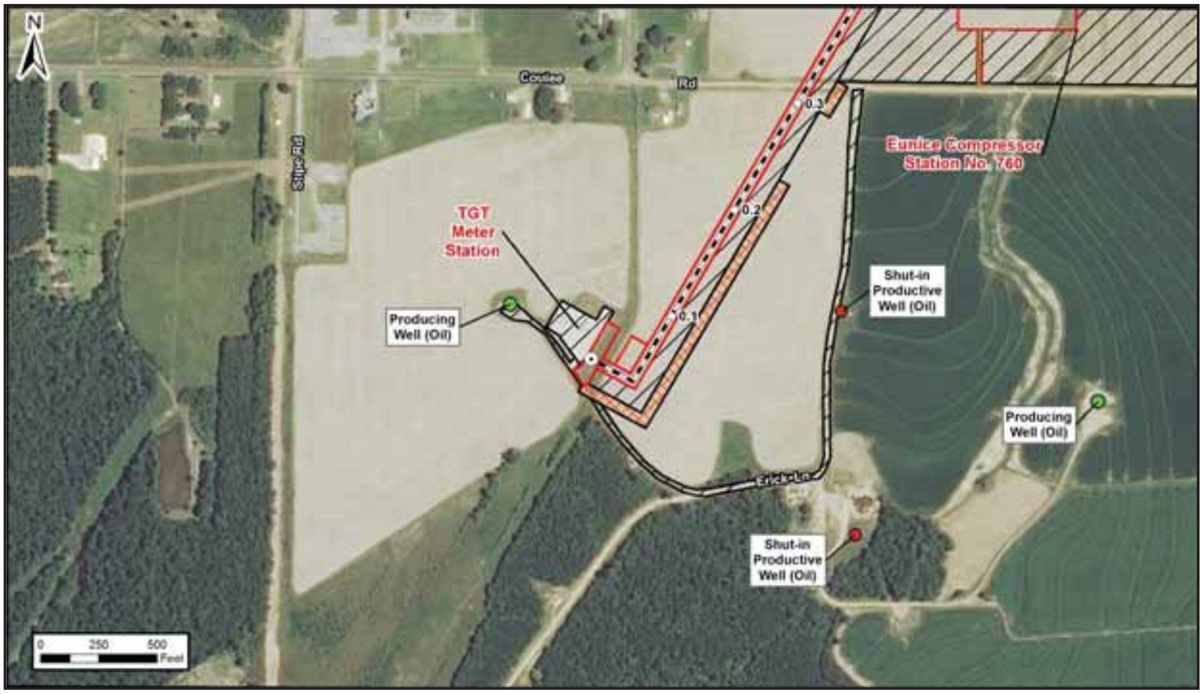


Figure 4.1.2-1 Active and Shut-in Oil and Gas Wells Within 0.25 Mile of the KMLP Facilities

4.1.3 Geologic Hazards

Geologic hazards are natural, physical conditions that can result in damage to land and structures or injury to people. Such hazards typically include seismicity (e.g., earthquakes, surface faults, tsunamis, and soil liquefaction), subsidence, flooding and storm damage, and shoreline erosion and landslides. Conditions necessary for the development of other geologic hazards, including avalanches, volcanism, and karst terrain are not present near the LNG terminal or KMLP facilities. In general, the potential for geologic hazards to markedly affect construction or operation of the proposed LNG terminal and KMLP facilities is low.

4.1.3.1 Seismicity

Earthquakes and Surface Faults

The majority of significant earthquakes around the world are associated with tectonic subduction zones, where one crustal plate is overriding another (e.g., the Japanese islands), where tectonic plates are sliding past each other (e.g., the San Andreas Fault in California), or where tectonic plates are converging (e.g., the Indian Sub-Continent). Relative to these highly active tectonic regions, Louisiana and the surrounding areas are seismically quiet.

A belt of hundreds of mostly seaward-facing faults, collectively known as the Gulf-margin normal faults, occur along the Gulf of Mexico. However, these faults exist in sediments and poorly lithified rocks; most of these materials are unable to support the extreme stresses required for the propagation of significant seismic events and ground motion (Crone and Wheeler, 2000). The closest known active fault runs southwest-northeast approximately 3 miles north of the proposed LNG terminal. A desktop fault analysis conducted by Magnolia concluded that the site is potentially at a higher than normal risk of being affected by a fault due to the proximity of this fault and a multitude of others (Fugro, 2014a, 2015). As a result, Magnolia conducted a Phase II Geologic Fault Study to assess the features identified and determine site vulnerability to surface faulting. Results of the Phase II study indicate there is no differential displacement at the LNG terminal and, therefore, surface faulting does not create a design concern for the LNG terminal (Tolunay-Wong Engineers, Inc., 2013).

Historically, there have only been sporadic, low-magnitude seismic events recorded within the Gulf-margin normal faults. Six damaging earthquakes have been reported through 2009, which were located in westernmost Florida (1780), southern Alabama (1993, 1997), southern Louisiana (1930), and eastern Texas (1891, 1932) (USGS, 2009c). The 1930 earthquake was the largest earthquake measured in Louisiana, with a magnitude of 4.2 on the Richter scale; its epicenter was about 60 miles west of New Orleans. The largest recorded earthquake in the vicinity of the projects occurred on October 16, 1983, 10 miles west of Lake Charles, Louisiana and was a magnitude of 3.8 on the Richter scale (Stevenson and McCulloh, 2001). An event such as this today would cause considerable damage to poorly built structures but only negligible damage to buildings of good design and construction. The most significant seismic source site is the New Madrid Seismic Zone, which is approximately 400 miles northeast of the LNG terminal in the vicinity of New Madrid, Missouri. In 1811 and 1812, the Seismic Zone experienced three very large earthquakes with magnitudes estimated to range between 7.2 and 7.6.

The shaking during an earthquake can be expressed in terms of the acceleration due to gravity. Based on USGS seismic hazard mapping, peak ground acceleration (PGA) for the LNG terminal and KMLP facilities, with 2 percent probability of exceedance in 50 years, is 4 to 5 percent of gravity (USGS, 2008). For reference, PGAs less than 9 percent of gravity would result in moderate to no perceived shaking and very light to no potential damage (USGS, 2006). Therefore, it is unlikely that the proposed facilities would be affected if a small earthquake were to take place. The USGS PGA values are for rock sites and the ground motions on soft soil sites, such as those found at the LNG terminal, can be amplified by a factor of 2 or more. The proposed facilities would be designed for earthquake ground motions and, therefore, it is unlikely they would be affected by the design earthquake(s).

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. Areas susceptible to liquefaction generally include sandy or silty soils along rivers, streams, lakes, and shorelines or in areas with shallow groundwater. The soil conditions necessary for liquefaction to occur are present at the LNG terminal and each of the KMLP facilities.

At the proposed LNG terminal, surficial and subsurface conditions include sandy silt and silty sand horizons of varying thickness to a depth of 30 feet. The water table was encountered between 4 and 12 feet below grade, allowing for the saturation of these non-cohesive subsurface materials (Fugro, 2014a, 2015). Liquefaction studies (Fugro, 2014a, 2015) performed across the site suggest that thin sandy layers (0.5 to 1.0 feet) encountered in the primarily clayey fill in the shallowest 10 to 20 feet could liquefy if submerged. However, these layers are generally thin and not continuous, and hence, soil liquefaction would be localized and discontinuous if it occurs. Conversely, cohesionless strata encountered at deeper depths are too dense to liquefy. Overall, liquefaction-induced settlements were estimated to range from negligible to a maximum of 2 inches across the site for 2-percent probability of exceedance in 50-year ground motion levels. The potential for liquefaction and associated loss of soil strength in the fill soils would be addressed in the foundation design by requiring all LNG facilities to be supported on pile foundations, which extend well beyond the liquefiable layers.

At the Compressor Station 760 site, results of the geotechnical investigation concluded that although soil saturation occurred between 3 and 4 feet below the surface, the soils present at the site (medium stiff to stiff fat/lean clays) are not susceptible to liquefaction (Terracon, 2015).

Soil conditions necessary for liquefaction to occur (i.e., sandy or silty textures and a shallow water table) may be present at the remaining KMLP facilities; however, the potential for soil liquefaction to occur is very low due to the low seismic ground motion potential at these facility locations.

4.1.3.2 Subsidence

Common causes of ground subsidence include the presence of karst terrain, underground mining, and substantial groundwater or fluid withdrawal. Underground mining poses risks to engineered structures due to the potential for the overlying strata to collapse into the voids formed by the extraction of minerals. Based on a review of available information, there are no underground mining activities or potential to encounter karst terrain near the LNG terminal or KMLP facilities (USGS, 2013a, 2013b; Epstein et al., 2002). Therefore, subsidence associated with these causes is not anticipated.

Subsidence could occur near the LNG terminal and KMLP facilities due to oil and gas extraction. As discussed above, these facilities would be within active oil and gas fields. In addition, the LNG terminal would be proximate to several active water supply wells and the TRANSCO Meter Station would be approximately 150 feet from a domestic supply well, as discussed in section 4.3.1.2.

Magnolia's storm surge analysis (Moffatt and Nichol, 2013) estimated that regional subsidence proximate to the LNG terminal will be 0.18 inch per year. This subsidence combined with an estimated sea level rise of 0.12 inch per year would equate to a loss in elevation of approximately 9 inches over the 30-year life of the LNG terminal. Subsidence rates in the vicinity of the KMLP facilities are between 0.0 and 0.1 millimeter per year, which would equate to a loss in elevation of 0.1 inch over the 30-year life of the facilities (Kent, 2012).

4.1.3.3 Flooding and Storm Damage

The Federal Emergency Management Agency (FEMA) produces flood insurance rate maps for municipalities across the nation. The maps are divided into zones with assigned probabilities of experiencing a flood event during any 1-year period. The 100-year flood represents a river channel water level that, based on an analysis of the historic record, is likely to be equaled or exceeded every 100 years, meaning that there is a 1 percent chance that the water level will be equaled or exceeded in any individual year during a flood event. The lowest mapped probability of flooding is 0.2 percent, which would have an average flooding recurrence interval of 500 years.

We evaluated the potential for flooding at the LNG terminal using FEMA's Map Service Center, the associated flood insurance rate maps, and the National Flood Hazard Layer. The majority of the site is within Zone X-Unshaded, meaning the area is outside of the 500-year floodplain (FEMA, 2014). A small area along the shoreline and eastern boundary of the site is within areas mapped as Zone AE (100-year floodplain) and Zone X-Shaded. The Zone X-Shaded designation represents areas that are within the 100- and/or 500-year floodplain, but would have an average inundation of 1 foot for less (FEMA, 2014).

The LNG terminal would be subject to periodic hurricanes. Hazards associated with hurricanes include storm surges, heavy rainfall, inland flooding, high winds, tornadoes, and rip currents. Hurricane intensity is measured on the Saffir-Simpson Scale and ranges from a Category 1 storm with winds from 74 to 95 miles per hour (mph) that produce some damage, to a Category 5 storm with winds greater than

157 mph that produce catastrophic damage (National Weather Service, 2014a). Based on historical data, the site has a greater than 85 percent exceedance probability of experiencing a hurricane, and about a 60 percent exceedance probability of experiencing a major hurricane (Category 3 or above) within 50 nautical miles during the LNG terminal's 30-year design life (Moffatt and Nichol, 2013). Taking expected wave action, subsidence, and sea level rise over the next 30 years into consideration, water levels around the LNG terminal are anticipated to reach between 12 and 17 feet for 100- and 500-year storms. A 500-year return period storm surge level has an annual probability of 0.2 percent of being exceeded (Moffatt and Nichol, 2013). The elevations of the top of foundations for the LNG terminal would range from 18 to 28 feet NAVD 88, and would be above the 500-year storm surge levels. In addition, rock armoring would be installed along the slope at the water's edge. Therefore, the LNG terminal facilities should be able to withstand storm surges without damage from at least a Category 3 storm.

Magnolia conducted a tsunami hazard evaluation to assess the potential for a tsunami or seiche (i.e., a condition in which a body of water is caused to rock, causing wave action) to impact the LNG terminal. Because the LNG terminal would be 22.4 miles north of the Gulf of Mexico shoreline and given the low probability of strong seismic events in the Gulf, the report concluded that the potential for a seismically generated tsunami or seiche hazard to impact the LNG terminal is unlikely to be significant (Fugro, 2014b). We concur with this determination. Tsunamis could also be generated by offshore landslides in the Gulf; however, the maximum estimated run-up values are substantially less than those from storm surge and, therefore, the tsunami hazard is inherently considered because the facility is designed for storm surge.

As discussed above, the KMLP facilities in Acadia and Evangeline Parishes are 50 to 70 miles inland of the LNG terminal at elevations ranging from 35 to 60 feet above sea level. The closest perennial streams are Bayou Barwick and Bayou des Cannes. Based on a review of FEMA flood insurance rate maps, none of the KMLP facilities are within the 100- or 500-year floodplains (FEMA, 2014).

4.1.3.4 Shoreline Erosion and Landslides

The LNG terminal would be on the Industrial Canal, which is a dead-end, low-energy channel off of the Calcasieu Ship Channel. Tidal fluctuations within the canal are low, and ship traffic and subsequent wave action are anticipated to have a negligible impact on shoreline erosion. However, some limited portions of the existing slopes along the Industrial Canal of the dredged fill containment dike have experienced localized landslides. Magnolia plans to re-grade and armor these slopes. Therefore, no landslide hazards are anticipated after construction is completed.

Due to the nearly level topography and distance from streams or rivers, the proposed KMLP facilities would not be subject to shoreline erosion or landslide hazards.

4.1.4 Blasting

Based on available soils and geologic maps, and the geotechnical investigations conducted by Magnolia and KMLP, we do not anticipate that any blasting would be required for construction of the LNG terminal or KMLP facilities. Should blasting be required, Magnolia and/or KMLP would submit a blasting plan to the Deputy Secretary of Public Safety Services in accordance with the Louisiana Administrative Code Title 55, Part I, Chapter 15 (LAC 55:I.15).

4.1.5 Paleontology

Outcrops of fossil-bearing sedimentary rocks are rare in Louisiana. The geologic materials of the state are generally young (Holocene to late-Pleistocene) and do not have a high potential to contain significant paleontological resources. Holocene and Pleistocene marine fossil fragments are sometimes found within sedimentary units deposited in these epochs, but these fragments have little scientific value. The LNG terminal and KMLP facilities would not impact any older underlying geologic formations or the fossils, if any, within them. The oldest rocks exposed within Louisiana occur as patchy Late Cretaceous outcrops along the edges of the Prothro and Rayburns salt domes in Bienvielle Parish (Frey and Kaiser, 1984). Located more than 150 miles north of the proposed projects, these fossiliferous strata contain marine organisms from about 70 to 82 million years ago. Therefore, construction and operation of the LNG terminal would not likely affect paleontological resources.

4.1.6 Design and Construction of the LNG Terminal

4.1.6.1 Site Grading

The LNG terminal site would be cleared, grubbed, and prepared using standard earthmoving and compaction equipment. Existing site grade elevations of the plateau region of dredged fill zone generally range between 25 and 32 feet above NAVD 88. The burning of brush, vegetation, and trees or burying of any these materials would not be permitted on site. Magnolia anticipates that site grading would be a balance of cut and fill of existing on-site soil materials. The final grade elevations would be 28 feet in the workshop area, 17 feet in the LNG storage tank area, and 24 feet in the process areas (all elevations represent elevation above NAVD 88). The LNG storage tank area would be surrounded by a containment dike with a crest elevation of 30 feet.

4.1.6.2 Foundations

Foundations used for the LNG terminal would range from shallow foundations for lightly loaded structures to deep pile foundations for the LNG storage tanks and the other LNG facilities and buildings. Deep foundations would either be driven precast concrete piles or open-ended steel piles. The selection of the type and length of the pile would depend on loads, pile type, and size, downdrag loads, and allowable settlement of the structure and would be determined during final design. At this preliminary stage of design, Magnolia proposes to use 24-inch square pre-stressed concrete piles that are 105 feet long to support the LNG storage tanks. For the remaining LNG facilities and buildings, Magnolia proposes to use 24-inch square pre-stressed concrete piles that range in length from 70 to 130 feet.

Because Compressor Station 760 would be a large, greenfield facility capable of producing over 103,000 hp and would be in an area underlain by clay or mud, KMLP conducted geotechnical investigations of the site on February 26, 2015. The results indicated that the site is underlain by medium-stiff to stiff clay and that shallow foundation systems would be acceptable. Seismic risk at the site is considered low and it is not considered susceptible to liquefaction.

4.1.6.3 Facility and Structure Design

The LNG terminal would be constructed to satisfy the design requirements of 49 CFR 193, NFPA 59A-2001, the 2009 International Building Code, and American Society of Civil Engineers (ASCE) 7-05. For seismic design, the facility would be designed to satisfy the requirements of NFPA 59A-2006 and ASCE 7-05.

Wind Design

LNG facilities as defined in 49 CFR 193 would be designed for a sustained wind speed of 150 mph, which is equivalent to a 3-second wind gust of 183 mph.

Seismic Design Ground Motions

Geotechnical investigations of the LNG terminal site determined that the site is classified as Site Class E (soft clay) in accordance with the International Building Code and standard ASCE 7-05 based on a site average shear wave velocity (Vs) that ranged between 157 and 171 meters per second (Fugro, 2014b). Sites with soil conditions of this type would experience significant amplifications of surface earthquake ground motions.

Fugro performed a site-specific seismic hazard study for the site. The study concluded that earthquake ground motions at the ground surface of the site that have a 2 percent probability of being exceeded in 50 years have a 0.2-second spectral acceleration value of 0.29 standard gravity (g), while the 1.0-second spectral acceleration at the site is 0.19 g (Fugro, 2014b). These predicted spectral accelerations are relatively low compared to other locations in the United States.

4.1.6.4 Submittal of Final Design Documents

The design of the facility is currently at the Front End Engineering Design (FEED) level of completion. Magnolia has proposed a feasible design and has committed to conducting additional detailed design work for the proposed LNG terminal if the project is authorized by the Commission. Information regarding the development of the final design, as detailed below, would need to be reviewed by FERC staff in order to ensure that the final design addresses the requirements identified in the FEED. Further, the timing of the production of this information should occur prior to the stage Magnolia has indicated in its application and subsequent filings. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Magnolia file with the Secretary the following information, stamped and sealed by the professional engineer-of-record:**

  a. site preparation drawings and specifications;

  b. LNG storage tank and foundation design drawings and calculations;

  c. LNG terminal structures and foundation design drawings and calculations;

  d. seismic specifications for procured equipment; and

  e. quality control procedures to be used for civil/structural design and construction.

  In addition, Magnolia should file, in its Implementation Plan, the schedule for producing this information.

4.1.7 General Impacts and Mitigation

LNG Terminal

Construction and operation of the LNG terminal would impact 114.0 acres of the 115.0-acre site. Magnolia would clear, grade, and fill 107.6 acres of the LNG terminal site to the extent necessary to install the proposed facilities on a level platform with sufficient space to safely execute the work. The remaining 6.4 acres would become part of the recessed berthing area through the use of a combination of onshore excavation and dredging. As a result, the LNG terminal would permanently alter the existing geologic conditions at the site. Final grade surfacing and landscape would consist of gravel, asphalt, concrete, topsoil, and grass surface areas. Magnolia would drive approximately 5,000 precast concrete piles to support key terminal components and structures (see section 2.5.1.3).

The LNG terminal would also require the excavation and dredging of approximately 131,200 yd^3 and 862,550 yd^3, respectively, of material from a 16.2-acre area within and adjacent to the Industrial Canal to construct the recessed berthing area. Of this, 9.8 acres would occur within the Industrial Canal where sediments would be removed using a hydraulic cutterhead dredge and piped to a site approximately 8,000 feet east of the LNG terminal. The remaining 6.4 acres of this area consists of existing onshore locations where soil materials would be excavated and relocated on site using backhoes, front-end loaders, bulldozers, and similar heavy equipment.

Although there are oil and gas fields under the LNG terminal, these fields are typically over 9,000 feet below ground and would not be affected by construction or operation of the LNG terminal. In addition, there are no active mining activities or oil and gas wells within 0.25 mile of the LNG terminal; therefore, we do not anticipate that there would be impacts on mineral resources in the area.

Magnolia has completed geotechnical investigations at the LNG terminal site in order to identify foundation design criteria for the facility. Further, the LNG terminal would be designed and installed in accordance with DOT standards, including those in 49 CFR 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards*. The facilities would be designed and constructed to provide adequate protection from unstable soils, landslides, or other hazards that could cause it to move or sustain abnormal loads. Based on the low probability of localized earth movements in the vicinity of the LNG terminal and the design criteria described above, we do not anticipate any problems attributable to such movements.

As discussed above, critical infrastructure at the LNG terminal would have a minimum elevation of 24 feet above NAVD 88; therefore, substantial flooding or storm damage resulting from a hurricane is not anticipated.

During construction and operation of the LNG terminal, Magnolia would implement measures outlined in its project-specific Plan and Procedures to minimize shoreline erosion. In addition, Magnolia conducted a scour protection analysis, which included analysis of wave characteristics at the shoreline of the dredge slip and property frontage. Based on the results of the analysis, Magnolia would install rock armoring at the base of the steel sheet pile bulkhead, along the east and west ends of the marine basin, and around the base of the LNG loading platform and breasting dolphin piles. This rock armoring would prevent erosion of the adjacent unprotected shoreline by wave activity from vessels maneuvering within the recessed berthing area (Moffatt and Nichol, 2014).

Based on the above discussion, and in consideration of Magnolia's proposed mitigation and design criteria, we conclude that the LNG terminal would not markedly affect or be affected by geological conditions in the area.

KMLP Facilities

Impacts on topography and geology associated with the KMLP facilities would be limited to 12.0 acres of land that would be permanently converted to industrial use. Temporary workspaces and the pipeline easements would be restored to pre-construction conditions, limiting geological impacts to temporary disturbance of slopes resulting from grading and trenching operations. KMLP would minimize impacts by returning contours to pre-construction conditions to the maximum extent practicable. At the aboveground facilities, grading and filling may be required to create a safe and stable land surface to support the facility.

No active mining occurs within 0.25 mile of the KMLP facilities. A total of four active or shut-in wells are within 0.25 mile of the KMLP facilities. One of the active wells and both shut-in wells are between 600 and 2,000 feet from proposed Compressor Station 760, the TGT Meter Station, and the southern origin of the low pressure header pipeline. Due to the distance from these wells, we do not anticipate that there would be impacts on these resources. The other active well is 150 feet west of the TGT Meter Station. KMLP's alignment sheets indicate that the existing access road for the TGT Meter Station is immediately adjacent to this well. To avoid impacts on this active well, KMLP has stated that the well's owner would be notified 72 hours prior to construction activities near the well, and that the owner or owner's representative would be on-site during construction activities.

Results of the geotechnical investigation concluded that the proposed pre-engineered steel buildings and compressor station equipment could be supported on shallow foundations with the native soils and compacted engineered fill, and that no potentially liquefiable soils occur within 100 feet of the surface (Terracon, 2015).

As with the LNG terminal discussed above, the potential for geologic hazards to impact the KMLP facilities would be low. KMLP would routinely monitor the geotechnical integrity of its facilities as part of its current operations and maintenance activities, and take any corrective actions necessary to repair damage during the life of the project.

Based on the above discussion, and in consideration of KMLP's proposed mitigation, we conclude that KMLP facilities would not markedly affect or be affected by geological conditions in the area.

4.2 SOILS

4.2.1 Existing Soil Resources

The soils affected by the proposed projects were identified and assessed using the Soil Survey Geographic (SSURGO) database (Soil Survey Staff, 2014). The SSURGO database is a digital version of the original county soil surveys developed by the NRCS for use with geographic information systems (GIS). It provides the most detailed level of soils information for natural resource planning and management. The attribute data within the SSURGO database provides the proportionate extent of the component soils and their properties for each soil map unit.

The soils at the LNG terminal site and the adjacent DII facility are mapped as udifluvents, which formed from the deposition of sandy and/or clayey dredge spoils removed from the adjacent Industrial Canal and turning basin. These very deep, moderately well to poorly drained soils have slopes ranging from 1 to 20 percent and do not contain bedrock or other root restrictive layers within 80 inches of the surface.

Soils mapped within the dredge material placement area and along the dredge material and effluent pipelines are Mowata-Vidrine silt loams and urban land. Mowata-Vidrine silt loams have slopes ranging from 0 to 3 percent and do not contain bedrock or other root restrictive layers within 80 inches of the surface. The Mowata series consist of poorly drained soils that formed in loamy fluviomarine deposits on nearly level coastal prairies and depressions. The Vidrine series consist of somewhat poorly drained soils that formed in loamy and clayey deposits on convex circular mounds. Urban land consists of areas of disturbed land where more than 85 percent of the surface is covered by impervious surfaces such as asphalt, concrete, and buildings.

The soils at the KMLP facilities are mapped as Acadiana silt loams, Crowley silt loams, Jeanerette silt loams, Mowata silt loams, Kinder-Vidrine complexes, Patoutville-Crowley complexes, and Crowley-Vidrine complexes. These soils have slopes ranging from 0 to 3 percent and do not contain bedrock or other root restrictive layers within 80 inches of the surface. The Acadiana soil series consists of well drained soils that formed in loamy and clayey alluvium on stream terraces. The Crowley and Jeanerette series consist of somewhat poorly drained soils that formed on meander scrolls from the deposition of clayey fluviomarine deposits and loamy alluvial material, respectively. The Kinder series consists of very deep, very poorly drained soils formed in loamy alluvium of late Pleistocene age or in loamy deltaic sediments over Pleistocene age terraces. The Patoutville series consist of somewhat poorly drained soils that formed in loess on gently sloping terraces. Mowata and Vidrine soils are described above.

The soils within the proposed facility locations were evaluated to identify prime farmland and major soil characteristics that could affect construction or increase the potential for adverse construction-related soil impacts. The soil characteristics evaluated include erosion potential, the potential for compaction, and revegetation concerns. Table 4.2.1-1 summarizes the amount of prime farmland and the soil characteristics within each component of the projects.

4.2.1.1 Prime Farmland

The USDA defines prime farmland as “land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops” (Soil Survey Staff, 1993). This designation includes cultivated land, pasture, woodland, or other lands that are either used for food or fiber crops, or are available for these uses. Urbanized land, built-up land, and open water cannot be designated as prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods, and is not subject to frequent, prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by draining or irrigating).

None of the soils at the proposed LNG terminal site are designated as prime farmland. Approximately 95 percent (141.7 acres) of the soils within the dredge material placement area and along the associated dredge material and effluent pipeline routes are mapped as prime farmland. However, it should be noted that since the time of NRCS mapping, approximately 33.5 acres of this land have been altered due to construction of a borrow pit. Due to the loss and/or alteration of productive topsoil, the borrow pit would no longer meet the requirements for designation as prime farmland. Therefore, approximately 73 percent (108.2 acres) of the soils associated with the dredge material placement area and associated dredge material and effluent pipelines would be considered prime farmland. All soils impacted by construction of the KMLP facilities are designated as prime farmland.

TABLE 4.2.1-1

Characteristics of Soils Associated with the LNG Terminal and KMLP Facilities (acres) [a]

Facility	Total	Prime Farmland [b]	Highly Erodible Water [c]	Highly Erodible Wind [d]	Compaction Prone [e]	Revegetation Concerns [f]
LNG Terminal Facilities						
LNG terminal [g]	123.8	0.0	0.0	0.0	114.0	0.0
DII construction yard and parking area	5.2	0.0	0.0	0.0	5.2	0.0
Dredge material transport and placement	148.7	108.2[h]	0.0	0.0	148.7	0.0
LNG Terminal Facilities Subtotal	**277.7**	**108.2**	**0.0**	**0.0**	**267.9**	**0.0**
KMLP Facilities						
Header pipelines	21.9	21.9	0.0	0.0	21.9	0.0
Compressor Station 760	40.6	40.6	0.0	0.0	40.6	0.0
CGT Meter Station	2.0	2.0	0.0	0.0	2.0	0.0
TRANSCO Meter Station	1.6	1.6	0.0	0.0	1.6	0.0
TETCO Meter Station	1.7	1.7	0.0	0.0	1.7	0.0
ANR Meter Station	1.7	1.7	0.0	0.0	1.7	0.0
Pine Prairie Meter Station	2.0	2.0	0.0	0.0	2.0	0.0
TGT Meter Station	1.3	1.3	0.0	0.0	1.3	0.0
Access roads	3.0	3.0	0.0	0.0	3.0	0.0
KMLP Facilities Subtotal	**75.8**	**75.8**	**0.0**	**0.0**	**75.8**	**0.0**
TOTAL	**353.5**	**184.0**	**0.0**	**0.0**	**343.7**	**0.0**

a The totals shown in this table may not equal the sum of the addends due to rounding.
b As designated by the NRCS. Includes soils that are considered prime if a limiting factor is mitigated (e.g., artificial drainage).
c Includes land in capability subclasses IVe through VIIe, which have severe to extreme erosion limitations for agricultural use, and soils with an average slope greater than 8 percent.
d Includes soils in wind erodibility groups 1 and 2, which includes soils with poor aggregation that are particularly susceptible to wind erosion.
e Includes soils in somewhat poor, poor, and very poor drainage classes with surface textures of sandy clay loam or finer.
f Includes coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained and soils with an average slope greater than 8 percent.
g Includes facilities proposed by Magnolia as well as KMLP's Magnolia Meter Station and interconnect pipeline.
h Borrow pit (33.5 acres) is not considered to be prime farmland. See discussion above in section 4.2.1.1.
Source: Soil Survey Staff, 2014

4.2.1.2 Erosion

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 degree of erosion. 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. Based on the soil properties reviewed, none of the soils impacted are considered highly susceptible to erosion by wind or water.

4.2.1.3 Compaction Potential

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils. Construction equipment traveling over wet soils could disrupt soil structure, reduce pore space, increase runoff potential, and cause rutting. The degree of compaction depends on moisture content and soil texture. Fine-textured soils with poor internal drainage that are moist or saturated are the most susceptible to compaction and rutting. With the exception of the portion of the recessed berthing area within the Industrial Canal (9.8 acres) at the LNG terminal, all soils impacted are considered to be prone to compaction due to fine textures and poor drainage class.

4.2.1.4 Revegetation Potential

Successful restoration and revegetation are important for maintaining soil productivity and protecting the underlying soil from potential damage, such as erosion. The revegetation potential of soils was evaluated based on the soil surface texture, slope, and drainage class. Drier soils have less water to aid in the germination and eventual establishment of new vegetation. Coarser textured soils have a lower water holding capacity following precipitation, which could result in moisture deficiencies in the root zone and unfavorable growing conditions for many plants. Based on the soil properties reviewed, we expect that the soils impacted would be relatively easy to restore and revegetate.

4.2.2 Soil Contamination

Based on a review of the EPA's Toxic Release Inventory Program sites in Louisiana, we identified one hazardous waste site within 1 mile of the projects. The Lake Charles Carbon Company is listed as being in Significant Violation for releases of benzoperylene, hydrogen fluoride, lead, mercury, and polycyclic aromatic compounds (EPA, 2006). This site is 0.6 mile north of the proposed LNG terminal, across the Industrial Canal.

Magnolia conducted a contaminated soils sampling study within the LNG terminal site. A total of 10 cores were taken, including four within the Industrial Canal and six on land at the terminal site. The cores were analyzed for contaminants of concern (e.g., heavy metals, semivolatile organic compounds, polychlorinated biphenyls, and pesticides). The results were compared to LDEQ's Risk Evaluation/Corrective Action Program's (RECAP) parameters for tolerable limits of hazardous contaminant concentrations. The findings of the investigation determined that all of the materials sampled met the RECAP standards and the site did not contain any contaminated dredge material (Ecology and Environment, Inc., 2013b).

Based on the results of the sampling report and the distance between the LNG terminal and the Lake Charles Carbon Company, no contaminated soils are expected to be encountered during construction or operation.

4.2.3 General Impacts and Mitigation

4.2.3.1 LNG Terminal

Construction activities such as clearing, grading, excavation, backfilling, and the movement of construction equipment may affect soil resources. Clearing removes protective vegetation cover and exposes the soil to the effects of wind and rain, which increases the potential for soil erosion and sedimentation of sensitive areas. Grading, spoil storage, and equipment traffic can compact soil, reducing porosity and increasing runoff potential.

In order to increase the load bearing capacity of soils along the heavy haul road, an engineered grout would be added to the subsoil that would alter the physical characteristics of the soil. The resulting substrate would have characteristics resembling soft rock (e.g., lightly cemented sandstone). Once soil alteration has taken place, it is not possible to revert to pre-existing conditions. Magnolia anticipates that the grout used would be left in place. Of the 7.5 acres proposed for the heavy-haul access road, 5.1 acres would be part of the sub-base for the LNG terminal infrastructure. The remaining 2.4 acres would be graded, covered with a soil base and topsoil, and seeded per NRCS recommendations to prevent erosion.

Magnolia would create a standard elevation of 28 feet above NAVD 88 throughout the majority of the site; a base elevation of 24 feet for the liquefaction trains; and a base elevation of 17 feet, with a 30-foot secondary containment wall, for the LNG storage tanks. The construction of the recessed berthing area would also require the removal of approximately 993,750 yd^3 of material from a 16.2-acre area within and adjacent to the Industrial Canal through a combination of mechanical excavation (131,200 yd^3) and hydraulic dredging (862,550 yd^3).

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

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

The majority of the soils disturbed within the LNG terminal site (90.1 acres) would be permanently impacted by paved or gravel plant roads, occupied by aboveground facilities, or converted to open water within the recessed berthing area. Magnolia would seed the remaining 33.7 acres within the LNG terminal site with native vegetation recommended by the NRCS. Revegetated areas would be monitored following construction for the first and second growing seasons to ensure successful restoration (see section 2.5.1.9).

To dispose of dredge materials, Magnolia would install two 24-inch-diameter pipelines, one to move the dredge spoils to the placement area, and the other to return effluent to the Industrial Canal. As described in additional detail in section 2.5.1.4 and depicted in appendix B, with the exception of a 250-foot-long segment of the pipelines beneath Big Lake Road, the dredge material and effluent pipelines would be temporary. The pipelines would be installed prior to the beginning of dredging activities and removed following the completion of dredge placement and dewatering activities. The 75-foot-wide construction right-of-way would temporarily impact 6.9 acres of previously disturbed soils (e.g., paved dock space and storage area, dirt/aggregate road). No clearing or grading would be required for the pipeline rights-of-way except where the pipelines would be installed beneath Big Lake Road using the conventional bore method.

Placement of dredge spoil materials at the deposition site would require clearing, grading, and modification of the entire 141.8-acre site. The existing 33.5-acre borrow pit would be drained, and 5- to 10-foot earthen dikes would be constructed around the perimeter of the site using soil taken from the interior of the property. Once the borrow pit is drained, the interior of the site would be modified to facilitate sedimentation, dewatering of dredge spoil, and clarification of effluent prior to discharge into the Industrial Canal. Upon completion of dredging and dewatering activities, Magnolia plans to grade the earthen dams and interior of the dredge material placement area and reseed in order to facilitate drainage and minimize erosion, returning the site to upland meadow or pasture. Additional information regarding revegetation is included in section 4.5.2.1. Impacts on wetlands within the site would be mitigated through construction avoidance, wetland restoration, or compensatory mitigation (see section 4.4.3.1).

To prevent contamination of soils within nearby wetlands, waterbodies, and other sensitive resources during construction, Magnolia has stated that it would implement its *Spill Prevention Plan* during construction and its SPCC Plan during operation of the LNG terminal. These plans would outline potential sources of releases at the site, measures to prevent a release to the environment, and initial responses in the event of a spill. As of this writing, Magnolia has submitted to the FERC a draft *Spill Prevention Plan*, but has not yet submitted its SPCC Plan. Because Magnolia has not yet provided its final spill plans, **we recommend that:**

- **<u>Prior to construction,</u> Magnolia file with the Secretary, for review and written approval by the Director of the Office of Energy Projects (OEP), its *Spill Prevention Plan* for construction and SPCC Plan for operation of the project.**

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

4.2.3.2 KMLP Facilities

As shown in table 4.2.1-1, construction of the KMLP facilities would impact 75.8 acres of soils, all of which are classified as prime farmland and considered prone to compaction. Operation of the facilities would permanently convert 12.0 acres of land to industrial use within the new Compressor Station 760 and the expanded CGT, TRANSCO, and TGT Meter Stations (see table 2.2-1 in section 2.2). Temporary workspaces and the header pipeline easements (totaling 63.8 acres) would be restored to pre-construction conditions, replanted in accordance with the landowner's request in agricultural land or using a native seed mix developed in consultation with the NRCS, and are anticipated to retain their former productivity.

Soil impacts would be minimized through the implementation of the measures outlined in the FERC Plan and Procedures, with the exception of the measures described in section 4.4.3. Further, KMLP would implement its SPCC Plan to reduce potential impacts on soils from spills of hazardous materials used during construction and operation, which we have reviewed and found to be acceptable.

Given the impact minimization and mitigation measures described in these plans, we conclude that impacts on soils due to construction and operation of the KMLP facilities would be permanent, but minor.

4.3 WATER RESOURCES

4.3.1 Groundwater Resources

The LNG terminal and KMLP facilities are within the coastal lowlands aquifer system in southwestern Louisiana, which underlies most of the Gulf Coastal Plain, extending from southern Texas to the Florida panhandle (USGS, 2003). It contains numerous local aquifers, including the Chicot aquifer, within a complex sequence of mostly unconsolidated beds of clay, silt, sand, and gravel. The sequence, which ranges in age from the Oligocene to Holocene epochs, is generally wedge-shaped and thickens towards the Gulf of Mexico, where it is up to 14,000 feet thick. Depths in the vicinity of the LNG terminal and KMLP facilities are generally between 6,000 and 10,000 feet (USGS, 1998). This aquifer system is capable of supplying large quantities of water from properly constructed wells. In Louisiana, data from 2012 shows total withdrawals from the Chicot, Chicot equivalent, Evangeline, Evangeline equivalent, Jasper, Jasper equivalent, and Catahoula aquifers was approximately 1.1 billion gallons per day (USGS and LDNR, 2013). These are the principal freshwater aquifers in Louisiana that are also part of the Coastal Lowlands Aquifer system.

Local surficial groundwater sources consist of discontinuous beds of sand near the surface, which provide small quantities of groundwater for domestic use. The shallow subsurface geology varies but generally consists of alternating deposits of clays, silts, and sands deposited over time by ancestral streams, tidal marshes, and/or estuarine environments. Depth to these surficial groundwater sources within Calcasieu, Acadia, and Evangeline Parishes is typically less than 50 feet but can be more than 150 feet from the surface (DOTD and USGS, 2004).

4.3.1.1 Sole Source Aquifers

The EPA defines a sole or principal source aquifer as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. To be defined as a sole source aquifer, there cannot be an alternative drinking water source(s) that could physically, legally, and economically supply all those who depend upon the aquifer with drinking water (EPA, 2012).

The Chicot aquifer system is an EPA-designated sole source aquifer (EPA, 2008). This system is approximately 9,000 square miles, extending from eastern Texas to the Atchafalaya River in eastern Louisiana. The Chicot aquifer is the principal source of fresh groundwater for southwest Louisiana and is the largest provider of groundwater to the state (DOTD and USGS, 2011). It is composed of productive, saturated coarse sands and gravels and the adjoining silt and clay deposits which confine them (DOTD and USGS, 2004). Three units of the Chicot aquifer are present in the vicinity of the LNG terminal and KMLP facilities: the 200-foot sand, the 500-foot sand, and the 700-foot sand (Lovelace et al., 2004). In 2012, an average of 714 million gallons per day was withdrawn from the Chicot aquifer, which accounted for 44 percent of Louisiana’s total groundwater usage (USGS and LDNR, 2013).

4.3.1.2 Water Supply Wells

Louisiana’s Wellhead Protection Program is a component of the LDEQ’s Drinking Water Protection Program and is designed to protect the quality of public drinking water supplies obtained from community water wells. The LDEQ delineates a drinking water protection area around each well, ranging from a 1,000-foot radius to a 1-mile radius, depending on well screen depth, construction date, or aquifer source. A management plan is then created for each well to minimize the potential risks to public water supplies, which can include ordinances, source prohibitions, and/or education of the public.

Based on consultation with the LDEQ, the LNG terminal would be within seven drinking water protection areas (LDEQ, 2014). Each of the drinking water protection areas has a 1-mile radius centered on the well due to the well depths being less than 1,000 feet. Two of the protection areas are associated with wells immediately adjacent to the southeast corner of the LNG terminal that supply water for Calcasieu Parish District 12 Water Works. Three of the protection areas are associated with wells that supply water to the Lake Charles Carbon Company, and are between 0.4 and 0.8 mile north of the LNG terminal across the Industrial Canal. The final two protection areas are associated with wells that supply water to the existing Trunkline LNG Terminal, and are 0.3 mile north of Magnolia's proposed LNG terminal, across the Industrial Canal.

Based on a review of the LDNR's SONRIS database, no private water wells were identified within 150 feet of the LNG terminal (LDNR, 2014d). The closest private well is approximately 2,400 feet east of the LNG terminal.

No public drinking water supply wells were identified within 1 mile of the KMLP facilities (LDNR, 2014d). The SONRIS database identified two private water wells within 150 feet of the proposed facilities, including a domestic supply well approximately 16 feet north of the TRANSCO Meter Station on the north side of Transco Road and a plugged and abandoned rig supply well approximately 100 feet south of the access road to the Pine Prairie Meter Station.

4.3.1.3 Groundwater Quality

The LDEQ runs an Aquifer Sampling and Assessment Program to monitor the quality of groundwater produced in Louisiana's major freshwater aquifers. The program samples approximately 200 wells across 14 aquifers every 3 years and presents the results in a triennial report. Under the Federal Safe Drinking Water Act, the EPA has established the primary Maximum Contaminant Level (MCL) for pollutants that may pose a health risk in public drinking water. A primary MCL is the highest level of a contaminant that the EPA allows in public drinking water. Secondary MCLs have also been set by the EPA, but are defined as non-enforceable guidelines for the taste, odor, or appearance of water (LDEQ, 2009a, 2009b).

The LDEQ's 2009 triennial report (the most recent year for which data are available) indicates that the water from the Chicot aquifer is hard, of good quality when considering health risk guidelines, and of fair quality when considering taste, odor, or appearance. There were no wells sampled by the LDEQ in 2008 that exceed the primary MCL of any of the 90 contaminants regulated by the EPA. However, several wells exceeded secondary MCLs, including 17 wells for iron, 5 wells for total dissolved solids, 4 for pH, 3 for chloride, and 3 for color. Over the past 12 years, the Chicot aquifer has shown an average increase in 6 analytical parameters: pH, alkalinity, chloride, hardness, barium, and iron. The aquifer has exhibited an average decrease in temperature, total phosphorus, and nitrogen.

In some areas, groundwater withdrawals from the Chicot aquifer are causing lowered water levels (drawdown) and saltwater encroachment. The rate of decline in these areas is due primarily to industrial use in the Lake Charles area and rice irrigation, where intense pumping of the 500-foot sand has resulted in the water level declining by as much as 1 to 2 feet per year (LDNR, 2012c; DOTD and USGS, 2011). Chloride levels have remained relatively stable since the mid-1970s; however, elevated chloride levels (i.e., greater than 100 milligrams per liter [mg/L]) observed at public supply wells in eastern and southern Lake Charles suggest that additional upconing of salt water from the 700-foot sand to the 500-foot sand may occur in the future (DOTD and USGS, 1999; LDEQ, 2009a).

The LDNR's Office of Conservation has the authority to regulate groundwater usage on a statewide basis through designation as an Area of Ground Water Concern or a Critical Area of Ground Water Concern. Areas of Ground Water Concern are defined as areas where the sustainability of an aquifer is not being maintained due to either movement of a salt water front, water level decline, or subsidence. A Critical Area of Groundwater Concern is defined as an Area of Ground Water Concern in which the Office of Conservation's Commissioner of Conservation finds that the sustainability of the aquifer cannot be maintained without withdrawal restrictions. The State of Louisiana has three designated Areas of Ground Water Concern, all of which are in north Louisiana within the Sparta aquifer.

Although no portion of the Chicot aquifer has been designated as an Area of Ground Water Concern, high water use in southwest Louisiana has been identified as one of the current major issues having an impact on groundwater sustainability management (LDNR, 2012c). In 2012, the LDNR and USGS entered into a joint partnership to increase groundwater monitoring. As a result, the number of wells within the State of Louisiana being monitored for water level, chlorides, and water quality has nearly doubled. In addition, the University of Louisiana at Lafayette has initiated a 3-year study of regional groundwater use and management in southwest Louisiana (LDNR, 2014c).

4.3.1.4 Groundwater Impacts and Mitigation

Excavation

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

The two new groundwater wells would be used during operation of the LNG terminal for process, service, and fire water systems. Each well would be drilled to a depth between 500 and 700 feet (the 500-foot sand). Concrete and steel piles required for the LNG storage tanks and LNG ship loading and berthing areas would be driven to a depth no lower than approximately 110 feet.[1] These direct and indirect impacts would be temporary and would have a minor impact on groundwater resources. To further minimize or avoid potential impacts on groundwater, Magnolia would implement the measures in its project-specific Plan and Procedures and KMLP would implement the FERC Plan and Procedures, with the exception of the measures described in section 4.4.3.

Following construction of the LNG terminal and KMLP facilities, the portion of the ground surface that is not paved or occupied by the aboveground facilities would be revegetated or graveled to eliminate exposed soils and to ensure restoration of overland flow and recharge patterns.

---

[1] Concrete piles to be used for the LNG storage tanks are expected to be 70 feet in length. Based on a surface elevation of 17 feet above NAVD 88, pile tip penetration would be approximately 53 feet below NAVD 88. Both concrete and steel piles would be installed within the LNG loading and ship berthing area; the greatest pile lengths would be associated with the breasting dolphin and loading platform, which would have a pile tip penetration no lower than approximately 110 feet below NAVD 88. In the Lake Charles area, the 200-foot sand is overlain by about 150 feet of surficial sediments (Lovelace, 1999); therefore, piles driven to a depth of 110 feet below NAVD 88 are not expected to have direct impacts on the underlying aquifer.

As described above (see section 4.3.1.2), one domestic supply well is approximately 16 feet north of the TRANSCO Meter Station. KMLP stated that no sub-surface work greater than 10 feet in depth would be required at the TRANSCO Meter Station site and that it would coordinate with the well owner to test the well water both before and after construction. KMLP has stated that it would contact each affected landowner to confirm the locations of private wells within 150 feet and public wells within 400 feet of the construction workspace. Affected landowners also would be notified at this time about their ability to request well testing and monitoring. KMLP would file a report with the FERC summarizing the findings of the landowner consultations, which would also provide the distance and direction of any previously unidentified drinking water supply wells and any mitigation measures requested by the owner of each well. To document impacts on water wells and verify that they are appropriately addressed, **we recommend that:**

- **<u>Within 30 days of placing the Lake Charles Expansion Project facilities in service</u>, KMLP file with the Secretary a report identifying all public or private water supply wells/systems damaged by construction and a description of how they were repaired. The report should also include a discussion of any other complaints concerning well yield or water quality and how each problem was resolved.**

With the implementation of the measures described above and our recommendation regarding the repair of any damaged water supply wells, we conclude that potential impacts on groundwater resources due to excavation activities within the LNG terminal and KMLP facilities would be minimal.

Contamination

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

Implementation of Magnolia's project-specific Plan and Procedures, *Spill Prevention Plan*, and SPCC Plan would minimize the potential for groundwater impacts associated with an inadvertent spill of hazardous materials during construction and operation. Similarly, KMLP would implement the FERC Plan and Procedures as well as its SPCC Plan. These plans would identify preventive measures to reduce the likelihood of a spill (e.g., secondary containment for petroleum products, daily vehicle inspection for leaks, and restrictions on the transport of potentially hazardous materials to the construction work areas) and also specify measures to contain and clean up a spill should one occur. In addition, these plans would address the storage and transfer of hazardous materials and petroleum products. We are recommending in section 4.2.3.1 that Magnolia's final *Spill Prevention Plan* and SPCC Plan be filed with the Secretary prior to construction. Therefore, we conclude that the potential for the projects to contaminate the Chicot aquifer or water supply wells would be minimal.

Groundwater Withdrawals

Groundwater required during construction of the LNG terminal would be primarily be provided by Calcasieu Parish District No. 12 Water Works and would be used for construction worker sanitation, dust suppression, hydrostatic testing of plant piping at the LNG terminal, cleaning of the LNG storage tanks following hydrostatic testing, and other general utility uses. Construction of the LNG terminal would require the withdrawal of up to approximately 2.5 million gallons of groundwater over the 45-month construction period (the majority of which would take place during the first 36 months of construction). On average, approximately 1,800 gallons of groundwater would be required per day, although approximately 6,000 gallons of groundwater would be required per day during peak construction. Construction wastewater would be collected from temporary construction facilities into holding tanks and disposed of off site. Magnolia anticipates that approximately 60,000 gallons of groundwater would be used during the first year of construction for dust suppression. No additional dust suppression water would be needed for the remainder of the project. Approximately 60,000 gallons of groundwater would be required for hydrostatic testing of plant piping and related components within the LNG terminal. Following completion of hydrostatic testing, the water would be tested for quality and discharged to stormwater holding basins at the LNG terminal.

In addition, approximately 13,000 gallons of water would be required for hydrostatic testing of the Magnolia Meter Station and interconnect pipeline; this water would be obtained from the City of Lake Charles. Following completion of hydrostatic testing, the water would be tested for quality and discharged within the southeastern portion of the Magnolia Meter Station site.

Groundwater required during construction of the KMLP facilities would be limited to approximately 346,000 gallons of water for hydrostatic testing of the header pipelines and meter station modifications; this water would be obtained from the city of Eunice and transported to the test locations by truck. Water used for hydrostatic testing at each of the meter stations would be returned to the water truck and transported to the next meter station site for reuse. Following completion of hydrostatic testing, the water would be tested for quality and discharged to an upland agricultural area within the Compressor Station 760 site using energy dissipation devices (e.g., hay bales) to minimize erosion and sedimentation into nearby waterbodies (see additional discussion in section 4.3.2.2).

Groundwater required during operation of the LNG terminal would be supplied by the tie-in to Calcasieu Parish District No. 12 Water Works' existing potable water line and by two groundwater wells within the LNG terminal site. Between 740 and 3,329 gallons of potable water would be provided by Calcasieu Parish District 12 Water Works daily for plant personnel in buildings, safety showers, and eye wash stations. The two proposed groundwater wells would provide between 130,090 and 167,378 gallons of water per day, which would be required for operation of the demineralized water treatment plant and use as service water. Only one well is anticipated to be used at a time; the second well would only be used if the primary well is out of service.

Groundwater use associated with operation of the LNG terminal would increase overall withdrawal from the Chicot aquifer, potentially resulting in drawdown and saltwater encroachment. Approximately 714 million gallons of water are withdrawn from the Chicot aquifer daily (USGS and LDNR, 2013). The proposed daily maximum groundwater withdrawal for the LNG terminal during operation (167,378 gallons) is equivalent to about 0.023 percent of the current daily water withdrawal from the Chicot aquifer, or represents an increase of less than 0.001 percent.

Using a withdrawal rate of 150 gallons per minute, which is more than the anticipated withdrawal rate of 120 gallons per minute, Magnolia calculated that the anticipated drawdown from the new on-site well within the 500-foot sand would be less than 1.5 feet at a distance of 1,500 feet from the point of withdrawal. The nearest water supply wells to the LNG terminal site are the two Calcasieu Parish District No. 12 Water Works wells, which are over 1,400 feet east of the proposed wells and have over 400 feet of head above their screened interval (400 feet of available water above the extraction point). Therefore, we conclude that the potential for operation of the LNG terminal to cause substantial drawdown, impacting nearby users of the Chicot aquifer, would be minimal.

As described above (see section 4.3.1.3), elevated chloride levels (i.e., greater than 100 mg/L) observed at public supply wells in eastern and southern Lake Charles suggest that additional upconing of salt water from the 700-foot sand to the 500-foot sand may occur as a result of increased groundwater withdrawals (DOTD and USGS, 1999; LDEQ, 2009a). However, because the proposed groundwater wells at the LNG terminal would not be within an Area of Groundwater Concern, as designated by the LDNR, and groundwater withdrawals associated with operation of the LNG terminal would result in an increase of less than 0.001 percent over current withdrawals from the Chicot aquifer, we conclude that the potential for water withdrawals associated with operation of the LNG terminal to result in saltwater encroachment into the 500-foot sand of the Chicot aquifer would be minimal.

No groundwater would be necessary for the operation of the KMLP facilities; therefore, no impacts on groundwater resources are anticipated.

4.3.2 Surface Water

Surface Water Quality Standards and Designated Uses

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

The LDEQ reports on water quality in the state by basin subsegment, which is a discrete hydrologic unit or watershed (LDEQ, 2008). Subsegments describe the primary waterbody within the watershed; however, the water quality standards and criteria apply to all tributaries and connected waterbodies within the boundaries of a subsegment. There are seven designated uses established for surface waters in Louisiana, including:

- <u>Primary Contact Recreation</u>: any recreational or other water contact use involving prolonged or regular full-body contact with the water and in which the probability of ingesting appreciable amounts of water is considerable;
- <u>Secondary Contact Recreation</u>: any recreational or other water contact activity in which prolonged or regular full-body contact with the water is either incidental or accidental, and the probability of ingesting appreciable amounts of water is minimal;
- <u>Fish and Wildlife Propagation</u>: the use of water for aquatic habitat, food, resting, reproduction, cover, and/or travel corridors for any indigenous wildlife and aquatic life species associated with the aquatic environment;
- <u>Drinking Water Supply</u>: the use of water for human consumption and general household use;
- <u>Oyster Propagation</u>: the use of water to maintain biological systems that support economically important species of oysters, clams, mussels, or other mollusks so that their productivity is preserved and the health of human consumers of these species is protected;
- <u>Agricultural</u>: the use of water for crop spraying, irrigation, livestock watering, poultry operations, and other farm purposes not related to human consumption; and
- <u>Outstanding Natural Resource Waters</u>: waterbodies designated for preservation, protection, reclamation, or enhancement of wilderness, aesthetic qualities, and ecological regimes.

4.3.2.1 Existing Surface Water Resources

LNG Terminal

The LNG terminal is within the Calcasieu River Basin, which drains an area of approximately 4,105 square miles into the Gulf of Mexico. The Calcasieu Saltwater Barrier (a man-made dam across the Calcasieu River upstream of Lake Charles) divides the upper and lower basins and prevents saltwater intrusion into the upper basin (COE, 2015a; LDEQ, 2008). The LNG terminal would be on the south shore of the Industrial Canal. The Industrial Canal discharges into the Calcasieu River before flowing into Calcasieu Lake (see figure 4.3.2-1). In addition to the Calcasieu River, numerous bayous and smaller rivers, and the extensive surrounding marshlands discharge freshwater into Calcasieu Lake. The Calcasieu River Basin receives abundant rainfall and contains numerous lakes and reservoirs as well as an extensive estuary system. Other sources of fresh water in the estuary system include stormwater runoff and municipal, industrial, and agricultural return flow.

Between July 2013 and February 2014, the LDWF collected water quality data from two locations within the Industrial Canal: the entrance and the turning basin. At each location, water quality was analyzed at the top, middle, and bottom of the water column. During this time, water temperature within the canal ranged from 46.1 °F to 91.6 °F. Water was typically warmer at the surface and middle of the water column than at the bottom, although between October and December, water was slightly warmer at the bottom of the water column. Salinity varied from 5.4 to 32.4 parts per thousand (ppt). Salinity was highest at the bottom of the water column. Dissolved oxygen levels varied from less than 0.1 mg/L at the bottom of the water column to 11.5 mg/L at the top of the water column (LDWF, 2014b).

The LDEQ has established three designated uses for the Industrial Canal.[2] The designated uses include primary contact recreation, secondary contact recreation, and fish and wildlife propagation. Based on the numerical criteria established for these designated uses, water quality within the canal fully supports its designated uses for secondary contact recreation. Use for primary contact recreation is not fully supported due to elevated temperature levels resulting from drought-related impacts and natural causes. Use for fish and wildlife propagation is not fully supported due to chloride, sulfate, and total dissolved solid levels that have been impaired as a result of changes in tidal circulation and hydrostructure flow regulation (e.g., flow regulation through construction and operation of the Calcasieu Saltwater Barrier). Due to this subsegment not fully supporting its designated uses for primary contact recreation and fish and wildlife propagation, it is included on Louisiana's 2012 Section 303(d) List (LDEQ, 2013a).

LNG carriers would transit the Gulf of Mexico and lower Calcasieu River through the Calcasieu Ship Channel while en route to and from the LNG terminal.[3] Tidal exchange between the Gulf of Mexico and Calcasieu Lake occurs through the lower Calcasieu River, including the Calcasieu Ship Channel. The Calcasieu Ship Channel, which connects Lake Charles to the Gulf of Mexico, is 400 feet wide and maintained at a depth of 40 feet (COE, 2015b). The LDEQ has established four designated uses for the lower Calcasieu River and the portion of the Gulf of Mexico within 3 miles of the coast, including primary contact recreation, secondary contact recreation, fish and wildlife propagation, and oyster propagation. Water quality within the river and coastal waters of the Gulf of Mexico fully support these designated uses (LDEQ, 2013a).

---

[2] The Industrial Canal is located within subsegment LA031101, which includes the Intracoastal Waterway from the Calcasieu Lock to the East Calcasieu River Basin watershed boundary (LDEQ, 2013a).

[3] The portion of the lower Calcasieu River transited by LNG carriers en route to and from the LNG Terminal is within subsegment LA030401, described as the portion of the Calcasieu River from below Moss Lake to the Gulf of Mexico, including the Calcasieu Ship Channel and Monkey Island Loop (LDEQ, 2013a).

Figure 4.3.2-1
Waterways in the Vicinity of the LNG Terminal
Magnolia LNG and Lake Charles Expansion Projects
Calcasieu Parish, Louisiana

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2014\08\Waterways\Waterways.mxd | REVISED: 05/04/2015 | SCALE: 1:60,000 DRAWN BY: JSSuess

The Industrial Canal, Calcasieu River, and portions of the Gulf of Mexico have been designated as EFH (NOAA Fisheries, 2011b), which is discussed in section 4.6.3. The Calcasieu River and portions of the Gulf of Mexico also contain suitable habitat for federally listed species (NOAA Fisheries, 2012), which are discussed in section 4.7.1. In addition, the Calcasieu River and Industrial Canal have been designated as Navigable Waterways under section 10 of the RHA (COE, 2013b). Segments of the Calcasieu River are designated as Louisiana Natural and Scenic Rivers under the Louisiana Scenic Rivers Act of 1988; however, the nearest designated segment is about 10 miles north of the LNG terminal (LDWF, 2012).

In August 2013, Magnolia conducted a contaminated soils sampling study within the proposed LNG terminal site. A total of 10 cores were taken, including 4 within the Industrial Canal and 6 on land at the terminal site. As discussed in additional detail in section 4.2.2, the cores were analyzed for contaminants of concern (e.g., heavy metals, semivolatile organic compounds, polychlorinated biphenyls, and pesticides). The results were compared to LDEQ's RECAP standards, which use risk evaluation to determine if corrective action is necessary for the protection of human health and the environment. None of the constituents detected in the sediment samples exceeded the RECAP standards used in the evaluation. The COE, New Orleans District evaluated the results of the sediment sampling and concluded that:

- contaminants of concern within sediments sampled at the LNG terminal site were present at comparable levels to those measured by the COE in 2007 from navigation shoal material near Devil's Elbow;
- all LNG terminal site sediments meet the LDEQ's working definition of uncontaminated dredge material; and
- conservative estimates of the concentration of contaminants of concern in dredged material effluent that would be discharged from the LNG terminal site would be below the LDEQ and EPA Water Quality Standards/Criteria (based on the COE Engineer Research and Development Center's Tier II Screening Spreadsheet) (COE, 2013c).

Other waterbodies within the areas potentially affected by construction and operation of the LNG terminal include an intermittent waterbody at the terminal site, a borrow pit within the dredge material placement area, and a perennial waterbody along the dredged material and effluent pipeline route. The intermittent waterbody within the LNG terminal site is not hydrologically connected to either the Industrial Canal or Calcasieu River;[4] therefore, the LDEQ's water quality designations do not apply to this waterbody. The perennial waterbody along the dredge material and effluent pipeline route is hydrologically connected to the Calcasieu River.

Table 4.3.2-1 provides a list of the waterbodies affected by the LNG terminal and KMLP facilities, including the waterbody name, location, description, waterbody type, water quality classification, and crossing length.

---

[4] The COE, New Orleans District did not include this waterbody in its May 14, 2014 jurisdictional determination for the LNG terminal site; therefore, this waterbody is not defined as a water of the United States under section 404 of the CWA. However, because it had flowing water at the time of delineation it is included in our analysis.

TABLE 4.3.2-1

Waterbodies Potentially Affected by the LNG Terminal and KMLP Facilities

Facility/Waterbody	Milepost	Description	Type	Water Quality Classification [a]	Crossing Width (feet)	Impact Profile
LNG Terminal Facilities						
LNG Terminal						
Gulf of Mexico	NA	Gulf	Open water	ABCD Section 10 [b] EFH [c]	NA	Vessel traffic
Calcasieu River	NA	River	Open water	ABCD [d] Section 10 [b] EFH [c]	NA	Vessel traffic
Industrial Canal	NA	Canal	Open water	ABC/303(d) [e] Section 10 [b] EFH [c]	NA	Vessel traffic Berthing area
S1ACA001 [f]	NA	Stream	Intermittent	ABCE [g]	12	None
Dredge Material Transport and Placement						
Unnamed waterbody	0.2	Stream	Perennial	ABCE [g]	20	None
Borrow pit	NA	Man-made borrow pit	Open water	ABCE [g]	NA	Dredge material placement
KMLP Facilities						
Low Pressure Header Pipeline						
S1AAC011	0.0	Tributary	Intermittent	ABCE [g]	4	Wet or dry crossing
S1AAC010 [h]	0.0	Agricultural ditch	Ephemeral	ABCE [g]	2	Construction workspace for access road
S1AAC009	0.3	Roadside ditch	Ephemeral	ABCE [g]	1	Bored crossing
S1AAC002	0.3	Roadside ditch	Ephemeral	ABCE [g]	2	Bored crossing
S1AAC005	0.6	Agricultural ditch	Intermittent	ABCE [g]	4	Wet or dry crossing
S1AAC003	0.9	Agricultural ditch	Ephemeral	ABCE [g]	5	Wet or dry crossing
S1AAC002	1.2	Roadside ditch	Ephemeral	ABCE [g]	2	Bored crossing
S1AAC001	1.2	Roadside ditch	Ephemeral	ABCE [g]	3	Culvert Installation
High Pressure Header Pipeline						
S1AAC005	0.6 [i]	Agricultural ditch	Intermittent	ABCE [g]	4	Wet or dry crossing
Compressor Station 760						
S1AAC005	NA	Agricultural ditch	Intermittent	ABCE [g]	4	Construction workspace
S1AAC006	NA	Tributary	Intermittent	ABCE [g]	4	Culvert installation
S1AAC007 [h]	NA	Agricultural ditch	Ephemeral	ABCE [g]	4	Construction workspace
S1AAC008 [h]	NA	Agricultural ditch	Ephemeral	ABCE [g]	4	Construction workspace
S1AAC002	NA	Roadside ditch	Ephemeral	ABCE [g]	2	Culvert installation

TABLE 4.3.2-1 (cont'd)						
Waterbodies Potentially Affected by the LNG Terminal and KMLP Facilities						
Facility/Waterbody	Milepost	Description	Type	Water Quality Classification [a]	Crossing Width (feet)	Impact Profile
ANR Meter Station						
S1AAC001	NA	Roadside ditch	Ephemeral	ABCE [g]	3	Construction workspace
TGT Meter Station						
S1AAC010 [h]	NA	Agricultural ditch	Ephemeral	ABCE [g]	1	Culvert installation

[a] Louisiana State Water Quality Classifications (LDEQ, 2013a).
Designated uses include:
A = Primary Contact Recreation
B = Secondary Contact Recreation
C = Fish and Wildlife Propagation
D = Oyster Propagation
E = Agriculture

[b] Designated as a section 10 waterbody under the RHA.

[c] Designated as EFH under the MSA.

[d] The portion of the Calcasieu River that LNG carriers would transit is within subsegment LA030401, which fully supports each of its designated uses (LDEQ, 2013a).

[e] The Industrial Canal is within subsegment LA031101, which does not support its designated use for primary contact recreation or fish and wildlife propagation. Therefore, this subsegment is included on Louisiana's 2012 Section 303(d) List (LDEQ, 2013a).

[f] The COE, New Orleans District did not include waterbody S1ACA001 in its May 14, 2014 jurisdictional determination for the LNG terminal site; therefore, this waterbody is not defined as a water of the United States under section 404 of the CWA. However, because it had flowing water at the time of delineation it is included in our analysis.

[g] Waterbody is not classified by the LDEQ; therefore, the waterbody classification is representative of the subsegment watershed in which the waterbody is located (LDEQ, 2004).

[h] The COE, New Orleans District did not include waterbodies S1AAC007, S1AAC008, and S1AAC010 in its September 10, 2014 jurisdictional determinations for the KMLP facilities; therefore, these waterbodies are not defined as a water of the United States under section 404 of the CWA. However, because they had flowing water at the time of delineation, they are included in our analysis.

[i] Because the high pressure header pipeline would be 700 feet in length, the milepost provided corresponds to the nearest milepost on the adjacent low pressure header pipeline.

KMLP Facilities

The KMLP facilities would be within the Mermentau River Basin, which covers an area of approximately 3,710 square miles. The Mermentau River Basin is in southwestern Louisiana and is bordered on the north and east by the Vermilion – Teche River Basin, on the west by the Calcasieu River Basin, and on the south by the Gulf of Mexico. Because of relatively low relief, the basin is characterized by annual backwater flooding of agricultural lands, poor drainage, and salt water intrusion along the Gulf of Mexico. Low stream flows generally occur during warm weather in September and October (LDEQ, 2008).

Ten waterbodies occur within the areas affected by the KMLP facilities, including three intermittent waterbodies and seven ephemeral waterbodies. Table 4.3.2-1 identifies the waterbodies affected by the KMLP facilities, including the waterbody name, location, description, waterbody type, water quality classification, and crossing length.

None of the waterbodies affected by the KMLP facilities are listed as Louisiana Wild and Scenic Rivers, designated as EFH, contain federally or state-listed species, or are suspected of containing contaminated sediments (LDWF, 2012; LDEQ, 2013a). All of the waterbodies currently support their designated uses, with the exception of fish and wildlife propagation. The suspected cause of impairment is identified as total dissolved solids associated with agricultural activities (LDEQ, 2013a). No surface water intakes are within 3 miles of the aboveground facilities or header pipeline crossing locations (Louisiana Department of Health and Hospitals, 2006).

4.3.2.2 Surface Water Impacts and Mitigation

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

LNG Terminal

Table 4.3.2-1 describes the surface waters that would be affected as a result of construction and operation of the LNG terminal. Potential impacts on surface waters during construction and operation of the LNG terminal are associated with dredging, construction of the LNG loading and ship berthing facilities, vessel traffic, site modification and stormwater runoff, hydrostatic testing, operation of the LNG storage tank deluge system, and spills or leaks of hazardous materials. The following sections describe these potential impacts as well as measures proposed by Magnolia to minimize impacts on surface waters.

Dredging

To create the recessed berthing area and accommodate a fully loaded LNG carrier, a 16.2-acre area (composed of 9.8 acres of existing open water within the Industrial Canal, 5.4 acres of existing uplands, and 1.0 acre of existing wetlands) would be dredged to an elevation of 44 feet below NAVD 88.[5] As described in additional detail in section 2.5.1.4, a combination of onshore excavation and dredging would be used to construct the ship berthing area, which would be recessed into the northern boundary of the LNG terminal site. Approximately 131,200 yd^3 of upland soils along the bank of the Industrial Canal would be excavated and relocated on site using backhoes, front-end loaders, bulldozers, and similar equipment. Following the excavation and relocation of upland soils, approximately 862,550 yd^3 of sediment and soil would be removed from the berthing area using a hydraulic cutterhead dredge. Dredging is currently expected to take place over a 12-week period.

Dredge material would be transported by pipeline to the placement area, which is approximately 8,000 feet east of the LNG terminal (as depicted in figure 2.2.1-2 in section 2.2.1). The dredge material and effluent pipeline route would cross one perennial waterbody; however, no in-water impacts would occur because the pipeline would cross the waterbody along an existing road where a culvert is in place. A 33.5-acre borrow pit is present in the northern portion of the dredge material placement area, which currently contains approximately 60.6 million gallons of water. Prior to the commencement of dredging activities, water within the borrow pit would be removed and discharged into the Industrial Canal via the proposed effluent return pipeline (described in detail in section 2.5.1.4). Throughout dredging operations, dredge materials would be discharged to the placement area and allowed to dewater, after which the decanted water would be pumped through the effluent return pipeline and discharged back into the Industrial Canal. In total, Magnolia anticipates that a total of 252 million gallons of water from dewatered dredge spoil would be returned to the Industrial Canal.

Potential impacts on water quality in the Industrial Canal resulting from dredging and the subsequent discharge of water back to the canal would include temporary increases in suspended solids and turbidity levels as well as potential resuspension of contaminated sediments. Increased suspended

[5] In order to accommodate fully loaded LNG carriers and provide clearance during low tide, the design depth of the recessed berthing area is 42 feet below NAVD 88. An advance maintenance allowance of 2 feet is proposed.

sediment and turbidity levels could cause a reduction in light penetration through the water column, which could lower the rate of photosynthesis, introduce organic material and/or nutrients that could lead to an increase in biological oxygen demand and reduce dissolved oxygen, and alter water circulation and flow patterns. The COE and Lake Charles Harbor and Terminal District partner to conduct maintenance dredging within the Industrial Canal, which is expected to occur every other year to maintain deep draft access (COE, 2015b). This routine dredging, combined with existing vessel traffic associated with operation of other facilities along the canal, causes sustained high and variable turbidity levels within the Industrial Canal.

Magnolia would conduct dredging using a hydraulic cutterhead suction dredge. This dredging method minimizes turbidity from resuspension of the sediment in the water column and other water quality impacts. To further minimize these impacts, Magnolia has prepared a preliminary *Dredging Water Quality Monitoring Plan*. This plan calls for the use of best management practices during dredging and disposal activities and requires monitoring of turbidity, flow rate, pH, and total suspended solids at three locations, including two locations near dredging operations and one at the effluent outfall. If monitoring within the dredge area indicates that total suspended solid or turbidity levels exceed the limits established by the plan or the COE or EPA permit requirements, Magnolia would implement the following:

- reduction of cutterhead rotation speed to reduce potential for side casting sediment away from the suction entrance and re-suspending sediment (typically effective on relatively loose, fine grain sediment);
- reduction of swing speed to ensure that the dredge head does not move through the cut faster that it can hydraulically pump the sediment, thus reducing resuspended sediment;
- reduction or elimination of bank undercutting by removing the sediment in maximum lifts equal to 75 percent of the cutterhead diameter; and/or
- termination of suction pump motor after cutterhead during shutdown and commencement of the suction pump before cutterhead during startup to avoid a period when materials are resuspended without active suction occurring.

If monitoring near the effluent outfall indicates that total suspended solid or turbidity levels exceed the limits established by the plan or the COE or EPA permit requirements, Magnolia would implement the following:

- suspension of dredging operations to allow suspended sediments to settle;
- adjustment of interior channelization within the placement area to improve sedimentation rate; and/or
- installation of sediment/turbidity curtains within the placement area.

Magnolia has stated that it would finalize the *Dredging Water Quality Monitoring Plan* prior to commencement of dredging operations. Therefore, **we recommend that**:

- **<u>Prior to construction</u>, Magnolia file with the Secretary, for review and written approval by the Director of OEP, its final *Dredging Water Quality Monitoring Plan*.**

As discussed in section 4.2.2, Magnolia's soil sampling and analysis conducted at the LNG terminal site and within the Industrial Canal determined that the sediments to be dredged from within the Industrial Canal do not contain contaminated dredge material. As described above, the COE, New Orleans District reviewed the results of the sampling and determined that sediments at the LNG terminal meet the LDEQ's working definition of uncontaminated dredge material. In May 2014, Magnolia applied for authorization from the COE, New Orleans District to dredge and/or fill of waters of the United States under section 404 of the CWA and section 10 of the RHA (see discussion in section 4.4). Magnolia would be required to implement the measures incorporated into the COE permit, including any special requirements/procedures for handling contaminated sediments (e.g., silt curtains or other in-water controls that may be included as conditions of the permit). Therefore, we conclude that impacts on water quality due to the resuspension of contaminated sediments are not anticipated.

With the implementation of our recommendation, we conclude that dredging and the subsequent discharge of water back to the Industrial Canal would result in temporary and minor increases in turbidity and suspended solid levels, but would not result in permanent or long-term water quality impacts.

During operation, maintenance dredging of the recessed berthing area would be required periodically to maintain adequate water depths for LNG vessel maneuvering. Magnolia would conduct maintenance dredging within the recessed berthing area every 4 to 5 years based on past shoaling rates within the Industrial Canal (COE, 2010a). Approximately 65,000 yd^3 would be removed during each maintenance dredging episode. Maintenance material would be placed in an upland CDF in coordination with the Lake Charles Harbor and Terminal District. Although maintenance dredging would result in a temporary increase in suspended sediment and turbidity levels, these impacts are expected to be temporary and limited to the vicinity of dredging activity within the Industrial Canal. Therefore, we conclude that impacts on water quality due to maintenance dredging would be temporary and minor.

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

In-water construction associated with the LNG loading and ship berthing facilities would include the installation of:

- sheet pile bulkhead along the shoreline of the Industrial Canal;
- pilings for the breasting dolphins and LNG loading platform; and
- rock armoring at the base of the steel sheet pile bulkhead, along the east and west ends of the marine basin, and around the base of the LNG loading platform and breasting dolphin piles.

Construction of the LNG loading and ship berthing facilities would also require over-water and land-based equipment installation (e.g., LNG loading platform, terminal jetty/pier, pipe and roadway trestle, marine gangway, firewater monitor towers, and dry chemical system) (see figure 2.5.1-1 in section 2.5.1.4). A combination of conventional in-water marine construction equipment (e.g., barges, cranes, pile driving equipment) and shore-based construction equipment (e.g., backhoes, bulldozers) would be used to install the bulkhead, pilings, and over-water structures.

Construction of the LNG loading and ship berthing facilities would result in localized, temporary increases in turbidity and suspended sediment levels. However, these impacts are expected to be temporary (i.e., confined primarily to the period of in-water activity and shortly thereafter) and limited to the area within and immediately adjacent to the LNG loading and ship berthing facilities. No permanent or long-term water quality impacts are anticipated.

Vessel Traffic

Shoreline Erosion and Resuspension of Sediments

During construction of the LNG terminal, barges and support vessels would deliver large equipment and materials to the DII construction yard. Magnolia estimates that 50 or fewer marine deliveries would occur during construction. During operation, approximately 208 LNG vessels (104 LNG carriers and 104 LNG barges) would call on the LNG terminal per year.

During construction and operation, vessel traffic within the recessed berthing area and along vessel transit routes has the potential to increase shoreline erosion and suspended sediment concentrations due to increased wave activity. Shoreline erosion is a concern when hard structures are placed along the shoreline that could cause changes in wave dynamics and increase erosion of adjacent areas. As described above, Magnolia would install rock armoring to provide scour protection from propeller wash both within and along the east and west ends of the recessed berthing area. The proposed rock armoring would prevent erosion of the adjacent unprotected shoreline by wave activity from vessels maneuvering within the recessed berthing area (Moffatt and Nichol, 2014). The Industrial Canal and Calcasieu Ship Channel were specifically created to provide deepwater access for maritime commerce. They are managed by the Port of Lake Charles, a deepwater seaport, and are maintained by regular dredging (COE, 2015b). Similarly, LNG carriers transiting the Gulf of Mexico would use established shipping channels. As such, use of the waterways by LNG carriers, barges, and support vessels during construction and operation of the LNG terminal would be consistent with the planned purpose and use of active shipping channels, and associated impacts on water quality within the shipping channel would be minor.

Ballast Water Discharge

LNG carriers serving the LNG terminal would likely arrive with empty cargo tanks because they would be loaded at the terminal with LNG destined for export. Vessels with empty cargo tanks ride higher in the water and can experience challenges associated with navigation due to the extra sail area (ship surface area above the water line). Challenges include the vessel being more susceptible to wind influences and less efficient as a result of reduced performance of the propeller, rudder, and propulsion system. To reduce or eliminate the challenges of navigating the ship without cargo aboard, water is often taken in from the surrounding waters and placed in ballast tanks to provide additional draft and improve navigation. To maintain a constant draft, ballast water is typically discharged below the water surface as the LNG cargo is loaded. This procedure would likely occur aboard LNG carriers calling at the LNG terminal; however, LNG barges have a different design and are unlikely to have the need for or capability of using ballast water.

Based on information provided by Magnolia, the amount of ballast water discharged during LNG cargo loading would range from approximately 8,711,000 to 12,264,000 gallons, depending on the size of the LNG carrier. Ballast water discharge periods would vary but, generally, vessels would discharge a volume equal to 10 percent of their LNG capacity each hour. For example, a 155,000 m^3 LNG vessel (with a ballast of approximately 8,711,000 gallons) would discharge approximately 581,000 gallons per hour, or 21.5 cubic feet per second, over a 15-hour period.

As required by 33 CFR 151.2026, vessels equipped with ballast tanks must implement one of five options to control nonindigenous species in waters of the United States. The IMO has adopted this regulation and requires each vessel to install and operate a ballast water management system (option 1 as currently defined). Compliance dates associated with this IMO requirement will be phased, but will apply to all vessels beginning in 2016.[6] Until this rule is fully implemented, Magnolia has stated that it would require LNG carriers to conduct complete ballast water exchange at least 200 nautical miles from any shoreline (option 4 as currently defined), except in extraordinary circumstances causing safety or stability concerns that would require a ballast exchange less distant from the shoreline, which is authorized under 33 CFR 151.2040. Therefore, ballast water that is likely to be introduced into the Industrial Canal would be composed mainly of open ocean water collected during ballast water exchange (see additional discussion in section 4.6.2.2).

Ballast water discharges at the LNG terminal could impact water quality by changing the salinity, temperature, pH, and dissolved oxygen level of water within the Industrial Canal. The physiochemical composition of ballast water in comparison to the water present within the Industrial Canal and Calcasieu River would vary depending on tidal and hydrologic conditions at the time of discharge.

The primary potential impact on water quality due to ballast water discharge would be a temporary increase in salinity level. As described above, salinity within the canal varies throughout the year (between about 5 and 32 ppt during the period measured) (LDWF, 2014b), and tends to increase with water depth. Ballast water, which would generally consist of open ocean water, would have a salinity between 32 and 37 ppt (U.S. Department of the Navy, Office of Naval Research, 2015). Because of the natural variability in salinity levels in the canal, the discharge of ballast water may not have a measurable impact on salinity under normal tidal cycles. However, during periods of heavy rainfall when salinity levels decrease in the Industrial Canal, ballast water would have a higher salinity than the surrounding water. Ballast water would be discharged near the bottom of the berthing area, where relatively dense saltwater from the Gulf of Mexico characteristically underlies freshwater from inland sources, with a resulting salinity range between 17 and 32 ppt. Furthermore, the amount of ballast water discharged into the Industrial Canal during each LNG carrier visit to the LNG terminal would make up approximately 0.6 percent of the approximately 2 billion gallons of water within the Industrial Canal. Therefore, we anticipate that natural flow and tidal exchange would dilute the ballast water discharge to salinity levels that typically occur within the Industrial Canal in the immediate vicinity of the LNG terminal and conclude that increased salinity would represent a temporary and minor impact on water quality within the Industrial Canal.

Ballast water is stored in the ship's hull below the waterline; as a result, discharged water temperatures are not expected to deviate markedly from ambient water temperatures. The pH of the ballast water (reflective of sea water in open ocean conditions) is maintained in a fairly narrow range (8.1 to 8.5). Although pH within the Industrial Canal can be lower than seawater (generally ranging from 7.4 to 8.6), it varies over space and time (LDWF, 2014b). Therefore, impacts on water temperature and pH would be temporary and minor.

Another water quality parameter that may be influenced by ballast water discharges is dissolved oxygen level. Dissolved oxygen levels in water are dependent upon many factors including temperature, rainfall, tidal magnitude, depth, currents, and phytoplankton activity. Ballast water would contain low dissolved oxygen levels and could decrease existing dissolved oxygen levels in the immediate vicinity of the discharge point. However, low dissolved oxygen levels (0 to 4 mg/L) are naturally found in the deeper zones of the Industrial Canal, particularly during warm summer months (LDWF, 2014b). Additionally, as noted previously, the relative minimal volume of discharged ballast water compared to the water volume of the Industrial Canal (less than 0.6 percent) would make effects to dissolved oxygen from ballast discharge temporary and minor.

---

[6] This regulation (33 CFR 151.2026) currently applies to all new vessels as well as existing vessels with ballast water capacity between 1,500 and 5,000 m^3 that have been drydocked since January 1, 2014. Compliance by existing vessels with ballast water capacity less than 1,500 m^3 or greater than 5,000 m^3 will be required as of the vessel's first scheduled drydocking after January 1, 2016.

To minimize impacts on water quality and ensure compliance with U.S. laws and regulations governing ballast water discharges, upon entry into the recessed berthing area and as part of the LNG terminal operating procedures, Magnolia staff would review any applicable documentation that the visiting vessel is operating in accordance with federal standards and practices prior to discharging any ballast water. Therefore, we conclude that impacts on surface waters would occur as a result of ballast water discharge would be temporary and minor.

Cooling Water Discharge

During operation, LNG carriers and LNG barges require water for cooling of the main engine/condenser, diesel generators, and fire main auxiliary and hotel services (Hunt, 2003). The volume of water required for cooling varies depending on what mode of operation the vessel is in (i.e., transit, maneuvering, in-port). Transit mode would be used during open ocean transit. Magnolia indicated that the LNG carrier would be operating in maneuvering mode from the time it embarks the pilot at the Calcasieu "CC" buoy until it is berthed at the LNG terminal. While at the LNG terminal (in-port mode), LNG carriers would need cooling water for the auxiliary diesel engines that are used to generate electrical power for onboard systems while loading.

As shown in table 4.3.2-2, water required for engine cooling would vary greatly based on the type of vessel calling on the LNG terminal. Steam-powered LNG carriers (maximum LNG capacity of 138,000 m^3) would have the highest cooling water requirements, using 11.7 million gallons of water for engine cooling during maneuvering and while docked at the LNG terminal.[7] During the same period, LNG carriers with dual fuel/diesel electric engines (maximum LNG capacity of 218,000 m^3) would use 5.5 million gallons of water. LNG barges would require only 535 gallons of water due to their smaller size (maximum LNG capacity of 15,000 m^3), increased maneuverability, and reduced time spent at the LNG terminal.

TABLE 4.3.2-2

Estimates of LNG Carrier Cooling Water Use and Intake Rates at the LNG Terminal

Vessel Type	Time to Maneuver (hours)	Time to Load (hours)	Maneuvering Rate (gallons per hour)	Maneuvering Volume (gallons)	In-port Rate (gallons per hour)	In-port Volume (gallons)	Total Volume (gallons)
Duel fuel/diesel electric LNG carrier	2	18	1,680,000	3,360,000	120,000	2,160,000	5,520,000
Steam-powered LNG carrier	3	18	2,820,000	8,460,000	180,000	3,240,000	11,700,000
Articulated tug/barge	1.25	4	300	375	40	160	535

Impacts on surface waters as a result of cooling water intake and discharge would be primarily limited to an increase in water temperature in the vicinity of the LNG vessel. Cooling water return temperatures vary widely depending on the type of LNG carrier and mode of operation. Based on a review of available information, we anticipate that cooling water discharged at the LNG terminal could range between 2.7 ˚F and 7.2 °F warmer than ambient water temperatures (Caterpillar, 2007, 2011, 2012). Due to the limited temperature differences, relatively small volume of discharge compared to the total water within the Industrial Canal (approximately 0.6 percent), and location within an active port that is already subject to withdrawals and discharges of vessel engine cooling water, we anticipate that the

7 Cooling water requirements at the LNG terminal assume that LNG carriers and LNG barges would depart the terminal immediately after completion of the 18-hour and 4-hour loading process, respectively. Therefore, the cooling water requirements do not take into account potential delays due to inclement weather or other users of the Industrial Canal and Calcasieu Ship Channel.

increased water temperature levels would diminish shortly after discharge and, therefore, would have temporary and minor impacts on water quality. Information on the effects of cooling water intakes and discharges on aquatic resources is presented in section 4.6.2.2.

While in transit through the Gulf of Mexico, the temperature of water used for engine cooling could increase by as much as 9.5 ˚F. However, due to the volume of water within the Gulf of Mexico and the use of established shipping lanes where frequent vessel traffic would increase the speed at which the warmer water would be diluted to ambient temperatures, we conclude that increased water temperatures would have a negligible impact on water quality within the Gulf of Mexico.

Site Modification and Stormwater Runoff

During site preparation activities at the LNG terminal, one intermittent stream within the LNG terminal site and the 33.5-acre borrow pit within the dredge material placement area would be filled. This intermittent stream is not hydrologically connected to the Industrial Canal and likely serves as a drainage pathway for adjacent upland areas. The COE, New Orleans District did not include this waterbody in its May 14, 2014 jurisdictional determination for the LNG terminal site; therefore, this waterbody is not defined as a water of the United States under section 404 of the CWA, and mitigation for the fill of this waterbody would not be required.

Prior to the commencement of dredging activities, the borrow pit would be drained and the water (approximately 60.6 million gallons) would be pumped back to the eastern end of the Industrial Canal using the temporary effluent pipeline, where it would be discharged in accordance with federal and state permit requirements. Dredge material placement would result in the borrow pit being permanently filled and converted to upland grassland or meadow habitat. Impacts on the borrow pit would be permanent; however, if determined to be jurisdictional by the COE, New Orleans District, impacts would be fully mitigated through implementation of Magnolia's project-specific *Compensatory Mitigation Plan* (see our recommendation in section 4.4.1 as well as section 4.4.4 for additional information). Upon completion of dredge material placement and dewatering, the earthen dikes within the dredge material placement area would be graded to facilitate drainage of the site and minimize erosion, and the area would be reseeded.

Ground disturbance and filling two waterbodies during construction would increase stormwater discharges, resulting in a temporary increase in suspended sediment levels. As described in section 4.2.2, there are no contaminated soils within the LNG terminal site, including the portion of the site within the Industrial Canal. Therefore, increased stormwater runoff is not expected to result in the introduction of contaminated sediments to surface waters within the Industrial Canal. To minimize impacts on water quality due to increased stormwater runoff, land disturbing activities would be conducted in compliance with the LPDES, General Permit for stormwater discharges from construction activities of 5 acres or more; Magnolia's project-specific Construction SWPPP; and Magnolia's Plan and Procedures. Measures to control erosion and sedimentation during construction are discussed in detail in section 4.2.3.

Operation of the LNG terminal would increase the amount of impervious surface, which would result in an increased volume of stormwater runoff. Stormwater would be directed into two holding basins (east and west) for dilution and temperature adjustment to ambient levels before being discharged into the Industrial Canal in accordance with Magnolia's Operational SWPPP, and LDEQ and EPA requirements. With the implementation of these mitigation measures, we have determined that stormwater discharges resulting from construction and operation of the LNG terminal would result in temporary and minor impacts on surface waters.

Hydrostatic Testing

Magnolia would hydrostatically test the integrity of the dredge material and effluent pipelines before beginning dredging activities. Similarly, before being placed into service, plant piping and the LNG storage tanks would be hydrostatically tested. Both municipal sources and surface waters would be used for hydrostatic testing. For each component requiring hydrostatic testing, table 4.3.2-3 identifies the volume of water required, proposed water source, and discharge location.

TABLE 4.3.2-3

Hydrostatic Test Water Requirements for the LNG Terminal

Component Tested	Water Source	Discharge Location	Volume Required (gallons)
Dredge material and effluent pipelines	Borrow pit or Industrial Canal	Industrial Canal	1,000,000
Plant piping	Calcasieu Parish District No. 12 Water Works	Stormwater holding basin	20,000
Magnolia Meter Station and interconnect pipeline	City of Lake Charles	Meter station site	13,000
LNG storage tanks	Industrial Canal	Industrial Canal	26,200,000
LNG storage tank cleaning after completion of hydrostatic test	Calcasieu Parish District No. 12 Water Works	Industrial Canal	27,000

Hydrostatic test water used for the dredge material and effluent pipelines would be obtained from either the borrow pit within the dredge material placement area or the Industrial Canal. Following the completion of hydrostatic testing, water would be discharged into the Industrial Canal.

To test plant piping, Magnolia would obtain approximately 20,000 gallons of water from the proposed tie-in to Calcasieu Parish District No. 12 Water Works line that runs along the southern boundary of the LNG terminal. To minimize the volume of water, Magnolia would recycle the water over five intervals; between tests, the water would be held in a water tank. Following completion of the final test, water would be discharged on site into a stormwater holding basin prior to ultimate discharge into the Industrial Canal.

To test the Magnolia Meter Station and interconnect pipeline, KMLP would obtain approximately 13,000 gallons of water from the City of Lake Charles, which would be trucked to the LNG terminal site. Following completion of the final test, water would be discharged on site to the southeastern corner of the Magnolia Meter Station site.

To test the LNG storage tanks, approximately 26.2 million gallons of water would be withdrawn from the Industrial Canal through screened intake hoses at rates ranging from 1,500 to 3,333 gallons per minute. As with the plant piping, Magnolia proposes to conduct hydrostatic testing of the LNG storage tanks independently, allowing the water to be reused. Because water from the Industrial Canal would be used to test the storage tanks, as the hydrostatic test water is discharged, the tank walls would be washed with a total of approximately 27,000 gallons of potable water to remove any silt particles that adhere to the walls of the tanks. Both hydrostatic test and LNG storage tank wash water would be discharged to the Industrial Canal. A detailed description of the hydrostatic test process for the LNG storage tanks is provided in section 2.5.1.6.

To minimize potential impacts on water quality, no chemical additives would be used in association with hydrostatic testing, and Magnolia and KMLP would comply with all testing requirements and environmental conditions of the LPDES General Permit for Discharges of Hydrostatic Test Water. Therefore, we conclude that impacts on surface waters as a result of hydrostatic testing would be negligible.

LNG Storage Tank Deluge System

During operation of the LNG terminal, an LNG storage tank deluge system would be used to distribute water over the LNG storage tank's outer surfaces for cooling in the event of a fire on the adjacent tank. The deluge system would be operated in the event of a fire emergency as well as periodically for system maintenance and testing. When in operation, the fire deluge pumps would appropriate water from the Industrial Canal at a rate of up to 6,300 gallons per minute. Water used for deluge purposes would be directed into two holding basins (east and west) before being discharged back into the Industrial Canal. Because of the infrequent operation of the system and eventual discharge of the water back into the Industrial Canal, we conclude that the LNG storage tank deluge system would have negligible impacts on water quality within the Industrial Canal.

Spills

During construction and operation, hazardous materials resulting from spills or leaks flushed into waterbodies with stormwater runoff or entering the Industrial Canal and the Calcasieu River could have an adverse impact on water quality. To prevent spills and leaks, Magnolia would implement its project-specific *Spill Prevention Plan* during construction and its SPCC Plan during operation of the LNG terminal, which outline potential sources of releases at the site, measures to prevent a release, and initial responses in the event of a spill (see our recommendation and additional discussion in section 4.2.3.1). Given the impact minimization and mitigation measures described above, we conclude that impacts on surface waters due to spills or leaks during construction and operation of the LNG terminal would be temporary and minor.

KMLP Facilities

Header Pipelines

Seven waterbodies (two intermittent and five ephemeral) would be affected by construction and operation of the low and high pressure header pipelines (see table 4.3.2-1). Two of the affected waterbodies are adjacent to roads that would be crossed using the conventional bore method. This crossing method is designed to avoid disturbing the bed or bank of the waterbodies. Three waterbodies would be crossed using dry crossing construction techniques (i.e., dam-and-pump or flume method) if flowing water is present within the waterbodies at the time of construction; if no water is present at the time of construction, traditional upland installation techniques would be used. One waterbody is within a construction workspace associated with an access road, and impacts on the final waterbody would be limited to installation of a culvert.

Activities associated with construction of the header pipelines include clearing and grading, in-stream trenching, trench dewatering, and backfilling. These activities could increase sedimentation rates, turbidity levels, and water temperature; decrease dissolved oxygen concentrations; and release chemical or nutrient pollutants from sediments. In addition, refueling of vehicles and storage of fuel, oil, or other hazardous materials near surface waters could result in accidental spills that could contaminate surface waters.

KMLP would minimize potential impacts on surface waters by implementing the FERC Procedures and by utilizing dry crossing techniques, if flowing water is present at the time of construction. Dry crossing methods isolate the in-stream trenching activities from flowing water. In order to minimize potential impacts associated with an accidental spill of fuel, oil, or other hazardous materials, KMLP would implement its project-specific SPCC Plan, which identifies potential sources of hazardous materials present during construction activities and the measures that would be implemented to prevent, contain, and clean up accidental releases. With the implementation of these plans and the FERC Procedures, impacts on water quality in the event of a spill or leak are expected to be minor.

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

Aboveground Facilities

Construction of Compressor Station 760 would result in temporary impacts on two intermittent and three ephemeral waterbodies. One waterbody (S1AAC006) is within the permanent footprint of the facility; however, impacts would be limited to the installation of a culvert (no permanent fill would occur).

Modifications at the ANR Meter Station would result in temporary impacts on one ephemeral roadside ditch, which parallels the southern boundary of the temporary workspace at the site. One waterbody (an ephemeral agricultural ditch) parallels the southern boundary of the TGT Meter Station; impacts on this waterbody would be limited to the installation of a culvert.

Impacts on water quality associated with construction of Compressor Station 760 and modifications at the ANR and TGT Meter Stations would be similar to those described above and would be minimized through the implementation of the FERC Procedures and KMLP's project-specific SPCC Plan (see *Header Pipelines*, above).

Hydrostatic Testing

The header pipelines would be hydrostatically tested prior to being placed into service to ensure structural integrity in accordance with DOT standards (49 CFR 192). A detailed description of the hydrostatic test process is provided in section 2.5.2.1. Approximately 346,000 gallons of water would be required to complete hydrostatic testing of the header pipelines and meter station modifications (320,000 gallons for the low pressure header, 16,000 gallons for the high pressure header, and 10,000 gallons for the meter station modifications). To minimize the volume of water, KMLP would recycle the water used to test the meter station modifications; between tests, the water would be held in a water truck. As described in section 4.3.1.4, KMLP proposes to obtain water for hydrostatic testing activities from the City of Eunice, which would be transported by truck to the construction right-of-way.

After successful completion of hydrostatic testing, water would be discharged to an agricultural area within the compressor station site using energy dissipation devices as needed to minimize erosion and sedimentation. KMLP would not add any chemicals to the hydrostatic test water, and the discharged water would be tested, monitored, and reported in accordance with the LPDES Hydrostatic Test Water Discharge Permit (Permit Number LAG670000).[8] In addition to complying with the requirements of the

[8] Permit LAG670000 requires testing for flow rate, total suspended solids, oil and grease, total organic content, benzene, BTEX, lead, and pH prior to initiating discharge as well as daily for the first week of discharge. If the discharge extends beyond one calendar week, weekly sampling is required. Discharge Monitoring Reports are required to be submitted to the LDEQ on a quarterly basis.

LPDES Hydrostatic Test Water Discharge Permit, KMLP would minimize the environmental impacts from the discharge of hydrostatic test water by implementing the measures outlined in the FERC Procedures, which include:

- locating hydrostatic test manifolds outside of wetlands and riparian areas to the maximum extent practicable;
- regulating discharge rates;
- using energy dissipation devices; and
- installing sediment barriers as necessary to prevent erosion, streambed scour, suspension of sediments, or excessive streamflow.

4.4 WETLANDS

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

Wetlands are protected under section 404 of the CWA, which is implemented by the COE, New Orleans District. Section 404 establishes standards to evaluate and reduce total and net impacts on wetlands under the jurisdiction of the COE. These standards require avoidance of wetlands where possible and minimization of disturbance where impacts are unavoidable, to the degree practicable. Magnolia and KMLP must also demonstrate that appropriate steps have been taken to minimize wetland impacts, in compliance with the COE's section 404(b)(1) guidelines that restrict discharges of dredged or fill material where less environmentally damaging alternatives exist.

Wetland impacts authorized under section 404 of the CWA also require state water quality certification under section 401 of the CWA. Water quality certification has been delegated to the state agencies (in the State of Louisiana, the LDEQ has jurisdiction over section 401 of the CWA), with review by the EPA.

4.4.1 Existing Wetland Resources

Magnolia conducted wetland delineations at the LNG terminal in July 2013; KMLP conducted wetland delineations at the Magnolia Meter Station and along the interconnect pipeline within the LNG terminal and at the KMLP facilities in March 2014. Wetland delineations were performed in accordance with the COE's Wetlands Delineation Manual and the Atlantic and Gulf Coastal Plain regional supplement, which require the identification of wetlands based on the presence of three parameters: hydrophytic vegetation, hydric soils, and wetland hydrology (Environmental Laboratory, 1987; COE, 2010b).

Wetland types identified during surveys within the proposed LNG terminal site and KMLP facilities were classified as palustrine emergent, palustrine scrub-shrub, and estuarine intertidal emergent wetlands. Palustrine wetlands are defined as non-tidal wetlands dominated by trees, shrubs, persistent emergent vegetation, emergent mosses, or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 parts per trillion. Palustrine wetlands have traditionally been called marshes, swamps, bogs, fens, and prairies, and may include small shallow permanent and intermittent waterbodies referred to as ponds. Estuarine wetlands are defined as tidal wetlands that are usually semi-enclosed by land, but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from land (Cowardin et al., 1979).

To date, access has not been granted to conduct the necessary wetland delineations along the dredge material and effluent pipeline route or within the dredge material placement area. Therefore, NWI data and aerial photography were used to identify wetlands within these areas. Because Magnolia has not yet conducted wetland delineations within these areas, **we recommend that:**

- **<u>As soon as they are available and prior to the start of construction</u>, Magnolia file with the Secretary, for review and written approval by the Director of OEP, the results of the wetland and waterbody surveys within areas associated with the transport and placement of dredge materials.**

4.4.1.1 LNG Terminal

Palustrine emergent and scrub-shrub wetlands are the most common wetland type within the LNG terminal site. Palustrine emergent wetlands are present within the southern and western portions of the site. Dominant vegetation within the four palustrine emergent wetlands at the LNG terminal includes goldenrod (*Solidago sempervirens*), sand spikerush (*Eleocharis montevidensis*), dwarf spikerush (*Eleocharis parvula*), peppervine (*Ampolopsis arborea*), cattail (*Typha latifolia*), bulrush (*Scirpus robustus*), and salt bush (*Baccharis halimifolia*). One palustrine scrub-shrub wetland is present in the southern portion of the site in the vicinity of the Magnolia Meter Station. Species likely present within the scrub-shrub wetland include the species described above as well as eastern false-willow (*Baccharis halimifolia*), small spikerush (*Eleocharis minima*), southern bayberry (*Myrica cerifera*), bushy bluestem (*Andropogon glomeratus*), soft rush (*Juncus effusus*), and Chinese tallow (*Triadica sebifera*).

One estuarine intertidal emergent wetland occurs along the fringe of the south bank of the Industrial Canal on the northern edge of the LNG terminal. This wetland is a brackish marsh with dominant vegetation of common reed (*Phragmites austrilis*), salt bush, cordgrass (*Spartina alterniflora* and *S. spartinae*), sea oxide daisy (*Borrichia frutescens*), and bulrush.

As described above, NWI data and aerial photography were used to identify wetlands along the dredge material and effluent pipeline routes and within the dredge material placement area. Land along the dredge material and effluent pipeline routes is graveled or paved, and does not appear to contain wetlands. Two small wetlands are present within the southern portion of the dredge material placement area, including one palustrine emergent wetland and one palustrine forested/scrub-shrub wetland. Wetland species present within the palustrine emergent wetland are likely to be similar to those described above within the LNG terminal site. Wetland species likely to be present within the forested/scrub-shrub wetland include willow (*Salix nigra*), slash pine (*Pinus elliotti*), loblolly pine (*Pinus taeda*), salt bush, American beautyberry (*Callicarpa americana*), yaupon (*Ilex vomitoria*), smartweed (*Polygonum hydropiperoides*), slender arrowhead (*Sagittaria graminea*), and wingleaf primrose-willow (*Ludwigia decurrens*).

4.4.1.2 KMLP Facilities

Palustrine emergent wetlands are the only wetland type within the KMLP facilities. Based on field observations and visual inspection of aerial photographs, wetlands within and adjacent to the KMLP facilities are largely within previously disturbed areas adjacent to existing facilities and roadways. Dominant vegetation within these emergent wetlands includes dwarf spikerush, sedge (*Cyperus sp.*), Bermudagrass (*Cynodon dactylon*), grassleaf rush (*Juncus marginatus*), and torpedograss (*Panicum repens*).

4.4.2 Wetland Impacts and Mitigation

4.4.2.1 LNG Terminal

Construction of the LNG terminal would result in the permanent loss of 16.2 acres of wetlands, including 8.1 acres of palustrine emergent wetlands, 6.6 acres of palustrine scrub-shrub wetland, 1.0 acre of estuarine emergent intertidal wetland, and 0.5 acre of palustrine forested/scrub-shrub wetland (see table 4.4.2-1). Approximately 87 percent (14.0 acres) of the wetlands would be converted to upland industrial or open land within the LNG terminal site, 7 percent (1.2 acres) would be converted to an upland herbaceous community within the dredge material placement area, and the remaining 6 percent (1.0 acre) would be converted to open water within the recessed berthing area or filled for shoreline stabilization. In its jurisdictional determination for the LNG terminal (COE, 2014a), the COE determined that wetlands delineated by KMLP in the vicinity of the Magnolia Meter Station are not jurisdictional under section 404 of the CWA. However, because these wetlands (a 7.9-acre palustrine emergent and scrub-shrub wetland complex and a less than 0.1 acre palustrine emergent wetland) meet the three parameters of a wetland (Environmental Laboratory, 1987), they are included in our analysis.

TABLE 4.4.2-1

Wetlands Affected by the LNG Terminal and KMLP Facilities (in acres) [a]

Facility	Wetland ID	Wetland Classification	Construction Impact (acres)	Operation Impact (acres)
LNG TERMINAL FACILITIES				
LNG terminal	WW-001-001	Palustrine emergent	0.1	0.1
	WW-001-002	Estuarine emergent intertidal	1.0	1.0
	WW-001-003	Palustrine emergent	6.0	6.0
	W1ACA001 [b]	Palustrine emergent	1.3	1.3
	W1ACA001 [b]	Palustrine scrub-shrub	6.6	6.6
	W1ACA002 [b]	Palustrine emergent	<0.1	<0.1
Dredge material placement area	NWI 1	Palustrine forested/scrub-shrub	0.5	0.5
	NWI 2	Palustrine emergent	0.7	0.7
Total for LNG Terminal Facilities			**16.2**	**16.2**
KMLP FACILITIES				
High pressure header pipeline	W1AAC002 [c]	Palustrine emergent	0.1	<0.1
TRANSCO Meter Station	W1AEV001 [c]	Palustrine emergent	0.1	0.1
TGT Meter Station	W1AAC003 [c]	Palustrine emergent	0.2	0.2
Total for KMLP Facilities			**0.3**	**0.3**
TOTAL			**16.5**	**16.5**

a The totals shown in this table may not equal the sum of the addends due to rounding.

b Wetlands W1ACA001 and W1ACA002 were delineated by KMLP as part of its review of the area within and around the proposed Magnolia Meter Station. In its May 14, 2014 jurisdictional determination for the LNG terminal, the COE determined that these wetlands are not jurisdictional under section 404 of the CWA. However, because they meet the three parameters of a wetland, they are included in our analysis.

c Wetlands W1AAC002, W1AAC003, and W1AEV001 were delineated by KMLP in March 2014. In its September 10, 2014 jurisdictional determinations for the facilities, the COE determined that these wetlands are not jurisdictional under section 404 of the CWA. However, because the wetlands meet the three parameters of a wetland, they are included in our analysis.

The estuarine emergent intertidal wetland that would be affected at the LNG terminal site comprises a portion (70 percent) of a 1.4-acre wetland fringe along the southern shore of the Industrial

Canal. During project design, Magnolia minimized project impacts on this wetland to the extent feasible, while still allowing creation of the recessed berthing area. Magnolia would minimize construction-related impacts on the adjacent estuarine emergent intertidal wetland by implementing its project-specific Procedures, except where deviations are justified (see section 4.4.3.1), and the wetland mitigation measures determined necessary by the COE through the section 10/404 permit process. Magnolia would be required to mitigate for unavoidable impacts on jurisdictional wetlands as part of its project-specific Compensatory Mitigation Plan, which is discussed in additional detail in section 4.4.4.

During operation, vessel traffic along the Industrial Canal and within the recessed berthing area could result in increased shoreline erosion, potentially impacting the remaining 0.4 acre of wetland fringe along the Industrial Canal due to increased wave activity. As described in section 4.3.2.2, Magnolia would install rock armoring to provide scour protection from propeller wash both within and along the east and west ends of the recessed berthing area (Moffatt and Nichol, 2014). In addition to providing scour protection, the rock armoring would prevent erosion of the adjacent unprotected shoreline by wave activity from vessels maneuvering within the recessed berthing area. With the implementation of Magnolia's proposed rock armor, and considering the anticipated vessel speed and the fact that the Industrial Canal is an existing ship channel regularly subject to commercial marine traffic, we have determined the increase in vessel traffic within the Industrial Canal and recessed berthing area would cause a negligible increase in erosion of the adjacent wetland fringe.

4.4.2.2 KMLP Facilities

Construction and operation of the KMLP facilities would permanently convert 0.3 acre of palustrine emergent wetlands to upland industrial use (see table 4.4.2-1), including 0.2 acre at the TGT Meter Station and very small areas (totaling 0.1 acre) at the TRANSCO Meter Station and where connection of the high pressure header pipeline would require modifications of existing interconnect facilities adjacent to the Pine Prairie Meter Station. In its jurisdictional determinations for the KMLP facilities (COE, 2014b, 2014c), the COE determined that wetlands present are not jurisdictional under section 404 of the CWA. However, because the wetlands meet the three parameters of a wetland (Environmental Laboratory, 1987), they are included in our analysis.

Ground-disturbing activities, including clearing and grading of temporary work areas, excavation activities associated with the meter stations and pipeline interconnection could temporarily affect the rate and direction of water movement within wetlands. If contours and elevations are not properly restored, these effects could adversely impact wetland hydrology and revegetation by creating soil conditions that may not support wetland communities and hydrophytic vegetation at pre-construction levels. If soils are not properly segregated during construction, the resulting mixed soil layers could alter biological components of the wetland and affect the reestablishment of native wetland vegetation. The temporary stockpiling of soil and movement of heavy machinery across wetlands could also lead to inadvertent compaction and furrowing of soils, which could alter natural hydrologic patterns, inhibit seed germination, and increase seedling mortality. Heavy equipment could also introduce non-native and invasive species to the disturbed soil. Altered surface drainage patterns, stormwater runoff, runoff from disturbed areas, and accidental spills could also negatively affect wetland regeneration. With the exception of the alternative measures described in section 4.4.3.2, KMLP would minimize impacts on wetlands by implementing the FERC Procedures.

Following construction, the less than 0.1 acre of wetland within temporary workspace would be restored in accordance with the FERC Procedures and allowed to revegetate naturally using the seedbank within the existing topsoil. Within 1 to 2 years, the area would be expected to transition back into a community with a function similar to that of the wetland prior to construction. In the event that a pipeline anomaly (i.e., corrosion, dent, rupture) is detected during routine inspections that could require pipeline excavation or replacement within a wetland, impacts would be similar to those described above for construction.

4.4.3 Alternative Measures to the FERC Procedures

4.4.3.1 LNG Terminal

Magnolia proposes to locate the administration and control building and portions of the workshop within wetland WW-001-003. Similarly, KMLP proposes to locate portions of the Magnolia Meter Station within wetland W1ACA001. Table 4.4.3-1 identifies the wetlands affected, proposed facilities, and justification for the alternative measure.

TABLE 4.4.3-1

Alternative Measures Requested for Impacts Within and Near Wetlands

Facility	Wetland ID	Procedures Section Reference	Deviation Description	Justification for Deviation	FERC Staff Conclusion
LNG TERMINAL					
Administration and control building	WW-001-003	VI.A.6	Aboveground facilities within a wetland	All areas within the site boundary are required for construction and operation of the LNG terminal.	Sufficiently justified. A suitable alternative location for the facility that would completely avoid wetlands is not available.
Workshop	WW-001-003	VI.A.6	Aboveground facilities within a wetland	All areas within the site boundary are required for construction and operation of the LNG terminal.	Sufficiently justified. A suitable alternative location for the facility that would completely avoid wetlands is not available.
Magnolia Meter Station	W1ACA001	VI.A.6	Aboveground facilities within a wetland	All areas within the site boundary are required for construction and operation of the LNG terminal.	Sufficiently justified. A suitable alternative location for the facility that would completely avoid wetlands is not available.
KMLP FACILITIES					
TGT Meter Station	W1AAC003	VI.A.6	Aboveground facilities within a wetland	Wetland impacts could not be avoided completely due to the locations of existing aboveground and subsurface infrastructure at the meter station.	Sufficiently justified.[a] A suitable upland alternative location for the required modification is not available.
TRANSCO Meter Station	W1AEV001	VI.A.6	Aboveground facilities within a wetland	Wetland impacts could not be avoided completely due to the locations of existing aboveground and subsurface infrastructure at the meter station.	Sufficiently justified.[a] A suitable upland alternative location for the required modification is not available.

[a] Although adequate justification has been provided for these alternative measures, KMLP would be required to comply with other requirements of the FERC Procedures. Erosion and sedimentation control devices should be monitored and maintained in these areas more frequently than the minimum time intervals required by the FERC Procedures until final grading and revegetation have been completed.

Section VI.A.6 of the FERC Procedures states that aboveground facilities should be located outside of wetlands, except where such siting would prohibit compliance with DOT regulations. Construction and operation of the administration and control building, the workshop, and the Magnolia Meter Station would be constructed on 0.9 acre of palustrine emergent and scrub-shrub wetlands, permanently converting these areas to industrial land (see table 4.4.3-1). Magnolia has stated that construction and operation of the LNG terminal would require 114 acres of the 115-acre site, with the exception of approximately 0.4 acre of estuarine emergent intertidal wetland and 0.6 acre of upland vegetation along the Industrial Canal. Because the proposed alternative measures to section VI.A.6 of the FERC Procedures are necessary due to land use requirements and limitations at the LNG terminal, we have determined that the proposed deviations from the FERC Procedures are reasonable and adequately justified.

4.4.3.2 KMLP Facilities

KMLP proposes to increase the footprint of two aboveground facilities (the TRANSCO and TGT Meter Stations) within wetlands, resulting in the permanent conversion of 0.3 acre of palustrine emergent wetlands to industrial use (see table 4.4.3-1). KMLP stated that wetland impacts could not be avoided completely due to the locations of existing aboveground and subsurface infrastructure at the existing aboveground facility locations. Because the proposed facilities would be located within and/or adjacent to existing aboveground facility locations, we have determined that the proposed siting is reasonable and adequately justified.

4.4.4 Compensatory Mitigation

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

As discussed in section 4.4.2.2, construction and operation of the LNG terminal and KMLP facilities would result in the permanent loss of 7.9 and 0.3 acre of wetlands, respectively, that are not jurisdictional under section 404 of the CWA. Therefore, Magnolia and KMLP would not be required to offset these impacts.

As required by 33 CFR 332.3, Magnolia is required to propose compensatory mitigation that is commensurate with the amount and type of wetland impacts resulting from construction and operation of the project. There are three mechanisms for providing compensatory mitigation: permittee-responsible compensatory mitigation, mitigation banks, and in-lieu fee mitigation. As part of the section 10/404 permit process, Magnolia would be required to develop a *Compensatory Mitigation Plan* to mitigate unavoidable wetland impacts. The *Compensatory Mitigation Plan* would be subject to review and approval by the District Engineer for the COE, New Orleans District as part of the section 404/10 permit process. Magnolia has stated that permanent impacts on wetlands that are jurisdictional under section 404 of the CWA would be mitigated through the purchase of credits from an established and approved mitigation bank. Magnolia filed its section 404/10 permit applications with the COE, New Orleans District in May 2014. However, because the *Compensatory Mitigation Plan* has not been finalized and approved by the COE, **we recommend that**:

- **<u>Prior to filing its Implementation Plan</u>, Magnolia file with the Secretary its *Compensatory Mitigation Plan* and documentation of COE approval of the plan.**

4.5 VEGETATION

The LNG terminal and KMLP facilities would be situated in the Western Gulf Coastal Plain ecoregion, which spans coastal portions of Texas and Louisiana. With little topographical relief, the ecoregion is generally favorable to grasslands and croplands (EPA, 2013b) though, historically, the region was dominated by longleaf pine (*Pinus palustris*) forests and savannas (LDWF, 2005).

4.5.1 Existing Vegetation Resources

4.5.1.1 LNG Terminal Facilities

The Louisiana Natural Heritage Program (LNHP) (2009) of the LDWF recognizes 68 natural vegetation communities in Louisiana. Components of some of these natural vegetation communities are found in the vicinity of the LNG terminal. The LNG terminal site is bordered by the Industrial Canal to the north and the Intracoastal Waterway to the west. To the south, a large wetland complex and associated drainages flow towards the Intracoastal Waterway. While these geographical characteristics and hydrologic connections usually typify coastal wetlands, past dredge spoil disposal activities disturbed the vegetation communities and raised elevations at the site from between -2 and 8 feet (USGS, 1955) to upwards of 25 feet (USGS, 2012). As a result of dredge spoil disposal, vegetation communities at the LNG terminal are limited in diversity and do not directly correlate to the natural vegetation communities described by the LNHP. Therefore, a combination of aerial photography and field investigation was used to provide a more accurate assessment of vegetation resources.

The LNG terminal site is dominated by upland shrub communities, which occur on 64 percent of the site and extend the width of the LNG terminal site (see table 4.5.1-1). Upland shrub communities present are comprised of large shrubs or small trees (less than 35 feet in height). Typical species at the LNG terminal include blackberry (*Rubus* sp.), hackberry (*Celtis laevigata*), salt bush, wax myrtle (*Myrica cerifera*), willow, and yaupon (*Ilex vomitoria*).

Forested habitat, consisting of a mixture of hardwood trees and loblolly pine (*Pinus taeda*), is present on about 29 percent of the LNG terminal site, primarily within the northern and eastern portions. As described previously, the LNG terminal site was used for the placement of dredge material between 1975 and 1984. Therefore, forested vegetation is generally comprised of trees less than 30 years old. Loblolly trees make up about 20 percent of the forest canopy. Other species observed in this community include blackberry, Chinese tallow, hackberry, hickory (*Carya* sp.), silktree (*Albizia julibrissin*), and yaupon. Although several species and characteristics described by the LNHP as Mixed Hardwood-Loblolly Pine Forest are present, the presence of Chinese tallow and silktree, which are exotic species in Louisiana, within this community are indicative of the site's past disturbance. In a conference call with Magnolia on February 3, 2014 (Magnolia, 2014b), the FWS noted that the habitat present is of very low quality.

Estuarine emergent wetland occurs along the northernmost boundary of the site, adjacent to the Industrial Canal. Although comprising less than 1 percent of the site, estuarine emergent wetlands provide important ecological functions including water purification, shoreline stabilization, and flood protection as well as support essential habitat for various life stages of many fish and wildlife species. Relatively small palustrine (freshwater) emergent wetlands occur on 10 percent of the site, mainly within the southern and northwestern portions. Typical species of these wetland communities are described in section 4.4.1.

TABLE 4.5.1-1

Vegetation Communities Affected by Construction and Operation of the LNG Terminal and KMLP Facilities (in acres) [a]

Facilities	Agriculture		Upland Herbaceous		Upland Shrub		Mixed Hardwood Loblolly Forest		Estuarine Wetland		Palustrine Wetland		Total	
	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.
LNG TERMINAL FACILITIES [b]														
LNG terminal [c]	0.0	0.0	0.0	0.0	65.0	65.0	34.0	34.0	1.0	1.0	14.0	14.0	114.0	114.0
Dredge material placement area	0.0	0.0	106.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2 [d]	1.2 [d]	107.3	1.2 [d]
Total for LNG Terminal Facilities	**0.0**	**0.0**	**106.1**	**0.0**	**65.0**	**65.0**	**34.0**	**34.0**	**1.0**	**1.0**	**15.2**	**15.2**	**221.3**	**115.2**
KMLP FACILITIES														
Header Pipelines														
Low pressure header	20.2	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.2	7.8
High pressure header	0.9	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	<0.1	1.0	0.5
Subtotal	**21.1**	**8.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**<0.1**	**21.2**	**8.3**
Aboveground Facilities														
Compressor Station 760	40.4	11.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.4	11.2
CGT Meter Station	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.3
TRANSCO Meter Station	0.6	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.7	0.1
TETCO Meter Station	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
ANR Meter Station	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Pine Prairie Meter Station	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
TGT Meter Station	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.4	0.4
Subtotal	**42.4**	**11.5**	**0.4**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**	**0.3**	**43.1**	**12.0**
Total for KMLP Facilities	**63.5**	**19.8**	**0.4**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**	**0.3**	**64.3**	**20.2**
TOTAL	**63.5**	**19.8**	**106.5**	**0.2**	**65.0**	**65.0**	**34.0**	**34.0**	**1.0**	**1.0**	**15.5**	**15.5**	**285.6**	**135.5**

a The totals shown in this table may not equal the sum of the addends due to rounding.

b The DII construction yard and the dredged material and effluent pipelines occur within areas that have undergone previous disturbance and/or have been graded and graveled; therefore, no vegetation communities occur within these areas.

c The LNG terminal includes those facilities that would be constructed and operated at the site by Magnolia as well as KMLP's Magnolia Meter Station and interconnect pipeline.

d Access to the dredge material placement area and the dredged material and effluent pipeline routes has not been granted at the time of this writing; therefore, NWI data and aerial photography were used to identify wetlands present. Magnolia has stated that wetlands identified during survey may be avoided, restored, or filled. Because actual wetland impacts have not been determined at this time, our impact analysis assumes the worst-case scenario (fill of wetlands present within the placement area and pipeline route). See additional discussion in section 4.4.2.1.

Land within the DII construction yard and along the dredged material and effluent pipeline routes has undergone previous disturbance and/or has been graded and graveled; therefore, vegetation communities are not present within these project components. Vegetation within the dredge material placement area is largely composed of upland herbaceous communities. Typical species present include soft-leaf mimosa (*Mimosa malacophylla*), Canadian horseweed (*Conyza canadensis*), Canadian goldenrod (*Solidago canadensis*), pepper vine, and southern dewberry (*Rubus trivalis*). Because the placement area is currently used by CB&I for staging and laydown, vegetation is routinely mowed and maintained in a graminaceous or weedy state. Based on review of NWI data, the dredged material placement area also contains small palustrine emergent and forested wetlands, which are described in section 4.4.1.

4.5.1.2 KMLP Facilities

The proposed KMLP facilities would be primarily within existing meter stations and on adjacent agricultural land, which comprises 99 percent of the vegetated communities within the affected areas. Small areas of upland herbaceous communities occur within the Pine Prairie and TGT Meter Stations. These communities contain Bermudagrass (*Cynodon* spp.), white clover (*Trifolium repens*), common vetch (*Vicia sativa*), wild geranium (*Geranium maculatum*), and southern dewberry (*Rubus trivalis*).

Small areas containing palustrine emergent wetlands are present at the TGT and TRANSCO Meter Stations as well as along the high pressure header pipeline route. Typical species within these wetlands are described in section 4.4.1.

4.5.2 Vegetation Impacts and Mitigation

As summarized in table 4.5.2-1, a total of 285.6 acres of vegetation would be cleared during construction of the LNG terminal and KMLP facilities. Following construction, approximately 126.0 acres would be converted to developed land within the LNG terminal (114.0 acres) and KMLP facilities (12.0 acres), 124.7 acres would return to pre-construction conditions, and 34.9 acres would be restored to a vegetated community although it would be converted from an upland scrub or palustrine wetland community to an upland herbaceous community. Overall, the projects would have the greatest impact on upland herbaceous (106.5 acres), upland shrub (65.0 acres), and agricultural (63.5 acres) vegetation communities. Proposed activities within the DII construction yard, existing meter stations, and along the dredged material and effluent pipeline routes would not affect vegetation because these areas have undergone previous disturbance and/or have been graded and graveled. Therefore, they are not discussed further in this section.

4.5.2.1 LNG Terminal Facilities

A total of 114.0 acres of vegetation would be cleared during construction at the LNG terminal site. Following construction, the majority of the vegetation affected at the terminal (80.3 acres) would be permanently converted to industrial use associated with operation of the facility, resulting in a permanent loss of 34.0 acres of mixed hardwood loblolly forest, 31.3 acres of upland shrub, and 15.0 acres of wetlands (including palustrine and estuarine emergent wetlands). Magnolia would seed the remaining 33.7 acres of land (currently an upland shrub community) within the LNG terminal site with native vegetation per NRCS recommendations, which would result in the conversion of an upland shrub community to an upland herbaceous community.

Construction activities within the dredge material placement area, including the disposal of dredged material, would affect 107.3 acres of vegetation, including 106.1 acres of upland herbaceous vegetation and 1.2 acres of palustrine wetlands.[9] Following dredging and dewatering activities, the dredge material placement area (including an existing site road and a borrow pit) would be graded and seeded in accordance with landowner requirements. As a result, 33.5 acres of open water within the borrow pit, 1.0 acre currently used as a site road, and 1.2 acres of palustrine wetland habitat would be converted to an upland herbaceous community.

Impacts on upland herbaceous communities within the dredge material placement area would be short term and minor because the site would be reseeded following dredging and dewatering activities. We would expect these areas to revegetate to a cover similar to pre-construction conditions within one to two growing seasons.

Impacts on wetlands that are jurisdictional under section 404 of the CWA at the LNG terminal and dredge material placement area would be permanent, but fully mitigated through implementation of Magnolia's project-specific *Compensatory Mitigation Plan*, which would require review and approval by the COE, New Orleans District (see our recommendation in section 4.4.1 as well as section 4.4.4 for additional information).

Magnolia's implementation of its project-specific Plan and Procedures, which require the use of temporary and permanent erosion control measures, revegetation procedures, and post-construction monitoring, would further minimize impacts on vegetation communities within and adjacent to the LNG terminal and within the dredge material placement area. Due to the limited vegetation diversity within these areas caused by previous disturbances, the temporary nature of impacts associated with the site, and the proposed mitigation measures, we have determined that impacts on vegetation from construction and operation of the LNG terminal would be permanent, but minor.

4.5.2.2 KMLP Facilities

As indicated in table 4.5.2-1, construction of KMLP facilities would affect a total of 64.3 acres of vegetation, including 21.2 acres associated with the header pipelines and 43.1 acres associated with the aboveground facilities. The majority of the vegetation affected by the KMLP facilities would be agricultural, which comprises 99 percent of the vegetation affected.

<u>Header Pipelines</u>

Construction of the header pipelines would affect 21.1 acres of agricultural vegetation and 0.1 acre of palustrine wetlands. Following construction, 8.3 acres of agricultural land (7.8 acres for the low pressure header pipeline and 0.5 acre for the high pressure header pipeline) and less than 0.1 acre of wetland within the permanent easement associated with the high pressure header pipeline would be restored to pre-construction conditions but would be subject to routine maintenance. The remaining 12.9 acres of vegetation within construction workspaces and additional workspaces would be allowed to revert to pre-construction condition in accordance with the FERC Plan and Procedures, NRCS recommendations, other agency requirements and permit conditions, and landowner requests.

KMLP would construct the low and high pressure header pipelines within a 125-foot-wide construction right-of-way. In addition, construction of the low pressure header pipeline would require additional workspaces at road and utility crossings. During construction, KMLP would remove surface vegetation and grade the construction right-of-way as necessary to facilitate pipeline installation and allow for safe operation of equipment. Though no forested vegetation occurs within the header pipeline

---

[9] As described in section 4.4.1, access to the dredge material placement area has not been granted at the time of this writing; therefore, NWI data was used to identify wetlands present. Our description and analysis of wetland impacts at the dredged material placement area will be updated pending receipt of the results of Magnolia's wetland delineation.

workspaces, any trees present would be removed only where necessary for construction purposes. Vegetation within some portions of the construction workspace would be left in place and some non-woody vegetation would be mowed to minimize soil erosion. Following construction, KMLP would restore the construction workspaces to pre-construction conditions and contours in accordance with the FERC Plan and Procedures, NRCS recommendations, other agency requirements and permit conditions, and landowner requests. KMLP would maintain a 50-foot-wide permanent easement over each of the header pipelines, which would be adjacent to, but would not overlap with, the permanent easement over KMLP's existing mainline.

The primary impacts on vegetation from construction of the header pipelines would be the cutting, clearing, and/or removal of existing vegetation within the construction workspace. The duration and magnitude of impacts would depend on the type and amount of vegetation affected, the rate at which vegetation regenerates after construction, and the frequency of vegetation maintenance conducted on the permanent easement during pipeline operation. In addition, revegetation would depend on factors such as local climate, soil types, and land use. Impacts on agriculture and palustrine wetland communities would be minor and short term because we would expect these areas to revegetate to a cover similar to pre-construction conditions within one to two growing seasons. With the exception of the measures described in section 4.4.3.2, KMLP's implementation of the FERC Plan and Procedures, which require the use of temporary and permanent erosion control measures, topsoil segregation in select areas, testing and mitigation for soil compaction, and limited routine vegetation maintenance would minimize impacts on vegetation. In addition, disturbed areas would be routinely monitored until restoration and revegetation are successful in accordance with the FERC Plan and Procedures.

<u>Aboveground Facilities</u>

Construction of the aboveground facilities would affect a total of 43.1 acres of vegetation, including 42.4 acres of agriculture, 0.4 acre of upland herbaceous, and 0.3 acre of palustrine wetland communities. Following construction, 12.0 acres of vegetation (including 11.5 acres of agriculture, 0.3 acre of palustrine wetland, and 0.2 acre of upland herbaceous communities) would be permanently converted to industrial land associated with the new or modified aboveground facilities. The remaining 31.1 acres of vegetation within construction workspaces and additional workspaces would be allowed to revert to pre-construction condition in accordance with the FERC Plan and Procedures, NRCS recommendations, other agency requirements and permit conditions, and landowner requests.

To minimize impacts on vegetation communities during and after construction of the aboveground facilities, KMLP would conduct the work associated with the meter station modifications within or adjacent to existing meter stations. With the exception of the measures described in section 4.4.3.2, KMLP would also implement the FERC Plan and Procedures, which require the use of temporary and permanent erosion control measures, topsoil segregation in select areas, testing and mitigation for soil compaction, post-construction monitoring, and limited routine vegetation maintenance. All disturbed areas would be routinely monitored in accordance with the FERC Plan and Procedures until restoration and revegetation are successful.

With the implementation of the mitigation measures described above, we conclude that construction and operation of the KMLP facilities would have a permanent, but minor impact on vegetation communities.

4.5.3 Exotic or Invasive Plant Communities and Noxious Weeds

Exotic plant communities, invasive species, and noxious weeds can out-compete and displace native plant species, thereby negatively altering the appearance, composition, and habitat value of affected areas. In accordance with the Plant Protection Act of 2000 (7 USC 7701), 13 plants have been federally designated as noxious weeds that could occur in Louisiana (NRCS, 2015), and one plant has been designated as a noxious weed, Chinese tallow, by the State of Louisiana (Louisiana Revised Statutes Title 3 Part 1791).

Field surveys at the LNG terminal site identified Chinese tallow and silktree. Chinese tallow is an exotic (introduced) tree that grows and spreads quickly. Intensive herbicide application is necessary to control this species because fire and mechanical removal (chopping and root removal) fail to control the aggressive seedlings (USGS, 2000). Silktree is an exotic species though it is not federally or state-designated as a noxious weed. Magnolia would implement its project-specific *Noxious Plant Control Plan* during construction to minimize the spread of Chinese tallow. Magnolia would implement a Chinese tallow control and maintenance plan during operation of the LNG terminal, which would require ongoing mechanical (mowing, cutting, and hand pulling) and potentially chemical treatment to effectively manage Chinese tallow while providing the opportunity for native and other preferred species to establish in designated areas.

In accordance with the FERC Plan and Procedures, KMLP would coordinate with the appropriate agencies to prevent any project-related introduction or spread of invasive plants and noxious weeds, and would conduct post-construction monitoring. As part of this monitoring program, KMLP would be required to examine disturbed non-agricultural areas (upland herbaceous and palustrine wetland communities) for the presence of invasive species.

4.5.4 Vegetation Communities of Special Concern

Vegetation communities of special concern may include ecologically important natural communities, threatened or endangered plant species, or other rare or imperiled plants in need of special protection or minimal disturbance. During coordination regarding the LNG terminal and KMLP facilities, the LNHP (2013, 2014) determined that impacts are not anticipated on rare, threatened, or endangered species of vegetation or critical habitats. Therefore, we do not anticipate that construction or operation of the LNG terminal and KMLP facilities would affect vegetation communities of special concern.

4.6 WILDLIFE AND AQUATIC RESOURCES

4.6.1 Wildlife Resources

Wildlife species occurring in the vicinity of the LNG terminal and KMLP facilities are characteristic of the habitats provided by the plant communities that occur in these areas. Section 4.5.1 provides detailed information on the vegetation communities present in the vicinity of the LNG terminal and KMLP facilities. Habitat types were identified based on aerial photography and field surveys. Aquatic resources and protected wildlife species are discussed in sections 4.6.2 and 4.7, respectively.

4.6.1.1 Existing Wildlife Habitats

The wildlife habitat types present in the vicinity of the LNG terminal and KMLP facilities include wetlands, forest, open water, open land, and agricultural land. Typical wildlife occurring within these habitat types are described below.

Wetland habitats present within the affected areas include relatively small (less than 7 acres in size) palustrine emergent, palustrine scrub-shrub, palustrine forested/scrub-shrub, and estuarine emergent wetlands. Wetlands typically support a diverse ecosystem that provides nutrients, cover, shelter, and water for a variety of terrestrial and aquatic wildlife species, including waterfowl, wading birds, raptors, mammals, reptiles, and amphibians. Typical wildlife associated with palustrine wetlands include white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), river otter (*Lutra canadensis*), rice rat (*Oryzomys palustris*), swamp rabbit (*Sylivagus aquaticus*), wood duck (*Aix sponsa*), least bittern (*Ixobrychus exilis*), green heron (*Butorides striatus*), red-winged blackbird (*Agelains phoeniceus*), southern leopard frog (*Rana utricularia*), bullfrog (*Rana catesbeiana*), cottonmouth (*Agkistrodon piscivorus*), and mud snake (*Farancia abacura*). Typical wildlife associated with estuarine emergent wetlands include raccoon, rice rat, nutria (*Myocastor coypus*), brown pelican (*pelecanus occidentalis*), great blue heron (*Ardea herodias*), green heron, fiddler crab (*Uca rapax*), and salt marsh snake (*Nerodia clarkia*) (LDWF, 2014a, 2014c, 2014d; USGS, 2013c).

Forested habitat is present within the northern and eastern portions of the LNG terminal and is composed of mixed hardwood loblolly forest. In addition, a small, forested/scrub-shrub wetland is within the dredge material placement area. No forested habitat is within areas that would be affected by the KMLP facilities. Tree and shrub layers provide shelter and foraging habitat for various bird species and larger mammals. Organic material on the forest floor provides habitat for invertebrates, reptiles, smaller mammals, and amphibians. Mammals typically associated with forest habitat in the vicinity of the LNG terminal and dredge material placement area include the white-tailed deer, gray fox (*Urocyon cinereoargenteus*), gray squirrel (*Sciurus carolinensis*), cotton mouse (*Sigmodon hispidus*), and striped skunk (*Mephitis mephitis*). Typical bird species include the prothonotary warbler (*Protonotaria citrea*), wood thrush (*Hylocichla mustelina*), red-shouldered hawk (*Buteo lineatus*), Carolina chickadee (*Parus carolinensis*), loggerhead shrike (*Lanius ludovicianus*), eastern kingbird (*Tyrannus tyrannus*), brown-headed nuthatch (*Sitta pusilla*), pine warbler (*Dendroica pinus*), Northern bobwhite (*Colinus virginianus*), and tufted titmouse (*Parus bicolor*). Amphibians and reptiles include the green tree frog (*Hyla cinerea*), garter snake (*Thamnophis sirtalis sirtalis*), racer (*Coluber constrictor*), and pigmy rattlesnake (*Sistrurus miliarius*) (LDWF, 2014a, 2014c, 2014d; USGS, 2013c).

Open water habitat present within the LNG terminal and dredge material placement area include the Industrial Canal, an intermittent waterbody in the southwestern portion of the LNG terminal site, and a borrow pit[10] within the northeastern portion of the dredge material placement area. Open water habitats associated with the KMLP facilities include three intermittent waterbodies and seven ephemeral waterbodies. Typical wildlife associated with open water habitat includes wading birds, waterfowl, beavers, otters, nutria, snakes, and other wildlife species dependent on an aquatic environment (see additional discussion in section 4.6.2).

Open lands (defined in this section as wildlife habitat consisting of uplands dominated by grasses, forbs, and shrubs) comprise the majority (81 percent) of the LNG terminal site and dredge material placement area. As described in section 4.5.1.1, the LNG terminal site was previously used by the COE for dredge material disposal. As a result, vegetation communities at the site are limited in diversity and do not directly correlate to the natural vegetation communities in the vicinity. The dredge material placement area is currently used by CB&I for staging and laydown; therefore, vegetation in this area is routinely mowed and maintained in a graminaceous or weedy state. Very small areas (less than 0.5 acre) of open lands are present within the boundaries of the existing KMLP facilities, specifically at the Pine Prairie and TGT Meter Stations. Mammals typically associated with open lands include white-tailed deer, striped skunk, spotted skunk (*Spilogale putorius*), cotton mouse, armadillo (*Dasypus novemcinctus*), raccoon, and eastern harvest mouse (*Reithrodontomys humulis*). Bird species include common yellowthroat (*Geothlypis trichas*), northern bobwhite, eastern bluebird (*Sialia sialis*), dickcissel (*Spiza americana*), rusty blackbird (*Euphagus carolinus*), red-tailed hawk (*Buteo jamaicensus*), northern harrier

[10] A borrow pit is a man-made open water area that is formed when the original material is removed for use in another area, and the void subsequently fills with water from rainfall and stormwater runoff.

(*Circus cyaneus*), American robin (*Turdus migratorius*), cattle egret (*Bubulcus ibis*), and red-winged blackbird. Typical reptiles and amphibians include chorus frog (*Pseudacris* sp.), western rat snake (*Pantherophis obsolete*), and garter snake (LDWF, 2014a, 2014c, 2014d; USGS, 2013c).

Agricultural lands, which comprise 99 percent of the vegetated wildlife habitat that would be affected by the KMLP facilities, include those lands used for crawfish farming and cultivated crops. No agricultural lands are present within areas that would be affected by the LNG terminal. Due to low diversity and frequent disturbance, agricultural lands do not provide high quality habitat for cover or nesting, but do provide foraging opportunities for several species. Irrigation ditches, ponds, and flooded fields provide habitat for shorebirds, wading birds, and waterfowl. Many species capable of inhabiting open lands would also utilize agricultural lands. Typical mammal species that forage in agricultural lands in the vicinity of the KMLP facilities include white-tailed deer, striped skunk, eastern spotted skunk, cotton mouse, armadillo, raccoon, and eastern harvest mouse. Bird species occurring within agricultural lands include cattle egret, red-tailed hawk, northern harrier, American robin, red-winged black bird, and mourning dove. Typical amphibians and reptiles include rat snake, garter snake, and chorus frog (LDWF, 2014a, 2014c, 2014d; USGS, 2013c).

4.6.1.2 Impacts and Mitigation

A total of about 329.2 acres of wildlife habitat would be affected by construction of the LNG terminal and KMLP facilities. Overall, the greatest impacts would be on open land (187.6 acres), agricultural (63.5 acres), and open water (43.6 acres) habitats. Proposed activities within the DII construction yard, existing meter stations, and along the dredged material and effluent pipeline routes would not be expected to affect wildlife habitat because these areas have been graded and graveled.

LNG Terminal

Construction of the LNG terminal would affect 114.0 acres of vegetated wildlife habitat and 9.8 acres of open water habitat (see tables 4.5.2-1 and 4.8.1-1). Following construction, 80.3 acres of vegetated habitat at the LNG terminal would be permanently converted to industrial land, 33.7 acres would be restored and maintained as open land (although it would be converted from a shrub to an herbaceous community), and 6.4 acres would be permanently converted to open water habitat for the recessed berthing area. Open water habitat within the Industrial Canal affected during construction would be retained during operation of the LNG terminal, although water depth would be increased from an average of 40 feet to 44 feet; less than 0.1 acre of open water habitat within the intermittent waterbody within the terminal site would be permanently filled.

Activities at the dredge material placement area would affect 107.3 acres of vegetated wildlife habitat and 33.5 acres of open water habitat within the borrow pit. Following dredging and dewatering activities, the dredge material placement area would be graded and seeded in accordance with landowner requirements. As a result, 33.5 acres of open water habitat, 1.0 acre currently used as a site road, and 0.5 acre of forested/scrub-shrub wetland would be converted to open land.

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

The greatest impacts on terrestrial wildlife would result from the permanent loss of approximately 68 acres of forested and open lands within the LNG terminal site (approximately 34 and 31 acres, respectively), which would result in a permanent reduction in these habitat types in the general vicinity of the LNG terminal. Due to the site's previous use as a dredge disposal site, vegetation species diversity is low, which lessens its value as habitat for wildlife.

Construction and operation of the LNG terminal would also result in the permanent loss of 16.2 acres of wetlands, including 7.4 acres of palustrine emergent wetlands within the southern and western portion of the LNG terminal site, 6.6 acres of palustrine scrub-shrub wetlands in the vicinity of the Magnolia Meter Station, 1.0 acre of estuarine intertidal emergent wetland along the fringe of the south bank of the Industrial Canal on the northern edge of the LNG terminal, and 1.2 acres of palustrine emergent and forested/scrub-shrub wetlands within the dredge material placement area. Although these are relatively small areas, wetland habitats support a diverse ecosystem that provides nutrients, cover, shelter, and water for a variety of terrestrial and aquatic wildlife species. Magnolia would mitigate impacts on wetlands determined to be jurisdictional under section 404 of the CWA through implementation of its project-specific *Compensatory Mitigation Plan*, which would require review and approval by the COE, New Orleans District (see our recommendation in section 4.4.1 as well as section 4.4.4 for additional information).

Operation of the LNG terminal would result in increased noise, lighting, and human activity that could disturb wildlife in the area. However, due to current industrial activities at other facilities on the Industrial Canal (i.e., Trunkline LNG Terminal, Lake Charles Carbon Company, Leevac Shipyards, DII, Martin Energy Services, and Marine Spill Response Corporation), wildlife species in the area are expected to be acclimated to the noise and artificial lighting associated with these activities (see section 4.6.1.3 for further discussion of lighting at Magnolia's proposed LNG terminal).

To minimize project-related impacts on wildlife, Magnolia would implement its project-specific Plan and Procedures as well as its *Spill Prevention Plan* during construction, and would develop and implement a SPCC Plan during operation (see our recommendation and additional discussion in section 4.2.3.1). Magnolia would also implement BMPs, which typically include a combination of silt fencing, routine inspection, and good housekeeping techniques.

Based on the previous use of the site for dredge material placement, adequate similar habitat for wildlife in the vicinity of the site, presence of exotic and/or invasive species (e.g., Chinese tallow, silkweed, and nutria), limited amount of forest and wetland habitat impacts, and implementation of Magnolia's proposed mitigation measures, we have determined that construction and operation of the proposed LNG terminal would have permanent, but minor impacts on wildlife.

KMLP Facilities

As described in tables 4.5.2-1 and 4.8.1-1, a total of 64.3 acres of vegetated wildlife habitat and 0.3 acre of open water wildlife habitat would be affected by construction of the KMLP facilities. The wildlife habitats affected by construction of the KMLP facilities would include agricultural lands (63.5 acres), open land (0.4 acre), and wetlands and open water (0.3 acre each). Following construction, 12.0 acres of the habitat affected by the KMLP facilities would be permanently converted to industrial land, 8.3 acres (7.8 acres for the low pressure header pipeline and 0.5 acre for the high pressure header pipeline) would be restored to the pre-construction habitat type but would be subject to routine maintenance, and 44.3 acres would be restored to the pre-construction habitat type.

The majority of the impacts on wildlife habitat (40.6 acres, or 63 percent) would be associated with construction of Compressor Station 760 and the header pipelines (21.2 acres, or 33 percent), as discussed below. Activities within existing facility boundaries (i.e., CGT, TRANSCO, TETCO, ANR, Pine Prairie, and TGT Meter Stations), would not affect wildlife habitat because these areas have been graveled and occur within fenced areas.

Aboveground Facilities

Construction of Compressor Station 760 and modifications to the existing meter stations would affect 40.4 and 2.7 acres, respectively, of vegetated wildlife habitat. In addition, 0.2 acre of open water would be affected during construction associated with the aboveground facilities.

Construction of Compressor Station 760 would impact 40.6 acres of wildlife habitat; of which 11.2 acres of agricultural land would be permanently converted to industrial use and 29.4 acres (29.2 acres of agricultural land and 0.2 acre of open water) would be restored to pre-construction conditions and surrounded with a barbed-wire fence. Fencing would be expected to limit the use of suitable habitat at Compressor Station 760 by larger wildlife species, particularly mammals. In addition, increased noise levels in the vicinity of the compressor station may result in avoidance of the area by wildlife until they become acclimated to the noise increase.

Modifications at the six existing meter stations would impact a total of 2.7 acres of wildlife habitat, including agricultural (2.0 acres), open land (0.4 acre), wetlands (0.3 acre), and open water habitat (less than 0.1 acre). Activities would affect relatively small areas of wildlife habitat, ranging from 0.1 to 0.7 acre at each meter station, and would occur adjacent to the existing facilities. A total of 0.8 acre of vegetated wildlife habitat would be converted to industrial use for operation of the expanded facilities at the CGT, TRANSCO, and TGT Meter Stations. Operation of the modified facilities within the TETCO, ANR, and Pine Prairie Meter Stations would not result in the permanent conversion of wildlife habitat to industrial use.

The impacts of aboveground facility construction on terrestrial wildlife and wildlife habitats would vary depending on the type of habitat affected, the requirements of each species, the timing of construction, and the types of construction techniques used. The greatest effect on wildlife habitat would result from cutting, clearing, and/or removal of existing vegetation, which would reduce the amount of available wildlife habitat in the area and may result in direct mortality of less mobile wildlife (e.g., small rodents and reptiles). Larger or more mobile wildlife, such as birds and large mammals, would relocate to adjacent similar habitats. Noise and human disturbance during construction would also cause most wildlife to avoid areas of active construction.

Although individuals of some wildlife species would be affected by construction and operation of the aboveground facilities, most impacts on wildlife would be temporary or short-term. With the exception of the measures described in section 4.4.3.2, KMLP would implement the FERC Plan and Procedures, which would minimize impacts on wildlife habitat. With the implementation of these measures, and because abundant similar habitat is available for wildlife adjacent to the affected areas, we conclude that construction and operation of the KMLP facilities would have permanent, but minor impacts on local wildlife populations and habitat.

Header Pipelines

Construction of the low and high pressure header pipelines would result in both temporary and permanent impacts on wildlife and wildlife habitat. Construction would affect a total of 21.3 acres of wildlife habitat, including 21.1 acres of agricultural land, 0.1 acre of wetland habitat, and 0.1 acre of open water habitat (see tables 4.5.1-2 and 4.8.1.1). Impacts on wildlife and habitat during construction of the header pipelines would be similar to those described above for the aboveground facilities. Following construction, disturbed areas would be restored to pre-construction conditions in accordance with the FERC Plan and Procedures; approximately 13.0 acres would be allowed to revert to pre-construction conditions and the remaining 8.3 acres would be within permanent easements and subject to routine maintenance.

The duration of impacts on terrestrial wildlife habitat would depend on the rate at which vegetation regenerates after construction. Agricultural lands would be available for replanting during the growing season immediately following construction. Emergent wetland habitat would generally revegetate within 2 to 4 years after construction is completed. Open water habitats would revert to pre-construction condition shortly after the completion of in-water work (see section 4.6.2.2 for further discussion of impacts on aquatic resources). Because wildlife use of agricultural lands is typically limited to foraging activities, and the impacts from construction and operation of the header pipelines on wildlife would be short term in duration, we anticipate that impacts on wildlife would be minimal.

4.6.1.3 Unique and Sensitive Wildlife

No public or conservation lands have been identified within or adjacent to the proposed LNG terminal site or KMLP facilities. Based on information from the LNHP (2013, 2014), no state or federal parks, wildlife refuges, scenic streams, or wildlife management areas are within or adjacent to any project components. Migratory birds may be present in the vicinity of the LNG terminal and KMLP facilities, as discussed below. Species protected under the ESA, the Bald and Golden Eagle Protection Act (BGEPA), and by state endangered and threatened species regulations 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 Migratory Bird Treaty Act (MBTA), which prohibits the 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 Memorandum of Understanding (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.

In order to accurately identify bird species with the greatest conservation priority 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 (BCR) levels. The LNG terminal and KMLP facilities are within BCR 37 – Gulf Coastal Prairie (FWS, 2008). Appendix C of this EIS identifies Birds of Conservation Concern with potential to occur in the vicinity of the LNG terminal and KMLP facilities, indicates which species breed within the region, and identifies the nesting habitat of the breeding species.

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). Colonial waterbirds demonstrate nest fidelity, meaning that they return to the same rookery year after year. Rookeries are typically established in marshes or near the shores of ponds or streams. Although some colonial waterbirds (e.g., least terns) will nest in developed areas, many waterbirds (e.g., great blue heron and great egrets) are wary of human activity. No colonial waterbird rookeries were identified at the LNG terminal or KMLP facilities.

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, where they remain throughout the non-breeding season. The LNG terminal and KMLP facilities are within the Mississippi Flyway, which terminates at the Gulf Coast. Of the 650 species of birds known to occur in the United States, nearly 400 species occur along the Gulf Coast (Esslinger and Wilson, 2003). The Gulf Coast provides wintering and migration habitat for large numbers of continental duck and goose populations that use the Mississippi Flyway. The coastal marshes of Louisiana, Alabama, and Mississippi regularly hold half of the wintering duck population of the Mississippi Flyway (Esslinger and Wilson 2003). For the reasons listed above, the Gulf Coast is considered one of the most important waterfowl areas in North America.

Impacts and Mitigation

The vegetation communities within the LNG terminal and KMLP facilities provide potential habitat for migratory bird species, including songbirds, waterbirds, and raptors. However, much of the vegetated land associated with the LNG terminal and KMLP facilities is previously disturbed, within or adjacent to existing facilities, and/or composed of agricultural land, all of which reduce bird nesting habitat value. Impacts on migratory birds and their habitat due to construction and operation of the LNG terminal and KMLP facilities would typically be similar to impacts on general wildlife resources (see section 4.6.1.2). In addition, potential impacts specific to migratory birds include loss of habitat and injury or disorientation due to flaring and other artificial illumination.

Construction and operation of the LNG terminal would result in the permanent loss of 34.0 acres of upland forest, 31.3 acres of open uplands, and 16.2 acres of wetland habitat (including 1.0 acre of estuarine emergent wetland, 8.1 acres of palustrine emergent wetlands, 6.6 acres of palustrine scrub-shrub wetlands, and 0.5 acre of palustrine forested/scrub-shrub wetlands), which could directly impact the available nesting and foraging habitat for migratory birds. Magnolia participated in a conference call with the FWS regarding migratory bird impacts at the LNG terminal on February 3, 2014. During the call, the FWS stated that its primary project-related concern is whether fringe wetlands at the site would be affected. The FWS confirmed that no significant impacts on migratory birds are anticipated at the LNG terminal site due to low habitat quality (Magnolia, 2014b).

Construction of the KMLP facilities would affect 64.3 acres of vegetated habitat; of which 12.0 acres would be permanently converted to industrial use. To minimize impacts on migratory birds, KMLP developed a *Migratory Bird Review Technical Memorandum*, which was submitted to the FWS for review and comment on April 9, 2015. KMLP's memorandum states that the following measures would be implemented, where practicable, to avoid impacts on migratory birds:

- clear areas with potential nesting habitat prior to the nesting season, based on the current construction schedule;
- conduct nesting surveys to identify species and avoid active nests if migratory birds are observed prior to construction;
- inspect construction equipment regularly for opportunistic wildlife species, including nesting migratory birds; and
- stabilize the right-of-way to protect soil resources and promote restoration of temporarily disturbed areas.

Many migratory birds use natural light from the sun, moon, and stars for navigation. Artificial lighting can hide natural light sources, having unknown effects on birds at the population level. Fatalities to avian species due to artificial light are well documented. 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).

Magnolia anticipates that flaring would occur for approximately 5 days during startup of the LNG terminal. During operation of the LNG terminal, use of the marine and emergency flares would only occur during process upset conditions, which Magnolia anticipates would be no more than 12 hours during the first year of operation and no more than 6 hours in each subsequent year (each flaring event is expected to occur for between 15 and 60 minutes). Therefore, we have determined that the temporary flaring during construction and the occasional flaring during operation would not substantially impact migratory birds.

The LNG terminal and KMLP facilities would require adequate lighting for operations and safety. During construction, Magnolia would direct all nighttime lighting towards construction activity and use the minimum light level necessary to ensure site safety and security. While the *Facility Lighting Plan* for operation of the LNG terminal has not been developed, Magnolia expects the plan to include down-facing lights with shielding needed to meet regulatory standards and minimize illumination specifications. Facility lighting would be chosen to minimize the horizontal emission of light away from intended areas, and shielding would help minimize impacts on birds and other wildlife while providing the illumination needed to ensure safe operation of the facility. Because Magnolia has not yet developed its *Facility Lighting Plan* for operation of the LNG terminal, **we recommend that:**

- **<u>Prior to construction,</u> Magnolia file with the Secretary, for review and written approval by the Director of OEP, its *Facility Lighting Plan* for operation of the LNG terminal.**

Magnolia conducted visual simulations depicting anticipated nighttime lighting conditions at the LNG terminal (see detailed discussion in section 4.8.5.2). Based on our review of the visual simulations, and implementation of the above recommendation, we have determined that the overall increase in nighttime lighting during construction and operation of the LNG terminal would result in permanent, but minor impacts on migratory birds.

To minimize the effects of artificial lighting on migratory birds, outdoor lighting at the KMLP facilities would be limited, shielded, and downward-facing to facilitate safe operations at night or during inclement weather. Perimeter lighting at aboveground facilities would be turned off at night and would only be used when necessary for work conducted at night. With the implementation of the mitigation measures described above, we conclude that impacts on migratory birds would be negligible.

4.6.2 Aquatic Resources

4.6.2.1 Existing Aquatic Resources

LNG Terminal Facilities

Habitat for aquatic resources present within the LNG terminal and dredge material placement area includes the Industrial Canal, estuarine emergent wetland along the southern shoreline of the Industrial Canal, an intermittent stream in the southwestern portion of the terminal site, and a borrow pit within the northeastern portion of the dredge material placement area. Of the waterbodies within the LNG terminal and dredge material placement area, only the Industrial Canal, estuarine emergent wetlands, and the borrow pit provide year-round warmwater habitat for aquatic resources; the intermittent stream provides limited habitat value for aquatic resources due to restricted water flow regimes, which are likely dependent upon precipitation.

Surface waters within the Industrial Canal have been designated by the LDEQ (2013) as supporting fish and wildlife propagation. However, based on the numerical criteria established for fish and wildlife propagation, water quality within the Industrial Canal does not currently support its designated use for fish and wildlife propagation due to chloride, sulfate, and total dissolved solid levels that have been impaired as a result of changes in tidal circulation and hydrostructure flow regulation (e.g., flow regulation through construction and operation of a dam) (see section 4.3.2.1). The Calcasieu Saltwater Barrier, which is within the Calcasieu River over 10 miles north of the LNG terminal site, generally limits the distribution of freshwater species south of the barrier. As a result, the fishery resources in the Industrial Canal are classified as estuarine.

Water depth within the Industrial Canal ranges from 0 feet at the shoreline to approximately 40 feet within the navigation channel, and substrates are composed mainly of estuarine subtidal unconsolidated bottom sediment. Unconsolidated sediments within the canal provide foraging habitat for benthic (bottom-dwelling) organisms and fish and are designated as EFH for red drum, shrimp, reef fish, and coastal migratory pelagic species (see discussion in section 4.6.3). Substrates within the Industrial Canal are considered early successional due to frequent disturbance from maintenance dredging, propeller wash, and vessel traffic.

An estuarine emergent wetland is present along the southern shoreline of the Industrial Canal within the LNG terminal site. This habitat provides nutrients, cover, shelter, and water for a variety of aquatic wildlife species and is designated as EFH for red drum, shrimp, reef fish, and coastal migratory pelagic species (see discussion in section 4.6.3).

The borrow pit within the dredge material placement area was created after 2010 and was disturbed by construction activities until 2013. Magnolia stated that there does not appear to be a consistent source of water to the pond; therefore, it is assumed that rainfall and the associated runoff from surrounding areas is the only source of water for the borrow pit. Aquatic resources potentially present within the borrow pit include aquatic insects as well as tadpoles, minnows, and small fish that were transported to the borrow pit by terrestrial wildlife. Fishery resources present within the borrow pit are classified as freshwater.

Table 4.6.2-1 lists representative fish species found in the vicinity of the LNG terminal site and indicates which of these species are economically important for commercial or recreational fisheries. Life histories of many Gulf of Mexico fish species can be characterized as estuarine-dependent because these species typically spawn in the Gulf, allowing their larvae to be carried inshore by currents. Juvenile fish generally remain in estuarine nurseries for about a year, taking advantage of the estuary's greater availability of food and protection, before returning to the Gulf of Mexico to either spawn or spend the remainder of their lives. Estuary-dependent species potentially occurring within the proposed LNG terminal area include Gulf menhaden; red drum; gray snapper; Spanish mackerel; blue crab; and brown, pink, and white shrimp.

No significant commercial fisheries resources occur in the vicinity of the LNG terminal; however, recreational fishing takes place within the Industrial Canal. Recreational fishing is discussed in more detail in section 4.8.4.

KMLP Facilities

Table 4.3.2-1 lists the waterbodies that would be crossed or affected by the KMLP facilities as well as the proposed crossing method and water quality classification for each feature. All of the waterbodies affected by the KMLP facilities are freshwater and classified as warmwater fisheries. Of the 10 waterbodies affected, all are classified as intermittent or ephemeral, which typically provide limited habitat value for aquatic resources due to restricted water flow regimes. Representative species found within these waterbodies include prairie crawfish (*Fallicambarus macneesei*), painted crawfish (*Orconectes hathawayi*), Pine Hills crawfish (*Fallicambarus dissitus*), and other species that do not require perennial water flow regimes. No sensitive fish species, fisheries of concern, or EFH are present within the waterbodies affected by the KMLP facilities.

4.6.2.2 Impacts and Mitigation

LNG Terminal Facilities

Potential impacts on aquatic resources during construction and operation of the LNG terminal include those associated with dredging, pile driving, hydrostatic testing, vessel traffic, stormwater runoff, lighting, LNG storage tank deluge system, and inadvertent spills.

Dredging

Construction of the recessed berthing area at the LNG terminal site would require the dredging of a 16.2-acre area in the Industrial Canal, which currently consists of 9.8 acres of open water, 1.0 acre of wetlands, and 5.4 acres of uplands. As described in section 2.2.1, dredging would remove approximately 862,550 yd^3 of sediments over a period of approximately 12 weeks using a hydraulic cutterhead suction dredge. Dredge material would be transported by pipeline to the placement area where it would be allowed to dewater, after which the decanted water would be pumped through the effluent pipeline and discharged back into the Industrial Canal. Potential impacts on aquatic resources resulting from dredging activities include direct take and habitat modification as well as temporary increases in noise, turbidity, and suspended solid levels, which are described below.

TABLE 4.6.2-1

Representative Fish Species Potentially Occurring in the Vicinity of the LNG Terminal

Common Name	Scientific Name	Classification
Shellfish		
Blue crab [a]	*Callinectes sapidus*	Estuarine
Brown shrimp [a]	*Farfantepenaeus aztecus*	Estuarine
Pink shrimp [a]	*Farfantepenaeus duorarum*	Estuarine
White shrimp [a]	*Litopenaeus setiferus*	Estuarine
Finfish		
Atlantic croaker [a]	*Micropogonias undulates*	Estuarine
Black crappie	*Pomoxis nigromaculatus*	Freshwater
Common carp	*Cyprinus carpio*	Freshwater
Freshwater drum	*Aplodinotus grunniens*	Freshwater
Gafftopsail catfish	*Bagre marinus*	Estuarine
Golden shiner	*Notemigonus crysoleucas*	Freshwater
Gray snapper [a]	*Lutjanus griseus*	Estuarine
Green sunfish	*Lepomis cyanellus*	Freshwater
Gulf menhaden [a]	*Brevoortia patronus*	Estuarine
Hardhead catfish	*Arius felis*	Estuarine
Hogchoker	*Trinectes maculatus*	Estuarine
Killifish	*Fundulus* spp.	Estuarine
Ladyfish	*Elops saurus*	Estuarine
Mosquitofish	*Gambusia affinis*	Estuarine
Puffer	*Sphoeroides parvus*	Estuarine
Red drum [a]	*Sciaenops ocellatus*	Estuarine
Redear sunfish	*Lepomis microlophus*	Freshwater
Sheepshead minnow	*Cyprindon variegatus*	Estuarine
Silver perch	*Bairdiella chrysura*	Estuarine
Silverside	*Menidia bervllina*	Estuarine
Southern flounder [a]	*Paralichthys lethostigma*	Estuarine
Spanish mackerel [a]	*Scomberomorus maculatus*	Estuarine
Spot	*Leiostomus xanthurus*	Estuarine
Spotted seatrout [a]	*Cynoscion nebulosus*	Estuarine
Striped mullet [a]	*Mugil cephalus*	Estuarine
Warmouth	*Lepomis gulosus*	Freshwater
Yellow bullhead	*Ameiurus natalis*	Freshwater

[a] This species is considered economically important (i.e., commercially or recreationally sought after).

Most fish species are highly mobile and would be expected to leave the area during dredging activities. Dredging would, however, result in direct mortality of benthic organisms (e.g., aquatic macroinvertebrates, mollusks, and crustaceans, which are important food sources for many species of fish) within the 9.8-acre portion of the dredge footprint that currently provides open water habitat. Slower, less mobile benthic invertebrates would also be directly affected, while larger, more mobile species (e.g., blue crab) would experience temporary displacement. Following construction activities, aquatic resources would be expected to return to the recessed berthing area, which would be similar to the existing habitat within the Industrial Canal, but would contain an additional 6.4 acres of open water habitat and have an increased water depth of 44 feet.

Dredging of the recessed berthing area would result in the permanent conversion of 1.0 acre of estuarine emergent wetland habitat to open water habitat. This wetland comprises a portion (70 percent) of a 1.4-acre wetland fringe along the southern shore of the Industrial Canal. During project design, Magnolia minimized project impacts on this wetland to the extent feasible, and would mitigate unavoidable impacts on this wetland through the implementation of its *Compensatory Mitigation Plan* (see section 4.4.4 for additional information). However, as described in section 4.6.2.1, wetlands support a diverse ecosystem that provides nutrients, cover, shelter, and water for a variety of fish and invertebrate species. The permanent reduction in estuarine emergent wetland habitat within the Industrial Canal as well as the influx of individuals to the adjacent 0.4 acre of wetland may increase population densities for certain species, resulting in increased inter- and intra-specific competition and reduced reproductive success of individuals. Due to the proposed creation of 6.4 acres of open water habitat and limited impacts on estuarine emergent wetland habitat, we have determined that impacts on aquatic resources due to direct take and habitat modification from dredging activities would be permanent, but minor.

Prior to the placement of dredge material, the 33.5-acre borrow pit would be dewatered, resulting in direct mortality of any aquatic resources present. As described above (see section 4.6.2.1), aquatic resources within the man-made borrow pit are expected to be limited to aquatic insects as well as tadpoles, minnows, and small fish that were transported to the borrow pit by terrestrial wildlife. Therefore, impacts from dredge material placement on aquatic resources in the borrow pit would be permanent, but minor.

Dredging activities would also temporarily increase noise, turbidity, and suspended solid levels within the water column, which could reduce light penetration and the corresponding primary production of aquatic plants, algae, and phytoplankton. Increased turbidity and suspended solid levels could also adversely affect fish eggs and juvenile fish survival, benthic community diversity and health, foraging success, and suitability of spawning habitat. Sediments in the water column could be deposited on nearby substrates, burying aquatic macroinvertebrates. Impacts on aquatic resources due to increased turbidity and suspended solid levels would vary by species; however, the aquatic resources present within the project area are likely accustomed to regular fluctuations in noise and turbidity levels from industrial activity and maintenance dredging (which is scheduled to occur every other year) within the Industrial Canal.

To minimize impacts on aquatic resources due to increased turbidity and suspended solid levels, Magnolia would use a hydraulic cutterhead suction dredge. Because excavated material would be suctioned into a pipeline, resuspension of sediments and the associated increase in turbidity and suspended solid levels would be minimized. To further minimize these impacts, Magnolia has prepared a preliminary *Dredging Water Quality Monitoring Plan*. This plan, which is discussed in detail in section 4.3.2.2, requires monitoring of turbidity and total suspended solids levels at three locations, including two locations near dredging operations and one at the effluent outfall. The plan also includes mitigation measures that would be implemented if monitoring indicates that turbidity or total suspended solid levels exceed the limits established by the plan or the COE or EPA permit requirements. Due to the proposed use of a hydraulic cutterhead suction dredge and our recommendation that Magnolia file its final *Dredging Water Quality Monitoring Plan*, we have determined that impacts on aquatic resources due to temporary increases in noise, turbidity, and suspended solid levels from dredging would be localized, temporary, and minor.

Maintenance dredging of the recessed berthing area would be conducted by Magnolia every 4 to 5 years during operation of the LNG terminal, and would remove approximately 65,000 yd^3 of sediment per cycle. Maintenance material would be placed in an upland CDF in coordination with the Lake Charles Harbor and Terminal District. Potential impacts on aquatic resources from maintenance dredging include direct take and habitat modification as well as temporary increases in noise, turbidity, and suspended solid levels. These impacts would be similar to those described above for dredging during construction of the LNG terminal; however, impacts would be shorter in duration due to the reduced amount of material being removed from the recessed berthing area. Therefore, we conclude that maintenance dredging would have temporary and minor impacts on aquatic resources.

Pile Driving

Construction of the LNG terminal would require the installation of approximately 5,000 piles to support the proposed structures. As discussed in section 2.5.1.3, pile driving activities would take place 10 hours per day, up to 7 days per week; however, due to pre-work coordination and start-up activities, actual pile driving operations (hammering) are expected to occur for only about 8 hours per day. Pre-stressed concrete piles would be installed onshore to support the liquefaction trains, LNG storage tanks, and other process equipment and structures. Onshore piles would be driven by seven or eight hydraulic piling rigs over a 10-month period. In-water pile driving would be required to install the steel sheet pile bulkhead along the shoreline of the Industrial Canal and the steel pipe piles supporting the LNG loading platform as well as the breasting and mooring dolphins. Marine piles would be installed using between two and four hydraulic pile drivers over a 6-month period. As depicted in table 2.5.1-1 in section 2.5.1.3, pile driving would occur over a total of about 16 months during the first 2 years of construction.

The primary impacts on aquatic resources from pile driving activities would be avoidance of the area, stress, or injury due to the underwater sound pressure levels. 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 (Abbott and Bing-Sawyer, 2002; Popper et al., 2006). NOAA Fisheries is currently developing guidelines for determining sound pressure level thresholds for fish and marine mammals. The agency's interim guidelines use 150 decibels (dB) re: 1 microPascal (μPa) as the threshold for behavioral effects on fish species of particular concern, citing that noise levels in excess of 150 dB re: 1 μPa can cause temporary behavior changes (startle and stress) that could decrease a fish's ability to avoid predators. The current interim thresholds for the onset of injury to fish are a peak sound pressure of 206 dB re: 1 μPa regardless of fish size, a cumulative sound pressure level of 187 dB re: 1 μPa for fish 2 grams or greater, and a cumulative sound pressure level of 183 dB re: 1 μPa for fish of less than 2 grams (NOAA Fisheries, 2015; Stadlar and Woodbury, 2009; ICF Jones and Stokes, 2012).

The intensity of the sound pressure levels produced during pile driving depends on a variety of factors such as the 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. In discussing the impacts of sound on aquatic resources, it is important to note the difference in sound intensity in air versus water. Sound in water and sound in air are both waves that move similarly and can be characterized the same way; however, the differences in density and sound speed (the speed at which the sound wave travels through the medium, in this case air or water) result in a different reference pressure in air than in water (see detailed discussion in section 4.11.2.2).

Magnolia has stated that it intends to perform hydro-acoustic monitoring during the initial pile testing to determine the sound pressure levels generated under site-specific conditions at the LNG terminal. If these readings indicate that the sound pressures would be above acceptable thresholds (see discussion above), the following mitigation measures would be considered:

- minimizing impact energy to the lowest practical level to reduce the resulting noise generated by driving the pile;
- implementing soft starts (an initial series of low energy impacts on the pile) to allow aquatic resources an opportunity to leave the area;
- placing cushion blocks consisting of wood, nylon, or micarta between the pile and hammer to minimize the noise generated while driving the pile;
- using bubble curtains around the pile to reduce noise levels; and
- using vibratory pile driving, which generates lower sound pressure levels.

Because Magnolia has not finalized pile driving plans, an estimate of underwater noise has not been provided. Magnolia does not anticipate that land-based pile driving activities would result in underwater noise levels in exceedance of a peak sound pressure of 206 dB re: 1 μPa or a cumulative sound pressure level of 183dB re: 1 μPa; however, the potential exists for water-based pile driving activities to exceed these levels, resulting in injury to aquatic resources. To allow for an accurate analysis of potential impacts on aquatic resources during pile driving, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Magnolia file with the Secretary a *Pile Driving Noise Impact Mitigation Plan*, which describes the hydroacoustic monitoring methods that would be used to determine representative sound pressure levels associated with in-water pile driving as well as mitigation measures to be implemented to reduce sound pressure levels. The plan should include a description of the locations where monitoring would occur in relation to the pile being driven, and the maximum impact energy used on the pile during monitoring.**

With the implementation of hydroacoustic monitoring and mitigation measures, if needed, pile driving activities would minimize underwater noise levels to a level that would not cause significant impacts on aquatic resources.

<u>Hydrostatic Testing</u>

Prior to being placed into service, the LNG storage tanks and dredge material and effluent pipelines would be hydrostatically tested with surface water to ensure their integrity. Water to be used for hydrostatic testing of the dredge material and effluent pipelines would be withdrawn from the borrow pit or the Industrial Canal; water to be used for testing of the LNG storage tanks would be withdrawn from the Industrial Canal, as described in section 4.3.2.2.

The water withdrawal process could entrain fish eggs and juvenile fish present near the intake structures within the Industrial Canal and borrow pit. In accordance with its project-specific Procedures, Magnolia would screen intake hoses to limit the entrainment of larvae and pre-juvenile fish and invertebrates during water withdrawal. Water would be withdrawn from the borrow pit at a rate of about 3,333 gallons per minute. Because the borrow pit would be fully dewatered prior to being permanently filled during dredge material placement, impacts on aquatic resources would be permanent, but minor.

Within the Industrial Canal, Magnolia would utilize an intake rate of 1,500 gallons per minute and would place screened intake structures at the lowest possible elevation to reduce the impingement of biological organisms and debris on intake screens. With the implementation of these measures, impacts on aquatic resources as a result of water intake would be temporary and negligible.

Magnolia would not use biocides, detergents, or additives in the hydrostatic test water or power-wash water. In accordance with the LPDES Hydrostatic Test Wastewater Discharge Permit requirements, the water would be tested for total suspended solids, oil and grease, and pH, and treated (if test results indicate that the water would not meet LPDES requirements) prior to being discharged to the Industrial Canal. Therefore, we have determined that impacts on aquatic resources due to the discharge of hydrostatic test water would be temporary and negligible.

Vessel Traffic

During construction and operation of the LNG terminal, barges, support vessels, and LNG vessels (LNG carriers and LNG barges) would call on the LNG terminal, increasing ship traffic within the Industrial Canal, Calcasieu Ship Channel, Intracoastal Waterway, and Gulf of Mexico. Potential impacts on aquatic marine mammals resulting from vessel strikes are discussed in section 4.7.2.2. Potential impacts on aquatic resources resulting from increased vessel traffic include shoreline erosion and resuspension of sediments, ballast water discharges, cooling water discharges, and increased noise levels. The following sections describe these potential impacts as well as measures proposed by Magnolia to minimize impacts on aquatic resources.

Shoreline Erosion and Resuspension of Sediments

During construction of the LNG terminal, barges and support vessels would deliver large equipment and materials to the DII construction yard. Magnolia estimates that barges and tugs would make 50 or fewer marine deliveries to the DII construction yard during construction. During operation, a maximum of 208 LNG vessels would be expected to call on the LNG terminal per year, which would be comprised of 104 LNG carriers and 104 LNG barges.

Vessel traffic within and adjacent to the recessed berthing area has the potential to increase shoreline erosion and suspended sediment concentrations due to increased wave activity. Because Magnolia would modify the existing shoreline to create the recessed berthing area, there is potential for the modified shoreline to cause changes in wave dynamics and increase erosion of adjacent areas. Magnolia would install rock armoring to provide scour protection from propeller wash both within and along the east and west ends of the recessed berthing area. The rock armoring would prevent erosion of the adjacent unprotected shoreline by wave activity from vessels maneuvering within the recessed berthing area (Moffatt and Nichol, 2014).

The Industrial Canal, Calcasieu Ship Channel, and Intracoastal Waterway were specifically created to provide deepwater access for maritime commerce and are maintained by regular dredging (COE, 2015b). Similarly, LNG carriers transiting the Gulf of Mexico would use established shipping channels. As such, use of the waterways by LNG carriers, barges, and support vessels during construction and operation of the LNG terminal would be consistent with the planned purpose and use of these active shipping channels, and associated impacts on aquatic resources due to increased shoreline erosion and resuspension of sediments would be negligible.

Ballast Water Discharge

The effects of ballast water discharges on four ambient water quality parameters (temperature, pH, dissolved oxygen, and salinity) are described in section 4.3.2.2. Ballast water is stored below the ship's hull; as a result, the temperature of discharged water is not expected to deviate substantially from ambient water temperature. The pH of ballast water would be similar to or slightly lower than ambient water within the canal. However, this difference would not be outside the tolerance range of resident species, and impacts would be temporary and negligible.

Estuarine salinities can naturally range from freshwater (0.5 ppt), near the source of freshwater input, to full seawater (30 to 40 ppt) (Patillo et al., 1995). Salinity levels within the Industrial Canal naturally vary within this range dependent upon tidal regime and rainfall. During and immediately following ballast water discharges, benthic aquatic species may be affected by higher salinity levels because the higher salinity ballast water would sink to the lower portion of the canal due to its higher specific gravity relative to the ambient water. However, ships moving into and out of the Industrial Canal and berthing area would displace water, circulating it into, around, and out of the berthing area. Therefore, any increased salinity levels resulting from ballast water discharges would be temporary. Resident species within the Industrial Canal are euryhaline (able to live in waters with a wide range of salinity), and the salinity of seawater is well within their tolerance range. Therefore, we have determined that increases in salinity from ballast water discharges would be temporary and not likely to adversely affect aquatic resources.

Dissolved oxygen levels below 4 mg/L are generally considered unhealthy for aquatic life, and levels below 2 mg/L are considered hypoxic and inadequate to support most aquatic life. As discussed in section 4.3.2.2, ballast water would contain low dissolved oxygen levels and could decrease existing dissolved oxygen levels within the immediate vicinity of the discharge point. Depending on the oxygen levels present in both the ballast and ambient water at the time of discharge, aquatic resources present in the vicinity of the discharge point could be exposed to dissolved oxygen levels considered unhealthy for aquatic life. The adaptability of resident species within the Industrial Canal to natural spatiotemporal variation in oxygen levels, and the ability to move over a short distance to more suitable conditions, would minimizes the adverse impacts associated with ballast water discharges. Given that the amount of ballast water discharged into the Industrial Canal during each LNG vessel visit to the LNG terminal would make up only approximately 0.6 percent of the approximately 2 billion gallons of water within the Industrial Canal, we have determined that impacts on aquatic resources would be temporary and minor.

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

U.S. regulations require that all vessels equipped with ballast water tanks that enter or operate in U.S. waters maintain a vessel-specific ballast water management plan and assign responsibility to the master or appropriate official to understand and execute the ballast water management strategy for that vessel (33 CFR 151.2026). Under these requirements, vessels must implement one of five strategies to prevent the spread of exotic aquatic nuisance species in U.S. waters. The IMO has adopted this regulation and requires each vessel to install and operate a ballast water management system (option 1 as currently defined). Compliance dates associated with this IMO requirement will be phased, but will apply to all vessels beginning in 2016.[11] Until this rule is fully implemented, Magnolia has stated that it would require LNG carriers to conduct complete ballast water exchange at least 200 nautical miles from any shoreline (option 4 as currently defined), except in extraordinary circumstances causing safety or stability concerns that would require a ballast exchange less distant from the shoreline, which is authorized under 33 CFR 151.2040. Therefore, ballast water that is likely to be introduced into the Industrial Canal would be composed mainly of open ocean water collected during ballast water exchange.

A wide variety of ballast water treatment systems are currently available that may be utilized by LNG Carriers frequenting the LNG terminal during operation. Some treatment systems utilize chemical additives such as chlorine and/or sulphate/bisulphate-based products, which could have adverse impacts on aquatic resources if discharged in high concentrations. However, all ballast water treatment systems (including those using chemical additives) are required to ensure that discharged ballast water either meets or exceeds the Coast Guard's regulatory limits for environmental compliance. Magnolia has stated that it would ensure that any visiting vessels possess documentation to demonstrate their compliance with ballast water regulations and BMPs prior to allowing any ballast water to be discharged into the berthing area. With the implementation of the mandatory practices required by the Coast Guard, we conclude that the impacts on aquatic resources from ballast water discharges would be temporary and minor.

The LDWF's proposed Louisiana Marine Fisheries Enhancement, Research, and Science Center (Fisheries Research Center) would be immediately south of the proposed LNG terminal, across Henry Pugh Boulevard. The Fisheries Research Center would have a water intake within the Industrial Canal, which would be approximately 3,000 feet southeast of the recessed berthing area. The LDWF requested that Magnolia provide ballast water discharge notifications so that pumping activity associated with its water intake could be halted if LNG carrier discharge water would be unsuitable for its use. Magnolia has stated it would provide telephone notification to the LDWF prior to ballast water discharges so that water intake periods could be adjusted accordingly. More information regarding the LDWF's proposed Fisheries Research Center is included in sections 4.8.3 and 4.13.1.7.

Cooling Water Discharge

All ships use water to cool their boilers. The cooling water would be withdrawn along the vessel transit routes and from the Industrial Canal within the recessed berthing area. LNG barges would use approximately 535 gallons of water for engine cooling while at the LNG terminal. Depending upon engine type, LNG carriers would use between 5.5 and 11.7 million gallons of water for engine cooling while they are at the LNG terminal. Intake of water can also result in the entrainment of aquatic resources. Early life stages that utilize the canal for nursery habitat would be most susceptible to entrainment.

Water used for engine cooling would be discharged at a temperature between 2.7 °F and 7.2 °F warmer than the ambient water temperature (Caterpillar, 2001, 2011, 2012). Using the most conservative estimates (assuming the highest ambient temperature generally found within the canal [86 °F], the greatest change in water temperature [7.2 °F], and the largest volume of water [11.7 million gallons]), discharged cooling water would be 95.5 °F and would constitute approximately 0.6 percent of the total water within the Industrial Canal. Fish and invertebrates within the immediate vicinity of the LNG carrier could be temporarily affected by this increase in temperature; however, many of the species present are mobile and would be expected to relocate to more suitable conditions during discharges. Given the volume of cooling water discharged relative to the total volume of water within the Industrial Canal, and

11 This regulation (33 CFR 151.2026) currently applies to all new vessels as well as existing vessels with ballast water capacity between 1,500 and 5,000 m^3 that have been drydocked since January 1, 2014. Compliance by existing vessels with ballast water capacity less than 1,500 m^3 or greater than 5,000 m^3 will be required as of the vessel's first scheduled drydocking after January 1, 2016.

the mobility of resident species, which could relocate to cooler surrounding waters if necessary, we have determined that impacts on aquatic resources would be intermittent and minor.

Increased Noise Levels

Engine-noise produced by LNG vessels would result in temporary increases in underwater noise levels near the transiting ships (see additional discussion in section 4.11.2.4). Noise generated by LNG vessels is generally omni-directional, emitting from all sides of the vessel (Whale and Dolphin Conservation Society, 2004), but are greatest on the sides of the ship and weakest on the front and rear of the ship. Impacts on aquatic resources due to increased noise levels would vary by species; however, the aquatic resources present within the LNG carrier routes are likely accustomed to regular fluctuations in noise levels from ongoing industrial and commercial shipping activities. Additionally, as described above, many of the species present within the LNG carrier routes are mobile and would be able to move out of areas of noise that would startle or stress aquatic resources present. Due to the existing industrial and shipping activities within the LNG vessel transit routes and the mobility of resident species, we have determined impacts to aquatic resources associated engine-noise produced by LNG carriers during operation of the LNG terminal would be intermittent and minor.

Stormwater Runoff

Construction activities at the LNG terminal would remove vegetation cover at the site and expose the underlying soils to the effects of wind and rain, which increases the potential for soil erosion and sedimentation of aquatic habitat. Similarly, during operation of the LNG terminal, 80.3 acres of currently vegetated land would be converted to impervious or semi-pervious surfaces associated with aboveground facilities and plant roads, which would increase stormwater runoff into adjacent vegetated and open water habitats. Potential impacts from stormwater runoff on aquatic resources include increased turbidity and suspended solid levels, which are discussed above (see section 4.6.2.2, *Dredging*).

To minimize impacts on aquatic resources due to stormwater runoff, Magnolia would conduct land-disturbing activities in compliance with its LPDES, General Permit for stormwater discharges from construction activities of 5 acres or more; project-specific Construction SWPPP; and project-specific Plan and Procedures (see our recommendation and detailed discussion in section 4.2.3).

Lighting

Temporary lighting would be installed and used during construction of the LNG terminal to facilitate construction activities during evening hours and meet applicable safety requirements. Construction of the LNG loading and ship berthing facilities and dredging would require additional over-water lighting during the construction period. The work areas, dredges, and smaller work boats associated with dredging operations would be well-lighted during construction activities to promote safety. Lighting associated with in-water activities would have the greatest potential to affect aquatic resources. To minimize potential impacts on aquatic resources, Magnolia would direct all nighttime lighting towards the construction activity being conducted. During operation of the LNG terminal, lighting would be installed and used to meet safety and security requirements. Facility lighting would be chosen to minimize the horizontal emission of light away from intended areas, and over-water lighting would be limited to the extent necessary to carry out marine operations or facility maintenance and would be shielded. To minimize impacts on wildlife and aquatic resources, we have recommended that Magnolia develop and file a final *Facility Lighting Plan* prior to operation (see section 4.6.1.3).

Illumination of surface waters in the vicinity could cause artificially induced aggregations of small organisms that rely on sun or moonlight to determine movement patterns, resulting in increased predation by larger species. Generally, impacts on aquatic species would be minor as these species may change their feeding habits over time. Due to the industrial nature of the area surrounding the LNG terminal, aquatic species within the Industrial Canal are likely acclimated to ambient light from surrounding industrial sources. Based on the existing light conditions within the Industrial Canal and the likelihood that aquatic resources would acclimate over time to increased lighting at the LNG terminal, we have determined that impacts on aquatic resources from increased lighting during construction and operation of the LNG terminal would be negligible.

<u>LNG Storage Tank Deluge System</u>

During operation of the LNG terminal, an LNG storage tank deluge system would be used to distribute water over the LNG storage tank's outer surfaces for cooling in the event of a fire on the adjacent tank. The deluge system would be operated in the event of a fire emergency as well as periodically for system maintenance and testing. When in operation, two pumps near the LNG loading platform would appropriate water from the Industrial Canal at a rate of up to 6,300 gallons per minute. Intake structures would be screened to minimize entrapment of aquatic resources and prevent debris from entering the system. Water used for deluge purposes would be directed into two holding basins (east and west) before being discharged back into the Industrial Canal. Because of the infrequent operation of the system and use of screening to minimize entrapment of aquatic resources, we conclude that the LNG storage tank deluge system would have intermittent and minor impacts on aquatic resources.

<u>Inadvertent Spills</u>

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

KMLP Facilities

Construction of the KMLP facilities would require temporary impacts on 0.2 acre of open water habitat within 10 intermittent or ephemeral waterbodies. No waterbodies would be permanently filled by construction of the KMLP facilities, nor are impacts anticipated during operation. As noted in section 4.6.2.1, due to restricted water flow regimes, these waterbodies typically provide limited habitat value for aquatic resources. No sensitive fish species, fisheries of concern, or EFH are known to occur within the waterbodies affected by the KMLP facilities. Therefore, we have determined that impacts on aquatic resources from construction and operation of the KMLP facilities would be negligible.

4.6.3 Essential Fish Habitat

4.6.3.1 Regulatory Background

The MSA (Public Law 94-265 as amended through October 11, 1996) was established, along with other goals, to promote the protection of EFH during the review of projects to be conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH is defined in the MSA as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Federal agencies that authorize, fund, or undertake activities that may adversely affect EFH must consult with NOAA Fisheries. Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as NEPA, the Fish and Wildlife Coordination Act, and the ESA, to reduce duplication and improve efficiency (50 CFR 600.920(e)). Generally, the EFH consultation process includes the following steps:

1. Notification – The action agency should clearly state the process being used for EFH consultations (e.g., incorporating EFH consultation into an EIS).

2. EFH Assessment – The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH Assessment should include:

    - a description of the proposed action;
    - an analysis of the effects (including cumulative effects) of the proposed action on EFH, managed fish species, and major prey species;
    - the federal agency's views regarding the effects of the action on EFH; and
    - proposed mitigation, if applicable.

3. EFH Conservation Recommendations – After reviewing the EFH Assessment, NOAA Fisheries should provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.

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

The FERC proposes to incorporate EFH consultation for the Magnolia LNG Project with the interagency coordination procedures required under NEPA. As such, we are requesting that NOAA Fisheries consider this draft EIS as initiation of EFH consultation.

4.6.3.2 Essential Fish Habitat at the LNG Terminal

Between 1979 and 1987, the Gulf of Mexico Fishery Management Council (GMFMC) prepared fishery management plans for seven marine groups within the Gulf of Mexico: reef fish, migratory pelagic fish, red drum, shrimp, spiny lobster (*Panulirus argus*), stone crab (*Menippe adina* and *Menippe mercenaria*), and corals. Each fishery management plan has been amended at least several times since then. One important amendment that applied to all seven fishery management plans was implemented in 1998 and involved the identification of EFH for each group. All estuarine systems of the Gulf (e.g., Calcasieu River estuary) are considered EFH, which is managed by the GMFMC (GMFMC, 2010).

The GMFMC (2005) designated the Calcasieu River estuary and surrounding waters as EFH for four groups of finfish and shellfish, namely red drum, shrimp, reef fish, and coastal migratory pelagics (NOAA Fisheries, 2013d). Life stage occurrences for several species within these groups found within the vicinity of the LNG terminal are presented in table 4.6.3-1. The only areas classified as EFH within the areas affected by the Magnolia LNG Project are the Industrial Canal (including the estuarine emergent wetland along the shoreline and the northern boundary of the LNG terminal) and associated waterbodies along the LNG vessel transit route including the Calcasieu River, Intracoastal Waterway, and Gulf of Mexico. Three categories of EFH are present within the Industrial Canal: estuarine wetlands, mud substrates, and estuarine water column. Estuarine and marine water column is present within the Calcasieu, Intracoastal Waterway, and Gulf of Mexico along the LNG vessel transit routes.

TABLE 4.6.3-1

Life Stage Occurrence for Species with Essential Fish Habitat Designated in the Vicinity of the LNG Terminal

Species	Adults	Eggs	Juveniles	Larvae	Spawners
Brown shrimp	X	–	X	X	–
Pink shrimp	X	–	X	–	–
White shrimp	X	–	X	–	–
Gray snapper	X	–	X	–	–
Red drum	X	–	X	–	–
Spanish mackerel	X	–	X	–	–

X Life stage documented within Calcasieu Lake
– Life stage not documented within Calcasieu Lake
Source: NOAA Fisheries, 2011b

The estuarine emergent wetlands within the recessed berthing area provide nursery, shelter, and feeding habitat for many fish and invertebrate species. The mud substrates in and near the Industrial Canal are composed of sub-tidal unconsolidated sediments. This EFH type serves as important nursery and feeding habitat for many fish and the invertebrates they feed on (e.g., worms and mollusks living on and in the sediments). Estuarine and marine water column habitat serves as EFH for several species and their prey at various life stages by providing suitable habitat for spawning, breeding, and foraging. The community composition of both the mud substrates and estuarine water column within the Industrial Canal remain in an early successional stage due to maintenance dredging, propeller wash from passing vessels, and natural sedimentation.

4.6.3.3 Impacts and Mitigation

As described in section 4.6.2.2, construction of the LNG terminal (in particular, construction of the LNG loading and berthing facilities) would result in temporary increases in noise, artificial lighting, turbidity, and suspended solids within the estuarine water column. Impacts on managed species during construction and operation of the LNG terminal would be similar to those described above for aquatic resources (see section 4.6.2.2). Potential impacts on estuarine wetlands, mud substrates, and estuarine water column habitat are described below.

Estuarine Wetlands

Construction of the recessed berthing area would remove and permanently convert 1.0 acre of estuarine emergent wetland habitat to estuarine water column habitat within the Industrial Canal. This wetland comprises 70 percent of a 1.4-acre wetland fringe along the southern shore of the Industrial

Canal. As described above (see section 4.6.2.2, *Dredging*), wetlands support a diverse ecosystem that provides nutrients, cover, shelter, and water for a variety of fish and invertebrate species. The permanent reduction in estuarine emergent wetland habitat within the Industrial Canal as well as the influx of individuals to the adjacent 0.4 acre of wetland may increase population densities for certain species, resulting in increased inter- and intra-specific competition and reduced reproductive success of individuals.

During project design, Magnolia minimized project impacts on this wetland to the extent feasible; and would mitigate unavoidable impacts on this wetland through the implementation of its *Compensatory Mitigation Plan*, which is subject to review and approval by the COE, New Orleans District as part of the section 404/10 permit process (see our recommendation and detailed discussion in section 4.4.4). Section 404 of the CWA requires that unavoidable wetland impacts must be offset by the creation, restoration, enhancement, or preservation of at least an equal amount of wetlands. Due to the relatively small amount of estuarine wetland affected at the LNG terminal site, its location adjacent to an existing canal with regular industrial vessel traffic, and the requirement for Magnolia to offset estuarine wetland impacts, we have determined that the Magnolia LNG Project would not have a significant adverse impact on estuarine wetland habitat.

Mud Substrates

Construction of the 16.2-acre recessed berthing area would require deepening the existing 9.8-acre open water area to a depth of 44 feet below NAVD 88 to accommodate LNG carrier traffic. Dredging activities would result in the removal of the existing mud substrates from a 9.8-acre area (which would remove the existing benthic community) and the creation of 6.4 acres of new mud substrates. In addition, sediments resuspended in the water column during dredging and other construction activities would be redeposited on nearby substrates, potentially smothering immobile fish eggs and larvae as well as benthic invertebrates. Dredging activities could also cause mortality of larval or post-larval shrimp and fish species in the immediate vicinity of the cutterhead of the dredge. Although the dredging schedule has not been developed at the time of this writing, impacts on mud substrates would be greatest if dredging occurs during a period of peak larval abundance in early spring or summer.

Maintenance dredging within the 16.2-acre recessed berthing area would occur every 4 to 5 years, and would have impacts on mud substrates similar to those described above for dredging during construction; however, impacts would be shorter in duration due to the reduced amount of material being removed from the recessed berthing area.

As described above, mud substrates within the Industrial Canal remain in an early successional stage due to maintenance dredging of the canal. Given that impacts on mud substrates would generally be limited to the period during and immediately following construction and maintenance dredging, we have determined that the Magnolia LNG Project would not have a significant adverse impact on mud substrate habitat.

Water Column

Construction of the LNG terminal would increase noise, artificial lighting, turbidity, and suspended solids levels within the estuarine water column in the vicinity of the terminal. Impacts on the estuarine water column would be greatest during dredging and pile driving activities, but would occur throughout construction of the terminal. During operation of the terminal, increased noise and artificial lighting, stormwater runoff, and vessel traffic could impact estuarine water column habitat in the vicinity of the LNG terminal. Impacts would primarily be limited to the 16.2-acre recessed berthing area; however, some impacts (e.g., noise and suspended solids) may extend beyond the recessed berthing area, although the impact would decrease with distance. Potential impacts on fisheries present within the water column due to project-related changes in water quality and increased noise and artificial lighting could include decreased survival of juvenile fish, foraging success, and suitability of spawning habitat (see additional discussion in section 4.6.2.2).

Construction of the LNG loading and berthing areas would create 6.4 acres of estuarine water column habitat. Dock facilities and rock armor placed along the sheet piling for protection against scour would create a hard substrate for the growth of attached organisms as well as three-dimensional structures to be used by some species as refuge. Given the proposed creation of additional water column habitat, measures Magnolia would implement to reduce impacts on aquatic resources, and the existing, similar industrial activity in the Industrial Canal, we have determined that impacts on estuarine water column habitat would not be significant.

Traffic associated with construction and operation of the LNG terminal could affect estuarine and marine water column habitat within the Industrial Canal, Calcasieu River, Intracoastal Waterway, and Gulf of Mexico. Impacts on water quality may occur due to resuspension of suspended solids, discharge of ballast water, and intake and discharge of cooling water. However, these waterways were specifically created to provide deepwater access for maritime commerce and support high levels of deep draft traffic; therefore, impacts on water quality due to the incremental increase in vessel traffic within these waterways during construction and operation of the Magnolia LNG Project would not have a significant adverse impact on water column habitat.

Conclusions

As a non-federal party assisting the FERC in meeting its obligations under the MSA, Magnolia coordinated with NOAA Fisheries' Habitat Conservation Division on February 10, 2014, regarding impacts on EFH. During the call, NOAA Fisheries indicated that the Magnolia LNG Project would not have significant impacts on EFH, provided the applicant addresses stormwater management and wetland mitigation. As described in the preceding sections, Magnolia would conduct ground disturbing activities in compliance with LPDES permit requirements as well as its project-specific Construction SWPPP, Plan, and Procedures. Magnolia would mitigate for all impacts on wetlands determined to be jurisdictional under section 404 of the CWA in accordance with its COE-approved *Compensatory Mitigation Plan* (see our recommendation in section 4.4.4).

On March 20, 2015, a conference call with staff from the FERC and NOAA Fisheries was held to discuss project-related impacts on EFH (Piper, 2015). Concerns regarding the conversion of estuarine wetland habitat to water column habitat were discussed during the call. However, implementation of Magnolia's *Compensatory Mitigation Plan* is expected to offset wetland impacts. Assuming an adequate plan is developed in coordination with NOAA Fisheries, the plan would address concerns regarding impacts on EFH.

Due to the relatively small area of EFH impacted within the Industrial Canal (the recessed berthing area represents approximately 5 percent of the total acreage within the canal), the increase in the amount of estuarine water column habitat created during construction of the berthing area, Magnolia's proposed mitigation measures, and preliminary coordination with NOAA Fisheries, we have determined that the Magnolia LNG Project would not have a significant adverse impact on EFH.

4.7 THREATENED, ENDANGERED, AND OTHER SPECIAL STATUS SPECIES

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species that are protected under the ESA, as amended; species that are currently candidates for federal listing under the ESA; state-listed threatened or endangered species; and species otherwise granted special status at the state or federal level (e.g., protected under the Marine Mammal Protection Act of 1972 [MMPA]).

Federal agencies are required under Section 7 of the ESA, as amended, to ensure that any actions authorized, funded, or carried out by the agency would not jeopardize the continued existence of a federally listed threatened or endangered species, or result in the destruction or adverse modification of the designated critical habitat of a federally listed species. As the lead federal agency, the FERC is required to coordinate with the FWS and NOAA Fisheries to determine whether federally listed threatened or endangered species or designated critical habitat are found in the vicinity of the projects, and to determine potential effects on those species or critical habitats.

For actions involving major construction activities with the potential to affect listed species or designated critical habitat, the lead federal agency must prepare a BA and submit its BA to the FWS and/or NOAA Fisheries. If the action would adversely affect a listed species, the federal agency must also submit a request for formal consultation. In response, the FWS and/or NOAA Fisheries would issue a Biological Opinion as to whether or not the federal action would likely jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat.

As required by Section 7 of the ESA, we request that NOAA Fisheries accept the information provided in this EIS as the BA for the projects. Furthermore, we request concurrence with our findings of effect for the federally listed species in table 4.7-1. The projects would have no effect on listed species under the jurisdiction of the FWS; therefore, preparation of a BA and consultation between the FERC and FWS is not necessary.

To assist in compliance with Section 7 of the ESA, Magnolia, acting as the FERC's non-federal representative for the Magnolia LNG Project, coordinated with the FWS Louisiana Ecological Services Field Office and with NOAA Fisheries Protected Resources Division in August 2013 regarding its project. On September 27, 2013, the FWS confirmed that Magnolia's proposed activities would have no effect on federal trust resources that are under its jurisdiction and currently protected by the ESA (FWS, 2013). Similarly, KMLP requested comments from the FWS Louisiana Ecological Services Field Office on June 25, 2014 regarding its project and *Protected Species and Habitat Survey Report*. On July 25, 2014, the FWS confirmed that KMLP's proposed activities would have no effect on federal trust resources that are under its jurisdiction and currently protected by the ESA (FWS, 2014a). Magnolia and KMLP also coordinated with the LDWF and requested a review of information contained within the LNHP's database regarding species and habitats potentially affected by construction or operation of the projects, respectively. Federally and state-listed species, as well as species that are candidates for listing, potentially occurring in the vicinity of the projects are identified in table 4.7-1.

TABLE 4.7-1

Federally and State-listed Species Potentially Occurring in the Vicinity of the Magnolia LNG and Lake Charles Expansion Projects

Common Name *Scientific Name*	Federal Status	State Status	Parish	Project Components	Determination of Effect and Habitat Assessment
Birds					
Bald eagle *Haliaeetus leucocephalus*	Delisted [a, b]	Endangered	Calcasieu	LNG terminal	*Impacts are not anticipated* Nesting typically occurs in mature trees (e.g., bald cypress, sycamore, willow) in or near cypress/tupelo swamps, fresh to intermediate marshes, or open water. No suitable habitat is present in or adjacent to the LNG terminal.
Brown pelican *Pelecanus occidentalis*	Delisted [b]	Endangered	Cameron	LNG transit routes	*Impacts would not be significant* The species is largely restricted to coastal waters for foraging and nesting. No suitable nesting habitat is present in or adjacent to the LNG transit routes. Although foraging habitat exists near the LNG transit routes, it is unlikely that brown pelicans would use these areas regularly due to the existing high level of ship traffic.
Piping plover *Charadrius melodus*	Threatened, [b] Critical Habitat	Threatened / Endangered	Cameron	LNG transit routes	*No effect* The species breeds in the northern United States and Canada and overwinters along the coast of the Gulf of Mexico. Wintering habitat includes sandy beaches along the shoreline of the Gulf of Mexico. No suitable wintering habitat would be affected by the LNG terminal. *No destruction or adverse modification of critical habitat* The nearest designated critical habitat is over 20 miles south of the LNG terminal site and includes the shoreline on either side of the entrance to the Calcasieu Ship Channel. As this is an existing heavily trafficked area with reinforced shorelines, the increase in wave activity due to the proposed LNG carrier traffic is not expected to cause increased shoreline erosion or otherwise impact designated critical habitat.
Red-cockaded woodpecker *Picoides borealis*	Endangered [b]	Endangered	Calcasieu Evangeline	LNG terminal KMLP facilities – CGT, TRANSCO, and TETCO Meter Stations	*No effect* Species occurs in open, park-like stands of mature pine forest. No suitable habitat is present in or adjacent to the LNG terminal site or KMLP facilities.
Red knot *Calidris canutus*	Threatened [b]	-	Cameron	LNG transit routes	*No effect* The species breeds in Alaska and Canada and may overwinter along the coast of the Gulf of Mexico. Wintering habitat includes tidal flats and beaches. No suitable wintering habitat would be affected by the LNG terminal.
Sprague's pipit *Anthus spragueii*	Candidate [b]	-	Acadia Calcasieu Cameron	KMLP facilities – Compressor Station 760; TGT, ANR, and Pine Prairie Meter Stations; header pipelines LNG terminal LNG transit routes	*Project would not contribute to a trend toward federal listing* The species breeds in the Great Plains. Wintering habitat in southern Louisiana consists of native prairie. No suitable habitat is present within or adjacent to the project components.

TABLE 4.7-1 (cont'd)

Federally and State-listed Species Potentially Occurring in the Vicinity of the Magnolia LNG and Lake Charles Expansion Projects

Common Name *Scientific Name*	Federal Status	State Status	Parish	Project Components	Determination of Effect and Habitat Assessment
Fish					
Gulf sturgeon *Acipenser oxyrinchus desotoi*	Threatened	Threatened	Cameron	LNG transit routes	*No Effect* This anadromous fish spawns in large, free-flowing freshwater rivers with hard substrates composed of sand, rock, or rubble in spring; forages in lower rivers during summer months; and returns to coastal waters of the Gulf of Mexico during the winter. The western extent of the species' present range is Lake Pontchartrain, which is over 125 miles east of the projects (FWS, 2009).
Marine/Aquatic Mammals					
West Indian manatee *Trichechus manatus*	Endangered [c]	Endangered	Cameron	LNG transit routes Recessed berthing area	*Not Likely to Adversely Affect* Species inhabits large, slow-moving rivers, river mouths, and shallow coastal areas such as coves and bays. Though extremely rare, this species has been documented within the Calcasieu River Basin and could utilize coastal areas along LNG transit routes.
Blue whale *Balaenoptera musculus*	Endangered [c]	-	Cameron	LNG transit routes	*Not Likely to Adversely Affect* The species inhabits the open ocean. Recorded twice in the Gulf of Mexico (1924 and 1940) (Texas Tech, 1997). The blue whale could utilize offshore areas along LNG vessel transit routes.
Fin whale *Balaenoptera physalus*	Endangered [c]	-	Cameron	LNG transit routes	*Not Likely to Adversely Affect* The species inhabits the open ocean. Though rarely documented in the Gulf of Mexico, this species could utilize offshore areas along LNG transit routes.
Humpback whale *Megaptera novaeangliae*	Endangered [c, d]	-	Cameron	LNG transit routes	*Not Likely to Adversely Affect* The species inhabits the open ocean, coastal waters, and sometimes inshore areas such as bays. Though rarely documented in the Gulf of Mexico, this species could utilize offshore areas along LNG transit routes.
Sei whale *Balaenoptera borealis*	Endangered [c]	-	Cameron	LNG transit routes	*Not Likely to Adversely Affect* The species inhabits the open ocean. Though rarely documented in the Gulf of Mexico, this species could utilize offshore areas along LNG transit routes.
Sperm whale *Physeter macrocephalus*	Endangered [c]	-	Cameron	LNG transit routes	*Not Likely to Adversely Affect* The species inhabits deep waters in the open ocean. The sperm whale is widely distributed throughout waters along and offshore of the continental slope (NOAA Fisheries, 2013f). This species could utilize offshore areas along LNG vessel transit routes.

TABLE 4.7-1 (cont'd)

Federally and State-listed Species Potentially Occurring in the Vicinity of the Magnolia LNG and Lake Charles Expansion Projects

Common Name *Scientific Name*	Federal Status	State Status	Parish	Project Components	Determination of Effect and Habitat Assessment
Marine Reptiles					
Green sea turtle *Chelonia mydas*	Threatened	-	Cameron	LNG transit routes	*Not Likely to Adversely Affect* Although rarely encountered in waters off the coast of western Louisiana, the green sea turtle could utilize areas along LNG vessel transit routes.
Hawksbill sea turtle *Eretmochelys imbricate*	Endangered	-	Cameron	LNG transit routes	*Not Likely to Adversely Affect* Although very rarely encountered in waters off the coast of Louisiana, this species was reported near Calcasieu Lake in 1986 and could utilize areas along LNG transit routes.
Kemp's ridley sea turtle *Lepidochelys kempii*	Endangered	-	Cameron	LNG transit routes	*Not Likely to Adversely Affect* Although extremely rare, this species has been documented in Calcasieu Lake and occurs off the coast of Louisiana within coastal and offshore waters more than other species of sea turtles. This species could utilize areas along LNG vessel transit routes.
Leatherback sea turtle *Dermochelys coriacea*	Endangered	-	Cameron	LNG transit routes	*Not Likely to Adversely Affect* Although rarely encountered in waters off the coast of western Louisiana, the leatherback sea turtle could utilize areas along LNG transit routes.
Loggerhead sea turtle *Caretta caretta*	Threatened	-	Cameron	LNG transit routes	*Not Likely to Adversely Affect* Although rarely encountered in waters off the coast of western Louisiana, the loggerhead sea turtle could utilize areas along LNG transit routes.

[a] Species protected under the BGEPA (see section 4.7.2.1)
[b] Species protected under the MBTA (see section 4.6.1.3)
[c] Species protected under the MMPA (see section 4.7.2.2)
[d] On April 21, 2015, NOAA Fisheries proposed to divide the humpback whale into 14 distinct population segments (DPS), remove the current species-level listing under the ESA, and list two DPS as endangered and two DPS as threatened. The remaining 10 DPS (including the West Indies DPS, which is the DPS that may occur along the vessel transit route) are not proposed for listing.

Based upon our review of publicly available information, agency correspondence, and field surveys, a total of 18 federally and/or state-listed threatened and endangered, or candidate species may occur in parishes affected by the projects. Within these parishes, critical habitat has been designated for one species, the piping plover. Potentially suitable habitat for federally listed species is not present within areas affected by construction or operation of the LNG terminal or KMLP facilities; however, potentially suitable habitat is present along the portion of the LNG transit route in Cameron Parish and the Gulf of Mexico.

We have determined that the projects would have no effect on four federally listed species, are not likely to destroy or adversely modify designated critical habitat, and would not contribute to the trend toward federal listing for the one candidate species. Because we have determined that the projects would not affect these species or their designated critical habitat, they are not discussed further in this EIS. Additional discussion of the13 remaining federally and/or state-listed species is provided in sections 4.7.1 and 4.7.2, respectively.

4.7.1 Federally Listed Threatened and Endangered Species

Based on information obtained from the FWS and NOAA Fisheries, 15 federally listed threatened and endangered species and 1 species that is a candidate for listing under the ESA may occur within the parishes affected by the projects. Of these, four federally listed and the one candidate species do not have the potential to occur in the vicinity of the proposed facilities (see table 4.7-1). The remaining 11 federally listed species are marine species (i.e., five sea turtle species, five whale species, and the West Indian manatee) that occur within or off the Gulf Coast of Cameron Parish, Louisiana. Therefore, potentially suitable habitat for these species is limited to the portion of the LNG vessel transit in Cameron Parish and the Gulf of Mexico. Other components of the projects (construction and operation of the LNG terminal and KMLP facilities) are outside of Cameron Parish, and are not discussed further.

4.7.1.1 Sea Turtles

Sea turtles are found throughout the tropical and subtropical seas of the world where they occur at or near the surface of the water. All species are listed as threatened or endangered under the ESA and are under the shared jurisdiction of the FWS and NOAA Fisheries.[12] Trade of sea turtles is restricted by the Convention on International Trade in Endangered Species; however, not all countries have ceased to harvest these species. The major threats to sea turtle populations are overharvesting, fisheries by-catch, disease, pollution, and coastal development of nesting beaches. Five species of federally listed sea turtles could occur along the portion of the LNG transit routes in Cameron Parish and the Gulf of Mexico, including the green, hawksbill, Kemp’s ridley, leatherback, and loggerhead sea turtles. These turtles are further described below.

Green Sea Turtle

The green sea turtle is currently federally listed as threatened. On March 23, 2015, the FWS and NOAA Fisheries found that the green sea turtle population is composed of 11 distinct population segments (DPS) that qualify as unique species for the purposes of listing under the ESA (Federal Register 15271–15337). As a result, the FWS and NOAA Fisheries are proposing to remove the current range-wide listing status and, in its place, to list eight DPSs as threatened and three DPSs as endangered. Green sea turtles occurring off the coast of Louisiana are part of the North Atlantic DPS, which is proposed for listing as threatened. This species occurs within coastal and offshore waters off of Louisiana, but is rarely documented off the western portion of the state (Fuller et al., 1987).

[12] The FWS has jurisdiction over sea turtles on land and NOAA Fisheries has jurisdiction over sea turtles within the marine environment.

Green sea turtles are generally found in shallow waters inside bays, inlets, and reefs with an abundance of seagrass and algae. They use coral reefs and rocky outcrops near feeding areas to rest, and they feed on marine plants, mollusks, sponges, crustaceans, and jellyfish. As one of the more coastal species of sea turtle, adult green sea turtles forage primarily on seagrass and marine algae. Hatchlings feed on a variety of plants and animals and have been observed utilizing *Sargassum* mats for food and refuge. Green sea turtles can exhibit high nesting site fidelity, which can lead to common migratory routes between feeding grounds and nesting beaches. Green sea turtles nest on open, sloping beaches with minimal disturbance (FWS, 2012b). This species is not commonly known to occur in either inshore or offshore waters of Louisiana. Suitable nesting habitat is not present along the LNG transit routes; however, adult green sea turtles could potentially utilize these areas for transit and juveniles could potentially utilize these areas for foraging.

Hawksbill Sea Turtle

The hawksbill sea turtle is federally listed as endangered. This species is widely distributed throughout the Caribbean Sea and western Atlantic Ocean. The hawksbill sea turtle is one of the most infrequently encountered sea turtles in offshore Louisiana (COE, 2013a). However, a hawksbill was reported near Calcasieu Lake in 1986 (Fuller et al., 1987). They occur in shallow coastal areas, oceanic islands, rocky areas, and coral reefs (FWS, 2012c). Hawksbill sea turtles feed on sponges, other invertebrates, and algae (NOAA Fisheries, 2013a). Young hawksbills are found foraging in association with *Sargassum* mats in the open ocean; as they mature, hawksbill sea turtles commonly forage over coral reefs and hard bottom substrates. They nest in low densities on scattered undisturbed deep-sand beaches in the tropics. (FWS, 2012c). This species is not commonly known to occur in either inshore or offshore waters of Louisiana. Suitable nesting habitat is not present along the LNG transit routes; however, adult hawksbill sea turtles could potentially utilize these areas for transit and juveniles could potentially utilize these areas for foraging.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle is federally listed as endangered. This species is the smallest marine turtle in the world and has been documented off the coast of Louisiana more than other sea turtles (Fuller et al., 1987). This species has been documented within Calcasieu Lake, though very rarely (Fuller et al., 1987). Juvenile Kemp's ridley sea turtles are generally found in Louisiana's coastal waters from May through October, and adults are common during the spring and summer near the mouth of the Mississippi River. During the winter months, Kemp's ridley sea turtles typically move offshore to deeper, warmer waters, but some of the deepwater channels and estuaries in Louisiana could provide thermal refuge (COE, 2013a). Kemp's ridley sea turtles feed primarily on crabs, but are also known to feed on fish, jellyfish, and mollusks (FWS, 2012d; NOAA Fisheries, 2013b). This species is not known to nest on the Louisiana coast; however, it could utilize the estuarine and offshore waters along the LNG transit routes for foraging and transit during the non-nesting season (LDWF, 2014f).

Leatherback Sea Turtle

The leatherback sea turtle is federally listed as endangered. The leatherback is the largest sea turtle and spends more of its life in the open ocean environment than other sea turtles. Because it spends most of its life in offshore waters, the leatherback sea turtle is rarely documented off the coast of Louisiana (Fuller et al., 1987). Leatherback sea turtles occur globally, and range farther north and south than other sea turtles, likely due to their ability to maintain warmer body temperatures. Leatherback sea turtles feed primarily on soft-bodied animals such as jellyfish and sea squirts; however, they are also known to consume sea urchins, crustaceans, fish, and floating seaweed. Females require sandy beaches with deepwater approach for nesting habitat. (FWS, 2012e, NOAA Fisheries, 2013c). The largest nesting assemblages are found in northern South America and West Africa; however, within the United States, southeast Florida, the U.S. Virgin Islands, and Puerto Rico are their primary nesting locations (NOAA Fisheries, 2013c). This species is not commonly known to occur in either inshore or offshore waters of Louisiana. While leatherback sea turtles could potentially utilize offshore waters along the LNG transit routes for foraging habitat and transit, suitable nesting habitat for this species is not present within these areas.

Loggerhead Sea Turtle

The loggerhead sea turtle is federally listed as threatened. This species occurs throughout the world in temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. The loggerhead sea turtle is occasionally documented off the coast of Louisiana, although the majority of the sightings occur east of the Vermillion River (over 70 miles east of the LNG vessel transit route through the Gulf of Mexico) (Fuller et al., 1987). The loggerhead sea turtle can migrate significant distances between foraging areas, breeding areas, and nesting locations. They can be found in inshore areas such as bays, ship channels, large river mouths, and salt marshes as well as hundreds of miles offshore. Loggerhead sea turtles feed on mollusks, crustaceans, fish, conchs, and other marine animals (FWS, 2012f; NOAA Fisheries, 2013e). Young loggerheads occur in the open ocean and are often found in association with *Sargassum* mats, while juveniles and adults reside in coastal areas in between reproductive migrations where females return to their natal beach to nest. In the United States, loggerheads can be found nesting from Texas to Virginia, though the major nesting concentrations occur in Florida, Georgia, South Carolina, and North Carolina (FWS, 2012f). While loggerhead sea turtles could potentially utilize inshore and offshore waters along the LNG transit routes for foraging habitat and transit, suitable nesting habitat for this species is not present within these areas.

Sea Turtle Impacts and Mitigation

No suitable nesting habitat for sea turtles is present along the LNG vessel transit routes, although foraging and transit habitat for these species is present within these areas. The increased traffic within the Calcasieu Ship Channel and Gulf of Mexico due to LNG vessel transit to and from the LNG terminal site could pose an increased risk to sea turtles from vessel strikes. LNG transit vessels (LNG carriers and LNG barges) would use well-traveled shipping lanes. In total, LNG transit vessels could make up to 208 trips to the LNG terminal per year (up to four round trips per week). Vulnerability to collision with an LNG transit vessel would be greatest while sea turtles feed, swim, and rest near the surface of the water. LNG transit vessels operating within the U.S. Exclusive Economic Zone (EEZ) in the Gulf of Mexico are generally slower and generate more noise than typical large vessels, and would be more readily avoided by sea turtles. Additionally, LNG carriers push a considerable bow wave when underway on the open ocean because of their design and large displacement tonnage. This wave pushes water, flotsam, and other small objects (such as sea turtles) away from the vessel. To further minimize the potential for vessel strikes, Magnolia would provide LNG ship captains with the NOAA-issued document entitled *Vessel Strike Avoidance Measures and Reporting for Mariners* (NOAA Fisheries, 2008)" which outlines collision avoidance measures. Based on the sea turtle's characteristics and habitat requirements, and because Magnolia would provide LNG ship captains with NOAA Fisheries' recommended strike avoidance measures, we have determined that the Magnolia LNG Project *may affect, but is not likely to adversely affect* sea turtles.

4.7.1.2 West Indian Manatee

The West Indian manatee is federally listed as endangered. This species is an herbivorous marine mammal most commonly found in coastal estuaries and rivers in Florida and Georgia, but it has been documented from Texas to Massachusetts. Manatees are a sub-tropical species that are not cold-tolerant and reside in the warm waters of peninsular Florida during the winter; however, they may disperse great distances during warmer months (FWS, 2007). They feed on aquatic plants such as seagrass, water hyacinths, hydrilla, and eelgrass. Mating can occur at any time of year with adults usually giving birth to a calf every 2 to 5 years. Calves may be present throughout the year and usually remain with their mother for up to 2 years. The greatest threats to the manatee are collisions with boats and loss of warm water habitat. They often rest suspended just below the water's surface, making them very vulnerable to being hit by vessels (FWS, 2014c).

Although extremely rare in the general project area, the manatee has been documented within the Calcasieu River Basin and could occur along the portion of the LNG transit routes in Cameron Parish and the Gulf of Mexico (FWS, 2014b); however, given the level of industrial activity and lack of foraging habitat within the Calcasieu Ship Channel, their presence within this area is unlikely (LDWF, 2014g). Due to its location several miles north of Calcasieu Lake within the Industrial Canal, the likelihood of manatees occurring in the vicinity of the recessed berthing area is so unlikely as to be discountable.

Increased traffic within the Calcasieu Ship Channel due to LNG vessel transit to and from the LNG terminal could pose an increased risk to manatees from vessel strikes. In areas of intense ship traffic, manatees can experience propeller or collision injuries; however, most of these injuries are caused by small, fast moving vessels. As described in section 4.7.1.1, Magnolia proposes to provide LNG ship captains with a NOAA-issued guidance document that outlines collision avoidance measures in order to minimize impacts from vessel strikes.

Based on the manatee's characteristics and habitat requirements, the lack of foraging habitat along the LNG transit routes, and because Magnolia would provide LNG ship captains with NOAA Fisheries' recommended strike avoidance measures, we have determined that the Magnolia LNG Project *may affect, but is not likely to adversely affect* the West Indian manatee.

4.7.1.3 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. Whales could utilize the offshore areas of the Gulf of Mexico along the LNG transit routes for migration and feeding.

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 (NOAA Fisheries, 2010b). Sperm whales are present in the northern Gulf of Mexico in all seasons, but are more common during the summer months (NOAA Fisheries, 2014c). The sperm whale is the only federally listed whale that is known to commonly occur in the Gulf of Mexico (NOAA Fisheries, 2012).

The humpback whale is a baleen whale that is distributed throughout the world's oceans. They generally spend winter months in lower temperate and tropical waters then migrate to higher latitudes during the summer months to feed in areas of high productivity. They winter in tropical waters in close proximity to deeper water. Calving occurs primarily during the winter months and the only breeding ground in U.S. waters is near Puerto Rico (NOAA Fisheries, 1991). Although humpback whales have been documented within the Gulf of Mexico, no population estimates are available for this area as sightings are uncommon (NOAA Fisheries, 2012).

Other baleen whales, including the fin, sei, and blue whales are listed by NOAA Fisheries as occurring within the southeast region. Like the humpback, these whales are not commonly found in the Gulf of Mexico, but could occur within the area during migrations or other movements (NOAA Fisheries, 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 (NOAA Fisheries, 1998, 2010a, 2011a). Calving and breeding grounds have not been identified for these species in the Gulf of Mexico.

Whales could be vulnerable to vessel strikes during operation of the proposed LNG terminal. Vulnerability to collision with LNG transit vessels would be greatest while these 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, most of these injuries are caused by small, fast moving vessels. LNG transit vessels operating within the EEZ in the Gulf of Mexico are generally slower and generate more noise than typical large vessels, and would be more readily avoided by whales. These LNG transit vessels would use established and well-traveled shipping lanes. As described in section 4.7.1.1, Magnolia proposes to provide LNG ship captains with a NOAA-issued guidance document that outlines collision avoidance measures to be implemented in order to minimize the likelihood of a vessel strike. Based on the whales' characteristics and habitat requirements, and because Magnolia would provide LNG ship captains with NOAA Fisheries' recommended strike avoidance measures, we have determined that the Magnolia LNG Project *may affect, but is not likely to adversely affect* federally listed whales.

4.7.2 State-listed and Special Status Species

4.7.2.1 State-listed Species

Based on information obtained from the LDWF, six state-listed threatened or endangered species are listed within the parishes that would be affected by the projects (LDWF, 2014h). Four of the six state-listed species (piping plover, red-cockaded woodpecker, Gulf sturgeon, and West Indian manatee) are also federally listed as threatened or endangered; as indicated in table 4.7-1 and discussed in section 4.7.1. The projects are expected to have no impact on one of the two remaining state-listed species (bald eagle) due to the absence of suitable habitat within or near the LNG terminal. The remaining state-listed species, the brown pelican, is discussed below.

The brown pelican is listed by the State of Louisiana as endangered and may occur within Cameron Parish; therefore, impacts resulting from construction and operation of the LNG terminal and KMLP facilities, which are outside of Cameron Parish, are not discussed within this section. The brown pelican was federally delisted in 2009, but is still federally protected by the MBTA, which prohibits the "taking" of brown pelicans, including their parts, nests, or eggs (see section 4.6.1.3). In Louisiana, the brown pelican occurs along the coasts in bays and tidal estuaries; nesting occurs primarily in southeastern coastal areas on barrier islands within dune shrub thickets. Brown pelicans primarily forage on fish and some marine invertebrates. Current threats to this species include loss of nesting habitat due to barrier island erosion, loss of coastal land, and the illegal take of eggs (LDWF, 2014e).

While no suitable nesting habitat is present along the LNG transit routes, the Calcasieu Ship Channel and coastal waters of the Gulf of Mexico may provide foraging habitat for the brown pelican. Although this species commonly occurs within the Sabine National Wildlife Refuge (NWR), which is approximately 12 miles south-southwest of the proposed LNG terminal site on the west side of the Calcasieu Ship Channel (Audubon, 2014), due to the high level of ship traffic, it is unlikely that brown pelicans would use the Calcasieu Ship Channel regularly.

Based on Magnolia's proposed use of existing, highly traveled shipping lanes, we have determined that adverse impacts on brown pelicans due to LNG transit during operation of the LNG terminal are not anticipated.

4.7.2.2 Marine Mammals

Marine mammals are federally protected under the MMPA. The MMPA established, with limited exceptions, a moratorium on the "taking" of marine mammals in waters or on lands under United States jurisdiction. The act further regulates, with certain exceptions, the "take" of marine mammals on the high seas by persons, vessels, or other conveyances subject to the jurisdiction of the United States. A total of 29 mammals protected under the MMPA may occur along the LNG transit routes (NOAA Fisheries, 2012). Six of these species are also listed under the ESA (five whales and the West Indian manatee) and are included in table 4.7-1 and discussed in sections 4.7.1.2 and 4.7.1.3. The remaining 23 whale and dolphin species and their potential area of occurrence along the LNG transit routes are described in table 4.7.2-1 and discussed below.

TABLE 4.7.2-1

Non-Endangered Species Act Listed Marine Mammals Potentially Occurring Along the LNG Transit Routes

Common Name	Scientific Name	Area Where Mammal May Occur
Dolphins		
Atlantic spotted dolphin	*Stenella frontalis*	Calcasieu Ship Channel and Gulf of Mexico
Bottlenose dolphin	*Tursiops truncatus*	Calcasieu Ship Channel and Gulf of Mexico
Clymene dolphin	*Stenella clymene*	Gulf of Mexico
False killer whale	*Pseudorca crassidens*	Gulf of Mexico
Frasier's dolphin	*Lagenodelphis hosei*	Gulf of Mexico
Killer whale	*Orcinus orca*	Gulf of Mexico
Melon-headed whale	*Peponocephala electra*	Gulf of Mexico
Pantropical spotted dolphin	*Stenella attenuata*	Gulf of Mexico
Pygmy killer whale	*Feresa attenuata*	Gulf of Mexico
Risso's dolphin	*Grampus griseus*	Gulf of Mexico
Rough-toothed dolphin	*Steno bredanensis*	Gulf of Mexico
Short-finned pilot whale	*Globicephala macrorhynchus*	Gulf of Mexico
Spinner dolphin	*Stenella longirostris*	Gulf of Mexico
Striped dolphin	*Stenella coeruleoalba*	Gulf of Mexico
Whales		
Blainville's beaked whale	*Mesoplodon densirostris*	Gulf of Mexico
Bryde's whale	*Balaenoptera edeni*	Gulf of Mexico
Cuvier's beaked whale	*Ziphius cavirostris*	Gulf of Mexico
Dwarf sperm whale	*Kogia sima*	Gulf of Mexico
Gervais' beaked whale	*Mesoplodon europaeus*	Gulf of Mexico
Minke whale	*Balaenoptera acutorostrata*	Gulf of Mexico
North Atlantic right whale	*Eubalaena glacialis*	Gulf of Mexico
Pygmy sperm whale	*Kogia breviceps*	Gulf of Mexico
Sowerby's beaked whale	*Mesoplodon bidens*	Gulf of Mexico

Source: NOAA Fisheries, 2012

Two marine mammal species, the Atlantic spotted dolphin and bottlenose dolphin, could potentially occur within the Calcasieu Ship Channel. Due to the distance from the Gulf of Mexico (transit is 24 nautical miles from the entrance to the Calcasieu River jetties in the Gulf of Mexico [River Mile 0] to the LNG terminal) and the increased freshwater influence, it is unlikely that dolphins would be found within the Industrial Canal. Atlantic spotted dolphins are widely distributed within warm tropical to temperate waters of the Atlantic Ocean, including the Gulf of Mexico. Their diet consists of small fish, squid, octopus, and benthic invertebrates. Bottlenose dolphins are found in tropical and temperate waters worldwide. Coastal populations commonly migrate into bays and estuaries while offshore populations reside along the continental shelf. The coastal populations feed on fish and benthic invertebrates while offshore populations feed on pelagic fish and squid. Bottlenose dolphins commonly occur in coastal waters of Louisiana and offshore waters within the Gulf of Mexico and could occur within the Calcasieu Ship Channel. Atlantic spotted dolphins could also occur within these areas due to their occasional association with bottlenose dolphins (NOAA Fisheries, 2014a, 2014b).

Impacts on marine mammals occurring along the LNG transit routes would be similar to those discussed in sections 4.7.1.2 and 4.7.1.3 regarding the West Indian manatee and federally listed whales, respectively. The primary threat to marine mammals resulting from LNG vessel transits would be an increased risk of vessel strikes during operation. LNG transit vessels operating within the EEZ in the Gulf of Mexico are generally slower and generate more noise than typical large vessels, and would be more readily avoided by marine mammals. Additionally, LNG ships push a considerable bow wave when underway on the open ocean because of their design and large displacement tonnage. This wave pushes water, flotsam, and other small objects (e.g., dolphins) away from the vessel. LNG vessels would use established and well-traveled shipping lanes. As described in section 4.7.1.1, Magnolia proposes to provide LNG ship captains with a NOAA-issued guidance document that outlines collision avoidance measures to be implemented in order to minimize the likelihood of a vessel strikes. Based on Magnolia's proposed use of existing, highly traveled shipping lanes and proposed mitigation measure, we have determined that construction and operation of the LNG terminal would have no significant adverse impacts on marine mammals.

4.8 LAND USE, RECREATION, AND VISUAL RESOURCES

4.8.1 Land Use

4.8.1.1 Environmental Setting

The LNG terminal and KMLP facilities would affect five general land use types, including agricultural, industrial/commercial, open land, open water, and forest. Table 4.8.1-1 summarizes the acreage of each land use type that would be affected by construction and operation of the LNG terminal and KMLP facilities. The definitions of each land use type are as follows:

- <u>Agricultural</u> – includes active cropland, pasture, hayfields, and crawfish ponds;
- <u>Industrial/Commercial</u> – includes power or utility stations, manufacturing or industrial plants, paved areas, commercial facilities, and roads;
- <u>Open Land</u> – includes non-forested uplands, maintained (vegetated) utility rights-of-way, and emergent (herbaceous) and scrub-shrub wetlands;
- <u>Open Water</u> – includes waterbodies such as the Industrial Canal, borrow pit, intermittent streams, and ditches; and
- <u>Forest</u> – includes upland forest and forested/scrub-shrub wetland complexes.

TABLE 4.8.1-1

Land Use Types Affected by Construction and Operation of the LNG Terminal and KMLP Facilities (in acres) [a]

	Agricultural		Industrial/ Commercial		Open Land		Open Water		Forest		Total	
Facility	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons. [b]	Oper. [c]
LNG TERMINAL FACILITIES												
LNG terminal [d]	0.0	0.0	0.0	0.0	80.1	80.1	9.8	9.8	34.0	34.0	123.8	123.8
DII construction yard	0.0	0.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	0.0
Dredge material and effluent pipelines [e]	0.0	0.0	6.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.9	0.0
Dredge material placement area [f]	0.0	0.0	1.0	0.0	106.8	0.0	33.5	0.0	0.5	0.0	141.8	0.0
Total for LNG Terminal Facilities	**0.0**	**0.0**	**13.1**	**0.0**	**186.9**	**80.1**	**43.3**	**9.8**	**34.5**	**34.0**	**277.7**	**123.8**
KMLP FACILITIES												
Header Pipelines												
Low pressure header pipeline	20.2	7.8	0.4	0.3	0.0	0.0	0.1	0.0	0.0	0.0	20.7	8.1
High pressure header pipeline	0.9	0.5	0.2	0.2	0.1	0.0	<0.1	0.0	0.0	0.0	1.1	0.7
Subtotal	**21.1**	**8.3**	**0.6**	**0.5**	**0.1**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**21.9**	**8.8**
Aboveground Facilities												
Compressor Station 760	40.4	11.2	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	40.6	11.2
CGT Meter Station	0.6	0.3	1.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.3
TRANSCO Meter Station	0.6	<0.1	0.9	0.0	0.1	0.1	0.0	0.0	0.0	0.0	1.6	0.1
TETCO Meter Station	0.5	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0
ANR Meter Station	0.3	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0
Pine Prairie Meter Station	0.0	0.0	1.9	0.0	0.1	0.0	0.0	0.0	0.0	0.0	2.0	0.0
TGT Meter Station	0.0	0.0	0.9	0.0	0.5	0.4	<0.1	0.0	0.0	0.0	1.3	0.4
Existing access roads	0.0	0.0	3.0	0.0	0.0	0.0	<0.1	0.0	0.0	0.0	3.0	0.0
Subtotal	**42.4**	**11.5**	**10.6**	**0.1**	**0.7**	**0.5**	**0.2**	**0.0**	**0.0**	**0.0**	**54.0**	**12.0**
Total for KMLP Facilities	**63.5**	**19.8**	**11.2**	**0.6**	**0.7**	**0.5**	**0.3**	**0.0**	**0.0**	**0.0**	**75.8**	**20.8**
TOTAL	**63.5**	**19.8**	**24.3**	**0.6**	**187.6**	**80.6**	**43.6**	**9.8**	**34.5**	**34.0**	**353.5**	**144.6**

[a] The totals shown in this table may not equal the sum of the addends due to rounding.
[b] Total construction impacts include both temporary and permanent work areas.
[c] New operation impacts include only new permanent easement or facility footprint (i.e., land within the existing meter stations is not included).
[d] LNG terminal includes those facilities that would be constructed and operated at the site by Magnolia as well as KMLP's Magnolia Meter Station and interconnect pipeline.
[e] Access to areas that would be crossed by the dredge material and effluent pipelines has not been granted at the time of this writing. Land use categories were determined based on review of aerial photography.
[f] Access to the dredge material placement area has not been granted at the time of this writing; therefore, NWI data was used to identify wetlands present. Magnolia has stated that wetlands identified during survey may be avoided, restored, or filled. Because actual wetland impacts have not been determined at this time, our impact analysis assumes the worst-case scenario (fill of wetlands present within the placement area). See additional discussion in section 4.4.2.1.

LNG Terminal Facilities

The LNG terminal would be located on 114 acres of land within a 115-acre site along the southern shore of the Industrial Canal. The site, which is zoned for heavy industrial use (Calcasieu Parish Police Jury, 2015), was used by the COE for the placement of dredge material from within the Industrial Canal and turning basin between 1975 and 1984. As a result, the site is comprised of open land (70 percent) and relatively young forest (30 percent). In addition, 9.8 acres of open water within the Industrial Canal would be required during construction and operation of the recessed berthing area at the LNG terminal.

Utilities within the site include KMLP's natural gas pipeline that largely parallels the southern portion of the site, a Chevron natural gas pipeline that transects the western corner of the site, and water and telephone lines along the southern boundary of the site, adjacent to Henry Pugh Boulevard. No buildings or aboveground structures are present within the LNG terminal site. The nearest occupied residences are 0.6 mile south of the site; this community is situated along a canal leading to the Intracoastal Waterway.

Magnolia plans to use a 5.2-acre portion of the existing DII construction yard for marine deliveries, materials staging and transport, and temporary parking for construction workers. Land use within this portion of the DII site is industrial/commercial. In addition, Magnolia plans to use a 148.7-acre area for the temporary placement of dredge material and effluent pipelines and dredge material placement. Land use along the dredge material and effluent pipeline route is industrial/commercial; land use within the dredge material placement area is primarily open land (75 percent), although open water (24 percent), forest (1 percent), and industrial/commercial (less than 1 percent) are also present.

The LNG terminal would be on the southern shore of the Industrial Canal on land owned by the Port of Lake Charles. Land use adjacent to the Industrial Canal east and northeast of the LNG terminal is primarily industrial/commercial and developed. In contrast, land use to the northwest and south of the site consists of open land and forest. Land use in the vicinity of the LNG terminal is depicted in figure 4.8.1-1 and described in additional detail below:

- East of the LNG terminal along the Industrial Canal – Land use within the DII, Seabulk Towing, and Leevac Shipyards sites is comprised primarily of industrial/commercial. As described above, portions of the DII site would be used during construction of the LNG terminal.
- East of the Industrial Canal across Big Lake Road – The proposed dredge material and effluent pipelines and dredge material placement area would be within the CB&I site. Land use within the western portion of the CB&I site, through which the dredge material and effluent pipelines would be routed, is industrial/commercial. The eastern portion of the site, where the dredge material placement area would be located, contains primarily open land.
- Southeast of the LNG terminal – Land use within the Calcasieu Parish District 12 Water Works site, which contains two public water supply wells and one water storage tank, is developed (analysis relating to the water supply wells is provided in section 4.3.1).
- Northeast of the LNG terminal – Across the Industrial Canal, land use within the Trunkline LNG Terminal and Lake Charles Carbon Company sites is industrial/commercial.

Magnolia LNG Project

1:12,000

0 500 1,000 Feet

Figure 4.8.1-1
Development in the Vicinity of the LNG Terminal

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\03\Land_Uses_MLP_LNG_Land_Uses.mxd | REVISED: 03/20/2015 | SCALE: 1:12,000 DRAWN BY: JSSuess

- West of the LNG terminal along the Industrial Canal – Land use within Martin Energy Services' vessel bunkering facility and Marine Spill Response Corporation's pier for supporting oil spill response services is industrial/commercial. Land use within Calcasieu Point Landing, a public park, is developed (analysis relating to Calcasieu Point Landing is provided in section 4.8.4).

- Northwest and south of the LNG terminal – Undeveloped land occurs both to the northwest and south of the LNG terminal site, across the Industrial Canal and Henry Pugh Boulevard, respectively. Land use within these areas contains a mixture of forest and open land.[13]

KMLP Facilities

Construction of the header pipelines, Compressor Station 760, and proposed modifications to KMLP's existing meter stations would affect about 76 acres of land in Evangeline and Acadia Parishes. Because the activities associated with the KMLP facilities involve modification or expansion of existing facilities, much of the land affected by the KMLP facilities would be adjacent to the permanent easement associated with KMLP's existing mainline or would be adjacent to or within existing meter station sites.

As described in table 4.8.1-1, the new facilities (the header pipelines and Compressor Station 760) would be constructed almost entirely within agricultural lands (98 percent) currently used for rice and crawfish production. The nearest residence to the header pipelines is approximately 500 feet west of the low pressure header pipeline (milepost 0.2). The nearest residences to Compressor Station 760 include three homesteads approximately 1,500 feet west of the compressor station site.

Because the meter station modifications would take place within and adjacent to existing facilities, the majority of the land affected would be industrial/commercial (73 percent); the remaining land affected by the meter station modifications would be agricultural (19 percent) and open lands (8 percent). The nearest residence to the meter stations is approximately 100 feet northwest of the existing TRANSCO Meter Station.

A permanent road would be constructed for access to Compressor Station 760. With the exception of the installation of a culvert, the access road would be entirely within agricultural land. Existing access roads within industrial/commercial land would be used to provide access to the TETCO, Pine Prairie, and TGT Meter Stations. One residence is approximately 50 feet from the existing access road to the Pine Prairie Meter Station.

4.8.1.2 Impacts and Mitigation

Construction of the LNG terminal and KMLP facilities would affect a total of 353.5 acres of land. Of this, 144.6 acres would be permanently affected by operation of the LNG terminal and KMLP facilities and 173.9 acres would be allowed to revert to the existing land use type after the completion of construction activities. The remaining 35.0 acres, within the dredge material placement area, would be converted from open water (33.5 acres), industrial/commercial (1.0 acre), and forest (0.5 acre) to open land in accordance with landowner requirements. Impacts on agricultural, industrial/commercial, open land, open water, forest, and residential land use are discussed below.

---

[13] Additional facilities planned in the vicinity of the LNG Terminal include G2X Energy's natural gas to gasoline facility, which would be located north of the LNG terminal across the Industrial Canal and the LDWF's Fisheries Research Center, which would be located immediately south of the LNG terminal across Henry Pugh Boulevard. These facilities, which have begun the permitting process but are not yet under construction, are described in detail in section 4.13.

LNG Terminal Facilities

Construction of the LNG terminal would affect a total of 277.7 acres of land within the LNG terminal site, Industrial Canal, DII construction yard, along the dredge material and effluent pipelines, and at the dredge material placement area. The land use types affected during construction of the LNG terminal would include open land (67 percent), open water (16 percent), forest (12 percent), and industrial/commercial (5 percent).

Open Land

Open land affected by construction of the LNG terminal would include 80.1 acres at the LNG terminal site and 106.8 acres at the dredge material placement area. Within the LNG terminal site, impacts on open land would be permanent due to the conversion of the affected area to industrial/commercial use. The permanent loss of emergent wetlands determined to be jurisdictional under section 404 of the CWA within open land at the LNG terminal would be mitigated by Magnolia's implementation of its *Compensatory Mitigation Plan*, as described in section 4.4.4. Open land within the dredge material placement area would be temporarily disturbed by the placement of dredge spoil and grading activities. Impacts would be short term and would be reduced by the implementation of Magnolia's project-specific Plan and Procedures. Following dredge placement and dewatering, the dredge material placement area would be graded, reseeded, and maintained as open land, resulting in a 35-acre increase in open land (including 33.5 acres within the borrow pit, 1.0 acre that is currently a site road, and 0.5 acre of forest/scrub-shrub wetland).

Open Water

Construction and operation of the LNG terminal would impact a total of 43.3 acres of open water, including 33.5 acres within the borrow pit at the dredge material placement area and 9.8 acres within the Industrial Canal. Construction of the recessed berthing area at the LNG terminal would require dredging a 16.2-acre area within the Industrial Canal (existing land use includes 9.8 acres of open water and 6.4 acres of open land) to a depth of 44 feet and installation of LNG loading and berthing facilities (see section 2.5.1.4). Operation of the LNG terminal would result in the conversion of 9.8 acres of open water to industrial/commercial use associated with LNG vessel loading. Impacts on use of open water within the Industrial Canal associated with construction and operation of the recessed berthing area include reduced access for recreational users when an LNG vessel is at the LNG terminal as well as increased marine vessel traffic. Impacts on recreational use of the Industrial Canal and marine vessel traffic are described in sections 4.8.4 and 4.9.6.2, respectively.

The borrow pit occurs within a developed area owned by CB&I; although not required for operation of the LNG terminal, this area would be filled in accordance with the landowner agreement between CB&I and Magnolia. Potential impacts on surface waters and aquatic resources within the borrow pit are discussed in sections 4.3.2.2 and 4.6.2.2, respectively.

Forest

Forest affected by construction of the LNG terminal would include 34.0 acres of low quality upland forest at the LNG terminal site and 0.5 acre of palustrine forest/scrub-shrub wetland at the dredge material placement area. Impacts on forest at the LNG terminal would be permanent, due to the conversion of the affected area to industrial/commercial use. Forest at the dredge material placement area would be converted to open land in accordance with the landowner agreement described above. Impacts on wetlands jurisdictional under section 404 of the CWA would be mitigated through the implementation of Magnolia's *Compensatory Mitigation Plan*, as described in section 4.4.4.

Industrial/Commercial

A total of 13.1 acres of industrial/commercial land would be affected by construction of the LNG terminal, including 5.2 acres within the DII construction yard, 6.9 acres along the dredge material and effluent pipelines, and 1.0 acre within the dredge material placement area. Impacts on industrial/commercial areas during construction would include increased dust from exposed soils, construction noise, and traffic congestion. Impacts on dust and noise levels would be minimized as described in sections 4.11.1 and 4.11.2, respectively. Impacts associated with construction traffic are discussed in section 4.9.6. Following the completion of construction activities, land use within industrial/commercial areas at the DII construction yard and along the dredge material and effluent pipelines would be restored to pre-construction conditions. Following the placement and dewatering of dredge spoil within the dredge material placement area, 1.0 acre of industrial/commercial land (an existing site road) would be converted to open land, in accordance with the landowner agreement.

Residential

No residential land is present within the footprint of the areas that would be affected by construction or operation of the LNG terminal. The nearest occupied residences are 0.6 mile south of the terminal site. Temporary impacts on residential areas during construction of the LNG terminal could include inconvenience caused by increased traffic from transporting workers, equipment, and materials to the work site as well as temporary increases in noise levels. Impacts on nearby residences due to increased traffic and noise levels are described in sections 4.9.6.1 and 4.11.2, respectively.

Summary and Conclusions

Over 99 percent of the land permanently affected by construction of the LNG terminal is within areas that have been previously disturbed by commercial or industrial activities, including 113.0 acres at the LNG terminal that was previously used for dredge material disposal and 9.8 acres within the Industrial Canal.[14] Impacts on the remaining 1.0 acre of land permanently affected by construction and operation of the LNG terminal would be fully mitigated in accordance with Magnolia's *Compensatory Mitigation Plan*, as described in section 4.4.4. Following the completion of construction activities, the remaining 153.9 acres of land affected by construction of the LNG terminal would be allowed revert to pre-construction use, with the exception of the 35.0-acre area within the dredge material placement area that would be converted to open land in accordance with the landowner agreement between CB&I and Magnolia. Because the areas affected by construction and operation of the LNG terminal are zoned for heavy industrial use (Calcasieu Parish Police Jury, 2015), we have determined that impacts on land use would be negligible.

KMLP Facilities

Construction of the KMLP facilities would affect a total of 75.8 acres of land associated with the low and high pressure header pipelines, Compressor Station 760, and the meter station modifications. Construction of the KMLP facilities would primarily impact agricultural (63.5 acres) and industrial/commercial (11.2 acres) land. The remaining 1.0 acre of land affected would be comprised of open land and open water. Potential impacts on land use associated with construction and operation of the KMLP facilities, as well as measures proposed to minimize impacts, are described in the following sections.

[14] The Industrial Canal was created to provide deepwater access for maritime commerce and is maintained by regular dredging, as described in more detail in section 4.3.2.2 (COE, 2015).

Agricultural

A total of 63.5 acres of agricultural land primarily used for rice and crawfish production would be affected by construction of the KMLP facilities, including 40.4 acres at Compressor Station 760, 21.1 acres along the low and high pressure header pipelines, and 2.0 acres at the meter station modification sites. Of this, operation of the KMLP facilities would result in the permanent conversion of 11.5 acres of agricultural land to industrial/commercial use within Compressor Station 760 and at the modified CGT and TRANSCO Meter Stations.

Impacts on agricultural areas would also include the temporary loss of production during and shortly after construction is completed. Impacts could also include damage to existing irrigation systems and soil rutting or compaction due to construction equipment. Following construction activities, the 43.7 acres of land within temporary workspaces and 8.3 acres of land within the permanent easements for the header pipelines would be restored to pre-construction condition in accordance with the FERC Plan and landowner requests. If drain tiles are exposed or damaged during construction activities, KMLP would implement measures to repair/replace them after communication with the landowner and in accordance with applicable regulatory guidelines. Following restoration, agricultural land within these areas would revert to the previous land use; however, land within the permanent easements for the header pipelines would be subject to routine maintenance to facilitate inspection of the header pipelines.

Industrial/Commercial

Construction of the KMLP facilities would affect 11.2 acres of industrial/commercial lands consisting of the existing meter stations and roads. Construction impacts on industrial/commercial areas during construction would include increased dust from exposed soils, construction noise, and traffic congestion. Impacts on dust and noise levels would be minimized as described in sections 4.11.1 and 4.11.2, respectively. Impacts associated with construction traffic are discussed in section 4.9.6. Operation of the KMLP facilities would permanently affect 0.6 acre of industrial/commercial land, which includes two locations where the low pressure header pipeline would be beneath a road (Coulee and Fournerat Roads), an increased footprint at the CGT Meter Station, and areas adjacent to Pine Prairie Meter Station where the header pipelines would connect to existing facilities.

Open Land

Small areas of open land totaling 0.7 acre would be affected by construction of the KMLP facilities. Of this, 0.5 acre would be permanently converted to industrial/commercial use at the TRANSCO and TGT Meter Stations. Impacts on the remaining 0.2 acre of open land temporarily disturbed by construction activities at the Pine Prairie and TGT Meter Stations would be short term and minimized by the implementation of the FERC Plan and Procedures, with the exception of the measures described in section 4.4.3.2. Following the completion of construction activities, the areas would be graded, reseeded, and allowed to revert to pre-construction conditions.

Open Water

Construction of the KMLP facilities would temporarily affect 0.3 acre of open water along the header pipelines and within Compressor Station 760 and the TGT Meter Station. Impacts on open water resulting from construction activities could include increased sedimentation rates, turbidity levels, and water temperature; decreased dissolved oxygen concentrations; and release of chemical or nutrient pollutants from sediments (see detailed discussion in section 4.3.2.2). However, these impacts would be temporary and would not preclude these areas from functioning as open water areas. Impacts on open waters would be minimized by the implementation of the FERC Procedures. No impacts on open water are anticipated during operation of the KMLP facilities.

Residential

No residential land is present within the footprint of the areas affected by construction or operation of the KMLP facilities. Two occupied residences are within approximately 100 feet of the proposed construction workspaces, including a residence approximately 100 feet northwest of the existing TRANSCO Meter Station and a residence 50 feet south of the existing access road for the Pine Prairie Meter Station. Temporary impacts on residential areas during construction activities at the TRANSCO and Pine Prairie Meter Stations could include inconvenience caused by increased traffic from transporting workers, equipment, and materials to the work site as well as temporary increases in noise levels. Impacts on nearby residences due to increased traffic and noise levels are described in sections 4.9.6.1 and 4.11.2, respectively.

Summary and Conclusions

As described above, the activities associated with the KMLP facilities involve modification or expansion of existing facilities; as a result, much of the land affected by the KMLP facilities would be located adjacent to the permanent easement associated with KMLP's existing mainline or would be adjacent to or within existing meter station sites. Impacts on land use associated with construction and operation of the KMLP facilities would be temporary and minor within 84 percent of the areas affected, which would be allowed to revert to pre-construction conditions, although 8.8 acres of land would be subject to routine maintenance over the header pipelines. Operation of Compressor Station 760 and the CGT, TRANSCO, and TGT Meter Stations would result in the permanent conversion of a total of 12.0 acres of land to industrial/commercial use. However, with the implementation of the FERC Plan and Procedures, we have determined that impacts on land use would be negligible.

4.8.2 Landowner and Easement Requirements

LNG Terminal

Magnolia has entered into an agreement with the Lake Charles Harbor and Terminal District to lease the 115-acre LNG terminal site for the minimum expected operational life of 30 years, with the option to extend the lease for four additional periods of 10 years each. Temporary workspaces proposed within the existing DII site would be subcontracted from DII. Temporary workspaces proposed along the dredge material and effluent pipelines would be leased from the landowners/leaseholders along the route. Magnolia is currently in negotiations with CB&I for use of the dredge material placement area. Aside from the Lake Charles Harbor and Terminal District, no federal, state, or local agency owned or managed lands occur within the LNG terminal site or proposed temporary workspaces.

KMLP Facilities

The lands necessary for construction and operation of the KMLP facilities would be composed of both land currently owned or leased by KMLP and other private land. For privately owned lands along the header pipeline routes, KMLP would need to secure easements that convey temporary and permanent rights-of-way.

An easement agreement between a company and a landowner typically specifies compensation for losses resulting from construction, including losses of non-renewable and other resources, damages to property during construction, and restrictions on existing uses that would not be permitted on the permanent right-of-way. Compensation would be fully determined through negotiations between KMLP and the landowner.

If an easement cannot be negotiated with a landowner and the project has been certificated by the Commission, KMLP could use its right to eminent domain under section 7(h) of the NGA and the procedure set forth under the Federal Rules of Civil Procedure (Rule 71A) to obtain the right-of-way and construction workspace areas. KMLP would still be required to compensate the landowner for the right-of-way and any damages incurred during construction; however, the level of compensation would be determined by a court according to state or federal law.

KMLP has entered into an option agreement with a private landowner to lease the 40.6-acre Compressor Station 760 site. The option agreement provides KMLP with the first right of refusal on the property until October 2016 (the seller cannot sell the property to another entity during this time without first offering the property to KMLP). Applications for rights-of-way would be filed for pipeline easement on the proposed low and high pressure header pipelines. In addition, applications for rights-of-way would be filed for footprint expansion at the CGT, TRANSCO, and TGT Meter Stations and for a new right-of-way for the proposed Magnolia Meter Station and interconnect pipeline.

4.8.3 Planned Developments

LNG Terminal

There are no residential areas or subdivisions currently proposed within a 0.25-mile radius of the LNG terminal site (Southwest Louisiana [SWLA] Economic Development Alliance, 2015b). Three commercial or industrial facilities are planned within 1 mile of the LNG terminal site, including the proposed Lake Charles Liquefaction Project, G2X Energy's natural gas to gasoline facility, and the LDWF's Fisheries Research Center, which are depicted on figure 4.8.1-1. Certain non-jurisdictional facilities are also planned to provide utilities (i.e., electric power, water) to the LNG terminal and KMLP facilities. Each of these non-jurisdictional projects, as well as other planned residential and commercial/industrial development projects in the broader area, are discussed in the cumulative impact analysis provided in section 4.13.1.

KMLP Facilities

There are no residential areas or subdivisions currently proposed within a 0.25-mile radius of the KMLP facilities (SWLA Economic Development Alliance, 2015b). One industrial facility is planned within 1 mile of the proposed KMLP facilities. As part of the Ohio-Louisiana Access Project, modifications are proposed to TGT's existing Eunice Compressor Station. This project, as well as other planned commercial/industrial development projects in the broader area, is discussed in the cumulative impact analysis provided in section 4.13.1.

4.8.4 Recreation and Special Interest Areas

Construction and operation of the LNG terminal would not directly affect designated recreational areas. One designated recreational area, Calcasieu Point Landing, is within 1 mile of the LNG terminal site. In addition, portions of the Sabine NWR and East Cove Unit of the Cameron Prairie NWR, are in the vicinity of the Calcasieu Ship Channel. No recreational areas (e.g., trails, golf courses, parks) are within 0.25 mile of the KMLP facilities. Potential impacts on recreational areas in the vicinity of the LNG terminal are discussed below.

Calcasieu Point Landing

Calcasieu Point Landing is a public park that contains a boat launch, fishing pier, pavilion, picnic tables, amphitheater, restrooms, and seasonal store. The park is approximately 525 feet west of the proposed LNG terminal site at the western end of Henry Pugh Boulevard. In 2013, eight fishing tournaments were held at the park that drew in a total of approximately 1,000 boats (Carter, 2015).

Recreational boating and fishing activities occurring within the Industrial Canal and near Calcasieu Point Landing could be affected by construction and operation of the LNG terminal due to increased noise, delayed access to the park, restrictions on fishing in the immediate vicinity of the LNG terminal, and vessel traffic. Increased noise associated with construction of the LNG terminal would likely deter recreational users from fishing in the immediate vicinity of project activities. In particular, dredging and pile driving activities, which would occur up to 7 days per week and 6 days per week, respectively, during the first 20 months of construction, could result in avoidance of the area by recreational users. As a result, we have determined that construction of the LNG terminal would result in temporary and moderate impacts on recreational use of Calcasieu Point Landing.

During construction of the LNG terminal, access to Calcasieu Point Landing could be delayed due to dredging, construction of transmission lines along the road right-of-way, and increased roadway traffic on Henry Pugh Boulevard from concrete deliveries and construction workers commuting to and from the site. Operation of the project would also result in increased traffic along Henry Pugh Boulevard. Magnolia anticipates that 67 workers would be employed at the LNG terminal and that up to 52 LNG trucks would call on the LNG terminal per year. The potential impacts of additional roadway traffic during construction and operation of the LNG terminal and recommendations for mitigating these impacts are described in detail in section 4.9.6.1. With the implementation of the proposed and recommended mitigation measures, traffic delays on users of Calcasieu Point Landing due to construction and operation of the LNG terminal would be minor.

Restrictions on fishing within the fixed security zone surrounding the LNG terminal would require avoidance of this area by recreational users of the Industrial Canal. However, there is extensive similar habitat in the Industrial Canal and the surrounding waters within the Calcasieu River for displaced recreational users; therefore, impacts are expected to be minimal.

Impacts on recreational users of Calcasieu Point Landing and the Industrial Canal could result from increased marine traffic during construction and operation of the LNG terminal. We conclude that the impacts of construction-related barge traffic within the Industrial Canal on recreational boats would be minimal due to the relative infrequency of the marine deliveries (50 or fewer deliveries during construction) and because the ship channel, which was specifically created to provide deep draft access to the Port of Lake Charles, is routinely used for both recreational and industrial traffic. During operation of the LNG terminal, delays to recreational users could occur due to the moving security zone around LNG vessels during transit to and from the LNG terminal, which we expect would be intermittent and minor. Additional discussion of project-related impacts on marine traffic is provided in section 4.9.6.2.

National Wildlife Refuges

The Sabine NWR is approximately 12 miles south-southwest of the proposed LNG terminal site on the west side of the Calcasieu Ship Channel. The Sabine NWR is a 124,511-acre coastal marsh refuge that was established in 1937 to provide habitat for migratory waterfowl and other birds. Over 280,000 people visit the refuge annually, participating in recreational fishing, hunting, and wildlife observation (FWS, 2015).

Users of the Sabine NWR adjacent to the ship channel may observe a small increase in barge traffic during the construction period and may also observe LNG vessel traffic through the channel during operation of the LNG terminal. However, because LNG vessel traffic would be consistent with existing use of the Calcasieu Ship Channel, we have determined that the resulting impact on users of the Sabine NWR would be minor.

The East Cove Unit of the Cameron Prairie NWR is approximately 19 miles south-southwest of the proposed LNG terminal and 1.4 miles east of the Calcasieu Ship Channel on the eastern shore of Calcasieu Lake. The East Cove Unit is a 14,927-acre coastal marsh refuge that was established in 1937 to provide wintering habitat for waterfowl (FWS, 2012a). The refuge, which is accessible only by boat, hosts 8,000 visitors annually, who participate in fishing, hunting, trapping, wildlife observation, and photography.

Because the East Cove Unit is about 1.4 miles east of the Calcasieu Ship Channel at the nearest point, and there is land east of the ship channel that would block views from the refuge, users of the East Cove Unit are not expected to be affected by marine traffic during construction or operation of the LNG terminal.

4.8.5 Visual Resources

"Visual resources" refers to the composite of basic terrain features, geologic features, hydrologic features, vegetation patterns, and anthropogenic features that influence the visual appeal of an area for residents or visitors. In general, impacts on visual resources may occur during construction when large equipment, excavation activities, spoil piles, and construction materials are visible to local residents and visitors and during operation to the extent that facilities or portions of facilities and their lighting are visible to residents and visitors. The degree of visual impact resulting from the proposed facilities would be highly variable among individuals, and would typically be determined by the general character of the existing landscape and the visually prominent features of the proposed facilities.

4.8.5.1 LNG Terminal

The primary existing structures in the viewshed of Magnolia's proposed LNG terminal include the existing Trunkline LNG Terminal, Lake Charles Carbon Company, and other industrial properties adjacent to the Industrial Canal. The viewshed also includes the Industrial Canal to the north and west, the Intracoastal Waterway and Calcasieu Ship Channel to the south, and forest and wetlands to the northwest and south of the site (see section 4.8.1.1). Because the site is slightly higher in elevation than the surrounding area due to the previous placement of dredge spoil at the site, and the topography of the surrounding area is fairly level, visibility would extend outward from the site except where buffered by vegetation or existing structures.

The LNG terminal would not affect nationally or state-designated visual resources or visually sensitive areas such as natural landmarks, scenic roads, trails, or scenic rivers (Marcell and Beal, ND; National Park Service, 2007, 2009, 2010). The viewshed of the proposed LNG terminal includes a portion of the Creole Nature Trail Scenic Byway (Highway 27), which is approximately 2 miles west of the LNG terminal across the Calcasieu Ship Channel and as close as 0.3 mile west of the LNG vessel transit route along the Calcasieu Ship Channel. No other federally, state, or locally designated visual resources have been identified in the viewshed.

Activities associated with construction of the LNG terminal may be visible from residences to the south and southeast of the LNG terminal, along Airhart and Joe Ledoux Roads, and possibly residences along the northeastern shoreline of Calcasieu Lake on Big Lake Road (although these residences are over 3 miles south of the site). There are no residences within 1 mile of the LNG terminal to the west, north, or east. Due to the distance between the residences within the viewshed, visual impacts from construction activities are expected to be limited to the 36-month period when the majority of construction activities would occur (see additional discussion in section 2.3).

Construction activities would also be visible to recreationists using the Industrial Canal, Calcasieu River, and northern portions of Calcasieu Lake as well as motorists along Henry Pugh

Boulevard, Big Lake Road, and a segment of the Creole Nature Trail Scenic Byway. The presence of large construction equipment and truck traffic would change the visual quality of these waterways, roadways, and the scenic byway but, due to the distance from the site and short duration of impact (until the vehicle passes the site), impacts would be minor.

Permanent changes to the visual character of the area would result from operation of the LNG terminal due to the presence of aboveground structures that would modify the viewshed. The most prominent visual features at the terminal would be two LNG storage tanks, which would each be approximately 258 feet wide and 174 feet in height, and the flare stack, which would be approximately 100 feet in height when no flame is present and approximately 229 feet in height when a flame is present. Magnolia anticipates that flaring would occur for approximately 5 days during startup of the LNG terminal. During operation of the LNG terminal, use of the marine and emergency flares would only occur during process upset conditions, which Magnolia anticipates would be no more than 12 hours during the first year of operation and no more than 6 hours in each subsequent year (each flaring event is expected to occur for between 15 and 60 minutes). In addition, structures present within the LNG terminal would include four liquefaction trains, an administration/workshop building, the Magnolia Meter Station, LNG truck loading facilities, and mooring and breasting dolphins within the recessed berthing area. The new facilities would also require lighting for operations, safety, and to comply with Federal Aviation Administration requirements.

Magnolia conducted visual simulations for several scenarios at observation points in the vicinity of the LNG terminal. The following summarizes the visual simulations conducted as well as potential impacts on the viewshed based on our review:

- <u>Calcasieu Point Landing (0.1 mile west of the property boundary)</u> – Magnolia conducted visual simulations for both daytime and evening visual impacts from Calcasieu Point Landing (see figures 4.8.5-1 and 4.8.5-2). Due to the proximity of Calcasieu Point Landing to the LNG terminal and lack of visual buffers, the LNG storage tanks would be prominent when viewed from Calcasieu Point Landing both during daytime hours and in the evening when the facilities (including the LNG storage tanks) would be illuminated in accordance with federal safety regulations (see section 4.12.3). The tops of the liquefaction trains, auxiliary boilers, and vapor barrier would be also visible from this direction, but would not be prominent features. Neither the flare stack nor the flame itself would be visible from Calcasieu Point Landing; although the flame would be taller than the LNG storage tanks (approximately 229 feet and 174 feet, respectively), the position of the LNG storage tanks in the foreground would conceal the flame.

  To minimize visual impacts, lighting at the LNG terminal would be shielded and downcast to avoid interference with navigation (see our recommendation regarding Magnolia's *Facility Lighting Plan* in section 4.6.1.3); in addition, facilities within the LNG terminal site would be partially obscured by the proposed vapor barrier. To further minimize visual impacts, we are recommending that, prior to construction, Magnolia file its *Facility Lighting Plan* for operation of the LNG terminal. Facilities associated with the LNG terminal (e.g., LNG storage tanks, flare, liquefaction trains, and lighting) would be consistent with the viewshed presented by other industrial features along this portion of the Industrial Canal. Therefore, we have determined that the LNG terminal would have a permanent and moderate impact on visual resources when viewed from the Calcasieu Point Landing.

Longitude (W): -93.307107

Latitude (N): 30.103951

Elevation: 0

Distance Facility: 0.5 Miles

Weather Conditions: Mostly cloudy, some sun breaks, light rain with instant evaporation.

Visibility Conditions: Mostly clear

Camera Model and Lens: Canon EOS Digital Rebel XT; Tamron 28-80mm lens

Digital Focal Length: 49.00 mm

35mm Equivalent Focal Length: 79.49

Camera Bearing: NE

Total Viewable Area: Approx. 99 degrees

This information is for environmental review purposes only.

Figure 4.8.5-1
Visual Simulation of View from Calcasieu Point Landing - Daytime
Magnolia LNG and Lake Charles Expansion Projects
Calcasieu Parish, Louisiana

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Visual_Simulation\MLP_visual_Day.mxd | REVISED: 04/09/2015 DRAWN BY: JSSuess

Longitude (W): -93.307107

Latitude (N): 30.103951

Elevation: 0

Distance Facility: 0.5 Miles

Weather Conditions: Partly cloudy

Visibility Conditions: Mostly clear

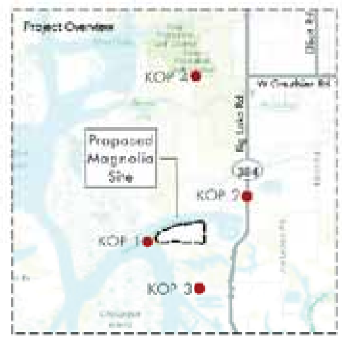
Camera Model and Lens: Canon EOS Digital Rebel XT; Tamron 28-80mm lens

Digital Focal Length: 49.00 mm

35mm Equivalent Focal Length: 79.49

Camera Bearing: NE

Total Viewable Area: Approx. 99 degrees



This information is for environmental review purposes only.

Figure 4.8.5-2
Visual Simulation of View from Calcasieu Point Landing - Evening
Magnolia LNG and Lake Charles Expansion Projects
Calcasieu Parish, Louisiana

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Visual_Simulation\MLP_visual_Day_Evening.mxd | REVISED: 04/09/2015 DRAWN BY: JSSuess

- Big Lake Road (0.6 and 0.8 mile east of the site) – Magnolia conducted visual simulations at two locations along Big Lake Road for both daytime and nighttime visual impacts during flare operation. Although the LNG storage tanks would be visible from Big Lake Road, they would not be a prominent feature in the viewshed. Because the Trunkline LNG Terminal and Leevac Shipyards are adjacent to Big Lake Road, structures associated with these facilities are the prominent features. During operation of the flare, the flare stack and flame (with a total height of approximately 229 feet) would be visible to drivers traveling south along Big Lake Road for a distance of approximately 0.6 mile. Along this segment of the road, the flare would be 0.8 mile from travelers along Big Lake Road and would be consistent with existing activities in the area. Therefore, we have determined that Magnolia's proposed LNG terminal would have minimal impacts on visual resources when viewed from Big Lake Road.

- Residential neighborhood south of the LNG terminal (0.6 mile south of the site) – Magnolia conducted visual simulations for both daytime and nighttime visual impacts during flare operation from the residential neighborhood approximately 0.6 mile south of the LNG terminal. Due to landscaping and established trees within this community, facilities at the LNG terminal would generally not be visible to residents, although some properties may have less vegetation screening, in which case the LNG storage tanks and tops of the liquefaction trains may be visible. In the evening, the LNG terminal would be illuminated in accordance with federal safety regulations (see section 4.12.3). Although the lights are not likely to be directly visible from this neighborhood, the LNG terminal would increase the general nighttime lighting visible to the north (toward the Industrial Canal) when viewed from the neighborhood. Therefore, we have determined that the LNG terminal would have a permanent but minor impact on visual resources within this neighborhood.

- Residential neighborhood north of the LNG terminal (2.3 miles north of the site) – Magnolia conducted visual simulations for both daytime and evening visual impacts from the residential neighborhood approximately 2.3 miles north of the LNG terminal. Due to distance from the LNG terminal and established trees within this community, operation of the LNG terminal is expected to be difficult to see or imperceptible to residents within this community. Therefore, we have determined that the LNG terminal would have minimal impacts on visual resources within this neighborhood.

- Intracoastal Park off of the Creole Nature Trail Scenic Byway (3.9 miles southwest of the site) – Magnolia conducted visual simulations for both daytime and evening visual impacts from the Intracoastal Park due to its location off of the Creole Nature Trail Scenic Byway. Due to distance from the LNG terminal and the visual buffer provided by Choupique Island, the LNG terminal would generally be difficult to see or imperceptible from the Intracoastal Park. It is possible that visitors who walk to the water's edge may be able to see the LNG storage tanks at the site but, due to the distance, the storage tanks would appear small and would not be expected to diminish the quality of the viewshed. Therefore, we have determined that the LNG terminal would have minimal impacts on visual resources when viewed from the Intracoastal Park.

Residences along the shores of the Calcasieu Ship Channel would be within the viewshed of marine traffic. The frequency of vessels transiting the Calcasieu Ship Channel would increase during LNG terminal construction and operation, but marine traffic would have minimal impact on the viewshed for these residences because the increased ship traffic would be consistent with the current use and visual character of the waterway.

4.8.5.2 KMLP Facilities

Header Pipelines

The header pipelines would be located in a primarily agricultural area, which contains easements for 46 oil and gas pipelines within a 1-mile radius. As a result, the existing structures in the viewshed of the header pipelines are primarily meter stations (include the existing ANR, Pine Prairie, and TGT Meter Stations), compressor stations, and farms and agricultural outbuildings. The viewshed also includes forested land to the south and east within the floodplain of Bayou Barwick and Bayou des Cannes, respectively.

During construction of the header pipelines, the primary visual impacts would result from the presence of personnel, large construction equipment, and vehicles, all of which could be visible in areas accessible to the public, such as roads crossed by the low pressure header pipeline (Coulee and Fournerat Roads) and nearby residences. However, the nearest residence is approximately 500 feet west of the low pressure header pipeline, and the routes do not cross densely populated areas. The presence of construction equipment and personnel would be temporary and short term and we expect that vegetation would revegetate to a cover similar to pre-construction conditions within one to two growing seasons; therefore, we conclude that visual impacts would be short term and minor.

Compressor Station 760

Construction of Compressor Station 760 would occur within a rural area of Acadia Parish off of Coulee Road and east of Refinery Road (see *Header Pipelines* and figure 2.1.3-1 in section 2.1.3). Construction-related impacts, including the presence of equipment and workers, would be temporary and limited to the 11-month construction period. As described in section 4.8.1.2, the areas that would be cleared and graded predominantly consist of agricultural land, which would be converted to industrial/commercial land. During both construction and operation, Compressor Station 760 would be visible to passing motorists travelling along nearby roads in Acadia Parish. Construction and operation of Compressor Station 760 would not affect any designated visual resources; however, the station would be visible to the few nearby residences, the closest of which is about 1,200 feet west of the station perimeter. To minimize visual impacts on nearby residences and passing motorists, KMLP would plant shrubbery along the west, north, and east sides of the perimeter fence and to limit and down-shield perimeter lighting during nighttime hours. With the implementation of these measures, we have determined that visual impacts would be permanent, but minor.

Meter Stations

Construction activities at the existing meter stations would result in short-term, localized visual impacts similar to those described above for Compressor Station 760. There would be no permanent visual impacts at the existing meter stations that would not be expanded (TETCO, ANR, and Pine Prairie Meter Stations). The expanded meter stations (CGT, TRANSCO, and TGT Meter Stations) would result in new, permanent impacts on visual resources. The CGT, TRANSCO, and TGT Meter Station expansions would increase the footprint of the existing facility by 0.3, 0.1, and 0.4 acre, respectively. The expansions would result in an increased footprint along the southern boundary of the TRANSCO Meter Station, along the eastern boundary of the TGT Meter Station, and along the western and southern sides of the CGT Meter Station. The expanded footprint of each of these facilities would be consistent with the existing viewshed and would not affect any designated visual resources. Therefore, we conclude that the meter station modifications would have minimal impacts on visual resources.

4.8.6 Coastal Zone Management

The Coastal Zone Management Act 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 Coastal Zone Management Act requires participating states to develop management programs that demonstrate how those states will meet their obligations and responsibilities in managing their coastal areas. In Louisiana, the LDNR's Office of Coastal Management administers the state's Coastal Zone Management Program and is the lead state agency that performs federal consistency reviews. As such, the LDNR evaluates activities or development affecting land within Louisiana's coastal zone for compliance with the Coastal Zone Management Act through a process called a "federal consistency" review.

The inland extent of the coastal zone boundary is defined by the Intracoastal Waterway (LDNR, 2012a). The LNG terminal site is approximately 140 feet northeast of the 2012 Louisiana Coastal Zone boundary at its closest point. Magnolia submitted a Solicitation of Views letter to the LDNR, dated October 15, 2013, requesting agency concurrence that the LNG terminal would be located outside of Coastal Zone Management jurisdiction and would not require a Coastal Use Permit. A response from the LDNR, Office of Coastal Management, dated October 29, 2013, indicates that the Project is outside the Louisiana Coastal Zone and, therefore, a Coastal Use Permit would not be required.

4.9 SOCIOECONOMICS

Construction and operation of the LNG terminal and KMLP facilities could impact socioeconomic conditions, either adversely or positively, in the general project vicinity. These potential impacts include alteration of population levels or local demographics, 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.

The socioeconomic analysis for the proposed facilities examines data from Acadia, Calcasieu, Cameron, Evangeline, and Jefferson Davis Parishes. The proposed facilities would be in Acadia, Calcasieu, and Evangeline Parishes. Of these, the greatest socioeconomic impacts would occur in Calcasieu Parish, where the LNG terminal would be located. Cameron and Jefferson Davis Parishes are also included in the socioeconomic analysis because they are close to the LNG terminal and would likely see an increase in non-local workers relocating to these areas due to the relatively short commute distances. For the purposes of our socioeconomic analysis, these five parishes are defined as the "affected area."

4.9.1 Population

Table 4.9.1-1 provides a summary of selected population and demographic information for the affected area.

4.9.1.1 LNG Terminal

Calcasieu Parish, anchored by the cities of Lake Charles and Sulphur, has the largest population of the five parishes within the affected area, with a population of approximately 195,296 residents in 2013 and a population density of 181 persons per square mile (U.S. Census Bureau, 2014a). In comparison, the 2013 population of the State of Louisiana was approximately 4,629,284 residents.

TABLE 4.9.1-1							
Existing Socioeconomic Conditions in the Affected Area							
State/Parish	2010 Population [a]	2013 Population (est.) [a]	Population Density (per square mile) [a]	Per Capita Income [a]	Civilian Labor Force [b]	Unemployment Rate (percent) [b]	Top Industries [c]
Louisiana	4,533,479	4,629,284	105	$24,442	2,181,191	6.2	H, R, A
Acadia	61,773	62,204	94	$19,910	25,993	5.6	R, H, M
Calcasieu	192,768	195,296	181	$24,355	100,680	5.4	H, A, R
Cameron	6,839	6,744	5	$29,559	3,342	4.9	T, W, Q
Evangeline	33,984	33,578	51	$18,023	12,842	7.0	H, R, M
Jefferson Davis	31,594	31,301	49	$21,132	15,052	5.2	R, H, A

[a] U.S. Census Bureau, 2014a
[b] Louisiana Workforce Commission, 2014
[c] U.S. Census Bureau, 2014b

Industries:
A Accommodation and food services
H Health care and social services
M Manufacturing
Q Mining, quarrying, and oils and gas extraction
R Retail trade
T Transportation and warehousing
W Wholesale trade

Construction of the LNG terminal, which Magnolia tentatively expects to begin in January 2016, would take place over a 36-month period, with an additional 9 months until all four liquefaction trains would be commissioned and operational (resulting in a total construction period of approximately 45 months). The anticipated monthly construction workforce at the LNG terminal is depicted in figure 4.9.1-1. Magnolia has stated that construction workers would be on site during 32 months of the construction period and that the average construction workforce would be 355 workers. Approximately 60 percent of the workers would be hired locally, resulting in an average of 142 and a maximum of 217 non-resident workers.

KMLP estimates that 30 workers would be employed over the 3-month period required to construct the Magnolia Meter Station (between months 16 and 18), which would be located within the LNG terminal. KMLP stated that the majority of the construction workers would be hired from outside of Calcasieu Parish; therefore, we have conservatively estimated that the number of non-resident workers would be 18 (60 percent of the construction workforce).

During a 10-month period (months 18 through 27 of the construction period), the combined construction workforce at the LNG terminal would number over 500 construction workers, with a maximum of approximately 542 workers (see figure 4.9.1-1).

Should the non-resident workers be accompanied by family members, and based on an average household size of 3.1 persons in Louisiana, up to 672 non-local persons could relocate to the affected area during the 10-month period when over 500 construction workers would be at the LNG terminal (U.S. Census Bureau, 2010b). Although it is unlikely that all workers would relocate with families, this addition would represent a 0.3 percent increase in the total population within Calcasieu, Cameron, and Jefferson Davis Parishes.

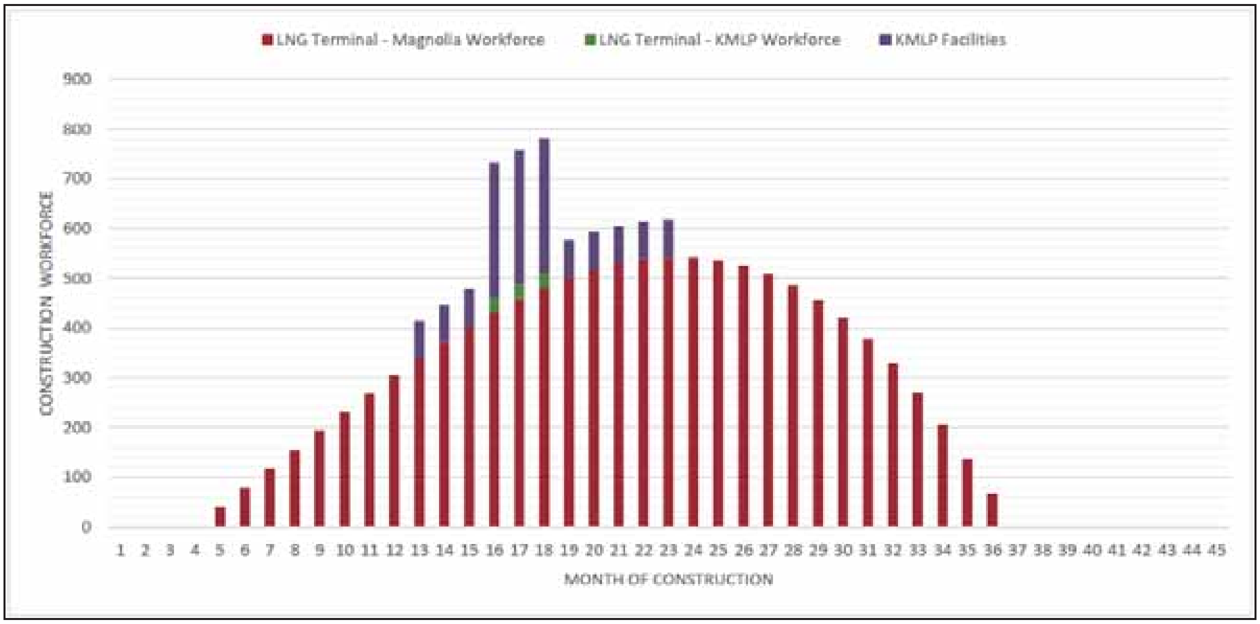


Figure 4.9.1-1 Construction Workforce Associated with the LNG Terminal and KMLP Facilities

After construction, Magnolia anticipates 67 workers would be employed at the LNG terminal, of which 27 are expected to be non-local hires. KMLP's Magnolia Meter Station would be unmanned during operation. This workforce and their families would represent a minor but permanent increase in the population in the vicinity of the LNG terminal site.

4.9.1.2 KMLP Facilities

The KMLP facilities would be constructed in Acadia and Evangeline Parishes, as described above. The estimated 2013 population densities, an indication of the extent of development, for Acadia and Evangeline Parishes were approximately 94 and 51 persons per square mile, respectively. In 2013, the estimated population within Acadia Parish was 62,204, and the estimated population within Evangeline Parish was 33,578 (U.S. Census Bureau, 2014a).

For the majority of the 11-month construction period, the construction workforce for the KMLP facilities would be 75 workers, who would be associated with construction of Compressor Station 760. However, during a 3-month period occurring between months 4 and 6 of construction, up to 270 workers would be employed at the KMLP facilities, as summarized in table 4.9.1-2.

KMLP stated that the majority of the construction workers would be hired from outside of Acadia and Evangeline Parishes. Therefore, we have conservatively estimated that the maximum the number of non-resident workers within Acadia and Evangeline Parishes would be 126 and 36, respectively (60 percent of the construction workforce). Because the peak construction period associated with the KMLP facilities would occur over a 3-month period, it is unlikely that non-local workers would be accompanied by family members.

Within Acadia Parish, non-local construction workers associated with the KMLP facilities would result in an increase to the local population of 45 persons for 8 months and up to 126 persons for 3 months. This would represent an increase of 0.2 percent in the current population. Similarly, within Evangeline Parish, non-local construction workers associated with the KMLP facilities would result in an increase to the local population of 36 persons for 3 months, which would represent an increase of 0.1 percent over the current population.

TABLE 4.9.1-2

Construction Workforce and Duration Associated with the KMLP Facilities

		Month of Construction										
Location / Facility	Workforce	1	2	3	4	5	6	7	8	9	10	11
Acadia Parish, Louisiana												
Header pipelines	60 to 75											
Compressor Station 760	75											
ANR Meter Station	20											
Pine Prairie Meter Station	20											
TGT Meter Station	20											
Subtotal	**195 to 210**											
Evangeline Parish, Louisiana												
CGT Meter Station	20											
TRANSCO Meter Station	20											
TETCO Meter Station	20											
Subtotal	**60**											
KMLP Facilities Total	**255 to 270**											

KMLP anticipates four workers would be employed at Compressor Station 760. The header pipelines and meter stations would be unmanned during operation. Assuming that all four workers are non-local, this would represent a minor but permanent increase in the local population.

4.9.2 Economy and Employment

Table 4.9.1-1 provides selected employment and income statistics for the affected area. The top industries in the affected area include:

- accommodation and food services;
- health care and social services;
- manufacturing; mining, quarrying, and oils and gas extraction;
- retail trade;
- transportation and warehousing; and
- wholesale trade (U.S. Census Bureau, 2014b).

Due to forecasted industrial growth in the region (discussed in additional detail in section 4.13.5), the SWLA Economic Development Alliance collaborated with educational facilities and industry in the development of a *Workforce Resource Guide*. The guide is intended to provide residents with step-by-step instructions for finding employment and includes a description of the types of training required for each profession, as well as the training centers in Southwest Louisiana that offer the relevant certifications. Currently, several programs designed to increase the number of qualified local workers are being offered, including programs through the Associated Builders and Contractors, Pelican Southwest Chapter in Westlake, Calcasieu Parish School Board, SOWELA Technical Community College (both the main campus in Lake Charles and Morgan Smith Campus in Jennings), and Central Louisiana Technical Community College (Lamar Salter Campus in Leesville).

4.9.2.1 LNG Terminal

The civilian labor force is defined as the sum of employed persons and those actively searching and available for work (U.S. Census Bureau, 2010a). During construction of the LNG terminal, approximately 60 percent of the workers would be hired from Calcasieu, Cameron, and Jefferson Davis Parishes. In 2014, the civilian labor force numbered 100,680 in Calcasieu Parish, 3,342 in Cameron Parish, and 15,052 in Jefferson Davis Parish. The average per capita income in both Calcasieu and Jefferson Davis Parishes ($24,255 and $21,132 respectively) was below the State of Louisiana’s average per capita income of $24,442. Cameron Parish had a per capita income of $29,559, which was above the State of Louisiana’s average. All three parishes had a lower unemployment rate than the State of Louisiana, which was 6.2 percent.

Construction of the LNG terminal would stimulate the economy through the $3.7 billion in total capital expenditures by Magnolia and KMLP, of which, an estimated $20 million would be spent on locally sourced construction materials (e.g., concrete, miscellaneous consumables, fuel supply). Additionally, a percentage of the estimated $63.5 million construction payroll would be spent locally by both local and non-local workers for the purchase of housing, food, gasoline, and other goods, services, and entertainment in the project vicinity. Typically, construction activities increase economic activity within an area in several ways:

- <u>a direct effect</u> – hiring of local construction workers and purchases of goods and services from local businesses;
- <u>an indirect effect</u> – the additional demand for goods and services, such as replacing inventory from the firms that sell goods and services directly to the project or to workers and their families; and
- <u>an induced effect</u> – the spending of disposable income by the construction workers at local businesses, which in turn order new inventory from their suppliers.

The increase in economic activity resulting from direct, indirect, and induced effects would result in a temporary positive economic impact in the vicinity of the LNG terminal.

Anticipated operational expenditures would include $53.6 million in annual taxable expenditures on goods and services, approximately $5 million per year in salaries, and additional indirect and induced expenditures as these dollars trickle through the economy. At least half of the total annual expenditures would be made locally, equaling $26.8 million in local materials and consumables purchased per year. We conclude that the expenditures and permanent workforce associated with operation of the LNG terminal would result in a minor, but positive permanent impact on the local economy.

4.9.2.2 KMLP Facilities

During construction of the KMLP facilities, we have estimated that approximately 40 percent of the workers would be hired from Acadia and Evangeline Parishes. In 2014, the civilian labor force numbered 25,993 in Acadia Parish and 12,842 in Evangeline Parish. The average per capita income in both Acadia and Evangeline Parishes ($19,910 and $18,023 respectively) was below average within the State of Louisiana. Acadia Parish had an unemployment rate of 5.6 percent, which was below the unemployment rate for the State of Louisiana as a whole. Evangeline Parish had an unemployment rate of 7.0 percent, which was higher than state as a whole.

Construction of the KMLP facilities would stimulate the economy through the $3.1 million in expenditures that would be spent on local and regional construction materials and fuel for KMLP facilities. Additionally, a percentage of the estimated $10 million construction payroll would be spent locally by both local and non-local workers for the purchase of housing, food, gasoline, and other goods, services, and entertainment in the vicinity of the KMLP facilities. The increase in economic activity resulting from direct, indirect, and induced effects would result in a temporary, positive economic impact in the vicinity of the KMLP facilities.

Operation of the KMLP facilities is expected to result in a total of $1,030,000 in annual taxable expenditures on goods and services, which would include $1,020,000 in Acadia Parish and $10,000 in Evangeline Parish. These expenditures would result in a minor, but positive permanent impact on the local economy.

4.9.3 Local Taxes and Government Revenue

Magnolia anticipates spending approximately $20 million on construction materials in the affected area, which would generate increased local, state, and federal sales tax revenues. The expenditures on goods and services by the construction workers and their families would also generate increased tax revenues. In addition, local, state, and federal governments would tax the $63.5 million in total construction workforce payroll. This increase in tax revenue would be a minor, temporary, and positive impact on tax revenue within the affected area.

During operation, Magnolia would contribute property taxes to Calcasieu Parish. The land would not be subject to property taxes because of tax exemptions for Port of Lake Charles property; however, all commercial improvements and business personal property would be subject to ad valorem tax. Based on projected values of the LNG terminal's commercial improvements as well as projected state tax incentives, the annual ad valorem taxes paid by Magnolia and KMLP to Calcasieu Parish would be $8.3 million (see table 4.9.3-1). Operation of the LNG terminal would also result in minor, long-term increases in sales tax revenue from expenditures on materials, goods, and services. Approximately $26.8 million is expected to be spent locally each year; assuming a Louisiana state sales tax of 4 percent and an average local sales tax of 4.87 percent, operation of the LNG terminal would generate approximately $1.1 million in state sales tax and $1.3 million in local sales tax annually.

TABLE 4.9.3-1

Estimated Annual Ad Valorem Taxes Paid During Operation of the LNG Terminal and KMLP Facilities

	Ad Valorem Tax		
Facility, Operator	Calcasieu Parish	Acadia Parish	Evangeline Parish
LNG Terminal			
Magnolia	$7,800,000	--	--
KMLP	$507,000	--	--
KMLP Facilities	--	$5,067,000	$277,000
Total	**$8,307,000**	**$5,067,000**	**$277,000**

During construction of the KMLP facilities, an estimated $3.1 million would be spent on local and regional construction materials and fuel. Due to this spending, a total of $223,000 in sales tax revenues would be generated for the State of Louisiana, Acadia Parish, Evangeline Parish, and other local taxing authorities. KMLP anticipates that annual ad valorem taxes payments to Acadia and Evangeline Parishes would be approximately $5.1 million and $0.3 million, respectively. Annual ad valorem tax revenues associated with assets and annual operation and maintenance budgets would also result in a long-term, minor, and positive impact on tax revenues within the affected area.

4.9.4 Housing

The number of housing units (permanent and temporary) varies across the affected area, largely based on parish population and the presence or absence of a major city. Table 4.9.4-1 provides data on the rental and other temporary living options in the affected area. Based on the 2013 American Community Survey (U.S. Census Bureau, 2014c), Calcasieu Parish has the greatest number of housing units (82,058), and also has the greatest number of residents (195,296) within the affected area. In contrast, Cameron Parish has both the lowest population (6,839) and number of housing units (3,593) within the affected area. Rental vacancy rates in the affected area ranged from a low of 4.6 percent in Jefferson Davis Parish to a high of 10.3 percent in Cameron Parish.

TABLE 4.9.4-1

Temporary and Short-term Housing Availability Within the Affected Area

State/Parish	Housing Units [a]	Vacant Housing Units [a]	Vacant Rental Units [a]	Median Rental Cost per Month [a]	Hotels and Motels [b]	Recreational Vehicle and Mobile Home Parks [c]
Louisiana	1,974,313	266,461	50,411	$773	1,875	N/A
Acadia	25,437	2,910	458	$524	8	7
Calcasieu	82,998	9,272	2,385	$739	85	28
Cameron	3,593	1,064	29	$723	7	6
Evangeline	14,705	2,738	326	$518	4	3
Jefferson Davis	13,377	1,743	146	$576	12	2

[a] U.S. Census Bureau, 2014c
[b] Hotels and Motels, 2015
[c] Yellow Pages, 2015

There are about 116 hotels/motels within the affected area that could be used by the short-term workforce. The area also offers temporary housing options such as campgrounds and recreational vehicle (RV) parks, the closest of which (Big Lake RV Park) is approximately 1 mile south of the site off of Big Lake Road. The Pelican Lodge industrial housing facility at the Port of Lake Charles is approximately 12 miles northeast of the LNG terminal in Calcasieu Parish. The facility, which is currently under construction, is expected to be completed in mid-2015 and will have the capacity to house 4,000 construction personnel when it begins operation (SWLA Economic Development Alliance, 2014) (see additional discussion in section 4.13.3).

4.9.4.1 LNG Terminal

As stated previously, local residents would comprise approximately 60 percent of the workers hired for construction of the LNG terminal. Within the affected area, Calcasieu Parish has the highest number of vacant housing units that would be available to the workforce, including vacant units for rent (2,385 units) as well as rooms at 85 hotels and motels and Pelican Lodge (when complete). The currently available housing in Calcasieu, Cameron, and Jefferson Davis Parishes would be sufficient to accommodate the 217 non-resident workers (as well as their families, should they relocate to the area) during the peak construction period.

The proposed construction schedule for the LNG terminal could coincide with other demands for housing and temporary accommodations from tourism. Non-local workers hired temporarily who seek hotel accommodations could potentially compete with seasonal visitors in Calcasieu, Cameron, and Jefferson Davis Parishes. Given the number of hotel rooms in the vicinity of the LNG terminal, no serious disruptions are anticipated, and construction of the LNG terminal would have a moderate, temporary impact on housing in the affected area. However, as discussed in section 4.13.3.5, housing constraints could occur if several of the other planned projects in the area are constructed in the same timeframe.

Operation of the LNG terminal would result in approximately 27 non-local workers relocating to the affected area. Because an adequate number of housing units are available in the affected area, we anticipate that this would have a minor but permanent impact on the local housing market.

4.9.4.2 KMLP Facilities

Non-local workers would comprise approximately 60 percent of the workforce associated with the KMLP facilities. For the majority of the 11-month construction period, the non-local construction workforce for the KMLP facilities would be between 36 and 45 workers, who would be associated with construction of Compressor Station 760. However, up to 162 non-local workers would relocate to the affected area for a 3-month period when construction of the header pipelines, Compressor Station 760, and the meter station sites are scheduled to occur, as summarized in table 4.9.1-2. Based on the number of available rental housing units and hotels/motels in the affected area, as discussed above, adequate housing exists to accommodate non-resident workers and their families. Overall, construction of the KMLP facilities would result in temporary and minor impacts on housing.

KMLP anticipates four workers would be employed at Compressor Station 760. The header pipelines and meter stations would be unmanned during operation. Assuming that all four workers are non-local, this would represent a permanent but negligible impact on the local housing market.

4.9.5 Public Services

Table 4.9.5-1 provides an overview of public services available to the project areas. Within the affected area, there are a total of 118 public schools, 25 police departments and sheriff's offices, 55 fire departments, and 15 hospitals.

TABLE 4.9.5-1

Public Services in the Affected Area

Parish	Public Schools [a]	Police Departments and Sheriff's Offices [b]	Fire Departments [c]	Hospitals [d, e]	Hospital Beds [d]
Acadia	28	5	14	3	218
Calcasieu	62	8	18	5	783
Cameron	3	1	6	1	25
Evangeline	12	5	7	3	303
Jefferson Davis	13	6	10	3	60

a Public School Review, 2015
b USA Cops, 2015
c Louisiana Office of State Fire Marshall, 2015
d Louisiana Hospital Association, n.d.
e Cameron Parish Police Jury, 2015

4.9.5.1 LNG Terminal

To understand potential impacts on schools, assumptions are made based on anticipated workforce. Magnolia estimates that the maximum number of non-local hires during peak construction of the LNG terminal is expected to be 217 workers. Because construction of the Magnolia Meter Station would occur over a 3-month period, it is not likely that temporary workers would relocate with their families. Assuming that the non-local workers hired by Magnolia would each relocate to the affected area with one school-aged child (based on an average family size of 3.1 persons in Calcasieu Parish [U.S. Census Bureau, 2010b]), approximately 217 children would enroll in one of the area's public schools. With the current student population of 40,403 in the three parishes affected by the LNG terminal, this would result in a temporary increase in the student population of approximately 0.5 percent. Therefore, measureable impacts on student-teacher ratios are not expected.

Construction of the LNG terminal would have little or no short-term impact on the availability of local community facilities and services such as police, fire, and medical because the non-local workforces would be small relative to the current population. The local fire department is part of a regional mutual aid organization that provides emergency services to numerous petro-chemical facilities and is an experienced responder to industrial incidents. The local communities have adequate infrastructure and community services to meet the needs of the workers that would be required for construction and operation of the facility. Therefore, we conclude that impacts on public services during construction of the LNG terminal would be temporary and minor.

Magnolia anticipates that 67 workers would be employed at the LNG terminal during operation, of which 27 are expected to be non-local hires that relocate to the affected area with their families. KMLP's Magnolia Meter Station would be unmanned during operation. This addition of 27 families would represent a negligible increase in the local population. Therefore, we conclude that local public services would not be affected.

4.9.5.2 KMLP Facilities

Construction of Compressor Station 760 would occur over an 11-month period, and would result in between 36 and 45 non-local workers relocating the affected area. Based on the assumptions described above (see section 4.9.5.1), a maximum of 45 children would enroll in one of the area's public schools. Given the short duration of construction (3 months) associated with the header pipelines and meter station modifications, it is not likely that workers would relocate with families. Therefore, impacts on student-teacher ratios would be negligible. Although there is potential that the temporary increase in the local population size could result in occasional need for police, fire, and/or medical services, those public services would experience only negligible impacts during construction.

The four new permanent positions would represent a negligible increase in the local population. Therefore, we conclude that local public services would not be affected.

4.9.6 Transportation

Several potential impacts on vehicular and marine traffic may result from the construction and operation of the LNG terminal and KMLP facilities. Potential impacts on vehicular traffic would generally be related to the construction of the LNG terminal and KMLP facilities and would be the result of the influx of workers commuting to and from the various construction sites as well as the transport of construction materials. Marine traffic impacts would generally result from the increase in large vessel movements in the Calcasieu Ship Channel and Industrial Canal during construction and operation of the LNG terminal.

4.9.6.1 LNG Terminal

Roadway Transportation

Access for transporting equipment, materials, and personnel to the LNG terminal would largely be available through the use of existing roadways. The entrance to the LNG terminal would be on Henry Pugh Boulevard, which is accessed from Big Lake Road (LA 384). For most of its length, Henry Pugh Boulevard is a two-lane asphalt road; however, as it approaches the intersection with Big Lake Road, Henry Pugh Boulevard is a four-lane asphalt road. Traffic count data provided by the Calcasieu Metropolitan Planning Organization indicated that at the intersection of Big Lake Road and Tank Farm Road (1.3 miles northeast of the LNG terminal site), an average of 5,850 vehicles travel along Big Lake Road and 799 vehicles travel along Tank Farm Road each day (IMCAL, 2013).

During construction of the LNG terminal, traffic levels on area roadways would increase due to the presence of worker vehicles, construction vehicles, and trucks delivering concrete to the site. Due to its location immediately adjacent to the LNG terminal site, materials would be delivered to the DII construction yard via the Industrial Canal. Therefore, except for trucks delivering concrete to the site, minimal construction truck traffic is anticipated. A summary of the anticipated increase in roadway traffic associated with construction of the LNG terminal is provided in figure 4.9.6-1.

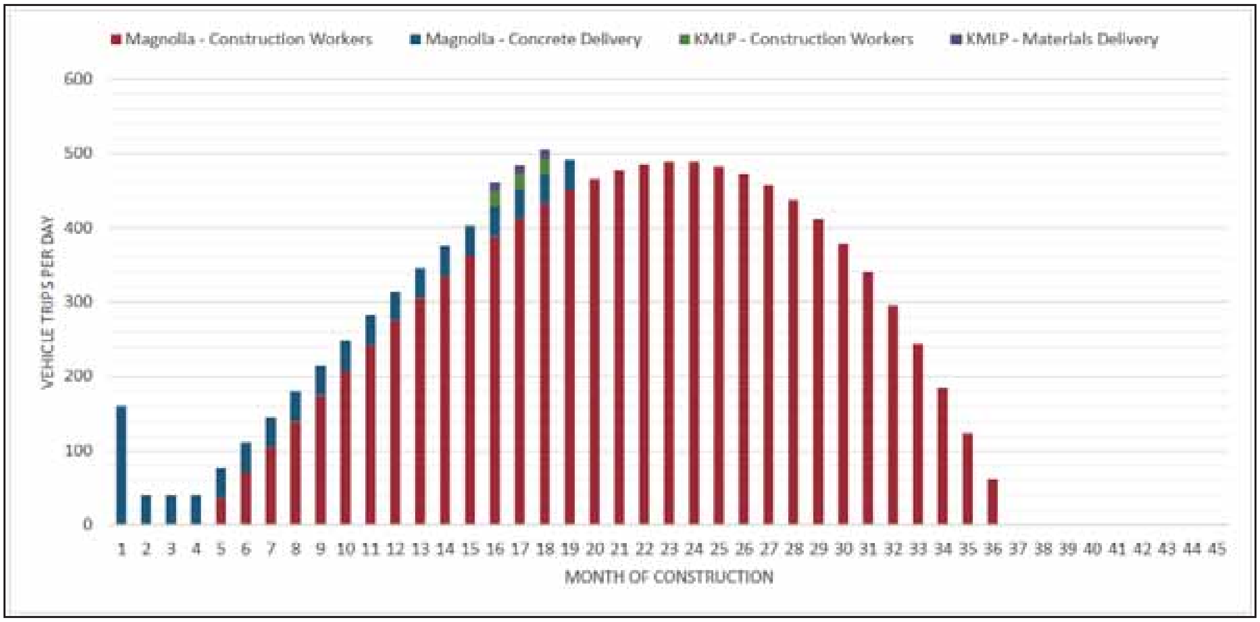


Figure 4.9.6-1 Roadway Traffic Associated with Construction of the LNG Terminal

Magnolia estimates that construction worker commutes would result in an average of 320 roundtrips to the LNG terminal site per day. During the peak of construction (occurring during months 23 and 24), approximately 488 roundtrips would be made to the LNG terminal site per day. In addition, the delivery of concrete to the LNG terminal site would result in 160 roundtrips per day during the first month of construction and 40 roundtrips per day during the subsequent 18 months. Construction of KMLP's Magnolia Meter Station (located within the LNG terminal site, see figure 2.1.1-4 in section 2.1.1.3) would occur between months 16 and 18, and would result in an average of 20 roundtrips to the site per day associated with construction worker commutes and 12 trips to the site per day for materials deliveries.

Impacts on local users of the roadway network due to construction of the LNG terminal include potential delays from increased traffic levels and diminished roadway capacity (roadway failure). To identify, quantify, and recommend mitigation for traffic impacts on area roadways during construction of projects currently proposed on the Industrial Canal, Magnolia, Lake Charles LNG, and G2X Energy commissioned a *Traffic Impact Study* (C.H. Fenstermaker and Associates, LLC, 2014). The study, which is discussed in additional detail in section 4.13.3.5, recommended that three intersection improvements be implemented to reduce impacts on area roadways, including:

- At the intersection of Tank Farm and Big Lake Roads:
    - construction of an eastbound left-turn lane;
    - construction of southbound left-turn and right-turn lanes;
    - construction of a northbound left-turn lane; and
    - utilization of a temporary traffic signal to provide intersection control.

- At the intersection of Big Lake and Lincoln Roads:
    - construction of a southbound left-turn lane;
    - construction of a westbound right-turn lane; and
    - utilization of a temporary traffic signal to provide intersection control.

- At the intersection of Lincoln Road and Gulf Highway:
    - construction of a southbound right-turn lane;
    - construction of eastbound dual-left turn lanes;
    - construction of a northbound left-turn lane;
    - utilization of a bypass lane for northbound thru-traffic to maintain free flow; and
    - utilization of a temporary traffic signal to provide intersection control.

Magnolia has stated that the measures recommended in the *Traffic Impact Study* would be implemented prior to construction as part of a cooperative effort between Magnolia, Lake Charles LNG, and G2X Energy. In a letter dated September 16, 2014, the Calcasieu Parish Police Jury stated that it has reviewed the study, agrees with its recommendations, and has no objections.

Magnolia, Lake Charles LNG, and G2X Energy also commissioned a *Calcasieu Point Traffic Mitigation Pavement Analysis* to complete an evaluation of the existing structural capacity of Lincoln, Big Lake, and Tank Farm Roads to determine the necessary overlay/rehabilitation options to sustain construction traffic (Advanced Materials Services, LLC, 2014). The study identified 10 segments along Lincoln Road and 2 segments along Tank Farm Road that, given the current condition, would fail during the construction period. The analysis included two recommendations for rehabilitation of the roadways, including overlaying segments of the road (recommended in two locations along Lincoln Road) and milling to a predetermined depth and then replacing the segment with new asphalt (recommended in eight locations along Lincoln Road and two locations along Tank Farm Road). Magnolia has stated that the areas of concern identified by the analysis would be upgraded as part of the effort described above resulting from the *Traffic Impact Study*.

With the implementation of the recommendations described above, traffic generated by construction of the LNG terminal is not expected to impact the existing roadway network in terms of roadway capacity. Construction of the LNG terminal would result in temporary increases in traffic along area roadways, which could result in delays to local users of the roadways. With the implementation of the recommended improvements at the intersections of Tank Farm and Big Lake Roads, Big Lake and Lincoln Roads, and Lincoln Road and Gulf Highway, we have determined that impacts from construction of the LNG terminal would have temporary and minor impacts on local users of the roadway network. However, as discussed in section 4.13.3.5, constraints on the roadway network could occur if other planned projects in the area (e.g., Lake Charles Liquefaction Project, G2X Energy's natural gas to gasoline facility) are constructed in the same timeframe.

Operation of the LNG terminal would result in an average of 40 roundtrips to the site per day associated with worker commutes. KMLP's Magnolia Meter Station would be unmanned during operation, and only occasional site visits by operations personnel would occur. Given the small increase in traffic and implementation of the road improvement measures described above, we have determined that operation of the LNG terminal would have permanent but minor impacts on roadway transportation.

Marine Transportation

During construction of the LNG terminal, the liquefaction train modules, concrete and steel pilings, sheet piling, rock armoring, specialized mooring equipment, and miscellaneous construction materials would be delivered to the DII construction yard via barge. At the DII construction yard, materials would be offloaded and delivered to the LNG terminal site using the heavy haul road. The most likely route taken by the barges, assuming the use of nearby facilities along the coast, would be via the Intracoastal Waterway, Calcasieu Ship Channel, and Industrial Canal.

Current vessel traffic in the Calcasieu Ship Channel is approximately 1,022 vessels per year, which equates to an average of about 85 vessels per month (Port of Lake Charles, 2015a). Magnolia estimates that 50 or fewer marine deliveries would occur during construction of the LNG terminal. Marine deliveries to the DII construction yard would occur between 1 and 3 times per month during the first year of construction, and approximately 1 time per month during the second and third years of construction, which would represent an increase of less than 4 percent in current vessel traffic. Because barges are subject to fewer restrictions and can be maneuvered between other vessels using the channel, an increase in barge traffic would not impact the traffic capacity of the channel (Ausenco, 2015).

During operation, approximately 208 LNG vessels (104 LNG carriers and 104 LNG barges) would call on the LNG terminal per year. In a letter dated February 12, 2015, the Coast Guard issued the LOR for the project,[15] which stated that the Calcasieu Ship Channel is considered suitable for LNG marine traffic in accordance with the guidance in the Coast Guard's NVIC 01-2011. The WSA review focused on the navigation safety and maritime security aspects of LNG vessel transits along the affected waterway. The WSA itself is designated Sensitive Security Information as defined in 49 CFR 1520. Because any unauthorized disclosure of these details could be employed to circumvent the proposed security measures, they are not releasable to the public.

The Coast Guard's LOR and 33 CFR 165.805(a)(2) establish a moving security zone for LNG vessels during transit, which extends 2 miles ahead of and 1 mile behind the LNG vessel (as discussed in additional detail in section 4.12.7). LNG vessels would reach the terminal using existing shipping channels, with the exception of the recessed turning basin at the LNG terminal itself. Throughout operation, LNG carriers would enter and depart the LNG terminal by transiting the Industrial Canal, Calcasieu Ship Channel, and Gulf of Mexico. LNG barges transiting to or from the Gulf of Mexico would utilize the route described above for LNG carriers; LNG barges transiting to or from other areas along the coast would utilize the route described above for barge traffic associated with construction of the LNG terminal.

[15] Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number, excluding the last three digits, in the "Docket Number" field (i.e., CP14-347). The LOR for the project was filed with the FERC on March 2, 2015.

Inbound LNG carriers would embark a Lake Charles Pilot at the CC buoy (also known as Pilot Boarding Area 4), approximately 28 nautical miles from the Cameron jetties (River Mile 0) offshore in the Gulf of Mexico. From this point, LNG carriers would transit the waterway under command of the pilot. LNG carriers would enter the Calcasieu Ship Channel, and continue northbound to the channel's intersection with the Intracoastal Waterway at a location known as "Devil's Elbow." At this intersection, inbound LNG carriers would make a turn to the northeast and proceed into the Industrial Canal where the ship would turn around within the turning basin and subsequently be maneuvered into the recessed berthing area by tugs. The pilot would direct the securing of the lines and would turn navigational control back to the captain when the carrier is fastened. Following loading at the LNG terminal, the pilot(s) would resume navigational control of the vessel when the mooring lines are let go, and the loaded LNG carrier would transit outbound along the reverse route described for inbound LNG carriers (although because the LNG carrier would turn around prior to docking, it would be able to proceed directly west within the Industrial Canal upon leaving the LNG terminal). The total transit distance from the CC buoy in the Gulf of Mexico to the LNG terminal is approximately 52 nautical miles.

Seagoing LNG barges transiting the Gulf of Mexico would embark a pilot at Pilot Boarding Area 1, approximately 8 nautical miles from the Cameron jetties. LNG barges would transit inbound to and outbound from the LNG terminal using the same route described above for LNG carriers. The total transit distance from Pilot Boarding Area 1 in the Gulf of Mexico to the LNG terminal is approximately 32 nautical miles. Non-seagoing (inland) LNG barges transiting the Intracoastal Waterway would not be required to travel under the control of a pilot.

The Port of Lake Charles is currently the thirteenth busiest seaport in the United States and accommodates 5 million tons of cargo annually at its public facilities (Port of Lake Charles, 2015b). Due to the existing levels of traffic within the port and the anticipated increase in traffic within the channel over the next 10 years (see additional discussion in section 4.13.3.5), a traffic impact study was conducted for the Calcasieu Ship Channel by Ausenco (2015). A model was developed for the Calcasieu Ship Channel that simulated the anticipated impacts on traffic within the channel between 2013 and 2033, assuming that the present infrastructure, operational rules, and dredging dimensions are maintained. For example, the simulations included Coast Guard requirements for LNG carriers (passing restrictions and safety zones, see detailed discussion in section 4.12.7), closures of the channel due to weather, boarding window restrictions, and availability of sufficient pilots and tugs. The following discussion summarizes the simulated traffic within the Calcasieu Ship Channel in 2018, which is the year the LNG terminal would begin operation.

The results of the simulation indicate that the median wait time is expected to increase by 2.3 hours per vessel, and notes that LNG carriers would experience the highest increase in median wait time (8.9 hours). The wait times are expected to vary seasonally, and would be higher during the winter months and lower during the summer months. In addition, the simulation indicated that 4 to 10 additional pilots and 1 or 2 additional sets of tugs would be required to accommodate vessel traffic without further increasing wait times.

To minimize impacts on other users of the Industrial Canal and Calcasieu Ship Channel, it is anticipated that vessels (including LNG vessels) would be organized in convoys to be handled in the most efficient manner. The convoy would be specifically organized to maximize efficient transit; therefore, vessels traveling the farthest upstream would be prioritized (to minimize delays to other vessels during maneuvering and docking).

To assess the need for changes to the channel infrastructure and regulations, the study simulated five scenarios where a change would be made to the existing channel operations. Although none of the scenarios have been proposed, they are summarized below to illustrate the resulting impacts on marine traffic during operation of the LNG terminal.

- Insufficient Dredging – Simulations indicate that insufficient dredging would result in increased delays and could impact the ability of the channel to accommodate fully laden vessels.

- Increased Pilot Requirements for LNG Carriers – Simulations indicate that increased pilot requirements would not impact vessel wait times.

- LNG Carrier Passing on the Outer Bar – Simulations indicate that changing the passing restrictions for LNG carriers on the outer bar would decrease the median wait time, resulting in an increase of 1.6 hours per vessel over current conditions (as compared to 2.3 hours per vessel without changes to channel infrastructure).

- Inner Channel Anchorages – Simulations indicate that the addition of anchorages to the inner channel would not impact vessel wait times.

- Inner Channel Passing Lane – Simulations indicate that the addition of a passing lane on the inner channel would decrease the median wait time, resulting in an increase of 1.0 hour per vessel over current conditions (as compared to 2.3 hours per vessel without changes to channel infrastructure).

Based on the Coast Guard's LOR for the Magnolia LNG Project and the expected increase in the median wait time by 2.3 hours per vessel, we have determined that operation of the LNG terminal would have a permanent and moderate increase in marine traffic within the Industrial Canal and Calcasieu Ship Channel.

Information on potential impacts on recreational boating and fishing in the vicinity of the LNG terminal is provided in section 4.8.4. Additional discussion of marine traffic and transportation as it relates to marine safety, including potential cryogenic/thermal impacts along the LNG vessel transit route, is provided in section 4.12.7.

4.9.6.2 KMLP Facilities

The local road and highway system in the vicinity of the proposed KMLP facilities is readily accessible by interstate highways, U.S. highways, state highways, secondary state highways, county roads, and private roads. Construction of the KMLP facilities may temporarily affect roadway traffic due to increased vehicle traffic associated with the commuting of the construction workforce and the delivery of equipment and materials to the construction work area.

As indicated in table 4.9.6-1, construction activities associated with the KMLP facilities would result in a temporary increase in traffic levels on area roads over the proposed 11-month construction period, which would be highest during the 3-month period when construction activities occur at each of these facilities. KMLP estimates that approximately 41 roundtrips per day (including 6 vehicle trips associated with truck deliveries and 35 vehicle trips associated with construction workers) would occur during construction of the header pipelines. Approximately 32 roundtrips per day (including 12 truck deliveries and 20 construction worker trips) would occur at Compressor Station 760 and the meter station sites.

TABLE 4.9.6-1

Construction Duration and Vehicle Trips per Day Associated with the KMLP Facilities

Location / Facility	Vehicle Trips per Day	Month of Construction 1	2	3	4	5	6	7	8	9	10	11
Near Eunice, Acadia Parish, Louisiana												
Header pipelines	41			■	■	■						
Compressor Station 760	32	■	■	■	■	■	■	■	■	■	■	■
ANR Meter Station	32			■	■	■						
Pine Prairie Meter Station	32			■	■	■						
TGT Meter Station	32			■	■	■						
Subtotal	**169**											
Southern Evangeline Parish, Louisiana												
CGT Meter Station	32			■	■	■						
TRANSCO Meter Station	32			■	■	■						
TETCO Meter Station	32			■	■	■						
Subtotal	**96**											
KMLP Facilities Total	**265**											

Construction of the header pipelines; Compressor Station 760; and the ANR, Pine Prairie, and TGT Meter Stations would occur within a localized area approximately 6 miles southwest of Eunice, Louisiana (see figure 2.1.3-2 in section 2.1.3). For 8 months of the 11-month construction period, the average daily increase in traffic on area roads would be approximately 32 vehicles; this would increase to approximately 169 vehicles during the 3-month period when construction is scheduled to occur at each of the facilities. Construction work is typically scheduled to take advantage of daylight hours, 6 days per week; therefore, most workers would commute to and from the construction areas during off-peak traffic hours. These facilities would be located in rural areas with low existing traffic levels and alternate routes are available in the vicinity of the facilities. Therefore, we have determined that impacts on traffic near Eunice, Louisiana would be temporary and minor during the 3-month period when construction is scheduled to occur at each of the facilities. During the remaining 8 months of construction associated with these facilities, impacts on traffic would be negligible.

Construction activities at the remaining KMLP facilities (CGT, TRANSCO, and TETCO Meter Stations) would occur within rural areas in southern Evangeline Parish (see figure 2.1.3-1 in section 2.1.3). Construction activities at each of the meter station sites would result in an average increase of 32 vehicle trips per day on area roads. Impacts on local traffic would be similar to those described above for the proposed facilities near Eunice, Louisiana and are expected to be temporary and minor.

KMLP anticipates that four workers would be hired for operation of Compressor Station 760. The header pipelines and meter stations would be unmanned during operation, and only occasional site visits by operations personnel would occur. Therefore, impacts on traffic or roadways resulting from operation of the KMLP facilities would be negligible.

In addition to increased traffic associated with construction and operation of the KMLP facilities, impacts on roadway traffic could occur as a result of installation of the low pressure header pipeline beneath Fournerat and Coulee Roads as well as construction of the gravel access road from Coulee Road to Compressor Station 760. KMLP would install the header pipeline beneath both roadways using the horizontal bore method (described in section 2.5.2.1) to prevent impacts on roadways and traffic. To further minimize impacts, traffic warning signs and other traffic control devices would be used at road crossings, as required by federal, state, and local regulatory agencies. With the implementation of these measures, construction activities within and adjacent to roadways would have temporary and minor impacts on roadway traffic.

4.9.7 Property Values

Potential impacts on the value of a tract of land depends on many factors, including size, the values of adjacent properties, presence of other industrial facilities or pipelines, the current value of the land, and the extent of development and other aspects of current land use. A potential purchaser will make an offer to purchase based on his or her own values, which might or might not take the LNG terminal or KMLP facilities' presence into account.

The proposed location of the LNG terminal is within an active port and is zoned for heavy industrial use. It is in a sparsely populated rural residential area where the nearest residences are 0.6 mile to the south. One study on this issue showed that the construction of industrial facilities (e.g. fossil fuel generation plants) in the vicinity of residential areas may have a minor negative effect on property values in those residential areas (Davis, 2010). However, given the number of projects and other economic development in the Lake Charles area (see section 4.13.2.8), it is more likely that property values of nearby residences would remain unchanged or would increase.

With the exception of Compressor Station 760, aboveground facilities associated with the KMLP facilities would be within or adjacent to existing meter station sites. KMLP would compensate the landowners for new easements at Compressor Station 760 and the expanded meter stations (CGT, TRANSCO, and TGT Meter Stations) as well as the temporary loss of land use associated with construction workspaces and any damages. The easement acquisition process is designed to provide fair compensation to the landowner for the right to use the property for facility construction and operation. Although not anticipated due to the amount of oil and gas infrastructure in the vicinity of the KMLP facilities (73 pipelines, 35 meter stations, 3 compressor stations, and 2 natural gas processing plants are within a 1-mile radius of the KMLP facilities), affected landowners who believe that their property values have been negatively affected could appeal to the local tax agency for reappraisal and potential reduction of taxes. The KMLP facilities would not negatively impact property values outside of the pipeline rights-of-way or aboveground facility boundaries.

Property taxes are generally based on the actual use of the land. Construction and operation of the header pipelines would not typically change the general use of the land, but would preclude the construction of aboveground structures within the permanent easements. Because the header pipelines would be adjacent to three existing pipelines (including KMLP's existing mainline) and would be located primarily within agricultural land, we have determined that use of the land, and the associated property value would not be negatively affected by the header pipelines.

4.9.8 Environmental Justice

Executive Order 12898 on environmental justice recognizes the importance of using the NEPA process to identify and address, as appropriate, any disproportionately high and adverse health or environmental effects of federal programs, policies, or activities on minority populations and low-income groups. The provisions of Executive Order 12898 apply equally to Native American programs. Consistent with Executive Order 12898, the CEQ has called on federal agencies to actively scrutinize the following issues with respect to environmental justice (CEQ, 1997):

- the racial and economic composition of affected communities;
- health-related issues that may amplify effects to minority or low-income individuals; and

- public participation strategies, including community or tribal participation in the NEPA process.

The EPA provides guidance on determining whether there is a minority or low-income community to be addressed in a NEPA analysis. According to this guidance, minority population issues must be addressed when they comprise over 50 percent of an affected area or when the minority population percentage of the affected area is substantially greater than the minority percentage in the larger area of the general population. Low-income populations are those that fall within the annual statistical poverty thresholds from the U.S. Department of Commerce, Bureau of the Census Population Reports, Series P-60 on Income and Poverty.

In accordance with these guidelines, we prepared an environmental justice analysis for the projects. In order to develop a more accurate understanding of the racial and ethnic characteristics of the communities in the immediate vicinity of the LNG terminal and KMLP facilities, census block group-level data was used, as opposed to the larger geographic areas included in census tract and parish level data.[16] In this analysis, the minority and low-income population percentages in the State of Louisiana and Calcasieu Parish were compared to the respective percentages within the three census blocks intersected by a 2-mile radius around the proposed LNG terminal. These three census block groups comprised the affected community based on the potential environmental impact. Similarly, the affected community included in our environmental justice analysis for the KMLP facilities includes four block groups within Acadia and Evangeline Parishes. Table 4.9.8-1 identifies racial composition and economic status of the seven block groups; Calcasieu, Acadia, and Evangeline Parishes; and the State of Louisiana. Table 4.9.8-2 provides an overview of the general economic status of these areas.

TABLE 4.9.8-1

Demographics in the Vicinity of the LNG Terminal and KMLP Facilities (in percent)

State/Parish/Block Group	White, not Hispanic or Latino	African-American	Hispanic or Latino	Asian	American Indian and Alaskan Native	Native Hawaiian and Pacific Islander	Two or more races
Louisiana	62.6	32.0	4.2	1.5	0.7	0.0	1.6
Calcasieu Parish	70.8	24.8	2.6	1.1	0.5	0.0	1.9
Block Group: LA0190018001	94.8	2.5	0.9	0.2	0.3	0.0	1.6
Block Group: LA0190018002	93.9	2.5	3.2	1.3	0.2	0.2	1.4
Block Group: LA0190032001	92.3	3.2	2.5	0.8	0.6	0.0	1.8
Acadia Parish	79.5	18.1	1.7	0.2	0.3	0.0	1.3
Block Group: LA0019603001	92.9	5.2	1.8	0.8	0.1	0.0	0.3
Evangeline Parish	69.0	28.3	2.3	0.3	0.3	0.0	1.1
Block Group: LA0399503001	89.8	6.1	1.5	0.1	1.0	0.0	1.9
Block Group: LA0399503001	88.6	9.0	0.9	0.4	0.0	0.0	1.4
Block Group: LA0399503001	72.5	25.6	2.0	0.0	0.2	0.0	1.3

Source: U.S. Census Bureau, 2010c

[16] In order from smallest to largest, the U.S. Census Bureau collects and tabulates data for the following hierarchical geographic levels: blocks, block groups, tracts, county subdivisions, counties, and states.

TABLE 4.9.8-2

Economic Statistics in the Vicinity of the LNG Terminal and KMLP Facilities

State/Parish//Block Group	Median Household Income [a]	Population Below Poverty (percent)
Louisiana	$44,673	18.7 [b]
Calcasieu Parish	$44,247	16.8 [b]
Block Group: LA0190018001	$67,022	5.3 [c]
Block Group: LA0190018002	$117,222	5.3 [c]
Block Group: LA0190032001	$42,446	14.1 [c]
Acadia Parish	$38,686	19.1 [b]
Block Group: LA0019603001	$60,893	13.3 [c]
Evangeline Parish	$32,125	22.7 [b]
Block Group: LA0399503001	$48,086	3.3 [c]
Block Group: LA0399508002	$43,043	19.1 [c]
Block Group: LA0399508003	$34,432	9.0 [c]

[a] USA.com, 2015
[b] U.S. Census Bureau, 2014a
[c] U.S. Census Bureau, 2010c
Note: 2014 poverty status for the past 12 months is only available at the state and parish level.

None of the communities near the LNG terminal have minority populations greater than the general EPA guideline of 50 percent. Within two of the three block groups analyzed (LA0190078001 and LA0190032001), the percentage of each minority population was lower than the parish as a whole. Block group LA0190018002 has slightly higher percentages of Hispanic or Latino, Asian, and Native Hawaiian or Pacific Islanders than the parish as a whole. However, because in each of these cases the difference is less than 1 percent, we have determined that block group does not have any minority populations representing a substantially greater percentage of the population than the parish as a whole. None of the communities near the LNG terminal have a higher portion of the population living below the poverty level than Calcasieu Parish or the State of Louisiana.

None of the communities near the KMLP facilities have minority populations greater than the general EPA guideline of 50 percent. Within three of the four block groups, the percentage of two minority populations was slightly higher than the parish as a whole. However, in each of these instances, the minority population within the block group was less than 1 percent higher than the Parish as a whole (for example, in block group LA0019603001, the Asian percentage of the population is 0.6 percent higher than Asian population within Acadia Parish as a whole). Therefore, it was determined that the minority percentage differences noted above are not substantial enough to distinguish these block groups as having disproportionately higher percentages of a particular minority group.

None of the communities analyzed near the KMLP facilities have a higher portion of the population living below the poverty level than Acadia or Evangeline Parishes. Therefore, we have determined that the KMLP facilities would not have disproportionately high effects on low-income groups.

4.10 CULTURAL RESOURCES

Section 106 of the NHPA, as amended, requires the FERC to take into account the effect of its undertakings (including the issuance of Certificates) on properties listed in or eligible for listing in the NRHP and to afford the ACHP an opportunity to comment on the undertaking. Magnolia and KMLP, as non-federal parties, are 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).

Construction and operation of the projects could have the potential to affect historic properties (that is, cultural resources listed or eligible for listing on the NRHP). Historic properties include prehistoric or historic archaeological sites, districts, buildings, structures, and objects, as well as locations with traditional value to Native Americans or other groups. Historic properties generally must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and must meet one or more of the criteria specified in 36 CFR 60.4.

4.10.1 Cultural Resources Survey

4.10.1.1 Magnolia LNG Project

The area of potential effects (APE) for the Magnolia LNG Project is defined as the boundaries of the 115-acre parcel of land upon which the proposed LNG terminal would be constructed as well as the areas that would be temporarily affected by construction of the LNG terminal, including the approximately 5-acre DII construction yard, 142-acre dredge material placement area, and the 7 acres required for the dredge material and effluent pipelines. The site is zoned for heavy industrial use and is surrounded by industrial and commercial sites and a recreational boat launch. The potential for visually affecting historic structures is low. Magnolia initiated consultation with the Louisiana State Historic Preservation Office (SHPO) in a letter dated August 28, 2013 regarding the need for, and scope of, cultural resources investigations within the APE for the 115-acre LNG terminal site. In a response letter dated October 28, 2013, the SHPO concurred with the definition of the APE and indicated that, given the environmental setting and amount of fill that has been placed on the property, no cultural resources investigation of the proposed LNG terminal site is necessary. We concur.

In March, 2015 Magnolia consulted with the Louisiana SHPO regarding the need for cultural resources investigations within the APE for the Turner Bay dredge material placement site, the 142-acre dredge material placement area, and the 7 acres required for the dredge material and effluent pipelines. The SHPO recommended that the use of the Turner Bay site or the CB&I site and 7 acres for dredge material and effluent pipelines would have no effect on historic properties. We concur.

On April 6, 2015 Magnolia consulted with the SHPO regarding the use of the approximately 5-acre DII site as a staging area and parking lot. The SHPO recommended use of the DII site would have no effect on historic properties. We concur.

4.10.1.2 Lake Charles Expansion Project

KMLP completed a records review and cultural resources survey of the proposed Lake Charles Expansion Project. The investigations covered both archaeological and architectural resources. The report (Cropley and Eberwine, 2014) was provided to the FERC and the Louisiana SHPO.

The cultural resources survey included examination of a 1.2-mile and a 0.13-mile-long by 400-foot-wide natural gas header pipeline rights-of-way, three possible compressor station construction locations (Compressor Station 760), six meter station locations that are proposed for modification or expansion, and a proposed interconnection facility location. In total, approximately 290 acres were surveyed. The survey identified a single non-site cultural resources locus and a 20th century standing structure complex within one of the areas proposed for Compressor Station 760. KMLP recommended that both resources were not eligible for the NRHP.

In a letter dated May 21, 2014, the Louisiana SHPO concurred that no historic properties would be affected by construction of the proposed Lake Charles Expansion Project. We concur.

4.10.2 Unanticipated Discoveries Plan

Magnolia prepared an Unanticipated Discoveries Plan that would be implemented in the event that cultural resources or human remains are encountered during construction of the Magnolia LNG Project. Magnolia provided its plan to the Louisiana SHPO on October 21, 2013. In a letter dated February 10, 2014, the Louisiana SHPO responded that it has no objection to the proposed plan.

KMLP prepared an Unanticipated Discoveries Plan that would be implemented in the event that cultural resources or human remains are encountered during construction of the Lake Charles Expansion Project. KMLP provided its plan to the Louisiana SHPO on May 24, 2014. In a letter dated October 8, 2014, the Louisiana SHPO responded that it has no objection to the proposed plan.

4.10.3 Native American Consultation

We mailed our NOIs for the Magnolia LNG Project to the Alabama Coushatta Tribe of Texas, the Caddo Nation, and the Coushatta Tribe of Louisiana. We did not receive responses to the NOIs from any of the tribes. We sent a letter to each of the tribes on July 1, 2013 requesting their comments on the project. To date, no responses have been received from any of the tribes.

We mailed our NOI for the Lake Charles Expansion Project to the Alabama Coushatta Tribe of Texas, the Caddo Nation, and the Coushatta Tribe of Louisiana. No responses have been received to date.

Subsequently, on August 20, 2014, we mailed letters to the Alabama Coushatta Tribe of Texas, the Chitimacha Tribe of Louisiana, the Jena Band of Choctaw Indians, the Mississippi Band of Choctaw Indians, the Choctaw Nation of Oklahoma, the Coushatta Tribe of Louisiana, and the Tunica-Biloxi Indians of Louisiana inviting the tribes to participate in the FERC's review of the Lake Charles Expansion Project. To date, no responses have been received from any of the tribes.

Magnolia sent letters to the Alabama Coushatta Tribe of Texas, the Caddo Nation, and the Coushatta Tribe of Louisiana on January 17, 2014. On March 18, 2014, KMLP also sent letters to the Alabama Coushatta Tribe of Texas and the Coushatta Tribe of Louisiana. Additionally, KMLP sent letters to the Chitimacha Tribe of Louisiana, the Choctaw Nation of Oklahoma, the Jena Band of Choctaw Indians, the Mississippi Band of Choctaw Indians, and the Tunica Biloxi Tribe of Louisiana. The letters requested the tribes communicate any concerns about potential impacts the proposed project may have on traditional cultural properties. To date, no responses have been received by Magnolia or KMLP; however, on August 4, 2014, the Choctaw Nation of Oklahoma sent a letter to the FERC responding to the letter it received from KMLP. The tribe requested a copy of the cultural resources survey report, a map depicting all known archaeological sites positioned within a 1-mile radius of the project APE, as well as GIS shapefiles for the project. On September 2, 2014, KMLP sent the requested materials to the tribe.

On September 8, 2014, the Choctaw Nation of Oklahoma filed a comment with the FERC providing comments on the documents received from KMLP. The tribe requested that it and the other federally recognized tribes that were consulted regarding the project be contacted in the event of any unanticipated find (not only if the discovery consists of human remains). The Unanticipated Discoveries Plan has been updated in response to the tribe's request.

Therefore, based on the information filed provided by Magnolia and KMLP and the comments of the SHPO and Indian tribes, we have determined that the projects as proposed would have no effect on any properties listed in, or eligible for listing in, the NRHP.

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

This section describes the air quality conditions that would be directly or indirectly affected by the construction and operation of the LNG terminal and KMLP facilities. The section summarizes federal and state air quality regulations that are applicable to the proposed facilities. The section also characterizes and quantifies the existing air quality and describes potential impacts the facilities may have on air quality.

4.11.1.1 Regional Climate

Due to its location near the Gulf of Mexico, the area in which the LNG terminal and KMLP facilities would be located has a subtropical climate that is generally categorized as warm and wet, with mild and humid winters (EPA, 2014a). A semi-permanent high-pressure system, known as the Bermuda High, is typically situated off of the Atlantic Coast. Depending on its position, it commonly draws moisture northward or westward from the Atlantic and Gulf of Mexico, especially during the warm season. As a result, summers in the area are characteristically warm and moist with frequent thundershower activity in the afternoon and early evening hours. Day-to-day and week-to-week variations in the positions of the Bermuda High can have a strong influence on precipitation patterns. When the Bermuda High builds west over the region, hot and dry weather occurs, although humidity often remains relatively high. This pattern can cause heat waves and poor air quality (NOAA Fisheries, 2013e).

January is typically the coolest month in the vicinity of the LNG terminal and KMLP facilities, followed by December and February; the months of June through September are the warmest (NOAA, 2013). The Lake Charles area receives an annual average of 57.19 inches of rain. Precipitation is distributed fairly evenly throughout the year; February is typically the driest month of the year with an annual mean of 3.3 inches, whereas June tends to be the wettest month with an annual mean of 6.1 inches. Snow events are rare with an annual mean of 0.3 inch of snow, which is only likely to occur in January or February. Normal annual average relative humidity is 79 percent; however, humidity levels above 85 percent frequently occur overnight throughout the year.

The predominant wind direction is from the south for much of the year, which tends to subdue extreme summer heat and shorten the duration of winter cold outbreaks, but also increases relative humidity in the area. During winter months, the highest wind speeds occur with the wind direction being predominantly from the north. On average, wind speed varies between 6 and 10 mph (NOAA, 1998).

4.11.1.2 Existing Air Quality

Ambient Air Quality Standards

The EPA, as required by the CAA, has established National Ambient Air Quality Standards (NAAQS) to protect public health (primary standards) and public welfare (secondary standards). Standards have been set for six principal pollutants that are called "criteria pollutants" (EPA, 2014c). These criteria pollutants are ground-level ozone, carbon monoxide (CO), NO_X, sulfur dioxide (SO_2), respirable and fine particulate matter (inhalable particulate matter with an aerodynamic diameter less than or equal to 10 microns [PM_{10}] and less than or equal to 2.5 microns [$PM_{2.5}$]), and airborne lead. Ozone is not directly emitted into the atmosphere from an emissions source. Ozone develops as a result of a chemical reaction between NO_X and volatile organic compounds (VOC) in the presence of sunlight. Therefore, NO_X and VOCs are often referred to as ozone precursors. The NAAQS are codified in 40 CFR 50 and are summarized in table 4.11.1-1. Louisiana has adopted the NAAQS.

TABLE 4.11.1-1

National Ambient Air Quality Standards

Criteria Pollutant	Primary/ Secondary	Averaging Time	Level	Form
CO	Primary	8-hour	9 ppm (10,000 µg/m^3)	Not to be exceeded more than once per year
		1-hour	35 ppm (40.000 µg/m^3)	
Lead	Primary and secondary	Rolling 3-month average	0.15 µg/m^3 [a]	Not to be exceeded
Nitrogen dioxide (NO_2)	Primary	1-hour	100 ppb (189 µg/m^3)	98th percentile, averaged over 3 years
	Primary and secondary	Annual	53 ppb[b] (100 µg/m^3)	Annual mean
Ozone	Primary and secondary	8-hour (2008)	0.075 ppm[c] (150 µg/m^3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
	Primary and Secondary	8-hour (1997)	0.08 ppm (157 µg/m^3)	
	Primary and secondary	1-Hour	0.12 ppm (235 µg/m^3)	
Particle pollution				
$PM_{2.5}$	Primary	Annual	12 µg/m^3	Annual mean, averaged over 3 years
	Secondary	Annual	15 µg/m^3	
	Primary and secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
PM_{10}	Primary and secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
SO_2	Primary	1-hour	75 ppb (195 µg/m^3)[d]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3-hour	0.5 ppm (1,300 µg/m^3)	Not to be exceeded more than once per year

[a] Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m^3 as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, which remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

[b] The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

[c] Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, the EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard (“anti-backsliding”). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

[d] Final rule signed June 2, 2010. The 1971 annual and 24-hour SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until 1 year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Notes: ppm = parts per million; µg/m^3 = microgram per cubic meter; ppb = parts per billion

Source: EPA, 2014c

In April 2007, the Supreme Court ruled that greenhouse gases (GHG) fell within the CAA's definition of "air pollutant," and required the EPA to conduct an endangerment finding for GHGs. On December 7, 2009, the EPA issued findings that current and projected concentrations of six key well-mixed GHGs in the atmosphere threaten the public health and welfare of current and future generations (EPA, 2014b). The six key GHGs are:

- carbon dioxide (CO_2);
- methane (CH_4);
- nitrous oxide (N_2O);
- hydrofluorocarbons;
- perfluorocarbons; and
- sulfur hexafluoride.

All GHGs have been assigned a Global Warming Potential (GWP). The GWP represents the ability of each different GHG to trap heat in the atmosphere. They are determined based on the heat-absorbing ability of each gas relative to that of CO_2, as well as the rate of decay, or rate of removal from the atmosphere, of each gas over a given number of years. GWPs are used to define the impact greenhouse gases have on global warming over different time periods. Because each of the gases remains in the atmosphere for a different amount of time and each has a varying ability to absorb solar radiation, the calculated GWP for each gas in relation to CO_2 can vary greatly. For example, for the 100-year GWP, CO_2 has a GWP of 1, whereas CH_4 has a GWP of 25 and N_2O has a GWP of 298.

Air Quality Control Regions and Attainment Status

An air quality control region (AQCR) is defined under 42 USC §7407(c) as "...any interstate area or major intrastate area which [the Administrator of the EPA] deems necessary or appropriate for the attainment and maintenance of ambient air quality standards." Each AQCR, or portion(s) of an AQCR, is classified as either attainment, non-attainment, 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 considered to be in non-attainment. Areas that have been designated nonattainment but have since demonstrated compliance with the NAAQS are designated maintenance 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 the air quality would remain in compliance with the NAAQS for that pollutant. Maintenance areas retain the classification for 20 years before being re-classified as attainment areas. Areas where air quality data are not available are considered to be unclassifiable and are treated as attainment areas. The LNG terminal and KMLP facilities would be located in areas classified as in attainment for all criteria pollutant standards.

In addition, there are no non-attainment or maintenance areas through which LNG vessels would transit en route to the Gulf of Mexico. Although the EPA maintains jurisdiction over portions of the outer continental shelf (OCS) within the Gulf of Mexico (40 CFR 55), attainment status does not apply in offshore areas. Therefore, LNG vessels transiting the Gulf of Mexico would not pass through non-attainment or maintenance areas.

Although currently in attainment for ozone, both the Lake Charles and Lafayette areas are vulnerable to being designated as non-attainment for ozone in the next few years, and the metropolitan planning districts responsible for air quality planning for these areas have applied for and been accepted into the EPA Ozone Advance program, which is a program that encourages emission reductions to assist areas to remain in attainment with ozone NAAQS.

Air Quality Monitoring and Background Concentrations

Ambient air monitoring operations in Louisiana are the responsibility of the LDEQ Air Quality Assessment Division, which has developed a statewide network of stationary monitoring stations to collect direct measurements of air pollutant concentrations. Data from these air monitoring sites are available through the EPA's AIRDATA database, which collects air monitoring data from all over the country. The majority of emissions generated during construction and operation of the LNG terminal and KMLP facilities would occur in Calcasieu and Acadia Parishes.

Ambient air quality monitoring data from the 3-year period of 2011 to 2013 are summarized in table 4.11.1-2 for those monitors that were nearest or most representative of the proposed facilities in Calcasieu and Acadia Parishes. The concentrations listed in table 4.11.1-2 are maximum or near maximum values for the identified monitors. As such, they are not necessarily representative of current actual air quality in the immediate vicinity of the proposed facilities. For each monitor, table 4.11.1-2 lists the applicable concentrations such as annual mean concentration in each year and/or a near maximum short-term concentration, which are comparable to the applicable NAAQS. As shown in the table, each of the measured concentrations is below or equivalent to the applicable NAAQS for the pollutant and averaging period, thus indicating attainment with the standard.

4.11.1.3 Regulatory Requirements for Air Quality

State air quality rules govern the issuance of air permits for construction and operation of a stationary emission source. The LDEQ is the lead air permitting authority for the LNG terminal and KMLP facilities. The LDEQ's air quality regulations are codified in LAC 33:III.1 through 59. The regulations incorporate the federal program requirements listed in 40 CFR 50-99 and establish permit review procedures for all facilities that can emit pollutants to the ambient air. New facilities are required to obtain an air quality permit prior to initiating construction. For larger facilities subject to major New Source Review (NSR), review and approval at the federal level may be required.

Federal Air Quality Requirements

<u>New Source Performance Standards</u>

Section 111 of the CAA authorized the EPA to develop technology-based standards that apply to specific categories of stationary sources. These standards, referred to as New Source Performance Standards (NSPS), are found in 40 CFR 60. The NSPS apply to new, modified, and reconstructed affected facilities in specific source categories.

We have determined that the following NSPS would be applicable to one or more of the proposed facilities.

Subpart A – General Provisions

The general provisions listed in Subpart A include broader definitions of applicability and various methods for maintaining compliance with requirements listed in subsequent subparts of 40 CFR 60. Subpart A also specifies the state agencies to which the EPA has delegated authority to implement and enforce standards of performance. The LDEQ has been delegated authority for all 40 CFR 60 standards promulgated by the EPA, except for *Subpart AAA – Standards of Performance for New Residential Wood Heaters*, which is not applicable to either the LNG terminal or KMLP facilities. Equipment at the LNG terminal and KMLP facilities subject to any of the NSPS subparts listed below would all be subject to Subpart A.

TABLE 4.11.1-2									
Ambient Air Quality Concentrations for Areas Near the LNG Terminal and KMLP Facilities									
Pollutant	Averaging Period	Rank	Location	2013	2012	2011	Applicable NAAQS	Units	Monitor
LNG Terminal – Calcasieu Parish									
CO	1-hour	2nd high	Jefferson County, TX	0.7	0.7	0.9	35	ppm	A
	8-hour	2nd high	Jefferson County, TX	0.6	0.5	0.5	9	ppm	A
NO_2	Annual	Mean	Calcasieu Parish, LA	N/A	N/A	6	53	ppb	B
	1-hour	98th percentile	Calcasieu Parish, LA	30	27	32	100	ppb	B
Ozone	8-hour	4th high	Calcasieu Parish, LA	0.07	0.075	0.069	0.075	ppm	B
$PM_{2.5}$	24-hour	98th percentile	Calcasieu Parish, LA	17	20	20	35	μg/m^3	E
	Annual	Mean	Calcasieu Parish, LA	N/A	N/A	8.9	12	μg/m^3	E
PM_{10}	24-hour	2nd high	Galveston County, TX	46	54	51	150	μg/m^3	C
SO_2	1-hour	99th percentile	Calcasieu Parish, LA	31	42	37	75	ppb	B
	3-hour	2nd high	Calcasieu Parish, LA	N/A	N/A	N/A	0.5 (ppm)	ppb	B
Lead	Quarterly	Maximum	Harris County, TX	N/A	N/A	N/A	0.15	μg/m^3	D
KMLP Facilities – Acadia Parish									
CO	1-hour	2nd high	Jefferson County, TX	0.7	0.7	0.9	35	ppm	A
	8-hour	2nd high	Jefferson County, TX	0.6	0.5	0.5	9	ppm	A
NO_2	Annual	Mean	Calcasieu Parish, LA	N/A	N/A	6	53	ppb	B
	1-hour	98th percentile	Calcasieu Parish, LA	30	27	32	100	ppb	B
Ozone	8-hour	4th high	Lafayette Parish, LA	0.07	0.07	0.07	0.075	ppm	F
$PM_{2.5}$	24-hour	98th percentile	Lafayette Parish, LA	18	18	21	35	μg/m^3	F
	Annual	Mean	Lafayette Parish, LA	7.9	8.6	9.0	12	μg/m^3	F
PM_{10}	24-hour	2nd high	Galveston County, TX	46	54	51	150	μg/m^3	C
SO_2	1-hour	99th percentile	Calcasieu Parish, LA	31	42	37	75	ppb	B
	3-hour	2nd high	Calcasieu Parish, LA	N/A	N/A	N/A	0.5 (ppm)	ppb	B
Pb	Quarterly	Maximum	Harris County, TX	N/A	N/A	N/A	0.15	μg/m^3	D

Monitor Key:
A Seattle Street, Nederland, Jefferson County, Texas (monitor no. 482451035)
B 2646 John Stine Rd, Lake Charles, Calcasieu Parish, Louisiana (monitor no. 220190008)
C 2516 Texas Avenue, Texas City, Galveston County, Texas (monitor no. 481670004)
D 1262 ½ Mae Drive, Houston, Harris County, Texas (monitor no.482011034)
E Common & E. McNeese, Lake Charles, Calcasieu Parish, Louisiana (monitor no. 220190010)
F 700 Cajundome, Lafayette, Lafayette Parish LA (monitor no. 22055007)
Notes: μg/m^3 = micrograms per cubic meter; ppm = parts per million; ppb = parts per billion; N/A = data not yet available
Source: EPA, 2015a

Subpart Dc – Standards of Performance for Small Industrial, Commercial, and Institutional Steam Generating Units

Subpart Dc applies to steam-generating units constructed after July 9, 1989 that have maximum heat input capacity of 100 million British thermal units (MMBtu) per hour (MMBtu/hr) or less. The auxiliary boilers that are part of each liquefaction train at the LNG terminal would be subject to NSPS Subpart Dc because they would be constructed after the applicability date and would have maximum heat input capacity of less than 100 MMBtu/hr.

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 (CI ICE) that commence construction after July 11, 2005 where the stationary CI ICE are: 1) manufactured after April 1, 2006 and are not fire pump engines, or 2) are manufactured as a certified NFPA fire pump engine after July 1, 2006.

Subpart IIII specifies emission standards, fuel requirements, compliance requirements, and testing requirements for CI ICE, some of which vary by model year, engine power, and displacement, and also specifies notification, reporting, and recordkeeping requirements for owners and operators of CI ICE subject to this subpart. CI ICEs at the LNG terminal for use with emergency electric generators and firewater pumps would be subject to NSPS Subpart IIII.

Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

Subpart JJJJ provides requirements for stationary spark ignition internal combustion engines that are constructed, modified, or reconstructed after June 12, 2006. The natural gas-fired emergency generator engine at Compressor Station 760 would be subject to the requirements of this rule for emergency natural gas-fired engines greater than or equal to 130 hp. KMLP would comply with NSPS Subpart JJJJ by purchasing a certified engine.

Subpart KKKK – Standards of Performance for Stationary Combustion Turbines

Subpart KKKK applies to owners and operators of stationary combustion turbines with a heat input peak load equal to or greater than 10 MMBtu/hr that commenced construction, modification, or reconstruction after February 18, 2005. Subpart KKKK regulates emissions of NO_X and SO_2. Subject turbines must meet the applicable emission limits and operational requirements as well as recordkeeping and reporting requirements of this subpart. The eight gas turbines at the LNG terminal and four gas turbines at Compressor Station 760 would be subject to NSPS Subpart KKKK.

Subpart OOOO – Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution

Subpart OOOO regulates emissions of VOC and SO_2 from gas processing and transmission. The rule applies to compressors, pneumatic controllers, liquefied natural gas units, gas sweetening unit, and fugitive VOC emissions from leaking components.

<u>National Emissions Standards for Hazardous Air Pollutants</u>

Section 112 of the CAA authorized the EPA to develop technology-based standards that apply to specific categories of stationary sources that emit hazardous air pollutants (HAP). These standards are referred to as National Emission Standards for Hazardous Air Pollutants (NESHAP) and are found in 40 CFR 61 and 63. Eight hazardous substances are regulated per 40 CFR 61, including asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. NESHAP can apply to major and/or area (minor) sources of HAPs. The EPA develops national priorities for NESHAPs that focus on significant environmental risks and noncompliance patterns.

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 area (minor) sources of HAPs. Major source thresholds for NESHAPs are 10 tons per year (tpy) of any single HAP or 25 tpy of total HAPs.

During operation of the LNG terminal, the annual emissions of each individual HAP would be less than 10 tpy, and the total annual emissions of all HAPs would be less than 25 tpy. Therefore, the facility would be an area (minor) source of HAPs. Likewise, Compressor Station 760 also has potential annual emission of each individual HAP of less than 10 tpy and total annual emissions of all HAPs of less than 25 tpy. Therefore, Compressor Station 760 would also be an area (minor) source of HAPs. The following NESHAP subparts apply to the LNG terminal and/or Compressor Station 760.

Subpart A – NESHAP General Provisions

The general provisions listed in Subpart A include broader definitions of applicability and various methods for maintaining compliance with requirements listed in subsequent subparts of 40 CFR 63. This subpart also addresses the delegation of NESHAP authority to the states. Though not all NESHAPs have been delegated to the state in Louisiana, the specific NESHAPs that are applicable to the LNG terminal and Compressor Station 760 have been delegated to LDEQ.

Subpart ZZZZ – NESHAP for Stationary Reciprocating Internal Combustion Engines

Subpart ZZZZ regulates HAP emissions from reciprocating internal combustion engines (RICE). Based on the potential to emit for HAPs, both the LNG terminal and Compressor Station 760 would be area sources. The RICE proposed for the LNG terminal includes the engines used for the emergency generators, the fire water pumps, and the deluge pumps. In accordance with 40 CFR 63.6590(c), compliance with Subpart ZZZZ would be achieved through compliance with NSPS Subpart IIII for compression ignition engines. The RICE proposed for Compressor Station 760 is an engine used for an emergency generator. Pursuant to 40 CFR 63.65909c), compliance with Subpart ZZZZ is achieved through compliance with NSPS Subpart JJJJ for spark ignition engines.

Mandatory Greenhouse Gas Reporting

On November 8, 2010, the EPA signed a rule that finalizes reporting requirements for the petroleum and natural gas industry under 40 CFR 98. Subpart W of 40 CFR 98 requires petroleum and natural gas facilities that emit 25,000 metric tons or more of CO_2e per year to report annual emissions of specified GHGs from various processes within the facility. LNG storage and LNG import and export equipment are considered part of the source category regulated by Subpart W. The LNG terminal would be required to report GHG emissions because annual emissions of GHGs would be above 25,000 metric tpy.

Compressor stations are also subject to GHG reporting requirements under Subpart W. Reporting is required for CO_2e from reciprocating compressor rod packing venting, centrifugal compressor venting, transmission storage tanks, blowdown vent stacks, natural gas pneumatic device venting, and equipment leaks from valves, connectors, open ended lines, pressure relief valves, and meters. Compressor Station 760 would include four turbines and one fuel gas heater that would be included in GHG reporting.

General Conformity

A General Conformity applicability analysis is required for any part of the project occurring in nonattainment or maintenance areas for criteria pollutants. Section 176(c) of the CAA requires federal agencies to ensure that federally approved or funded projects conform to the applicable approved State Implementation Plan. Such activities must not:

- cause or contribute to any new violation of any standard in any area;
- increase the frequency or severity of any existing violation of any standard in any area; or
- delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The areas where the LNG terminal and KMLP facilities would be located are classified as in attainment for all criteria pollutant standards; therefore, General Conformity requirements do not apply.

New Source Review – Prevention of Significant Deterioration

Congress established the NSR pre-construction permitting program as part of the 1977 CAA Amendments. Federal pre-construction review under NSR is conducted under separate procedures for sources in attainment areas and sources in nonattainment areas. Nonattainment New Source Review applies to sources in nonattainment areas. Because the LNG terminal and KMLP facilities would not be in nonattainment areas, this process does not apply and is not discussed further. Prevention of Significant Deterioration (PSD) applies to new major sources or major modifications at existing sources located in attainment areas or in areas that are unclassifiable. PSD is intended to keep new air emission sources from causing the existing air quality to deteriorate beyond acceptable levels. Under PSD, any new major source or major modification of an existing source of air pollutants is required to obtain an air quality permit before beginning construction. The definition of a PSD major source of air pollutants as applicable to the project is any stationary source which emits, or has the potential to emit, 250 tpy of a regulated criteria pollutant (40 CFR §51.166(b)(1)(i)(b)). Table 4.11.1-3 lists the major source emission thresholds applicable to the LNG terminal and the KMLP facilities.

TABLE 4.11.1-3

Major Stationary Source and Prevention of Significant Deterioration Emission Thresholds

Air Pollutant	Major Stationary Source Threshold (tpy)	PSD Significant Emission Rates (tpy)
NO_X	250	40
CO	250	100
VOCs	250	40
PM	250	25
PM_{10}	250	15
$PM_{2.5}$	250	10
SO_2	250	40
GHGs (as CO_2e)	NA	75,000

Once a facility is subject to PSD, the following requirements apply:

- installation of Best Available Control Technology (BACT);
- air quality monitoring and modeling analyses to ensure that a project's incremental increase of emissions will not cause or contribute to a violation of any NAAQS or PSD air quality increment;
- notification to the federal land manager of nearby Class I areas and modeling if applicable;
- a growth, soil and vegetation, and visibility analysis; and
- public comment on the permit.

BACT is an emissions limitation that is based on the maximum degree of control that can be achieved. It is a case-by-case decision that considers energy, environmental, and economic impact. BACT can be add-on control equipment or modification of the production processes or methods. This includes fuel cleaning or treatment and innovative fuel combustion techniques. BACT may be a design, equipment, work practice, or operational standard if imposition of an emissions standard is infeasible (EPA, 2014d). Magnolia completed a BACT assessment for the LNG terminal as part of the Title V and PSD permit application for CO, NO_X, VOC, PM_{10}, $PM_{2.5}$, and GHGs, the results of which were incorporated into subsequent facility emission calculations.

The air quality monitoring and modeling analysis involves an assessment of existing air quality, which may include ambient monitoring data and air quality dispersion modeling results, and predictions, using dispersion modeling, of ambient concentrations that will result from the proposed project and future growth associated with the project (EPA, 2014d).

There are three air quality classifications within an attainment area for purposes of PSD permitting review: Class I areas are designated as pristine natural areas or areas of natural significance and receive special protections under the CAA based on good air quality. Class III areas are heavily industrialized zones that are established only on request and must meet all requirements outlined in 40 CFR 51.166. The remainder of the United States is designated as Class II. The LNG terminal and KMLP facilities would be in Class II areas.

If a new source or major modification of an existing source is subject to the PSD permitting requirements and is within 62 miles of a Class I area, the facility is required to notify the appropriate federal officials and assess the impacts of the proposed project on the Class I area. The Breton NWR is the closest designated Class I area to the LNG terminal and KMLP facilities, and is over 260 and 220 miles to the east-southeast, respectively. Therefore, a PSD Class I analysis is not required.

<u>Title V Operating Permit</u>

The Part 70 Operating Permit program, as described in 40 CFR 70, requires major stationary sources of air emissions to obtain a federally enforceable operating permit. Part 70 operating permits are more commonly referred to as "Title V" permits. The EPA has delegated the authority to issue Title V permits to the LDEQ, which has incorporated the program in LAC 33:III.507. The threshold levels for determining the applicability for a Title V permit are:

- 100 tpy of any criteria air pollutant;

- 10 tpy of any individual HAP; or
- 25 tpy of any combination of HAPs.

Estimated potential emissions of NO_X, and CO during operation of the LNG terminal are greater than 100 tpy. Similarly, estimated potential emissions of CO during operation of Compressor Station 760 are greater than 100 tpy. Therefore both the LNG terminal and Compressor Station 760 would be subject to the Title V Operating Permit program. Magnolia submitted its Title V permit application for the LNG terminal on January 27, 2015. KMLP submitted its Title V permit application for Compressor Station 760 on October 7, 2014.

Louisiana Air Quality Requirements

The LNG terminal and KMLP facilities would be subject to state standards, codified in LAC 33:III. The regulations listed below would apply to the new facilities associated with the Terminal Expansion, including governing turbines, flares, generators, fire water pumps, condensate loading, amine units with incinerator, and fugitive emissions:

- Chapter 9 – General Regulations on Control of Emissions and Emission Standards
- Chapter 11 – Control of Air Pollution from Smoke
  - Section 1101 – Control of Air Pollution from Smoke
  - Section 1103 – Impairment of Visibility on Public Roads Prohibited
  - Section 1105 – Smoke from Flaring
  - Section 1109 – Outdoor Burning (smoke)
- Chapter 13 – Emission Standards for Particulate Matter
  - Section 1305 – Control of Fugitive Emission (particulate matter)
  - Section 1311 – Emission Limits (particulate matter)
  - Section 1313 – Fuel Burning Equipment (particulate matter)
- Chapter 15 – Emission Standards for Sulfur Dioxide
  - Section 1503 – Emission Limits (SO_2)
  - Section 1509 – Reduced Sulfur Compounds
- Chapter 17 – Control of Emissions of Carbon Monoxide (New Sources)
- Chapter 21 – Control of Emissions of Organic Compounds
  - Section 2103 – Storage of VOCs
  - Section 2111 – Pumps and Compressors
  - Section 2113 – Housekeeping
  - Section 2121 – Fugitive Emission Control (VOCs)
- Chapter 22 – Control of Emissions of Nitrogen Oxides (NO_X)
- Chapter 29 – Odor Regulations
- Chapter 51 – Comprehensive Toxic Air Pollutant Emission Control Program

Magnolia and KMLP have outlined the methods and measures by which they would comply with the requirements of each applicable LDEQ air quality regulation in section 22 of the AAE form included in their permit applications. It is expected that the LDEQ would include permit conditions in the respective permits to ensure compliance with these regulations.

4.11.1.4 Construction Air Emissions and Impacts and Mitigation

Air pollutant emissions during construction of the LNG terminal and KMLP facilities would result from the operation of construction vehicles, marine traffic, vehicles driven by construction workers commuting to and from work sites, and the generation of fugitive dust during construction activities. Particulate emissions would result from fugitive dust generated by construction-related activities, the quantity of which would depend on several factors, including:

- the size of area disturbed;
- the nature and intensity of construction activity;
- surface properties (such as the silt and moisture content of the soil);
- the wind speed; and
- the speed, weight, and volume of vehicular traffic.

LNG Terminal

Construction of the LNG terminal would occur over a 36-month period, with an additional 9 months until all four liquefaction trains would be commissioned and operational (resulting in a total construction period of 45 months).

Magnolia developed an inventory of non-road equipment, vessels, on-road vehicles, off-road vehicles, and expected activity levels (either hours of operation or miles travelled) based on expected duration of construction at the site. The level of activity for each piece of construction equipment was combined with the relevant emission factors to determine estimates of annual construction emissions. For the purpose of estimating construction emissions, construction was divided into six categories consisting of the following:

- Site Preparation – Site preparation would occur during the first year of construction and would consist of site clearing by removing debris, followed by stripping/grubbing topsoil (stockpiled on site), cut-fill and rough grading operations, construction of drainage swales and the short (approximately 1,500 feet) heavy-haul road from the construction workspace immediately east of the LNG terminal site and preparation for foundations.

- LNG Storage Tanks – Construction of the LNG storage tanks would occur during the first 3 years of construction and would include the installation of 3,016 concrete piles driven by up to eight hydraulic pile drivers to support the foundation of the storage tanks, followed by construction and testing of the LNG storage tanks.

- Balance of Plant – Construction of other components within the LNG terminal that would require specialized construction equipment would occur during the second and third year of construction. Activities would include installation of the foundations for the liquefaction trains, receipt of the LNG train modules at the temporary work yard, transport from the work yard to the LNG terminal site using heavy crawlers, assembly of the four liquefaction trains, and completion of other plant equipment (e.g., emergency water pumps, site buildings, onshore components of the LNG vessel loading facility).

- Building Construction – Construction of on-site buildings (i.e., workshop, control/administration, and Magnolia Meter Station) and other architectural components would occur during the second year of construction.

- Marine Work – Construction of the LNG loading and ship berthing facilities would occur during the first and second year of construction. The recessed berthing area would be constructed using a combination of onshore excavation (using backhoe and trackhoe equipment) and dredging using a hydraulic cutterhead suction dredge mounted on a self-propelled vessel. Bulkhead construction would consist of installing sheet pile bulkhead using hydraulic pile driving rigs and rock armoring at the base of the bulkhead and along the east and west ends of the marine basin. Breasting dolphins would be installed by driving 96-inch-diameter steel pilings into competent foundation soils adjacent to the terminal jetty using a hydraulic pile driver.

- Miscellaneous Construction – Miscellaneous construction tasks would occur throughout construction and would include operation of equipment that is not tied to a specific task, but would be used for general construction activities throughout the duration of construction.

Annual emissions estimates for activities associated with construction of the LNG terminal are summarized in table 4.11.1-4. The fugitive emission estimate consists of contributions from general site construction work (acreage impacted), earth-moving fugitive dust emissions (quantity of soil moved), and unpaved road travel (distance of travel and weight of vehicles).

Construction materials would be delivered to the site primarily by barge. Magnolia estimates that 50 or fewer marine deliveries would occur during construction of the LNG terminal. In addition, large quantities of concrete would be used to construct the LNG terminal. Cement would be sourced from existing concrete plants within 5 miles of the LNG terminal and would be delivered during the first 19 months of construction. Emissions associated with truck transport of concrete are included in the construction emission estimate in several of the construction phases (e.g., LNG storage tanks, balance of plant, and building construction).

Three types of marine vessels would be used during construction of the LNG terminal. Tugboats would be used for barge deliveries of construction material. A medium-sized (approximately 1,500 hp) dredging vessel would be used to dredge the recessed berthing area. Floating pile driving rigs would be used for installation of piles associated with the LNG loading and ship berthing area.

Fugitive dust emission levels would vary in relation to moisture content, composition, activity level, and volume of soils during construction. Fugitive dust would be produced primarily during the site preparation activities, when the site would be cleared of debris, leveled, and graded. In addition, approximately 131,200 yd^3 would be placed on site during excavation of upland portions of the recessed berthing area (see detailed discussion in section 2.5.1.4). Existing paved roads would be used to access the LNG terminal.

Because construction emissions are short term and temporary, standard EPA emission thresholds do not apply. As referenced in section 4.11.1.3, areas considered in non-attainment or maintenance for any of the NAAQS are required to assess construction emissions against General Conformity *de minimis* thresholds to determine if a General Conformity analysis is required; however, because the area is in attainment for all NAAQS, the General Conformity *de minimis* thresholds do not apply. The construction activities proposed in association with the LNG terminal are comparable to other types of infrastructure projects or industrial facilities and would represent a small portion of the overall annual emissions in the region. The construction emissions would, therefore, not have a long-term effect on air quality in the area.

TABLE 4.11.1-4

Annual LNG Terminal Construction Emissions

Activity	Emissions (tpy)						
	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2e
Year 1							
Site preparation	6.4	3.1	0.3	0.7	0.7	0.6	1,817
LNG tank construction	10.1	13.0	0.5	1.0	1.0	1.0	2,599
Balance of plant	5.3	5.2	0.3	0.5	0.5	0.5	1,435
Marine work (dock, jetty, dredging)	11.5	3.0	1.1	0.4	0.4	0.4	954
Material transport via tug / barge	--	--	--	--	--	--	--
Construction management (e.g., water trucks, pickup trucks)	0.6	2.4	0.1	0.1	0.1	0.1	225
Construction mobile sources (worker commutes)	0.1	1.6	--	--	--	--	238
Fugitive dust	--	--	--	14.9	1.5	--	--
Total for Year 1	**34.0**	**28.3**	**2.3**	**17.6**	**4.2**	**2.6**	**7,268**
Year 2							
LNG tank construction	25.0	93.0	1.5	2.9	2.9	4.1	8,739
Balance of plant	2.9	5.8	0.2	0.4	0.3	0.4	1,010
Building construction (workshop, control/admin, and Magnolia Meter Station)	3.7	49.0	0.2	0.2	0.2	1.4	856
Marine (dock, jetty)	12.0	31.0	1.0	0.8	0.8	1.2	2,523
Material transport via tug / barge	26.0	5.0	2.6	0.6	0.6	0.5	1,385
Construction management (e.g., water trucks, pickup trucks)	0.8	0.5	0.1	0.1	0.1	0.1	427
Construction mobile sources (worker commutes)	0.2	2.8	--	--	--	--	408
Fugitive dust	--	--	--	14.3	1.4	--	--
Total for Year 2	**70.6**	**187.1**	**5.6**	**19.3**	**6.3**	**7.7**	**15,348**
Year 3							
LNG tank construction	12.0	88.0	0.7	1.5	1.5	2.9	4,022
Balance of plant	0.9	4.6	0.1	0.1	0.1	0.2	372
Architectural	2.6	46.0	0.1	0.2	0.1	1.2	654
Marine (dock, jetty)	1.7	12.0	0.1	0.2	0.2	0.4	858
Construction management (e.g., water trucks, pickup trucks)	0.6	0.4	0.1	0.1	0.1	0.1	396
Construction mobile sources (worker commutes)	0.2	2.8	0.0	--	--	0.0	408
Fugitive dust	--	--	--	14.3	1.4	--	--
Total for Year 3	**18.0**	**153.8**	**1.1**	**16.4**	**3.4**	**4.8**	**6,710**

KMLP Facilities

Compressor Station 760

Construction of Compressor Station 760 would result in a temporary increase in the emissions of pollutants due to combustion of fuel in vehicles and equipment, dust generated from excavation, grading and fill activities, and general construction activities (e.g., painting and welding). KMLP anticipates that the construction phase of Compressor Station 760 would occur over approximately 11 months. Estimated emissions associated with construction of Compressor Station 760 are summarized in table 4.11.1-5.

TABLE 4.11.1-5

Compressor Station 760 Construction Emissions (Estimated)

Construction Activity	Emissions (tpy)						
	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$	VOC	CO_2e
Unpaved haul roads	---	---	---	<0.1	<0.1	---	---
Bulldozing, grading, compacting	---	---	---	4.8	0.5	---	---
Heavy equipment operation	36.1	23.1	<0.1	1.7	1.6	5.5	4,602
On-road vehicles	0.2	2.3	<0.1	<0.1	<0.1	0.2	445
Painting	---	---	---	---	---	1.3	---
Welding	---	---	---	0.3	0.2	---	---
Total	**36.3**	**25.4**	**<0.1**	**6.8**	**2.4**	**7.0**	**5,047**

As previously referenced, standard EPA emission thresholds do not apply to construction emissions, and General Conformity *de minimis* thresholds do not apply because the area is in attainment for all the NAAQS. The construction activities proposed in association with the KMLP facilities are comparable to other types of infrastructure projects or industrial facilities and would represent a small portion of the overall annual emissions in the region. Therefore, the construction emissions would not have a long-term effect on air quality in the area.

Meter Station Modifications and Header Pipelines

Construction emissions associated with the modified meter stations and the header pipelines would be minimal, localized to the construction area, and short term (3 months). These facilities would be in sparsely populated areas. Construction associated with each project component would require a small workforce ranging from an average of 20 workers for each meter station to between 60 and 75 workers for the header pipelines. Therefore, the construction emissions are expected to be insignificant.

Mitigation Measures

Generation of fugitive dust associated with construction of the LNG terminal resulting from travel on unpaved roads would be minimized due to the compact footprint of the onshore portion of the site and DII construction yard (119.2 acres), short distance of the heavy haul road (2,000 feet), and slow speeds used to transport components and other materials from the adjacent DII construction yard to the LNG terminal. Magnolia has provided a draft *Fugitive Dust Control Plan* describing control measures that would be implemented to minimize fugitive dust emissions. We have reviewed Magnolia's draft

Fugitive Dust Control Plan and conclude that more detail is necessary due to the sensitive nature of air quality in the area surrounding the LNG terminal. Therefore, **we recommend that:**

- **Prior to the end of the draft EIS comment period, Magnolia should file with the Secretary, for review and written approval by the Director of OEP, a revised version of the *Fugitive Dust Control Plan* that includes a description of the following mitigation measures:**

  a. identifying the speed limit that Magnolia would enforce on unsurfaced roads;

  b. clarifying that the EI has the authority to determine if/when water or a palliative needs to be used for dust control;

  c. further describing inspection procedures to identify and abate visible dust plumes; and

  d. clarifying the individuals with the authority to stop work if the contractor does not comply with dust control measures.

KMLP also committed to watering the construction workspaces as needed to minimize fugitive dust emissions. While the measures described by KMLP would help control fugitive dust, we conclude that more detail is necessary due to the sensitive nature of air quality in surrounding area. Therefore, **we recommend that:**

- **Prior to the end of the draft EIS comment period, KMLP should file with the Secretary, for review and written approval by the Director of OEP, a *Fugitive Dust Control Plan* that specifies the precautions that KMLP would take to minimize fugitive dust emissions from construction activities, including additional mitigation measures to control fugitive dust emissions of Total Suspended Particulates and PM_{10}. The plan should clearly explain how KMLP would implement measures, such as:**

  a. watering the construction workspace and access roads;

  b. providing measures to limit track-out onto the roads;

  c. identifying the speed limit that KMLP would enforce on unsurfaced roads;

  d. covering open-bodied haul trucks, as appropriate;

  e. clarifying that the EI has the authority to determine if/when water or a palliative needs to be used for dust control;

  f. describing inspection procedures to identify and abate visible dust plumes; and

  g. clarifying the individuals with the authority to stop work if the contractor does not comply with dust control measures.

Magnolia and KMLP would minimize vehicular exhaust and crankcase emissions from gasoline and diesel engines by complying with applicable EPA mobile source emission performance standards and by using equipment manufactured to meet these standards. Fugitive dust and construction emissions would occur during the construction period and would subside once construction activities for any given project component are complete. Additionally, LNG terminal construction emissions would be primarily limited to the construction area and would represent less than 1.3 percent of Calcasieu Parish's yearly CO emissions and less than 1 percent of the parish's yearly emissions inventories for all other pollutants, based on a comparison to 2013 annual reported emissions for the Calcasieu Parish (LDEQ, 2013b). Construction emissions associated with the KMLP facilities in Acadia Parish would primarily be associated with Compressor Station 760, would be limited to the construction area, and would represent less than 7 percent of Acadia Parish's yearly PM_{10} emissions and less than 3 percent of the parishes' yearly emissions inventories for all other pollutants (LDEQ, 2013b). Construction emissions associated with the KMLP facilities in Evangeline Parish would be limited to a 3-month period and would represent a negligible portion of overall emissions within the parish. While the measures described above would help control construction emissions, we conclude that more detail is necessary due to the sensitive nature of air quality in areas surrounding the projects. Therefore, **we recommend that:**

- **<u>Prior to the end of the draft EIS comment period,</u> Magnolia and KMLP should provide further details regarding commitments to reduce NO_X, CO, PM, and SO_2 from mobile and stationary construction equipment including:**

  a. feasibility of leasing new, clean equipment meeting the most stringent of applicable federal or state standards, if practicable. In general, commit to the best available emissions control technology;

  b. feasibility of using electric vehicles, natural gas, biodiesel, or other alternative fuels during construction and operation phases to reduce the projects' criteria and greenhouse gas emissions;

  c. commitments to limit idling of heavy equipment to less than 5 minutes and verify through unscheduled inspections;

  d. commitments to maintain and tune engines per manufacturer's specifications to perform at CARB and/or EPA certification levels, prevent tampering, and conduct unscheduled inspections to ensure these measures are followed; and

  e. clarify how it would manage construction traffic and parking in order to maintain traffic flow and minimize vehicle trips.

4.11.1.5 Operation Air Emissions Impacts and Mitigation

LNG Terminal

<u>Operating Air Emissions</u>

The emission sources associated with the four liquefaction trains are expected to operate continuously. Each of the four liquefaction trains at the LNG terminal would include the following emission sources:

- two gas turbines;
- one auxiliary boiler;
- one thermal oxidizer to treat emissions from the amine unit;
- one gas-fired regenerative fuel heater;
- one ammonia vent; and
- fugitive emissions from pipe flanges, valves, and valve stems.

The LNG terminal also would contain the following emission sources, which would operate on an intermittent or as-needed basis:

- one cold gas flare for treating low temperature gases;
- one warm gas flare for treating warm and high temperature process gases;
- one emergency electric generator;
- two emergency firewater pumps;
- two water deluge pumps;
- up to 208 LNG vessels per year, and their attendant tugs; and
- miscellaneous mobile sources.

Annual emissions by source for the LNG terminal and a summary of total annual emissions are provided in table 4.11.1-6. Emission estimates include control technologies proposed for the LNG terminal, based on the completion of the required BACT assessment for CO, NO_X, VOC, PM_{10}, $PM_{2.5}$, and GHGs. The LNG terminal would be a PSD major source for NO_X and CO. In addition, it would be a Title V major source for PM_{10} and $PM_{2.5}$, exceeding the major source threshold of 100 tpy. The facility would be considered a minor source of HAP emissions. As described in section 4.11.1.3, because emissions from the LNG terminal would be above the PSD significant emission rates (presented in table 4.11.1-3) for NO_X, CO, PM_{10}, $PM_{2.5}$, VOC, and CO_2e, these pollutants would be required to be addressed further. Magnolia would be required to show compliance with the NAAQS and PSD Increment requirements for NO_X, CO, PM_{10}, and $PM_{2.5}$. In addition, Magnolia would be required to show compliance with the ozone NAAQS and to comply with the federal requirements for major sources of CO_2e. Compliance with these requirements is discussed below.

<u>LNG Terminal Ambient Impacts</u>

As discussed in the PSD applicability section in section 4.11.1.3, Magnolia conducted a PSD Screening Analysis, NAAQS Analysis, and PSD Increment Analysis for stationary sources at the LNG terminal (ERM, 2015). The PSD Screening Analysis included a Significance Analysis, Area of Influence Analysis, and Pre-construction Monitoring Analysis. Pollutants modeled included only those that exceeded the PSD significant emission rates. These included NO_2, CO, PM_{10}, and $PM_{2.5}$. The significance analysis considers the emissions associated only with the proposed LNG terminal to determine if it would have a significant impact on the surrounding area. The modeled ground-level concentrations are compared to the corresponding significant impact levels (SIL), also known as modeling significance levels, to determine if any predicted concentrations at any receptor locations would be "significant." If the significance analysis reveals that modeled ground-level concentrations for a particular pollutant and averaging period are greater than the applicable SIL, a full impact analysis, which considers emissions from regional sources within the Area of Influence, is performed at the significant receptors. If predicted significance analysis impacts for a particular pollutant are below the applicable SIL(s), then no further analyses (e.g., NAAQS and PSD increment analyses) are required for that pollutant. Results from the significance analysis also dictate if pre-construction ambient monitoring is required.

TABLE 4.11.1-6

Emissions by Source and Total Annual Emissions Associated with Operation of the LNG Terminal

Emission Source	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$	VOC	HAPs	CO_2e
Liquefaction Train 1	266.4	270.5	4.6	22.1	22.1	15.6	4.9	568,278
Liquefaction Train 2	266.4	270.5	4.6	22.1	22.1	15.6	4.9	568,278
Liquefaction Train 3	266.4	270.5	4.6	22.1	22.1	15.6	4.9	568,278
Liquefaction Train 4	266.4	270.5	4.6	22.1	22.1	15.6	4.9	568,278
Emergency generator	0.7	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	77
Emergency firewater pumps	0.2	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	40
Water deluge pumps	0.8	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	81
Warm gas flare	8.3	45.2	<0.1	1.0	1.0	0.7	<0.1	16,559
Cold gas flare	4.5	24.5	<0.1	0.6	0.6	<0.1	<0.1	8,975
Fugitive emissions	--	--	--	--	--	14.7	0.3	2,222
LNG Terminal Stationary Sources Subtotal	**1,080.1**	**1,152.8**	**18.5**	**90.1**	**90.1**	**78.0**	**20.1**	**2,301,066**
LNG vessels and tugs	312	41	3	14	14	18	--	20,487
Worker commuting	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	111
Tug/barge/truck distribution	52	4.4	<0.1	3	3	3	--	3,449
LNG Terminal Mobile Sources Subtotal	**364**	**46**	**3**	**17**	**17**	**21**	**<0.1**	**24,047**
TOTAL	**1,444.1**	**1,198.8**	**21.5**	**107.1**	**107.1**	**99.0**	**20.1**	**2,325,113**

Note: All units of measurement are expressed in tpy.

In accordance with the modeling requirements outlined above, Magnolia performed significance analyses for NO_2, CO, PM_{10}, and $PM_{2.5}$. The results of these analyses are summarized in table 4.11.1-7, along with the associated SIL for each pollutant.

TABLE 4.11.1-7

Summary of Preliminary Air Dispersion Modeling at the LNG Terminal and Significant Impact Levels for Air Quality Impacts in Class II Areas

Air Pollutant	Maximum Annual Modeled Impact (SIL)	Maximum 24-hour Modeled Impact (SIL)	Maximum 8-hour Modeled Impact (SIL)	Maximum 1-hour Modeled Impact (SIL)	Full Impact Analysis Required (Yes/No)
NO_2 [a]	1.35 μg/m^3 (1 μg/m^3)	--	--	31.14 μg/m^3 (7.5 μg/m^3)	Yes
CO	--	--	177.59 μg/m^3 (500 μg/m^3)	611.83 μg/m^3 (2,000 μg/m^3)	No
PM_{10}	0.21 μg/m^3 (1 μg/m^3)	1.42 μg/m^3 (5 μg/m^3)	--	--	No
$PM_{2.5}$	0.19 μg/m^3 (0.3 μg/m^3)	1.08 μg/m^3 (1.2 μg/m^3)	--	--	No

[a] NO_2 is the compound regulated as a criteria air pollutant; however, significant emissions are based on the sum of all oxides of nitrogen. All impact (dispersion modeling) assessments for comparison to a NAAQS or PSD increment are based on NO_2.

CO, PM_{10}, and $PM_{2.5}$ Significance Analysis Impacts: This analysis showed that the SILs for CO, PM_{10}, and $PM_{2.5}$ would not be exceeded by impacts from the proposed LNG terminal. Since the modeled impacts do not exceed the SILs, the LNG terminal would not cause or significantly contribute to an exceedance of the CO, PM_{10}, or $PM_{2.5}$ NAAQS, and a full impact analysis is not required for these pollutants.

NO_2 Significance Analysis Impacts: This analysis showed that the NO_2 1-hour and annual SILs would be exceeded by impacts from the proposed LNG terminal. Since the 1-hour and annual SILs were exceeded, a NAAQS analysis was required to be performed for both the NO_2 1-hour and annual averaging periods. The impact analysis included an assessment of nearby sources within 31 miles of the LNG terminal's area of impact. In the event that 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. In the case of the NO_2 annual NAAQS analysis, the annual average design concentration is combined with the background concentration for each year for comparison to the NAAQS. Tables 4.11.1-8 and 4.11.1-9 show the results of this NAAQS assessment.

TABLE 4.11.1-8

Summary of NO_2 1-Hour National Ambient Air Quality Standards Modeling Results

		Concentrations					
Pollutant	Averaging Period	LNG Terminal Maximum (μg/m^3)	Background (at LNG Terminal Max Location) (μg/m^3)	Total (at LNG Terminal Max Location (μg/m^3)	SIL (μg/m^3)	NAAQS (μg/m^3)	NAAQS Exceedance? (Yes/No)
NO_2	1-Hour	5.45	192.54	197.99	7.5	188.7	No

TABLE 4.11.1-9

Summary of NO_2 Annual National Ambient Air Quality Standards Modeling Results

Pollutant	Averaging Period	Year	Model Predicted Total (μg/m^3)	NAAQS (μg/m^3)	NAAQS Exceedance? (Yes/No)
NO_2	Annual	2009	87.98	100	No
		2010	87.94	100	No
		2011	94.64	100	No
		2012	89.09	100	No
		2013	91.48	100	No

As shown in table 4.11.1-8, although the modeled concentrations exceeded the NO_2 1-hour NAAQS, the facility contribution would be below the SIL; therefore, the LNG terminal would not cause or contribute to a violation of the NO_2 1-hour NAAQS. As shown in table 4.11.1-9, the facility would not cause or contribute to a violation of the NO_2 annual NAAQS.

For pollutants with a modeled concentration greater than the corresponding SIL, PSD regulations also require a PSD Increment Analysis. The PSD Increment analysis demonstrates that the proposed LNG terminal would neither cause nor contribute to an exceedance of federal ordinances on industrial expansion. As discussed above, the NO_2 modeled concentrations exceeded the 1-hour and annual SILs.

Since a PSD Increment has not been promulgated for 1-hour NO_2 impacts, the LNG terminal is only required to demonstrate compliance with the annual NO_2 PSD Increment. The highest annual mean concentration was determined for each receptor for each year and compared to the PSD Increment. Table 4.11.1-10 shows the results of the PSD Increment Analysis. Based on this analysis, the facility would not exceed PSD Increment for the modeled years.

TABLE 4.11.1-10

Summary of NO_2 Prevention of Significant Deterioration Increment Modeling Results

Year	Model Predicted Total Increment Consumed by PSD Sources ($\mu g/m^3$)	Class II PSD Increment ($\mu g/m^3$)	Impact Less than Increment? (Yes/No)
2009	21.25	25	Yes
2010	21.17	25	Yes
2011	21.94	25	Yes
2012	22.76	25	Yes
2012	24.13	25	Yes

LNG Terminal Impacts on Regional Ozone

Cumulative impacts on regional ozone levels were also addressed through regional photochemical modeling performed for the LDEQ to determine the potential 8-hour ozone impact from the proposed emissions at the LNG terminal. The LNG terminal would be in Calcasieu Parish, which is currently designated as attainment for the 8-hour ozone NAAQS. However, it would be in proximity to parishes in the Baton Rouge Metropolitan Statistical Area that have been designated as non-attainment for the 2008 8-hour ozone NAAQS, and to the Texas Houston/Galveston/Brazoria and Beaumont/Port Arthur areas, which are classified as ozone non-attainment/unclassifiable for the 2008 standard. As previously noted (see section 4.11.1.2), both the Lake Charles and Lafayette areas are vulnerable to being designated as non-attainment for ozone in the next few years.

No standard approach exists for modeling ozone impacts from discrete sources, and no significance thresholds have been established for ozone. The ozone modeling completed for the LNG terminal was conducted using recommendations provided by the EPA Region 6 and the LDEQ.

The potential 8-hour ozone impact from the LNG terminal was quantified using a regional ozone model, known as the Comprehensive Air Quality Model with Extensions (CAMx), in conjunction with background data from the Baton Rouge area. The LNG terminal's potential impacts were evaluated both at existing ozone monitoring locations in Louisiana and Texas and at areas removed from the monitors. Based on the ozone modeling, the LNG terminal's impact is estimated to contribute between less than 0.1 and 0.3 parts per billion (ppb) of ozone in areas included in the modeling analysis. Based on the ozone modeling, the LNG terminal is estimated to impact daily maximum 8-hour average ozone concentrations in regions that have background ambient ozone concentrations of over 70 ppb by less than 1 ppb. A review of modeled ozone levels at ozone monitor locations shows that the modeled maximum 8-hour impacts from the LNG terminal are not likely to cause or contribute to an ozone impact that would exceed the 75 ppb ozone NAAQS.

LNG Terminal Hazardous Air Pollutant Impacts

LDEQ requires an ambient air impact analysis of toxic air pollutants if a proposed source is a major source of HAPs. Based upon the emission estimates summarized in table 4.11.1-6, the LNG terminal would not be a major source of HAPs; therefore, an ambient impact analysis for HAPs is not required. Based on the proposed level of HAP emissions, impacts from HAPs are expected to be insignificant.

LNG Terminal Greenhouse Gas Impacts

Based upon the emission estimates summarized in table 4.11.1-6, the LNG terminal would be a PSD major source of GHG emissions; therefore, Magnolia's Title V and PSD permit application included a BACT assessment for GHG emissions from the facility. Magnolia has committed to complying with the GHG BACT requirements.

KMLP Facilities

The KMLP facilities would result in operational emissions from the proposed Compressor Station 760 and fugitive emissions from pipeline blowdown events. These operational emissions and potential associated effects are discussed below.

Compressor Station 760

Compressor Station 760 would include some equipment that would operate continuously, and other equipment that would operate on an as-needed basis. The proposed emission generating sources at the compressor station would include:

- four natural gas-fired turbines;
- one fuel-gas heater;
- one natural gas-fired emergency generator engine; and
- five 7,050-gallon fixed roof storage tanks.

Emissions also would result from truck loading activities, pigging activities, pipeline blowdown activities, traffic on facility haul roads and fugitive emissions from piping components, such as valves and pump seals. Estimated annual emission rates for the proposed equipment are provided in table 4.11.1-11.

Based on the emission estimates provided in table 4.11.1-11, Compressor Station 760 would be a Title V major source for CO, exceeding the major source threshold of 100 tpy. The facility would be considered a minor source of all other criteria pollutants, as well as HAP emissions. As described in section 4.11.1.3, because emissions would be above the PSD significant emission rates (presented in table 4.11.1-3) for NO_X, CO, PM_{10}, $PM_{2.5}$, and CO_2e, these pollutants would be required to be addressed further. KMLP would be required to show compliance with the NAAQS for NO_X, CO, PM_{10}, and $PM_{2.5}$ and to comply with the federal requirements for major sources of CO_2e, as discussed below.

KMLP submitted a PSD permit application for Compressor Station 760 to the LDEQ, based upon GHG emissions. Subsequent to the submittal of this application, on June 23, 2014, the U.S. Supreme Court reversed permitting regulations that subject a facility to PSD permit review for GHG emissions only. Because Compressor Station 760 would not be subject to PSD review for any other criteria pollutants, the proposed facility is not subject to PSD permitting. However, KMLP completed a PSD modeling analysis for the proposed facility along with the initial permit application with evaluations of compliance with applicable NAAQS and PSD increments for pollutants greater than PSD significant emission rates (CO, NO_X, PM_{10}, and $PM_{2.5}$). The results of these the significance analyses for these pollutants are summarized in table 4.11.1-12, along with the associated SIL for each pollutant included in the analysis.

TABLE 4.11.1-11

Compressor Station 760 Estimated Annual Emission Rates

	Annual Emission Rates (tpy)							
Equipment	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$	VOC	Total HAPs	CO_2e
Natural gas turbine 1	18.2	32.8	1.9	8.4	8.4	1.2	0.6	65,588
Natural gas turbine 2	18.2	32.8	1.9	8.4	8.4	1.2	0.6	65,588
Natural gas turbine 3	18.2	32.8	1.9	8.4	8.4	1.2	0.6	65,588
Natural gas turbine 4	18.2	32.8	1.9	8.4	8.4	1.2	0.6	65,588
Emergency engine	0.1	0.9	<0.1	<0.1	<0.1	0.2	<0.1	94
Fuel gas heater	0.4	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	443
Fixed roof storage tanks	---	---	---	---	---	0.8	<0.1	---
Fugitive leaking equipment	---	---	---	---	---	9.9	0.5	---
Truck loading	---	---	---	---	---	1.0	<0.1	---
Paved haul roads	---	---	---	<0.1	<0.1	---	---	---
Pigging	---	---	---	---	---	1.6	<0.1	---
Blowdown	---	---	---	---	---	0.6	<0.1	---
Total	**73.3**	**132.4**	**7.6**	**33.7**	**33.7**	**18.9**	**3.1**	**262,889**

TABLE 4.11.1-12

Summary of Preliminary Air Dispersion Modeling at Compressor Station 760 and Significant Impact Levels for Air Quality Impacts in Class II Areas

Air Pollutant	Maximum Annual Modeled Impact (SIL)	Maximum 24-hour Modeled Impact (SIL)	Maximum 8-hour Modeled Impact (SIL)	Maximum 1-hour Modeled Impact (SIL)	Full Impact Analysis Required (Yes/No)
NO_2 [a]	0.2 $\mu g/m^3$ (1 $\mu g/m^3$)	--	--	5.8 $\mu g/m^3$ (7.5 $\mu g/m^3$)	No
CO	--	--	224 $\mu g/m^3$ (500 $\mu g/m^3$)	294 $\mu g/m^3$ (2,000 $\mu g/m^3$)	No
PM_{10}	0.2 $\mu g/m^3$ (1 $\mu g/m^3$)	1.5 $\mu g/m^3$ (5 $\mu g/m^3$)	--	--	No
$PM_{2.5}$	0.1 $\mu g/m^3$ (0.3 $\mu g/m^3$)	1.1 $\mu g/m^3$ (1.2 $\mu g/m^3$)	--	--	No

a NO^2 is the compound regulated as a criteria air pollutant; however, significant emissions are based on the sum of all oxides of nitrogen. All impact (dispersion modeling) assessments for comparison to a NAAQS or PSD increment are based on NO^2.

NO_X, CO, PM_{10}, and $PM_{2.5}$ Significance Analysis Impacts: This analysis showed that SILs for NO_X, CO, PM_{10}, and $PM_{2.5}$ were not exceeded by potential impacts from Compressor Station 760. Because the modeled impacts do not exceed the SILs, operation of the compressor station would not cause or significantly contribute to an exceedance of either the NO_X, CO, PM_{10}, or $PM_{2.5}$ NAAQS, and a full impact analysis is not required for these pollutants.

Meter Station Modifications

KMLP is not proposing to install any significant emission-generating units as a result of the proposed meter station modifications. Some minor fugitive VOC emissions may be generated during meter station operation associated with equipment leaks; however, these emissions are considered a result of operation of the existing meter stations, *de minimis*, and would not require an air permit.

4.11.2 Noise

Sound is a sequence of waves of pressure that propagates through compressible media such as air or water. When sound becomes excessive, annoying, or unwanted, it is referred to as noise. Construction and operation of the proposed projects would affect overall noise levels in the vicinity of project components. The ambient sound level of a region is defined by the total noise generated within the specific environment and usually comprises natural and man-made sounds. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of a day and throughout the week. This variation is caused in part by changing weather conditions and the effect of seasonal vegetation cover.

Two measurements used by some federal agencies to relate the time-varying quality of environmental noise to its known effects on people are the equivalent sound level (L_{eq}) and the day-night sound level (L_{dn}). The preferred single value figure to describe sound levels that vary over time is L_{eq}, which is defined as the sound pressure level of a noise fluctuating over a period of time, expressed as the amount of average energy. L_{dn} is defined as the 24-hour average of the equivalent average of the sound levels during the daytime (L_d – from 7:00 a.m. to 10:00 p.m.) and the equivalent average of the sound levels during the nighttime (L_n – 10:00 p.m. to 7:00 a.m.). Specifically, in the calculation of the L_{dn}, late night and early morning (10:00 p.m. to 7:00 a.m.) noise exposures are increased by 10 decibels (dB) to account for people's greater sensitivity to sound during nighttime hours. In general, if the sound energy does not vary over the given time period, the L_{dn} level will be equal to the L_{eq} level plus 6.4 dB. The 6.4 dB difference between the L_{dn} and the L_{eq} is a result of the 10 dB nighttime addition for the L_{dn} calculation.

Decibels (dB) are the units of measurement used to quantify the intensity of noise. To account for the human ear's sensitivity to low level noises the decibel values are corrected to weighted values known as decibels on the A-weighted scale (dBA). The A-weighted scale is used because human hearing is less sensitive to low and high frequencies than mid-range frequencies.

Table 4.11.2-1 demonstrates the relative dBA noise levels of common sounds measured in the environment and industry. A 3 dB change of sound level is considered to be barely perceivable by the human ear, a 5 or 6 dB change of sound level is considered noticeable, and a 10 dB increase is perceived as if the sound intensity has doubled.

TABLE 4.11.2-1			
Sound Levels and Relative Loudness			
Noise Source or Activity	Sound Level (dBA)	Subjective Impression [a]	Relative Loudness (perception of different sound levels)
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain	64 times as loud
Loud rock concert near stage	120	Uncomfortably loud	16 times as loud
Jet takeoff (2,000 feet)	100	Very loud	4 times as loud
Garbage disposal / food blender (2 feet)	80	Loud	Reference loudness
Vacuum cleaner (10 feet)	70	Moderate	1/2 as loud
Light auto traffic (100 feet)	50	Quiet	1/8 as loud
Quiet library, soft whisper (15 feet)	30	Very quiet	1/32 a loud
Wilderness with no wind or animal activity	25	Extremely quiet	
	0	Threshold of hearing	

[a] Barnes et al., 1977; EPA, 1971

4.11.2.1 Noise Regulations

Federal Regulations

In 1974, the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA, 1974). This publication evaluated the effects of environmental noise with respect to health and safety. The document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has determined that in order 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 (18 CFR 157.206(b)(5)) for new compression and associated pipeline facilities, and it is used here to evaluate the potential noise effects from operation of the LNG terminal and Compressor Station 760. An L_{dn} of 55 dBA is equivalent to a continuous noise level of 48.6 dBA for facilities that operate at a constant level of noise.

State and Local Regulations

The State of Louisiana has no regulations that would limit noise generated from the construction and operation of the LNG terminal or KMLP facilities.

Calcasieu Parish has adopted a noise ordinance (Code of Ordinances, Chapter 18, Article VIII – Disturbing the Peace) that does not set specific sound level limits, but restricts excessive noise as follows: “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 jurisdiction of the parish.”

Applicable exemptions include the following:

- Section 18–99, paragraph 3: noises made by persons having obtained a permit;

- Section 18–99, paragraph 4: any noise resulting from activities of temporary duration, for which a permit has been granted pursuant to this article, and which conforms to the conditions and limits stated thereon; and

- Section 18–100, paragraph 4 – Construction and Demolition: the operating of any equipment used in construction work within 165 feet of any residential or noise sensitive area (NSA) between sunset and sunrise on weekdays and Saturdays, and 9:00 p.m. and 8:00 a.m. on Sundays and holidays, except for emergency work.

Acadia Parish has adopted a noise ordinance (Code of Ordinances, Chapter 13, Article V – Loud and Unusual Noises) that establishes maximum permissible sound pressure levels for various land use types, as well as establishes limitations on construction noise. Table 4.11.2-2 provides maximum permissible sound pressure levels by land use type.

TABLE 4.11.2-2

Acadia Parish Sound Pressure Level Limits

District	Day – 7:00 a.m. to 11:00 p.m. (dBA)	Night – 11:00 p.m. to 7:00 a.m. (dBA)
Residential	50	40
Commercial	60	55
Industrial	80	75

Note: Acadia Parish code does not specify the metric for measuring sound pressure levels, but the values are presumed to represent L_{eq}.

The proposed location of Compressor Station 760 would be in an agricultural area near three residences and several industrial facilities (28 meter stations, 2 compressor stations, and 2 natural gas processing plants are within 1 mile of the site). The definitions of districts within the Acadia Parish noise ordinances do not specifically address multi-use districts or agricultural residences. As such, KMLP designed the proposed compressor station to ensure compliance with the FERC's noise standard, which is more stringent than the Acadia Parish sound pressure limit levels for both commercial and industrial zones.

Section 13-87 of the Acadia Parish noise ordinance states that it is unlawful to conduct construction or non-emergency repair work between the hours of 10:00 p.m. and 7:00 a.m. within 500 feet of a residential or commercial zone (nearest residences to Compressor Station 760 include three homesteads that would be approximately 1,500 feet west of the site). Construction noise is limited to the maximum permissible noise level specified for industrial districts (see table 4.11.2-2) for the periods within which construction is to be completed pursuant to any applicable buildings permit.

4.11.2.2 Existing Sound Levels and Noise Sensitive Areas

LNG Terminal

Magnolia's consultant (Ecology and Environment, Inc.) conducted a noise survey between September 23 and 25, 2013 to characterize the existing noise environment at the NSAs nearest to the LNG terminal site (see figure 4.11.2-1) (Ecology and Environment, Inc., 2013a). The results of the ambient noise survey as well as the distance and direction of each identified NSA from the LNG terminal are provided in table 4.11.2-3.

Figure 4.11.2-1
LNG Terminal
Nearby Noise Sensitive Areas
Calcasieu Parish, Louisiana

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\03\NSAs\NSA_LNG_Facility.mxd | REVISED: 03/24/2015 | SCALE: 1:20,000 DRAWN BY: JSSuess

TABLE 4.11.2-3					
LNG Terminal Facilities – Existing Noise Levels at Nearby Noise Sensitive Areas					
NSA	Distance from Terminal (feet)	Direction from Terminal	Average Daytime L_{eq} (dBA)	Average Nighttime L_{eq} (dBA)	Calculated L_{dn} (dBA)
1	3,820	South	47	44	51
2	4,485	Southeast	49	45	52
3	7,075	East-southeast	44	40	47

KMLP Facilities

KMLP conducted a noise survey between June 3 and 11 and between September 17 and18, 2014 to characterize the existing noise environment at the NSAs nearest to the proposed Compressor Station 760 site (see figure 4.11.2-2). The results of the ambient noise survey as well as the distance and direction of each identified NSA from the compressor station site are provided in table 4.11.2-4.

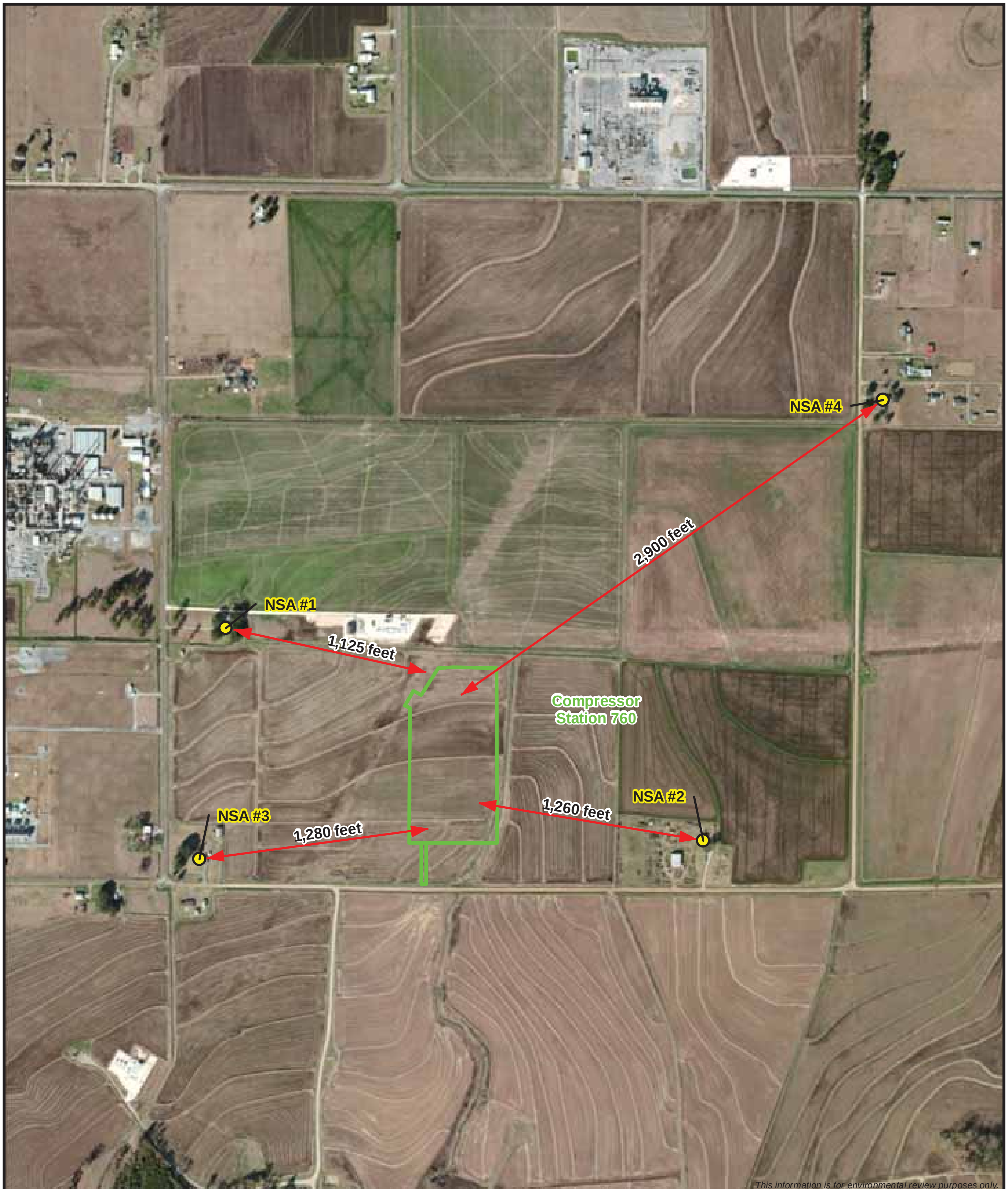
TABLE 4.11.2-4					
Compressor Station 760 – Existing Noise Levels at Nearby Noise Sensitive Areas					
NSA	Distance from Station (feet)	Direction from Station	Average Daytime L_{eq} (dBA)	Average Nighttime L_{eq} (dBA)	Calculated L_{dn} (dBA)
1	1,125	West-northwest	59	59	65
2	1,260	East-southeast	52	57	63
3	1,280	West-southwest	54	53	60
4	2,900	Northeast	49	58	64

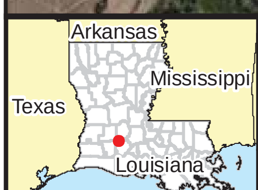
4.11.2.3 Construction Noise Impacts and Mitigation

LNG Terminal

Construction activities at the LNG terminal would generate temporary increases in sound levels over a total of 45 months, which includes the primary 36-month construction period, as well as an additional 9 months until the LNG terminal is fully operational. Construction activities would occur predominantly during the day, between 7:00 a.m. and 7:00 p.m., Monday through Saturday. However, certain activities would occur up to 24 hours per day, 7 days per week. In particular, dredging may occur up to 24 hours per day, 6 days per week and pile driving could occur up to 10 hours per day, 7 days per week. Construction activities at the LNG terminal site would involve clearing and grading associated with site preparation; materials and equipment delivery; installation of the facility foundations (e.g., pile driving) and liquefaction trains; construction of the LNG loading and ship berthing facilities, LNG storage tanks and processing facilities, LNG truck loading facilities, and Magnolia Meter Station and interconnect pipeline; and site restoration, as described in detail in section 2.5.1.

The most prevalent sound-generating equipment and activity during construction of the LNG terminal is anticipated to be pile driving, although internal combustion engines associated with general construction equipment and dredging would also produce sound levels that would be perceptible in the vicinity of the site. The various types of construction activities proposed at the LNG terminal and associated noise levels are described below.





Noise Sensitive Area

Compressor Station

0 250 500 Feet

Figure 4.11.2-2
Compressor Station 760
Nearby Noise Sensitive Areas
Acadia Parish, Louisiana

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\03\NSAs\NSA_Station760.mxd | REVISED: 03/24/2015 | SCALE: 1:9,250 DRAWN BY: JSSuess

Facility Construction Activities

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. Magnolia estimated construction equipment needs for site preparation (clearing and grading) and facility construction as well as the composite noise levels for these two activities (a composite noise level is typically used to describe the overall noise generated by multiple noise-generating units operating at the same time). Table 4.11.2-5 provides the estimated composite noise levels for site preparation and facility construction at various distances from the LNG terminal site.

TABLE 4.11.2-5

LNG Terminal – Construction Noise Estimates

Distance from Right-of-Way or Property Line (feet)	Site Preparation Noise Level (dBA L_{max} [a])	Facility Construction Noise Level (dBA L_{max} [a])
50	90	89
250	76	75
500	70	69
1,000	64	63
1,500	61	59
3,820 (NSA 1)	52	51

[a] L_{max} is a sound measurement typically used with variable noise sources, such as construction equipment or vehicles, that corresponds to the maximum sound level observed during a measurement period or noise event (EPA, 1974).

The nearest NSA to the LNG terminal site is approximately 3,820 feet to the south. During site preparation activities, the composite noise level at the nearest NSA is estimated to be 52 dBA; during facility construction, the composite noise level at the nearest NSA is estimated to be 51 dBA. The current daytime noise level at the nearest NSA is 47 dBA (see table 4.11.2-3). Sound pressure levels are measured on a logarithmic scale; therefore, although the construction noise would, at times, be perceptible at the NSA, it would not be substantially above existing daytime noise levels.

Pile Driving Activities

Magnolia anticipates that impact-type pile drivers would be used during construction of the proposed facilities, which may be installed using both land-based and floating platforms. Magnolia estimated the maximum sound level observed during a measurement period or noise event (L_{max}) for one pile driver to be 101 dBA. Onshore piles would be driven by seven or eight hydraulic piling rigs. Marine piles would be driven by between two and four hydraulic pile rigs, which may include both land-based and floating rigs. Based upon the construction schedule provided by Magnolia (see table 2.5.1-1 in section 2.5.1.3), onshore pile driving to create the foundations for the LNG storage tanks and other process equipment foundations and structures would occur over a period of 10 months, and pile driving associated with construction of the LNG loading and ship berthing area would occur over a period of 6 months. Based upon Magnolia's current construction schedule, land and water-based pile driving would not occur simultaneously. Table 4.11.2-6 provides estimates of pile driving noise based upon the various proposed pile-driving scenarios.

TABLE 4.11.2-6 LNG Terminal – Pile Driving Noise Estimates		
Distance from Pile Driving (feet)	Land-based Pile Driving Noise Level (dBA L_{max} [a])	Water-based Pile Driving Noise Level (dBA L_{max} [a])
50	110	107
3,820 (NSA 1)	72	69
4,485 (NSA 2)	71	68
7,075 (NSA 3)	67	64

[a] L_{max} is a sound measurement typically used with variable noise sources, such as construction equipment or vehicles, that corresponds to the maximum sound level observed during a measurement period or noise event (EPA, 1974).

Pile driving is scheduled to occur over 10-hour shifts, 7 days per week over a total of about 16 months; however, due to start-up coordination, actual pile driving operations are expected to occur for approximately 8 hours per day, 7 days per week. During land-based pile driving operations, the estimated sound level at the nearest NSA (NSA 1) when the maximum number of pile-driving platforms are in use (8 land-based pile driving rigs) would be 72 dBA L_{max}. During water-based pile driving operations, the corresponding sound level at NSA 1 when the maximum number of pile-driving platforms are in use (a total of 4 land-based or floating rigs) would be 69 dBA L_{max}. These levels would correspond to a moderate sound level (similar to operation of a vacuum cleaner) on the Relative Loudness Scale presented in table 4.11.2-1 and would be clearly audible. Based on the estimates provided by Magnolia and because of the 16-month duration of the pile driving activities, these sound levels may have an adverse impact at the nearest NSAs. Therefore, **we recommend that:**

- **Prior to the end of the draft EIS comment period, Magnolia should include in its *Pile Driving Noise Impact Mitigation Plan* (see our recommended condition in section 4.6.2.2) measures to reduce pile driving noise (L_{max}) to no greater than 10 dBA over L_{eq} ambient levels at the three nearest NSAs.**

Vibration levels detectable to humans would not extend beyond about 500 feet from the pile driving operation (Maekawa, 1994). As described above, the three nearest NSAs range from about 3,820 feet to 7,075 feet from the proposed pile driving activities. No structures were identified within 500 feet of the proposed pile driving activities.

The construction of the proposed facility, particularly pile driving, would also result in the generation and propagation of underwater noise energy. As referenced in section 4.6.2.2, Magnolia has not finalized pile driving plans, and an estimate of underwater noise associated with either land-based or in-water pile driving activities has not been provided. Magnolia stated that it does not anticipate that land-based pile driving activities would result in underwater noise levels in exceedance of levels that would result in fish injuries; however, the potential exists for water-based pile driving activities to exceed these levels. Therefore, FERC staff included a recommendation in section 4.6.2.2 regarding the development of a *Pile Driving Noise Impact Mitigation Plan* including noise monitoring, reporting requirements, and mitigation implementation triggers for underwater noise.

With the implementation of our recommended hydroacoustic monitoring and mitigation measures, if needed, pile driving activities would not result in underwater noise levels that would cause injury to aquatic resources. As previously noted, pile driving activities would result in overland noise levels that would be clearly audible at the nearest NSAs. As currently proposed, these sound levels may have an impact at the nearest NSAs over the course of pile driving activities. Our recommendation above addresses this.

Dredging Activities

Dredging activities may occur 24 hours per day, 7 days per week. Dredging would be accomplished by use of a hydraulic cutterhead suction dredge. Magnolia has estimated noise levels associated with the dredging activities to be approximately 60 to 80 dBA at a distance of 50 feet. Predicted noise levels attributable to dredging activities at the nearest NSAs would range from about 37 to 41 dBA L_{eq}, which are below existing ambient noise levels. Therefore, noise associated with dredging activities is not expected to be perceptible at the nearest NSAs.

Proposed Mitigation Measures and Conclusion

Magnolia has stated that it may implement one of more of the following mitigation measures to control construction noise:

- turn off idling equipment when not in use;
- install temporary acoustic barriers around stationary construction equipment, as feasible; and
- ensure that all equipment has sound control devices no less effective than those provided by the manufacturer.

Based upon the construction noise estimates provided by Magnolia, the maximum noise levels generated by construction activities, with the exception of pile driving activities discussed in further detail above (which we address with our recommendation), would be below the existing daytime background noise at the nearest NSA. Therefore, we conclude that construction of the LNG terminal would result in temporary and moderate noise impacts on residents and the surrounding communities.

KMLP Facilities

Construction activities associated with the header pipelines and meter station modifications would occur over a 3-month period, while construction of Compressor Station 760 would occur over a period of approximately 11 months. KMLP has stated that noisy construction activities would take place during the day, between 7:00 a.m. and 7:00 p.m., Monday through Friday.

Construction activities associated with the KMLP facilities would involve clearing and grading associated with site preparation; materials and equipment delivery; installation of the header pipelines; construction of aboveground facilities associated with Compressor Station 760; and installation of additional metering equipment, pigging equipment, and interconnects at the existing meter stations, as described in detail in section 2.5.2.

The most prevalent sound-generating equipment and activity during construction of the KMLP facilities is anticipated to be the operation of internal combustion engines associated with general construction equipment. 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. KMLP estimated equipment needs for construction of the KMLP facilities as well as the resulting composite noise level from construction activities. Table 4.11.2-7 provides the estimated composite noise levels from construction of the KMLP facilities at various distances from the property boundary or right-of-way.

TABLE 4.11.2-7 **KMLP Facilities Construction – Noise Estimates**	
Distance from the Right-of-way or Property Line (feet)	Estimated Noise Level L_{eq} (dBA)
50	83
100	79
200	74
400	69
800	63
1,600	58
3,200	52
6,400	46

The nearest NSA (NSA 1) to Compressor Station 760 (where noise generating activities would occur over the longest period of time) is approximately 1,125 feet west of the site. During construction activities, the composite noise level at NSA 1 is estimated to be between 58 L_{eq} (dBA) and 63 L_{eq} (dBA). The current daytime noise level at this NSA is 59 dBA L_{eq} (see table 4.11.2-4). Although construction noise would, at times, be perceptible at NSA 1, it would not be substantially above existing daytime noise levels. Based upon the distance to NSAs 2 and 3 from the compressor station site and the existing background noise levels at these two locations, noise attributable to the construction activities is estimated to be lower than the current background noise levels and would, therefore, likely be imperceptible at the NSAs. Therefore, we conclude that construction of the KMLP facilities would result in temporary and minor noise impacts on residents and the surrounding communities.

4.11.2.4 Operation Noise Impacts and Mitigation

LNG Terminal

Operation of the LNG terminal would produce noise on a continual basis. Magnolia performed modeling to calculate noise levels that would be generated by operation of the LNG terminal. Sound level data for the proposed equipment were obtained either from vendors or from measurements at other LNG facilities. The modeling also included three noise mitigation measures (gas turbine exhaust silencer, boil-off gas building enclosures, and liquefaction train pipe insulation), which Magnolia has committed to implementing in the facility design. Table 4.11.2-8 provides the estimated equipment quantities and sound power levels used in the modeling. Table 4.11.2-9 presents the results of the modeling, along with a comparison with the existing ambient noise level, the expected noise level during operation of the LNG terminal compared to the ambient noise level, and the resulting increase in ambient noise level due to operation of the LNG terminal. Based on these estimates, the noise generated by the operation of the LNG terminal is likely to be slightly perceptible at NSAs 1 and 2, but imperceptible at NSA 3.

TABLE 4.11.2-8

LNG Terminal Operation – Equipment Quantities and Sound Power Levels

Equipment	Quantity	Sound Power Level Per Item (dBA)
Gas turbine compressor/generator package	8	105
Gas turbine compressor exhaust	8	135
Solution cooler fan unit	128	103
Cooler fan	40	94
Steam generator	8	105
Amine charge pumps	8	102
Miscellaneous pumps	54	101
Instrument air package	12	98
Boil-off gas compressor	5	112
Boil-off gas compressor motor	5	108
Ammonia compressor	8	85
Liquefaction train piping	4	116

TABLE 4.11.2-9

LNG Terminal Operation – Composite Noise Levels at Nearby Noise Sensitive Areas

NSA	Distance and Direction from LNG Terminal (feet)	Existing Ambient L_{dn} (dBA)	Predicted LNG Terminal Contribution L_{dn} (dBA)	Ambient + LNG Terminal L_{dn} (dBA) [a]	Predicted Increase in Ambient Noise Level (dBA)
1	3,820 south	51	46	52	1
2	4,485 southeast	52	45	53	1
3	7,075 east-southeast	47	24	47	0

[a] Sound pressure levels are measured on a logarithmic scale; therefore, the predicted increase in ambient noise level at the NSAs during operation of the LNG terminal would not be the sum of the two noise levels.

The results of the noise impact analysis indicate that the noise attributable to the project would be lower than the FERC sound level requirement of 55 dBA L_{dn} at the nearest NSA. We recognize, however, that actual results may be different from those obtained from modeling. Therefore, **we recommend that:**

- **Magnolia make all reasonable efforts to ensure that predicted noise levels during operation of the LNG terminal are not exceeded at nearby NSAs and should file with the Secretary a full load noise survey <u>no later than 60 days</u> after each of the first three liquefaction trains is placed into service. If the noise attributable to the operation of the LNG terminal exceeds an L_{dn} of 55 dBA at any nearby NSAs, Magnolia should reduce operation of the LNG terminal or install additional noise controls until a noise level below an L_{dn} of 55 dBA at nearby NSAs is achieved. Magnolia should confirm compliance with the above requirement by filing a second noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

In addition, **we recommend that:**

- **Magnolia file a noise survey with the Secretary <u>no later than 60 days</u> after placing the entire LNG terminal into service. If a full load condition noise survey is not possible, Magnolia should provide an interim survey at the maximum possible horsepower load <u>within 60 days</u> of placing the LNG terminal into service and provide the full load survey <u>within 6 months</u>. If the noise attributable to the operation of all of the equipment at the LNG terminal under interim or full horsepower load conditions exceeds an L_{dn} of 55 dBA at any nearby NSAs, Magnolia should file a report on what changes are needed and should install the additional noise controls to meet the level <u>within 1 year</u> of the in-service date. Magnolia should confirm compliance with the above requirement by filing an additional noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

The purpose of a flare system is to safely and reliably protect plant systems from overpressure during start-up, shutdown, plant upsets, and emergency conditions. Magnolia anticipates that flaring would occur for approximately 5 days during startup of the LNG terminal. During operation, use of the flares would only occur during process upset conditions, which Magnolia anticipates would be no more than 12 hours during the first year of operation and no more than 6 hours in each subsequent year (each flaring event is expected to occur for between 15 and 60 minutes). The flaring creates noise with a low-pitched 'roaring' character. Magnolia has estimated the peak sound pressure level for a high pressure flare as measured at 1,500 feet from the flare to be 80 dBA. The estimated sound pressure level at the nearest NSA during a flaring event would be 72 dBA. Based upon the Relative Loudness Scale presented in table 4.11.2-1, this would be a moderate sound level impact, which Magnolia anticipates would occur no more than 12 hours during the first year of operation and no more than 6 hours in each subsequent year (each flaring event is expected to occur for between 15 and 60 minutes).

Vessel traffic associated with operation of the LNG terminal would generate underwater sounds. Cargo vessels, which are in the same category as LNG vessels, are known to emit high levels of low frequency sound (6.8 to 7.7 hertz at 181 to 190 decibels (re: 1 μPa)) capable of traveling long distances (Richardson, et al., 1995). Noise generated by LNG vessels is generally omni-directional, emitting from all sides of the vessel (Whale and Dolphin Conservation Society, 2004). However, noise levels are greatest on the sides of the ship and weakest on the front and rear of the ship. Above-water noise associated with the LNG vessels would be similar to other large vessel traffic along the waterway and would result in temporary and minor noise impacts along the vessel transit route.

KMLP Facilities

The primary source of operational noise associated with the KMLP facilities would be from Compressor Station 760. Operation of Compressor Station 760 would produce noise on a continual basis. KMLP performed modeling to calculate noise levels that would be generated by operation of Compressor Station 760. Sound level data for the proposed equipment were obtained from vendor information and included combustion air intake, exhaust, and turbine/compressor-radiated mechanical noise. The modeling also assumed the installation of noise mitigation measures, including acoustical enclosures and barriers; pipe insulation; and acoustical-rated wall, ceiling, and door assemblies for the compressor building. Table 4.11.2-10 presents the results of the modeling, along with a comparison with the existing ambient level, the expected future noise level after adding the facility noise to the ambient, and the increase in ambient level as a result of adding the facility. Based on these estimates, the noise generated by the operation of Compressor Station 760 is likely to be slightly perceptible at NSAs 2 and 3, but imperceptible at NSAs 1 and 4. Kinder Morgan also evaluated the proposed equipment and determined that the proposed compressor station would result in no detectible increase in vibration at nearby NSAs.

TABLE 4.11.2-10					
Compressor Station 760 Operation – Noise Levels at Nearby Noise Sensitive Areas					
NSA	Distance and Direction from Station (feet)	Existing Ambient L_{dn} (dBA)	Predicted Compressor Station Contribution L_{dn} (dBA)	Ambient + Compressor Station L_{dn} (dBA) [a]	Predicted Increase in Ambient Noise Level (dBA)
1	1,125 west-northwest	65	55	65	0
2	1,260 east-southeast	63	55	64	1
3	1,280 west-southwest	60	54	61	1
4	2,900 northeast	64	50	64	0

[a] Sound pressure levels are measured on a logarithmic scale; therefore, the predicted increase in ambient noise level at the NSAs during operation of Compressor Station 760 would not be the sum of the two noise levels.

The results of the noise impact analysis indicate that the noise attributable to operation of Compressor Station 760 would be in compliance with the FERC sound level requirement of 55 dBA L_{dn} at the nearest NSA. We recognize, however, that actual results may be different from those obtained from modeling. Therefore, **we recommend that:**

- **KMLP file a noise survey with the Secretary <u>no later than 60 days</u> after placing Compressor Station 760 in service. If a full load condition noise survey is not possible, KMLP should provide an interim survey at the maximum possible horsepower load <u>within 60 days</u> of placing the station into service and provide the full load survey <u>within 6 months</u>. If the noise attributable to the operation of all of the equipment at Compressor Station 760 under interim or full horsepower load conditions exceeds an L_{dn} of 55 dBA at any nearby NSAs, KMLP should file a report on what changes are needed and should install the additional noise controls to meet the level <u>within 1 year</u> of the in-service date. KMLP should confirm compliance with the above requirement by filing an additional noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

The KMLP facilities also include modifications to six existing meter stations in Acadia and Evangeline Parishes. There are several NSAs within 0.5 mile of the all of the six existing meter stations. Because the changes proposed to these metering stations would be limited to the installation of valves and piping to allow for the bi-directional measurement of gas flow, installation of a pig launching facility, and/or interconnects to the proposed header pipelines, it is unlikely that the modifications would markedly alter existing noise levels. However, KMLP has committed to installing noise mitigation measures (e.g., low noise valves, acoustical insulation, noise barriers, and blowdown silencer) as needed to ensure that noise attributable to the meter stations does not exceed 55 dBA L_{dn} at the nearest NSA.

4.12 RELIABILITY AND SAFETY

4.12.1 Regulatory Oversight

Multiple federal agencies share regulatory authority over the siting, design, construction, and operation of LNG import and export terminals.

The FERC authorizes the siting and construction of LNG import and export facilities 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 require each applicant to identify how its proposed design would comply with the DOT's siting requirements of 49 CFR 193, Subpart B. As part of our NEPA review, we use this information from the applicant, developed to comply with the DOT's regulations, to assess whether or not a facility would have a public safety impact. As a cooperating agency, the DOT assists FERC staff in evaluating whether an applicant's proposed siting meets the DOT requirements. If a facility is constructed and becomes operational, the facility would be subject to the DOT's inspection program. Final determination of whether a facility is in compliance with the requirements of 49 CFR 193 would be made by DOT staff.

The DOT establishes federal safety regulations for siting, construction, operation, and maintenance of onshore LNG facilities, as well as for the siting of marine cargo transfer systems at waterfront LNG plants. Those regulations are codified in 49 CFR 193. In 1985, the FERC and DOT entered into an MOU regarding the execution of each agency's respective statutory responsibilities to ensure the safe siting and operation of LNG facilities. In addition to FERC's existing ability to impose requirements to ensure or enhance the operational reliability of LNG facilities, the MOU specified that FERC may, with appropriate consultation with the DOT, impose more stringent safety requirements than those in Part 193.

The Coast Guard has authority over the safety of an LNG facility's marine transfer area and LNG marine traffic, as well as over security plans for the entire LNG facility and LNG marine traffic. The Coast Guard regulations over LNG facilities are codified in 33 CFR Parts 105 and 127. In accordance with 33 CFR 127, the Coast Guard has provided FERC with the LOR for the project in a letter dated February 12, 2015,[17] regarding the suitability of the waterway for the type and frequency of planned LNG carrier traffic.

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

The EPA establishes federal safety regulations to prevent the accidental release and to minimize the consequences of any such release of extremely hazardous substances under the CAA. These regulations are codified in 40 CFR 68, *Chemical Accident Prevention Provisions*, also called the EPA's Risk Management Program (RMP). Typically, these regulations would not apply to LNG facilities as clarified in the EPA's preamble to its final rule in 63 Federal Register 640-645 (January 6, 1998), that exempted substances in transportation, including storage incident to transportation, subject to oversight or regulation under 49 CFR 193. This would include facilities used to liquefy natural gas or used to transfer, store, or vaporize LNG in conjunction with pipeline transportation. However, the EPA has indicated that this exemption did not envision the use of toxic materials above threshold quantities to liquefy natural gas. Magnolia's proposed use of approximately 140,000 pounds of anhydrous ammonia (ammonia) in each train (4 trains) would be above the 10,000-pound threshold listed in the EPA's RMP regulations (40 CFR §68.130). Due to the quantities of ammonia stored on site, the EPA has asserted their jurisdiction over Magnolia's facility.

[17] Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number, excluding the last three digits, in the "Docket Number" field (i.e., CP14-347). The LOR for the project was filed with the FERC on March 2, 2015.

The Occupational Safety and Health Administration (OSHA) establishes federal safety standards for the protection of the health and safety of on-site personnel under the Occupational Safety and Health Act. These standards are codified in 29 CFR 1910.119, *Process Safety Management of Highly Hazardous Chemicals* (PSM). Typically, LNG facilities would not be subjected to PSM regulations as clarified in letter issued on October 30, 1992 and December 9, 1998, which precluded the enforcement of PSM regulations over gas and LNG transmission and distribution facilities. However, this letter stated that the DOT regulations indicate that fire and explosion hazards were adequately covered and did not reference the potential use of toxic hazards. Magnolia's proposed use of approximately 140,000 pounds of ammonia in each train would be above the 10,000-pound threshold listed in OSHA's PSM regulations (29 CFR §1910.119 App A). Due to the quantities of ammonia stored on site, OSHA has asserted their jurisdiction over Magnolia's facility.

As part of the review required for a FERC authorization, Commission staff must ensure that all proposed facilities would operate safely and securely. The design information that must be filed in the application to the Commission is specified by 18 CFR 380.12 (m) and (o). The level of detail necessary for this submittal requires the project sponsor to perform substantial front-end engineering of the complete facility. The design information is required to be site-specific and developed to the extent that further detailed design would not result in changes to the siting considerations, basis of design, operating conditions, major equipment selections, equipment design conditions, or safety system designs, which we considered during our review process.

The DOT, Coast Guard, and EPA are participating as cooperating agencies, and remain responsible for enforcing their regulations covering LNG facility design, construction, and operation. All three agencies have some oversight and responsibility for inspection and compliance during the facility's operation.

4.12.2 LNG Facility Hazards

With the exception of the October 20, 1944, failure at an LNG facility in Cleveland, Ohio, 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. The 1944 incident in Cleveland led to a fire that killed 128 people and injured 200 to 400 people.[18] The failure of the LNG storage tank was due to the use of materials inadequately suited for cryogenic temperatures. LNG migrating through streets and into underground sewers due to the lack of adequate spill impoundments at the site was also a contributing factor. Current regulatory requirements ensure that proper materials suited for cryogenic temperatures are used and that spill impoundments are designed and constructed properly to contain a spill at the site.

Another operational accident occurred in 1979 at the Cove Point LNG facility in Lusby, Maryland. A pump seal failure resulted in gas vapors entering an electrical conduit and settling in a confined space. When a worker switched off a circuit breaker, the gas ignited, causing heavy damage to the building and a worker fatality. With the participation of the FERC, lessons learned from the 1979 Cove Point accident resulted in changing the national fire codes to better ensure that the situation would not occur again.

On January 19, 2004, a blast occurred at Sonatrach's Skikda, Algeria, LNG liquefaction facility, which 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 to the high-pressure steam boiler by the combustion air fan. An explosion developed inside

[18] For a description of the incident and the findings of the investigation, see "U.S. Bureau of Mines, Report on the Investigation of the Fire at the Liquefaction, Storage, and Regasification Plant of the East Ohio Gas Co., Cleveland, Ohio, October 20, 1944," dated February 1946.

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 (LPG) 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 at the proposed project, Magnolia 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.

On March 31, 2014, an explosion and fire occurred at Northwest Pipeline Corporation's LNG peak-shaving facility in Plymouth, Washington. The facility 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. The accident investigation is still in progress. Once developed, measures to address any causal factors which led to this incident will be applied to all facilities under Commission jurisdiction.

For past incidents of facilities handling ammonia, over 1,200 ammonia refrigeration incidents have occurred at ammonia facilities regulated under the EPA's RMP between 1994 and 2013. These incidents have resulted in 84 injuries to the public and 1 public fatality. Lessons learned from these incidents have resulted in updates to codes and standards to reduce the risk of any incident from impacting the public. Recently on January 15, 2015, the Chemical Safety Board released a report investigating a release of 32,000 pounds of ammonia at Theodore, Alabama on August 23, 2010, after hydraulic shock caused a pipe to catastrophically fail.[19] We are recommending an evaluation of dynamic surge to prevent failures associated with hydraulic shock. Additional recommendations have been placed on Magnolia's proposed ammonia systems design and mitigation measures to further reduce the risk of any incidents from impacting the public.

Hazards Associated with the Proposed Equipment

Before liquefaction, Magnolia would pre-treat the feed gas for the removal of hydrogen sulfide (H_2S), CO_2, water (H_2O), and mercury (Hg). The removal of these substances from the feed gas stream can be hazardous as a result from the physical, chemical, flammability, and/or toxicity properties of Hg and H_2S. The process of removing H_2S would require the use of an amine solution, a hazardous substance. Additionally, the feed gas may contain pentane and heavier hydrocarbons, including freezable aromatic hydrocarbons such as benzene and cyclohexane. Although a small amount is expected, they are still considered hazardous substances.

Magnolia proposes a design capacity to handle up to 4 ppm by volume H_2S, 2 percent by volume CO_2, and trace amounts of Hg. However, lower quantities and concentrations of these substances would be expected in the natural gas feed stream and would not pose a hazard to the public.

The CO_2 and H_2S would be removed from the feed gas by a closed-loop regenerative amine system, which uses a methyl diethanolamine (amine) solution. As the CO_2 and H_2S are removed by the amine solution, these substances would accumulate within the amine solution and reduce the effectiveness of the amine system. Therefore, the amine solution would be regenerated periodically, where an acid gas stream with concentrations up to 240 ppm by mole H_2S and 99.98 mole percent CO_2 would be separated from the contaminated amine solution and routed to a H_2S scavenger unit. The H_2S scavenger unit would reduce the H_2S content to 0.1 ppm. Magnolia expects to replace the H_2S adsorbent material once every

[19] "Key Lessons for Preventing Hydraulic Shock in Industrial Refrigeration Systems," CSB Safety Bulletin No. 2010-13-A-AL, http://www.csb.gov/assets/1/19/final_CSB_CaseStudy_Millard_0114_0543PM.pdf, (January 15, 2015).

9.5 months. The resulting waste gas stream would then be sent to the Thermal Oxidizer for treatment prior to discharge to the atmosphere.

Following CO_2 and H_2S removal, the water-saturated feed gas stream would be cooled using the auxiliary refrigeration system and would pass through a knock-out separator to remove bulk H_2O. Then the feed gas would flow through the molecular sieve vessels to lower H_2O content to less than 0.5 ppm. The molecular sieve vessels would regenerate via a side stream of heated dry gas. The spent regeneration gas would then be routed to the high pressure fuel gas system. After H_2O removal, mercury in the feed gas would be removed by absorption in non-regenerative mercury guard beds. Magnolia expects to replace the mercury adsorbent once every 15 years (per LNG train). Maintenance and safety procedures would cover the proper replacement of the spent adsorbent.

In addition to the removal of H_2S, CO_2, H_2O, and Hg, Magnolia would remove heavier hydrocarbons that may be present in the feed gas. During this removal process, heavy hydrocarbons including benzene, toluene, ethylbenzene, and xylenes (BTEX) would be extracted and the heavy liquids would be vaporized and used as auxiliary boiler fuel. The BTEX would be handled on site at temperature and pressure conditions under which a loss of containment would result primarily in a vapor release and the ability to produce damaging overpressures. In the event the BTEX vaporizer is out of service, any liquid BTEX would be contained within the Heavy Hydrocarbon ISO Container. A loss of containment from the Heavy Hydrocarbon ISO Container would primarily result in a liquid release.

A loss of the containment from the storage tanks or process piping would result in the formation of flammable or toxic vapor at the release location, as well as from any LNG or liquid refrigerant that pooled. Releases occurring in the presence of an ignition source would most likely result in a fire at the vapor source. A spill without ignition would form a vapor cloud that would travel with the prevailing wind until it either dispersed below the flammable or toxic limits or encountered an ignition source. In some instances, ignition of a vapor cloud may produce damaging overpressures. These hazards are described in more detail below.

Loss of Containment

A loss of the containment is the initial event that results in all other potential hazards. The initial loss of containment can result in a 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 and flammable vapors. The extent of the hazard will depend on the material released, the storage and process conditions, and the volumes released.

Magnolia would store the following on site: LNG at atmospheric pressure and at a cryogenic temperature of about –260 °F; ethane at ambient temperature and 535 pounds per square in gauge (psig); compressed liquid n-butane at ambient temperature and 261 psig; liquid nitrogen at about –320 °F and 116 psig; and ammonia would be provided via ammonia tank trucks. The temperature of the amine process used to pretreat the feed gas would range from 109 °F to 260 °F. The temperature of natural gas liquids (NGL) in the heavy hydrocarbon removal process would be as low as –44 °F. The mixed refrigerant process stream would consist of nitrogen, methane, ethane, and n-butane. Cryogenic temperatures as low as –253 °F would occur within the mixed refrigerant process stream used to liquefy the feed gas. The ammonia refrigeration process would operate in temperatures as low as 2.8 °F.

Loss of containment of LNG, liquid nitrogen, and mixed refrigerant could lead to the release of both liquid and vapor into the immediate area. 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.

LNG, liquid nitrogen, and portions of the mixed refrigerant stream are cryogenic liquids that would 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. These temperatures, however, would be accounted for in the design of equipment and structural supports, and would not be substantially different from the hazards associated with the storage and transportation of liquid oxygen (–296 ºF) or several other cryogenic liquids that have been routinely produced and transported in the United States.

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. The average overpressures recorded at the source of the RPTs during the Coyote tests have ranged from 0.2 pounds per square inch (psi) to 11 psi.[20] These events are typically limited to the area within the spill and are not expected to cause damage outside of the area 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

In the event of a loss of containment, LNG, ethane, n-butane, liquid nitrogen, mixed refrigerant, NGL, and ammonia would vaporize on release from any storage or process facilities. Depending on the size of the release, cryogenic liquids may form a liquid pool and vaporize. Additional vaporization would result from exposure to ambient heat sources, such as water or soil. When released from a containment vessel or transfer system, LNG will generally produce 620 to 630 standard cubic feet (ft^3) of natural gas for each cubic foot of liquid. Ethane will produce about 270 ft^3 of gas for each cubic foot of liquid. n-Butane will produce about 230 ft^3 of gas for each cubic foot of liquid. Liquid nitrogen will produce about 700 ft^3 of gas for each cubic foot of liquid. The composition of the extracted NGL would vary throughout the heavy hydrocarbon removal process and may produce up to about 260 ft^3 of gas for each cubic foot of liquid. Ammonia will produce about 900 ft^3 of gas for each cubic foot of liquid.

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 due to the relative density of the vapor to the air 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). An ethane release could form a denser-than-air vapor cloud that sinks to the ground. As the ethane vapor cloud disperses downwind and mixes with warm surrounding air, it would become neutrally buoyant. An

---

[20] The Lawrence Livermore National Laboratory conducted seven tests (the Coyote series) on vapor cloud dispersion, vapor cloud ignition, and RPTs at the Naval Weapons Center in China Lake, California in 1981.

n-butane release would form a denser-than-air vapor cloud that would sink to the ground; however, n-butane would remain denser than the surrounding air, even after warming to ambient temperatures. Any NGL release would form a denser-than-air vapor cloud, even after warming to ambient temperatures. An ammonia release would initially form a denser-than-air vapor cloud that sinks to the ground. As the ammonia cloud disperses downwind and mixes with warm surrounding air, it may raise into the atmosphere.

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 a number of 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.[21] Other federal agencies, such as the DOE, EPA, and NOAA, use AEGLs and ERPGs as the primary measure of toxicity.[22, 23, 24]

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 RMP regulation, the EPA currently requires the determination of distances to toxic concentrations based on

---

21 U.S. Environmental Protection Agency, *Dose-Response Assessment for Assessing Health Risks Associated With Exposure to Hazardous Air Pollutants*, http://www2.epa.gov/fera/dose-response-assessment-assessing-health-risks-associated-exposure-hazardous-air-pollutants, July 3, 2014.

22 U.S. Department of Energy, *Temporary Emergency Exposure Limits for Chemicals: Methods and Practice*, DOE Handbook, DOE-HDBK-1046-2008, August 2008.

23 U.S. Environmental Protection Agency, *40 CFR 68 Final Rule: Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*, 61 Federal Register 31667-31732, Vol. 61, No. 120, Thursday, June 20, 1996.

24 U.S. National Oceanic and Atmospheric Administration, *Public Exposure Guidelines*, http://response.restoration.noaa.gov/oil-and-chemical-spills/chemical-spills/resources/public-exposure-guidelines.html, December 3, 2013.

ERPG-2 levels.[25, 26] 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. The endpoints for various toxic components are presented in tables 4.12.2-1 and 4.12.2-2 below for both AEGL and ERPG.

In addition, methane and heavier hydrocarbons are 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 and heavier hydrocarbons normally represent negligible risks to the public.

TABLE 4.12.2-1

Acute Exposure Guideline Levels of Various Material Components (in ppm) [a]

Material Components	Acute Exposure Guideline Level	10 minutes	30 minutes	1 hour	4 hours	8 hours
Ammonia	AEGL 1	30	30	30	30	30
	AEGL 2	220	220	160	110	110
	AEGL 3	2,700	1,600	1,100	550	390
Benzene	AEGL 1	130	73	52	18	9
	AEGL 2	2,000 [b]	1,100	800	400	200
	AEGL 3	9,700 [c]	5,600 [b]	4,000 [b]	2,000 [b]	990
Hydrogen Sulfide	AEGL 1	0.75	0.60	0.51	0.36	0.33
	AEGL 2	41	32	27	20	17
	AEGL 3	76	59	50	37	31
Toluene [d]	AEGL 1	67	67	67	67	67
	AEGL 2	1,400 [b]	760	560	310	250
	AEGL 3	10,000 [c]	5,200 [b]	3,700 [b]	1,800 [b]	1,400 [b]
Xylenes	AEGL 1	130	130	130	130	130
	AEGL 2	2,500 [b]	1,300 [b]	920 [b]	500	400
	AEGL 3	7,200 [c]	3,600 [b]	2,500 [b]	1,300 [b]	1,000 [b]

a U.S. Environmental Protection Agency, Acute Exposure Guideline Levels, http://www.epa.gov/oppt/aegl/pubs/chemlist.htm, October 3, 2014.
b Greater than or equal to 10 percent LFL.
c Greater than or equal to 50 percent LFL.
d Toluene AEGLs updated in 2014. Magnolia's toluene toxicity modeling is based on previous 10-minute values of 200 ppm for AEGL-1; 3,100 ppm for AEGL-2; and 13,000 ppm for AEGL-3.

25 The EPA has issued a request for information that is exploring the use of AEGL in lieu of ERPG. Available online at https://www.federalregister.gov/articles/2014/07/31/2014-18037/accidental-release-prevention-requirements-risk-management-programs-under-the-clean-air-act-section.

26 RMP toxic endpoints are based on ERPG-2 levels where these levels are available. For substances that do not have established ERPG-2 levels, the toxic endpoint is the level of concern from the EPA's 1987 Technical Guidance for Hazards Analysis.

TABLE 4.12.2-2

Emergency Response Planning Guidelines for Various Material Components (in ppm) [a]

Material Components	ERPG-1	ERPG-2	ERPG-3
Ammonia	25 [b]	150 [c]	1,500 [c]
Benzene	50 [b]	150	1,000
Hydrogen Sulfide	0.1 [b]	30	100
Toluene	50 [b]	300	1,000
Xylenes	None available	None available	None available

[a] American Industrial Hygiene Association (AIHA), 2014 ERPG/WEEL Handbook, https://www.aiha.org/get-involved/AIHAGuidelineFoundation/EmergencyResponsePlanningGuidelines/Pages/default.aspx, 2014.

[b] Odor detectable near ERPG-1

[c] In 1992, the EPA RMP and OSHA PSM regulations used values from the 1988 and 1991 AIHA ERPG levels. At the time, ERPG-2 was 200 ppm and ERPG-3 was 1,000 ppm for ammonia.

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 flammable properties for the various material components stored and processed on site are tabulated in table 4.12.2-3.

TABLE 4.12.2-3

Flammable Properties [a]

Material Component	Flash Point	LFL (percent volume)	UFL (percent volume)
Methane	–283 °F	5.0	15.0
Ethane	–211 °F	3.0	12.5
n-Butane	–76 °F	1.8	8.5
Ammonia	–71 °F [b]	15.0	28
n-Pentane	–56 °F	1.4	7.8
i-Pentane	–60 °F	1.4	7.6
n-Hexane	–7.6 °F	1.2	7.5
Benzene	12 °F	1.4	7.1
Toluene	45 °F	1.2	7.1
m-Xylene	77 °F	1.1	7.0
o-Xylene	75 °F	1.1	6.0
p-Xylene	77 °F	1.1	7.0
Hydrogen sulfide	–116 °F	4.3 [c]	45.5 [c]

[a] Society of Fire Protection Engineers, The SFPE Handbook of Fire Protection Engineering, Fourth Edition, 2008

[b] SIGTTO, Liquefied Gas Fire Hazard Management, First Edition, 2004

[c] Air Liquide Gas Encyclopedia, 2013

While ammonia is combustible, it has a very narrow flammability range and is not easy to ignite. As a result, ammonia is regulated based upon its toxicity. Under ambient conditions, ammonia would be a toxic gas, and exposure to ammonia vapors could be hazardous to human health if inhaled at high concentrations. Without properly designed, constructed, operated, and maintained ammonia refrigerant systems, a release could disperse downwind and cause exposure injuries, including death, to the public.

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. Magnolia has modeled the extent of the potential vapor dispersion hazards for the project, which is discussed in section 4.12.5.

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. Magnolia has modeled the extent of the potential flammable vapor dispersion hazards for the project, which is discussed in section 4.12.5.3.

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. Magnolia has modeled the extent of the potential overpressure hazards for the project, which is discussed in section 4.12.5.4.

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. Magnolia has modeled the extent of the potential radiant heat hazards from a pool fire for the project, which is discussed in section 4.12.5.5.

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. This shock wave, rather than the heat, would begin to 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 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 Coast Guard 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 Coast Guard 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. In order to prevent such an occurrence, Magnolia would take measures to mitigate the vapor dispersion and ignition into confined areas, such as buildings. Magnolia 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.[27] 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. Magnolia proposes to use methane (low reactivity), ethane (medium reactivity), and n-butane (medium reactivity) in the mixed refrigerant stream. In addition, the NGL process stream would contain a mixture of components such as the ones discussed above (i.e., propane). Therefore, a potential exists for these process streams to produce unconfined vapor clouds that could produce damaging overpressures in the event of a release.

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,

[27] Pierorazio, A.J., Thomas, K., Baker, Q.A., Ketchum, D.E., An Update to the Baker–Strehlow–Tang Vapor Cloud Explosion Prediction Methodology Flame Speed Table, Process Safety Progress (Vol.24, No.1), March 2005.

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.

Discussion of these hazards and potential mitigation are in section 4.12.5 for the project facilities. Magnolia also has mitigated the risk for cascading event hazards for the project, which is also discussed in section 4.12.5.6.

4.12.3 Technical Review of the Facility Preliminary Engineering Design

Operation of the proposed facility poses a potential hazard that could affect the public safety if strict design and operational measures to control potential accidents are not applied. The primary concerns are those events that could lead to an LNG spill of sufficient magnitude to create an off-site hazard as discussed in section 4.12.2. However, it is important to recognize the stringent requirements in place for the design, construction, operation, and maintenance of the facility, as well as the extensive safety systems proposed to detect and control potential hazards.

In general, we consider an acceptable design to include various layers of protection or safeguards in the facility design to reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public. These layers of protection are independent of one another so that any one layer would perform its function regardless of the action or failure of any other protection layer or initiating event. Such design features and safeguards typically include:

- a facility design that prevents hazardous events through the use of suitable materials of construction; operating and design 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 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 structural fire protection, to prevent escalation to a more severe event;

- site security measures for controlling access to the facility, including security inspections and patrols; response procedures to any breach of security and liaison with local law enforcement officials; and

- on-site and off-site emergency response, including hazard detection and control equipment, firewater systems, and coordination with local first responders to mitigate the consequences of a release and prevent it from escalating to an event that could impact the public.

We believe the inclusion of such protection systems or safeguards in a facility design can minimize the potential for an initiating event to develop into an incident that could impact the safety of the off-site public. In addition, siting of the facility with regard to potential off-site consequences can be further used to minimize impacts to public safety. As discussed in section 4.12.4, the DOT's regulations in 49 CFR 193, Subpart B require a siting analysis be performed by Magnolia.

As part of the application, Magnolia provided a FEED for the project. In developing the FEED, Magnolia performed a hazard identification (HAZID) analysis on the project's preliminary design based on the proposed plot plans, process flow diagrams, and heat and material balances. The HAZID analysis identifies potential hazards in the early stage of the project's design that could produce undesirable consequences through the occurrence of an incident by evaluating the materials, systems, process, and plant design. In addition, we have analyzed the information filed by Magnolia to determine the extent that layers of protection or safeguards to enhance the safety, operability, and reliability of the facility are included in the FEED.

The objectives of our FEED review focused on the engineering design and safety concepts of the various protection layers, as well as the projected operational reliability of the proposed facilities. The design would use materials of construction suited to the pressure and temperature conditions of the process design. Piping would be designed in accordance with ASME B31.3 as well as ASME B31.5 in accordance with IIAR standards for ammonia refrigerant piping. The ammonia piping would consist of welded connections on the majority of the piping connections to minimize the possibility of flange leaks. Pressure vessels would be designed in accordance with ASME Section VIII and the storage tanks would be designed in accordance with American Petroleum Institute (API) Standard 620, per 49 CFR 193 and the NFPA's Standard 59A (NFPA 59A). Both LNG storage tanks would also include boil-off gas compression to prevent the release of boil-off to the atmosphere in accordance with NFPA 59A for an inherently safer design. Valves and other equipment would be designed to generally accepted good engineering practices.

LNG facilities would be designed to withstand a sustained wind of 150 mph, which converts to 183 mph at a 3-second gust per 49 CFR §193.2067.[28] The ground surface of the liquefaction facilities would be elevated to about 24 feet above NAVD 88 in order to be above 12 and 17 feet for the 100- and 500-year storm flood elevations. The LNG storage tanks would be 17 feet above NAVD 88 and would have a secondary containment wall elevated to about 30 feet above NAVD 88. The dock would be 44 feet below NAVD 88 and the loading platform would be 30 feet above NAVD 88. The proposed site would be located 22 miles north of the Gulf of Mexico shoreline.

Magnolia has consulted with Lake Charles Regional Airport and submitted FAA Form 7460-1_2017 to notify the FAA of any proposed construction or alterations associated with the project. The proposed facility would be located outside of the flight path from the airport and would be approximately 22,000 feet from the secondary runway. Magnolia's design does not include any structure at or over 200 feet above ground level and Magnolia does not anticipate any hazard to air travel from structures or flare operation during startup, shutdown, and upset conditions. On February 17, 2015, the FAA issued a determination of no hazard to air navigation.

Magnolia would install process control valves and instrumentation to safely operate and monitor the facility. Alarms would have visual and audible notification in the control room to warn operators that process conditions may be approaching design limits. Operators would have the capability to take action from the control room to mitigate an upset.

Magnolia would develop facility operation procedures after completion of the final design; this timing is fully consistent with accepted industry practice. We have made recommendations for Magnolia

---

[28] A 150 mph sustained wind speed would correspond to a 183 mph 3-second gust using the Durst Curve in ASCE 7-05 and a 185 mph 3-second gust using a 1.23 gust factor for onshore winds at a coast line recommended in World Meteorological Organization, *Guidelines for Converting Between Various Wind Averaging Periods in Tropical Cyclone Conditions*. These wind speeds are equivalent to approximately a 14,000-year mean return interval or 0.36percent probability of exceedance in a 50-year period for the site based on ASCE 7-05 wind speed return period conversions.

to provide more information on the operating and maintenance procedures as they are developed, including safety procedures, hot work procedures and permits, abnormal operating conditions procedures, and personnel training. In addition, we have made recommendations for measures such as labeling of instrumentation and valves, piping, and equipment and car-seals/locks, to address human factor considerations and improve facility safety. Magnolia would also install robust barricades to prevent vehicles from impacting ammonia equipment. We also have made a recommendation to ensure an alarm management program would be in place to ensure effectiveness of the alarms.

Safety valves and instrumentation would be installed to monitor, alarm, shutdown, and isolate equipment and piping during process upsets or emergency conditions. Safety instrumented systems would comply with International Society for Automation (ISA) Standard 84.01 and other recommended and generally accepted good engineering practices. We also made recommendations on the 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 valves in the facility control system. In addition, Magnolia would install remotely actuated shut-off valves to enable rapid isolation of ammonia inventories, remote isolation capability on the ammonia truck unloading valve, and excess flow valves on ammonia truck liquid and vapor transfer lines to limit the quantity of ammonia releases.

Safety relief valves and flares would be installed to protect the process equipment and piping. The safety relief valves would be designed to handle process upsets and thermal expansion within piping, per NFPA 59A and ASME section VIII, and would be designed based on API 520, 521, 526, 527, and other recommended and generally accepted good engineering practices. In addition, we made recommendations to ensure the design and installation of pressure and vacuum relief devices are adequate.

The security requirements for the liquefaction facilities are governed by 49 CFR 193, Subpart J - Security. This subpart includes 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. Requirements for maintaining security of the liquefaction facility can be found in 33 CFR 105. These security requirements were authorized by the Maritime Transportation Security Act (MTSA) of 2002, which requires all terminal owners and operators to submit a Facility Security Assessment and a Facility Security Plan to the Coast Guard for review and approval. Some of the responsibilities of the applicant include, but are not limited to:

- designating an Facility Security Officer with a general knowledge of current security threats and patterns, risk assessment methodology, and the responsibility for implementing the Facility Security Assessment and Facility Security Plan and performing an annual audit for the life of the project;

- conducting a Facility Security Assessment to identify site vulnerabilities, possible security threats and consequences of an attack, and facility protective measures;

- developing a Facility Security Plan based on the Facility Security Assessment, with procedures for: responding to transportation security incidents; notification and coordination with local, state, and federal authorities; prevention of unauthorized access; measures and equipment to prevent or deter dangerous substances and devices; training; and evacuation;

- implementing scalable security measures to provide increasing levels of security at increasing maritime security levels for facility access control, restricted areas, cargo handling, vessel stores and bunkers, and monitoring;

- ensuring the Transportation Worker Identification Credential program is properly implemented; and

- reporting all breaches of security and security incidents to the National Response Center.

Magnolia proposed to install a security fence with limited access openings as well as security cameras to monitor the marine facilities, the fence line, active access points, the waters along the proposed facility, and the facility interior. The site would be illuminated with not less than 2.2 lux between sunset and sunrise. Intrusion detection systems would be installed at the security fence and in all buildings. In addition, under 33 CFR 105, Magnolia would be required to submit a Facility Security Plan to the Coast Guard for review and approval before commencement of operations.

In the event of a release, drainage systems from LNG storage and liquefaction process facilities would direct a spill away from equipment in order to minimize flammable vapors from dispersing to confined, occupied, or public areas and to minimize heat from impacting adjacent equipment and public areas if ignition occurs. In addition, Magnolia proposes to install grading under vessels to divert any ammonia spilled on the ground to containment sumps. Spacing of vessels and equipment between each other, from ignition sources, and to the property line would meet the requirements of NFPA 59A (2001 edition), as referenced in 49 CFR 193.2401.

Magnolia performed a preliminary fire protection evaluation to ensure that adequate hazard detection, hazard control, and firewater coverage would be installed to detect and address any upset conditions. Structural fireproofing and cryogenic protection, proposed to prevent failure of structural supports of equipment and pipe racks, would comply with NFPA 59A and other recommended and generally accepted good engineering practices. Magnolia would also install hazard detection systems to detect, alarm, and alert personnel in the area and control room to initiate an emergency shutdown and/or initiate appropriate procedures, and would meet NFPA 72, ISA 12.13, and other recommended and generally accepted good engineering practices. Magnolia would install ammonia detection systems throughout the plant that would initiate automated shutdown systems in the event of an ammonia release.

Hazard control devices would be installed to extinguish or control incipient fires and releases, and would meet NFPA 59A and NFPA 10, 13, 15, 17, and other recommended and generally accepted good engineering practices. Magnolia would provide automatic firewater systems and monitors for use during an emergency to cool the surface of storage vessels, piping, and equipment exposed to heat from a fire, and would meet NFPA 59A, 20, 22, and 24 requirements. Magnolia would also install a high expansion foam system to reduce vaporization rates from LNG pools and would meet NFPA 59A and NFPA 11. We have made recommendations for Magnolia to provide more information on the design, installation, and commissioning of hazard detection, hazard control, and firewater systems as Magnolia would further develop this information during the final design phase. In addition, Magnolia proposes to install remotely operated firewater monitors, sprinkler systems, fixed water spray systems, and firewater hydrants and hoses with fog nozzles to mitigate dispersion of released ammonia. We have included specific recommendations on Magnolia's final design of the firewater system that would mitigate ammonia releases.

Magnolia would also have written emergency procedures in accordance with 49 CFR 193 and 33 CFR 127. The emergency procedures would provide for protection of personnel and the public as well as the prevention of property damage that may occur as a result of incidents at the facility. Personnel training would include the characteristics, hazards, and response steps for an ammonia release. The facility would also provide appropriate personnel protective equipment to enable operations personnel and first responders access to the area. Magnolia would also be required to develop an Emergency Response Plan in accordance with EPAct 2005, as discussed further in section 4.12.9.

The use of these protection layers would minimize the potential for an initiating event to develop into an incident that could impact the safety of the off-site public. As a result of the technical review of the information provided by Magnolia in the submittal documents, we identified a number of concerns in information data request letters issued on December 9, 2014, March 20, 2015, and April 1, 2015 relating to the reliability, operability, and safety of the proposed design. Magnolia provided written responses to these information data requests on December 29, 2014, April 1, 2015, and April 20, 2015. Some of these responses indicated that Magnolia would correct or modify its design in order to address issues raised in the information request. As a result, **we recommend that:**

- **<u>Prior to construction of the final design</u>, Magnolia should file with the Secretary, for review and written approval by the Director of OEP, information/revisions pertaining to Magnolia's response to numbers 5, 10, 11, 12, 13, 16, 19, 20, 22, 24, 31, 33, 37, 38, 40, 41, 43, 44, 45, 50, 52, 53, 55, 56, 57, 64, 65, 66, 67, 70, 72, 73, 74, 76, 78, 82, 85, 90, and 92 of its December 29, 2014 filing, which indicated features to be included or considered in the final design.**

The FEED and specifications submitted for the proposed facilities to date are preliminary, but would serve as the basis for any detailed design to follow. If authorization is granted by the Commission, the next phase of the project would include development of the final design, including final selection of equipment manufacturers, process conditions, and resolution of some safety-related issues. We do not expect that the detailed design information to be developed would result in changes to the basis of design, operating conditions, major equipment selections, equipment design conditions, or safety system designs that were presented as part of the FEED.

While the RMP prevention program would only apply to ammonia, Magnolia plans to apply OSHA's PSM program to the entire plant. OSHA's PSM program requires a prevention program including a process hazard analysis (PHA) that identifies, evaluates, and controls the hazards involved. The PHA evaluates deviations from normal operating conditions and confirms mitigation measures needed to prevent, detect, mitigate, or respond to a range of hazard scenarios (including an unintentional release of ammonia). Magnolia would utilize a range of risk assessment processes to evaluate the mitigation systems including a Preliminary Hazard Identification, Hazard and Operability Analysis (HAZOP), Layer of Protection Analysis (LOPA), Safety Integrity Level (SIL) Assignment, and SIL Verification. In addition, Magnolia would include a prevention program that complies with the relevant EPA and OSHA regulations and incorporates a written plan of action to implement employee participation, mandatory training for all employees whose job functions include the operation of the ammonia systems, the completion of a process hazard analysis prior to start-up in order to identify and control all hazards of the process, and the preparation and implementation of procedures to maintain the on-going mechanical integrity of the entire facility, including the ammonia process equipment once in operation. Recommendations to prevent or minimize these hazards would be generated from the results of the HAZOP and LOPA reviews.

Once the design has been subjected to the HAZOP and LOPA evaluations, Magnolia's design development team would track changes in the facility design, operations, documentation, and personnel. The project would also utilize a Management of Change process to ensure that all design changes receive appropriate reviews to analyze any potential safety impacts. Magnolia would evaluate these changes to ensure that the safety, health, and environmental risks arising from these changes are addressed and controlled. Resolutions of the recommendations generated by the HAZOP and LOPA reviews would be monitored by FERC staff. We have included a recommendation that Magnolia should file HAZOP and LOPA reviews on the completed final design.

Information regarding the development of the final design, as detailed below, would need to be filed with the Secretary for review and written approval by the Director OEP before equipment construction at the site would be authorized. To ensure that the concerns we've identified relating to the reliability, operability, and safety of the proposed design are addressed by Magnolia, and to ensure that the facility is subject to the Commission's construction and operational inspection program, **we recommend that the following measures should apply to the Magnolia LNG Project facilities. Information pertaining to these specific recommendations should be filed with the Secretary for review and written approval by the Director of OEP either: <u>prior to initial site preparation</u>; <u>prior to construction of final design</u>; <u>prior to commissioning</u>; <u>prior to introduction of hazardous fluids</u>; or <u>prior to commencement of service</u>, as indicated by each specific condition. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 683 (Docket No. RM06-24-000), including security information, should be submitted as critical energy infrastructure information (CEII) pursuant to 18 CFR 388.112. See Critical Energy Infrastructure Information, Order No. 683, 71 Federal Register 58,273 (October 3, 2006), FERC Stats. & Regs. ¶31,228 (2006). Information pertaining to items such as: off-site emergency response; procedures for public notification and evacuation; and construction and operating reporting requirements, would be subject to public disclosure. All information should be filed <u>a minimum of 30 days</u> before approval to proceed is requested.**

- **<u>Prior to initial site preparation</u>, Magnolia should provide procedures for controlling access during construction.**

- **<u>Prior to initial site preparation</u>, Magnolia should file the issued for construction quality assurance and quality control procedures for construction activities.**

- **<u>Prior to initial site preparation</u>, Magnolia should file an overall project schedule, which includes the proposed stages of the commissioning plan.**

- **<u>Prior to initial site preparation</u>, Magnolia should file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.**

- **The <u>final design</u> should include change logs that list and explain any changes made from the FEED provided in Magnolia'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.**

- **The <u>final design</u> should provide up-to-date Process Flow Diagrams with heat and material balances and P&IDs. 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. piping with line number, piping class specification, size, and insulation type and thickness;

    e. piping specification breaks and insulation limits;

f. **all control and manual valves numbered;**

g. **valve high pressure side and cryogenic ball valve internal and external vent locations;**

h. **relief valves with set points; and**

i. **drawing revision number and date.**

- **The final design should include the car seal philosophy with a list of all car-sealed and locked valves consistent with the P&IDs.**

- **The final design should provide an up-to-date complete equipment list, process and mechanical data sheets, and specifications.**

- **The final design EPC contractor should conduct a HAZID to review and verify that the recommendations from the FEED HAZID are complete and consistent with the requirements of the final design as determined by the EPC contractor.**

- **The final design should include a hazard and operability review and a LOPA of the completed design prior to issuing the P&IDs for construction. These reviews should include initial startup as well as shutdown operations. A copy of each review with a list of recommendations, and actions taken on the recommendations, should be filed.**

- **The final design hazard and operability review should include participants with years of relevant design and operating experience and an evaluation of past incidents, such as dynamic surge associated with hydraulic shock.**

- **The final design hazard and operability review should include consideration of basket strainers at the bottom outlet of the Molecular Sieve Vessels to prevent molecular sieve and support material from entering the piping system.**

- **The final design should include an updated fire protection evaluation of the proposed facilities carried out in accordance with the requirements of NFPA 59A 2001, chapter 9.1.2 as required by 49 CFR §193.2801. A copy of the evaluation, a list of recommendations and supporting justifications, and actions taken on the recommendations should be filed.**

- **The final design should provide complete drawings and a list of the hazard detection equipment. Plan drawings should clearly show the location and elevation of all detection equipment. The list should include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment.**

- **The final design should install a technical review of facility design that:**

  a. **identifies all combustion/ventilation air intake equipment and the distances to any possible flammable gas or toxic release; and**

  b. **demonstrates that these areas are adequately covered by hazard detection devices and indicates how these devices would isolate or shut down any**

combustion or HVAC equipment whose continued operation could add to or sustain an emergency.

- **The <u>final design</u> of the hazard detectors should account for the calibration gas when determining the lower flammable limit set points for flammable refrigerants, NGL, and LNG. Include a list of alarm and shutdown set points for each hazard detector.**

- **The <u>final design</u> of the hazard detectors should account for the calibration gas when determining the set points for toxic components such as ammonia, NGL, and hydrogen sulfide. Include a list of alarm and shutdown set points for each hazard detector.**

- **The <u>final design</u> should provide complete plan drawings and a list of the fixed and wheeled dry-chemical, hand-held fire extinguishers, and other hazard control equipment. Drawings should clearly show the location by tag number of all fixed, wheeled, and hand-held extinguishers. The list should include the equipment tag number, type, capacity, equipment covered, discharge rate, and automatic and manual remote signals initiating discharge of the units.**

- **The <u>final design</u> should provide facility plans and drawings that show the location of the firewater and any foam systems. Plan drawings should clearly show: firewater and foam piping; post indicator valves; and the location, and area covered by, each monitor, hydrant, deluge system, foam system, water-mist system, and sprinkler. The drawings should also include piping and instrumentation diagrams of the firewater and foam system.**

- **The <u>final design</u> of the water spray and deluge systems should specify a water density of 0.4 gallon per minute per square foot to mitigate ammonia releases.**

- **The <u>final design</u> should provide calculations for the firewater spray systems sized to provide cooling for mitigation of BLEVEs.**

- **The <u>final design</u> of the firewater system should include the water required for foam generation in calculating the total water required for 2 hours of supply.**

- **The <u>final design</u> should specify that two firewater jockey pumps are to be installed.**

- **The <u>final design</u> should specify a 2-hour fire duration for passive fire protection systems.**

- **The <u>final design</u> should include the 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.**

- **The <u>final design</u> should specify an alarm management program to ensure effectiveness of process alarms.**

- **The <u>final design</u> should include a drawing showing the location of the emergency shutdown buttons. Emergency shutdown buttons should be easily accessible,**

conspicuously labeled, and located in an area which would be accessible during an emergency.

- **The <u>final design</u> should specify emergency shutdown valve closure time and release volumes. Include an analysis that describes the time to detect an upset condition, notify plant personnel, and close the emergency shutdown valve.**

- **The <u>final design</u> should specify the bypass valves around the ESDV-11001 to be locked closed.**

- **The <u>final design</u> should provide the safe operating limits (upper and lower), alarm and shutdown set points for all instrumentation (i.e., temperature, pressures, flows, and compositions).**

- **The <u>final design</u> should evaluate the voting logic and voting degradation for flammable and toxic gas detectors.**

- **The <u>final design</u> should provide 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; should alarm the hazardous condition; and should shutdown the appropriate systems.**

- **The <u>final design</u> should provide electrical area classification drawings.**

- **The <u>final design</u> should provide spill containment system drawings with dimensions and slopes of curbing, trenches, and impoundments.**

- **The <u>final design</u> should specify that for hazardous fluids, piping and piping nipples 2 inches or less in diameter are to be no less than schedule 160 for carbon steel and no less than schedule 80 for stainless steel, and are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and operator live loads in areas accessible by operators.**

- **The <u>final design</u> should specify welded connections on ammonia piping to minimize flange leaks or provide justification for the use of flanges with mitigation to reduce likelihood and consequences from flange leaks.**

- **The <u>final design</u> should include a piping flexibility and valve dynamic surge analysis to consider the impact forces caused by external (i.e., thermal cycling, equipment vibration) and internal conditions (i.e., hammer effects) when designing the nozzles and selecting the piping schedules for the ammonia system.**

- **The <u>final design</u> should include 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 required by 49 CFR 193, and should provide justification if not using an inert or non-flammable gas for clean-out, dry-out, purging, and tightness testing.**

- **The <u>final design</u> should provide the procedures for pressure/leak tests which address the requirements of ASME VIII and ASME B31.3.**

- **The <u>final design</u> should include the sizing basis and capacity for the flare stacks and the pressure and vacuum relief valves for major process equipment, vessels, and storage tanks.**

- **The <u>final design</u> of the ammonia relief valves should include a relief discharge collection header with knockout drum for safe discharge of ammonia vapors to the atmosphere. An evaluation of the vapor dispersion should be provided to demonstrate the ammonia vapors can be safely discharged to the atmosphere.**

- **The <u>final design</u> should include provisions to vent the heavy hydrocarbon iso-container to the flare system.**

- **The <u>final design</u> should provide a human error/reliability analysis. This analysis should include human machine interface considerations, fatigue prevention guidelines, alarm management, and healthy work environments (i.e., bright lighting, glare, eye strain) to increase operator awareness and reduce risk of hazardous conditions.**

- **The <u>final design</u> should provide appropriate operator camera coverage to enable rapid monitoring of the facility from the control room.**

- **The <u>final design</u> should include complete plan drawings of the security fencing and of facility access and egress.**

- **The <u>final design</u> should include an analysis of the structural integrity of the outer containment of the full containment storage tanks when exposed to a roof tank top fire or adjacent tank top fire.**

- **The <u>final design</u> should include the details of the LNG storage tank structural design that demonstrate the tanks can withstand overpressures from ignition of design spills.**

- **The <u>final design</u> should specify the forward pressure regulating valves PV-11001 and PV-11002 should be provided with an automatic shutoff activated interlock through PAHH-11004/5/6.**

- **The <u>final design</u> should specify isolation valves at the base of each loading arm.**

- **The <u>final design</u> should specify an automatic shutoff valve in the liquid line to the heavy hydrocarbon iso-container.**

- **The <u>final design</u> should specify double isolation valves at the suction and discharge of all ammonia pumps.**

- **The <u>final design</u> should specify that the ball valve upstream of the hose connection to the ammonia truck be a shutoff valve closed by local and remote actuation.**

- **The final design should specify that the Reboiler Steam Condensate Pot, V-1307, should have the same pressure rating as the 6C2 piping specification.**

- **Prior to commissioning, Magnolia should provide 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. Magnolia 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.**

- **Prior to commissioning, Magnolia should file plans and detailed procedures for: testing the integrity of on-site mechanical installation; functional tests; introduction of hazardous fluids; operational tests; and placing the equipment into service.**

- **Prior to commissioning, Magnolia should maintain a detailed training log to demonstrate that operating staff has completed the required training.**

- **Prior to commissioning, Magnolia should file results of the LNG storage tank hydrostatic test and foundation settlement results. At a minimum, foundation settlement results should be provided thereafter annually.**

- **Prior to commissioning, Magnolia should label piping with fluid service and direction of flow in the field in addition to the pipe labeling requirements of NFPA 59A.**

- **Prior to commissioning, Magnolia should tag all equipment, instrumentation and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves.**

- **Prior to commissioning, Magnolia should file a tabulated list and drawings of the proposed hand-held fire extinguishers. The list should include the equipment tag number, extinguishing agent type, capacity, number, and location. The drawings should show the extinguishing agent type, capacity, and tag number of all hand-held fire extinguishers.**

- **Prior to commissioning, Magnolia should file the operation and maintenance procedures and manuals, as well as safety procedures, hot work procedures and permits, abnormal operating conditions reporting procedures, and management of change procedures and forms.**

- **Prior to introduction of hazardous fluids, Magnolia should complete a prestartup safety review to ensure that installed equipment meets the design and operating intent of the facility. The prestartup 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.**

- **Prior to introduction of hazardous fluids, Magnolia should complete a firewater pump acceptance test and firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant should be shown on facility plot plan(s).**

- **Prior to introduction of hazardous fluids, Magnolia should complete all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the Distributed Control System and the Safety Instrumented System that demonstrate full functionality and operability of the system.**

- **Prior to introduction of hazardous fluids, Magnolia should specify the personal protective equipment required to minimize disabling of personnel from ammonia releases.**

- **Prior to commencement of service, Magnolia should include a preventative and predictive maintenance program that performs periodic or continuous equipment condition monitoring.**

- **Prior to commencement of service, Magnolia should develop procedures for off-site contractors' responsibilities, restrictions, and limitations and for supervision of these contractors by Magnolia staff.**

- **Prior to commencement of service, Magnolia should notify FERC staff of any proposed revisions to the security plan and physical security of the facility.**

- **Prior to commencement of service, Magnolia should file progress on the construction of the proposed systems in monthly reports filed with the Secretary. Details should include a summary of activities, problems encountered, contractor non-conformance/deficiency logs, remedial actions taken, and current project schedule. Problems of significant magnitude should be reported to the FERC within 24 hours.**

In addition, **we recommend that the following measures should apply throughout the life of the facility:**

- **The facility should be subject to regular FERC staff technical reviews and site inspections on at least an annual basis or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, Magnolia 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 piping and instrumentation diagrams reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, should be submitted.**

- **Semi-annual operational reports should be filed with the Secretary to identify changes in facility design and operating conditions, abnormal operating experiences, activities (including ship arrivals, quantity and composition of imported and exported LNG, and liquefied, boil-off/flash gas, etc.), plant modifications, including future plans and progress thereof. Abnormalities should include, but not be limited to: unloading/loading/shipping problems, potential hazardous conditions from off-site vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels,**

hazardous fluids releases, fires involving hazardous fluids and/or from other sources, negative pressure (vacuum) within a storage tank and higher than predicted boil-off rates. Adverse weather conditions and the effect on the facility also should be reported. Reports should be submitted 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)" also should be included in the semi-annual operational reports. Such information would provide FERC staff with early notice of anticipated future construction/maintenance projects at the LNG facility.

- **In the event the temperature of any region of any secondary containment, including imbedded pipe supports, becomes less than the minimum specified operating temperature for the material, the Commission should be notified within 24 hours and procedures for corrective action should be specified.**

- **Significant non-scheduled events, including safety-related incidents (e.g., hazardous fluid releases, fires, explosions, mechanical failures, unusual over pressurization, and major injuries) and security-related incidents (e.g., attempts to enter site, suspicious activities) should be reported to FERC staff. In the event an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification should be made immediately, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification should be made to FERC staff within 24 hours. This notification practice should be incorporated into the LNG facility's emergency plan. Examples of reportable hazardous fluids related incidents include:**

  a. **fire;**

  b. **explosion;**

  c. **estimated property damage of $50,000 or more;**

  d. **death or personal injury necessitating in-patient hospitalization;**

  e. **release of hazardous fluids for five 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 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 a facility that contains or processes hazardous fluids that constitutes an emergency;**

j. **inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;**

k. **any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20-percent reduction in operating pressure or shutdown of operation of a pipeline or a facility that contains or processes hazardous fluids;**

l. **safety-related incidents to hazardous material transportations 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, 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.

In addition to the final design review, we would conduct inspections during construction and would review additional materials, including quality assurance and quality control plans, nonconformance reports, and cooldown and commissioning plans, to ensure that the installed design is consistent with the safety and operability characteristics of the FEED. We would also conduct inspections during operation to ensure that the facility is operated and maintained in accordance with the filed design throughout the life of the facility. Magnolia would include a periodic inspection program to review the ammonia safety systems. We are recommending for Magnolia to provide more information on a predictive maintenance program that would periodically monitor the condition of process equipment. Based on our analysis and recommendations presented above, we believe that the FEED presented by Magnolia would include acceptable layers of protection or safeguards which would reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public.

4.12.4 LNG Facility Siting Requirements

The principal hazards associated with the substances involved in the liquefaction and storage of LNG result from cryogenic and flashing liquid releases, flammable and toxic vapor dispersion, vapor cloud ignition, pool fires, BLEVEs, and overpressures. As discussed in section 4.12.3, our FEED review indicates that sufficient layers of protection would be incorporated into the facility design to mitigate the potential for an initiating event to develop into an incident that could impact the safety of the off-site public. Siting of the facility with regard to potential off-site consequences is also required by the DOT's regulations in 49 CFR 193, Subpart B to ensure that impact to the public would be minimized. The Commission's regulations under 18 CFR 380.12(o)(14) require Magnolia to identify how the proposed design complies with the siting requirements of the DOT's regulations in 49 CFR 193, Subpart B. As part of our review, we used Magnolia's information, developed to comply with the DOT's regulations, to assess whether or not the facility would have a public safety impact. The Part 193 requirements state that an operator or government agency must exercise control over the activities that can occur within an "exclusion zone," defined as the area around an LNG facility that could be exposed to specified levels of thermal radiation or flammable vapor in the event of a release. Approved mathematical models must be used to calculate the dimensions of these exclusion zones. The 2001 edition of NFPA 59A, an industry consensus safety standard for the siting, design, construction, operation, maintenance, and security of LNG facilities, is incorporated into Part 193 by reference, with regulatory preemption in the event of conflict. The following sections of Part 193 specifically address the siting requirements applicable to each LNG container and LNG transfer system:

- Part 193.2001 (b)(3), Scope of part, excludes any matter other than siting provisions pertaining to marine cargo transfer systems between the marine vessel and the last manifold or valve immediately before a storage tank;

- Part 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;

- Part 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); and

- Part 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).

For the LNG facilities proposed for the project, these Part 193 siting requirements would be applicable to the following equipment:

- <u>Two 42,000,000 gallon (160,000 m^3) nominal full containment LNG storage tanks and associated piping and appurtenances</u> – Parts 193.2057 and 2059 require the establishment of thermal and flammable vapor exclusion zones for LNG tanks. NFPA 59A (2001), section 2.2.3.2 specifies three thermal exclusion zones based on the LNG container impounding area and one based on the LNG container design spill. NFPA 59A (2001), sections 2.2.3.3 and 2.2.3.4 specify a flammable vapor exclusion zone for the design spill which is determined with section 2.2.3.5.

- <u>One 30-inch-diameter LNG transfer line to the proposed ship loading dock</u> – Parts 193.2001, 2057, and 2059 require thermal and flammable vapor exclusion zones for the marine cargo transfer system. NFPA 59A (2001) does not address LNG transfer systems.

- <u>Six 11,007-gallon-per-minute in-tank pumps (three pumps per LNG storage tank) used for ship loading and associated piping and appurtenances</u> – Parts 193.2057 and 2059 require thermal and flammable vapor exclusion zones. NFPA 59A (2001) section 2.2.3.2 specifies the thermal exclusion zone and sections 2.2.3.3 and 2.2.3.4 specify the flammable vapor exclusion zone based on the design spills for containers and process areas.

- Eight liquefaction heat exchangers (two per liquefaction train) and associated piping and appurtenances, including eight 8-inch-diameter LNG rundown lines that combine into four 10-inch-diameter lines that further combine into one 20-inch-diameter LNG rundown header – Parts 193.2057 and 2059 require thermal and flammable vapor exclusion zones. NFPA 59A (2001) section 2.2.3.2 specifies the thermal exclusion zone and sections 2.2.3.3 and 2.2.3.4 specify the flammable vapor exclusion zone based on the design spills for containers and process areas.

Previous FERC environmental assessments/impact statements for past projects have identified inconsistencies and areas of potential conflict between the requirements in Part 193 and NFPA 59A (2001). Sections 193.2057 and 193.2059 require exclusion zones for each LNG container and LNG transfer system, and an LNG transfer system is defined in section 193.2007 to include cargo transfer system and transfer piping (whether permanent or temporary). However, NFPA 59A (2001) requires exclusion zones only for "transfer areas," which is defined as the part of the plant where the facility introduces or removes the liquids, such as truck loading or ship-unloading areas. The NFPA 59A (2001) definition does not include permanent plant piping, such as cargo transfer lines. Section 2.2.3.1 of NFPA 59A (2001) also states that transfer areas at the water edge of marine terminals are not subject to the siting requirements in that standard.

The DOT has addressed some of these issues in a March 2010 letter of interpretation.[29] In that letter, the DOT stated that: (1) the requirements in the NFPA 59A (2001) for transfer areas for LNG apply to the marine cargo transfer system at a proposed waterfront LNG facility, except where preempted by the regulations in Part 193; (2) the regulations in Part 193 for LNG transfer systems conflict with NFPA 59A (2001) on whether an exclusion zone analysis is required for transfer piping or permanent plant piping; and (3) the regulations in Part 193 prevailed as a result of that conflict. The DOT has determined that an exclusion zone analysis of the marine cargo transfer system is required.

In FERC environmental assessments/impact statements for past projects, we have also noted that when the DOT incorporated NFPA 59A into its regulations, it removed the regulation that required impounding systems around transfer piping. As a result of that change, it is unclear whether Part 193 or the adopted sections of NFPA 59A (2001) require impoundments for LNG transfer systems. We note that Part 193 requires exclusion zones for LNG transfer systems, and that those zones were historically calculated based on impoundment systems. We also note that the omission of containment for transfer piping is not a sound engineering practice. For these reasons, we consider it prudent design practice to provide containment for all LNG transfer piping within a plant's property lines.

As stated in section 193.2051, LNG facilities must be provided with the siting requirements of NFPA 59A (2001 edition). The siting requirements for hazardous fluids within an LNG facility are contained in NFPA 59A, Chapter 2:

- NFPA 59A (2001 edition) section 2.1.1 requires consideration of clearances between flammable refrigerant storage tanks, flammable liquid storage tanks, structures and plant equipment, both with respect to plant property lines and each other. This section also requires that other factors applicable to the specific site that have a bearing on the safety of plant personnel and surrounding public be considered, including an evaluation of potential incidents and safety measures incorporated in the design or operation of the facility.

[29] PHMSA Interpretation "Re: Application of the Siting Requirements in Subpart B of 49 CFR Part 193 to the Mount Hope Bay Liquefied Natural Gas Transfer System" (March 25, 2010).

- NFPA 59A (2001 edition) section 2.2.2.2 requires impoundments serving flammable refrigerants or flammable liquids to contain a 10-minute spill of a single accidental leakage source or during a shorter time period based upon demonstrable surveillance and shutdown provisions acceptable to the DOT. In addition, NFPA section 2.2.2.5 requires impoundments and drainage channels for flammable liquid containment to conform to NFPA 30, Flammable and Combustible Liquids Code.

- NFPA 59A (2001 edition) 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 BTU/ft^2-hr from reaching beyond a property line that can be built upon. The distance to this flux level is to be calculated with LNGFIRE or using models that have been validated by experimental test data appropriate for the hazard to be evaluated and that are acceptable to the DOT.

- NFPA 59A (2001 edition) 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 alternative models that take into account physical factors influencing LNG vapor dispersion. Alternative models must have been validated by experimental test data appropriate for the hazard to be evaluated and must be acceptable to the DOT. NFPA 59A (2001 edition) section 2.2.3.5 requires the design spill for impounding areas serving vaporization and process areas to be based on the flow from any single accidental leakage source.

For the following liquefaction facilities that are proposed for the project, the refrigerant siting requirements from Part 193 and NFPA 59A (2001 edition) would be applicable to the following equipment:

- eight liquefaction heat exchangers (two per liquefaction train) and associated piping and appurtenances;

- one 5,945-gallon ethane ISO Frame (in 10-tube cylinder bank) and associated piping;

- one 6,500-gallon n-butane ISO container and associated piping; and

- one 6,500-gallon heavy hydrocarbon liquids ISO container and associated piping.

Furthermore on January 13, 2015, the DOT determined Magnolia's proposal to comply with the EPA's RMP and OSHA's PSM would satisfy the requirements of NFPA 59A (2001) section 2.1.1(d) for the anhydrous ammonia refrigerant system.[30]

4.12.5 LNG Facility Siting Analysis

Suitable sizing of impoundment systems and selection of design spills on which to base hazard analyses are critical for establishing an appropriate siting analysis. Although impoundment capacity and design spill scenarios for storage tank impoundments are well described by Part 193, a clear definition for other impoundments is not provided either directly by the regulations or by the adopted sections of NFPA 59A (2001). 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

[30] Accession number: 20150121-5190.

accidental leakage source during a 10-minute period or during a shorter time period based upon demonstrable surveillance and shutdown provisions acceptable to the DOT. However, no definition of single accidental leakage source is provided in the regulations.

We consider it prudent design practice to size impoundments based on the greatest flow capacity from a single pipe for 10 minutes, recognizing that different spill scenarios may be used for the single accidental leakage sources for the hazard calculations required by Part 193. A similar approach is used with impoundments for process vessels, where the impoundments should be able to contain the contents of the largest process vessel served while smaller design spills may be appropriate for Part 193 calculations.

4.12.5.1 Impoundment Sizing

Part 193.2181 references NFPA 59A (2001) for siting, which specifies 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. We also consider it prudent design practice to provide a barrier to prevent liquid from flowing to an unintended area (i.e., outside the plant property) in the event that the full containment storage tank primary and secondary containers have a common cause failure. The purpose of the barrier is to prevent liquid from flowing off the plant property, and does not define containment or an impounding area for thermal radiation or flammable vapor exclusion zone calculations or other code requirements already met by sumps and impoundments throughout the site.

Table 4.12.5-1 lists the spill volumes and their corresponding impoundment systems. Magnolia proposes two full containment LNG storage tanks where the outer tank wall would serve as the impoundment system. The proposed LNG storage tanks would have a design maximum volume of 44,442,844 gallons with a maximum potential capacity of 45,835,387 gallons. As shown in table 4.12.5-1, the outer tank would have a volumetric capacity of 52,687,046 gallons, which exceeds the 110 percent requirement by 3,799,918 gallons. The outer tank would contain 119 percent of the design maximum volume and 115 percent of the maximum potential capacity of the inner tank, meeting the Part 193 requirements. Magnolia would construct an earthen berm around both of the LNG storage tanks to limit liquid from flowing off the plant property in the case of a common cause failure of the existing full containment storage tank primary and secondary containers. This earthen berm would have a minimum containment capacity equal to the gross volume of one LNG tank and would meet our recommendation that a barrier be provided to prevent liquid from flowing off plant property.

Potential spills occurring from the LNG Tank withdrawal lines, ship transfer lines, LNG trucking lines, LNG rundown lines, and associated pumps, vessels, equipment, piping and appurtenances located within the earthen berm would drain toward trenches and would be directed to the LNG Tank Area Impound Basin. The LNG Tank Area Impound Basin would be a square impoundment, 75-feet-long, 75-feet-wide, and 15-feet-deep, with a usable capacity of approximately 631,169 gallons. Each LNG storage tank would be equipped with three in-tank pumps, each rated at 11,007 gallons per minute with a maximum runout flow rate of 14,578 gallons per minute. With four in-tank pumps utilized for ship loading operations, the maximum 10-minute spill volume from the 30-inch-diameter in-tank pump header would be 583,116 gallons. Any volume contained within the piping after 10 minutes would also be contained within the LNG Tank Area Impound Basin.

TABLE 4.12.5-1 **Impoundment Area Sizing**			
Source	Spill Size (gallons)	Impoundment System	Impoundment Size (gallons)
LNG storage tank	45,835,387	Outer tank concrete wall	52,687,046
30-inch-diameter in-tank pump withdrawal header	583,116	LNG tank area impound basin	631,169
10-inch-diameter LNG rundown line (process area)	14,196	Process area impound basin	21,843
12-inch-diameter HP ammonia receiver discharge line	18,367	Process area impound basin	21,843
16-inch-diameter ammonia/mixed refrigerant precooler discharge line	21,843	Process area impound basin	21,843
LNG truck	12,500	LNG truck loading impound basin	16,831
3-inch LNG truck loading line	2,683	LNG truck loading impound basin	16,831
n-Butane ISO container	6,500	Process area impound basin	21,843
Heavy hydrocarbon liquids ISO container	6,500	Process area impound basin	21,843
Lean amine tank	3,800	Module 1 curbed area	23,665
Liquid nitrogen tank	44,000	Module 5 curbed area	68,663

Potential spills occurring in the liquefaction area would drain toward trenches and would be directed to the Process Area Impound Basin. The Process Area Impound Basin would be a square impoundment, 20-feet-long, 20-feet-wide, and 7.3-feet-deep, with a usable capacity of approximately 21,843 gallons. This impoundment would contain the largest 10-minute LNG spill volume of 14,196 gallons from the 10-inch-diameter LNG rundown line, the largest 10-minute ammonia spill volume of 18,367 gallons from the 12-inch-diameter HP Ammonia Receiver discharge line, and the largest mixed refrigerant 10-minute spill volume of 21,843 gallons from the 16-inch-diameter Ammonia/Mixed Refrigerant Precooler discharge line.

Potential spills occurring from LNG truck loading lines and associated pumps, vessels, equipment, piping and appurtenances located outside the earthen berm would drain toward trenches and would be directed to the LNG Truck Loading Impound Basin. The LNG Truck Loading Impound Basin would be square impoundment, 15-feet-long, 15-feet-wide, and 10-feet-deep, with a usable capacity of approximately 16,831 gallons. This volume capacity would hold the entire contents of a full LNG truck (approximately 12,500 gallons) as well as a 10-minute spill volume of 2,683 gallons from the 3-inch-diameter truck loading line.

The refrigerant storage area would be located to the north of liquefaction Train 1. Ethane would be stored as a high pressure gas in a 10 tube cylinder bank in an ISO Frame with a nominal volume of 5,945 gallons. n-Butane would be stored as compressed liquid within IMO 5 type ISO containers with a volume of 6,500 gallons. The ISO Frame and ISO container would be located within a 25-feet-long by 100-feet-wide curbed area that would connect via a sloped trench to the 21,843-gallon Process Area Impound Basin.

Magnolia proposes to vaporize the heavy hydrocarbon liquids and mix it with fuel gas powering the Auxiliary Boiler. In the event the vaporizer is out of service, temporary storage for the heavy hydrocarbons would be provided by a 6,500 gallon Heavy Hydrocarbon Liquids ISO Container. This ISO container would be located within an 18-feet-long by 38-feet-wide curbed area that would connect via a sloped trench to the 21,843 gallon Process Area Impound Basin.

The amine systems as well as the 3,800 gallon Lean Amine Tank would be installed within module 1 of each train. Any liquid amine released from the amine process or the Lean Amine Tank would be contained within an irregularly shaped 6-inch curbed area in module 1. This curbed area would have a containment volume of approximately 23,665 gallons. Nitrogen piping as well as a 44,000 gallon Liquid Nitrogen Tank would be installed within module 5 of each train. A liquid nitrogen release would be contained within the irregularly shaped 6-inch curbed area in module 5. This curbed area would have a containment volume of approximately 68,663 gallons.

4.12.5.2 Design Spills

Design spills are used in the determination of the hazard calculations required by Part 193. Prior to the incorporation of NFPA 59A in 2000, the design spill in Part 193 assumed the full rupture of "a single transfer pipe which has the greatest overall flow capacity" for not less than 10 minutes (old Part 193.2059(d)). With the adoption of NFPA 59A, the basis for the design spill for impounding areas serving only vaporization, process, or LNG transfer areas became the flow from any single accidental leakage source. Neither Part 193 nor NFPA 59A (2001) defines "single accidental leakage source."

In a letter to FERC staff, dated August 6, 2013, the DOT requested that LNG facility applicants contact the Office of Pipeline Safety's Engineering and Research Division regarding the Part 193 siting requirements.[31] Specifically, the letter stated that the DOT required a technical review of the applicant's design spill criteria for single accidental leakage sources on a case-by-case basis to determine compliance with Part 193.

In response, Magnolia provided the DOT with their design spill criteria and identified leakage scenarios for the proposed equipment. The DOT reviewed the data and methodology that Magnolia used to determine the single accidental leakage sources for the design spills based on the flow from various leakage sources including piping, containers, and equipment containing LNG, refrigerants, and other hazardous fluids. Magnolia's methodology considers the failure probability of over 700 piping segments, valves, hose connections, and process vessels containing hazardous fluids for the purpose of selecting credible design spills using a list of nominal failure rates developed by FERC staff and presented by the DOT on its webpage for "LNG Facility Siting" (http://primis.phmsa.dot.gov/lng/index.htm).

NFPA 59A, section 2.1.1 requires consideration of clearances between flammable refrigerant storage tanks, flammable liquid storage tanks, structures and plant equipment, both with respect to plant property lines and each other. This section also requires that other factors applicable to the specific site that have a bearing on the safety of plant personnel and surrounding public be considered, including an evaluation of potential incidents and safety measures incorporated in the design or operation of the facility. Other factors include toxic releases and overpressure considerations from ignition of a flammable vapor cloud.

Initially, the DOT also evaluated ammonia spills as part of their design spill review. While the DOT's Part 193 and NFPA 59A address the flammable hazards of process fluids, these regulations do not have the same level of siting requirements for toxic hazards associated with a release from the ammonia refrigeration system. As discussed in section 4.12.2.1, ammonia is a toxic gas under ambient conditions and exposure to ammonia vapors could be hazardous to human health and result in death if inhaled at high concentrations. Magnolia's proposed design would consist of four liquefaction trains, each containing approximately 140,000 pounds of ammonia. As this quantity would exceed the 10,000 pound threshold listed under 40 CFR §68.130 and 29 §CFR 1910.119 App A, both the EPA and OSHA have asserted jurisdiction over the regulatory requirements governing the ammonia refrigeration system. Furthermore, on January 13, 2015, the DOT determined that Magnolia's compliance with the EPA's RMP and OSHA's

[31] August 6, 2013 Letter from Kenneth Lee, Director of Engineering and Research Division, Office of Pipeline Safety to Terry Turpin, LNG Engineering and Compliance Branch, Office of Energy Projects. Filed in Docket Number PF13-9-000 on August 13, 2013. Accession Number 20130813-4017.

PSM would satisfy the requirements of NFPA 59A (2001) section 2.1.1(d) for the anhydrous ammonia refrigerant system.

Under the EPA's RMP, Magnolia would be required to evaluate a worst-case release as well as alternative release scenarios. The EPA has defined (40 CFR §68.3) a worst-case release as the release of the largest quantity of a regulated substance from a vessel or process line (pipe) failure that results in the greatest distance to a specified endpoint. Magnolia selected a 10-minute release from the largest ammonia containing vessel, the Mixed Refrigerant/Ammonia Precooler, as the worst-case scenario. Alternative release scenarios are scenarios that are more likely to occur than the worst case scenario. As directed under 40 CFR §68.28, Magnolia selected three releases scenarios: a failure of the ammonia unloading hose, a leak from high pressure ammonia piping, and a leak from the intermediate pressure ammonia piping.

On September 17, 2014, the DOT provided a letter to FERC staff stating that the DOT had no objection to Magnolia's methodology for determining the single accidental leakage sources for candidate design spills to be used in establishing the Part 193 siting requirements for the proposed LNG liquefaction facilities.[32, 33] The design spills produced by this method were identified in the documents reviewed by the DOT and have been filed in the FERC docket for this project. These are the same design spills described in the following sections.

The DOT's conclusions on the candidate design spills used in the siting calculations required by Part 193 was based on preliminary design information which may be revised as the engineering design progresses. If the Magnolia's design or operation of the proposed facility differs from the details provided in the documents on which the DOT based its review, then the facility may not comply with the siting requirements of Part 193. As a result, **we recommend that:**

- **<u>Prior to the construction of the final design</u>, Magnolia file with the Secretary, for review and written approval by the Director of OEP, certification that the final design is consistent with the information provided to the DOT as described in the design spill determination letter dated September 17, 2014 (Accession Number 20140918-4009). In the event that any modifications to the design alter the candidate design spills on which the 49 CFR 193 siting analysis was based, Magnolia should consult with the DOT on any actions necessary to comply with Part 193.**

As design spills vary depending on the hazard (vapor dispersion, overpressure, or radiant heat), the specific design spills used for project's siting analysis are discussed under "Vapor Dispersion Analysis," "Overpressure Analysis," and "Thermal Radiation Analysis."

4.12.5.3 Vapor Dispersion Analysis

As discussed in section 4.12.2, a release may form a toxic or flammable cloud depending on the material released. A large quantity of flammable material released without ignition would form a flammable vapor cloud that would travel with the prevailing wind until it either dispersed below the flammable limit or encountered an ignition source. In order to address these hazards, 49 CFR §193.2051 and 193.2059 require vapor dispersion evaluation of potential incidents and exclusion zones in accordance with applicable sections of NFPA 59A (2001). NFPA 59A, section 2.1.1 requires consideration of clearances between flammable refrigerant storage tanks, flammable liquid storage tanks,

[32] September 17, 2014 Letter "Re: Magnolia LNG, LLC, FERC Docket No. CP14-347-000, Design Spill Determination" from Kenneth Lee to Rich McGuire. Filed in Docket Number CP14-347-000 on September 18, 2014. Accession Number 20140918-4009.

[33] PHMSA based this decision on the following documents: (1) April 30, 2014 initial submittal to FERC/PHMSA, FERC Accession Numbers 20140430-5336, -5337, and -5338; (2) Supplemental submission on June 25, 2014, FERC Accession Numbers 20140625-5092, -5093, and -5094; and (3) Supplemental submission on September 16, 2014, FERC Accession Numbers 20140916-5181, and -5182.

structures and plant equipment, both with respect to plant property lines and each other. This section also requires that other factors applicable to the specific site that have a bearing on the safety of plant personnel and surrounding public be considered, including an evaluation of potential incidents and safety measures incorporated in the design or operation of the facility. NFPA 59A section 2.2.3.4 also 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. Taken together, Part 193 and NFPA 59A (2001) require that flammable vapors either from an LNG tank impoundment or a single accidental leakage source do not extend beyond a facility property line that can be built upon and that other potential incidents (e.g., toxic releases) must also be considered.

Title 49 CFR §193.2059 requires that dispersion distances be calculated for a 2.5 percent average gas concentration (one-half the LFL of LNG vapor) under meteorological conditions which result in the longest downwind distances at least 90 percent of the time. Alternatively, maximum downwind distances may be estimated for stability Class F, a wind speed of 4.5 mph, 50 percent relative humidity, and the average regional temperature. Similar factors to account for model uncertainty (i.e., one-half the LFL of other flammable materials and one half the AEGL of toxic materials) and parameters (i.e., F stability, 2 m/s wind speed, 50 percent relative humidity, average regional temperature, and 0.03 m surface roughness) have also been specified for other hazardous fluids.

The regulations in Part 193 specifically approve the use of two models for performing these dispersion calculations, DEGADIS and FEM3A. In October 2011, two additional dispersion models were approved by the DOT for use in vapor dispersion exclusion zone calculations: PHAST-UDM Version 6.6 and Version 6.7 (submitted by Det Norske Veritas) and FLACS Version 9.1 Release 2 (submitted by GexCon). PHAST 6.7 and FLACS 9.1, with their built-in source term models, were used to calculate dispersion distances. In addition, the EPA and NOAA have developed a software program, RMP*Comp, to calculate the estimated distance to the toxic endpoint associated with ERPG-2 for the worst case scenario and each alternative release scenario. Magnolia has utilized RMP*Comp to calculate the toxic endpoints for each ammonia release scenario.

As discussed under “Design Spills” in section 4.12.5.2, failure scenarios must be selected as the basis for the Part 193 dispersion analyses. Process conditions at the failure location would affect the resulting vapor dispersion distances. In determining the spill conditions for these leakage sources, process flow diagrams for the proposed design, used in conjunction with the heat and material balance information (i.e., flow, temperature, and pressure), can be used to estimate the flow rates and process conditions at the location of the spill. In general, higher flow rates would result in larger spills and longer dispersion distances; higher temperatures would result in higher rates of flashing; and higher pressures would result in higher rates of jetting and aerosol formation. Therefore, two scenarios may be considered for each design spill:

- the pressure in the line is assumed to be maintained by pumps and/or hydrostatic head to produce the highest rate of flashing and jetting (i.e., flashing and jetting scenario); and

- the pressure in the line is assumed to be depressurized by the breach and/or emergency shutdowns to produce the highest rate of liquid flow within a curbed, trenched, or impounded area (i.e., liquid scenario).

Alternatively, a single scenario for each design spill could be selected if adequately supported with an assessment of the depressurization calculations and/or an analysis of process instrumentation and shutdown logic acceptable to the DOT.

In addition, the location and orientation of the leakage source must be considered. The closer a leakage source is to the property line, the higher the likelihood that the vapor cloud would extend off site. As most flashing and jetting scenarios would not have appreciable liquid rainout and accumulation, the siting of impoundment systems would be driven by liquid scenarios, while siting of piping and other remaining portions of the plant would be driven by flashing and jetting scenarios.

Magnolia reviewed multiple releases for the liquid scenarios and for the flashing and jetting scenarios. Magnolia used the following conditions, corresponding to 49 CFR §193.2059, for the vapor dispersion calculations: ambient temperature of 69.2 °F, relative humidity of 50 percent, atmospheric stability class of F and a ground surface roughness of 0.03 m. In addition, a sensitivity analysis to the wind speed and direction was provided to demonstrate the longest predicted downwind dispersion distance in accordance with the PHAST and FLACS Final Decisions. For ammonia release scenarios, RMP*Comp assumes an ambient temperature of 77 °F and 50 percent relative humidity.

For scenarios modeled using FLACS, Magnolia accounted for the facility geometry, including the impoundment and trench geometry details as established by available plant layout drawings. The plant geometry accounts for any on-site wind channeling that could occur and allows for inclusion of mitigation measures, such as vapor barriers. The releases were initiated after sufficient time had passed in the model simulations to allow the wind profile to stabilize from effects due to the presence of buildings and other on-site obstructions. PHAST and RMP*Comp account for surface/ground roughness, but do not account for the effects of obstructions (e.g., structures) on the flow field in simulating vapor dispersion. Excluding obstructions will generally over-predict the hazard area for vapor dispersion and overpressures. The endpoints specified within RMP*Comp for each toxic substance are intended to be protective of the general public.

Vapor Dispersion Design Spill Analyses for LNG

As required by 49 CFR 193, design spills from containers with over the top withdrawal lines and no bottom penetrations should be the largest flow from the container (i.e., storage tank) withdrawal pumps for a 10-minute duration at full-rated capacity.[34] Design spills from process areas should be single accidental leakage sources for a 10-minute duration.

Magnolia used the failure rate methodology discussed in section 4.12.5.2 to select the following design spills: a guillotine rupture and a 2-inch-diameter hole in the 30-inch-diameter LNG in-tank withdrawal header, a guillotine rupture and a 2-inch-diameter hole in the 10-inch-diameter LNG rundown line, and a guillotine rupture and a 2-inch-diameter hole in the 3-inch-diameter LNG truck loading line. However, Magnolia's design spill methodology did not account for full guillotine ruptures of connections less than 6 inches in diameter. Since the issuance of the letter by the DOT approving the design spill methodology, the DOT has expressed that connections less than 6 inches in diameter should be considered. Therefore, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Magnolia should file with the Secretary concurrence from the DOT as to whether full guillotine ruptures of connections less than 6 inches in diameter should be considered for LNG design spills.**

[34] 49 CFR 193.2059 incorporates by reference table 2.2.3.5 of NFPA 59A (2001 edition).

Magnolia proposes to install two sets of vapor barriers in order to control vapor clouds and limit the extent of the vapor dispersion zones: an outer set of 30-feet tall barriers placed along the property boundaries, and an inner set of 10-feet tall barriers located closer to the liquefaction trains and other potential release locations, as shown in figure 4.12.5-1. In order to ensure that the vapor barriers are maintained throughout the life of the facility, **we recommend that:**

- **<u>Prior to construction of the final design,</u> Magnolia should file with the Secretary, for review and written approval by the Director of OEP, the procedures to maintain and inspect the vapor barriers provided to meet the siting provisions of 49 CFR §193.2059. This information should be filed a minimum of 30 days before approval to proceed is requested.**

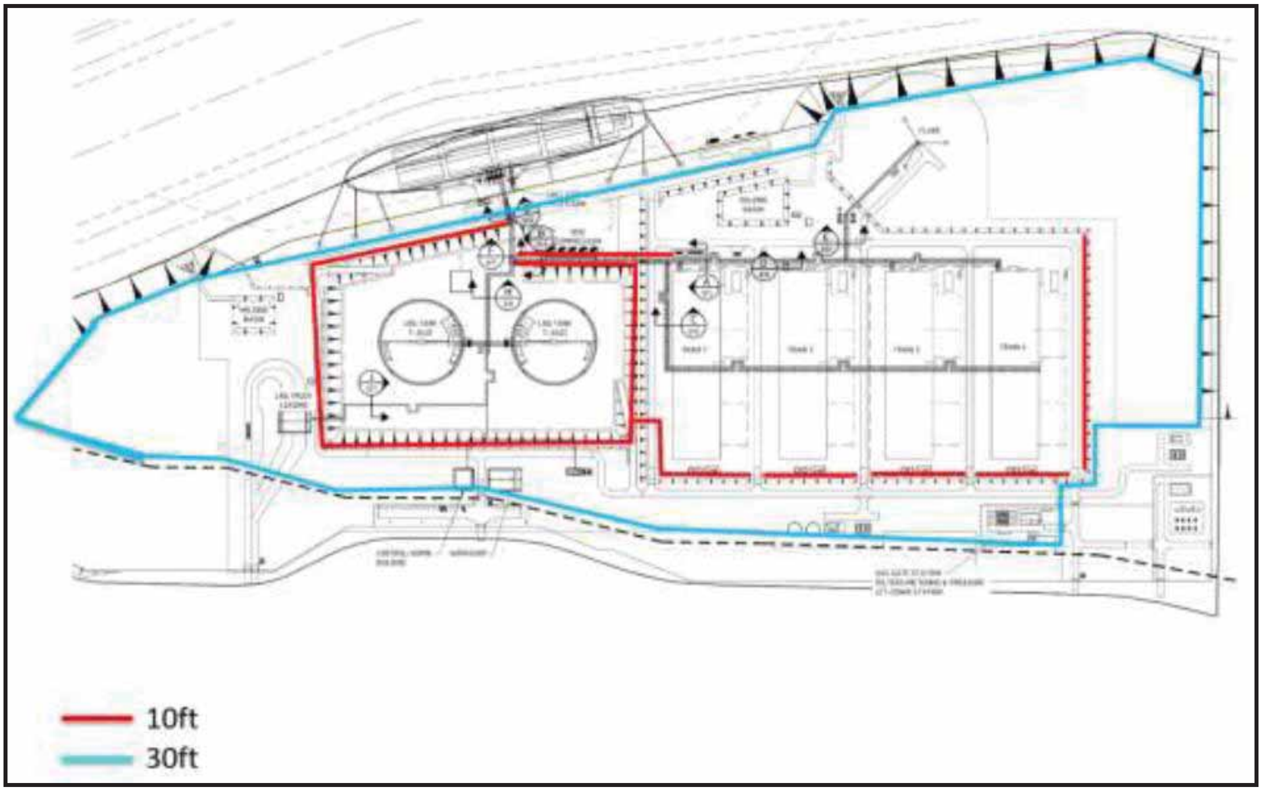


Figure 4.12.5-1   Vapor Barrier Locations

Magnolia's submitted simulations included different release directions, wind speeds, and wind directions. Figures 4.12.5-2 to 4.12.5-8 show the FLACS results to the longest ½-LFL vapor clouds for LNG liquid release scenarios and jetting and flashing scenarios from the LNG storage tanks area, liquefaction area, and LNG trucking area. Table 4.12.5-2 summarizes the LNG release scenarios from the LNG storage tank area and liquefaction area.

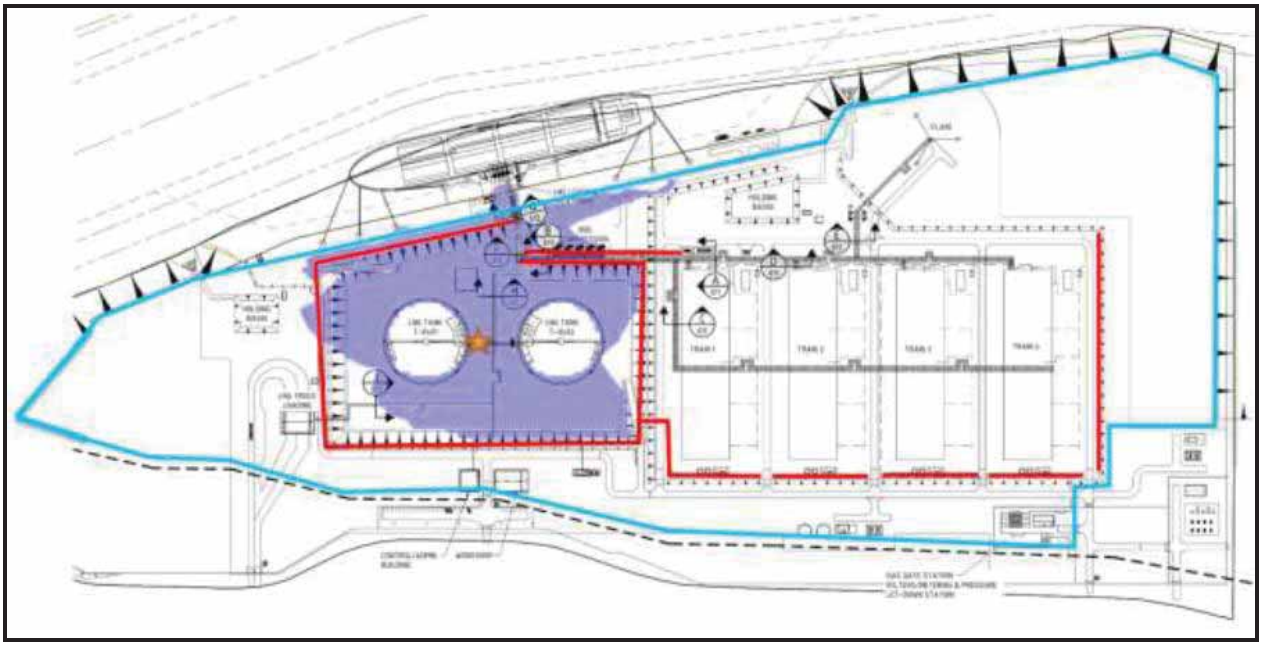


Figure 4.12.5-2 LNG Release from a Guillotine Rupture of the In-tank Pump Header

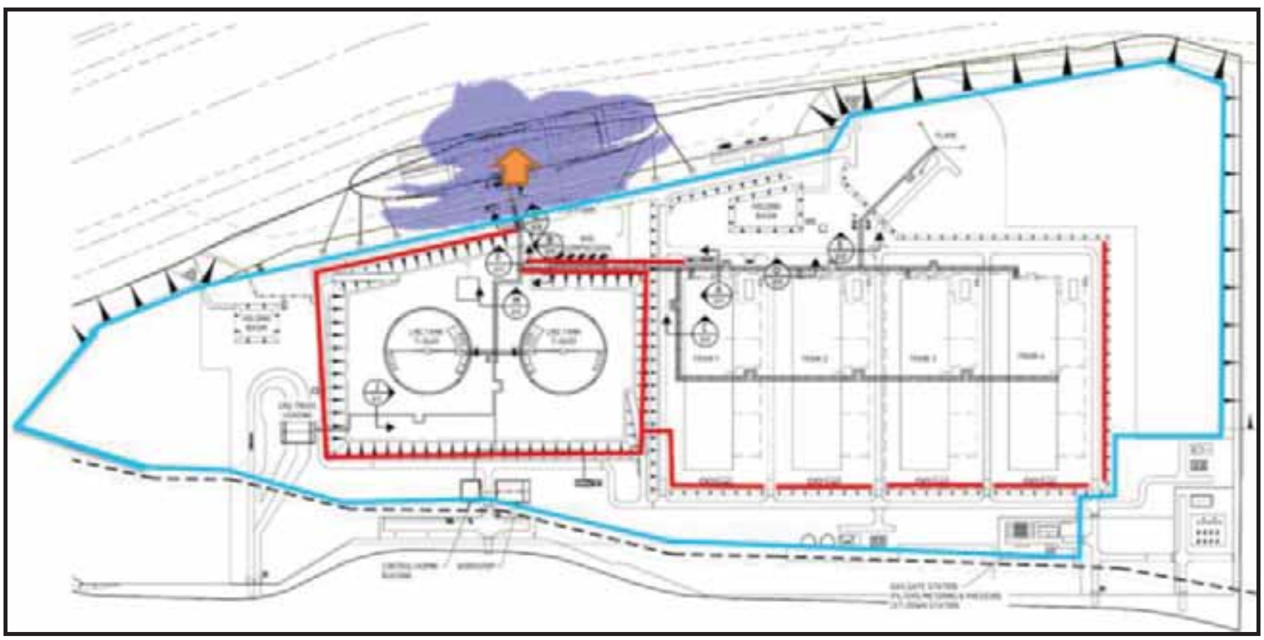


Figure 4.12.5-3 LNG Jetting and Flashing Scenario from the In-tank Pump Header at Dock

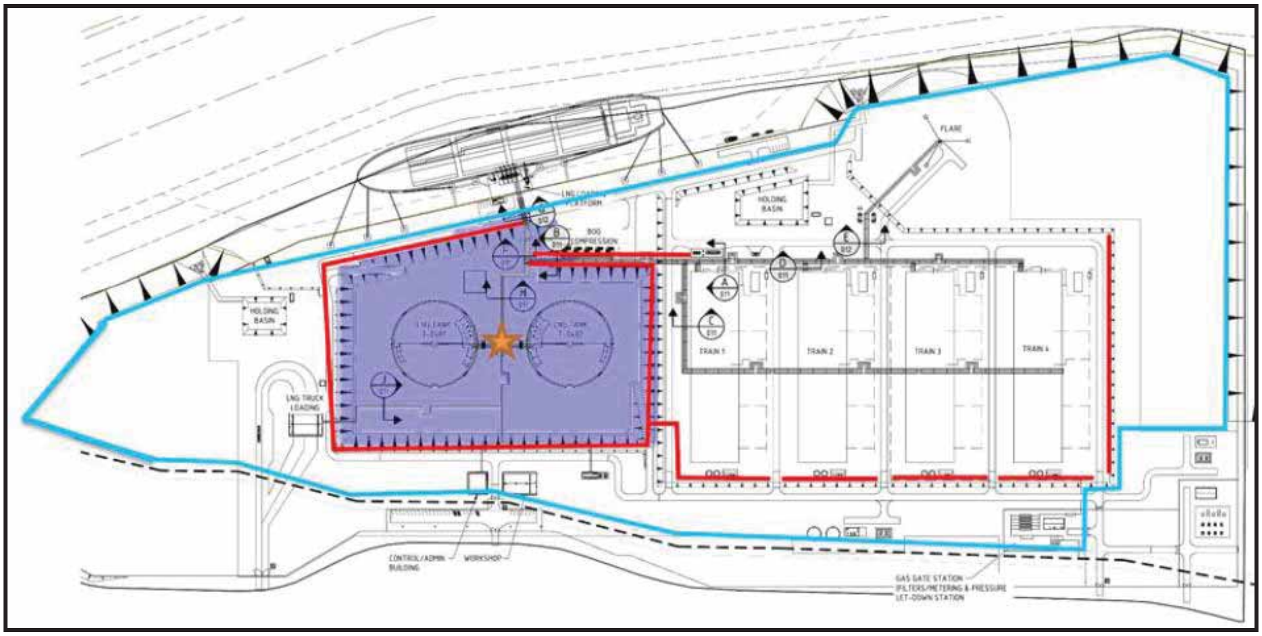


Figure 4.12.5-4 LNG Release from the LNG Rundown Line in the Tank Area

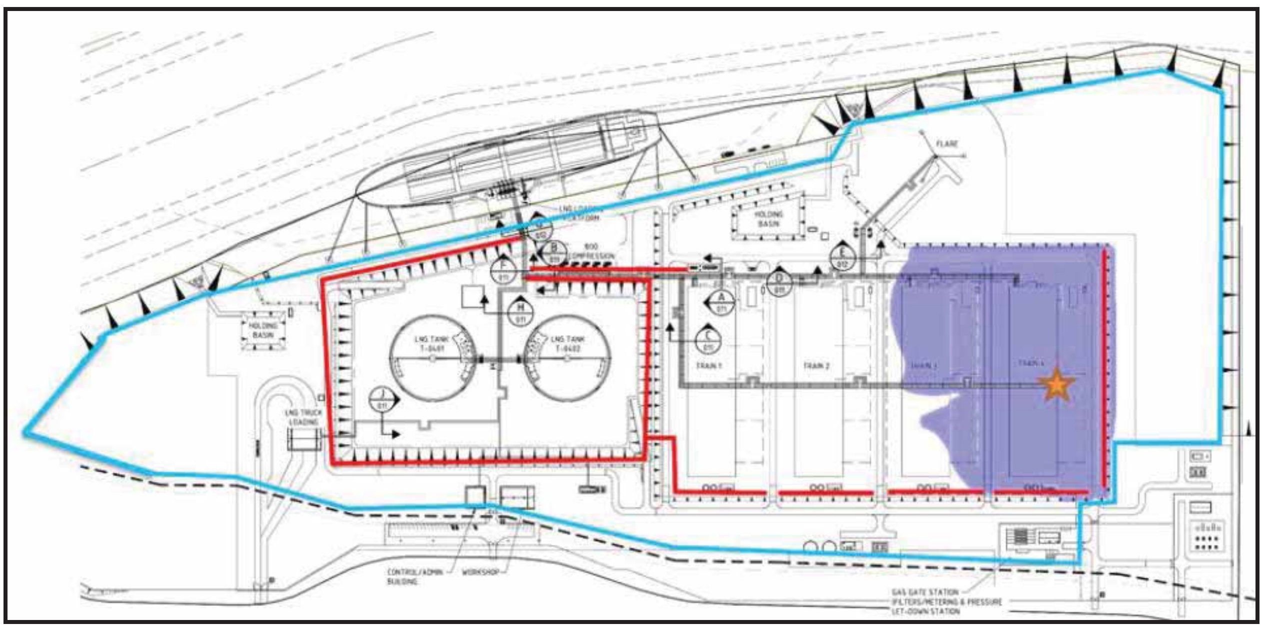


Figure 4.12.5-5 LNG Release from the LNG Rundown Line in the Liquefaction Area

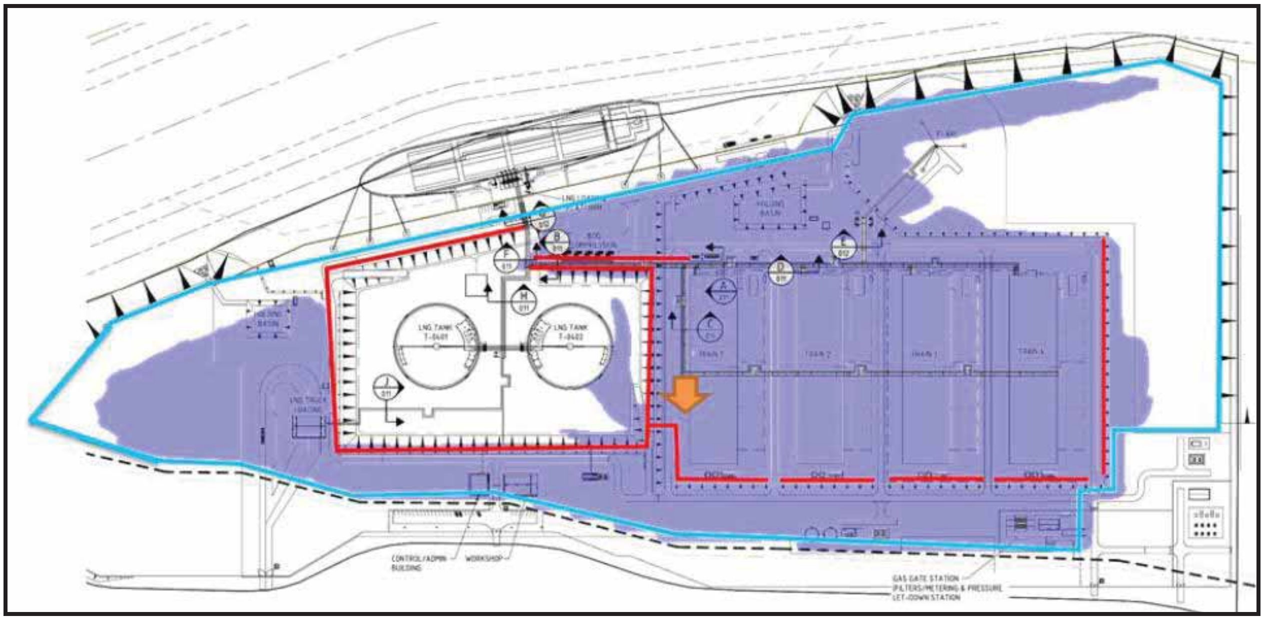


Figure 4.12.5-6   LNG Jetting and Flashing Scenario from the LNG Rundown Line

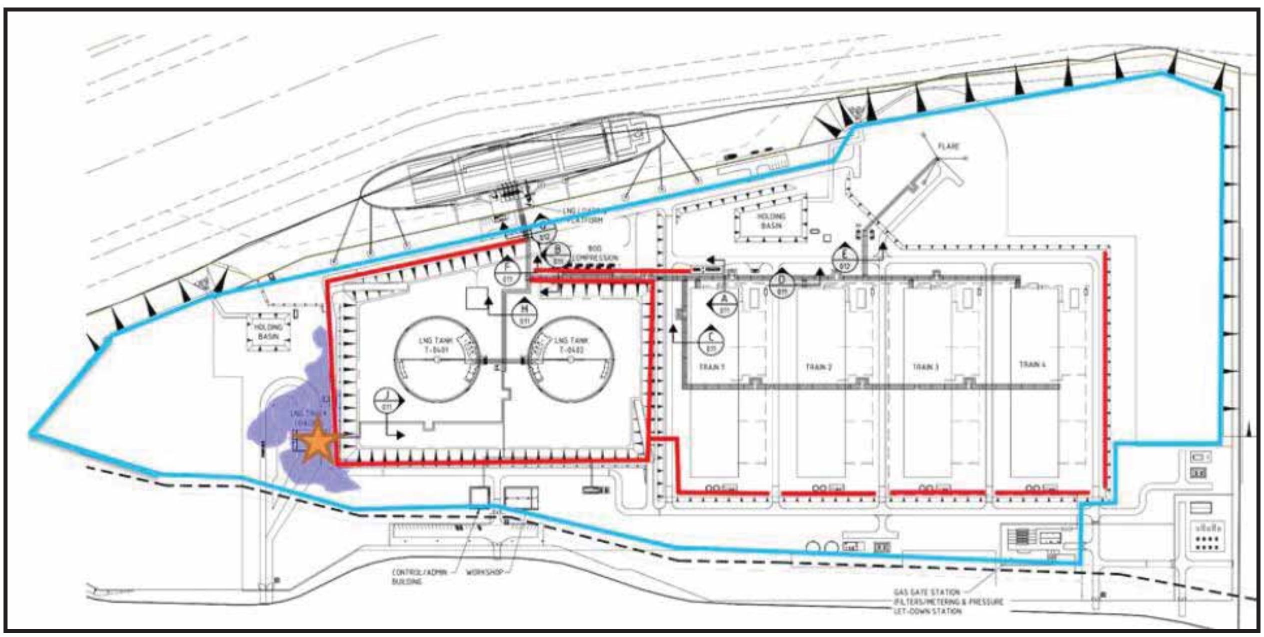


Figure 4.12.5-7   LNG Release from the LNG Truck Loading Line

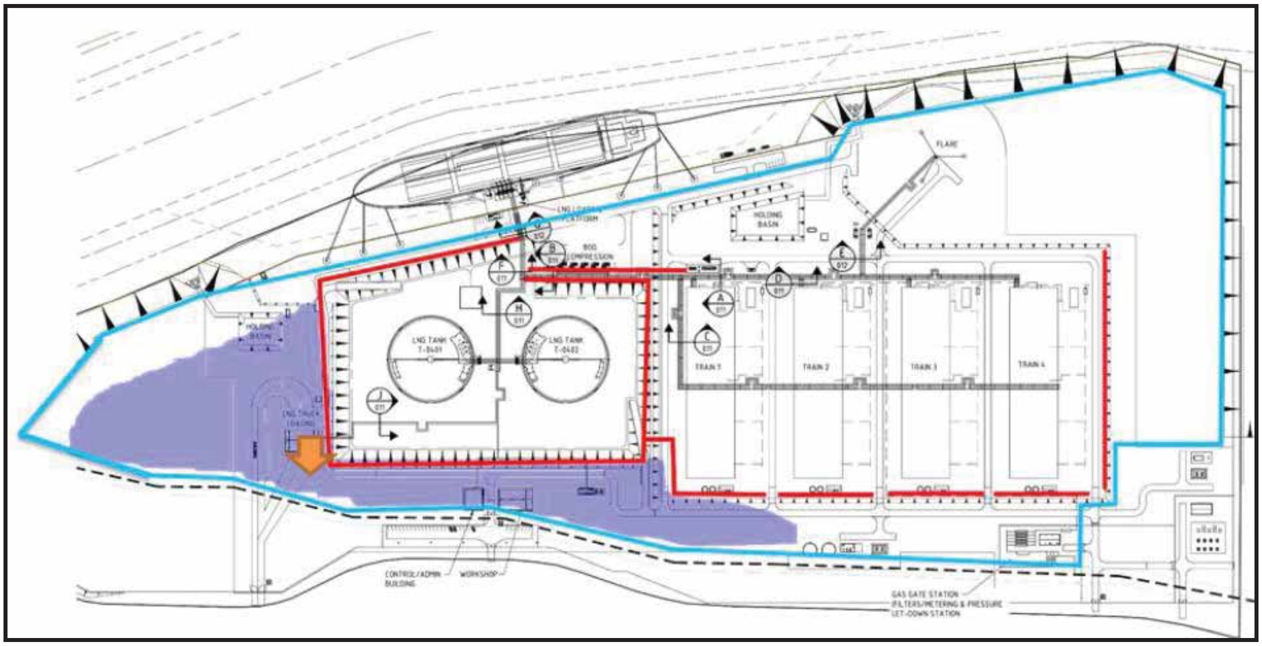


Figure 4.12.5-8 LNG Jetting and Flashing Scenario from the LNG Truck Loading Line

TABLE 4.12.5-2

LNG Design Spills

Scenario Type	Location	Hole Diameter	Pressure (psig)	Temperature (°F)	Flow Rate (lb/hr)
Liquid Release	In-tank Pump Withdrawal Header	30-inch guillotine	57.8	-262.2	9,722,286
Jetting and Flashing	In-tank Pump Withdrawal Header	2-inch	57.8	-262.2	174,606[a]
Liquid Release	LNG Rundown Line	10-inch guillotine	108.6	-242.3	605,750
Jetting and Flashing	LNG Rundown Line	4-inch	108.6	-242.3	609,534[a]
Liquid Release	LNG Truck Loading Line	3-inch guillotine	57.8	-254.6	46,257
Jetting and Flashing	LNG Truck Loading Line	2-inch	57.8	-254.6	84,128[a]

[a] Flow rates through hole approximated using orifice equation.

With four in-tank pumps running in parallel at their maximum pump runout, the maximum flow rate from the LNG storage tank withdrawal line would be 58,312 gallons per minute. FLACS was used to predict the extent of the ½-LFL vapor cloud from a guillotine rupture of the 30-inch-diameter in-tank pump withdrawal header (i.e., liquid scenario). For the jetting and flashing scenario from this piping segment, Magnolia also used FLACS to perform a vapor dispersion analysis from a 2-inch-diameter hole on the in-tank pump withdrawal header at the marine loading berth. As shown in figures 4.12.5-2 and 4.12.5-3, the FLACS modeling shows that the flammable vapor cloud would remain within Magnolia's property.

The LNG rundown lines would deliver LNG product from the Main Cryogenic Heat Exchangers to the LNG storage tanks. FLACS was used to predict the extent of the ½-LFL vapor cloud from a guillotine rupture of the 10-inch-diameter LNG rundown header from each train (i.e., liquid scenario). For the jetting and flashing scenario from this piping segment, Magnolia used PHAST to perform a hole sensitivity analysis to determine that a 4-inch-diameter hole would result in the worst flashing and jetting scenario. Then FLACS was used to perform a vapor dispersion analysis from the 4-inch-diameter hole. As shown in figures 4.12.5-4, 4.12.5-5, and 4.12.5-6, the FLACS modeling shows that the flammable vapor cloud would remain within Magnolia's property.

For LNG trucking operations, FLACS was used to predict the extent of the ½-LFL vapor cloud from a guillotine rupture of the 3-inch-diameter LNG truck loading header from the LNG storage tank (i.e., liquid scenario). For the jetting and flashing scenario from this piping segment, Magnolia used PHAST to perform a hole sensitivity analysis to determine that a 2-inch-diameter hole would result in the worst flashing and jetting scenario. Then FLACS was used to perform a vapor dispersion analysis from the 2-inch-diameter hole. As shown in figures 4.12.5-7, and 4.12.5-8, the FLACS modeling shows that the flammable vapor cloud would remain within Magnolia's property.

Therefore, we conclude that the siting of the proposed project would not have a significant impact on public safety with respect to flammable vapor dispersion from LNG releases. If the facility is constructed and operated, compliance with the requirements of 49 CFR 193 would be addressed as part of the DOT inspection and enforcement program.

Vapor Dispersion Analyses for Other Hazardous Fluids

In addition to the LNG releases evaluated above, Magnolia considered other release scenarios for ethane, n-butane, NGL, and H_2S based on the design spill methodology selected by Magnolia and reviewed by the DOT. Design spills from process areas would be a 10-minute duration. Only the spills that produced the highest release rates and consequently the longest ½-LFL vapor clouds are discussed in this section.

Magnolia used the failure rate methodology discussed under "Design Spills" above to select the following design spills: a guillotine rupture from a 2-inch-diameter ethane hose connection, a guillotine rupture from a 2-inch-diameter n-butane hose connection, a guillotine rupture on the 4-inch-diameter Heavy Hydrocarbon Liquids (NGL) reflux pump discharge piping, and a 1.2-inch-diameter hole on the 12-inch-diameter Thermal Oxidizer inlet piping (H_2S). However, Magnolia's design spill methodology did not account for full guillotine ruptures of connections less than 6 inches in diameter. As a result, the design spill methodology did not include a mixed refrigerant scenario. Since the issuance of the letter by the DOT approving the design spill methodology, the DOT has expressed that connections less than 6 inches in diameter should be considered. Therefore, **we recommend that**:

- **<u>Prior to the end of the draft EIS comment period</u>, Magnolia should file with the Secretary concurrence from the DOT as to whether full guillotine ruptures of connections less than 6 inches in diameter should be considered for mixed refrigerant and other hazardous fluid design spills.**

Magnolia modeled the ½-LFL vapor cloud dispersion distances for the ethane, n-butane, and NGL releases and the ½-AEGLs for toxicity for the NGL and H_2S releases. Table 4.12.5-3 summarizes the design spills selections.

TABLE 4.12.5-3 **Other Hazardous Fluid Design Spills**				
Location	Release Size	Pressure (psig)	Temperature (°F)	Flow Rate [a] (lb/hr)
Ethane hose connection	2-inch-diameter guillotine	535	69.2	157,391
n-Butane hose connection	2-inch-diameter guillotine	261	69.2	456,877
NGL piping	4-inch-diameter guillotine	811.3	-61.5	15,290
H_2S piping	1.2-inch-diameter hole	848.3	140	23,289

[a] Flow rates calculated in PHAST.

Magnolia used both PHAST and FLACS to predict the distances to the ½-LFL vapor cloud. Table 4.12.5-4 provides the PHAST results and figure 4.12.5-9 provides the FLACS results.

TABLE 4.12.5-4 **Vapor Dispersion Scenarios from Refrigerants and Natural Gas Liquids Releases**		
Released Material	Release Location	Approximate Downwind Distance to ½-LFL (feet)
Ethane	Refrigerant storage area	365
n-Butane	Refrigerant storage area	See FLACS (see figure 4.12.5-9)
NGL	Liquefaction process	115

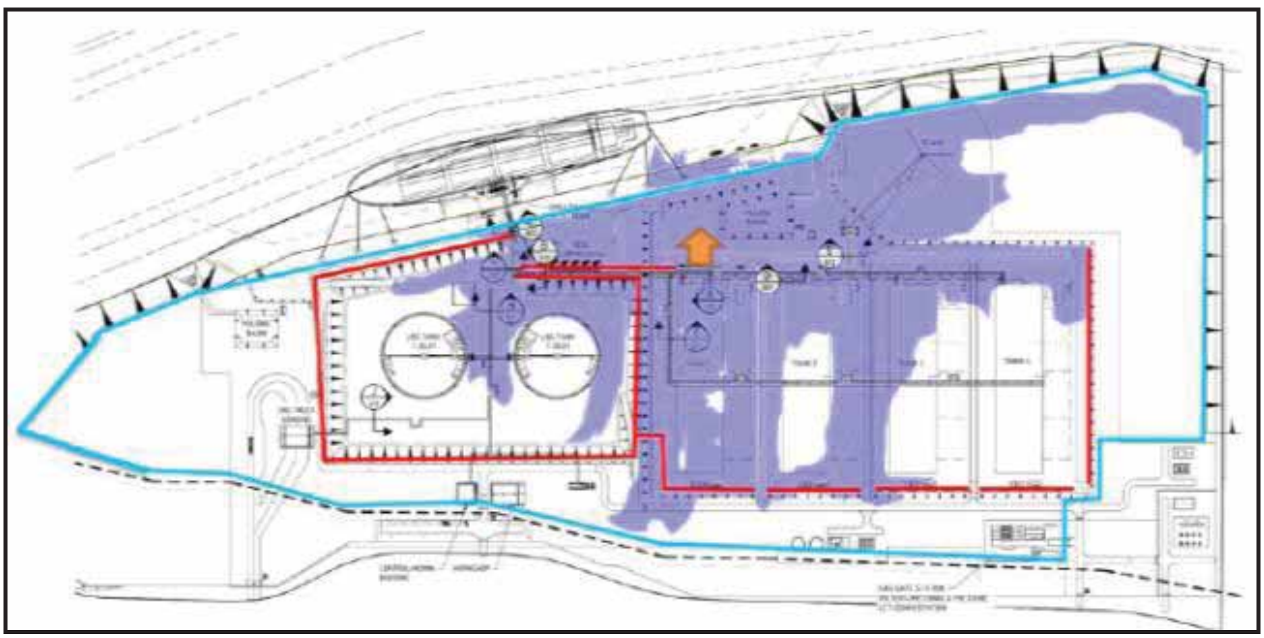


Figure 4.12.5-9 n-Butane Release Scenario at Refrigerant Storage Area

As Magnolia's calculations show the flammable vapor dispersion would stay within the Magnolia's property, we conclude that the siting of the proposed project would not have a significant impact on public safety from ethane, n-butane, and NGL releases. If the facility is constructed and operated, compliance with the requirements of 49 CFR 193 would be addressed as part of the DOT's inspection and enforcement program.

Since the NGL and H_2S releases would also contain toxic components, Magnolia used PHAST to calculate the dispersion distances to toxic threshold exposure limit based on the toxicity levels that were at or below ½-AEGLs. Table 4.12.5-5 shows the distances to the ½-AEGLs for releases for H_2S and NGL (i.e., benzene and toluene) at the 10-minute exposure time. The toxicity effects associated with AEGL-1 are non-disabling and reversible. The distances to the ½-AEGL 1 would remain within the facility boundary. As a result, we conclude that the siting of the proposed project would not have a significant impact on public safety with respect to the presence of the toxic components (i.e., hydrogen sulfide, benzene, and toluene). If the facility is constructed and operated, compliance with the requirements of 49 CFR 193 would be addressed as part of the DOT's inspection and enforcement program.

TABLE 4.12.5-5

Distance to the ½-AEGL 1 and 2 at 10-minute Exposure Time

Substance	½-AEGL 1 (feet)	½-AEGL 2 (feet)
Hydrogen Sulfide	304	No hazard [a]
Benzene	No hazard [a]	No hazard [a]
Toluene	No hazard [a]	No hazard [a]

[a] PHAST results show concentrations below the AEGL levels at any distance.

As discussed in section 4.12.2.1, ammonia is a toxic gas under ambient conditions and exposure to ammonia vapors could be hazardous to human health and result in death if inhaled at high concentrations. Since the ammonia inventory at the proposed facility would be above the 10,000 pound threshold listed in 40 CFR §68.130 and 29 CFR 1910.119 App A, the EPA and OSHA would have regulatory oversight over equipment containing ammonia. The DOT's Part 193 regulations and NFPA 59A primarily focus on the flammability of hazardous fluids. To address the regulatory requirements for the toxic characteristics of ammonia, the DOT has determined that compliance with the EPA's RMP and OSHA's PSM would satisfy the requirements of NFPA 59A (2001) section 2.1.1(d) for the ammonia refrigerant system. Magnolia has proposed to comply with the relevant EPA and OSHA regulations to ensure the safe siting and operation of the ammonia refrigerant systems.

The EPA has defined (40 CFR 68.3) a worst-case release as the release of the largest quantity of a regulated substance from a vessel or process line (pipe) failure that results in the greatest distance to a specified endpoint. Magnolia selected a 10-minute release from the largest ammonia vessel, Mixed Refrigerant/Ammonia Precooler, and the RMP*Comp results indicate that the toxic endpoint would reach 2.6 miles to the ERPG-2 level and could impact a population of approximately 1,429 people (2010 census data) and would extend over the Calcasieu Point Landing recreational area that includes a boat launch, a fishing pier, a store, and public restrooms. The distance to the toxic endpoint estimated under worst-case conditions should not be considered a zone in which the public would likely be in danger; instead, it is intended to provide an estimate of the maximum possible area that might be affected in the unlikely event of catastrophic conditions. Because the assumptions required for the worst case analysis are very conservative (including the omission of mitigating measures such as vapor barriers), the results likely will also be very conservative.

Alternative release scenarios are scenarios that are more likely to occur than the worst case scenario. 40 CFR §68.28 provides examples of alternative releases scenarios that should be considered when conducting an off-site consequence analysis. Magnolia selected three releases scenarios: a 2-inch-diameter failure of the ammonia unloading hose for 20 seconds, a 10-mm leak from high pressure ammonia piping for 30 seconds, and a 10-mm leak from the intermediate pressure ammonia piping for 30 seconds. The RMP*Comp results for each alternative release scenario indicate that the toxic endpoint would reach beyond the property boundaries and a release scenario from Train 1 would potentially impact the Calcasieu Point Landing area. The toxic endpoint from the alternative release scenarios would not impact public receptors. The EPA's RMP toxic endpoints are summarized in table 4.12.5-6.

TABLE 4.12.5-6

Ammonia Release Toxic Endpoints

Scenario Type	Scenario	Release Duration	Distance to ERPG-2
Worst Case	Mixed Refrigerant/Ammonia Precooler release	10 minutes	2.6 miles
Alternative Release	2-inch-diameter failure of ammonia unloading hose	20 seconds	0.6 mile
Alternative Release	10-mm hole from high pressure ammonia piping	30 seconds	0.3 mile
Alternative Release	10-mm hole from intermediate pressure ammonia piping	30 seconds	0.3 mile

Magnolia's use of ammonia in the liquefaction process would therefore by regulated by the DOT, EPA, and OSHA. Magnolia would comply with the comprehensive EPA RMP and OSHA PSM programs as well as the DOT's requirements under Part 193 and NFPA 59A. By complying with the EPA RMP and OSHA PSM, Magnolia would comply with the same regulations as every other facility in the United States that uses quantities of ammonia above the regulatory threshold. As a result, we conclude that the siting of the proposed project would not have a significant impact on public safety due to other hazardous fluid releases. If the facility is constructed and operated, compliance with the requirements of 40 CFR 68, 29 CFR 1910.119, and 49 CFR 193 would be addressed as part of the EPA, OSHA, and DOT inspection and enforcement programs.

4.12.5.4 Overpressure Analysis

As discussed in section 4.12.2, the propensity of a vapor cloud to detonate or produce damaging overpressures is influenced by the reactivity of the material, the level of confinement and congestion surrounding and within the vapor cloud, and the flame travel distance. It is possible that the prevailing wind direction may cause the vapor cloud to travel into a partially confined or congested area.

LNG Vapor Clouds

As adopted by Part 193, section 2.1.1 of NFPA 59A (2001) requires an evaluation of potential incidents and safety measures incorporated in the design or operation of the facility be considered. As discussed under "Flammable Vapor Ignition" in section 4.12.2.1, unconfined LNG vapor clouds would not be expected to produce damaging overpressures.

The potential for unconfined LNG vapor cloud detonations was investigated by the Coast Guard 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 Coast Guard 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.

The Coast Guard indicated overpressures of 4 bar and flame speeds of 78 mph were produced from vapor clouds of 86 percent to 96 percent methane in near stoichiometric proportions using exploding charges as the ignition source. The 4 bar overpressure was the same overpressure produced during the calibration test involving exploding the charge ignition source alone, so it remains unclear that the overpressure was attributable to the vapor deflagration.

Additional tests were conducted to study the influence of confinement and congestion on the propensity of a vapor cloud to detonate or produce damaging overpressures. The tests used obstacles to create a partially confined and turbulent scenario, but found that flame speeds developed for methane were not significantly higher than the unconfined case and were not in the range associated with detonations.

Although it has been possible to produce damaging overpressures and detonations of unconfined LNG vapor clouds, Magnolia's project would be designed to receive feed gas with methane concentrations as low as 91 percent, which are not in the range shown to exhibit overpressures and flame speeds associated with high-order explosions and detonations.

Ignition of a confined LNG vapor cloud could result in higher overpressures. In order to prevent such an occurrence, Magnolia would take measures to mitigate the vapor dispersion and ignition into confined areas, such as buildings. Buildings would be located away from process areas, and combustion and ventilation air intake equipment would be required to have hazard detection devices that enable isolation of the air dampers. Hazard detection with shutdown capability would also be installed at air intakes of combustion equipment whose continued operation could add to, or sustain, an emergency.

Vapor Clouds from Other Hazardous Fluids

In comparison with LNG vapor clouds, there is a higher potential for refrigerants used in the liquefaction process streams to produce damaging overpressures when ignited. In order to evaluate this hazard, Magnolia used both PHAST and FLACS to perform an overpressure analysis. Table 4.12.5-7 summarizes the overpressure scenarios and results.

TABLE 4.12.5-7

Overpressure Distances from Refrigerants and Natural Gas Liquids

Release Scenario	Overpressure Threshold (psi)	Overpressure Distance (feet)
2-inch-diameter guillotine rupture from ethane hose	1	620 (figure 4.12.5-10)
4-inch-diameter guillotine rupture from NGL piping	1	201 (figure 4.12.5-11)
2-inch-diameter guillotine rupture from n-butane hose	0.5	See FLACS (figure 4.12.5-12)
n-Butane released between parallel vapor barriers	0.5	See FLACS (figure 4.12.5-13)

Magnolia used the Baker-Strehlow-Tang Explosion model in PHAST to perform an overpressure analysis for ethane and NGL. The model assumed that the obstructed volume includes the entire vapor cloud and estimated the 1-psig threshold at different wind speeds. As shown in figures 4.12.5-10 and 4.12.5-11, the PHAST results show that the maximum overpressure for the ignition of ethane or NGL vapor clouds would remain on Magnolia’s property. However the PHAST results show that the distance to 1-psig for n-butane would extend beyond Magnolia’s property boundary. Therefore the n-butane overpressure scenarios were identified for modeling using FLACS to account for the detailed geometry of the facility. Distances were determined with a safety factor of 2 (i.e., ½ psi), as a result of previous validation studies and peak-pressure averaging.[35] The levels of confinement are input parameters in the overpressure modeling software. The overpressure threshold were calculated by placing an uniform, stoichiometric fuel/air mixture within each congested region and several vapor cloud explosion simulations were performed on FLACS. As shown in figure 4.12.5-12, the distance to ½ psig overpressure from vapor cloud explosion would remain within Magnolia’s boundary. This overpressure would not reach the LNG storage tanks.

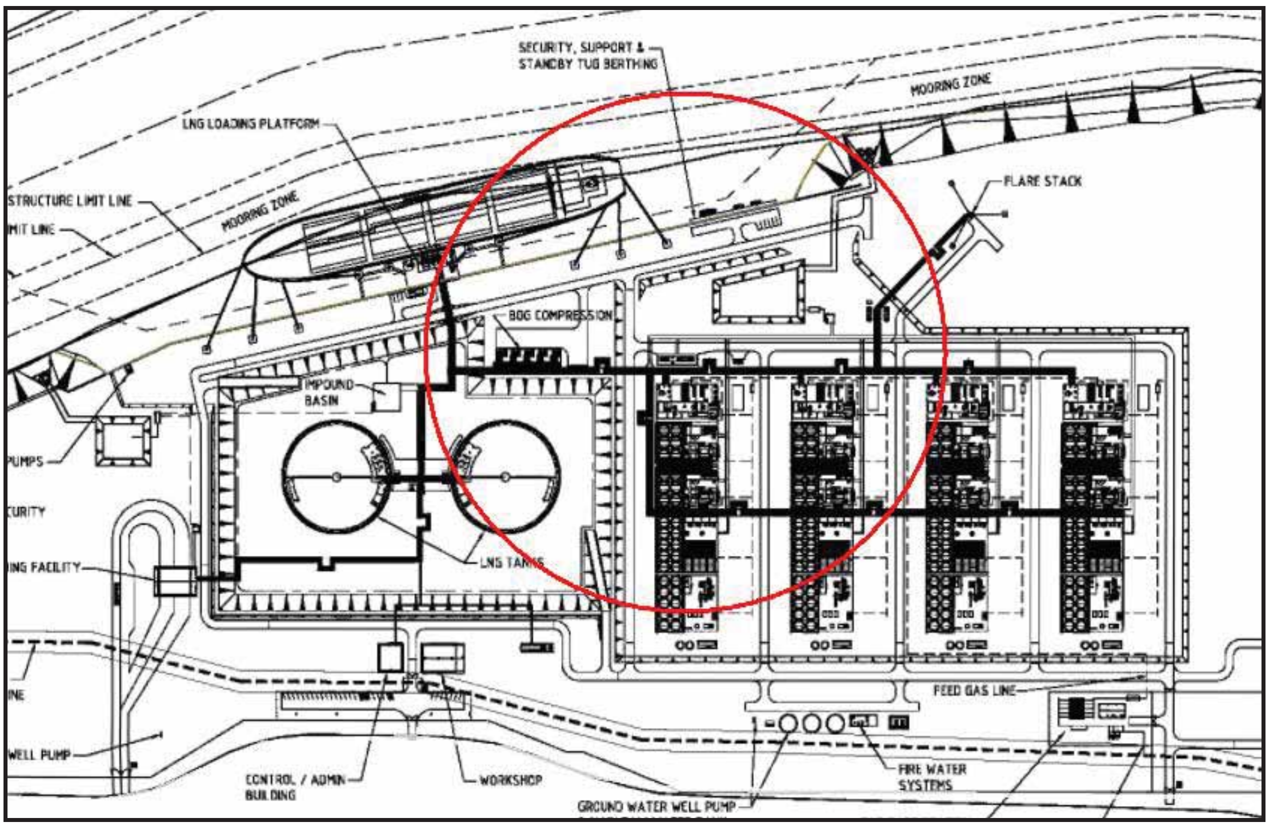


Figure 4.12.5-10 Ethane Overpressure Scenario at Train 1

35 Hansen, O.R., Hinze, P., Engel, D., Davis, S. 2010. Using Computation Fluid Dynamics (CFD) for Blast Wave Predictions, Journal of Loss Prevention in the Process Industries, Vol 23, 885-906, 2010.

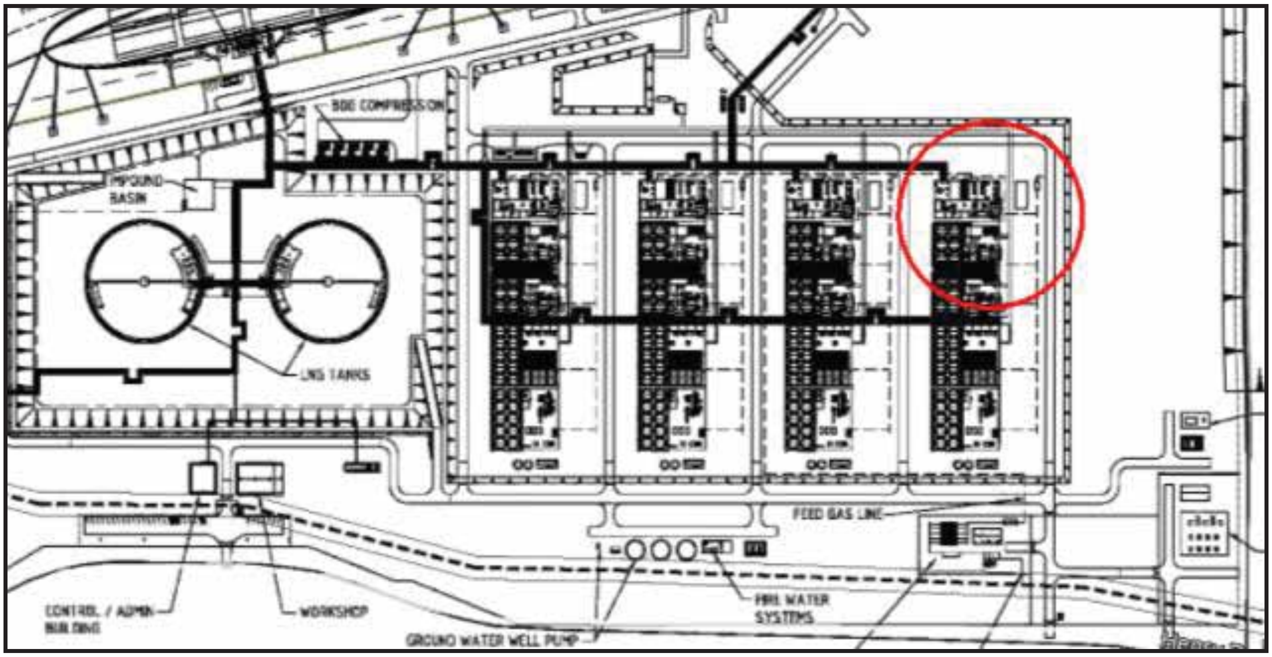


Figure 4.12.5-11 Natural Gas Liquids Overpressure Scenario at Train 4

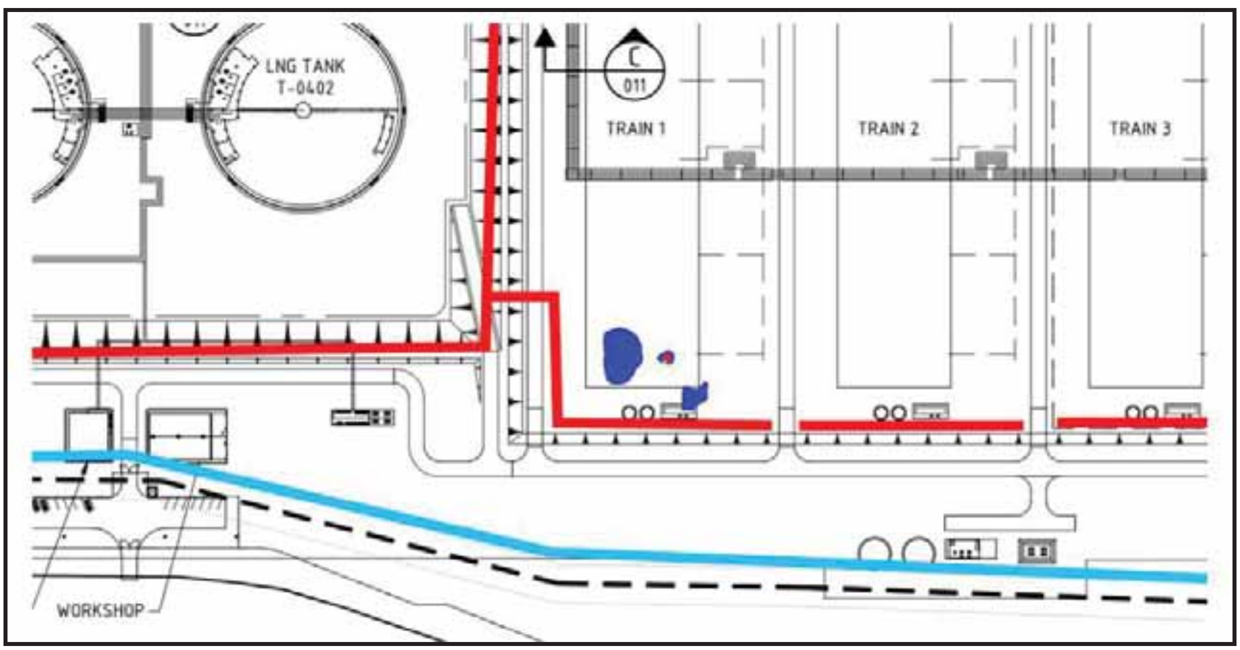


Figure 4.12.5-12 n-Butane Overpressure Scenario at Train 1

FLACS also calculated an overpressure scenario from the ignition of an n-butane vapor cloud between parallel 10-foot vapor barriers. As shown in figure 4.12.5-13, the distance to ½ psig overpressure from vapor cloud explosion would remain within Magnolia's boundary and would not reach the LNG storage tanks. All of the overpressure scenarios, as calculated by PHAST and FLACS, would remain within the Magnolia's property. As a result, we conclude that the siting of the proposed Project would not have a significant impact on public safety due to vapor cloud explosion events. If the facility is constructed and operated, compliance with the requirements of 49 CFR 193 would be addressed as part of the DOT inspection and enforcement program.

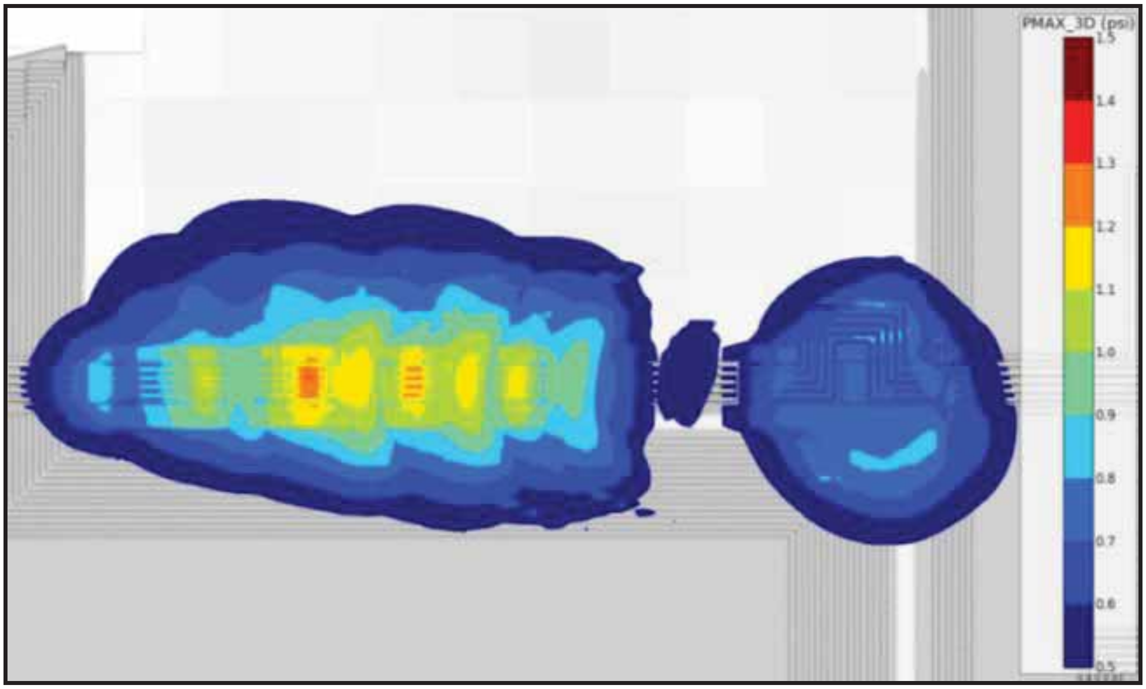


Figure 4.12.5-13 n-Butane Overpressure Scenario between Parallel Vapor Barriers

4.12.5.5 Thermal Radiation Analysis

As discussed in section 4.12.2, if flammable vapors are ignited, the deflagration could propagate back to the spill source and result in a pool fire causing high levels of thermal radiation (i.e., heat from a fire). In order to address this, 49 CFR 193.2057 requires each LNG container and LNG transfer system to have a thermal exclusion zone in accordance with section 2.2.3.2 of NFPA 59A (2001). Together, Part 193 and NFPA 59A (2001) specify different hazard endpoints for spills into LNG storage tank containment and spills into impoundments for process or transfer areas. For a fire in an LNG storage tank impoundment, there are three radiant heat flux levels which must be considered:

- 1,600 Btu/ft^2-hr – This level can extend beyond the facility's property line that can be built upon but cannot include areas that, at the time of facility siting, are used for outdoor assembly by groups of 50 or more persons;
- 3,000 Btu/ft^2-hr – This level can extend beyond the facility's property line that can be built upon but cannot include areas that, at the time of facility siting, contain assembly, educational, health care, detention or residential buildings or structures; and
- 10,000 Btu/ft^2-hr – This level cannot extend beyond the facility's property line that can be built upon.

The requirements for spills from process or transfer areas are more stringent. For these impoundments, the 1,600 Btu/ft^2-hr flux level cannot extend beyond the facility's property line that can be built upon.

Part 193 requires the use of the LNGFIRE3 computer program model developed by the Gas Research Institute to determine the extent of the thermal radiation distances. Part 193 stipulates that the wind speed, ambient temperature, and relative humidity that produce the maximum exclusion distances must be used, except for conditions that occur less than 5 percent of the time based on recorded data for the area. Magnolia selected the following ambient conditions to produce the maximum exclusion distances: wind speeds of 0 to 24 mph, ambient temperature of 34 °F, and 25 percent relative humidity. We agree with the Magnolia's selection of atmospheric conditions.

For the proposed liquefaction project, Magnolia used LNGFIRE3 to predict the thermal radiation distances as a result of fires from the LNG Storage Tank Outer Containment, the Tank Area Impoundment Basin, the Liquefaction Area Impoundment Basin, and the Truck Loading Area Impoundment Basin. Although LNGFIRE3 is specifically designed to calculate thermal radiation flux levels for LNG pool fires, LNGFIRE3 could also be used to conservatively calculate the thermal radiation flux levels for flammable hydrocarbons such as ethane, n-butane, and NGL. Two of the parameters used by LNGFIRE3 to calculate the thermal radiation flux is the mass burning rate of the fuel and the surface emissive power (SEP) of the flame, which is an average value of the thermal radiation flux emitted by the fire. The mass burning rate and SEP of an ethane, n-butane, and NGL fire would be less than an equally sized LNG fire. Since the thermal radiation from a pool fire is dependent on the mass burning rate and SEP, the thermal radiation distances required for ethane, n-butane, and NGL fires would not extend as far as the exclusion zone distances previously calculated for an LNG fire in the same sump.

The resulting maximum thermal radiation distances are shown in table 4.12.5-8 and figure 4.12.5-14. As shown in figure 4.12.5-14, the 1,600 Btu/ft^2-hr flux level would extend beyond the southern property line of the proposed terminal and onto Port of Lake Charles property. Magnolia has signed an Exclusion Zone Agreement to limit the activities that can be done on this property to demonstrate compliance with 49 CFR 193. However, the DOT has not reviewed this agreement. Therefore, **we recommend that:**

- **__Prior to the end of the draft EIS comment period__, Magnolia should file with the Secretary concurrence from the DOT that the restriction of property use between Lake Charles Harbor and Terminal District and Magnolia would satisfy the exclusion zone requirements of 49 CFR 193.2057.**

TABLE 4.12.5-8

Thermal Radiation Exclusion Zones

	Thermal Flux Level (Btu/ft^2-hr)		
	10,000	3,000	1,600
Distance from LNG Storage Tank Outer Containment (feet)	403	744	951
Distance from Tank Area Impoundment Basin (feet)	250	331	390
Distance from Liquefaction Area Impoundment Basin (feet)	92	117	134
Distance from Truck Loading Area Impoundment Basin (feet)	74	92	106

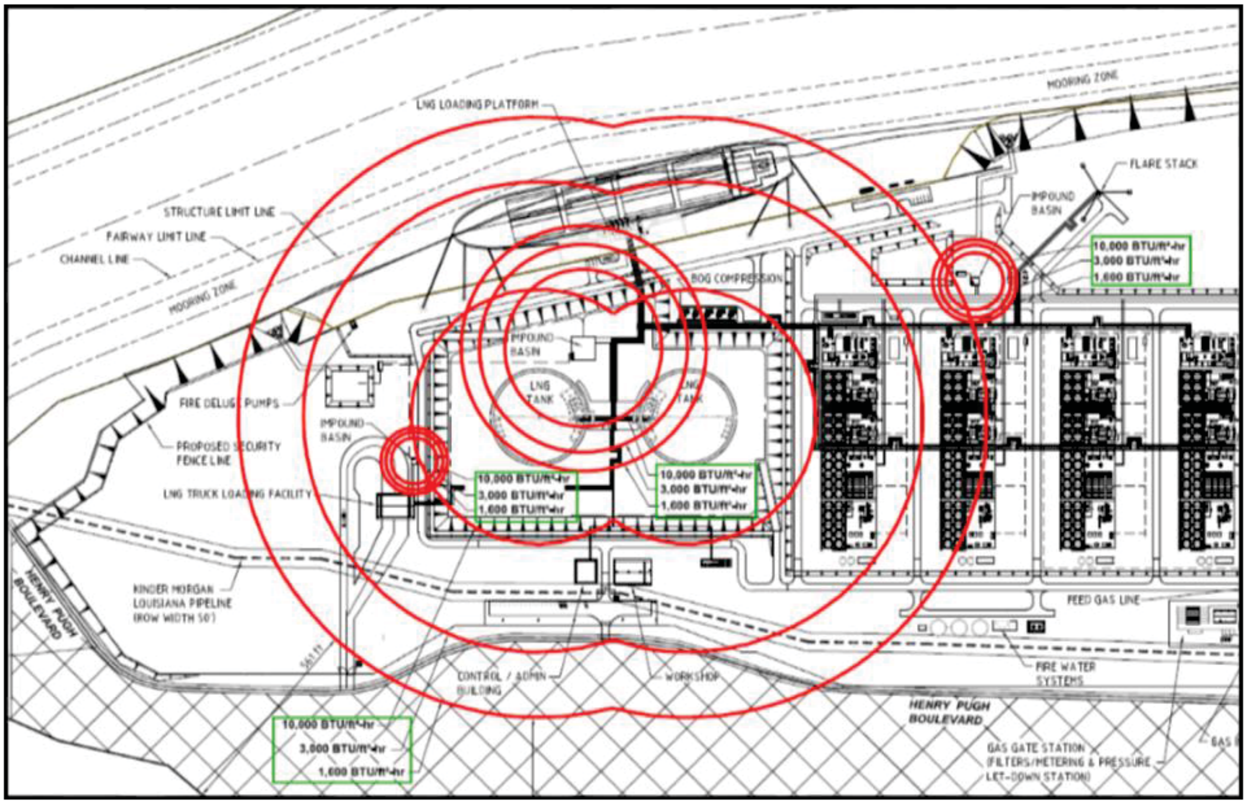


Figure 4.12.5-14 Thermal Radiation Zones

If the DOT concurs with the land use agreement, we conclude that the siting of the proposed project would not have a significant impact on public safety with respect to radiant heat from the LNG Storage Tank fire or from the proposed impoundment basins. If the facility is constructed and operated, compliance with the requirements of 49 CFR 193 would be addressed as part of the DOT's inspection and enforcement program.

The refrigerant storage area would be located about 55 feet to the north of Train 1. We identified that the refrigerant vessels as well as equipment within Train 1could be exposed to damaging heat flux from an LNG storage tank roof fire. On April 1, 2015, Magnolia clarified that the design would install mitigation measures for these process vessels including firewater spray systems to provide cooling to prevent BLEVEs. We believe these mitigation measures would reduce the likelihood of a BLEVE occurring in these areas and recommended in section 4.12.3 that Magnolia provide the final design information for these mitigation measures. As a result, we conclude that the siting of the proposed project would not have a significant impact on public safety due to fire radiation impacts.

4.12.6 LNG Carriers

Since 1959, ships have transported LNG without a major release of cargo or a major accident involving an LNG carrier. There are more than 370 LNG carriers in operation routinely transporting LNG between more than 100 import/export terminals currently in operation worldwide. Since U.S. LNG terminals first began operating under FERC jurisdiction in the 1970s, there have been more than 2,600 individual LNG carrier 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.

Design and Operating Requirements

The LNG carriers used to import and export LNG to and from the United States are constructed and operated in accordance with the IMO's *Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, the International Convention for the Safety of Life at Sea*, and 46 CFR 154, which contains the United States safety standards for vessels carrying liquefied natural gas in bulk.

As required by the IMO's conventions and design standards, hold spaces and insulation areas on an LNG carrier must be equipped with gas detection and low temperature alarms. These devices monitor for leaks of LNG into the insulation between primary and secondary LNG cargo tank barriers. In addition, hazard detection systems must also be provided to monitor the hull structure adjacent to the cargo tank, compressor rooms, motor rooms, cargo control rooms, enclosed spaces in the cargo area, specific ventilation hoods and gas ducts, and air locks.

In 1993, amendments to the IMO's *Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk* required all vessels to have monitoring equipment with an alarm facility which is activated by detection of over-pressure or under-pressure conditions within a cargo tank. In addition, cargo tanks must be heavily instrumented, with gas detection equipment in the hold and inter-barrier spaces, temperature sensors, and pressure gauges. LNG carriers are to be equipped with a firewater system with the ability to supply at least two jets of water to any part of the deck in the cargo area and parts of the cargo containment and tank covers above-deck. A water spray system is also available for cooling, fire prevention, and crew protection in specific areas. In addition, certain areas of LNG carriers are fitted with dry chemical powder-type extinguishing systems and carbon dioxide smothering systems for fighting fires. Fire protection must include the following systems:

- a water spray (deluge) system that covers the accommodation house control room and all main cargo valves;
- a traditional firewater system that provides water to fire monitors on deck and to fire stations found throughout the vessel;
- a dry chemical fire extinguishing system for hydrocarbon fires; and
- a carbon dioxide system for protecting machinery including the ballast pump room, emergency generators, and compressors.

All LNG vessels entering U.S. waters are required to possess a valid IMO Certificate of Fitness and either a Coast Guard Certificate of Inspection (for U.S. flag vessels) or a Coast Guard Certificate of Compliance (for foreign flag vessels). These documents certify that the vessel is designed and operating in accordance with both international standards and the U.S. regulations for bulk LNG carriers under 46 CFR 154.

The LNG carriers which would receive LNG from the proposed 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 2003. 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 vessels, as well as other cargo vessels 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:

- ships must develop security plans and have a Vessel Security Officer;
- ships must have a ship security alert system. These alarms 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;
- ships must have a comprehensive security plan for international port facilities, focusing on areas having direct contact with ships; and
- ships 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 *International Ship and Port Facility Security Code* and the *International Convention for the Safety of Life at Sea*. The resulting Coast Guard regulations, contained in 33 CFR 104, require vessels to conduct vulnerability assessments and develop corresponding security plans. All LNG carriers servicing the facility comply with the MTSA requirements and associated regulations while in U.S. waters.

4.12.7 LNG Carrier Routes

The Project would be located on the Industrial Canal South Shore PLC Tract 475 at the Port of Lake Charles, Louisiana, on the U.S. Gulf Coast, with access via the Calcasieu Ship Channel. The Calcasieu Ship Channel runs inland for approximately 30 nautical miles from the Gulf of Mexico to Lake Charles. The proposed site would be located approximately 22 nautical miles from the Gulf of Mexico.

Inbound LNG carriers with capacities between 125,000 and 218,000 m^3 would enter the southern entrance to the Calcasieu Pass Safety Fairway and would continue north within the limits of the Calcasieu Pass Safety Fairway to the entrance of the Calcasieu Ship Channel located approximately 26 nautical miles offshore from Calcasieu Pass in the Gulf of Mexico. In the northern portion of the Calcasieu Pass Safety Fairway, inbound LNG carriers would embark a Lake Charles Pilot and enter the Calcasieu Ship Channel at the CC buoy. During daylight hours, one Pilot would meet the inbound LNG carrier at the CC buoy and a second Pilot boards the vessel inside the jetties at Cameron. Larger LNG Q-Flex carriers (between 210,000 and 216,000 m^3 capacity) and LNG carriers transiting the channel at night would require two Pilots at all times. From this point, the deep-draft LNG carriers would be confined to the Calcasieu Ship Channel because of surrounding shallow water depths. Inbound ships would proceed into the entrance of the Calcasieu Jetties and continue northbound in the Calcasieu Ship Channel to the channel's intersection with the Gulf Intracoastal Waterway at "Devil's Elbow." At this intersection, inbound LNG carriers would make a turn to the northeast and proceed into the Industrial Canal where the ships would moor at the Magnolia LNG terminal. Loaded LNG carriers would transit outbound along the reverse route described for inbound ships. LNG barges with a capacity up to 15,000 m^3 would also transit inbound and outbound from the Magnolia terminal using these same channels and safety fairways.

4.12.7.1 Hazards Resulting from Accidents

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 vessels, including minor collisions with other vessels of all sizes, groundings, minor LNG releases during cargo unloading operations, and mechanical/equipment failures typical of large vessels. Some of the more significant occurrences, representing the range of incidents experienced by the worldwide LNG 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 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 vessel and shore piping. The cargo loading had been secured just before the wind struck, but the loading arms had not been drained. Consequently, the LNG remaining in the loading arms spilled onto the deck, causing fracture of some plating.

- **Mostefa Ben Boulaid** had an electrical fire in the engine control room during unloading at Everett, Massachusetts. The ship crew extinguished the fire and the ship completed unloading.

- **Khannur** had a cargo tank overfill into the vessel's vapor handling system on September 10, 2001, during unloading at Everett, Massachusetts. Approximately 100 gallons of LNG were vented and sprayed onto the protective decking over the cargo tank dome, resulting in several cracks. After inspection by the Coast Guard, the Khannur was allowed to discharge its LNG cargo.

- **Mostefa Ben Boulaid** had LNG spill onto its deck during loading operations in Algeria in 2002. The spill, which is believed to have been caused by overflow rather than a mechanical failure, caused significant brittle fracturing of the steelwork. The vessel was required to discharge its cargo, after which it proceeded to dock for repair.

- **Norman Lady** was struck by the USS Oklahoma City nuclear submarine while the submarine was rising to periscope depth near the Strait of Gibraltar in November 2002. The 87,000 cubic meter (m3) LNG 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 vessel was refloated, repaired, and returned to service.

- **Golar Freeze** moved away from its docking berth during unloading on March 14, 2006, in Savannah, Georgia. The powered emergency release couplings on the unloading arms activated as designed, and transfer operations were shut down.

- **Catalunya Spirit** lost propulsion and became adrift 35 miles east of Chatham, Massachusetts on February 11, 2008. Four tugs towed the vessel to a safe anchorage for repairs. The Catalunya Spirit was repaired and taken to port to discharge its cargo.

- **Suez Matthew** grounded on the reef off Cayo Maria Langa, near Guayanilla, Puerto Rico on December 19, 2009. The ship was refloated and no damage was found to the hull.

- **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, fatalities, or injuries were reported.

Although the history of LNG shipping has been free of major incidents, and no incidents have resulted in significant quantities of cargo being released, the possibility of an LNG spill from a vessel over the duration of the proposed project must be considered. If an LNG spill were to occur, the primary hazard to the public would be from radiant heat from a pool fire. If an LNG release were to occur without ignition, an ignitable gas cloud could form and also present a hazard. Historically, the events most likely to cause a significant release of LNG were a vessel casualty such as:

- a grounding sufficiently severe to puncture an LNG cargo tank;
- a vessel colliding with an LNG vessel in transit;
- an LNG vessel alliding with the terminal or a structure in the waterway; or
- a vessel alliding with an LNG vessel while moored at the terminal.

To result in a spill of LNG, any of the above events would need to occur with sufficient impact to breach an LNG vessel's double hull and cargo tanks. All LNG vessels used to deliver LNG to the proposed project would have double-hull construction, with the inner and outer hulls separated by about 10 feet. Furthermore, the cargo tanks are normally separated from the inner hull by a layer of insulation approximately 1-foot thick.

As a result, many grounding incidents severe enough to cause a cargo spill on a single-bottom oil tanker would be unable to penetrate both inner and outer hulls of an LNG vessel. Previous incidents with LNG vessels have primarily involved grounding, and none of these have resulted in the breach of the double hull and subsequent release of LNG cargo. The likelihood of an LNG vessel sustaining cargo tank damage in a collision would depend on several factors:

- the displacement and construction of both the struck and striking vessels;
- the velocity of the striking vessel and its angle of impact with the struck vessel; and
- the location of the point of impact.

In December 2004, the DOE released a study on the potential for an LNG vessel breach. At the request of the DOE, Sandia conducted the research and wrote the 2004 Sandia Report. The 2004 Sandia Report included an LNG cargo tank breach analysis using modern finite element modeling and explosive shock physics modeling to estimate a range of breach sizes for both credible accidental and intentional LNG spill events. Accidental breaching evaluations were based on finite element modeling of collisions of double-hulled oil tankers similar in size and design to LNG ships. The analysis of accidental events found that groundings, collisions with small vessels, and low-speed (less than 7 knots) collisions with large vessels striking at 90 degrees could cause minor vessel damage but would not result in a cargo spill. This is due to the protection provided by the double-hull structure, the insulation layer, and the primary cargo tank of an LNG vessel. High-speed (12 knots) collisions with large vessels striking at 90 degrees were found to potentially cause cargo tank breach areas of from 0.5 to 1.5 meters squared (m^2).

The possibility of an LNG release due to an accident, such as a collision or grounding, is considered minimal. In addition, current operational procedures in use by the Coast Guard, such as managing ship traffic, coordinating ship speeds, and active ship control in inner and outer harbors, would also further reduce the potential of LNG spill from accidental causes.

4.12.7.2 Hazards Resulting from Intentional Acts

The 2004 Sandia Report also analyzed credible intentional breaches on LNG carriers up to 145,000 m^3 in capacity using modern finite element modeling and explosive shock physics modeling. The events considered for credible intentional acts were based on intelligence and historical data ranging from sabotage and hijacking to other types of physical attacks. Physical attacks included those documented to have occurred to several types of international shipping vessels, including attacks with small missiles and rockets, and attacks with bulk explosives.

For intentional scenarios, the size of the cargo tank hole depends on the location of the ship and source of threat. Intentional breach areas were estimated to range from 2 to 12 m^2. In most cases, an intentional breaching scenario would not result in a nominal hole area of more than 5 to 7 m^2, which is a more appropriate range to use in calculating potential hazards from spills. These hole sizes are equivalent to circular hole diameters of 2.5 and 3 meters.

The 2004 Sandia Report evaluated cascading damage due to brittle fracture from exposure to cryogenic liquid or fire-induced damage to foam insulation. While possible under certain conditions, the cascading damage was found to not likely involve more than two or three cargo tanks. Cascading events were expected to increase the fire duration but not to significantly increase the overall fire hazard.

The 2004 Sandia Report also included guidance on risk management for intentional spills, based on the findings that the most significant impacts to public safety and property exist within approximately 500 meters (1,640 feet) of a spill due to thermal hazards from a fire, with lower public health and safety impacts beyond 1,600 meters (approximately 1 mile). Large un-ignited LNG vapor releases were found to be unlikely, but could extend from nominally 2,500 meters (8,200 feet) to a conservative maximum distance of 3,500 meters (2.2 miles) for an intentional spill.

In 2008, the DOE released another study prepared by Sandia, *entitled Breach and Safety Analysis of Spills Over Water from Large Liquefied Natural Gas Carriers*, May 2008 (2008 Sandia Report). The 2008 Sandia Report assessed the scale of possible hazards for newer LNG vessels with capacities up to 265,000 m^3. Using the same methodology as the 2004 Sandia Report, the 2008 Sandia Report concluded thermal hazard distances would be only 7 to 8 percent greater than those from vessels carrying 145,000

m^3 of LNG, due primarily to the slightly greater height of LNG above the waterline. The 2008 Sandia Report also noted the general design of the larger vessels was similar to the previously analyzed ship designs and, for near-shore facilities; the calculated breach size for intentional scenarios would remain the same. Overall, the 2008 Sandia Report maintained the same impact zones as with the smaller vessels that were analyzed in the 2004 Sandia Report.

In February 2007, the U.S. Government Accountability Office (GAO) published a report assessing several studies, including the 2004 Sandia Report that had been conducted on the consequences of an LNG spill resulting from a terrorist attack on an LNG vessel (GAO, 2007). The GAO's panel of experts agreed that the most likely public safety impact of an LNG spill would be the radiant heat from a pool fire and suggested that further study was needed to eliminate uncertainties in the assumptions used in modeling large LNG spills on water. After the GAO report, Congress requested the DOE to further address these research needs. In May 2012, a report entitled *Liquefied Natural Gas Safety Research Report to Congress* was released and is summarized below.

DOE contracted Sandia to conduct a series of large-scale LNG fire and cryogenic damage tests to investigate the larger classes of LNG carriers with capacities up to 260,000 m^3, representative of the largest LNG vessels in operation. Sandia conducted the largest LNG pool fire tests done to date and performed advanced computational modeling and ship simulations between 2008 and 2011. As in the earlier studies, Sandia worked with marine safety, law enforcement, and intelligence agencies to assess threats and credible intentional acts. Scenarios included attacks with shoulder-fired weapons, explosives, and attacks by aircraft and other boats. Sandia identified several ranges of possible hull breaches ranging from 0.005 m^2 (Very Small) to 15 m^2 (Very Large). Based on the collected pool fire test data and the ship simulations, Sandia concluded that thermal hazard distances to the public from a large LNG pool fire was smaller, by at least 2 to 7 percent, than the results listed in the 2004 and 2008 Sandia Reports.

In order to more robustly analyze the potential for cascading failure of LNG carrier cargo tanks, Sandia use detailed vessel structural and thermal damage models to simulate the effects to an LNG carrier from a spill. For the large breaches considered, Sandia predicts that as much as 40 percent of the LNG released from the cargo tank would remain within the ship's structure. Due to both the cold temperature of the LNG and the heat from a pool fire, the LNG carrier's structural steel would be degraded. The effects could be significant enough to cause the ship to be disabled, severely damaged, and at risk of sinking.

Although LNG ship design and construction practices render simultaneous, multiple tank failures as extremely unlikely, Sandia concluded that sequential multi-tank spills may be possible. If sequential failures were to occur, they would not increase the size of the area impacted by the pool fire but could increase the duration of the fire hazards. Based on this research, Sandia concluded that use of a nominal one-tank spill, with a maximum of a three-tank spill, as was recommended in the 2004 Sandia report, is still appropriate for estimating hazard distances.

4.12.7.3 Hazard Zones

On June 14, 2005, the Coast Guard published a Navigation and Vessel Inspection Circular – *Guidance on Assessing the Suitability of a Waterway for Liquefied Natural Gas (LNG) Marine Traffic* (NVIC 05-05). The purpose of NVIC 05-05 was to provide the Coast Guard 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. Since 2005, the Coast Guard updated this guidance twice, publishing NVIC 05-08 and NVIC 01-11. The current guidance from the Coast Guard is contained in NVIC 01-11.

All three NVICs direct the use of the 2004 Sandia Report as the best available information on LNG spills. NVIC 05-08 and NVIC 01-11 also include use of the 2008 Sandia Report. Three concentric Zones of Concern, based on LNG carriers with a cargo carrying capacity up to 265,000 m^3, are used to assess the maritime safety and security risks of LNG marine traffic. The Zones of Concern are:

- Zone 1 – impacts on structures and organisms are expected to be significant within 500 meters (1,640 feet). The outer perimeter of Zone 1 is approximately the distance to thermal hazards of 37.5 kW/m^2 (12,000 Btu/ft^2-hr) from a pool fire.

- Zone 2 – impacts would be significant but reduced, and damage from radiant heat levels are expected to transition from severe to minimal between 500 and 1,600 meters (1,640 and 5,250 feet).The outer perimeter of Zone 2 is approximately the distance to thermal hazards of 5 kW/m^2 (1,600 Btu/ft^2-hr) from a pool fire.

- Zone 3 – impacts on people and property from a pool fire or an un-ignited LNG spill are expected to be minimal between 1,600 meters (5,250 feet) and a conservative maximum distance of 3,500 meters (11,500 feet or 2.2 miles). The outer perimeter of Zone 3 should be considered the vapor cloud dispersion distance to the LFL from a worst case un-ignited release. Impacts to people and property could be significant if the vapor cloud reaches an ignition source and burns back to the source.

As LNG carriers proceed along the intended track line, Hazard Zone 1 would encompass coastal areas along the Calcasieu Ship Channel, including multiple residential buildings within and near Hackberry, the Cameron LNG Terminal, portions of the Intracoastal Park, and the easternmost portion of the Sabine NWR. Hazard Zone 1 would also encircle coastal areas along the Industrial Canal, which are comprised of industrial and commercials facilities as well as Calcasieu Point Landing (see discussion in sections 4.8.3 and 4.8.4). Portions of Monkey Island, St. John's Island, Hog Island, Choupique Island, and Hackberry would also be within Zone 1. Commercial vessels, recreational and fishing vessels may also fall within Zone 1, depending on their course. Transit of such vessels through a Zone 1 area of concern can be avoided by timing and course changes, if conditions permit.

Zone 2 would cover a wider swath of coastal areas along the Calcasieu River, Cameron, and Hackberry, including multiple residential, commercial, and industrial buildings.

Zone 3 would span Monkey Island, St. John's Island, Hog Island, and Choupique Island, as well as larger portions of both Hackberry and Cameron, including two volunteer fire departments, two sheriff's departments, and multiple residential, commercial, industrial, and institutional (e.g., church, school, library) buildings.

The areas impacted by the three different hazard zones are illustrated for both accidental and intentional events in figures 4.12.7-1 and 4.12.7-2.

Figure 4.12.7-1
Zones of Concern
from Accidental Events
Magnolia LNG and Lake Charles Expansion Projects
Calcasieu Parish, Louisiana

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Hazard_Zones\Hazard_Zones_Accidental.mxd | REVISED: 05/19/2015 | SCALE: 1:300,000 DRAWN BY: JSSuess

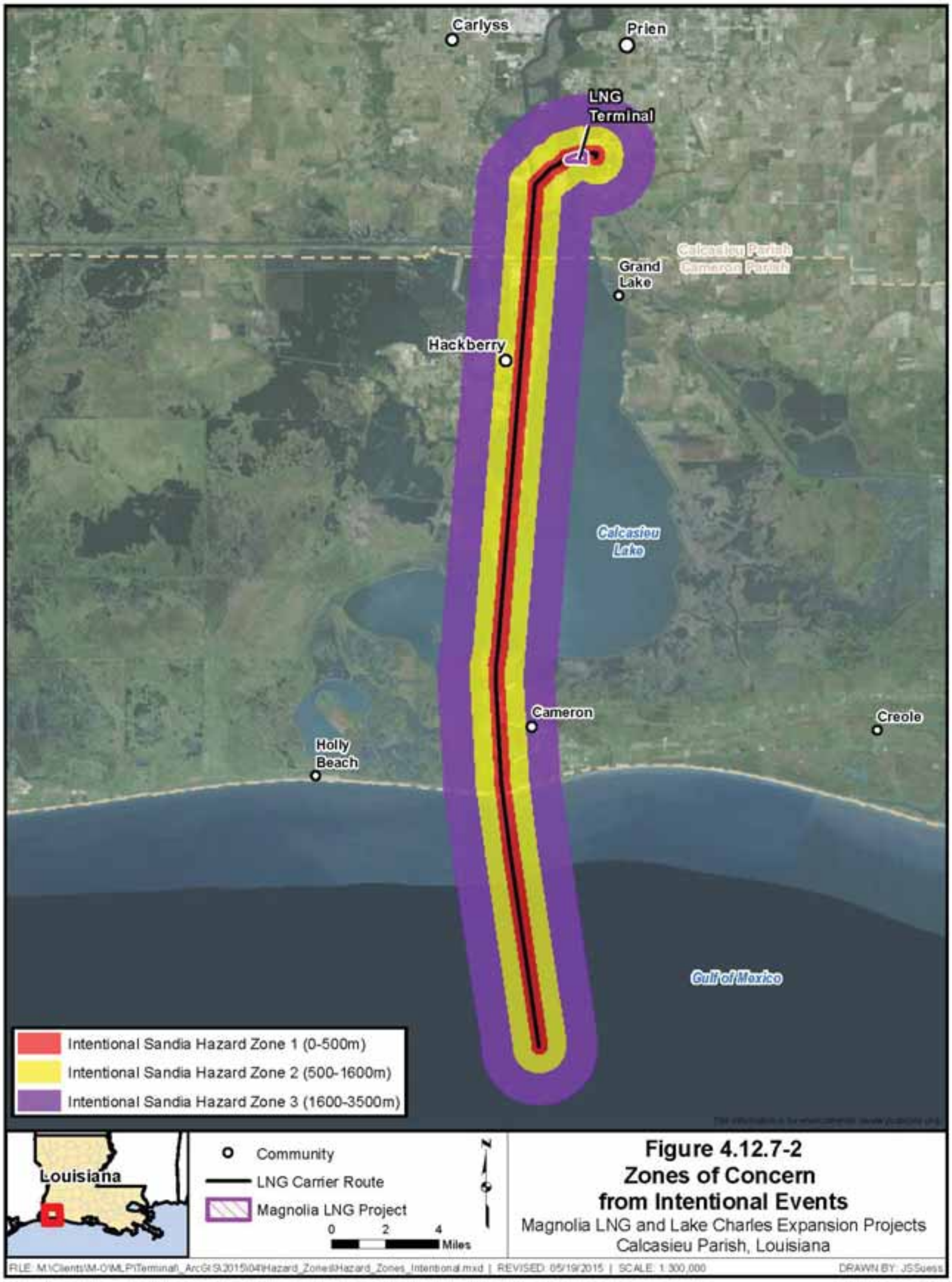


Figure 4.12.7-2
Zones of Concern from Intentional Events
Magnolia LNG and Lake Charles Expansion Projects
Calcasieu Parish, Louisiana

4.12.8 Regulatory Requirements for LNG Carrier Operations

The Coast Guard exercises regulatory authority over LNG facilities that affect the safety and security of port areas and navigable waterways under Executive Order 10173; the Magnuson Act (50 USC 191); the Ports and Waterways Safety Act of 1972, as amended (33 USC 1221, et seq.); and the MTSA of 2002 (46 USC 701). The Coast Guard is responsible for matters related to navigation safety, carrier engineering and safety standards, and all matters pertaining to the safety of facilities or equipment located in or adjacent to navigable waters up to the last valve immediately before the receiving tanks. The Coast Guard also has authority for LNG facility security plan review, approval, and compliance verification as provided in 33 CFR 105.

The Coast Guard regulations in 33 CFR 127 apply to the marine transfer area of waterfront facilities between the LNG vessel and the first manifold or valve located inside the containment. 33 CFR 127 regulates the design, construction, equipment, operations, inspections, maintenance, testing, personnel training, firefighting, and security 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, Magnolia would be required to submit two copies of its Operations and Emergency Manuals to the Coast Guard Captain of the Port (COTP) for examination at least 30 days prior to the first LNG transfer.

Both the Coast Guard regulations under 33 CFR 127 and FERC regulations under 18 CFR §157.21, require an applicant who intends to build an LNG terminal facility to submit a Letter of Intent (LOI) to the Coast Guard at the same time the pre-filing process is initiated with the Commission. Consequently, Magnolia notified the Coast Guard that it proposed to construct a waterfront facility handling LNG located on the Industrial Canal South Shore in Lake Charles, Louisiana and submitted an LOI to the COTP, Marine Safety Unit Port Arthur, on March 12, 2013.

In addition to the LOI, 33 CFR 127 and FERC regulations require each LNG project applicant to submit a Waterway Suitability Assessment (WSA) to the cognizant COTP no later than the start of the FERC pre-filing process. Until a facility begins operation, applicants must annually review their WSAs and submit a report to the COTP as to whether changes are required. The WSA must include the following information:

- port characterization;
- risk assessment for maritime safety and security;
- risk management strategies; and
- resource needs for maritime safety, security, and response.

As described in 33 CFR 127 and in NVIC 01-11, the applicant develops the WSA in two phases. The first phase is the submittal of the Preliminary WSA, which begins the Coast Guard's review process to determine the suitability of the waterway for LNG marine traffic. The second phase is the submittal of the Follow-On WSA. This document is reviewed and validated by the Coast Guard and forms the basis for the agency's LOR to the FERC.

The Preliminary WSA provides an outline which characterizes the port community and the proposed facility and transit routes. It provides an overview of the expected major impacts LNG operations may have on the port, but does not contain detailed studies or conclusions. This document is used to start the Coast Guard's scoping process for evaluating the suitability of the waterway for LNG marine traffic. Magnolia submitted the Preliminary WSA with its LOI to the Coast Guard on March 12, 2013.

A Follow-On WSA is required to provide a detailed and accurate characterization of the LNG facility, the LNG tanker route, and the port area. The assessment is to identify appropriate risk mitigation measures for credible security threats and safety hazards. According to NVIC 01-11, the Follow-on WSA should provide a complete analysis of the topics outlined in the Preliminary WSA. It should identify credible security threats and navigational safety hazards for the LNG marine traffic, along with appropriate risk management measures and the resources (federal, state, local, and private sector) needed to carry out those measures. Based on feedback from the Coast Guard and other stakeholders, Magnolia prepared and submitted the Follow-on WSA to the Coast Guard on December 12, 2013.

As required by its regulations (33 CFR §127.009), the Coast Guard is responsible for issuing an LOR to the FERC regarding the suitability of the waterway for LNG marine traffic with respect to the following items:

- physical location and description of the facility;
- the LNG 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 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 vessels from the channel and the width of the channel.

Once the applicant submits a complete Follow-On WSA, the Coast Guard reviews the document to determine if it presents a realistic and credible analysis of the public safety and security implications from LNG marine traffic in the port. Finally, the Coast Guard issues a LOR. The Coast Guard 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. On September 15, 2014, the COTP issued an LOR and an LOR Analysis which summarized the Coast Guard's recommended risk mitigation measures. Following discussions between the Coast Guard and FERC staff, the Coast Guard re-issued an updated LOR and LOR Analysis on February 12, 2015.[36]

Based on the results of the assessment of potential risks to navigation safety and maritime security associated with the proposed facility, the Coast Guard has determined that the Calcasieu Ship Channel would be suitable for accommodating the type and frequency of LNG marine traffic associated with this project.

[36] Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number, excluding the last three digits, in the "Docket Number" field (i.e., CP14-347). The LOR for the project was filed with the FERC on March 2, 2015.

The Coast Guard's LOR is a recommendation on the current status of the waterway to the FERC, the lead agency responsible for siting the proposed LNG facility. Neither the Coast Guard 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 or the Cost Sharing Plan (see section 4.12.9). However, if the project is approved and if the appropriate resources are not in place, then neither agency would allow the project to go into operation. Measures proposed by Magnolia in the WSA would be needed to responsibly manage the maritime safety and security risks associated with LNG marine traffic. Therefore, **we recommend that:**

- **<u>Prior to commencement of service</u>, Magnolia should receive written authorization from the Director of OEP. Such authorization will only be granted following a determination by the Coast Guard, under its authorities under the Ports and Waterways Safety Act, the Magnuson Act, the Maritime Transportation Security Act of 2002, and the Safety and Accountability For Every Port Act, that appropriate measures to ensure the safety and security of the facility and the waterway have been put into place by Magnolia or other appropriate parties.**

4.12.9 Emergency Response and Evacuation

As required by 49 CFR 193.2059, Magnolia 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, §193.2509(b)(3) requires "Coordinating with appropriate local officials in preparation of an emergency evacuation plan…"

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 Emergency Response Plan in consultation with the Coast Guard and state and local agencies. The FERC must approve the Emergency Response Plan prior to any final approval to begin construction. Therefore, **we recommend that:**

- **<u>Prior to initial site preparation</u>, Magnolia should develop an Emergency Response Plan (including evacuation) and coordinate procedures with the Coast Guard; state, county, and local emergency planning groups; fire departments; state and local law enforcement; and appropriate federal agencies. This plan should include at a minimum:**

    a. designated contacts with state and local emergency response agencies;

    b. scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;

    c. procedures for notifying residents and recreational users within areas of potential hazard;

d. **evacuation routes/methods for residents and public use areas that are within any transient hazard areas along the route of the LNG marine transit;**

e. **locations of permanent sirens and other warning devices; and**

f. **an "emergency coordinator" on each LNG carrier to activate sirens and other warning devices.**

The Emergency Response Plan should be filed with the Secretary for review and written approval by the Director of OEP. Magnolia should notify the FERC staff of all planning meetings in advance and should report progress on the development of its Emergency Response Plan <u>at 3-month intervals</u>.

A number of organizations and individuals have expressed concern that the local community would have to bear some of the cost of ensuring the security and emergency management of the LNG facility and the LNG carriers while in transit and unloading/loading at the berth. Section 3A(e) of the NGA (as amended by EPAct 2005) specifies that the Emergency Response Plan must include a *Cost-Sharing Plan* that contains a description of any direct cost reimbursements the applicants agree to provide to any state and local agencies with responsibility for security and safety at the LNG terminal and in proximity to LNG carriers that serve the facility. Therefore, **we recommend that:**

- **The Emergency Response Plan should include 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. In addition to the funding of direct transit related security/emergency management costs, this comprehensive plan should include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. Magnolia should file the Cost-Sharing Plan for review and written approval by the Director of OEP <u>prior to initial site preparation</u>. Magnolia should notify the FERC staff of all planning meetings in advance and should report progress on the development of its *Cost-Sharing Plan* <u>at 3-month intervals</u>.**

The Cost-Sharing Plan must specify what the LNG terminal operator would provide to cover the cost of the state and local resources required to manage the security of the LNG terminal and LNG carrier, and the state and local resources required for safety and emergency management, including:

- direct reimbursement for any per-transit security and/or emergency management costs (for example, overtime for police or fire department personnel);
- capital costs associated with security/emergency management equipment and personnel base (for example, patrol boats, firefighting equipment); and
- annual costs for providing specialized training for local fire departments, mutual aid departments, and emergency response personnel, and for conducting exercises.

The cost-sharing plan must include the LNG terminal operator's letter of commitment with agency acknowledgement for each state and local agency designated to receive resources.

4.12.10 Conclusions on Facility Reliability and Safety

As part of the NEPA review, Commission staff must assess whether the proposed facilities would be able to operate safely and securely. As a result of our technical review of the preliminary engineering design, we have made a number of recommendations to 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 to the public. Based on our analysis and recommended mitigation, we believe that the facility design proposed by Magnolia includes acceptable layers of protection or safeguards which would reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public.

In addition, we analyzed whether Magnolia would be sited consistently with federal regulations. As a cooperating agency, the DOT assisted FERC staff in evaluating whether Magnolia's proposed design would meet the DOT siting requirements. The DOT reviewed the data and methodology Magnolia used to determine the design spills from various leakage sources, including piping, containers, and equipment containing hazardous liquids. Magnolia used those design spills to model hazardous releases. On September 17, 2014, the DOT provided a letter to the FERC staff stating that the DOT had no objection to Magnolia's methodology for determining the single accidental leakage sources for candidate design spills to be used in establishing the Part 193 siting requirements for the proposed LNG liquefaction facilities. Since the issuance of the letter by the DOT approving the design spill methodology, the DOT has expressed that connections less than 6 inches in diameter should be considered; therefore, FERC staff recommends Magnolia receive confirmation from the DOT on the design spills prior to the end of the draft EIS comment period. If a facility is constructed and becomes operational, the facility would be subject to the DOT inspection and enforcement program. Final determination of whether a facility is in compliance with the requirements of 49 CFR 193 would be made by the DOT staff.

As the quantity of ammonia refrigerant would exceed the 10,000 pound threshold listed under 40 CFR §68.130 and 29 §CFR 1910.119 App A, both the EPA and OSHA have asserted jurisdiction over the regulatory requirements governing the ammonia refrigeration system. In addition, the DOT has determined that applying the EPA's RMP and OSHA's PSM would satisfy the requirements of NFPA 59A (2001) section 2.1.1(d) for the toxic hazards from potential ammonia releases. Magnolia's use of ammonia in the liquefaction process would, therefore, be regulated by the DOT, EPA, and OSHA. Magnolia would comply with the comprehensive EPA RMP and OSHA PSM programs as well as the DOT's requirements under Part 193 and NFPA 59A. By complying with the EPA RMP and OSHA PSM, Magnolia would comply with the same regulations as every other facility in the United States that uses quantities of ammonia above the regulatory threshold. As a result, we conclude that potential hazards from the siting of the facility at this location would not have a significant impact on public safety. If the facility is constructed and becomes operational, compliance with the requirements of 40 CFR 68, 29 CFR 1910.119, and 49 CFR 193 would be addressed as part of the EPA, OSHA, and DOT inspection and enforcement programs. We also analyzed the potential impacts along the waterway from LNG marine traffic. As a cooperating agency, the Coast Guard analyzed the suitability of the waterway for LNG marine traffic. On September 15, 2014, the COTP issued an LOR and an LOR Analysis, which summarized the Coast Guard's recommended risk mitigation measures. Following discussions between the Coast Guard and FERC staff, the Coast Guard re-issued an updated LOR and LOR Analysis on February 12, 2015.[37] Based on the results of the assessment of potential risks to navigation safety and maritime security associated with the proposed facility, the Coast Guard has determined that the Calcasieu Ship Channel would be suitable for accommodating the type and frequency of LNG marine traffic

[37] Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number, excluding the last three digits, in the "Docket Number" field (i.e., CP14-347). The LOR for the project was filed with the FERC on March 2, 2015.

associated with this project. The recommendation was based on full implementation of the strategies and risk management measures identified to the Coast Guard by Magnolia in its WSA. Under the Ports and Waterways Safety Act, the Magnuson Act, the MTSA, and the Safety and Accountability For Every Port Act, the COTP has the authority to prohibit LNG transfer or LNG carrier movements within his or her area of responsibility if he or she determines that such action is necessary to protect the waterway, port, or marine environment. If appropriate resources are not in place prior to LNG carrier movement along the waterway, then the COTP would consider at that time what, if any, vessel traffic and/or facility control measures would be appropriate to adequately address navigational safety and maritime security considerations. FERC staff recommends Magnolia receive written authorization from the Director of OEP before commencement of service at the LNG terminal to ensure the Coast Guard has determined that appropriate measures to ensure the safety and security of the facility and the waterway have been put into place by Magnolia or other appropriate parties.

Based on our engineering design analysis and recommendations, the DOT siting requirements and recommendations, the LOR issued by the Coast Guard concluding the LNG vessel transit is suitable for LNG marine traffic, and the regulatory requirements for the design, construction, and operation of the Terminal, we conclude that the project would not result in significantly increased public safety risks.

4.12.11 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.

Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death.

Methane has an auto-ignition temperature of 1,000 °F and is flammable at concentrations between 5.0 percent and 15.0 percent in air. An unconfined mixture of methane and air is not explosive, however it may ignite and burn if there is an ignition source. A flammable concentration within an enclosed space in the presence of an ignition source can explode. It is buoyant at atmospheric temperatures and disperses rapidly in air.

The DOT regulates and enforces a regulatory program to provide adequate protection against risks to life and property posed by pipeline transportation and pipeline facilities under 49 USC 601. The Pipeline and Hazardous Materials Safety Administration (PHMSA) Office of Pipeline Safety (OPS) administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards which set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve 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. Section 5(a) of the Natural Gas Pipeline Safety Act provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing the federal standards, while section 5(b) permits a state agency that does not qualify under section 5(a) to perform certain inspection and monitoring functions. The state of Louisiana has section 5(a) certification.

The DOT pipeline standards are published in 49 CFR 190 to 199. Part 192 addresses natural gas pipeline safety issues. Under a Memorandum of Understanding on Natural Gas Transportation Facilities

(Memorandum) dated January 15, 1993 between the DOT and the FERC, the DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of the FERC's regulations require that an applicant certify that it will design, install, inspect, test, construct, operate, replace, and maintain the facility for which a certificate is requested in accordance with federal safety standards and plans for maintenance and inspection, or 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. The FERC accepts this certification and does not impose additional safety standards other than the DOT standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert the DOT. The Memorandum also provides for referring complaints and inquiries made by state and local governments and the general public involving safety matters related to pipelines under the Commission's jurisdiction. The FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee which determines if proposed safety regulations are reasonable, feasible, and practicable.

The header pipelines and aboveground facilities associated with the KMLP facilities would be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. The DOT specifies material selection and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion. Part 192 also defines area classifications, based on population density in the vicinity of the pipeline, and specifies more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline. The four area classifications are defined below:

- Class 1 – location with 10 or fewer buildings intended for human occupancy;

- Class 2 – location with more than 10 but less than 46 buildings intended for human occupancy;

- Class 3 – location with 46 or more buildings intended for human occupancy, or where the pipeline lies within 100 yards of any building or small well-defined outside area (e.g., playground, recreation area, outdoor theater, or other place of public assembly) occupied by 20 or more people for at least 5 days a week for 10 days in any 12-month period (the days and weeks need not be consecutive); and

- Class 4 – location where buildings with four or more stories aboveground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. Buried pipelines constructed on land in Class 1 locations must be provided with a minimum coverage 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. All pipelines installed in navigable rivers, streams, and harbors must have a minimum cover of 48 inches in normal soil or 24 inches in consolidated rock.

Section 192.179 specifies the maximum distance from a point on a pipeline to a sectionalizing block valve: each point on a pipeline in a Class 1 location must be within 10.0 miles of a block valve, in Class 2 locations the distance is 7.5 miles, and in Class 3 and 4 locations, the distance is 4.0 and 2.5 miles respectively. 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.

Based on the definitions in 49 CFR 192, both the low pressure header pipeline, which consists of 1.2 miles of 36-inch-diameter pipeline, and the high pressure header pipeline, which consists of 700 feet of 24-inch-diameter pipeline would be entirely located within Class 1 areas. KMLP would provide approximately 70 inches of cover, compared to the DOT-required 30 inches. During operations, if a subsequent increase in population density adjacent to the right-of-way results in a change in class location for the pipeline, KMLP may meet the new class location standard by reducing the operating pressure or by replacing the pipeline segment with pipe of sufficient grade and wall thickness to comply with the applicable DOT code of regulations for the new class location.

In 2002, Congress passed an act to strengthen the nation's pipeline safety laws. The Pipeline Safety Improvement Act of 2002 (HR 3609) was passed by Congress on November 15, 2002, and signed into law by the President in December 2002. Since December 17, 2004, gas transmission operators are required 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 covered transmission pipeline segment. Specifically, the law requires pipeline operators to establish an integrity management program which applies to all high consequence areas (HCA). The DOT (68 Federal Register 69778, 69 Federal Register 18228, and 69 Federal Register 29903) defines HCAs as they relate to the different class zones, potential impact circles, or areas containing an identified site as defined in 49 CFR 192.903.

The OPS published a series of rules from August 6, 2002, to May 26, 2004, (69 Federal Register 29903) that defines HCAs where a gas pipeline accident could do considerable harm to people and their property and require an integrity management program to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate in 49 USC 60109 for OPS to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCA may be defined in one of two ways. In the first method, an HCA includes:

- current Class 3 and 4 locations;
- any area in Class 1 or 2 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 which 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 program to those segments of the pipeline within the HCAs. The DOT regulations specify the requirements for the integrity management plan in 49 CFR 192.911. The pipeline integrity management rule for HCAs requires inspection of the entire pipeline in HCAs every 7 years. No HCAs are present along the proposed header pipeline routes.

The minimum standards for operating and maintaining pipeline facilities are prescribed in 49 CFR 192, including the requirement to establish a written plan governing these activities. Under 49 CFR 192.615, each pipeline operator must establish an emergency plan that includes written procedures to minimize the hazards in a natural gas pipeline emergency. Key elements of the plan include procedures for the following:

- receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- emergency shutdown 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.

Under 49 CFR 192.616, each operator must establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials. KMLP's existing liaison program encompasses the areas crossed by the proposed pipelines. Key elements of the liaison program include periodic safety training, special informational meetings and trainings at the request of the parishes, and periodic distribution of emergency telephone numbers and other pertinent information. KMLP also uses a Public Awareness Program that requires the company to communicate with the affected public, emergency response officials, public officials, and excavators/contractors on a regular basis.

KMLP would provide training to all employees responsible for operation and maintenance of the pipelines, compressor station, and meter stations installed or modified as part of the project, including review of routine and emergency procedures. Employees responsible for future support of the facilities would be given hands-on training to familiarize them with new equipment. In addition to in-house training, equipment vendors would provide training prior to start-up of new facilities.

The pipelines, compressor station, and meter stations associated with the KMLP facilities would be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. The DOT specifies material selection and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion. As a new pipeline and compressor station, and with the continuing advancements in materials and pipeline operating and maintenance practices, the chances of a failure of the proposed facilities is extremely low. In addition, the safety and reliability of the KMLP facilities would be based on safe design, appropriate equipment selection, code compliance, thorough review, careful construction, and competent maintenance and operation. Measures would be incorporated according to approved design practices and standards.

Measures to protect the public from inadvertent natural gas releases due to accidents or natural catastrophes can be grouped into three categories: passive protection, active controls, and procedural controls as described below.

Passive Protection Measures

Passive protection minimizes the hazards by process and equipment design features, which reduce either the frequency or consequence of a hazard without the active functioning of a device. Passive protection would include the following measures:

- pipeline design, construction, commissioning, and operation would be conducted in strict accordance with applicable DOT regulations found at 49 CFR 192;
- pipeline design factor, wall thickness, and other parameters would be established according to a classification system based on the number, proximity to the pipeline, and occupation levels of buildings intended for human occupancy located along the right-of-way, in accordance with DOT regulations;
- KMLP would comply with the applicable sections of the ASME/ANSI B31.8, which is the most widely used industry code for the design, operation, maintenance, and repair of natural gas distribution and transmission pipelines;
- header pipelines would be externally coated with fusion-bonded epoxy to protect against corrosion; and
- construction specifications would be developed for installation of the proposed facilities incorporating relevant sections of FERC's Plan and Procedures. These specifications along with project-specific plans and procedures for unique construction techniques would be included in a project-specific Environmental Management and Construction Plan.

Active Control Measures

Active (or engineering) controls use instruments, valves, safety interlocks, traffic control, and emergency shutdown systems to detect and correct process deviations; (e.g., line break detection systems). Active controls would include:

- KMLP's gas control center in Houston, Texas monitors system pressures, flows, and customer deliveries. The gas control center is manned 24 hours per day, 365 days per year. KMLP also operates area offices along its pipeline system that allow personnel to respond appropriately to emergency situations and direct safety operations as necessary. Additionally, KMLP maintains a backup location for gas control operations in the event the primary location is placed out of service;

- to protect the integrity of the KMLP system, an overpressure protection system, set at 104 percent of the MAOP of the pipeline, would be employed;

- to protect the integrity of the pipeline system, an impressed current cathodic protection system would be installed as a corrosion prevention measure;

- a Supervisory Control and Data Acquisition (SCADA) system would provide for and enable pipeline monitoring and the control of the gas pipeline;

- Remote Terminal Units for the SCADA system would be located at every interconnect manifold, and at the start and end point of the pipeline;

- all field girth welds would be tested via x-ray or ultrasonic;

- an increase in local traffic is anticipated as a result of construction activities. KMLP would coordinate with local authorities to provide for traffic control as necessary. If required, signage and flaggers would be provided to ensure public safety;

- the pipeline and associated facilities would be hydrostatically tested for structural integrity before commencing operation; and

- the pipeline would be equipped with facilities to accommodate smart pigging operations for the purpose of locating anomalies in the pipeline wall thickness that may indicate corrosion, and out-of-roundness than may indicate the pipe has been subjected to external forces.

Procedural Control Measures

Procedural (or administrative) controls use operating procedures, administrative checks, emergency response, and other management approaches to prevent incidents, or to minimize the effects of an accident (e.g., operating procedures, safe work practices, inspections and testing, and training). Procedural controls would include:

- procedures for testing, start-up, operation, and training of operations and maintenance staff on operational procedures;

- regularly scheduled preventative maintenance programs to meet government regulations for pipeline segments and metering stations;

- an Emergency Response Plan, to be developed with local fire departments and other agencies, to respond to hazardous conditions caused by the pipeline (KMLP would establish and maintain liaison with the appropriate fire, police, and public officials to coordinate mutual assistance during emergencies);

- a continuing education program to enable customers, the public, government officials, and those engaged in excavation to recognize a natural gas pipeline emergency and report it to appropriate public officials and the company; and

- procedures for aerial surveillance flights, on-ground leak detection surveys, internal pipeline inspection with pigging equipment, and cathodic protection system inspection and maintenance.

4.12.11.1 Pipeline Accident Data

Title 49 CFR 191 requires all operators of natural gas transmission pipelines to notify the DOT of any significant incidents and to submit a report within 20 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.[38]

During the 20-year period from 1994 through 2013, a total of 1,238 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 4.12.11-1 provides the number of significant incidents by cause from 1994 to 2013. The dominant causes of pipeline incidents are pipeline material, weld or equipment failure and corrosion, collectively constituting 48.5 percent of all significant incidents. The pipelines included in the data set in table 4.12.11-1 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 and material failure since corrosion and pipeline stress/strain are time-dependent processes. The use of both an external protective coating and a cathodic protection system, required on all pipelines installed after July 1971, substantially reduces the corrosion rate compared to unprotected or partially protected pipe.

The dominant causes of pipeline incidents are pipeline material, weld or equipment failure, and corrosion, collectively constituting 48.5 percent of all significant incidents. The pipelines included in the data set in table 4.12.11-1 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.

TABLE 4.12.11-1

Natural Gas Transmission Pipeline Significant Incidents by Cause (1994–2013)

Cause	Number of Incidents	Percentage of Total Incidents [a]
Corrosion	293	23.6
Excavation [b]	211	17.0
Pipeline material, weld, or equipment failure	309	24.9
Natural force damage	143	11.5
Outside forces [c]	75	6.0
Incorrect operation	34	2.7
All other causes [d]	173	13.9
Total	**1,238**	**--**

Source PHMSA, 2014a
[a] Due to rounding, column does not total 100 percent.
[b] Includes third-party damage.
[c] Fire, explosion, vehicle damage, intentional damage.
[d] Miscellaneous or unknown causes.

[38] $50,000 in 1984 dollars is about $113,000 dollars as of March 2015 (Bureau of Labor Statistics, 2015).

TABLE 4.12.11-2

Outside Force Incidents by Cause (1994–2013) [a]

Cause	Number of Incidents	Percentage of Total Incidents [b]
Third-party excavation damage	176	14.2
Operator excavation damage	25	2.0
Unspecified equipment damage / previous damage	10	0.7
Heavy rain / floods	72	5.8
Earth movement	35	2.8
Lightning / temperature / high winds	21	1.6
Unspecified natural force	15	1.2
Vehicle (not engaged with excavation)	45	3.6
Fire / explosion	8	0.6
Previous mechanical damage	6	0.4
Intentional damage	1	0.1
Fishing or maritime activity	7	0.4
Electrical arcing from other equipment / facility	1	0.1
Unspecified outside force	7	0.4
Total	**429**	--

Source PHMSA, 2014a

[a] Excavation, outside forces, and natural force damage from table 4.12.9-1.

[b] Due to rounding, column does not total 100 percent.

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 pipeline systems 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 movements.

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 (for example, oil pipelines and cable television) to provide pre-construction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts.

4.12.11.2 Impacts on Public Safety

The significant incident data summarized in table 4.12.11-1 include pipeline failures with varying magnitudes and consequences. Although the transportation of natural gas via pipeline involves some degree of risk to the public in the event of an accident and subsequent release of gas, it is important to examine the probabilistic level of risks for pipeline-related events. According to the PHMSA, there are 2.6 million miles of pipelines that cross the United States, and those pipelines offer a safe and cost-efficient way to transport natural gas (PHMSA, 2014a). Table 4.12.11-3 presents the average annual injuries and fatalities that occurred on natural gas transmission lines between 2009 and 2013. The data has been separated into employees and nonemployees to better identify a fatality rate experienced by the general public.

TABLE 4.12.11-3

Annual Average Injuries and Fatalities (2009–2013)

	Injuries		Fatalities	
Year	Employees	Public	Employees	Public
2009	4	7	0	0
2010 [a]	10	51	2	8
2011	1	0	0	0
2012	3	4	0	0
2013	0	2	0	0

Source PHMSA, 2014b

[a] All of the public injuries and fatalities in 2010 were due to the Pacific Gas and Electric pipeline rupture and fire in San Bruno, California on September 9, 2010.

The majority of fatalities from pipelines involve local distribution pipelines. These are natural gas pipelines that are not regulated by the 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 4.12.11-4 in order to provide a relative measure of the industry-wide safety of natural gas transmission pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. Furthermore, the fatality rate is more than 25 times lower than the fatalities from natural hazards such as lightning, tornados, and floods.

TABLE 4.12.11-4

Nationwide Accidental Deaths from Various Causes

Type of Accident	Annual Number of Deaths
All accidents	123,706
Motor vehicle	43,945
Poisoning	29,846
Falls	22,631
Drowning	3,443
Fire, smoke inhalation, burns	3,286
Flood	89 [a]
Lightning	52 [a]
Tornado	74 [a]
Natural gas distribution lines	14 [b]
Natural gas transmission lines	2 [b]

Source U.S. Census Bureau, 2010d

[a] National Weather Service, 2014b

[b] PHMSA, 2014b

The available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation. From 1994 to 2013, there were an average of 62 significant incidents and two fatalities per year (PHMSA, 2014b). 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. As described above, the KMLP facilities would be constructed and operated in accordance with DOT requirements; therefore we conclude operation of the KMLP facilities would be safe and would represent only a slight increase in risk to the nearby public.

As discussed in section 4.12.9, the risk associated with the proposed facilities would be small. Although operation of the KMLP facilities would have a very small incremental increase in the risk of a pipeline accident. As a result, the cumulative impact and risks associated with constructing or operating the facilities would be negligible.

4.13 CUMULATIVE IMPACTS

NEPA requires the lead federal agency to consider the potential cumulative impacts of proposals under its review. Cumulative impacts may result when the environmental effects associated with the proposed action are superimposed on or added to impacts associated with past, present, and reasonably foreseeable future projects. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

The project-specific impacts of the Magnolia LNG and Lake Charles Expansion Projects are discussed in detail in other sections of this EIS. The purpose of this section is to identify and describe cumulative impacts that would potentially result from implementation of the proposed projects along with other projects in the vicinity that could affect the same resources in the same approximate timeframe. To ensure that this analysis focuses on relevant projects and potentially significant impacts, the actions included in the cumulative impact analysis include projects that:

- impact a resource potentially affected by the proposed projects;
- impact that resource within all or part of the time span encompassed by the proposed or reasonably expected construction or operation schedule of the projects; and
- impact that resource within all or part of the same geographical area affected by the projects. The geographical area considered varies depending on the resource being discussed, which is the general area (region of influence) in which the projects could contribute to cumulative impacts on that particular resource.

4.13.1 Project and Activities Considered

With respect to past actions, CEQ guidance (2005) allows agencies to adopt a broad, aggregated approach without "delving into the historical details of individual past actions," an approach we have taken here. The current regional landscape in the Lake Charles area, which currently supports a large amount of industrial and commercial infrastructure, forms the environmental baseline described in other sections of this EIS and against which the impacts of reasonably foreseeable future actions are considered. Recently completed projects are included with past projects as part of the environmental baseline. Reasonably foreseeable projects that might cause cumulative impacts in combination with the proposed projects include projects that are under construction, approved, proposed, or planned. For FERC-regulated projects, proposed projects are those for which the proponent has submitted a formal application to the FERC, and planned projects are projects that are either in pre-filing or have been announced, but have not been proposed. Planned projects also include projects not under the FERC's jurisdiction that have been identified through publically available information such as press releases, internet searches, Magnolia's and KMLP's communications with local agencies, and information available from the Southwest Louisiana Economic Development Alliance (SWLA Economic Development Alliance), which monitors proposed development activities in southwest Louisiana.

Table 4.13.1-1 lists the projects and activities we considered in this cumulative impact analysis, including the location, distance from the projects, workforce, construction timeframe, and resources cumulatively affected in conjunction with the proposed facilities. Project locations are identified in figures 4.13.1-1 and 4.13.1-2. As noted in the following subsections, some projects were eliminated from further discussion if it was determined that they would not meet the criteria listed above or if sufficient information is not available to allow for a meaningful analysis. Descriptions of potential cumulative impacts by resource category are presented in section 4.13.2. In cases where quantitative information is not available for projects considered in this analysis (e.g., projects in the planning stages, or those contingent on economic conditions, availability of financing, or the issuance of permits), the potential impacts of those projects are considered qualitatively.

4.13.1.1 Liquefaction and LNG Export Projects

We identified 17 projects associated with the liquefaction and export of LNG that are proposed, planned, or under construction in the vicinity of the proposed projects that have the potential to contribute to cumulative impacts (see table 4.13.1-1 and figure 4.13.1-1). Of the 17 projects, 8 are associated with existing LNG terminals, including the Trunkline, Cameron, Sabine Pass, and Golden Pass LNG Terminals. Three of these projects (Cameron Liquefaction Project, Cameron Pipeline Expansion Project, and Sabine Pass Liquefaction Project) have been permitted and are currently under construction. One project (the Sabine Pass Liquefaction Expansion Project) has been authorized by the Commission, but has not yet begun construction. The four other projects at existing LNG terminals are undergoing the FERC's environmental review. In addition to projects at existing LNG terminals, nine new liquefaction and LNG export terminals are planned or proposed in the area. These include three projects that have entered the FERC's review process (Calcasieu Pass Project, Delfin LNG Project, and Port Arthur Liquefaction Project) and seven projects that have been announced but have not yet entered into the FERC's review process. Brief descriptions of each of the projects associated with liquefaction and LNG export are provided below.

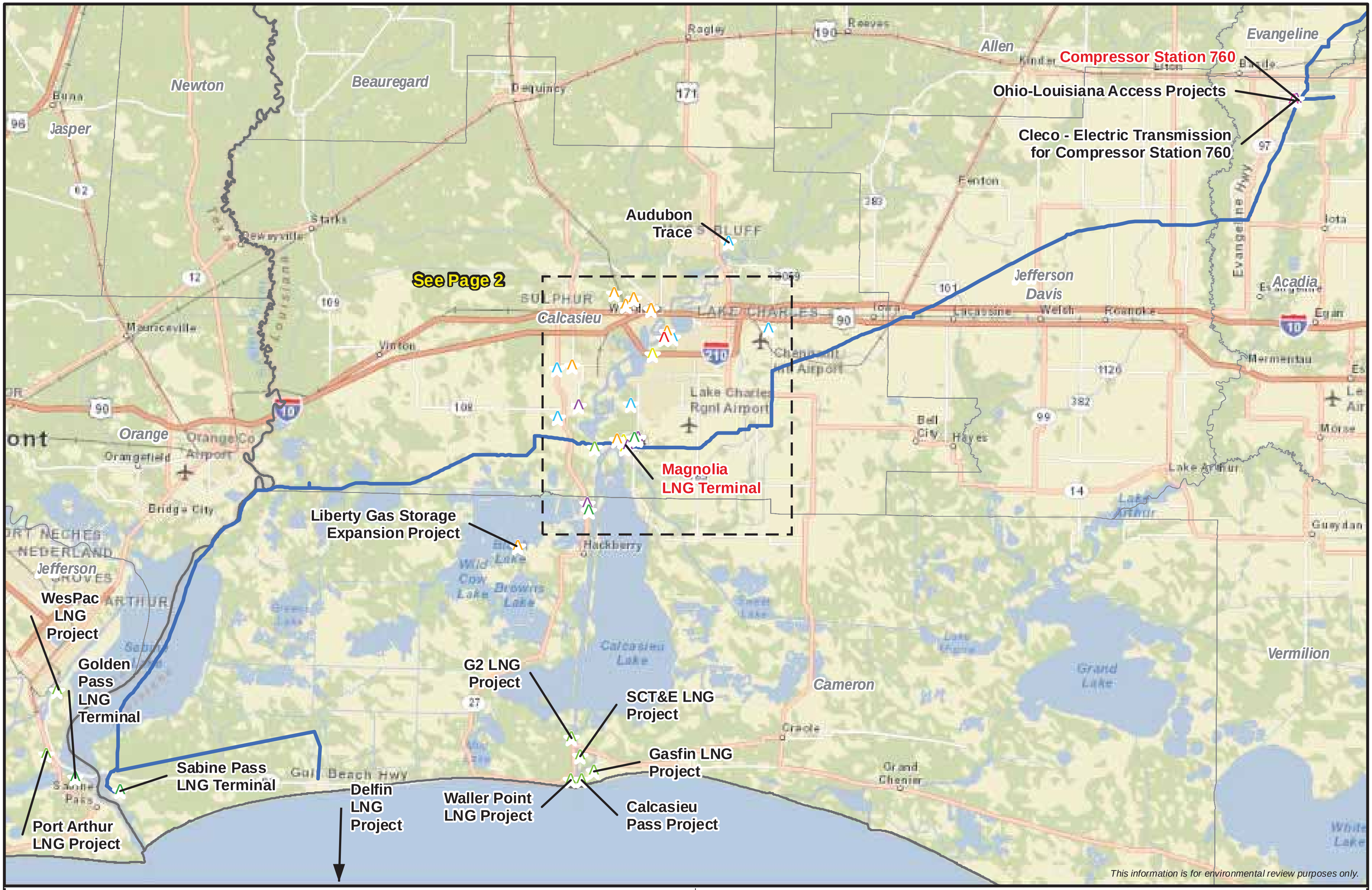
Liquefaction and LNG Export Projects at Existing LNG Terminals

<u>Cameron LNG Terminal</u>

The existing Cameron LNG Terminal is in Cameron Parish, Louisiana, approximately 5 miles south of Magnolia's proposed LNG terminal on the western shoreline of the Calcasieu Ship Channel. Four expansion projects associated with the Cameron LNG Terminal are currently under construction (Cameron Liquefaction Project and Cameron Pipeline Expansion Project), proposed (Cameron Access Project), or planned (Cameron Expansion Project).

The Cameron Liquefaction Project,[39] which will have a send-out capacity of approximately 15 MTPA of LNG, was authorized by the Commission in June 2014 and is currently under construction within and immediately adjacent to the existing Cameron LNG Terminal. The project, which is scheduled to begin operation in 2018, includes three liquefaction trains (Trains 1 through 3) and one LNG storage tank (Tank 4).

[39] The Cameron Liquefaction Project, Cameron Pipeline Expansion Project, and Cameron Expansion Project are discussed in more detail in section 3.2.1.1.



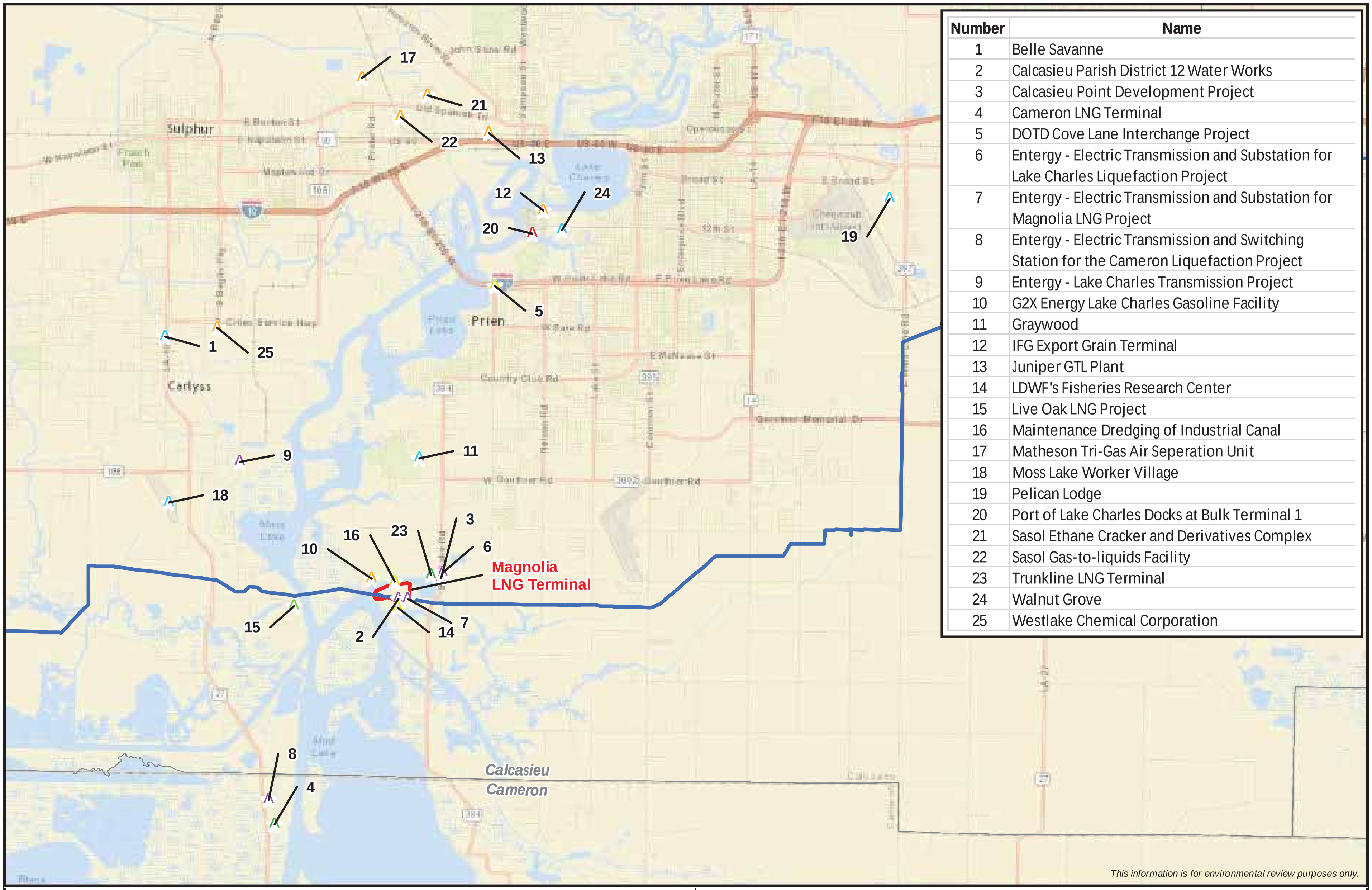
Page 1 of 2

Figure 4.13.1-1
Projects Considered in the Cumulative Impacts Analysis
Magnolia LNG and Lake Charles Expansion Projects

NATURAL RESOURCE GROUP
an ERM Group company

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\03\Area_Projects\MLP_Area_Projects.mxd | REVISED: 06/16/2015 | SCALE: 1:175,000

DRAWN BY: JSSuess



Number	Name
1	Belle Savanne
2	Calcasieu Parish District 12 Water Works
3	Calcasieu Point Development Project
4	Cameron LNG Terminal
5	DOTD Cove Lane Interchange Project
6	Entergy - Electric Transmission and Substation for Lake Charles Liquefaction Project
7	Entergy - Electric Transmission and Substation for Magnolia LNG Project
8	Entergy - Electric Transmission and Switching Station for the Cameron Liquefaction Project
9	Entergy - Lake Charles Transmission Project
10	G2X Energy Lake Charles Gasoline Facility
11	Graywood
12	IFG Export Grain Terminal
13	Juniper GTL Plant
14	LDWF's Fisheries Research Center
15	Live Oak LNG Project
16	Maintenance Dredging of Industrial Canal
17	Matheson Tri-Gas Air Seperation Unit
18	Moss Lake Worker Village
19	Pelican Lodge
20	Port of Lake Charles Docks at Bulk Terminal 1
21	Sasol Ethane Cracker and Derivatives Complex
22	Sasol Gas-to-liquids Facility
23	Trunkline LNG Terminal
24	Walnut Grove
25	Westlake Chemical Corporation

This information is for environmental review purposes only.

KMLP System
Agency Projects
Commercial Developments
Existing LNG Terminal Expansions
Greenfield LNG Terminal Projects
Industrial Projects
Residential Developments
Utility Projects

1:175,000
0 1.5 3 Miles

Page 2 of 2

Figure 4.13.1-1
Projects Considered in the Cumulative Impacts Analysis
Magnolia LNG and Lake Charles Expansion Projects

NATURAL RESOURCE GROUP
an ERM Group company

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\03\Area_Projects\MLP_Area_Projects_Zoom.mxd | REVISED: 06/16/2015 | SCALE: 1:175,000

DRAWN BY: JSSuess

TABLE 4.13.1-1

Reasonably Foreseeable Projects and Resources Considered in the Cumulative Impacts Analysis for the Magnolia LNG and Lake Charles Expansion Projects

Project/Activity	Location	Distance from Facilities	Estimated Timeframe	Included in Cumulative Impact Analysis
INDUSTRIAL DEVELOPMENTS				
Liquefaction and LNG Export Projects Associated with Existing LNG Terminals				
Cameron LNG Terminal				
Cameron Liquefaction Project	Calcasieu Ship Channel, Cameron Parish, LA	5 miles	Construction 2014 Operation 2018	Yes
Cameron Expansion Project	Calcasieu Ship Channel, Cameron Parish, LA	5 miles	Construction 2016 Operation 2019	Yes
Cameron Pipeline Expansion Project	Cameron and Beauregard Parishes, LA	14 miles	Construction 2014 Operation 2017	Yes
Cameron Access Project	Cameron, Calcasieu, and Jefferson Davis Parishes, LA	3 miles	Construction 2016 Operation 2017	Yes
Golden Pass LNG Terminal				
Golden Pass Products LNG Export Project	Sabine Pass, Jefferson County, TX	44 miles	Construction 2015 Operation 2018	No
Trunkline LNG Terminal				
Lake Charles Liquefaction Project	Industrial Canal, Calcasieu Parish, LA	1,000 feet	Construction 2015 Operation 2019	Yes
Sabine Pass LNG Terminal				
Sabine Pass Liquefaction Project	Sabine Pass, Cameron Parish, LA	42 miles	Construction 2013 Operation 2017	Yes
Sabine Pass Liquefaction Expansion Project	Sabine Pass, Cameron Parish, LA	42 miles	Construction 2015 Operation 2019	Yes
Greenfield Liquefaction and LNG Export Projects				
Calcasieu Pass Project	Calcasieu Ship Channel, Cameron Parish, LA	23 miles	Construction 2016 Operation 2019	Yes
Delfin LNG Project	Gulf of Mexico	74 miles	Construction 2017 Operation 2018	Yes
G2 LNG Project	Calcasieu Ship Channel, Cameron Parish, LA	20 miles	Construction TBD Operation 2019	Yes
Gasfin LNG Project	Calcasieu Ship Channel, Cameron Parish, LA	22 miles	Not Available	No
Live Oak LNG Project	Calcasieu Ship Channel, Calcasieu Parish, LA	2 miles	Construction NA Operation 2019	Yes
Port Arthur Liquefaction Project	Jefferson County, TX	45 miles	Construction 2017 Operation 2021	No
SCT&E LNG Project	Calcasieu Ship Channel, Cameron Parish, LA	22 miles	Not Available	No
Waller Point LNG Project	Calcasieu Ship Channel, Cameron Parish, LA	23 miles	Not Available	No
WesPac LNG Project	Jefferson County, TX	45 miles	Not Available	No

TABLE 4.13.1-1 (cont'd)

Reasonably Foreseeable Projects and Resources Considered in the Cumulative Impacts Analysis for the Magnolia LNG and Lake Charles Expansion Projects

Project/Activity	Location	Distance from Facilities	Estimated Timeframe	Included in Cumulative Impact Analysis
Non-jurisdictional Facilities Associated with the Magnolia LNG and Lake Charles Expansion Projects				
LNG Trucking	Lake Charles, Calcasieu Parish, LA	0 feet (property boundary)	Begin operation in 2018	Yes
LNG Bunkering and Domestic Marine Distribution	Calcasieu Ship Channel Calcasieu and Cameron Parishes, LA	0 feet (upon exiting the berthing area)	Begin operation in 2018	Yes
Calcasieu Parish District 12 Water Works' Tie-in to the LNG Terminal	Lake Charles, Calcasieu Parish, LA	0 feet (within LNG terminal)	Dependent on proposed LNG terminal schedule	Yes
Entergy's Electric Transmission Line for the LNG Terminal	Lake Charles, Calcasieu Parish, LA	0 feet (within and adjacent to LNG terminal)	Dependent on proposed LNG terminal schedule	Yes
Cleco's Electric Transmission Line for Compressor Station 760	Acadia Parish, LA	0 feet (adjacent to Compressor Station 760)	Dependent on KMLP facilities schedule	Yes
Pipeline System Modification Projects				
Ohio–Louisiana Access Project	Acadia Parish, LA	0.4 mile	Construction 2015 Operation 2016	No
Other Industrial and Commercial Projects				
G2X Energy's Natural Gas to Gasoline Facility	Industrial Canal, Calcasieu Parish, LA	1,000 feet	Construction 2015 Operation 2017	Yes
IFG Port Holdings, LLC's Export Grain Terminal Expansion	Port of Lake Charles, Calcasieu Parish, LA	8 miles	Construction 2012 Operation 2015	No
Juniper GTL Plant	Westlake, Calcasieu Parish, LA	9 miles	Construction 2014 Operation 2015	No
Liberty Gas Storage, LLC's Liberty Gas Storage Expansion Project	Calcasieu and Cameron Parishes, LA	5 miles	Construction 2015 Operation 2017	Yes
Matheson Tri-Gas' Air Separation Unit	Westlake, Calcasieu Parish, LA	10 miles	Construction 2015 Operation 2016	Yes
Port of Lake Charles' Docks at Bulk Terminal 1	Lake Charles, Calcasieu Parish, LA	7 miles	Not Available	Yes
Sasol's Ethane Cracker and Derivatives Complex	Westlake, Calcasieu Parish, LA	10 miles	Construction 2014 Operation 2018	Yes
Sasol's Gas-to-Liquids Facility	Westlake, Calcasieu Parish, LA	10 miles	Investment Decision Delayed	No
Westlake Chemical Corporation	Lake Charles, Calcasieu Parish, LA	6 miles	Construction 2015 Operation 2016	Yes
Other Utility Projects				
Calcasieu Point Development Project	Lake Charles, Calcasieu Parish, LA	0.6 mile	Construction 2015 Operation 2016	No
Entergy's Lake Charles Transmission Project	Lake Charles, Calcasieu Parish, LA	5 miles	Construction 2016 Operation 2018	Yes

TABLE 4.13.1-1 (cont'd)

Reasonably Foreseeable Projects and Resources Considered in the Cumulative Impacts Analysis for the Magnolia LNG and Lake Charles Expansion Projects

Project/Activity	Location	Distance from Facilities	Estimated Timeframe	Included in Cumulative Impact Analysis
Entergy's Transmission Line and Substation for the Lake Charles Liquefaction Project	Calcasieu and Beauregard Parishes, LA	0.7 mile	Dependent on an LNG Project	Yes
Entergy's Transmission Line for the Cameron Liquefaction Project	Cameron and Calcasieu Parishes, LA	5 miles	Dependent on an LNG Project	Yes
RESIDENTIAL DEVELOPMENTS				
Audubon Trace	Moss Bluff, Calcasieu Parish, LA	15 miles	Construction 2015 Operation unknown	Yes
Belle Savanne	Sulphur, Calcasieu Parish, LA	7 miles	Construction 2013 Operation unknown	Yes
Moss Lake Worker Village	Carlyss, Calcasieu Parish, LA	4 miles	Construction 2015 Operation TBD	Yes
Pelican Lodge Workforce Housing	Lake Charles, Calcasieu Parish, LA	12 miles	Construction 2014 Operation TBD	Yes
Walnut Grove Development	Lake Charles, Calcasieu Parish, LA	8 miles	Construction 2010 Operation 2019	Yes
FEDERAL AND STATE AGENCY PROJECTS				
DOTD's Cove Lane Interchange Project	Cameron and Calcasieu Parishes, LA	6 miles	Construction 2015 Operation 2015	No
LDWF's Fisheries Research Center	Lake Charles, Calcasieu Parish, LA	100 feet (adjacent to LNG terminal)	Construction 2016 Operation 2020–2021	Yes
COE and Lake Charles Harbor and Terminal District's Maintenance Dredging of the Calcasieu Ship Channel	Cameron and Calcasieu Parishes, LA	0 feet (adjacent to LNG terminal)	Ongoing	Yes

Notes: NA = Not applicable; TBD = To be determined

Modifications to Cameron Interstate's existing natural gas pipeline system are required to provide feed gas for the Cameron Liquefaction Project. The modifications, known as the Cameron Pipeline Expansion Project, were authorized by the Commission in June 2014 and include the construction and operation of about 21 miles of natural gas pipeline, one compressor station, one new interconnect, and associated facility modifications to provide for bi-directional transportation of natural gas. The closest component of the project to Magnolia's proposed LNG terminal is the natural gas pipeline, which is approximately 14 miles north-northwest of the site. Construction of the Cameron Pipeline Expansion Project began in 2014; the facilities are expected to begin operation in 2017.

Cameron LNG entered into the FERC's pre-filing process for the Cameron Expansion Project in March 2015, which would increase the LNG send-out capacity by 10 MTPA over the capacity authorized by the Cameron Liquefaction Project. The project would include the construction and operation of two additional liquefaction trains (Trains 4 and 5) and one additional LNG storage tank (Tank 5), which would be adjacent to and integrated with the Cameron Liquefaction Project. If approved by the Commission, the project would begin construction in May 2016 and begin operation in 2019.

Columbia Gulf Transmission, LLC (Columbia Gulf) filed an application with the FERC in March 2015 for a project (known as the Cameron Access Project) that would involve the construction of approximately 27 miles of 36-inch-diameter greenfield pipeline, approximately 10 miles of 30-inch-diameter loop pipeline, and a new 10,200-hp compressor station in Cameron, Calcasieu, and Jefferson Davis Parishes.[40] At its closest point, the pipeline would be about 3 miles south of Magnolia's proposed LNG terminal. If approved by the Commission, construction of the Cameron Access Project would begin in September 2016; operation of the project would begin in July 2017.

Due to the overlapping construction schedules and proximity to the projects, construction and operation of the four expansion projects associated with the Cameron LNG Terminal have been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Golden Pass LNG Terminal

The Golden Pass LNG Terminal is in Jefferson County, Texas, about 44 miles southwest of Magnolia's proposed LNG terminal. As discussed in section 3.2.1.1, Golden Pass submitted an application with the FERC in July 2014 for the Golden Pass Products LNG Export Project, which would be contiguous to and integrated with the existing Golden Pass LNG Terminal. The project would also include about 2.5 miles of natural gas pipeline, additional compression, and associated facility modifications. Due to the distance of this facility from the proposed projects as well as its location on the western shoreline of the Sabine Pass Channel in Texas, the Golden Pass Products LNG Export Project would not contribute to cumulative impacts on any resources affected by the projects, as indicated in table 4.13.1-1.

Sabine Pass LNG Terminal

The Sabine Pass LNG Terminal is in Cameron Parish, Louisiana, approximately 42 miles southwest of Magnolia's proposed LNG terminal. Two liquefaction and LNG export projects associated with the Sabine Pass LNG Terminal have been authorized by the Commission, including the Sabine Pass Liquefaction Project and the Sabine Pass Liquefaction Expansion Project.

The Sabine Pass Liquefaction Project was authorized by the Commission in April 2012 and is currently under construction within the existing Sabine Pass LNG Terminal. The project will include four liquefaction trains (Trains 1 through 4) that are expected to be placed into service in phases. The first liquefaction train is expected to begin service in late 2015; the remaining three liquefaction trains will be placed into service on a 6- to 9-month staggered basis thereafter.

The Sabine Pass Liquefaction Expansion Project was authorized by the Commission in April 2015, and it is expected that construction of two additional liquefaction trains (Trains 5 and 6) will begin in 2015 with an anticipated in-service date in 2019.

Due to the overlapping construction schedules and proximity to the projects, construction and operation of the two expansion projects associated with the Sabine Pass LNG Terminal have been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Trunkline LNG Terminal

The Trunkline LNG Terminal is in Calcasieu Parish, Louisiana, approximately 1,000 feet northeast of Magnolia's proposed LNG terminal on the north side of the Industrial Canal. The existing

[40] Docket No. CP15-109-000

import terminal includes vaporization units, four aboveground LNG storage tanks, and two LNG carrier berths on an approximately 125-acre site.

In March 2014, the Lake Charles LNG companies submitted an application to the FERC to construct and operate a liquefaction and LNG export project (the Lake Charles Liquefaction Project) that would be contiguous to and integrated with the existing Trunkline LNG Terminal (see section 3.2.1.1). The proposed liquefaction facilities would be immediately north of and adjacent to the existing Trunkline LNG Terminal and would include three liquefaction trains with a design production capacity of approximately 16.5 MTPA. Feed gas would be delivered via existing pipeline facilities that connect the terminal with various existing interstate pipeline systems, and/or by new pipeline facilities that have been proposed by the Lake Charles LNG companies.

Subject to the receipt of FERC authorization and other applicable permits, authorizations, and approvals, construction of the Lake Charles Liquefaction Project would commence in 2015, and the first liquefaction train would be placed into service in 2019. The second and third liquefaction trains would be placed into service in 6-month intervals following start-up of the first train. Due to the overlapping construction schedules and proximity to the projects, the construction and operation of the Lake Charles Liquefaction Project has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Greenfield Liquefaction and LNG Export Projects

<u>Calcasieu Pass Project</u>

Venture Global plans to develop a liquefaction and LNG export terminal in Cameron Parish approximately 23 miles south of Magnolia's proposed LNG terminal on the east side of the Calcasieu Ship Channel near the Gulf of Mexico (see figure 4.13.1-1). The Commission approved Venture Global's request to begin the pre-filing process for the Calcasieu Pass Project in October 2014. The project is described in detail in section 3.2.1.2. Subject to the receipt of the necessary approvals, Venture Global plans to begin construction of the project in October 2016 and would begin operation in December 2019. Due to the overlapping construction schedules and proximity to the projects, construction and operation of the Calcasieu Pass Project has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

<u>Delfin LNG Project</u>

Delfin plans to develop a floating liquefaction and LNG export terminal in the West Cameron Block 167 in the Gulf of Mexico. Delfin's facility would qualify as a "deepwater port" under the Deepwater Port Act and, as such, would require a license from MARAD in conjunction with the Coast Guard. The facility would be approximately 50 miles offshore from Cameron Parish, Louisiana and 74 miles south of Magnolia's proposed LNG terminal (see figure 4.13.1-1). The project is described in detail in section 3.2.1.2. On May 8, 2015, Delfin filed its deepwater port application with MARAD as well as its application for onshore facilities with the FERC.

Subject to the receipt of the necessary approvals, Delfin plans to begin construction of the offshore components of the project in 2018. Construction of the first phase of the onshore facilities would begin in the third quarter of 2017 and would be completed in October 2018. The second phase of construction of the onshore facilities (installation of additional compression) is expected to take place in 2020. Due to the overlapping construction schedules and the potential for cumulative impacts within the Gulf of Mexico, construction and operation of the Delfin LNG Project has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

G2 LNG Project

G2 LNG plans to develop a liquefaction and LNG export terminal on the Calcasieu Ship Channel in Cameron Parish, Louisiana, approximately 20 miles south of Magnolia's proposed LNG terminal (see figure 4.13.1-1). The project is in the initial development phase; G2 LNG has not submitted a request to enter the Commission's pre-filing process, but has stated that, if authorized, the G2 LNG Project is expected to begin operation in 2019. Due to the potential for overlapping construction schedules and proximity to Magnolia's proposed LNG terminal, construction and operation of the G2 LNG Project has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Gasfin LNG Project

Gasfin has announced plans for a liquefaction and LNG export terminal on the east side of the Calcasieu Ship Channel in Cameron Parish, Louisiana, approximately 23 miles south of Magnolia's proposed LNG terminal (see figure 4.13.1-1). The project is in the initial development phase and Gasfin has not requested initiation of the Commission's pre-filing process, nor has it released an anticipated schedule. Because the schedule and potential effects of this project are as yet unknown, it has not been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Live Oak LNG Project

Live Oak has announced plans for a liquefaction and LNG export facility on the west side of the Calcasieu Ship Channel in Calcasieu Parish, Louisiana, approximately 2 miles west of Magnolia's proposed LNG terminal (see figure 4.13.1-1). The project, which is described in additional detail in section 3.2.1.2, is in the initial development phase; Live Oak has not submitted a request to enter the Commission's pre-filing process, but has stated that, if authorized, the Live Oak LNG Project is expected to begin operation at the end of 2019. Due to the potential for overlapping construction schedules and proximity to Magnolia's proposed LNG terminal, construction and operation of the Live Oak LNG Project has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Port Arthur Liquefaction Project

Port Arthur has announced plans for a liquefaction and LNG export facility on the west side of the Sabine-Neches Waterway near Port Arthur, Texas. The facility would be approximately 45 miles southwest of Magnolia's proposed LNG terminal (see figure 4.13.1-1). The Commission approved Port Arthur's request to begin the pre-filing process for the Port Arthur Liquefaction Project in March 2015. The project is described in detail in section 3.2.1.2. Subject to the receipt of the necessary approvals, Port Arthur plans to begin construction of the project in 2017 and would begin operation in 2021. Due to the distance of the Port Arthur Liquefaction Project from the proposed projects as well as its location on the western shoreline of the Sabine-Neches Waterway in Texas, the Port Arthur Liquefaction Project would not contribute to cumulative impacts on any resources affected by the projects, as indicated in table 4.13.1-1.

SCT&E LNG Project

SCT&E LNG has announced plans for a liquefaction and LNG export terminal on Monkey Island in Cameron Parish, Louisiana, approximately 22 miles south of Magnolia's proposed LNG terminal (see figure 4.13.1-1). The project is in the initial development phase and SCT&E LNG has not requested initiation of the Commission's pre-filing process nor has it released an anticipated schedule. Because the schedule and potential effects of this project are as yet unknown, it has not been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Waller Point LNG Project

Waller Point LNG announced plans for a liquefaction and LNG export terminal on the western shore of the Calcasieu Ship Channel in Cameron Parish, Louisiana, approximately 23 miles south of Magnolia's proposed LNG terminal (see figure 4.13-1). The project is in the initial development phase, and Waller Point LNG has not submitted a request to enter the Commission's pre-filing process nor has it released an anticipated schedule. Because the schedule and potential effects of this project are as yet unknown, it has not been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

WesPac LNG Project

WesPac announced plans for a liquefaction and LNG export terminal on the Sabine-Neches Waterway near Port Arthur, Texas, approximately 45 miles south of Magnolia's proposed LNG terminal (see figure 4.13-1). The project is in the initial development phase and WesPac has not submitted a request to enter the Commission's pre-filing process nor has it released an anticipated schedule. Because the schedule and potential effects of this project are as yet unknown, it has not been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

4.13.1.2 Non-jurisdictional Facilities Associated with the LNG Terminal and KMLP Facilities

LNG Trucking

As described in section 1.4.1, the proposed LNG trucking facilities within the LNG terminal would be jurisdictional facilities. However, Magnolia's LNG trucking activities that occur after the LNG truck has departed from the terminal do not fall under the jurisdiction of the FERC.

During operation of the LNG terminal, a portion of the LNG would be loaded onto trucks for road distribution to refueling stations in Louisiana and the surrounding states. While no agreements have been executed for the transportation of LNG in trucks, Magnolia anticipates that, on average, one 12,500-gallon capacity LNG truck would be loaded per week at the LNG terminal. LNG trucks calling on the proposed terminal are expected to deliver the LNG to one of the nine LNG refueling stations currently in operation in Louisiana and Texas, or to additional LNG refueling stations currently under development. As part of the non-jurisdictional facilities associated with the proposed project, LNG trucking has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

LNG Bunkering and Domestic Marine Distribution

The proposed LNG barge loading facilities at the LNG terminal would be jurisdictional facilities. However, Magnolia's LNG bunkering and domestic marine distribution of LNG would occur after the LNG vessel has departed from the LNG terminal and, therefore, do not fall under the jurisdiction of the FERC.

Magnolia anticipates that LNG would be loaded onto one or two LNG barges per week (up to 104 per year) for domestic marine distribution and the possibility of LNG bunkering. LNG barges loaded at the LNG terminal would be expected to deliver LNG to the ship fueling facilities and offshore support port areas along the central Gulf Coast (ships and offshore supply vessels would not be directly fueled/bunkered at the LNG terminal). As part of the non-jurisdictional facilities associated with the proposed project, LNG bunkering and domestic marine distribution have been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Calcasieu Parish District 12 Water Works' Existing Water Pipeline

Calcasieu Parish District 12 Water Works' existing 12-inch-diameter water pipeline runs along the entire length of the proposed LNG terminal site just north of Henry Pugh Boulevard. In order to provide potable water during operation of the LNG terminal, Magnolia would request installation of an interconnect with the existing water pipeline, which would affect less than 0.1 acre of land within the LNG terminal site (see figure 1.4.2-1 in section 1.4.2). As part of the non-jurisdictional facilities associated with the proposed project, the water tie-in has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Entergy's Electric Transmission Line and Switching Station for the LNG Terminal

To provide electrical power to the LNG terminal, Entergy would build a 1.3-mile-long, double-circuit 230 kV electric transmission line connecting its existing Graywood substation to a new switching station at the LNG terminal site, as described in section 1.4.3 and depicted on figure 1.4.3-1.

Based on the preliminary design, Entergy would construct the electric transmission line within a 170-foot-wide right-of-way, which would be adjacent to, or possibly overlap with, the existing road and utility rights-of-way on Lincoln Road, Big Lake Road, and Henry Pugh Boulevard. The transmission line right-of-way would occupy 26.1 acres of land, including 11.5 acres of open land, 10.4 acres of wetland, and 4.2 acres of upland forest. The majority of the impacts associated with construction and operation of the transmission line would result from the installation of 15 to 18 poles to support the power lines, and the removal of select trees within the right-of-way. As part of the non-jurisdictional facilities associated with the proposed project, the electric transmission line and switching station have been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Cleco's Electric Transmission Line for Compressor Station 760

To provide electrical power to Compressor Station 760, Cleco would construct a 0.3-mile-long 34.5 kV electric transmission line from its existing 34.5 kV electric transmission line to the proposed compressor station, as described in section 1.4.4. The transmission line would begin at the existing transmission line on the west side of Refinery Road and would proceed east across Refinery Road and agricultural land to the Compressor Station 760 site.

Based on the initial design, the transmission line would be located within a 20-foot-wide right-of-way, which would occupy 0.7 acre of agricultural land and less than 0.1 acre of existing road and utility rights-of-way. The poles supporting the transmission line wires are expected to be between 90 and 100 feet in height and spaced approximately 600 feet apart (resulting in the installation of three poles). Impacts associated with construction and operation of the transmission line would be due to the installation of poles to support the power line and a small transformer pad at Compressor Station 760. As part of the non-jurisdictional facilities associated with the proposed project, the electric transmission line and switching station have been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

4.13.1.3 Pipeline System Projects

Ohio–Louisiana Access Project

TGT filed an application with the FERC in September 2014 for a project that would include one new compressor station in Ouachita Parish, Louisiana (Bosco Compressor Station); yard and station piping modifications at existing compressor stations in Caldwell, Acadia, and Rapides Parishes, Louisiana and Dearborn, Indiana; and piping and valve modifications and installation of bi-directional metering at an existing meter station in Ouachita Parish, Louisiana.[41] The proposed modifications at the existing Eunice Compressor Station would occur in Acadia Parish, Louisiana about 0.4 mile west of KMLP's proposed Compressor Station 760. FERC issued the *Notice of Schedule for Environmental Review of the Proposed Ohio–Louisiana Access Project* on March 13, 2015, which indicates that the Federal Authorization Decision Deadline for the project is July 2015. Pending regulatory approvals, TGT anticipates construction would begin in August 2015 and service of the modified compressor station would begin in June 2016. Because the Ohio–Louisiana Access Project would be in service prior to the beginning of construction activities at KMLP's Compressor Station 760, it is considered part of the environmental baseline and is not discussed further in this cumulative impact analysis.

4.13.1.4 Other Industrial and Commercial Projects

G2X Energy's Natural Gas to Gasoline Facility

G2X Energy, Inc. (G2X Energy) plans to construct a natural gas to gasoline facility along the Industrial Canal on a 200-acre site owned by the Lake Charles Harbor and Terminal District about 1,000 feet north-northwest of the proposed LNG terminal. The facility would convert domestic natural gas into approximately 12,500 barrels per day of sulfur, gasoline, and/or methanol. The product would then be supplied to customers by marine vessels or by pipeline. Air permits for the project were issued in May 2014. G2X Energy expects to have construction of the facility completed by 2017. At the time this EIS was prepared, construction had not started on the project. If constructed, the G2X Energy natural gas-to-gasoline facility would contribute to the cumulative effects on resources in the vicinity of the projects; therefore this facility has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

IFG Port Holdings, LLC's Export Grain Terminal Expansion

IFG Port Holdings, LLC's (IFG) export grain terminal at the Port of Lake Charles, is about 7 miles north of the proposed LNG terminal. The grain terminal is currently undergoing an extensive expansion and renovation while continuing to operate. When completed, the expanded and renovated facility will handle agricultural products such as rice, wheat, corn, soybeans, and dried distillers' grain for shipment to other countries. Construction of the expansion and renovations began in 2012 and is expected to be completed in 2015. Because the expansion of the export grain terminal would be completed before construction begins for the LNG terminal, it is considered part of the environmental baseline and is not discussed further in this cumulative impact analysis.

Juniper GTL Project

Juniper GTL, LLC is renovating a dormant steam methane reformer at its Westlake chemical plant, about 9 miles north of the proposed LNG terminal. The steam methane reformer will convert natural gas into synthesis gas, a combination of hydrogen and CO, which is used to make products such as methanol and ammonia. The methane reformer will be part of a new $100 million natural gas-to-liquids facility, producing about 1,100 barrels per day of waxes, drilling fluids, diesel, and naphtha. The new plant infrastructure is under construction and expected to begin operation in late 2015. Because the natural gas-to-liquids facility would begin operation before construction begins for the LNG terminal, it is considered part of the environmental baseline and is not discussed further in this cumulative impact analysis.

---

[41] Docket No. CP14-553

Liberty Natural Gas, LLC's Liberty Gas Storage Expansion Project

Liberty Natural Gas, LLC's (Liberty) Liberty Gas Storage Expansion Project was authorized by the Commission in April 2012 and is currently under construction.[42] The project will include one new compressor station, one new salt dome natural gas storage cavern, conversion of three existing salt dome brine storage caverns to natural gas storage caverns, and several support facilities approximately 10 miles southwest of the proposed LNG terminal. In addition, Liberty is constructing a 5.1-mile-long, 36-inch-diameter natural gas pipeline and one new meter station, which will interconnect with the Cameron Interstate Pipeline approximately 5 miles southwest of the LNG terminal site as well as a 4.0-mile-long brine disposal pipeline and four salt water disposal wells 10 miles south-southwest of the LNG terminal site. The Liberty Gas Storage Expansion Project is expected to begin operation in 2017. Due to overlapping construction schedules and proximity to the proposed LNG terminal, construction and operation of the Liberty Gas Storage Expansion Project has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Matheson Tri-Gas' Air Separation Unit

Matheson Tri-Gas announced in January 2015 that it will supply industrial gases (oxygen and nitrogen) to the ethane cracker and derivatives complex under construction by Sasol North America, Inc. (Sasol) (see discussion below). Matheson Tri-Gas has begun construction of a new air separation unit near Sasol's existing chemical complex in Westlake, Louisiana, approximately 10 miles north of the proposed LNG terminal. The new air separation unit is expected to begin operation in 2016. Due to the potential for overlapping construction schedules and proximity to the proposed LNG terminal, construction and operation of the air separation unit has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Port of Lake Charles

The Port of Lake Charles is planning to add two docks at Bulk Terminal 1, which would triple the port's ability to accommodate vessels. The schedule for construction of the new docks has not been released at the time of this writing. However, due to the potential for the construction schedules to overlap, and the proximity of the planned facilities within the Port of Lake Charles to the proposed LNG terminal, the new docks have been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Sasol Projects

Ethane Cracker and Derivatives Complex

Sasol operates a chemical complex in Westlake, Louisiana, approximately 10 miles north of the proposed LNG terminal. Sasol began construction of an ethane cracker and derivatives complex adjacent to Sasol's existing facilities. The ethane cracker would convert ethane contained in natural gas to ethylene, with a planned production rate of 1.5 million tons of ethylene and derivatives per year. The complex is expected to begin operation in 2018. Due to overlapping construction schedules and proximity to the proposed LNG terminal, construction and operation of Sasol's ethane cracker and derivatives complex has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

[42] Docket No. CP08-454-000

Gas-to-Liquids Facility

Sasol has also announced plans to construct and operate a natural gas-to-liquids facility adjacent to its existing chemical complex. The facility would use domestic natural gas to produce more than 96,000 barrels per day of liquid fuels and chemicals. On January 28, 2015, Sasol announced that it was delaying the final investment decision on the gas-to-liquids facility. Because the project has been placed on hold and a schedule is not available, Sasol's proposed gas-to-liquids facility has not been included in this cumulative impact analysis.

Westlake Chemical Corporation

Westlake Chemical Corporation's (Westlake Chemical) Lake Charles complex consists of three tracts within 2 miles of one another on over 1,300 acres, about 6 miles northwest of the proposed LNG terminal. The complex includes two ethylene plants, two polyethylene plants, and a styrene monomer plant. The combined capacity of the two ethylene plants is approximately 2.7 billion pounds per year. In the first quarter of 2013, Westlake Chemical completed the expansion of one of the ethylene units (Petro 2) and its conversion to 100 percent ethane feedstock capability, increasing ethylene capacity by approximately 240 million pounds annually. Westlake Chemical plans to begin expansion of the capacity of the other ethylene unit (Petro 1) in 2015 and to complete construction in early 2016. Due to the potential for overlapping construction schedules and proximity to the proposed LNG terminal, construction and operation of the air separation unit has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

4.13.1.5 Utility Projects

The Calcasieu Point Development Project includes intersection improvements in three locations (Tank Farm and Big Lake Roads, Big Lake and Lincoln Roads, and Lincoln Road and Gulf Highway) to reduce impacts on local users of the roadways during construction of the G2X Energy natural gas-to-gasoline facility, Lake Charles Liquefaction Project, and proposed LNG terminal. Roadway improvements are expected to begin in the second quarter of 2015 and be complete prior to beginning of construction of the LNG terminal. Because the Calcasieu Point Development Project would be completed before construction begins for the LNG terminal, it is considered part of the environmental baseline and is not discussed further in this cumulative impact analysis.

The Cameron Liquefaction and Lake Charles Liquefaction Projects each require the construction of non-jurisdictional electric facilities to serve the new or expanded facilities. Specifically, Entergy will construct a 12-mile-long electrical transmission line to provide power for the Cameron Liquefaction Project. In addition, if the project is authorized, Entergy would construct a 19-mile-long 230 kV electric transmission line and a new substation to provide incremental power for the Lake Charles Liquefaction Project. Due to overlapping construction schedules and proximity to the LNG terminal, construction and operation of Entergy's electric utilities described above have been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

Entergy's Lake Charles Transmission Project would consist of about 25 miles of new transmission lines (including 500-kV and 230-kV lines), two new substations, and the expansion of one existing substation. If the project is authorized, construction is expected to begin in 2016 and be complete in 2018. Due to overlapping construction schedules and proximity to the LNG terminal, construction and operation of Entergy's Lake Charles Transmission Project has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

4.13.1.6 Residential Developments

The Audubon Trace residential development would be on approximately 200 acres of land in Moss Bluff, Louisiana, approximately 15 miles north-northeast of the proposed LNG terminal. Phase I of the development involves the construction of approximately 100 single-family residences; Phase II would include approximately 80 single-family residences. Construction of Phase I is expected to begin in 2015.

The Belle Savanne residential/commercial development is in Sulphur, Louisiana, approximately 7 miles northwest of the proposed LNG terminal. Phase I of the development involves the construction of single-family residences on about 200 acres; Phase II would include multi-family residences and about 100,000 square feet of commercial development. Phase I land clearing began in late 2013/early 2014 and phased construction will likely be ongoing for several years.

The Moss Lake Worker Village is expected to be constructed on 100 acres of leased property at the Southland Field West Calcasieu Airport in Carlyss, approximately 4 miles west-northwest of the proposed LNG terminal. The community is designed to accommodate varying workforce numbers, with 2,500 personnel at peak occupancy. In addition to temporary housing and recreational amenities, workers would be provided transportation to and from job sites. In June 2014, the Calcasieu Parish Planning and Zoning board voted to approve a conditioned zoning exception to allow the workforce housing project. When the facility is no longer needed for construction workers, First Flight would have 6 months to remove the residential pods. The schedule for construction of the Moss Lake Worker Village has not been released at the time of this writing; however, the SWLA Economic Development Alliance's *2015 Estimated Workforce Needs Report* (2015) indicates that operation of the Moss Lake Worker Village will begin in 2015.

Construction of Pelican Lodge Workforce Housing began in November 2013 on a 200-acre property owned by the Port of Lake Charles approximately 12 miles northeast of the proposed LNG terminal. The complex is providing about 400 construction jobs and is currently designed to house up to 4,000 temporary construction personnel working on multiple development projects in the Lake Charles area over the next several years. In addition to housing and recreational amenities, workers are being provided transportation to and from job sites.

The Walnut Grove Development is on a 60-acre property on the north side of Contraband Bayou in Lake Charles, approximately 8 miles north-northeast of the proposed LNG terminal. The development includes various residence types (a total of 180 homes), parks, and a town square. Construction began in 2010 and is ongoing.

Due to overlapping construction schedules and proximity to the projects, construction and operation of the residential developments described above have been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

4.13.1.7 Federal, State, and Local Agency Projects

Louisiana Department of Transportation and Development's Cove Lane Interchange Project

The primary interstate roadways in the vicinity of Magnolia's proposed LNG terminal are I-210 and I-10. The Louisiana DOTD's Cove Lane Interchange Project in Calcasieu and Cameron Parishes is a three-phase project that includes a full interchange at Cove Lane and I-210, a roundabout at the intersection of Cove Lane and W. Prien Lake Road, and extension of Cove Lane north to connect with a new public roadway that will parallel I-210 on the north side of the interstate. The project is currently under construction and is anticipated to be completed in summer 2015. Because the interchange project will be complete before construction of the LNG terminal begins, it is considered part of the environmental baseline and is not discussed further in this cumulative impact analysis.

Louisiana Department of Wildlife and Fisheries' Fisheries Research Center

The LDWF's Fisheries Research Center would be a new facility developed as part of the compensation proposed under the Natural Resources Damage Assessment for the 2010 Deepwater Horizon oil spill in the Gulf of Mexico. The Fisheries Research Center would occupy two sites, in Calcasieu and Plaquemines Parishes, Louisiana. The stated goal of the Fisheries Research Center is to establish state of the art facilities to responsibly develop aquaculture-based techniques for marine fishery management.

The portion of the Fisheries Research Center in Calcasieu Parish would be on a 320-acre undeveloped tract of land approximately 100 feet south of the LNG terminal across Henry Pugh Boulevard. The proposed aboveground facilities associated with the Fisheries Research Center include a laboratory, library, and visitor complex to provide education on fisheries and restoration programs. A meeting complex/dormitory for staff and visiting researchers also is planned. The hatchery facility would be focused on the production of spotted seatrout, red drum, and southern flounder. The site would also include a recreational fishing pond, walking trails, three 0.5-acre ponds for propagation and research, a water reservoir with pipeline and water intake station, and an effluent pump station.

In June 2014, the federal and state natural resource trustee agencies issued a *Programmatic and Phase III Early Restoration Plan and Early Restoration Programmatic Environmental Impact Statement* as part of the Natural Resource Damage Assessment for the Deepwater Horizon Oil Spill, which included a detailed discussion of the Fisheries Research Center (U.S. Department of the Interior, 2014). A subsequent Record of Decision was issued in October 2014 in which the trustee agencies decided to implement 44 projects, including the center. Construction of the Fisheries Research Center is expected to begin in 2016 and would occur over a 4- to 5-year period. Due to overlapping construction schedules and proximity to the LNG terminal, construction and operation of the Fisheries Research Center has been included in our cumulative impacts analysis, as indicated in table 4.13.1-1.

U.S. Army Corps of Engineers and Lake Charles Harbor and Terminal District's Maintenance Dredging of the Calcasieu Ship Channel

The COE and Lake Charles Harbor and Terminal District partner to conduct maintenance dredging within the Calcasieu Ship Channel, which includes the Industrial Canal. Dredging is expected to occur every other year to maintain deep draft access (COE, 2015). If maintenance dredging within the Industrial Canal coincides with construction of the LNG terminal, it would contribute to the cumulative impact on some resources in the project area. Similarly, maintenance dredging during operation of the LNG terminal would contribute to cumulative impacts on some resources, as indicated in table 4.13.1-1.

4.13.2 Potential Cumulative Impacts by Resource

The following sections address the potential cumulative impacts of the projects and the other reasonably foreseeable projects identified within the cumulative impact area on specific environmental resources as identified in tables 4.13.1-1 and 4.13.2-1. The other projects considered in each section are those for which impacts on the resource(s) discussed would be within the same region of influence as those that would result from the proposed projects and would occur within the same timeframe.

TABLE 4.13.2-1

Projects Included in the Cumulative Impacts Analysis for the Magnolia LNG and Lake Charles Expansion Projects

Project / Activity	Workforce Const.	Workforce Oper.	Geology & Soils	Ground-water	Surface Water	Wetlands Veg. & Wildlife	Aquatic Res.	T&E	Socio	Road Traffic	Vessel Traffic	Land Use	Rec.	Air	Noise
INDUSTRIAL DEVELOPMENTS															
Liquefaction and LNG Export Projects Associated with Existing LNG Terminals															
Cameron LNG Terminal															
Cameron Liquefaction Project	2,300	130	–	+	+	–	+	+	+	+	+	–	+	+	–
Cameron Expansion Project	3,900	135	–	+	+	–	+	+	+	+	+	–	+	+	–
Cameron Pipeline Expansion	470	5	–	+	–	–	–	–	+	+	–	–	–	+	–
Cameron Access Project	200	0	–	+	–	–	–	–	+	+	–	–	–	–	–
Trunkline LNG Terminal			–												
Lake Charles Liquefaction Project	5,600	176	–	+	+	+	+	+	+	+	+	+	+	+	+
Sabine Pass LNG Terminal															
Sabine Pass Liquefaction Project	3,000	356	–	–	–	–	–	–	+	–	–	–	–	–	–
Sabine Pass Liquefaction Expansion Project	1,441	123	–	–	–	–	–	–	+	–	–	–	–	–	–

TABLE 4.13.2-1 (cont'd)

Projects Included in the Cumulative Impacts Analysis for the Magnolia LNG and Lake Charles Expansion Projects

Project / Activity	Workforce Const.	Workforce Oper.	Geology & Soils	Ground-water	Surface Water	Wetlands Veg. & Wildlife	Aquatic Res.	T&E	Socio	Road Traffic	Vessel Traffic	Land Use	Rec.	Air	Noise
Greenfield Liquefaction and LNG Export Projects															
Calcasieu Pass Project	625	93	–	+	+	–	+	+	+	+	+	–	+	–	–
Delfin LNG Project	170	9	–	–	–	–	–	+	+	–	+	–	–	–	–
G2 LNG Project	NA	NA	–	+	+	–	+	+	+	+	+	–	+	–	–
Live Oak LNG Project	250	75	–	+	+	–	+	+	+	+	+	–	+	+	–
Non-jurisdictional Facilities Associated with the Magnolia LNG and Lake Charles Expansion Projects															
LNG Trucking	0	0	o	o	o	o	o	o	+	+	o	o	o	+	+
LNG Bunkering and Domestic Marine Distribution	0	0	o	o	+	o	+	+	+	o	+	o	+	+	+
Calcasieu Parish District 12 Water Works' tie-in to the LNG terminal	10	0	+	+	–	+	–	–	+	+	–	+	+	+	+
Entergy's electric transmission line and switching station for the LNG terminal	55	0	+	o	–	+	–	–	+	+	–	+	+	+	+
Cleco's electric transmission line for Compressor Station 760	NA	0	+	o	–	+	–	–	+	+	–	+	–	+	+

TABLE 4.13.2-1 (cont'd)

Projects Included in the Cumulative Impacts Analysis for the Magnolia LNG and Lake Charles Expansion Projects

Project / Activity	Workforce Const.	Workforce Oper.	Geology & Soils	Ground-water	Surface Water	Wetlands Veg. & Wildlife	Aquatic Res.	T&E	Socio	Road Traffic	Vessel Traffic	Land Use	Rec.	Air	Noise
Other Industrial Projects															
G2X Energy's Natural Gas to Gasoline Facility	1,500	243	–	+	+	+	+	+	+	+	+	+	+	+	+
Liberty Gas Storage Expansion Project	630	3	–	+	–	–	–	–	+	+	–	–	–	+	–
Matheson Tri-Gas' Air Separation Unit	350	27	–	+	–	–	–	–	+	+	–	–	–	–	–
Port of Lake Charles' Docks at Bulk Terminal 1	NA	80	–	o	–	–	–	–	+	+	+	–	–	–	–
Sasol's Ethane Cracker and Derivatives Complex	5,000	500	–	+	–	–	–	–	+	+	–	–	–	–	–
Westlake Chemical Corporation	1,000	25	–	+	–	–	–	–	+	+	–	–	–	–	–
Other Utility Projects															
Entergy's Lake Charles Transmission Project	NA	NA	–	+	–	–	–	–	+	+	–	–	–	+	–
Entergy's transmission line and substation for the Lake Charles Liquefaction Project	NA	0	–	o	–	+	–	–	+	+	–	+	+	+	+
Entergy's transmission line for the Cameron Liquefaction Project	NA	0	–	o	–	–	–	–	+	+	–	–	+	+	–

TABLE 4.13.2-1 (cont'd)

Projects Included in the Cumulative Impacts Analysis for the Magnolia LNG and Lake Charles Expansion Projects

Project / Activity	Workforce Const.	Workforce Oper.	Geology & Soils	Ground-water	Surface Water	Wetlands Veg. & Wildlife	Aquatic Res.	T&E	Socio	Road Traffic	Vessel Traffic	Land Use	Rec.	Air	Noise
RESIDENTIAL DEVELOPMENTS															
Audubon Trace	NA	NA	–	+	–	–	–	–	+	+	–	–	–	–	–
Belle Savanne	NA	NA	–	+	–	–	–	–	+	+	–	–	–	–	–
Moss Lake Worker Village	NA	400	–	+	–	–	–	–	+	+	–	–	–	+	–
Pelican Lodge Workforce Housing	400	230	–	+	–	–	–	–	+	+	–	–	–	–	–
Walnut Grove Development	NA	NA	–	+	–	–	–	–	+	+	–	–	–	–	–
FEDERAL, STATE, AND LOCAL AGENCY PROJECTS															
LDWF's Fisheries Research Center	30	8	+	+	+	+	+	+	+	+	o	+	+	+	+
COE and Lake Charles Harbor and Terminal District's Maintenance Dredging of the Calcasieu Ship Channel	NA	NA	+	o	+	o	+	+	o	o	+	o	+	+	+

Key:
– Cumulative impacts precluded based on degree of geographic separation.
o The defined geographic sphere of influence for this resource indicates that the project/activity may result in cumulative impacts on the resource as a result of the projects. However, because the project/activity does not impact this resource, cumulative impacts would not occur and were not considered further.
\+ Project-related impacts are included in the cumulative impacts analysis described in section 4.13.2.
Notes: NA = Not available

4.13.2.1 Geologic Conditions

The cumulative impact area for geologic resources was considered to be the area that would be affected by and adjacent to the LNG terminal and KMLP facilities. As identified in table 4.13.2-1, the other projects encompassed by this impact area include the following:

- Calcasieu Parish District 12 Water Works' tie-in for the LNG terminal;
- Cleco's electric transmission line for Compressor Station 760;
- Entergy's electric transmission line and switching station for the LNG terminal;
- LDWF's Fisheries Research Center; and
- maintenance dredging of the Calcasieu Ship Channel.

At the proposed LNG terminal site, Magnolia would modify the existing topographic contours to accommodate its equipment and facilities and maintain adequate drainage from the site. No blasting or removal of bedrock would be required. The central portion of the site currently ranges in elevation from 28 to 32 feet above NAVD 88 and would be graded to a standard elevation of 28 feet above NAVD 88. The liquefaction trains would have a base elevation of 24 feet. The LNG storage tanks would have a base elevation of 17 feet above NAVD 88, but would have a secondary containment wall with a standard top elevation of 30 feet above NAVD 88.

To create the recessed berthing area, a combination of onshore excavation and dredging would be required at the site. Approximately 131,200 yd^3 of soils within a 6.4-acre portion of the recessed berthing area would be excavated and redistributed elsewhere on the terminal site. Following excavation, the 16.2-acre area required for the recessed berthing area would be dredged and an additional 862,550 yd^3 of sediment and soil would be removed. Magnolia would transport dredge material to a borrow pit approximately 8,000 feet east of the LNG terminal site using a dredge material pipeline. Dredge material would be placed within a 141.8-acre area. Excavation, dredging, and relocation of soils and sediments associated with construction of the LNG terminal would alter the existing site topography but would not markedly impact the geology of the area.

As described in section 4.1.3, the potential for impacts on or by the projects from a geologic hazards perspective would be low. The proposed LNG terminal is located in an area vulnerable to storm surge, particularly from tropical cyclones that can reach hurricane strength, due to its proximity to the Gulf of Mexico and the presence of the Calcasieu Lake-Calcasieu River system. In addition, regional subsidence and anticipated sea level rise can exacerbate flooding from significant weather events. Critical infrastructure at the LNG terminal would have a minimum elevation of 24 feet NAVD 88, which is above the water levels associated with both a 100- and 500-year storm event; therefore, significant flooding at the facility is not expected. In order to maintain a constant channel depth, maintenance dredging is scheduled to occur every other year within the Industrial Canal and Calcasieu Ship Channel. Because an increase in channel depth does not occur, maintenance dredging does not change the topography or geology; therefore, no cumulative impacts on topography or geologic resources would occur. Due to the location of the tie-in to Calcasieu Parish District 12 Water Works' existing waterline and Entergy's switching station within the LNG terminal site, we do not expect that these facilities would have a cumulative impact on geologic resources. Similarly, Entergy's 1.3-mile-long electric transmission line to the LNG terminal site would be expected to have a similar effect on geologic resources within the areas where the poles supporting the transmission line wires would be installed. Therefore, cumulative impacts on the topography and geology of the area would be negligible.

The LNG terminal would not materially impact (i.e., permanently curtail or preclude the extraction of) marketable mineral resources in the area. Fuel and non-fuel mineral resources are not anticipated to be affected by the LNG terminal because no active mining activities or oil and gas wells are within 0.25 mile of the LNG terminal. Therefore, cumulative impacts on mineral resources due to the construction or operation of the LNG terminal are not anticipated.

Construction and operation of the proposed KMLP facilities would not contribute markedly to cumulative impacts on geologic resources. The proposed header pipelines and meter station modifications would occur largely within previously disturbed areas. One active well is located approximately 150 feet west of the TGT Meter Station and the origin of the low pressure header pipeline; the well is also adjacent to the existing access road for the TGT Meter Station. As discussed in section 4.3.1.4, due to the shallow, temporary, and localized geological impacts associated with the proposed modifications at this existing meter station and installation of the low pressure header pipeline, we do not anticipate that there would be impacts on this active well. Therefore, we do not anticipate an increase in cumulative impacts on mineral resources due to the construction or operation of the KMLP facilities.

The KMLP facilities would affect 75.8 acres of land, of which 12.0 acres would be permanently converted to industrial use associated with Compressor Station 760 and the expanded facilities at the CGT, TRANSCO, and TGT Meter Stations. No blasting is anticipated to be necessary and any modifications to the existing topography where grading and trenching are required are expected to be temporary. Cleco's 0.3-mile-long transmission line to Compressor Station 760 would be expected to have a similar effect on geologic resources within the areas where the poles supporting the transmission line wires would be installed. Therefore, cumulative impacts on the topography and geology of the area would be negligible.

4.13.2.2 Soils

The cumulative impact area for soils was considered to be the area that would be affected by and adjacent to the LNG terminal and KMLP facilities. As identified in table 4.13.2-1, the other projects encompassed by this impact area include the following:

- Calcasieu Parish District 12 Water Works' tie-in for the LNG terminal;
- Cleco's electric transmission line for Compressor Station 760;
- Entergy's electric transmission line and switching station for the LNG terminal;
- LDWF's Fisheries Research Center; and
- maintenance dredging of the Calcasieu Ship Channel

Construction activities associated with the LNG terminal and KMLP facilities such as clearing, grading, excavation, backfilling, and the movement of construction equipment may affect soil resources. Clearing removes protective vegetation cover and exposes the soil to the effects of wind and rain, which increases the potential for soil erosion and sedimentation of sensitive areas. Grading, spoil storage, and equipment traffic can compact soil, reducing porosity and increasing runoff potential. The greatest impact on soils would occur within areas permanently occupied by the proposed new aboveground facilities that would be paved, graveled, or covered with other fill material. However, these areas have been previously disturbed due to past and ongoing maintenance of the adjacent Industrial Canal and Calcasieu Ship Channel; agricultural practices; commercial activities; and construction and maintenance of existing roads, railroads, natural gas and oil pipelines, transmission lines, and other utility lines.

To protect soil resources and minimize impacts on soils, Magnolia would implement its project-specific Plan and Procedures and KMLP would implement the FERC's Plan and Procedures, except where alternative measures are justified. This would include applying measures to control erosion and sedimentation during construction and ensuring proper restoration and revegetation of disturbed areas. As a result, most impacts on soils would be short term. It is anticipated that similar mitigation measures would be employed for each of the five projects described above. The tie-in to the existing water line and construction of the electric facilities (transmission lines and switching station) to provide power to the LNG terminal and Compressor Station 760 would result in short-term and localized soil impacts, with the exception of the soils that would be permanently affected by the foundations for the power poles used to hold up the transmission wires.

Development of the LDWF's Fisheries Research Center would result in soil impacts similar to the LNG terminal, including the loss of approximately 12 additional acres of soils associated with aboveground facilities and roadways. However, the combined impacts on soils resulting from both of these facilities would be relatively minor relative to the amount of similar soils in the surrounding area. Therefore, cumulative impacts on the soils in the vicinity of the LNG terminal and KMLP facilities would be negligible.

4.13.2.3 Water Resources

Groundwater

The cumulative impact area established for groundwater resources includes the Chicot aquifer, which underlies both the LNG terminal and KMLP facilities. As identified in table 4.13.2-1, the other projects encompassed by the impact area that may have impacts on groundwater resources include the following:

- Cameron LNG Terminal – four projects under construction, proposed, or planned;
- Trunkline LNG Terminal – Lake Charles Liquefaction Project;
- Calcasieu Pass Project;
- G2 LNG Project;
- Live Oak LNG Project;
- Calcasieu Parish District 12 Water Works' tie-in for the LNG terminal;
- G2X Energy's Natural Gas to Gasoline Facility;
- Liberty Gas Storage Expansion Project;
- Matheson Tri-Gas's Air Separation Unit;
- Port of Lake Charles' addition of two docks at Bulk Terminal 1;
- Sasol's Ethane Cracker and Derivatives Complex;
- Westlake Chemical Corporation;
- Entergy's Lake Charles Transmission Project;
- five residential developments; and
- LDWF's Fisheries Research Center.

In some areas, groundwater withdrawals from the Chicot aquifer are causing lowered water levels and saltwater encroachment. The rate of decline in these areas is due primarily to industrial use in the Lake Charles area and rice irrigation, where intense pumping of the 500-foot sand has resulted in the water level declining by as much as 1 to 2 feet per year (LDNR, 2012; DOTD and USGS, 2011). Chloride levels have remained relatively stable since the mid-1970s; however, elevated chloride levels (i.e., greater than 100 milligrams per liter) observed at public supply wells in eastern and southern Lake Charles suggest that additional upconing of salt water from the 700-foot sand to the 500-foot sand may occur in the future (DOTD and USGS, 1999; LDEQ, 2009a).

Although no portion of the Chicot aquifer has been designated as an Area of Ground Water Concern due to movement of the salt water front or water level decline or subsidence, high water use in southwest Louisiana has been identified as one of the current major issues having an impact on groundwater sustainability management (LDNR, 2012). In 2012, the LDNR and USGS entered into a joint partnership to increase groundwater monitoring. As a result, the number of wells within the State of Louisiana being monitored for water level, chlorides, and water quality has nearly doubled. In addition, the University of Louisiana at Lafayette has initiated a 3-year study of regional groundwater use and management in southwest Louisiana (LDNR, 2014a).

Construction activities associated with the LNG terminal and KMLP facilities, such as excavation; installation of groundwater wells, piles, and sheet piling; and groundwater withdrawals (an average of 1,800 gallons per day) would be expected to have temporary and minor impacts on groundwater within the Chicot aquifer (see discussion in section 4.3.1.4). For the majority of the projects listed above, groundwater requirements during construction are not publicly available, so the potential impact of those projects on groundwater has been considered qualitatively. Groundwater requirements for those projects where data are available are provided below:

- Cameron Liquefaction Project – an average of 50,000 gallons per day;
- Cameron Pipeline Expansion Project – no groundwater required;
- Cameron Access Project – no groundwater required;
- Lake Charles Liquefaction Project – an average of 30,800 gallons per day; and
- Liberty Gas Storage Expansion Project – an average of 6,192,000 gallons per day.

During the period when each of the projects described above would be under construction, groundwater requirements would result in an increase of approximately 1 percent over current daily withdrawals from the Chicot aquifer (714 million gallons per day). The duration of this cumulative effect would be temporary, occurring primarily during the period when the Liberty Gas Storage Expansion Project withdraws approximately 4,300 gallons of groundwater per minute to create the new salt dome storage cavern in Cameron Parish (expected to be complete in June 2017), and the overall cumulative impact would be minor compared to the overall withdrawals from the Chicot aquifer.

During operations, Magnolia would obtain groundwater from one of two on-site wells and the proposed tie-in to Calcasieu Parish District 12 Water Works' existing water line. The total volume of water used during operation (0.2 million gallons per day) would represent slightly less than 0.03 percent of the 714 million gallons per day withdrawn from the Chicot aquifer on a daily basis (USGS and LDNR, 2013). Magnolia calculated that the anticipated drawdown from the new on-site wells would be less than 1.5 feet at a distance of 1,500 feet from the point of withdrawal. The nearest water supply wells to the LNG terminal site are the two Calcasieu Parish District No. 12 Water Works' wells, which are over 1,400 feet east of the proposed wells and have over 400 feet of head above their screened interval (400 feet of available water above the extraction point). Therefore, the potential for operation of the LNG terminal to cause significant drawdown, impacting nearby users of the Chicot aquifer, would be minimal.

For the majority of the projects listed above, groundwater requirements during operation are not publicly available, so the potential impact of those projects on groundwater has been considered qualitatively. Groundwater requirements for those projects where data are available are provided below:

- Cameron Access Project – no groundwater required;
- Lake Charles Liquefaction Project – an average of 158,400 gallons per day; and
- Calcasieu Pass Project – an average of 600,000 gallons per day.

Operation of the projects listed above would increase daily withdrawal from the Chicot aquifer by less than 1 percent. While there would be localized effects, such as the lowering of the water table near the points of withdrawal, we conclude that the cumulative impact on groundwater or municipal water systems during construction and operation of these facilities would be permanent, but minor.

Surface Water

The cumulative impact area associated with surface water resources affected by construction and operation of the LNG terminal includes the Industrial Canal and the portion of the Calcasieu River downstream of the LNG terminal site. As identified in table 4.13.2-1, the other projects encompassed by the impact area for surface water at the LNG terminal include the following:

- Cameron LNG Terminal – Cameron Liquefaction and Expansion Projects;
- Trunkline LNG Terminal – Lake Charles Liquefaction Project;
- Calcasieu Pass Project;
- G2 LNG Project;
- Live Oak LNG Project;
- Magnolia's LNG bunkering and domestic marine distribution;
- G2X Energy's Natural Gas to Gasoline Facility;
- LDWF's Fisheries Research Center; and
- maintenance dredging of the Calcasieu Ship Channel.

The cumulative impact area associated with surface waters affected by the KMLP facilities includes those areas immediately downstream of construction activities. This distance was selected due to the low flow rates within the waterbodies that would be affected by construction activities. However, because no other reasonably foreseeable projects have been identified within the impact area, cumulative impacts on surface waters are not anticipated as a result of construction and operation of the KMLP facilities.

Potential impacts on surface waters during construction and operation of the LNG terminal would be associated with dredging, construction of the LNG loading and ship berthing facilities, vessel traffic, site modification and stormwater runoff, hydrostatic testing, operation of the LNG storage tank deluge system, and spills or leaks of hazardous materials.

The activity with the greatest potential impacts on surface waters would be dredging the 16.2-acre recessed berthing area at the LNG terminal. As described above (see section 4.13.2.1), a combination of onshore excavation and dredging would be used to construct the ship berthing area, which would be recessed into the northern boundary of the LNG terminal site. Dredging activities are expected to occur over a 12-week period using a hydraulic cutterhead dredge. Dredge material would be transported by pipeline to a placement area approximately 8,000 feet east of the LNG terminal. Throughout dredging operations, dredge materials would be placed in the disposal area and allowed to dewater, after which the decanted water would be pumped through the effluent return pipeline and discharged back into the Industrial Canal.

Potential impacts on water quality in the Industrial Canal resulting from dredging and the subsequent discharge of water back to the Industrial Canal would include temporary increases in suspended solids and turbidity levels as well as potential resuspension of contaminated sediments. Impacts on water quality due to dredging would be minimized through the use of a hydraulic cutterhead dredge, which minimizes turbidity from resuspension of the sediment in the water column and other water quality impacts. In addition, Magnolia would implement its *Dredging Water Quality Monitoring Plan* (discussed in detail in section 4.3.2.2). Therefore, dredging and the subsequent discharge of water back to the Industrial Canal are expected to result in temporary and minor increases in turbidity and suspended solid levels. In addition, Magnolia would conduct maintenance dredging of the ship berthing area every 4 to 5 years during operation of the LNG terminal. Given the naturally high turbidity levels that already exist in the Industrial Canal, we expect these impacts would be minor, temporary, and localized due to the methods that Magnolia would use to minimize the effects of suspended sediments, and the relatively short period of time the sediments would be suspended before they resettle on the canal bed.

If dredging at Magnolia's proposed LNG terminal were to occur at the same time as dredging for the Trunkline LNG Terminal, Live Oak LNG Project, G2X Energy's natural gas to gasoline facility, and/or maintenance dredging of the Calcasieu Ship Channel, the adverse impacts on water quality (e.g., increased turbidity and total suspended solids) could be exacerbated in the vicinity of the Industrial Canal. However, dredging impacts tend to be localized (i.e., generally confined to the areas close to the dredging activity) and limited primarily to the time when the dredging is taking place (i.e., the effects cease soon after the dredging stops). Similarly, if pile driving and sheet pile installation associated with Magnolia's proposed LNG terminal, the Lake Charles Liquefaction Project, and/or G2X Energy's natural gas to gasoline facility were to occur concurrently, they could result in cumulative impacts on water quality within the Industrial Canal; however, as with dredging, these impacts would be localized, short term, and temporary.

Before any dredging or pile driving can occur, Magnolia and the proponents of the other projects would need to obtain authorization under section 10/404 of the CWA from the COE and corresponding section 401 Water Quality Certification from the state. These authorizations would be contingent on the companies' use of best management practices to minimize effects on water quality and to ensure that state water quality standards are not violated. Additionally, the permits would require that the dredged material be tested before being disposed of in an approved offshore or onshore location. These measures would ensure that there are no long-term cumulative impacts on water quality as a result of foreseeable dredging and pile-driving activities in the Industrial Canal.

In addition to the COE permit and section 401 water quality certification, Magnolia and the proponents of the other projects listed above would be required to comply with the LDEQ LPDES regulations for discharge of pollutants in stormwater or point source discharges. Compliance by the proponents of the other projects with these regulations, implementation of the FERC's Plan and Procedures and other project erosion and sediment control plans, and project-specific best management practices would minimize cumulative effects on surface waters.

Magnolia estimates that 50 or fewer marine deliveries would be made to the LNG terminal during construction. During operation, approximately 208 LNG vessels (104 LNG carriers and 104 LNG barges) would call on the LNG terminal per year. As discussed in section 4.3.2.2, vessel traffic within the recessed berthing area and along vessel transit routes has the potential to increase shoreline erosion and suspended sediment concentrations due to increased wave activity. To provide scour protection from propeller wash, Magnolia would install rock armoring both within and along the east and west ends of the recessed berthing area. The proposed rock armoring would prevent erosion of the adjacent unprotected shoreline by wave activity from vessels maneuvering within the recessed berthing area.

If Magnolia's proposed LNG terminal, the four projects proposed at the Cameron LNG Terminal, Live Oak LNG Project, G2 LNG Project, G2X Energy's natural gas to gasoline facility, and Calcasieu Pass Project all receive the necessary authorizations and permits and are constructed, a substantial increase in marine vessel traffic would occur (see detailed discussion in section 4.13.2.9). The combined marine vessel traffic associated with these projects would increase the potential for shoreline erosion impacts along the Calcasieu Ship Channel (which includes the Industrial Canal). In addition, surface water quality could be affected by a cumulative increase in discharged engine cooling water. The volume of water discharged while each vessel is at port could range from 535 gallons for barges, to 5.5 million gallons for LNG carriers with dual fuel/diesel electric engines (maximum LNG capacity of 218,000 m^3), to 11.7 million gallons for steam-powered LNG carriers (maximum LNG capacity of 138,000 m^3). Impacts on surface waters as a result of cooling water discharges would be primarily limited to an increase in water temperature in the vicinity of the vessel. Cooling water return temperatures vary widely depending on the type of LNG carrier and mode of operation. However, based on a review of available information, we anticipate that cooling water discharged could range between 2.7 ˚F and 7.2 °F warmer than ambient water temperatures (Caterpillar, 2007, 2011, 2012). The Calcasieu Ship Channel was specifically created to provide deepwater access for maritime commerce. As such, use of the waterways by LNG carriers, barges, and support vessels during construction and operation of the projects would be consistent with the planned purpose and use of this active shipping channel and cumulative impacts on water quality due to shoreline erosion and engine cooling water discharges would be permanent, but minor.

LNG carriers serving the LNG terminal would likely arrive with empty cargo tanks because they would be loaded at the terminal with LNG destined for export. Vessels with empty cargo tanks ride higher in the water and can experience challenges associated with navigation due to the extra sail area (ship surface area above the water line). Therefore, water is often taken in from the surrounding waters and placed in ballast tanks to provide additional draft and improve navigation. To maintain a constant draft, ballast water is typically discharged below the water surface as the LNG cargo is loaded. Based on information provided by Magnolia, the amount of ballast water discharged during LNG cargo loading would range from approximately 8,711,000 to 12,264,000 gallons, depending on the size of the LNG carrier. Ballast water discharges at the LNG terminal could impact water quality by changing the salinity, temperature, pH, and dissolved oxygen level of water within the Industrial Canal. The physiochemical composition of ballast water in comparison to the water present within the Industrial Canal and Calcasieu River would vary depending on tidal and hydrologic conditions at the time of discharge, but is expected to result in temporary and minor impacts on water quality in the vicinity of the discharge.

LNG vessels calling on the Trunkline, Cameron, Calcasieu Pass, G2, and Live Oak LNG Terminals would also be expected to discharge ballast water into the Calcasieu Ship Channel. Barges do not have ballast tanks; therefore, operation of G2X Energy's natural gas to gasoline facility would not be expected to contribute to cumulative impacts on water quality due to ballast discharge. Ballast water discharges would be composed of mainly open ocean water collected during vessel transit. Assuming a similar volume of water would be discharged by vessels associated with these projects, the cumulative impact on the salinity, pH, temperature, and dissolved oxygen of the water in the Industrial Canal would be expected to be the greatest if ballast water discharges occur concurrently. However, due to the large volume of water in the Industrial Canal and Calcasieu River, dilution from tidal exchange and freshwater input, and mixing as a result of vessel traffic, the overall cumulative impact on water quality would be intermittent and minor.

4.13.2.4 Wetlands, Vegetation, and Wildlife

The cumulative impact area for wetlands, vegetation, and wildlife was considered to be the area that would be affected by the LNG terminal and KMLP facilities, as well as areas within approximately 1 mile of the proposed facilities. As identified in table 4.13.2-1, the other projects encompassed by this impact area that may impact wetlands, vegetation, or wildlife include the following:

- Trunkline LNG Terminal – Lake Charles Liquefaction Project;
- G2X Energy's natural gas to gasoline facility;
- Calcasieu Parish District 12 Water Works' tie-in for the LNG terminal;
- Entergy's electric transmission line and switching station for the LNG terminal;
- Cleco's electric transmission line for Compressor Station 760;
- Entergy's electric transmission line and substation for the Lake Charles Liquefaction Project;
- LDWF's Fisheries Research Center; and
- maintenance dredging of the Calcasieu Ship Channel.

Wetlands

As described in section 4.4.2, construction of the LNG terminal and KMLP facilities would result in the permanent loss of 16.2 acres of wetlands, including 8.1 acres of palustrine emergent, 6.6 acres of palustrine scrub-shrub, 1.0 acre of estuarine intertidal emergent, and 0.5 acre of palustrine forested/scrub-shrub wetlands.

Construction of the Lake Charles Liquefaction Project would result in the permanent loss of approximately 215 acres of wetlands, the majority of which would be forested mosaic, forested, and scrub-shrub wetlands. A review of aerial photography and NWI wetland data indicates that construction of G2X Energy's natural gas to gasoline facility also has the potential to affect emergent wetlands in the northern part of the site and that construction of the Fisheries Research Center is expected to have impacts on approximately 4 acres of predominately emergent wetlands. Based on available information, the proposed tie-in to the existing water line, construction and operation of the electric transmission facilities, and dredging of the Calcasieu Ship Channel would have negligible, if any, cumulative impacts on wetlands.

As noted previously, the proponents of each of the projects identified near the LNG terminal and KMLP facilities would need to obtain applicable permits from the COE. Therefore, although construction of the LNG terminal, KMLP facilities, and the other projects in the impact area could result in the conversion or reduction in the amount of existing wetlands in the vicinity, the creation of new wetlands and restoration or enhancement of existing wetlands, as required by the COE, are expected to appropriately mitigate for impacts on wetland resources and minimize any cumulative wetland effects.

Vegetation and Wildlife

A total of 285.6 acres of vegetation would be cleared during construction of the LNG terminal and KMLP facilities. Following construction, approximately 126.0 acres would be permanently converted to developed land, 124.7 acres would return to pre-construction conditions, and 34.9 acres would return to a vegetated community although it would be converted from an upland scrub or palustrine wetland community to an upland herbaceous community. Overall, the facilities would have the greatest impact on upland herbaceous (106.5 acres), upland shrub (65.0 acres), and agricultural (63.5 acres) vegetation communities.

Construction and operation of projects listed above would also result in the permanent conversion of nearby vegetated habitats to developed, industrial land. Development of the Lake Charles Liquefaction Project would result in the permanent removal of about 568 acres of vegetation communities, most notably, the permanent loss of 420 acres of forested uplands and wetlands. The extent of clearing required within G2X Energy's approximately 200-acre site for the natural gas to gasoline facility is not known. Based on desktop review, the site appears to consist primarily of open lands and emergent wetlands. Development impacts on vegetation from the LDWF's Fisheries Research Center are not fully known, but it is anticipated that approximately 12 acres of vegetation would be permanently replaced with aboveground facilities and roadways.

Due to the location of the tie-in to Calcasieu Parish District 12 Water Works' existing waterline and Entergy's switching station within the LNG terminal site, we do not expect that these facilities would have a cumulative impact on vegetation and wildlife resources. Similarly, Entergy's 1.3-mile-long electric transmission line to the LNG terminal and 19-mile-long transmission line to the Trunkline LNG Terminal would be adjacent to existing roadways and utility lines, and clearing is expected to be primarily limited to the areas where the poles supporting the transmission line wires would be installed, although select tree clearing would occur in order to prevent damage to the transmission line wires.

Cumulative impacts on vegetation and wildlife from construction of the LNG terminal, Lake Charles Liquefaction Project, G2X Energy's natural gas to gasoline facility, and the LDWF's Fisheries Research Center would include displacement, stress, and direct mortality of some individuals. To the extent that construction periods overlap, these impacts may be exacerbated. Operation of the facilities would result in increased noise, lighting, and human activity that could disturb wildlife in the area. However, due to current industrial activities adjacent to the Industrial Canal (including operation of the existing Trunkline LNG Terminal), most wildlife in the area are acclimated to these conditions. Therefore, we expect cumulative impacts due to noise, light, and human activity during operation of the facilities to be negligible.

Birds flying through the area could also be affected by flaring at both the proposed LNG terminal and the Lake Charles Liquefaction Project sites. Flaring would be required during start-up of the facilities; during operation of the facilities, use of the emergency flares would only occur occasionally. It is unlikely, but possible, that the start-up flares from the two facilities would be in use at the same time due to schedule variability. Upset conditions that would require the use of flares cannot be predicted; however, it is unlikely that upset conditions requiring flaring would occur at the same time at both facilities. We are not aware of any reported impacts of flaring on migratory birds in the area; therefore, we conclude that the cumulative impacts on birds from flaring would be minimal.

Vegetation and wildlife habitat in the vicinity of the proposed KMLP facilities have been affected by ongoing agricultural practices, and construction and maintenance of existing roads, railroads, natural gas and oil pipelines, utility lines, and electrical transmission line rights-of-way. Construction and operation of the KMLP facilities would affect a total of 64.3 acres of vegetation. Of this total, 44.1 acres would be in temporary work areas that would be allowed to revert to pre-construction condition after construction is completed. About 8.3 acres would be within the permanent easements for the header pipelines, and 12.0 acres would be within the new or modified aboveground facility footprints.

The proposed KMLP facilities would be primarily within existing meter stations and on adjacent agricultural land. The agricultural land, which comprises 99 percent of the vegetated communities within the KMLP facilities, consists of crayfish ponds and cropland. Agricultural land is expected to recover quickly after construction and continue to provide similar habitat during operations. Cumulative impacts resulting from construction and operation of Cleco's 0.3-mile-long electric transmission line to Compressor Station 760 would be limited to agricultural areas. Given the limited impacts on vegetation and wildlife, and the lack of other project activity in the vicinity of the KMLP facilities, cumulative impacts on vegetation and wildlife would be minimal.

4.13.2.5 Aquatic Resources

The cumulative impact area associated with aquatic resources affected by construction and operation of the LNG terminal includes the Industrial Canal and the portion of the Calcasieu River downstream of the LNG terminal. As identified in table 4.13.2-1, the other projects encompassed by the impact area for aquatic resources at the LNG terminal include the following:

- Cameron LNG Terminal – Cameron Liquefaction and Expansion Projects;
- Trunkline LNG Terminal – Lake Charles Liquefaction Project;
- Calcasieu Pass Project;
- G2 LNG Project;
- Live Oak LNG Project;
- Magnolia's LNG bunkering and domestic marine distribution;
- G2X Energy's natural gas to gasoline facility;

- LDWF's Fisheries Research Center; and
- maintenance dredging of the Calcasieu Ship Channel.

The cumulative impact area associated with aquatic resources affected by the KMLP facilities includes those areas immediately downstream of construction activities. This distance was selected due to the low flow rates within the waterbodies that would be affected by construction activities. However, because no other reasonably foreseeable projects have been identified within the impact area that would affect aquatic resources, cumulative impacts on aquatic resources are not anticipated as a result of construction and operation of the KMLP facilities.

Potential impacts on aquatic resources during construction and operation of the LNG terminal include those associated with dredging, pile driving, hydrostatic testing, vessel traffic, stormwater runoff, lighting, the LNG storage tank deluge system, and inadvertent spills.

The activities with the greatest potential impacts on aquatic resources would be dredging and pile driving within the 16.2-acre recessed berthing area. As discussed above and in section 4.6.2.2, dredging associated with construction of the recessed berthing area would occur over a period of approximately 12 weeks, and would be accomplished using a hydraulic cutterhead suction dredge. Dredge material would be transported by pipeline to the placement area where it would be allowed to dewater, after which the decanted water would be pumped through the effluent return pipeline and discharged back into the Industrial Canal. Potential impacts on aquatic resources resulting from dredging activities include direct take and habitat modification as well as avoidance of the area due to increases in noise, turbidity, and suspended solid levels. Most fish species are highly mobile and would be expected to leave the area during dredging activities. However, dredging would result in direct mortality of benthic organisms within the 16.2-acre dredge footprint. Slower, less mobile benthic invertebrates would also be directly affected, while larger, more mobile species would experience temporary displacement. Following construction activities, aquatic resources would be expected to return to the recessed berthing area, which would be similar to the existing open water habitat within the Industrial Canal.

Construction of the LNG terminal would require the installation of approximately 5,000 piles to support the proposed structures at the LNG terminal, including onshore installation of piles to support the liquefaction trains, LNG storage tanks, and other process equipment and structures as well as in-water installation of the steel sheet pile bulkhead along the shoreline of the Industrial Canal and the piles supporting the LNG loading platform and the breasting and mooring dolphins. Onshore piles would be driven by seven or eight hydraulic piling rigs over a 10-month period. Marine piles would be installed using between two and four hydraulic pile drivers over a 6-month period. As depicted in table 2.5.1-1 in section 2.5.1.3, onshore and in-water pile driving operations would occur over a total of approximately 16 months. Pile driving would occur 10 hours per day, up to 7 days per week; however, due to pre-work coordination and start-up activities, actual pile driving operations (hammering) are expected to occur for approximately 8 hours per day.

The primary impacts on aquatic resources from pile driving activities would be avoidance of the area, stress, or injury due to the underwater sound pressure levels produced by pile drivers. To avoid injury of aquatic resources, we have recommended in section 4.6.2.2 that Magnolia develop and implement a *Pile Driving Noise Impact Mitigation Plan*. The plan would include hydroacoustic monitoring and mitigation measures that would be implemented, if needed, to ensure that sound pressure levels would be below the NOAA Fisheries interim thresholds for the onset of injury to fish. With the implementation of these measures, impacts on aquatic resources due to pile driving activities are expected to include avoidance of the area by most fish species and behavioral changes for immobile or less mobile species.

If dredging and pile driving activities at the LNG terminal occur concurrently with those required for the Lake Charles Liquefaction Project, Live Oak LNG Project, and/or G2X Energy's natural gas to gasoline facility, impacts on aquatic resources are likely to be exacerbated as a direct result of each of the projects' dredge activities and as sediments resettle following construction. Similarly, if the LDWF's Fisheries Research Center were to install its water intake (located east of the recessed berthing area within the Industrial Canal) at the same time as dredging and pile driving activities associated with the other projects, it would slightly exacerbate impacts on aquatic resources. However, these impacts would occur within the Calcasieu Ship Channel, which is maintained (including periodic maintenance dredging) to support shipping for industrial activity. Additionally, benthos in soft bottom habitats (like that occurring within the Industrial Canal) recover rapidly through various reproductive and recolonization mechanisms. Impacts on estuarine fisheries, including those related to changes in benthic forage, should be temporary, with habitat use reverting to normal conditions following completion of construction.

During project operations, cumulative impacts would primarily be those associated with the transit and operation of vessels serving the various project facilities while in the Calcasieu Ship Channel. As described in detail above (section 4.13.2.3), the primary impacts on surface water, and thus aquatic resources, due to vessel traffic include increased shoreline erosion and changes in water quality due to the discharges of ballast and engine cooling water (see detailed discussion in sections 4.3.2.2 and 4.6.2.2). The Calcasieu Ship Channel was specifically created to provide deepwater access for maritime commerce. As such, use of the waterways by LNG carriers, barges, and support vessels during construction and operation of the projects would be consistent with the planned purpose and use of this active shipping channel and cumulative impacts on water quality due to shoreline erosion and engine cooling water discharges would be permanent, but minor. Further, due to the large volume of water in the Industrial Canal and Calcasieu River; dilution from tidal exchange and freshwater input; mixing as a result of vessel traffic; and tolerance of estuarine aquatic species to fluctuations in temperature, salinity, pH, and dissolved oxygen levels; the overall cumulative impact on water quality is expected to be intermittent and minor.

Because the Calcasieu River and Industrial Canal are designated as EFH, each of the projects listed above would be required to comply with the MSA. As federally authorized projects, NOAA Fisheries will review each of the project's potential impacts on EFH and ensure that the project would have a *de minimis* effect on EFH. Therefore, we conclude that cumulative impacts on aquatic resources would be minimal.

4.13.2.6 Threatened and Endangered Species

The cumulative impact area associated with threatened and endangered species potentially affected by construction and operation of the LNG terminal includes the areas affected by and adjacent to the LNG terminal, and the portion of the vessel transit route within the EEZ (including the Industrial Canal, Calcasieu River downstream of the LNG terminal, and the transit route through the Gulf of Mexico to the EEZ boundary). As identified in table 4.13.2-1, the other projects encompassed by the impact area include the following:

- Cameron LNG Terminal – Cameron Liquefaction and Expansion Projects;
- Trunkline LNG Terminal – Lake Charles Liquefaction Project;
- Calcasieu Pass Project;
- Delfin LNG Project;
- G2 LNG Project;
- Live Oak LNG Project;
- Magnolia's LNG bunkering and domestic marine distribution;

- G2X Energy's natural gas to gasoline facility;
- LDWF's Fisheries Research Center; and
- maintenance dredging of the Calcasieu Ship Channel.

The cumulative impact area associated with threatened and endangered species potentially affected by the KMLP facilities includes those areas affected by and adjacent to the proposed construction activities. However, construction and operation of the KMLP facilities would have no effect on listed species (see section 4.7 and table 4.7.1-1). Consequently, the KMLP facilities would not contribute to cumulative impacts on threatened and endangered species.

We identified 15 federally listed threatened and endangered species and 1 species that is a candidate for listing under the ESA that may occur within the impact area for the LNG terminal. As discussed in section 4.7, we determined that the project would have no effect on four federally listed species, and would not contribute to the trend toward federal listing for the candidate species. Consequently, the project would not contribute to cumulative impacts on these species.

A total of 11 federally listed species (including the West Indian manatee, five species of whales, and five species of sea turtles) were identified as potentially occurring along the LNG vessel transit route through and offshore of Cameron Parish, Louisiana. The increased traffic within the Calcasieu Ship Channel and Gulf of Mexico due to vessel transit to and from the LNG terminal site during construction and operation could pose an increased risk to federally listed species from vessel strikes. However, marine vessels (LNG carriers, LNG barges, and construction delivery barges) would use well-traveled shipping lanes. Magnolia anticipates that 50 or fewer marine deliveries would be made during construction of the LNG terminal. During operation of the LNG terminal, up to 208 LNG vessels (104 LNG carriers and 104 LNG barges) would call on the LNG terminal per year. For each of the federally listed species occurring along the transit route, vulnerability to collision with a transiting vessel would be greatest while the animal feeds, swims, and rests near the surface of the water.

LNG transit vessels operating within Industrial Canal, Calcasieu River, and the portion of the Gulf of Mexico within the EEZ are generally slower, generate more noise than typical large vessels, and would be more readily avoided by West Indian manatees, sea turtles, and whales. Additionally, LNG carriers push a considerable bow wave when underway on the open ocean because of their design and large displacement tonnage. This wave pushes water, flotsam, and other small objects (such as sea turtles and manatees) away from the vessel. To further minimize the potential for vessel strikes, Magnolia would provide LNG ship captains with the NOAA-issued document entitled "Vessel Strike Avoidance Measures and Reporting for Mariners, NOAA Fisheries Service (2008)," which outlines collision avoidance measures. Based on the characteristics and habitat requirements of the federally listed species potentially present along the transit route and Magnolia's proposed mitigation measure, we have determined that the LNG terminal *may affect, but is not likely to adversely affect* the West Indian manatee, sea turtles, and whales.

Each of the projects listed above has federal permit requirements, and each of the projects has (Cameron Liquefaction Project, Lake Charles Liquefaction Project, LDWF's Fisheries Research Center, and the COE and Lake Charles Harbor District's maintenance dredging of the Calcasieu Ship Channel) or would be required to (Cameron Expansion Project, Calcasieu Pass Project, Delfin LNG Project, G2 LNG Project, Live Oak LNG Project, and G2X Energy's natural gas to gasoline facility) comply with section 7 of the ESA (described in detail in section 4.7). As a result of the Section 7 consultation process, NOAA Fisheries will review each project's potential impacts on federally listed species and either provide concurrence that the project would not adversely affect listed species or issue a Biological Opinion as to whether the project would likely jeopardize the continued existence of listed species. Therefore, we conclude that cumulative impacts on threatened and endangered species would be less than significant.

4.13.2.7 Land Use, Recreation, and Visual Resources

Land Use

The cumulative impact area for land use was considered to be the area that would be affected by the LNG terminal and KMLP facilities, as well as areas within approximately 1 mile of the proposed facilities. As identified in table 4.13.2-1, the other projects encompassed by this impact area that would affect land use include the following:

- Trunkline LNG Terminal – Lake Charles Liquefaction Project;
- Calcasieu Parish District 12 Water Works' tie-in for the LNG terminal;
- Entergy's electric transmission line and switching station for the LNG terminal;
- G2X Energy's natural gas to gasoline facility;
- Entergy's electric transmission line and substation for the Lake Charles Liquefaction Project; and
- LDWF's Fisheries Research Center.

The proposed LNG terminal site is currently zoned for heavy industrial use. The site was used by the COE for the placement of dredge material from within the Industrial Canal between 1975 and 1984. As a result, the site is comprised of open land (70 percent) and forest (30 percent). The nearest occupied residences are 0.6 mile south of the LNG terminal site within a community situated along a canal leading to the Intracoastal Waterway.

Land use adjacent to the Industrial Canal east and northeast of the LNG terminal is primarily industrial/commercial and developed. In contrast, land use to the northwest and south of the site consists of open land and forest. If the Lake Charles Liquefaction Project is permitted and constructed, the liquefaction facility would convert approximately 286 acres of industrial, wetland, forest, and open water land to industrial use (the land is currently zoned for heavy industrial use). Similarly, if G2X Energy's natural gas to gasoline facility is permitted and constructed, it could result in the conversion of all or portions of the approximately 200-acre site to industrial use (the land is currently zoned for heavy industrial use). Because the LNG terminal, Lake Charles Liquefaction Project, and G2X's natural gas to gasoline facility are on an existing industrial port (the Port of Lake Charles) and the lands affected by construction and operation of the facilities are zoned for industrial use, we have determined that the projects would result in a permanent, but minor cumulative impact on land use.

Construction of LDWF's Fisheries Research Center would result in the conversion of a small amount (approximately 12 acres) of open land to developed land. However, because the majority of the 320-acre site would not be affected, cumulative impacts on land use would be negligible.

Construction of Entergy's transmission lines would be within or adjacent to existing road and utility rights-of-way. Similarly, the switching station and substation would be located within the proposed LNG terminal and adjacent to the Trunkline LNG Terminal, respectively. Therefore, these facilities would have a negligible cumulative impact on land use.

The proposed KMLP facilities would affect about 76 acres of land. Because the activities associated with the KMLP facilities involve modification or expansion of existing facilities, much of the land affected by the KMLP facilities would be adjacent to the permanent easement associated with KMLP's existing mainline or would be adjacent to or within existing meter station sites. Construction of the KMLP facilities would primarily impact agricultural (63.5 acres) and industrial/commercial (11.2 acres) land. The remaining 1.0 acre of land affected would be comprised of open land and open water. Operation of the KMLP facilities would result in the permanent conversion of 12 acres of land to industrial use within Compressor Station 760, and the expanded CGT, TRANSCO, and TGT Meter Stations. The remaining 64 acres of land would be restored and existing land uses would be allowed to resume following construction, which would minimize impacts on land use. Construction of Cleco's electric transmission line to Compressor Station 760 would affect a total of 0.8 acre of land, of which 0.7 acre is agricultural and 0.1 acre is within existing road/utility rights-of-way. Permanent impacts on land use would be limited to the areas where poles would be installed to support the transmission wires.

Although the majority of the land affected by the KMLP facilities would be agricultural, the area also contains a large number of facilities associated with oil and gas, as identified in table 4.13.2-2. This is particularly true in the vicinity of the proposed facilities near Eunice, Louisiana (the low and high pressure header pipelines; Compressor Station 760; and the ANR, Pine Prairie, and TGT Meter Stations), where 46 pipelines occur within a 1-mile radius. As described previously, the header pipelines would be collocated with KMLP's existing mainline. Two TransCanada pipelines are also within this corridor. If the KMLP facilities are permitted and constructed, the total number of pipelines within this 250- to 300-foot-wide corridor would be five or six (five along the low pressure header pipeline and six where the high pressure header pipeline would be adjacent to the low pressure header pipeline). Given the existing level of oil and gas infrastructure within an otherwise agricultural area, and the fact that agricultural land use can continue in areas where underground oil and gas pipelines are present, we have determined that cumulative impacts on land use would be negligible.

TABLE 4.13.2-2

Oil and Gas Industry Facilities Within 1 Mile of the KMLP Facilities

Facility	Oil and Gas Pipelines	Meter Stations	Compressor Stations	Natural Gas Processing Plants
Eunice Facilities [a]	46	28	2	2
CGT Meter Station	12	3	0	0
TRANSCO Meter Station	10	1	1	0
TETCO Meter Station	5	3	0	0

[a] Eunice facilities include the low and high pressure header pipelines; Compressor Station 760; and modifications at the ANR, Pine Prairie, and TGT Meter Stations.

Recreation

The cumulative impact area for recreational facilities was considered to be the area adjacent to and in the vicinity of the proposed LNG terminal. As identified in table 4.13.2-1, the other projects encompassed by this impact area include the following:

- Cameron LNG Terminal – Cameron Liquefaction and Expansion Projects;
- Trunkline LNG Terminal – Lake Charles Liquefaction Project;
- Calcasieu Pass Project;
- G2 LNG Project;
- Live Oak LNG Project;
- Magnolia's LNG bunkering and domestic marine distribution;

- Calcasieu Parish District 12 Water Works' tie-in for the LNG terminal;
- Entergy's electric transmission line and switching station for the LNG terminal;
- G2X Energy's natural gas to gasoline facility;
- Entergy's electric transmission line and substation for the Lake Charles Liquefaction Project;
- Entergy's electric transmission line for the Cameron Liquefaction Project;
- LDWF's Fisheries Research Center; and
- maintenance dredging of the Calcasieu Ship Channel.

There are no recreational facilities within 0.25 mile of the KMLP facilities. Consequently, the KMLP facilities would not contribute to cumulative impacts on recreation.

Construction and operation of the LNG terminal would not directly affect designated recreational areas. One designated recreational area, Calcasieu Point Landing, is approximately 525 feet west of the LNG terminal site. In addition, a portion of the Sabine NWR is in the vicinity of the Calcasieu Ship Channel and could be affected by cumulative impacts. Given current use of Calcasieu Point Landing and the Sabine NWR in the vicinity of project-related activities, cumulative impacts on recreational areas would primarily be limited to dredging and pile driving activities within the Industrial Canal as well as increased vessel traffic during both construction and operation of the projects listed above (see discussion of potential cumulative impacts on visual resources, below).

The greatest potential impact on recreational users of Calcasieu Point Landing associated with construction of the projects would be related to dredging and pile driving activities within the Industrial Canal. During these activities, described in detail in sections 4.13.2.3 and 4.13.2.5, it is likely that recreational fishers and boaters would avoid the area due to increased noise, construction activities, and suspended sediment levels. Although noise levels would be greater if the projects were to conduct dredging and pile driving activities during the same period, because it is likely that recreational users would avoid the area during these activities, cumulative impacts would not be anticipated. In contrast, if dredging and pile driving activities associated with these projects were to be staggered, it may result in a cumulative impact due to the increased duration that users would avoid the area.

Magnolia estimates that 50 or fewer marine deliveries would occur during construction of the LNG terminal. Marine deliveries to the DII construction yard would occur between one and three times per month during the first year of construction, and approximately one time per month during the second and third years of construction, which would represent an increase of less than 4 percent in current vessel traffic. However, as described in detail in section 4.13.2.9, *Marine Traffic*, when combined with construction of the other projects listed above (an addition of more than 400 marine deliveries per month), there would be a substantial increase in the number of barges transiting the Calcasieu Ship Channel. However, the cumulative impact of the three projects would be mitigated somewhat by the fact that recreational boating and fishing occurs more often on weekends and holidays and construction activities would likely be reduced during these peak times. Moreover, because barges do not have moving security zones, impacts on other recreational users of the waterway would be intermittent, minor, and consistent with existing use of the waterway.

During operation, Magnolia estimates that up to 208 LNG vessels would call on the LNG terminal per year (up to 104 LNG carriers and 104 LNG barges). Because number of LNG carriers calling on the Cameron and Trunkline LNG Terminals would not increase beyond what has been previously authorized (210 and 225, respectively), they are not included in the cumulative impact analysis because they are considered part of the environmental baseline. During transit of LNG vessels, a moving security zone would be established 2 miles ahead and 1 mile astern of LNG vessels and barges (33 CFR 165.805(a)(2)). Based on average vessel speed, recreational fishing and boating activities would be required to exit the immediate area of the Calcasieu Ship Channel for approximately 20 to 30 minutes as each LNG vessel traverses the area. However, recreational users would be allowed to fish or boat in adjacent waters while the LNG vessel passed through the area. Therefore, although cumulative impacts on recreational users of the Calcasieu River and Industrial Canal would be intermittent, but moderate if each of the projects listed above were to be permitted and constructed, because these waterways were designed for and currently support deepwater maritime commerce, we have determined that cumulative impacts on recreation would be less than significant.

Visual Resources

The cumulative impact area for visual resources was considered to be the area within the viewsheds of the LNG terminal and KMLP facilities. Because of the height of the structures at the proposed LNG terminal, the viewshed of the facility would extend for up to several miles, depending on the direction. The viewshed for the proposed KMLP facilities is about 0.5 mile from the header pipelines and the modified meter station locations. The other projects encompassed by this impact area include the following:

- Trunkline LNG Terminal – Lake Charles Liquefaction Project;
- Live Oak LNG Project;
- Magnolia's LNG bunkering and domestic marine distribution;
- Calcasieu Parish District 12 Water Works' tie-in for the LNG terminal;
- Entergy's electric transmission line and switching station for the LNG terminal;
- Cleco's electric transmission line for Compressor Station 760;
- G2X Energy's natural gas to gasoline facility;
- Entergy's electric transmission line and substation for the Lake Charles Liquefaction Project;
- LDWF's Fisheries Research Center; and
- maintenance dredging of the Calcasieu Ship Channel.

The area surrounding the LNG terminal site is flat and relatively open, but trees block the views into the LNG terminal site from Tank Farm Road to the north and Airhart Road, Joe Ledoux Road, and the nearest private road off of Big Lake Road to the south. To determine how visible the terminal would be and from what vantage points, Magnolia conducted visual simulations from six observation points. As described in detail in section 4.8.5.1, these included the Calcasieu Point Landing boat launch 0.1 mile to the west, two locations on Big Lake Road about 0.6 and 0.8 mile to the east, a residential neighborhood 0.6 mile to the south, another residential neighborhood 2.3 miles to the north, and the Intracoastal Park 3.9 miles to the southwest. Based on these simulations and our evaluation of other sources and maps, we determined that the LNG terminal would be visible from Big Lake Road to the east, the Industrial Canal to the north, the existing Calcasieu Point Landing to the west, and likely the LDWF's Fisheries Research Center to the south. The views from Tank Farm Road to the north would not be significantly affected by the LNG terminal because the terminal would be shielded by the trees growing along the south side of the road. Vegetation would also shield views of the site from residences and travelers on Airhart Road, Joe Ledoux Road, and the private road off Big Lake Road (that is just north of Airhart Road) to the south and southeast.

There would be little potential for cumulative visual impacts. While some of the views from the surrounding roads that could see the LNG terminal would also include the existing Trunkline LNG Terminal, the facility does not dominate the viewshed and is consistent with existing development adjacent to the Industrial Canal. If permitted and constructed, G2X Energy's natural gas to gasoline facility, the Lake Charles Liquefaction Project, and to a lesser extent the Live Oak LNG Project and LDWF's Fisheries Research Center may result in cumulative impacts within the viewshed of the LNG terminal. However, the increase would be minor because, depending on the viewer's location, the primary visual impact on the viewshed would be either the LNG terminal (particularly the two LNG storage tanks and flare stack), the expanded Trunkline LNG Terminal (particularly the four LNG storage tanks and flare stacks), or the Live Oak LNG Terminal. Due to their location in relation to the existing roads, one of these three facilities would dominate the viewshed and the other facilities would be consistent with the surrounding area.

For the reasons listed above, the LNG terminal would contribute more than the other projects to cumulative visual impacts from Calcasieu Point Landing. People using this park currently see buildings, small tanks, and various size ships; however, the existing viewshed does not have extensive views of the existing Trunkline LNG Terminal. The LNG terminal would also contribute more than the other nearby projects to cumulative visual impacts from the future LDWF's Fisheries Research Center, due to the location of the proposed LNG terminal north of the Fisheries Research Center, across Henry Pugh Boulevard. It is likely that the LNG terminal and existing Trunkline LNG Terminal would largely screen visual impacts associated with G2X Energy's natural gas to gasoline facility and the Lake Charles Liquefaction Project. The cumulative visual impact of Magnolia's proposed LNG terminal and Live Oak LNG Project on fisherman and recreational boaters would be incremental as it would add to the number of industrial facilities and ships already visible from the waterway. The new electric transmission line required for the LNG terminal would also contribute to the cumulative visual impact on the area; however, because the installation of the roughly 15 new poles and wires associated with the transmission line would be located along Big Lake Road and Henry Pugh Road where there are already similar existing high voltage power lines and poles, the cumulative visual impact would be permanent, but minor.

In summary, the LNG terminal would be within an existing industrial area and would be consistent with the surrounding land use. Although the LNG terminal would be clearly visible from some of the surrounding areas (Calcasieu Point Landing), we conclude that cumulative impacts on visual resources would be moderate because the LNG terminal and other facilities would be consistent with existing development in the area.

Construction and operation of the KMLP facilities would have only minor aesthetic impacts. Construction activities at the CGT Meter Station, Transco Meter Station, TETCO Meter Station, ANR Meter Station, Pine Prairie Meter Station, and the TGT Meter Station would be limited to small areas within or around the perimeters of existing meter station facilities and thus, except for temporary impacts, would not permanently affect the visual character of the areas in which they are built. The current visual character along the low and high pressure header pipelines is primarily agricultural, interspersed with surface waters, wetlands, and existing oil and gas facilities (compressor and meter stations). The visual character of these areas would be temporarily affected during construction, but the disturbed areas and visual character of the land would be restored following construction of the pipeline, which would minimize any visual impacts.

The visual character of the proposed Compressor Station 760 site is dominated by agricultural land, an existing compressor station, and an existing natural gas processing plant. In addition, three houses are approximately 1,500 feet west of the site, and one set of structures associated with management of agricultural lands is within 50 feet of the site. Construction and operation of the new compressor station would introduce a third industrial facility within the viewshed. This effect would not be compounded by construction of the 0.3-mile-long electric transmission line to the compressor station because the line would continue from and be consistent with Cleco's existing transmission line, which is located along Refinery Road. Therefore, the KMLP facilities and transmission line would result in permanent, but minor cumulative impacts on visual resources.

4.13.2.8 Socioeconomics

We considered the cumulative impact area for socioeconomics to include Acadia, Calcasieu, Cameron, Evangeline, and Jefferson Davis Parishes. The proposed facilities would be located in Acadia, Calcasieu, and Evangeline Parishes. Of these, the greatest socioeconomic impacts would occur in Calcasieu Parish, where the LNG terminal would be located. Cameron and Jefferson Davis Parishes are also included in the socioeconomic analysis because they are would likely see an increase in non-local workers relocating to these areas during construction and operation of the LNG terminal. Each of the projects identified in table 4.13.2-1 is included in the analysis.

Population and Employment

During construction of the LNG terminal, Magnolia has stated that construction workers would be on site during 32 months of the 45-month construction period. The average workforce during this period would be 355 workers, of which approximately 142 would be non-resident workers. Over a 9-month period, the construction workforce at the LNG terminal would number over 500 workers, of which, up to 217 are expected to be non-resident workers. Although unlikely, if all non-resident workers relocate with families, this addition would represent a 0.3 percent increase in population in Calcasieu, Cameron, and Jefferson Davis Parishes. Operation of the LNG terminal would result in the creation of 67 permanent positions.

For the majority of the 11-month construction period associated with the KMLP facilities, the construction workforce would be 75 workers. However, during a 3-month period, up to 270 construction workers would be employed. We have estimated that an average of 36 workers and peak of 126 of these workers would be non-residents. This would represent an increase in the population within Acadia and Evangeline Parishes of 0.1 percent. Operation of Compressor Station 760 would result in the creation of four permanent positions.

The projects listed in table 4.13.2-1 would also require construction workers during the same period as the LNG terminal and KMLP facilities. Table 4.13.2-3 provides a summary of the estimated workforce needs for industrial and large-scale projects between 2015 and 2019 (SWLA Economic Development Alliance, 2015a). Construction labor requirements for the LNG terminal and KMLP facilities in 2017 and 2018, when employment associated with construction would be highest, would represent between 9 and 14 percent of the projected construction jobs for those years, respectively. In total, the projects constructed in Southwest Louisiana are expected to employ over 31,000 construction workers during the peak construction years, which are anticipated to conclude between 2018 and 2020 (Adrian and Icaza, 2015). Following the completion of construction, collectively, the projects in Southwest Louisiana are expected to result in the addition of 18,000 or more permanent jobs due to direct and induced growth.

TABLE 4.13.2-3

Employment Forecast for Industrial and Large-Scale Projects Between 2015 and 2019

Year	Construction Jobs	Permanent Direct Jobs	Permanent Indirect Jobs	Permanent Induced Jobs
2015	4,475	974	475	470
2016	13,500	682	845	867
2017	5,475	415	2,080	1,859
2018	3,500	1,153	1,843	1,742
2019	700	965	1,250	350

Source SWLA Economic Development Alliance, 2015a

Due to forecasted long-term industrial growth in the region, several programs designed to increase the number of qualified local workers have been developed, including programs through the Associated Builders and Contractors, Pelican Southwest Chapter in Westlake, Calcasieu Parish School Board, SOWELA Technical Community College, and Central Louisiana Technical Community College. The SWLA Economic Development Alliance is also collaborating with educational facilities and industry in the development of a *Workforce Resource Guide*, which provides residents with step-by-step instructions for finding employment and includes a description of the types of training required for each profession, as well as the training centers in Southwest Louisiana that offer the relevant certifications.

Given that the planned construction projects would likely have staggered timelines for specific labor needs, it is likely that some construction personnel could work on multiple projects, which would have the effect of decreasing the overall labor requirement. In addition, some of the projects identified in table 4.13.2-1 may not be built, which would reduce the overall labor need. The cumulative effect would be a substantial reduction in unemployment in the area and potentially the need to train and hire construction workers from outside Southwest Louisiana.

Housing and Public Services

The influx of non-local workers would affect the availability of housing in Southwest Louisiana. The cumulative impact on local housing may result in increased rental rates and housing shortages for lodging if all of the proposed and planned projects are implemented according to the expected timeframes. This would benefit the local housing market, but would adversely affect those seeking housing. Some members of the workforce may be forced to commute longer distances to obtain housing in adjacent parishes or Texas.

To accommodate the anticipated influx of construction workers, two worker housing developments (Pelican Lodge and Moss Lake) are expected to be available for construction workers in 2015 (SWLA Economic Development Alliance, 2015a). The two worker housing developments would accommodate up to 6,500 of the 13,500 anticipated workers. In addition to worker housing developments, a number of residential housing developments are planned or under construction in the Lake Charles area. New housing units, which include single-family dwellings, multi-family dwellings, hotels, and various residential projects, could total 8,070 if all publicly announced projects are permitted and constructed according to current plans (SWLA Economic Development Alliance, 2013).

The combined construction workforces of the projects listed in table 4.13.2-1 would increase the need for some public services, such as police, medical services, and schools. The need for these services would generally be spread throughout the parishes that house the workforce (Acadia, Calcasieu, Cameron, Evangeline, and Jefferson Davis Parishes), but there may be an increased need for medical and emergency services in Cameron and Calcasieu Parishes where the proposed project facilities and construction workers are expected to be concentrated. Magnolia would provide its own on-site security and the Calcasieu Parish Sheriff's Office indicated that it believes it has sufficient resources available to provide protection services by adjusting patrol schedules or hiring additional staff with revenues allocated by the parish. In addition, Magnolia is currently in discussions with the Lake Charles Fire Department to identify measures for providing fire protection at the LNG terminal site. Options include funding fire-fighting services either independently or by entering into a mutual aid agreement with future industrial neighbors for the purpose of employing an industrial firefighting team trained in fighting fires at industrial facilities. With the increase in local taxes and government revenue associated with the proposed projects, the overall cumulative impact on public services would be expected to be minor.

With construction of some of the major projects listed in table 4.13.2-1 lasting several years, it is likely that some construction workers would bring their families, including school-age children. This would increase the population in some schools in parishes housing the workers with families. However, it is likely that those families would be housed throughout many school districts in the five parishes and the increase in school population would be distributed through many schools. As a result, it is expected that the cumulative impact on schools would be minor.

4.13.2.9Traffic

Roadway Traffic

We considered the cumulative impact area for roadway traffic to include Acadia, Calcasieu, Cameron, Evangeline, and Jefferson Davis Parishes. Of these, the greatest impacts on roadway traffic would occur in Calcasieu Parish, where the LNG terminal would be located. Cameron and Jefferson Davis Parishes are included in the roadway traffic analysis due to the number of construction workers residing in and commuting from these areas to the proposed LNG terminal as well as the other proposed and planned projects in the area. As identified in table 4.13.2-1, the other projects encompassed by the impact area with the potential to impact roadway traffic include the following:

- Cameron LNG Terminal – four projects under construction, proposed, or planned;
- Trunkline LNG Terminal – Lake Charles Liquefaction Project;
- Calcasieu Pass Project;
- G2 LNG Project;
- Live Oak LNG Project;
- Magnolia's LNG trucking;
- Calcasieu Parish District 12 Water Works' tie-in for the LNG terminal;
- Entergy's electric facilities associated with the LNG terminal;
- Cleco's transmission line to Compressor Station 760;
- G2X Energy's natural gas to gasoline facility;
- Liberty Gas Storage Expansion Project;
- Matheson Tri-Gas's Air Separation Unit;
- Port of Lake Charles' addition of two docks at Bulk Terminal 1;
- Sasol's Ethane Cracker and Derivatives Complex;
- Westlake Chemical Corporation;
- Entergy's Lake Charles Transmission Project;
- Entergy's electric transmission line and substation for the Lake Charles Liquefaction Project;
- Entergy's electric transmission line for the Cameron Liquefaction Project;
- five residential developments; and
- LDWF's Fisheries Research Center.

The greatest potential for cumulative impacts on roadway traffic during construction and operation of the LNG terminal and KMLP facilities is associated with construction of the LNG terminal. Construction-related traffic associated with the KMLP facilities and the Cleco transmission line to Compressor Station 760 would result in only minor, temporary impacts on traffic, would be relatively short term at any given location, and would not be in close proximity to other known projects.

During construction and operation of the LNG terminal and the other Lake Charles area projects described above and in table 4.13.2-1, roadways in the area would experience a substantial increase in daily vehicle trips as a result of material and equipment deliveries and commuting of construction personnel to and from the project sites. Due to staggered construction schedules and the distance between the project sites, cumulative impacts on traffic from the projects listed above that are not located adjacent to the Industrial Canal would be substantial at times, but are expected to be intermittent, short term, and localized.

Between early 2016 and the end of 2017, three facilities adjacent to and within the Industrial Canal could be constructed if they receive the necessary regulatory approvals. These include the proposed LNG terminal, Lake Charles Liquefaction Project, and G2X Energy Lake Charles gasoline facility (see figure 4.13.1-2). Magnolia, the Lake Charles LNG companies, and G2X Energy commissioned a *Traffic Impact Study* to assess potential impacts of vehicular traffic associated with both construction and operation of the three projects, and to develop measures to mitigate impacts on local users of area roadways (Fenstermaker, 2014). The study found that the existing roadway network does not have sufficient capacity to accommodate the expected peak hour traffic volumes associated with construction of the three facilities. Therefore, the following mitigation measures were considered and agreed upon by Magnolia, the Lake Charles LNG companies, G2X, Louisiana DOTD, and the Calcasieu Parish Police Jury:

- Lake Charles LNG companies would provide off-site parking for 1,000 construction workers.
- Lake Charles LNG companies would provide temporary parking facilities near-site on the north side of Lincoln Road, east of Big Lake Road.
- Lake Charles LNG companies would provide temporary parking facilities near-site on the south side of Lincoln Road, east of Elliot Road.
- Buses would be utilized to transport construction workers from the off-site and near-site parking facilities to the Lake Charles Liquefaction Project site.
- Lake Charles LNG companies would provide right-turn and left-turn lanes at the following driveways:
    - two temporary driveways on Big Lake Road, north of Tank Farm Road that would be used for construction laydown;
    - temporary delivery driveway on Big Lake Road, south of Tank Farm Road;
    - permanent driveway on Big Lake Road, approximately 300 feet south of Granger Road;
    - two driveways into the temporary parking facility on Lincoln Road, east of Big Lake Road; and
    - driveway into the temporary parking facility on Lincoln Road, east of Elliot Road.
- Improvements would be made at three intersections (described in detail in section 4.9.6.1):
    - Tank Farm and Big Lake Roads;
    - Big Lake and Lincoln Roads; and
    - Lincoln Road and Gulf Highway.

Magnolia has stated that the measures recommended in the *Traffic Impact Study* would be implemented prior to construction as part of a cooperative effort between Magnolia, the Lake Charles LNG companies, and G2X Energy, which is known as the Calcasieu Point Development Project (see section 4.13.1.5). In a letter dated September 16, 2014, the Calcasieu Parish Police Jury stated that it has reviewed the study, agrees with the study's recommendations, and has no objections.

Six Levels of Service (LOS) (A through F) identify the operating conditions of a roadway (Transportation Research Board, 2010). A designation of LOS A represents a roadway with the best operating conditions, and a designation of LOS F represents the worst operating conditions. With the implementation of the proposed mitigation measures, all intersections included in the study would operate at a peak hour LOS D or above during construction of the three facilities. A designation of LOS D indicates that the roadway is approaching unstable flow; speeds slightly decrease as traffic volumes slightly increase. Therefore, we conclude that impacts on local users of the roadways during construction would be moderate. Following construction of the facilities, all intersections would operate with a peak hour LOS A, which indicates that traffic would be flowing freely (Fenstermaker, 2014; Transportation Research Board, 2010). As such, we conclude that impacts on local users of the roadways due to increased traffic during operation of the projects would be negligible.

Marine Traffic

We considered the cumulative impact area for marine traffic to be the Calcasieu Ship Channel, which includes the Industrial Canal. As identified in table 4.13.2-1, the other projects encompassed by the impact area with the potential to impact marine traffic include the following:

- Cameron LNG Terminal – Cameron Liquefaction and Expansion Projects;
- Trunkline LNG Terminal – Lake Charles Liquefaction Project;
- Calcasieu Pass Project;
- Delfin LNG Project;
- G2 LNG Project;
- Live Oak LNG Project;
- Magnolia's LNG bunkering and domestic marine distribution;
- G2X Energy's natural gas to gasoline facility; and
- maintenance dredging of the Calcasieu Ship Channel.

The Port of Lake Charles is currently the thirteenth busiest seaport in the United States and accommodates 5 million tons of cargo annually at its public facilities (Port of Lake Charles, 2015a). Current vessel traffic in the Calcasieu Ship Channel is approximately 1,022 vessels per year, which equates to an average of about 85 vessels per month (Port of Lake Charles, 2015b).

Magnolia estimates that 50 or fewer marine deliveries would occur during construction of the LNG terminal. Marine deliveries to the DII construction yard would occur between one and three times per month during the first year of construction, and approximately one time per month during the second and third years of construction, which would represent an increase of less than 4 percent in current vessel traffic. When combined with deliveries associated with construction of the Cameron Liquefaction Project (275 per month initially, decreasing to 125 per month after 11 months, and to 10 per month after 15 months); Lake Charles Liquefaction Project (120 per month); and the G2X Energy natural gas to gasoline facility, Cameron Expansion Project, and Calcasieu Pass Project (for which the number of deliveries is not publicly available), cumulative impacts on vessel traffic within the Calcasieu Ship Channel would noticeably increase the number of barges transiting the channel. However, because barges do not have moving security zones, impacts on other users of the waterway would be temporary, minor, and consistent with existing use of the waterway.

During operation, Magnolia estimates that up to 208 LNG vessels would call on the proposed LNG terminal per year (up to 104 LNG carriers and 104 LNG barges). Although 225 and 210 LNG carriers would call on the Trunkline and Cameron LNG Terminals per year during operation, respectively, because the number of vessels would not increase beyond what is already authorized at the LNG terminals, they are not included in the cumulative impact analysis because they are considered part of the environmental baseline. During transit of LNG vessels, a moving security zone would be established 2 miles ahead and 1 mile astern of LNG vessels and barges (33 CFR 165.805(a)(2)).

Traffic within the Calcasieu Ship Channel is expected to markedly increase over the next 10 years. In 2018, traffic within the channel is expected be 1,668 vessels per year; in 2023, traffic within the channel is expected to be 2,183 vessels per year, more than twice the 2013 level. For this reason, the Port of Lake Charles commissioned a simulation to investigate the impact of increased traffic on the operations of the channel and to assess the need for changes to channel infrastructure and regulations. The study evaluated the cumulative impact of expanded operations by existing channel users (e.g., Trunkline and Cameron LNG Terminals) and the construction of several additional facilities (e.g., Calcasieu Pass Project and Magnolia's proposed LNG terminal).[43]

As discussed in section 4.9.6.1, the results of the simulation indicate that although the Calcasieu Ship Channel has the capacity to accommodate the cumulative increase in vessel traffic, the median wait time is expected to increase by 2.3 hours per vessel (Ausenco, 2015). The study further notes that LNG carriers would experience the highest increase in median wait time (8.9 hours). The wait times are expected to vary seasonally, and would be higher during the winter months and lower during the summer months. In addition, the simulation indicated that 4 to 10 additional pilots and 1 or 2 additional sets of tugs would be required to accommodate vessel traffic without further increasing wait times.

To minimize impacts on other users of the Industrial Canal and Calcasieu Ship Channel, it is anticipated that vessels (including LNG vessels) would be organized in convoys to be handled in the most efficient manner. The convoy would be specifically organized to maximize efficient transit; therefore, vessels traveling the farthest upstream would be prioritized (to minimize delays to other vessels during maneuvering and docking). The study indicated that changing the passing restrictions for LNG carriers on the outer bar and adding a passing lane on the inner channel would decrease the median wait times (see additional discussion in section 4.9.6.1). However, because these measures have not been proposed at the time of this writing, they are not evaluated further. Due to the expected increase in the median wait time by 2.3 hours per vessel, we expect that cumulative impacts on marine traffic within the Calcasieu Ship Channel and Industrial Canal during operation of the proposed projects as well as other projects along the waterways would be permanent and moderate.

4.13.2.10 Cultural Resources

The cumulative impact area for cultural resources was considered to be the area within and near the proposed LNG terminal and KMLP facilities. Magnolia and KMLP have consulted with the appropriate SHPO and completed the necessary cultural resource surveys and reports. The SHPO has concurred that construction of the projects would not affect historic properties, and we also concur. Therefore, the projects would not contribute to cumulative impacts on cultural resources.

43 G2X Energy's natural gas to gasoline facility was not included in the simulation because it is expected to handle only barge traffic, which would not affect other users of the channel (Ausenco, 2015).

4.13.2.11 Air Quality and Noise

Air Quality

<u>Construction Impacts</u>

The cumulative impact area for air quality during construction of the proposed LNG terminal and KMLP facilities is the area adjacent to the proposed facilities. The other projects encompassed by this impact area include the following:

- Trunkline LNG Terminal – Lake Charles Liquefaction Project;
- Calcasieu Parish District 12 Water Works' tie-in for the LNG terminal;
- Entergy's electric transmission line and switching station for the LNG terminal;
- Cleco's electric transmission line for Compressor Station 760;
- G2X Energy's natural gas to gasoline facility;
- Entergy's electric transmission line and substation for the Lake Charles Liquefaction Project;
- LDWF's Fisheries Research Center; and
- maintenance dredging of the Calcasieu Ship Channel.

Construction of the LNG terminal would temporarily affect air quality due to emissions from the combustion engines used to power construction equipment, vehicle emissions traveling to and from the LNG terminal site, marine deliveries of construction materials, and from fugitive dust emissions resulting from earth-disturbing activities and equipment movement on dirt roads.

We have determined that the other projects most likely to result in and contribute to cumulative air impacts include the Lake Charles Liquefaction Project, G2X Energy's Lake Charles Gasoline Project, maintenance dredging of the Calcasieu Ship Channel, and the LDWF's Fisheries Research Center, along with several smaller projects described above. The potential for cumulative construction emissions impacts would be greatest during site preparation when fugitive dust production would likely be at its peak. Emissions from equipment engines and vehicles operating concurrently for the different projects would also result in cumulative air quality impacts in the local area. Magnolia, the Lake Charles LNG companies, and G2X Energy would implement mitigation measures to minimize construction impacts on air quality, including application of water to minimize fugitive dust, compliance with applicable EPA mobile source emission performance standards, and use of equipment manufactured to meet air quality standards. Based on the temporary nature of construction and the implementation of appropriate mitigation measures, we conclude that cumulative impacts on air quality due to construction of these facilities would be temporary and minor.

Due to the limited amount of combustion engines required to construct transmission lines and the short duration of construction activities associated with construction of Cleco's 0.3-mile-long electric transmission line, we have determined that cumulative impacts on air quality due to construction of the KMLP facilities would be negligible.

<u>Operational Impacts</u>

The cumulative impact area for air quality during the operation of the LNG terminal and KMLP facilities is the PSD Area of Impact of 6.2 miles (10 km). The PSD Area of Impact is a circular area around the emission source with a radius equal to the distance to the farthest receptor with a concentration exceeding the SIL, otherwise known as the radius of impact. As identified in table 4.13.2-1, the other projects encompassed by this impact area include the following:

- Cameron LNG Terminal – Cameron Liquefaction, Expansion, and Access Projects;
- Trunkline LNG Terminal – Lake Charles Liquefaction Project;
- Live Oak LNG Project;
- Magnolia's LNG trucking;
- Magnolia's LNG bunkering and domestic marine distribution;
- Calcasieu Parish District 12 Water Works' tie-in for the LNG terminal;
- Entergy's electric transmission line and switching station for the LNG terminal;
- Cleco's electric transmission line for Compressor Station 760;
- G2X Energy's natural gas to gasoline facility;
- Entergy's electric transmission line and substation for the Lake Charles Liquefaction Project;
- Entergy's Lake Charles Transmission Project;
- Entergy's electric transmission line for the Cameron Liquefaction Project;
- LDWF's Fisheries Research Center;
- Moss Lake Worker Village; and
- maintenance dredging of the Calcasieu Ship Channel.

Air pollutant emissions during construction of the LNG terminal would result from the operation of construction vehicles, marine traffic, vehicles driven by construction workers commuting to and from project work sites, and the generation of fugitive dust during construction activities.

The region in the vicinity of the proposed LNG terminal is currently in attainment with air quality standards; however, increases in industrial point sources could affect local and regional air quality. Under federal and LDEQ regulations, the LNG terminal would be considered a major PSD emission source and would contribute to cumulative impacts on air quality within the cumulative impact area. Magnolia has supplied estimated operational emissions for the LNG terminal, and conducted a dispersion modeling analysis (see section 4.11.1.3). This analysis included a PSD Screening Analysis, NAAQS Analysis, and PSD Increment Analysis. The PSD Screening Analysis included a Significance Analysis, Area of Influence Analysis, and Pre-construction Monitoring Analysis. This analysis showed that the NO_2 1-hour and annual SILs would be exceeded by impacts from the proposed LNG terminal. Because the 1-hour and annual SILs were exceeded, a NAAQS analysis was performed for both the NO_2 1-hour and annual averaging periods. The cumulative NAAQS impact analysis included an assessment of nearby sources (within 31 miles) of the LNG terminal's determined area of impact. Results of the NAAQS assessment revealed that modeled concentrations are predicted to exceed the NO_2 1-hour NAAQS; however, the LNG terminal contribution would be below the SIL; therefore, the LNG terminal would not cause or contribute to a violation of the NO_2 1-hour NAAQS.

Projects that could contribute to cumulative impacts on air quality, and that are considered to be major sources of air emissions, would be required to conduct a PSD analysis. Should operation of a project result in a significant impact on air quality, the LDEQ would enforce operational limitations or require emissions controls that ensure the facility's compliance with the SIP and attainment with the NAAQS. In addition, the LNG terminal would be required to comply with LDEQ permit conditions during operation, which would include emission control requirements to limit the emissions of certain criteria pollutants, HAPs, and/or GHGs. Therefore, cumulative impacts on regional air quality as a result of the operation of these facilities would be permanent, but minor.

In addition to operation of the various components of the LNG terminal described in section 4.11.1.5, air emissions from LNG marine traffic and other project-related vessels, considered mobile sources of air emissions, would occur along the entire waterway from the boundary of the U.S. EEZ to the recessed berthing area at the proposed LNG terminal. However, due to the transitory nature of these mobile sources and the large area covered, cumulative impacts on air quality along the waterway due to these associated mobile source emissions would be temporary and minor.

KMLP has supplied facility emission estimates for Compressor Station 760. Because Compressor Station 760 would not be subject to PSD review for any criteria pollutants, the proposed facility is not subject to PSD permitting. However, KMLP completed a PSD modeling analysis for the proposed facility along with the initial permit application with evaluations of compliance with applicable NAAQS and PSD increments for pollutants greater than PSD significant emission rates (CO, NO_X, PM_{10}, and $PM_{2.5}$) (see section 4.11.1.3). This analysis showed that SILs for NO_X, CO, PM_{10}, and $PM_{2.5}$ were not exceeded by potential impacts from Compressor Station 760. Because the modeled impacts did not exceed the SILs, operation of the compressor station would not cause or significantly contribute to an exceedance of either the NO_X, CO, PM_{10}, or $PM_{2.5}$ NAAQS, and a full impact analysis was not required. As outlined in section 4.11.1.6, emissions from operation of the other KMLP facilities (low and high pressure header pipelines and meter station modifications) would be minor or insignificant. We anticipate that cumulative air quality impacts due to the proximity of KMLP's proposed Compressor Station 760 and Cleco's 0.3-mile-long electric transmission line would be negligible.

Climate Change

Climate change is the change in climate over time, whether due to natural variability or as a result of human activity, and cannot be represented by single annual events or individual anomalies. For example, a single, large flood event or particularly hot summer are not indications of climate change, while a series of floods or warm years that statistically change the average precipitation or temperature over years or decades may indicate climate change.

The Intergovernmental Panel on Climate Change (IPCC) is the leading international, multi-governmental scientific body for the assessment of climate change. The United States is a member of the IPCC and participates in the IPCC working groups to develop reports. The leading U.S. scientific body on climate change is the U.S. Global Change Research Program (USGCRP). Thirteen federal departments and agencies participate in the USGCRP, which began as a presidential initiative in 1989 and was mandated by Congress in the Global Change Research Act of 1990.

The IPCC and USGCRP have recognized that:

- globally, GHGs have been accumulating in the atmosphere since the beginning of the industrial era (circa 1750);
- combustion of fossil fuels (coal, petroleum, and natural gas), combined with agriculture and clearing of forests is primarily responsible for this accumulation of GHG;
- these anthropogenic GHG emissions are the primary contributing factor to climate change; and
- impacts extend beyond atmospheric climate change alone, and include changes to water resources, transportation, agriculture, ecosystems, and human health.

Although climate change is a global phenomenon, this GHG emissions/climate change cumulative impact analysis focuses on the impacts of climate change in the Southeast region of the United States. The USGCRP (2014), NOAA (2011), and U.S. Climate Change Science Program (2008) reports include the following impacts of climate change in the Southeast and Coastal regions:

- The region's climate is generally warm and wet, with mild and humid winters. Since 1970, average annual temperatures in the region have increased by about 2 °F. Winters, in particular, are getting warmer. The average number of freezing days has declined by 4 to 7 days per year since the mid-1970s.
- Average annual temperatures in the region are projected to increase by 4 to 9 °F by 2080.
- Most areas, with the exception of southern Florida, are getting wetter. Autumn precipitation has increased by 30 percent since 1901. The number of heavy downpours has increased in many parts of the region.
- Despite increases in fall precipitation, the area affected by moderate and severe drought, especially in the spring and summer, has increased since the mid-1970s.
- The coasts will likely experience stronger hurricanes and sea level rise. Storm surge could present problems for coastal communities and ecosystems.
- Many coastal areas in Texas and Louisiana are subsiding; local land elevation is sinking relative to sea level. Combined with global sea level rise, local subsidence will lead to a higher "relative" change in sea level at the local scale. Observed subsidence rates in the southeast are significant. For example, in Grand Isle, Louisiana and the plain of the Mississippi River delta, sea level is already rising at rates as high as 0.3 inch per year.
- Higher temperatures increase evaporation and water loss from plants. Projected increases in temperature will likely increase the frequency, duration, and intensity of droughts in the area.
- Projected changes in surface water runoff to the coast and groundwater recharge will likely allow saltwater to intrude and mix with shallow aquifers in some coastal areas of the Southeast, particularly in Florida and Louisiana.
- If the region increases groundwater pumping to offset water shortfalls, then aquifers will be further depleted. In the long term, the depletion of groundwater supplies would place additional strain on surface water resources.
- Growth in demand will also likely strain water resources. The Southeast region is attracting people, investment, and industry. The population of Florida has more than doubled during the past 30 years. Growth rates in most other southeastern states were 45 to 75 percent over the same period. Decreased water availability will challenge future growth and the quality of life of residents in the region.
- Higher temperatures and more frequent heat waves will likely increase heat stress, respiratory illnesses, and heat-related deaths in the Southeast. High temperatures also correlate with poor air quality and pose a risk to people with respiratory problems. While the number of cold-related deaths is projected to decrease, net climate-related mortality will likely increase.

- Increased flooding and hurricanes could present extreme public health and emergency management challenges.

- The spread of some types of bacteria has been linked to warmer temperatures. For example, food poisoning from eating shellfish infected with *Vibrio parahaemolyticus* bacteria has increased by 41 percent from 1996 to 2006 in the United States. As temperatures increase, the frequency of these types of shellfish-borne disease outbreaks in coastal waters is likely to increase.

The GHG emissions associated with the construction and the operation of the projects are identified in sections 4.11.4 and 4.11.5. A GHG BACT analysis has been performed for the LNG terminal; proposed GHG BACT for the LNG terminal includes use of low carbon fuels, combustion equipment (turbines, thermal oxidizers, emergency back-up and firewater pump engines) designed as operational energy efficient in accordance with the EPA GHG BACT guidance, and a leak detection and repair program for monitoring piping and storage tank components to limit the impact of methane emissions. Compressor Station 760 would not be subject to PSD permitting and, therefore, a GHG BACT analysis is not required for this facility. However, the installation of new turbines and internal combustion engines would also be designed for energy efficient operations.

There is no current methodology or policy guidance to determine how the projects' incremental contribution to GHGs would translate into physical effects on the global environment. The emissions would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources, and contribute incrementally to climate change that produces the impacts described above. However, it cannot be determined whether or not the projects' contribution to cumulative impacts on climate change would be significant.

Noise

The cumulative impact area for noise was conservatively estimated to be the area within 1.5 miles of the LNG terminal and within 1-mile of the KMLP facilities. The other projects encompassed by this impact area include the following:

- Trunkline LNG Terminal – Lake Charles Liquefaction Project;
- Magnolia's LNG trucking;
- Magnolia's LNG bunkering and domestic marine distribution;
- Calcasieu Parish District 12 Water Works' tie-in for the LNG terminal;
- Entergy's electric transmission line and switching station for the LNG terminal;
- Cleco's electric transmission line for Compressor Station 760;
- G2X Energy's natural gas to gasoline facility;
- Entergy's electric transmission line and substation for the Lake Charles Liquefaction Project;
- LDWF's Fisheries Research Center; and
- maintenance dredging of the Calcasieu Ship Channel.

The greatest potential for cumulative noise impacts associated with the LNG terminal and KMLP facilities would be during construction from internal combustion engines and pile driving activities. In general, the estimated noise generated from construction associated with the LNG terminal would not exceed 55 dBA L_{dn} at the nearest NSAs (approximately 0.7 mile south of the site). However, pile driving activities have the potential to produce sound levels of up to 72 dBA L_{max} at the nearest NSAs. Therefore, we have included a recommendation in section 4.11.2.3 that outlines measures to reduce pile driving noise (L_{eq}) to no greater than 10 dBA over ambient levels at the nearest NSA. Although construction of

G2X Energy's natural gas to gasoline facility, the Lake Charles Liquefaction Project, the LDWF's Fisheries Research Center, and the utilities associated with these projects could overlap with the construction of the LNG terminal and contribute to noise levels in the area, all of these projects, except for the LDWF's Fisheries Research Center, are farther from the nearest NSA. As a result, we conclude that construction of the LNG terminal along with the projects other than the LDWF's Fisheries Research Center would result in a temporary and insignificant cumulative impact on noise levels at the nearest NSA. If construction activities at the Fisheries Research Center were to coincide with pile driving activities at the LNG terminal, cumulative noise impacts at the nearest NSAs could occur. However, due to the distance between the proposed aboveground facilities within the Fisheries Research Center and the LNG terminal (approximately 1 mile), these impacts are expected to be temporary and minor.

The estimated operational noise level of the LNG terminal, when combined with the existing ambient noise levels, at the nearest NSA is 52 dBA L_{dn}, which is 1 dBA greater than the estimated ambient noise level. The threshold of perception of change in sound levels for human hearing is about 3 dB; therefore, the increase would be unnoticeable or barely noticeable at the nearest NSA. As a result, operational noise from the LNG terminal would result in minor impacts on the NSA.

Noise decreases logarithmically with increasing distance from a noise source; therefore, cumulative operational noise impacts would only occur where other facilities or activities would occur very close to the projects. We have determined that the other projects most likely to result in and contribute to cumulative noise impacts include the Lake Charles Liquefaction Project, G2X Energy's Lake Charles Gasoline Project, maintenance dredging of the Calcasieu Ship Channel, Magnolia's LNG trucking, Magnolia's LNG bunkering and domestic marine distribution, and the LDWF's Fisheries Research Center, along with several smaller projects described above.

The cumulative noise during operation of these facilities would likely be less than during construction because many of the projects including the electric transmission lines and substations, waterline tie-in, and the LDWF's Fisheries Research Center would generate little to no noise after they are built. The bi-annual maintenance dredging of the Calcasieu Ship Channel could contribute to the cumulative noise impact of NSAs near the LNG terminal, but the effect would be temporary and limited to when dredging is occurring very close by. The two projects with the greatest potential to contribute to the long-term cumulative noise impacts are the Lake Charles Liquefaction Project and G2X Energy's Lake Charles Gasoline Project, both of which are within 1,000 feet of the LNG terminal. As part of its application to the FERC, the Lake Charles LNG companies evaluated the potential for cumulative noise impacts at the NSAs near each site. This assessment, which was performed by Hoover and Keith, indicates that the sound level due to the concurrent operation of both facilities would not exceed an L_{dn} of 55 dBA at any of the existing NSAs. Overall, the expected contribution from Lake Charles Liquefaction Project at Magnolia NSAs 1 and 2 would be lower than the contribution from the LNG terminal. At NSA 3, the estimated contribution from Lake Charles Liquefaction Project would be higher than the LNG terminal, but the expected increase from ambient at this location is 0.7 dBA, which would be unnoticeable or barely noticeable at the nearest NSA. The Hoover and Keith assessment did not evaluate the potential noise contribution of the G2X Energy's Lake Charles Gasoline Project. This facility is not regulated by FERC and thus not subject to the FERC noise threshold; however, the facility would be subject to Calcasieu Parish noise regulations found in the Calcasieu Parish Police Jury Code of Ordinances, Chapter 18, Article VIII. Thus, the G2X Energy facility would not be expected to contribute markedly to the noise levels at the NSAs closest to Magnolia's proposed LNG terminal.

Construction of the KMLP facilities would generate temporary increases in sound levels over a period of approximately 11 months, predominantly during the day. Construction activities would involve clearing and grading, installation of the header pipelines, construction of Compressor Station 760, and installation of proposed modifications at existing meter stations. The estimated noise levels associated with construction of Compressor Station 760 at the nearest NSA (approximately 1,125 feet west of the site) would be between 63 L_{eq} (dBA) and 58 L_{eq} (dBA). While the construction activities may be audible at nearby NSAs, these noise levels would be limited to daytime and would be minor. Construction of Cleco's electric transmission line to Compressor Station 760 may result in temporary increases in noise levels at the NSAs west of the compressor station (NSAs 1 and 3). Although noise levels generated by construction of the transmission line are not available, it is expected that cumulative impacts on noise levels at NSAs 1 and 3 would be temporary, minor, and primarily limited to the period when poles are driven to support the transmission wires.

4.13.2.12 Safety

We considered the cumulative impact area for the projects to be the area adjacent to and in the vicinity of the LNG terminal site and KMLP facilities.

Magnolia would mitigate impacts on public safety through the implementation of applicable federal, state, and local rules and regulations for the proposed LNG terminal as described in section 4.12. Those rules and regulations would ensure that the applicable design and engineering standards are implemented to protect the public and avoid or minimize the potential for accidents and failures. Because the project would require an increase in the number of LNG carriers transiting the Calcasieu Ship Channel and Industrial Canal, it would add to the current public safety risk associated with vessel traffic in the Calcasieu Ship Channel or at berth in the Industrial Canal.

Emergency response time is a key aspect of public health and safety. In accordance with our regulations, Magnolia would prepare a comprehensive plan that identifies the cost sharing mechanisms for funding these emergency response costs. This plan would minimize the potential for a cumulative public safety impact associated with the project.

The Lake Charles Liquefaction Project, Cameron Liquefaction and Expansion Projects, and other liquefaction and LNG export projects listed in table 4.13.2-1, if authorized, constructed, and operated, each would also have to prepare and implement a similar comprehensive plan to provide emergency services. In addition, we anticipate that the other major project proponents in the Lake Charles area (e.g., G2X Energy, IFG, Sasol, and Juniper GTL, LLC) would include emergency services within their facilities, and have emergency response plans developed with the appropriate agencies. Emergency responses at any of those facilities could temporarily stress emergency services in the area, but we would not expect them to result in a long-term adverse impact on those services. In the unlikely event of major emergencies at several of the facilities at the same time, there could be a short-term but significant cumulative impact on emergency services within Calcasieu and/or Cameron Parishes. That impact could be mitigated by assistance from emergency service providers from surrounding parishes.

As discussed in section 4.12.11.2, the risk associated with the proposed KMLP facilities would be small. Although operation of the proposed facilities would incrementally increase the risk of a pipeline accident, the increase would be minor. As a result, the cumulative impact and risks associated with constructing or operating the KMLP facilities would be negligible.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF THE ENVIRONMENTAL ANALYSIS

The conclusions and recommendations presented in this section are those of the FERC environmental staff. Our conclusions and recommendations were developed with input from the COE, Coast Guard, DOE, DOT, and EPA, as cooperating agencies. The federal cooperating agencies may adopt the EIS per 40 CFR 1506.13 if, after an independent review of the document, they conclude that their permitting requirements and/or regulatory responsibilities have been satisfied. However, these agencies would present their own conclusions and recommendations in their respective and applicable records of decision or determinations. Otherwise, they may elect to conduct their own supplemental environmental analysis, if necessary.

We determined that construction and operation of the Magnolia LNG and Lake Charles Expansion Projects would result in limited adverse environmental impacts. Most adverse environmental impacts would be temporary or short term during construction and operation, but long-term and permanent environmental impacts on wetlands, vegetation, and land use would also occur as part of the projects. This determination is based on a review of the information provided by Magnolia and KMLP and further developed from data requests; field investigations; scoping; literature research; alternatives analysis; and contacts with federal, state, and local agencies as well as Indian tribes and individual members of the public. As part of our review, we developed specific mitigation measures that we determined would appropriately and reasonably reduce the environmental impacts resulting from construction and operation of the projects. Therefore, we are recommending that our mitigation measures be attached as conditions to any authorization issued by the Commission. If the proposed projects are constructed and operated in accordance with applicable laws and regulations, the mitigating measures discussed in this EIS, and our recommendations, adverse environmental impacts would be reduced to less than significant levels. A summary of the anticipated impacts from the projects and our conclusions regarding impacts are provided below by resource area.

5.1.1 Geologic Resources

Construction and operation of the projects would not affect active mining or nonfuel mineral resources during construction or operation. One active oil producing well is 150 feet west of the TGT Meter Station and immediately adjacent to an existing access road. To avoid impacts on this active well, KMLP has stated that the well's owner would be notified 72 hours prior to construction activities near the well, and that the owner or owner's representative would be on site during construction activities.

In general, the potential for geologic hazards such as earthquakes, soil liquefaction, landslides, or a seismically generated tsunami or seiche to significantly affect construction or operation of the proposed facilities is low. However, some hazards such as flooding and hurricanes could affect the projects during operation. Magnolia and KMLP would design and construct the aboveground facilities at the LNG terminal, Compressor Station 760, and modified meter stations at an elevation to minimize potential impacts from flooding and hurricanes.

Subsidence could occur in the project vicinity, particularly at the LNG terminal, due to oil and gas extraction and groundwater withdrawal. Magnolia estimated that regional subsidence proximate to the LNG terminal will be 0.18 inch per year. This subsidence combined with an estimated sea level rise of 0.12 inch per year would equate to a loss in elevation of approximately 9 inches over the 30-year life of the LNG terminal. Subsidence in the vicinity of the KMLP facilities is expected to result in a loss in elevation of 0.1 inch over the 30-year life of the facilities.

The overall effect of the projects on topography and geology would be minor. The primary impacts on geologic resources would be due to the permanent alteration of geologic conditions at the LNG terminal and to a lesser extent at Compressor Station 760. Final grade surfacing and landscape within these facilities would consist of gravel, asphalt, concrete, topsoil, and grass surface areas. Magnolia would drive approximately 5,000 precast concrete piles to support key terminal components and structures. Impacts on geologic resources due to installation of the header pipelines and meter station modifications would be primarily limited to construction activities and include disturbance of slopes within the work areas. Such impacts resulting from grading and trenching would be temporary because KMLP would restore these areas to preconstruction contours to the maximum extent practicable.

The design of the LNG terminal is currently at the FEED level of completion. Magnolia has proposed a feasible design and committed to conducting additional detailed design work for the LNG terminal if the project is authorized by the Commission. Information regarding the development of the final design would need to be reviewed by FERC staff in order to ensure that the final design addresses the requirements identified in the FEED. Therefore, we are recommending that Magnolia file site preparation drawings and specifications, LNG storage tank and foundation design drawings and calculations, LNG terminal structures and foundation design drawings and calculations, seismic specifications for procured equipment, and quality control procedures to be used for civil/structural design and construction on a schedule to be identified in its Implementation Plan.

We do not anticipate that any blasting would be required for the construction of the proposed facilities. Based on the above discussion, in consideration of Magnolia's and KMLP's proposed mitigation and design criteria, and based on our recommendations, we conclude that the projects would not markedly affect or be affected by geological conditions in the area.

5.1.2 Soils

Construction of the projects could affect soil resources by increasing the potential for erosion, compaction, and rutting. Based on the soil properties reviewed, none of the soils potentially affected by the projects are considered highly susceptible to erosion by wind or water. Due to fine textured soils and nearly level topography, no revegetation concerns were identified. However, approximately 97 percent of the soils are prone to compaction. About 108 acres within the dredge material placement area and all of the soils potentially affected by the KMLP facilities are designated as prime farmland.

Construction activities such as clearing, grading, excavation, backfilling, and the movement of construction equipment may affect soil resources at the LNG terminal. In order to increase the load bearing capacity of soils along the heavy haul road, an engineered grout would be added to the subsoil that would permanently alter the physical characteristics of 7.5 acres of soils at the terminal site. Following construction, approximately 90 acres of soils at the terminal would be permanently impacted by paved or gravel plant roads, occupied by aboveground facilities, or converted to open water within the recessed berthing area. Magnolia would seed the remaining 33.7 acres within the LNG terminal site with native vegetation recommended by the NRCS. Operation of the KMLP facilities would permanently convert 12.0 acres to industrial use for operation of Compressor Station 760 and the expanded CGT, TRANSCO, and TGT Meter Stations. The remaining 63.8 acres of prime farmland soils would be restored to pre-construction conditions and are anticipated to retain their former productivity.

Contamination from spills or leaks of fuels, lubricants, and coolant from construction equipment could also adversely affect soils. To prevent contamination of soils during construction, Magnolia has stated that it would implement its *Spill Prevention Plan* during construction and its SPCC Plan during operation of the LNG terminal. However, because Magnolia has not yet provided its final spill plans, we are recommending that, prior to construction, Magnolia file its final *Spill Prevention Plan* for construction and SPCC Plan for operation of the project. KMLP would employ the mitigation measures included in its project-specific SPCC Plan, which would specify cleanup procedures to minimize the potential for soil contamination from such spills or leaks.

One hazardous waste site was identified within 1 mile of the LNG terminal. The Lake Charles Carbon Company is 0.6 mile north of the terminal site across the Industrial Canal. The results of soil sampling performed by Magnolia within the Industrial Canal and on land at the terminal site determined that the materials sampled do not contain contaminated material. Based on the results of the sampling report and the distance between the LNG terminal and the Lake Charles Carbon Company, no contaminated soils are expected to be encountered during construction or operation.

To reduce the impacts of construction on soils, Magnolia would implement measures outlined in its project-specific Plan and Procedures, which include measures to control erosion and sedimentation during construction and to ensure proper restoration of disturbed areas following construction. Similarly, KMLP would implement the mitigation measures contained in the FERC Plan and Procedures to control erosion, enhance successful revegetation, and minimize any potential adverse impacts on soil resources. In addition, disturbed areas would be monitored by Magnolia and KMLP following construction for the first and second (as necessary) growing seasons in upland areas and at least 3 years in wetlands to ensure successful restoration. With implementation of the proposed mitigation measures and project-specific plans, and with our additional recommendation, we conclude that impacts on soil resources would be adequately minimized.

5.1.3 Water Resources

Groundwater

The LNG terminal and KMLP facilities are underlain by the Chicot aquifer, which is an EPA-designated sole-source aquifer. In some areas, groundwater withdrawals from the Chicot aquifer are causing lowered water levels (drawdown) and saltwater encroachment. Although no portion of the Chicot aquifer has been designated as an Area of Ground Water Concern, high water use in southwest Louisiana has been identified as one of the current major issues having an impact on groundwater sustainability management. In 2012, the LDNR and USGS entered into a joint partnership to increase groundwater monitoring. Construction of the LNG terminal would require approximately 2.5 million gallons of groundwater for construction worker sanitation, dust suppression, hydrostatic testing of plant piping at the LNG terminal, cleaning of the LNG storage tanks following hydrostatic testing, and other general utility uses over the 45-month construction period (the majority of which would take place during the first 36 months of construction). On average, approximately 1,800 gallons of groundwater would be required per day, although approximately 6,000 gallons of groundwater would be required per day during peak construction. Groundwater required during construction of the KMLP facilities would be limited to approximately 346,000 gallons of water, which would be used for hydrostatic testing.

The majority of the construction activities associated with the LNG terminal and KMLP facilities would involve shallow, temporary, and localized excavation, with the exception of the installation of two groundwater wells and concrete and steel piles at the LNG terminal. The two new groundwater wells would be installed at the LNG terminal, which would be used during operation for process, service, and fire water systems. Each well would be drilled to a depth between 500 and 700 feet (the 500-foot sand). Concrete and steel piles required for the LNG storage tanks and LNG ship loading and berthing areas would be driven to a depth no lower than approximately 110 feet, and are not expected to have direct impacts on the underlying aquifer, which is overlain by about 150 feet of surficial sediments.

The LNG terminal would be within seven drinking water protection areas, each of which has a 1-mile radius centered on the well. Two of the protection areas are associated with wells immediately adjacent to the southeast corner of the terminal site that supply water for Calcasieu Parish District 12 Water Works. The other five wells are associated with the Lake Charles Carbon Company and Trunkline LNG Terminal; these wells are between 0.3 and 0.8 mile north of Magnolia's proposed LNG terminal site, across the Industrial Canal.

No private water wells are within 150 feet of the proposed LNG terminal site. Two private water wells are within 150 feet of the KMLP facilities, including a domestic supply well approximately 16 feet north of the TRANSCO Meter Station on the north side of Transco Road and a plugged and abandoned rig supply well approximately 100 feet south of the access road to the Pine Prairie Meter Station. KMLP stated that no sub-surface work greater than 10 feet in depth would be required at the TRANSCO Meter Station site and that it would coordinate with the well owner to test the well water both before and after construction. In addition, KMLP would contact each affected landowner to confirm the locations of private wells within 150 feet and public wells within 400 feet of the construction workspace. To document impacts on water wells and verify that they are appropriately addressed, we are recommending that, within 30 days of placing facilities in service, KMLP file a report identifying all public or private water supply wells/systems damaged by construction and a description of how they were repaired. The report should also include a discussion of any other complaints concerning well yield or water quality and how each problem was resolved.

Groundwater use associated with operation of the LNG terminal would increase overall withdrawal from the Chicot aquifer by up to 167,378 gallons per day for operation of the demineralized water treatment plant and use as service water, which is equivalent to about 0.023 percent of the current daily water withdrawal from the Chicot aquifer. Magnolia conducted a drawdown analysis, which indicated that operation of the new on-site well within the 500-foot sand would result in drawdown of less than 1.5 feet at a distance of 1,500 feet from the point of withdrawal. No groundwater would be necessary for the operation of the KMLP facilities. We anticipate that construction and operation of the projects would have long-term, but minor impacts on the Chicot aquifer.

Surface Water

The Industrial Canal at the LNG terminal site has been designated as EFH and a Navigable Waterway under section 10 of the Rivers and Harbors Act. The primary impacts on water quality within the canal during construction of the LNG terminal would be associated with dredging the berthing area for LNG vessels and the associated suspension of sediments in the water column. Magnolia proposes to use a hydraulic cutterhead suction dredge, which would minimize turbidity and surface water quality impacts. Dredge material would subsequently be transported by pipeline approximately 8,000 feet east to the placement area. Throughout dredging operations, dredge materials would be discharged to the placement area and allowed to dewater, after which the decanted water would be pumped through the effluent return pipeline and discharged back into the Industrial Canal. Potential impacts on water quality in the Industrial Canal resulting from dredging and the subsequent discharge of water back to the canal would include temporary increases in suspended solids and turbidity levels as well as potential resuspension of contaminated sediments. Use of a hydraulic cutterhead suction dredge would minimize turbidity from resuspension of the sediment in the water column and other surface water quality impacts. To further minimize these impacts, Magnolia would implement its *Dredging Water Quality Monitoring Plan*. Because this plan has not been finalized, we are recommending that, prior to construction, Magnolia file the final *Dredging Water Quality Monitoring Plan*. During operation, maintenance dredging of the recessed berthing area would be required every 4 to 5 years to maintain adequate water depths for LNG vessel maneuvering. Although maintenance dredging would result in a temporary increase in suspended sediment and turbidity levels, these impacts are expected to be temporary and limited to the vicinity of dredging activity within the Industrial Canal.

In-water construction associated with the LNG loading and ship berthing facilities, ground disturbance, filling of one intermittent waterbody that is not hydrologically connected to the Industrial Canal and one man-made waterbody, and general construction activities within the terminal site would result in localized, temporary increases in turbidity and suspended sediment levels. To minimize impacts on water quality, land disturbing activities would be conducted in compliance with the LPDES General Permit. In addition, Magnolia would implement its project-specific Construction SWPPP, Plan, and Procedures; and KMLP would implement the FERC Plan and Procedures. As a result, impacts on water quality are expected to be temporary and limited to the area within and immediately adjacent to the LNG loading and ship berthing facilities. Operation of the LNG terminal would increase the amount of impervious surface, which would result in an increased volume of stormwater runoff. Stormwater would be directed into two holding basins for dilution and temperature adjustment to ambient levels before being discharged into the Industrial Canal in accordance with Magnolia's Operational SWPPP, and LDEQ and EPA requirements.

A total of 10 waterbodies, including 3 intermittent waterbodies and 7 ephemeral ditches would be crossed or otherwise affected (e.g., culvert installation) by construction of the KMLP facilities. None of the waterbodies that would be impacted by the KMLP facilities are listed as National Wild and Scenic Rivers, designated as Outstanding Natural Resource Waters, designated as EFH, or contain federally or state-listed species. KMLP would minimize potential impacts on surface waters by implementing the FERC Procedures and utilizing dry crossing construction techniques, if flowing water is present within the waterbodies at the time of construction.

During construction of the LNG terminal, barges and support vessels would deliver large equipment and materials to the DII construction yard. Magnolia estimates that 50 or fewer marine deliveries would occur during construction. During operation, approximately 208 LNG vessels (104 LNG carriers and 104 LNG barges) would call on the LNG terminal per year. The construction and operational vessel traffic may increase shoreline erosion and temporarily increase turbidity levels within the Industrial Canal and along vessel transit routes. Magnolia would install rock armoring to provide scour protection from propeller wash both within and along the east and west ends of the recessed berthing area. The rock armoring would prevent erosion of the adjacent unprotected shoreline by wave activity from vessels maneuvering within the recessed berthing area. The Industrial Canal and Calcasieu Ship Channel were specifically created to provide deepwater access for maritime commerce. As such, use of the waterways by LNG carriers, barges, and support vessels during construction and operation of the LNG terminal would be consistent with the planned purpose and use of active shipping channels, and associated impacts on water quality within the shipping channel would be minor.

LNG carriers serving the terminal would discharge between approximately 8,711,000 and 12,264,000 gallons of ballast water into the Industrial Canal during LNG loading. Ballast water discharges at the LNG terminal could impact water quality by changing the salinity, temperature, pH, and dissolved oxygen level of water within the Industrial Canal. The physiochemical composition of ballast water in comparison to the water present within the Industrial Canal and Calcasieu River would vary depending on tidal and hydrologic conditions at the time of discharge. The primary potential impact on water quality due to ballast water discharge would be a temporary increase in salinity level. Salinity within the canal varies throughout the year, and tends to increase with water depth. Ballast water, which would generally consist of open ocean water, would have a higher salinity than the surrounding water. Because ballast water would be discharged near the bottom of the berthing area, and would comprise approximately 0.6 percent of the approximately 2 billion gallons of water within the Industrial Canal, we anticipate that natural flow and tidal exchange would dilute the ballast water discharge to salinity levels that typically occur within the Industrial Canal in the immediate vicinity of the LNG terminal and that increased salinity would represent a temporary and minor impact on water quality.

During operation, LNG carriers and LNG barges require water for cooling of the main engine/condenser, diesel generators, and fire main auxiliary and hotel services. Steam-powered LNG carriers would have the highest cooling water requirements (11.7 million gallons), LNG carriers with dual fuel/diesel electric engines would use 5.5 million gallons of water, and LNG barges would require 535 gallons of water. Impacts on surface waters would be primarily limited to an increase in water temperature in the vicinity of the LNG vessel resulting from the discharge of water between 2.7 °F and 7.2 °F warmer than ambient water temperatures. Due to the limited temperature differences, relatively small volume of discharge compared to the total water within the canal, and location within an active port that is already subject to withdrawals and discharges of vessel engine cooling water, we have determined that cooling water discharges would have temporary and minor impacts on water quality.

Approximately 27.5 million gallons of water would be required for hydrostatic testing of the LNG terminal and KMLP facilities, which would be obtained using both municipal sources and surface waters. Hydrostatic test water would be withdrawn from the Industrial Canal through screened intake hoses at rates ranging from 1,500 to 3,333 gallons per minute. Following completion of testing, water would be discharged directly to the Industrial Canal (i.e., LNG storage tanks, dredge material and effluent pipelines), within the LNG terminal site (i.e., Magnolia Meter Station, interconnect pipeline, and plant piping), or within the Compressor Station 760 site (i.e., header pipelines and meter station modifications). To minimize potential impacts on water quality, no chemical additives would be used in association with hydrostatic testing, and Magnolia and KMLP would each comply with all testing requirements and environmental conditions of the LPDES General Permit for Discharges of Hydrostatic Test Water.

During construction and operation, hazardous materials resulting from spills or leaks flushed into waterbodies with stormwater runoff or entering the Industrial Canal and the Calcasieu River could have an adverse impact on water quality. To prevent spills and leaks, Magnolia would implement its project-specific *Spill Prevention Plan* during construction and its SPCC Plan during operation of the LNG terminal, which outline potential sources of releases at the site, measures to prevent a release, and initial responses in the event of a spill. Similarly, KMLP would implement its project-specific SPCC Plan, which identifies potential sources of hazardous materials present during construction activities and the measures that would be implemented to prevent, contain, and clean up accidental releases.

With implementation of Magnolia's and KMLP's project-specific plans, the proposed mitigation measures discussed in this EIS, and our recommendation, we conclude that impacts on surface waters would be adequately minimized.

5.1.4 Wetlands

Construction of the LNG terminal would result in the permanent loss of approximately 16 acres of wetlands, including 8 acres of palustrine emergent wetlands, 7 acres of palustrine scrub-shrub wetland, 1 acre of estuarine emergent intertidal wetland, and less than 1 acre of palustrine forested/scrub-shrub wetland. Approximately 87 percent of the wetlands would be converted to upland industrial or open land within the LNG terminal site, 7 percent would be converted to an upland herbaceous community within the dredge material placement area, and the remaining 6 percent would be converted to open water within the recessed berthing area or filled for shoreline stabilization. To date, access has not been granted to conduct the necessary wetland surveys along the dredge material and effluent pipeline route or within the dredge material placement area. Therefore, we are recommending that, as soon as they are available and prior to the start of construction, Magnolia file the results of the wetland and waterbody surveys within areas associated with the transport and placement of dredge materials. Magnolia would also be required to mitigate for unavoidable impacts on jurisdictional wetlands as part of its project-specific *Compensatory Mitigation Plan*.

During operation, vessel traffic along the Industrial Canal and within the recessed berthing area could result in increased shoreline erosion, potentially impacting the wetland fringe along the Industrial Canal due to increased wave activity. To avoid impacts on this wetland, Magnolia would install rock armoring both within and along the east and west ends of the recessed berthing area, which would prevent erosion of the adjacent unprotected shoreline by wave activity from vessels maneuvering within the recessed berthing area. With the implementation of Magnolia's proposed rock armor, and considering the anticipated vessel speed and the fact that the Industrial Canal is an existing ship channel regularly subject to commercial marine traffic, we have determined the increase in vessel traffic within the Industrial Canal and recessed berthing area would cause a negligible increase in erosion of the adjacent wetland.

Magnolia filed its section 404 permit applications with the COE, New Orleans District in May 2014. Because the *Compensatory Mitigation Plan* has not been finalized and approved by the COE, we are recommending that, prior to filing its Implementation Plan, Magnolia file its *Compensatory Mitigation Plan* and documentation of COE approval of the plan.

Construction and operation of the KMLP facilities would permanently convert 0.3 acre of palustrine emergent wetlands to upland industrial use. These impacts would primarily occur within the expanded TGT Meter Station, but would also include very small areas at the TRANSCO Meter Station and where connection of the high pressure header pipeline would require modifications of existing interconnect facilities adjacent to the Pine Prairie Meter Station. In its jurisdictional determinations for the KMLP facilities, the COE determined that wetlands present are not jurisdictional under section 404 of the CWA; therefore, compensatory mitigation for these wetland impacts would not be required. KMLP would still implement the mitigation measures described in the FERC Procedures during construction and operation within these wetlands. Following construction, the less than 0.1 acre of wetland within temporary workspace would be restored in accordance with the FERC Procedures and allowed to revegetate naturally using the seedbank within the existing topsoil.

Our Procedures state that aboveground facilities should be located outside of wetlands, except where such siting would prohibit compliance with DOT regulations. Magnolia and KMLP have each proposed locating portions of aboveground facilities within wetlands. We have determined that these proposed deviations from the FERC Procedures are reasonable.

With the implementation of Magnolia's and KMLP's project-specific plans, the proposed mitigation measures discussed in this EIS, and our recommendations, we conclude that impacts on wetlands due to construction and operation of the projects would be permanent but minor.

5.1.5 Vegetation

A total of 114.0 acres of vegetation would be cleared during construction at the LNG terminal site. Following construction, the majority of the vegetation affected at the terminal (80.3 acres) would be permanently converted to industrial use associated with operation of the facility, resulting in a permanent loss of 34.0 acres of mixed hardwood loblolly forest, 31.3 acres of upland shrub, and 15.0 acres of wetlands. Magnolia would seed the remaining 33.7 acres of land within the LNG terminal site with native vegetation per NRCS recommendations, with the site being maintained as an upland herbaceous community. Although impacts on the majority of the vegetation affected by the LNG terminal would be permanent, because the site was previously used for dredge material disposal, vegetation communities within the site are limited in diversity. Therefore, impacts on vegetation communities would be permanent, but minor.

Vegetation within the dredge material placement area is largely composed of upland herbaceous communities. Because the placement area is currently used for staging and laydown, vegetation is routinely mowed and maintained in a graminaceous or weedy state. Dredge material placement would affect 107.3 acres of vegetation, including 106.1 acres of upland herbaceous vegetation and approximately 1.2 acres of wetlands. Following dredging and dewatering activities, the dredge material placement area would be graded and seeded in accordance with landowner requirements.

The KMLP facilities would be primarily within existing meter stations and on adjacent agricultural land, which comprises 99 percent of the vegetated communities within the affected areas. Small areas of upland herbaceous communities and emergent wetlands are also present within the KMLP facilities. During construction, 64.3 acres of vegetation would be impacted, including 40.4 acres associated with the new compressor station, 21.2 acres associated with the header pipelines, and 2.7 acres associated with the meter station modifications. The primary impacts on vegetation from construction of the KMLP facilities would be the cutting, clearing, and/or removal of existing vegetation within the construction workspace. Following construction, 12.0 acres of vegetation would be permanently converted to industrial land associated with the new or modified aboveground facilities. The remaining 52.3 acres would be allowed to revert to pre-construction condition in accordance with the FERC Plan and Procedures, NRCS recommendations, other agency requirements and permit conditions, and landowner requests. However, 8.3 acres of this would be subject to routine maintenance over each of the header pipelines. To further minimize impacts on vegetation communities during and after construction, KMLP would conduct much of the work within or adjacent to existing maintained rights-of-way and facility sites. Impacts would be minor and short term because we would expect these areas to revegetate to a cover similar to pre-construction conditions within one to two growing seasons.

Field surveys at the LNG terminal site identified Chinese tallow, a noxious weed that grows and spreads quickly. In addition, silktree was identified during surveys, which is an exotic species though it is not federally or state-designated as a noxious weed. To control and prevent the spread of Chinese tallow, Magnolia would implement its project-specific *Noxious Plant Control Plan* during construction and a Chinese tallow control and maintenance plan during operation of the LNG terminal. The Chinese tallow control and maintenance plan would require ongoing mechanical and potentially chemical treatment to effectively manage Chinese tallow while providing the opportunity for native and other preferred species to establish in designated areas. In addition, the FERC Plan and Procedures require coordination with the appropriate land management and/or state agencies to prevent the introduction or spread of invasive species, noxious weeds, and soil pests.

Due to previous disturbance within the majority of the areas impacted, and with the implementation of Magnolia's and KMLP's project-specific plans, the proposed mitigation measures discussed in this EIS, and our recommendations, we conclude that impacts on vegetation due to construction and operation of the projects would be permanent but minor.

5.1.6 Wildlife and Aquatic Resources

Wildlife

Wildlife species in the vicinity of the LNG terminal and KMLP facilities are characteristic of the habitats provided by the plant communities that occur in these areas. About 329.2 acres of wildlife habitat would be affected by construction of the LNG terminal and KMLP facilities. Overall, the greatest impacts would be on open land (187.6 acres), agricultural (63.5 acres), and open water (43.6 acres) habitats. The greatest impacts on terrestrial wildlife would result from the permanent loss of approximately 68 acres of forested and open lands within the LNG terminal site (approximately 34 and 31 acres, respectively), which would result in a permanent reduction in these habitat types in the general vicinity of the LNG terminal. However, due to the site's previous use as a dredge disposal site, vegetation species diversity is low, which lessens its value as habitat for wildlife.

Operation of Magnolia's LNG terminal would result in increased noise, lighting, and human activity that could disturb wildlife in the area. However, due to current industrial activities at other facilities on the Industrial Canal (i.e., Trunkline LNG Terminal, Lake Charles Carbon Company, Leevac Shipyards, DII, Martin Energy Services, and Marine Spill Response Corporation), wildlife species in the area are expected to be acclimated to the noise and artificial lighting associated with these activities. Therefore, we expect impacts due to noise, light, and human activity during operation of the LNG terminal to be negligible. Birds could also be affected by flaring at the terminal. Magnolia anticipates that flaring would occur for approximately 5 days during startup of the LNG terminal. During operation of the terminal, use of the marine and emergency flares would only occur during process upset conditions, which Magnolia anticipates would be no more than 12 hours during the first year of operation and no more than 6 hours in each subsequent year (each flaring event is expected to occur for between 15 and 60 minutes). Therefore, we find that occasional flaring during operation would not substantially impact migratory birds passing through the area.

Construction of the KMLP facilities would affect 64.3 acres of vegetated wildlife habitat, nearly all of which would be agricultural lands. In addition, 0.3 acre of open water habitat would be affected by construction of the KMLP facilities. Operation of the KMLP facilities would permanently convert 12.0 acres of wildlife habitat to industrial land. The remaining 52.3 acres would be restored to the pre-construction habitat type, although 8.3 acres of wildlife habitat within the permanent easements associated with the header pipelines would be subject to routine maintenance. Individuals of some wildlife species would be affected by construction and operation of the facilities; however, most impacts on wildlife would be short term and limited predominantly to the construction period. In accordance with the FERC Plan, KMLP would not conduct routine vegetation mowing or clearing over the full width of the permanent easements in uplands more frequently than every 3 years, and routine vegetation mowing or clearing would not occur between April 15 and August 1 unless specifically approved in writing by the FWS. With the implementation of the FERC Plan and Procedures, and due to the fact that abundant similar habitat is available for wildlife adjacent to the affected areas, we conclude that construction and operation of the KMLP facilities would have permanent but minor impacts on local wildlife populations and habitat.

The vegetation communities within the areas affected by the proposed LNG terminal and KMLP facilities provide potential habitat for migratory bird species, including songbirds, waterbirds, and raptors. However, much of the vegetated land associated with the sites is previously disturbed, within or adjacent to existing facilities, and/or composed of agricultural land, all of which reduce bird nesting habitat value. Impacts on migratory birds and their habitat due to construction and operation of the LNG terminal and KMLP facilities would typically be similar to impacts on general wildlife resources described above. Potential impacts specific to migratory birds could result from artificial illumination. During construction, Magnolia would direct all nighttime lighting towards construction activity and use the minimum light level necessary to ensure site safety and security. Similarly, outdoor lighting at the KMLP aboveground facilities would be limited, shielded, and downward-facing to facilitate safe operations at night or during inclement weather. Perimeter lighting at aboveground KMLP facilities would be turned off at night and would only be used when necessary for work conducted at night. Magnolia has not developed its *Facility Lighting Plan* for LNG terminal operation; therefore, we are recommending that, prior to construction, Magnolia file its *Facility Lighting Plan* for operation of the LNG terminal that would include measures to minimize operational lighting impacts on birds. With our recommendation and with the implementation of Magnolia's and KMLP's project-specific plans, we conclude that impacts on wildlife, including migratory birds, would be permanent but minor.

Aquatic Resources

All waterbodies potentially affected by the projects support warmwater fisheries; the Industrial Canal and Calcasieu River are estuarine, and the borrow pit, intermittent, and ephemeral waterbodies are freshwater. Of the waterbodies that would be affected by construction of the LNG terminal site, only the Industrial Canal, estuarine emergent wetlands, and the borrow pit provide year-round habitat for aquatic resources. The waterbodies potentially affected by the KMLP facilities are classified as intermittent or ephemeral, which typically provide limited habitat value for aquatic resources due to restricted water flow regimes.

Activities associated with construction and operation of the LNG terminal with the greatest potential to impact aquatic resources include dredging, pile driving, and vessel traffic. The proposed waterbody modifications, water withdrawals for hydrostatic testing, stormwater runoff, lighting, and inadvertent spills could also affect aquatic resources; although the implementation of the proposed mitigation measures, would reduce these impacts to minimal levels.

Construction of the recessed berthing area at the LNG terminal site would require the dredging of a 16.2-acre area in the Industrial Canal, which currently consists of 9.8 acres of open water, 1.0 acre of wetlands, and 5.4 acres of uplands. Dredge material would be excavated with a suction dredge and transported by pipeline to the placement area where it would be allowed to dewater, after which the decanted water would be pumped through an effluent pipeline and discharged back into the Industrial Canal. Potential impacts on aquatic resources resulting from dredging activities include direct take and habitat modification as well as temporary increases in noise, turbidity, and suspended solid levels.

Most fish species are highly mobile and would be expected to leave the area during dredging activities. Dredging would, however, result in direct mortality of benthic organisms (e.g., aquatic macroinvertebrates, mollusks, and crustaceans, which are important food sources for many species of fish) within the 9.8-acre portion of the dredge footprint that currently provides open water habitat. Slower, less mobile benthic invertebrates would also be directly affected, while larger, more mobile species would experience temporary displacement. Following construction activities, aquatic resources would be expected to return to the recessed berthing area, which would be similar to the existing habitat within the Industrial Canal.

Dredging activities would also temporarily increase noise, turbidity, and suspended solid levels within the water column, which could reduce light penetration and the corresponding primary production of aquatic plants, algae, and phytoplankton. Increased turbidity and suspended solid levels could also adversely affect fish eggs and juvenile fish survival, benthic community diversity and health, foraging success, and suitability of spawning habitat. Sediments in the water column could be deposited on nearby substrates, burying aquatic macroinvertebrates. Impacts on aquatic resources due to increased turbidity and suspended solid levels would vary by species; however, the aquatic resources present within the project area are likely accustomed to regular fluctuations in noise and turbidity levels from industrial activity and maintenance dredging (which is scheduled to occur every other year) within the Industrial Canal. To minimize impacts on aquatic resources due to increased turbidity and suspended solid levels, Magnolia would use a hydraulic cutterhead suction dredge and would implement its *Dredging Water Quality Monitoring Plan*. With the implementation of these mitigation measures and our recommendation that Magnolia file its final *Dredging Water Quality Monitoring Plan*, we have determined that impacts on aquatic resources would be localized, temporary, and minor.

Maintenance dredging of the recessed berthing area would be conducted by Magnolia every 4 to 5 years during operation of the terminal. Potential impacts on aquatic resources from maintenance dredging would be similar to those described above for dredging during construction of the LNG terminal; however, impacts would be shorter in duration due to the reduced amount of material being removed from the recessed berthing area. Therefore, we conclude that maintenance dredging would have temporary and minor impacts on aquatic resources.

Construction of the LNG terminal would require the installation of approximately 5,000 piles over a 16-month period to support the proposed structures, including both in-water and onshore hydraulic piling rigs. It is anticipated that aquatic resources would largely avoid the pile driving area when the piles are being installed, although some aquatic resources could experience stress or injury due to the underwater sound pressure levels. Magnolia would perform hydro-acoustic monitoring during the initial pile testing to determine the sound pressure levels generated under site-specific conditions at the LNG terminal. Because pile driving plans have not been finalized and an estimate of underwater noise has not been provided, we are recommending that, prior to the end of the draft EIS comment period, Magnolia file a *Pile Driving Noise Impact Mitigation Plan*. This plan should describe the hydroacoustic monitoring methods that Magnolia would use to determine representative sound pressure levels associated with in-water pile driving as well as mitigation measures to be implemented to reduce sound pressure levels. The plan should include a description of the locations where monitoring would occur in relation to the pile being driven, and the maximum impact energy used on the pile during monitoring. With the implementation of hydroacoustic monitoring and mitigation measures, if needed, pile driving activities would minimize underwater noise levels to a level that would not cause significant impacts on aquatic resources.

During construction and operation of the LNG terminal, barges, support vessels, and LNG vessels (LNG carriers and LNG barges) would call on the LNG terminal, increasing ship traffic within the Industrial Canal, Calcasieu Ship Channel, Intracoastal Waterway, and Gulf of Mexico. Potential impacts on aquatic resources resulting from increased vessel traffic include shoreline erosion and resuspension of sediments, ballast water discharges, cooling water discharges, and increased noise levels.

Because Magnolia would modify the existing shoreline to create the recessed berthing area, there is potential for the modified shoreline to cause changes in wave dynamics and increase erosion of adjacent areas. Magnolia would install rock armoring to provide scour protection from propeller wash both within and along the east and west ends of the recessed berthing area. The rock armoring would prevent erosion of the adjacent unprotected shoreline by wave activity from vessels maneuvering within the recessed berthing area. The Industrial Canal, Calcasieu Ship Channel, and Intracoastal Waterway were specifically created to provide deepwater access for maritime commerce. Similarly, LNG carriers transiting the Gulf of Mexico would use established shipping channels. As such, use of the waterways during construction and operation of the LNG terminal would be consistent with the planned purpose and use of these active shipping channels, and associated impacts on aquatic resources due to increased shoreline erosion and resuspension of sediments would be negligible.

Ballast water discharges at the terminal would modify the temperature, pH, dissolved oxygen, and salinity of the water in the vicinity of the discharge. However, the impacts on water quality, and thus aquatic resources, due to changes in temperature and pH would be temporary and negligible. Salinity levels within the Industrial Canal are naturally variable, depending upon tidal regime and rainfall. During and immediately following ballast water discharges, benthic aquatic species may be affected by higher salinity levels, although ships moving into and out of the Industrial Canal and berthing area would displace water, circulating it into, around, and out of the berthing area. Therefore, any increased salinity levels resulting from ballast water discharges would be temporary and unlikely to adversely affect aquatic resources.

Depending on the oxygen levels present in both the ballast and ambient water at the time of discharge, aquatic resources present in the vicinity of the discharge point could be exposed to dissolved oxygen levels considered unhealthy for aquatic life. The adaptability of resident species within the Industrial Canal to natural variation in oxygen levels would mitigate this effect. It is also anticipated that mobile aquatic species would relocate short distances to more suitable conditions, which would minimize the adverse impacts associated with ballast water discharges. Given that the amount of ballast water discharged into the Industrial Canal during each LNG vessel visit to the LNG terminal would make up only approximately 0.6 percent of the approximately 2 billion gallons of water within the Industrial Canal, we have determined that impacts on aquatic resources would be temporary and minor.

During operation, LNG vessels require water for cooling of the main engine/condenser, diesel generators, and fire main auxiliary and hotel services. Each LNG carrier calling on the terminal would require between 5.5 and 11.7 million gallons of water, and each LNG barge would require 535 gallons of water. Impacts on aquatic resources would be primarily limited to an increase in water temperature in the vicinity of the LNG vessel resulting from the discharge of water between 2.7 °F and 7.2 °F warmer than ambient water temperatures. Given the volume of cooling water discharged relative to the total volume of water within the Industrial Canal, and the mobility of resident species, which could relocate to cooler surrounding waters if necessary, we have determined that impacts on aquatic resources would be intermittent and minor.

As a non-federal party assisting the FERC in meeting its obligations under the MSA, Magnolia coordinated with NOAA Fisheries' regarding potential project impacts on EFH. NOAA Fisheries has indicated that the Magnolia LNG Project would not have significant impacts on EFH, provided the applicant addresses stormwater management and wetland mitigation. As described in the preceding sections, Magnolia would conduct ground disturbing activities in compliance with LPDES permit requirements as well as its project-specific Construction SWPPP, Plan, and Procedures. Magnolia would mitigate for all impacts on wetlands determined to be jurisdictional under section 404 of the CWA in accordance with its COE-approved *Compensatory Mitigation Plan*.

Due to the relatively small area of EFH that would be impacted within the Industrial Canal (the recessed berthing area represents approximately 5 percent of the total acreage within the canal), the increase in the amount of estuarine water column habitat created during construction of the LNG vessel berthing area, Magnolia's proposed mitigation measures, and preliminary coordination with NOAA Fisheries, we have determined that the Magnolia LNG Project would not have a significant adverse impact on EFH. We are requesting that NOAA Fisheries consider the EIS as our EFH Assessment.

5.1.7 Threatened and Endangered Species

Based upon our review of publicly available information, agency correspondence, and field surveys, a total of 16 federally listed threatened, endangered, or candidate species may occur in parishes affected by the projects. Additionally, within these parishes, critical habitat has been designated for one species, the piping plover.

We have determined that the projects would have no effect on 4 of the 16 federally listed species potentially occurring in the area. We have also determined that the projects are not likely to destroy or adversely modify designated critical habitat, and would not contribute to the trend toward federal listing for the one candidate species.

There is no potentially suitable habitat within areas affected by construction or operation of the LNG terminal or KMLP facilities for the remaining 11 federally listed species (five species of sea turtles, five species of whales, and the West Indian manatee); however, potentially suitable habitat is present for these species along the portion of the LNG transit route in Cameron Parish and the Gulf of Mexico. However, sightings of these species are rare and, based on the their characteristics and habitat requirements, and because Magnolia would provide LNG ship captains with the NOAA Fisheries-issued *Vessel Strike Avoidance Measures and Reporting for Mariners*, we have determined that the Magnolia LNG Project *may affect, but is not likely to adversely affect* these federally listed species. As required by section 7 of the ESA, we request that NOAA Fisheries accept the information provided in this EIS as the BA for the projects. Further, we request concurrence with our findings of effect for federally listed species. The projects would have no effect on listed species under the jurisdiction of the FWS; therefore, preparation of a BA and consultation between the FERC and FWS is not necessary.

Based on information obtained from the LDWF, six state-listed threatened or endangered species occur within the parishes that would be affected by the projects. Four of these species are also federally listed as threatened or endangered. The projects are expected to have no impact on one of the two remaining state-listed species (bald eagle) due to the absence of suitable habitat within or near the LNG terminal. Although the remaining state-listed species (brown pelican) may occur within the Calcasieu Ship Channel and coastal waters of the Gulf of Mexico, because LNG vessels would transit within existing, highly traveled shipping lanes, adverse impacts on brown pelicans during operation of the LNG terminal are not anticipated.

5.1.8 Land Use, Recreation, and Visual Resources

Construction of the LNG terminal and KMLP facilities would affect a total of 353.5 acres of land. Of this, 144.6 acres would be permanently affected by operation of the LNG terminal and KMLP facilities and 173.9 acres would be allowed to revert to the existing land use type after the completion of construction. The remaining 35.0 acres within the dredge material placement area would be converted from open water, industrial/commercial, and forest to open land.

Construction of the LNG terminal would affect a total of 277.7 acres of land within the LNG terminal site, Industrial Canal, DII construction yard, along the dredge material and effluent pipelines, and at the dredge material placement area. The land use types affected during construction of the LNG terminal would include open land (67 percent), open water (16 percent), forest (12 percent), and industrial/commercial (5 percent). Over 99 percent of the land that would be permanently affected by construction of the LNG terminal is within areas that have been previously disturbed by commercial or industrial activities. Impacts on the remaining 1.0 acre of permanently affected land would be mitigated by Magnolia's implementation of its *Compensatory Mitigation Plan*. Because the areas affected by construction and operation of the LNG terminal are zoned for heavy industrial use (Calcasieu Parish Police Jury, 2015), we have determined that impacts on land use would be negligible.

Magnolia has entered into an agreement with the Lake Charles Harbor and Terminal District to lease the 115-acre LNG terminal site for the minimum expected operational life of 30 years, with the option to extend the lease for four additional periods of 10 years each. Temporary workspaces proposed within the existing DII site would be subcontracted from DII. Temporary workspaces proposed along the dredge material and effluent pipelines would be leased from the landowners/leaseholders along the route. Magnolia is currently in negotiations with CB&I for use of the dredge material placement area. Aside from the Port of Lake Charles, no federal, state, or local agency owned or managed lands would be directly affected by the LNG terminal.

Construction of the KMLP facilities would affect about 76 acres of land. Because the activities involve modification or expansion of existing facilities, much of the land affected by the KMLP facilities would be adjacent to the permanent easement associated with KMLP's existing mainline or would be adjacent to or within existing meter station sites. The KMLP facilities would be constructed almost entirely within agricultural lands, although small areas of industrial/commercial and open lands would also be affected. Impacts on land use associated with construction and operation of the KMLP facilities would be temporary and minor within 84 percent of the areas that would be affected, as these areas would be allowed to revert to pre-construction conditions. KMLP would retain permanent easements over the header pipelines, which would be subject to vegetation maintenance. The lands necessary for construction and operation of the KMLP facilities would be composed of both land currently owned or leased by KMLP and other private land.

No residential land is within the footprint of the areas that would be affected by construction or operation of the LNG terminal. The nearest occupied residences are 0.6 mile south of the terminal site. Two occupied residences are within approximately 100 feet of the proposed construction workspaces for the KMLP facilities, including a residence approximately 100 feet northwest of the existing TRANSCO Meter Station and a residence 50 feet south of the existing access road for the Pine Prairie Meter Station. There are no planned residential or commercial developments within 0.25 mile of the projects. However, three commercial or industrial facilities are planned within 1 mile of the proposed LNG terminal. Certain non-jurisdictional facilities are also planned to provide utilities (i.e., electric power, water) to the LNG terminal and KMLP facilities.

There is one designated recreational area, Calcasieu Point Landing, within 1 mile of the LNG terminal site (approximately 525 feet west of the terminal site). Recreational boating and fishing activities occurring within the Industrial Canal and near Calcasieu Point Landing could be affected by construction and operation of the LNG terminal due to increased noise, delayed access to the park, restrictions on fishing in the immediate vicinity of the LNG terminal, and vessel traffic. Increased noise associated with construction of the LNG terminal would likely deter recreational users from fishing in the immediate vicinity of project activities. In particular, dredging and pile driving activities, which would occur up to 7 days per week and 6 days per week, respectively, during the first 20 months of construction, could result in avoidance of the area by recreational users. As a result, we have determined that construction of the LNG terminal would result in temporary and moderate impacts on recreational use of Calcasieu Point Landing. During operation of the LNG terminal, delays to recreational users could occur due to the moving security zone around LNG vessels during transit to and from the LNG terminal, which we expect would be intermittent and minor.

The Sabine NWR is approximately 12 miles south-southwest of the proposed LNG terminal site on the west side of the Calcasieu Ship Channel. Users of the Sabine NWR adjacent to the ship channel may observe a small increase in barge traffic during the construction period and may also observe LNG vessel traffic through the channel during operation of the LNG terminal. Because LNG vessel traffic would be consistent with existing use of the Calcasieu Ship Channel, we have determined that the resulting impact on users of the Sabine NWR would be minor.

The viewshed of Magnolia's proposed LNG terminal includes a portion of the Creole Nature Trail Scenic Byway (Highway 27), which is approximately 2 miles west of the LNG terminal across the Calcasieu Ship Channel and as close as 0.3 mile west of the LNG vessel transit route along the Calcasieu Ship Channel. No other federally, state, or locally designated visual resources have been identified in the viewshed. The primary existing structures in the viewshed of the LNG terminal include the existing Trunkline LNG Terminal, Lake Charles Carbon Company, and other industrial properties adjacent to the Industrial Canal. The viewshed also includes the Industrial Canal to the north and west, the Intracoastal Waterway and Calcasieu Ship Channel to the south, and forest and wetlands to the northwest and south of the site. Because the site is slightly higher in elevation than the surrounding area due to the previous placement of dredge spoil at the site, and the topography of the surrounding area is fairly level, visibility would extend outward from the site except where buffered by vegetation or existing structures.

Activities associated with construction of the LNG terminal may be visible from residences to the south and southeast of the LNG terminal, along Airhart and Joe Ledoux Roads, and possibly residences along the northeastern shoreline of Calcasieu Lake on Big Lake Road (although these residences are over 3 miles south of the site). Construction activities would also be visible to recreationists using the Industrial Canal, Calcasieu River, and northern portions of Calcasieu Lake as well as motorists along Henry Pugh Boulevard, Big Lake Road, and a segment of the Creole Nature Trail Scenic Byway. The presence of large construction equipment and truck traffic would change the visual quality of these waterways, roadways, and the scenic byway but, due to the distance from the site and short duration of impact (until the vehicle passes the site), impacts would be minor.

Visually, the facilities associated with the LNG terminal would be consistent with other industrial features along this portion of the Industrial Canal. Although permanent changes to the visual character of the area would result from operation of the LNG terminal due to the presence of aboveground structures that would modify the viewshed. The most prominent visual features at the terminal would be two LNG storage tanks, each approximately 258 feet wide and 174 feet in height, and the flare stack, which would be approximately 100 feet in height when no flame is present and approximately 229 feet in height when a flame is present. Magnolia anticipates that flaring would occur for approximately 5 days during startup of the LNG terminal. During operation of the LNG terminal, use of the marine and emergency flares would only occur during process upset conditions, which Magnolia anticipates would be no more than 12 hours during the first year of operation and no more than 6 hours in each subsequent year. The new facilities would also require lighting for operations, safety, and to comply with Federal Aviation Administration requirements.

Due to the proximity of Calcasieu Point Landing to the LNG terminal and lack of visual buffers, the LNG terminal would be prominent when viewed from the landing both during daytime hours and in the evening when the facilities (including the LNG storage tanks) would be illuminated in accordance with federal safety regulations. Neither the flare stack nor the flame itself would be visible from Calcasieu Point Landing; although the flame would be taller than the LNG storage tanks, the position of the LNG storage tanks in the foreground would conceal the flame. To minimize visual impacts, lighting at the LNG terminal would be shielded and downcast to avoid interference with navigation; in addition, facilities within the LNG terminal site would be partially obscured by the proposed vapor barrier. To further minimize visual impacts, we are recommending that, prior to construction, Magnolia file its *Facility Lighting Plan* for operation of the LNG terminal. Therefore, we have determined that the LNG terminal would have a permanent and moderate impact on visual resources when viewed from the Calcasieu Point Landing.

The KMLP facilities in Acadia Parish would be located in a primarily agricultural area, which contains easements for 46 oil and gas pipelines within a 1-mile radius. As a result, the existing structures in the viewshed of these facilities are primarily meter stations, compressor stations, and farms and agricultural outbuildings. During construction activities, the primary visual impacts would result from the presence of personnel, large construction equipment, and vehicles, all of which could be visible in areas accessible to the public, such as Coulee and Fournerat Road and nearby residences. However, the nearest residence is approximately 500 feet west of the low pressure header pipeline, and the facilities would not be in densely populated areas. The presence of construction equipment and personnel would be temporary and short term. During operation, the compressor station would be visible to passing motorists travelling along nearby roads in Acadia Parish. To minimize visual impacts on nearby residences and passing motorists, KMLP proposes to plant shrubbery along the west, north, and east sides of the perimeter fence and to limit and down-shield perimeter lighting during nighttime hours. There would be no permanent visual impacts at the existing meter stations that would not be expanded (ANR, and Pine Prairie Meter Stations). The expanded TGT Meter Station would result in new, permanent impacts on visual resources; however, the expanded meter station footprint would be consistent with the existing viewshed and would not affect any designated visual resources. Therefore, we conclude that visual impacts would be permanent, but minor.

Construction activities at the existing meter stations in Evangeline Parish would result in short-term, localized visual impacts similar to those described above for the facilities in Acadia Parish. There would be no permanent visual impacts at the TETCO Meter Station, which would not be expanded. The expanded CGT and TRANSCO Meter Stations would result in new, permanent impacts on visual resources; however, the expanded footprint of these meter stations would be consistent with the existing viewshed and would not affect any designated visual resources. Therefore, we conclude that the meter station modifications would have minimal impacts on visual resources.

5.1.9 Socioeconomics

Construction of the projects would have a minor to moderate impact on local populations, employment, provision of community services, and property values. There would not be any disproportionately high or adverse environmental and human health impacts on low-income and minority populations from construction or operation of the projects. No residences or businesses would be displaced as a result of construction or operation of the LNG terminal or KMLP facilities.

Construction of the LNG terminal would take place over an approximate 45-month period. Magnolia expects that construction workers would be on site during 32 months of the construction period and that the average construction workforce would be 355 workers. KMLP estimates that an additional 30 workers would be employed at the terminal over the 3-month period required to construct the Magnolia Meter Station (which would be within the LNG terminal site). The combined workforce associated the terminal and meter station would peak during a 10 month period during which it would exceed 500 construction workers (at its highest, approximately 542 workers would be working at the site). Of this, approximately 307 workers would be hired locally and 235 would be non-local workers. Assuming non-resident workers would be accompanied by family members and based on the average household size in Louisiana, the peak construction non-resident workforce could result in up to 672 non-local persons temporarily relocating to the area, which would represent a 0.3 percent increase in the total population within Calcasieu, Cameron, and Jefferson Davis Parishes. Given the number of hotel rooms in the vicinity of the LNG terminal, no serious disruptions to housing and temporary accommodations are anticipated, and construction of the LNG terminal would have a moderate, temporary impact on housing in the affected area. After construction, Magnolia anticipates 67 workers would be employed at the LNG terminal, of which 27 are expected to be non-local hires. KMLP's Magnolia Meter Station would be unmanned during operation. This workforce and their families would represent a minor but permanent increase in the population in the vicinity of the LNG terminal site.

The construction workforce for the KMLP facilities would be 75 workers for the majority of the 11 months that it would take to construct Compressor Station 760. However, during a 3-month period when construction of the compressor station would coincide with construction of the header pipelines and modifications at KMLP's existing meter stations, up to 270 workers would be employed at the KMLP facilities. The majority of these construction workers (up to 162 during peak construction) are expected to be hired from outside of Acadia and Evangeline Parishes, which would result in a temporary increase in the local population of less than 0.2 percent. Because the peak construction period associated with the KMLP facilities would occur over a 3-month period, it is unlikely that non-local workers would be accompanied by family members. Based on the number of available rental housing units and hotels/motels in the vicinity of the KMLP facilities, adequate housing exists to accommodate non-resident workers. As such, construction of the proposed KMLP facilities would have only a temporary and minor impact on housing in the area. Operation of the KMLP facilities would require four new permanent employees. The relocation of these four individuals to the project area, even if they bring their families, would have a negligible impact on the local housing market.

Impacts on local users of the roadway network due to construction of the LNG terminal include potential delays from increased traffic levels and diminished roadway capacity. To identify, quantify, and recommend mitigation for traffic impacts on area roadways during construction of projects currently proposed on the Industrial Canal, Magnolia, Lake Charles LNG, and G2X Energy commissioned a *Traffic Impact Study*, which recommended that three intersection improvements be implemented to reduce impacts on area roadways. The measures recommended in the *Traffic Impact Study* would be implemented prior to construction as part of a cooperative effort between Magnolia, Lake Charles LNG, and G2X Energy. In addition, Magnolia, Lake Charles LNG, and G2X Energy commissioned a pavement analysis, which evaluated the existing structural capacity of Lincoln, Big Lake, and Tank Farm Roads in order to determine the necessary overlay/rehabilitation options to sustain construction traffic. The study identified 10 segments along Lincoln Road and 2 segments along Tank Farm Road that, given the current condition, would fail during the construction period. The analysis included two recommendations for rehabilitation of the roadways, which would be implemented as part of the effort resulting from the *Traffic Impact Study*.

With the implementation of the recommendations described above, traffic generated by construction of the LNG terminal is not expected to impact the existing roadway network in terms of roadway capacity. Construction of the LNG terminal would result in temporary increases in traffic along area roadways, which could result in delays to local users of the roadways. With the implementation of the recommended improvements at the intersections of Tank Farm and Big Lake Roads, Big Lake and Lincoln Roads, and Lincoln Road and Gulf Highway, we have determined that impacts from construction of the LNG terminal would have temporary and minor impacts on local users of the roadway network. Construction of the KMLP facilities would have minimal impact on traffic or roadways.

Current vessel traffic in the Calcasieu Ship Channel is approximately 1,022 vessels per year, which equates to an average of about 85 vessels per month. Magnolia estimates that 50 or fewer marine deliveries would occur during construction of the LNG terminal. Marine deliveries to the DII construction yard would occur between 1 and 3 times per month during the first year of construction, and approximately 1 time per month during the second and third years of construction, which would represent an increase of less than 4 percent in current vessel traffic. Because barges are subject to fewer restrictions and can be maneuvered between other vessels using the channel, an increase in construction barge traffic would not impact the traffic capacity of the channel.

During operation, approximately 208 LNG vessels (104 LNG carriers and 104 LNG barges) would call on the LNG terminal per year. In a letter dated February 12, 2015,[1] the Coast Guard 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 Coast Guard's NVIC 01-2011. Due to the existing levels of traffic within the port and the anticipated increase in traffic within the channel over the next 10 years, a traffic impact study was conducted for the Calcasieu Ship Channel that simulated the anticipated impacts on traffic within the channel between 2013 and 2033, assuming that the present infrastructure, operational rules, and dredging dimensions are maintained. The results of the simulation indicate that the median wait time is expected to increase by 2.3 hours per vessel, and notes that LNG carriers would experience the highest increase in median wait time (8.9 hours). The wait times are expected to vary seasonally, and would be higher during the winter months and lower during the summer months. In addition, the simulation indicated that 4 to 10 additional pilots and 1 or 2 additional sets of tugs would be required to accommodate vessel traffic without further increasing wait times.

[1] Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number, excluding the last three digits, in the "Docket Number" field (i.e., CP14-347). The LOR for the project was filed with the FERC on March 2, 2015.

To minimize impacts on other users of the Industrial Canal and Calcasieu Ship Channel, it is anticipated that vessels (including LNG vessels) would be organized in convoys to be handled in the most efficient manner. The convoy would be specifically organized to maximize efficient transit; therefore, vessels traveling the farthest upstream would be prioritized (to minimize delays to other vessels during maneuvering and docking). Based on the Coast Guard's LOR for the Magnolia LNG Project and the expected increase in the median wait time by 2.3 hours per vessel, we have determined that operation of the LNG terminal would have a permanent and moderate increase in marine traffic within the Industrial Canal and Calcasieu Ship Channel.

Construction of the projects would result in 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 projects would have a positive effect on the local governments' tax revenues due to the increase in property taxes that would be collected.

5.1.10 Cultural Resources

Due to the environmental setting, no cultural resource surveys were required within the areas affected by construction of the LNG terminal. In letters dated October 28, 2014, April 8, 2015, and May 12, 2015, the Louisiana SHPO concurred that no historic properties would be affected by construction of the proposed Magnolia LNG Project. We concur. Therefore, the process of complying with section 106 of the NHPA has been completed for the Magnolia LNG Project.

Cultural resources surveys have been completed where necessary for the KMLP facilities. The surveys identified a single non-site cultural resources locus and a 20th century standing structure complex within one of the areas proposed for Compressor Station 760. KMLP recommended that both resources were not eligible for the NRHP. In a letter dated May 21, 2014, the Louisiana SHPO concurred that no historic properties would be affected by construction of the proposed Lake Charles Expansion Project. We concur. Therefore, the process of complying with section 106 of the NHPA has been completed for the Lake Charles Expansion Project.

Magnolia, KMLP, and FERC staff contacted several Native American tribes to identify properties of traditional, religious, or cultural importance that may be affected by the proposed projects. On August 4, 2014, the Choctaw Nation of Oklahoma sent a letter to the FERC requesting a copy of the cultural resources survey report, a map depicting all known archaeological sites positioned within a 1-mile radius of the project APE, as well as GIS shapefiles for the project. These materials were subsequently sent to the tribe. In addition, the Choctaw Nation of Oklahoma requested that it and the other federally recognized tribes that were consulted regarding the Lake Charles Expansion Project be contacted in the event of any unanticipated find (not only if the discovery consists of human remains). The *Unanticipated Discoveries Plan* has been updated in response to the tribe's request.

5.1.11 Air Quality and Noise

Air Quality

The LNG terminal and KMLP facilities would be located in areas currently classified as being in attainment for all criteria pollutant standards. However, both the Lake Charles and Lafayette areas are vulnerable to being designated as non-attainment for ozone in the next few years. Air pollutant emissions during construction of the projects would result from the operation of construction vehicles, marine traffic, vehicles driven by construction workers commuting to and from work sites, and the generation of fugitive dust during construction activities. Air quality impacts due to construction of the projects would generally be temporary and localized, and are not expected to cause or contribute to a violation of applicable air quality standards. Magnolia and KMLP would minimize emissions from gasoline and diesel engines by complying with applicable EPA mobile source emission performance standards and by using equipment manufactured to meet these standards. Fugitive dust emissions would be limited or mitigated, if necessary, by spraying water to dampen dry work surfaces during the first year of construction (during site preparation). However, due to the sensitive nature of air quality in areas surrounding the projects, we are recommending that, prior to the end of the draft EIS comment period, Magnolia file a revised *Fugitive Dust Control Plan* and KMLP file a *Fugitive Dust Control Plan*; each plan should specify the precautions that would be taken to minimize fugitive dust emissions from construction activities.

LNG terminal construction emissions would be primarily limited to the construction area and would represent less than 1.3 percent of Calcasieu Parish's yearly CO emissions and less than 1 percent of the parish's yearly emissions inventories for all other pollutants. Construction emissions associated with the KMLP facilities in Acadia Parish would primarily be associated with Compressor Station 760, limited to the construction area, and represent less than 7 percent of Acadia Parish's yearly PM_{10} emissions and less than 3 percent of the parishes' yearly emissions inventories for all other pollutants. Construction emissions associated with the KMLP facilities in Evangeline Parish would represent a negligible portion of overall emissions within the parish. However, due to the sensitive nature of air quality in areas surrounding the projects, we are recommending that, prior to the end of the draft EIS comment period, Magnolia and KMLP each provide further details regarding commitments to reduce NO_X, CO, PM, and SO_2 from mobile and stationary construction equipment.

The LNG terminal would be a PSD major source for NO_X and CO. In addition, it would be a Title V major source for PM_{10} and $PM_{2.5}$. The facility would be considered a minor source of HAP emissions. Therefore, operation of the LNG terminal would result in long-term impacts on air quality. Magnolia would minimize these impacts by adhering to applicable federal and state regulations and installing BACT as described in its January 2015 revised Title V and PSD permit application to the LDEQ.

Compressor Station 760 would be a Title V major source for CO and would be considered a minor source of all other criteria pollutants, as well as HAP emissions. KMLP would minimize potential impacts on air quality due to operation of the compressor station by adhering to applicable federal and state regulations described in its air permit application.

Based on the analyses conducted and mitigation measures proposed, we conclude that construction and operation of the projects would result in a moderate impact on air quality; however, given the mitigation measures proposed by Magnolia and KMLP, and air quality controls and monitoring requirements to be included in the Title V/PSD permits for the facilities, the projects would not result in a degradation of regional air quality.

Noise

Construction activities at the LNG terminal would generate temporary increases in sound levels over a total of 45 months. Construction activities would occur predominantly during the day, Monday through Saturday. However, certain activities would occur up to 24 hours per day, 7 days per week. In particular, dredging may occur up to 24 hours per day, 6 days per week and pile driving could occur up to 10 hours per day, 7 days per week.

The most prevalent sound-generating equipment and activity during construction of the LNG terminal is anticipated to be pile driving, although internal combustion engines associated with general construction equipment would also produce sound levels that would, at times, be perceptible at the nearest

NSAs. Magnolia anticipates that impact-type pile drivers would be used during construction of the facilities, which may be installed using both land-based and floating platforms. Onshore piles would be driven by seven or eight hydraulic piling rigs. Marine piles would be driven by between two and four hydraulic pile rigs, which may include both land-based and floating rigs. Based upon the construction schedule provided by Magnolia, onshore pile driving to create the foundations for the LNG storage tanks and other process equipment foundations and structures would occur over a period of 10 months, and pile driving associated with construction of the LNG loading and ship berthing area would occur over a period of 6 months. Based upon Magnolia's current construction schedule, land and water-based pile driving would not occur simultaneously.

Pile driving is scheduled to occur over 10-hour shifts, 7 days per week over a total of about 16 months; however, due to start-up coordination, actual pile driving operations are expected to occur for approximately 8 hours per day, 7 days per week. During land-based pile driving operations, the estimated sound level at the nearest NSA when the maximum number of land-based pile-driving platforms are in use would be 72 dBA L_{max}. During water-based pile driving operations, the corresponding sound level at NSA 1 when the maximum number of pile-driving platforms are in use would be 69 dBA L_{max}. These levels would correspond to a moderate sound level (similar to operation of a vacuum cleaner) and would be clearly audible. Based on the estimates provided by Magnolia and because of the 16-month duration of the pile driving activities, these sound levels may have an adverse impact at the nearest NSAs. Therefore, we are recommending that Magnolia include in its *Pile Driving Noise Impact Mitigation Plan* measures to reduce pile driving noise (L_{max}) to no greater than 10 dBA over L_{eq} ambient levels (an increase of 10 dBA is perceived by the human ear as though the sound intensity has doubled) at the three nearest NSAs.

The most prevalent sound-generating equipment and activity during construction of the KMLP facilities is anticipated to be the operation of internal combustion engines associated with general construction equipment. 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. KMLP has stated that noisy construction activities would take place during the day, Monday through Friday. Based on estimated equipment needs for construction of the KMLP facilities, the resulting composite noise level from construction activities at the nearest NSA (NSA 1, which is 1,125 feet west) is estimated to be between 58 L_{eq} (dBA) and 63 L_{eq} (dBA). The current daytime noise level at NSA 1 is 59 L_{eq} (dBA); therefore, although construction noise would be perceptible at times, it would not be substantially above existing daytime noise levels. Due to the greater distance between NSAs 2 and 3 and construction activities (each is over 1,250 feet away), and because noise decreases logarithmically with increasing distance from a noise source, we have determined that noise attributable to construction activities is likely to be imperceptible at the other NSAs.

Operation of the LNG terminal would produce noise on a continuous basis throughout the lifetime of the facility. The modeling results indicate that, with the incorporation of proposed noise-mitigation measures, the noise generated by the operation of the LNG terminal is likely to increase the ambient noise level at NSAs 1 and 2 (3,820 and 4,485 feet from the terminal site, respectively) by 1 dBA, which may be slightly perceptible. Due to its greater distance from the terminal (7,075 feet), noise generated during operation of the terminal would likely be imperceptible at NSA 3. The noise from operation of the LNG terminal would not exceed the 55-dBA threshold (the noise threshold established to protect the public from activity interference and annoyance outdoors in residential areas) at any of the NSAs. To ensure that NSAs are not adversely impacted by operation of the LNG terminal, we are recommending that Magnolia file a full load noise survey with the Secretary after each of the first three liquefaction trains is placed into service. If noise attributable to operation of the LNG terminal exceeds the FERC threshold at nearby NSAs, Magnolia should reduce operation or install additional noise controls until the noise level at nearby NSAs is below the FERC threshold. In addition, Magnolia should file noise surveys after placing the entire LNG terminal into service. If the noise attributable to operation of all of the equipment at the LNG terminal exceeds the FERC threshold, Magnolia should file a report on what changes are needed and should install additional noise controls to meet the level within 1 year of the in-service date. Magnolia should confirm compliance with these requirements by filing an additional noise survey with the Secretary no later than 60 days after it installs the additional noise controls. With the implementation of these recommendations, we conclude that operational noise from the LNG terminal would result in minor impacts on the nearest NSA.

The primary source of operational noise associated with the KMLP facilities would be from Compressor Station 760, which would produce noise on a continual basis. The modeling analysis conducted for the compressor station indicates that the noise attributable to operation of Compressor Station 760 would be in compliance with the FERC sound level requirement of 55 dBA L_{dn} at the nearest NSA. We recognize, however, that actual results may be different from those obtained from modeling. Therefore, we are recommending that KMLP file a noise survey with the Secretary after placing Compressor Station 760 into service. If the noise attributable to operation of Compressor Station 760 exceeds the FERC threshold at any nearby NSAs, KMLP should file a report on what changes are needed and should install additional noise controls to meet the level within 1 year of the in-service date. KMLP should confirm compliance with these requirements by filing an additional noise survey with the Secretary no later than 60 days after it installs the additional noise controls. With the incorporation of the proposed mitigation measures, operational noise at Compressor Station 760 would not exceed the 55-dBA L_{dn} noise threshold at any of the nearby NSAs.

Based on the analyses conducted, mitigation measures proposed, and with our additional recommendations, we conclude that construction of the projects would result in temporary and moderate noise impacts on residents and the surrounding communities and that operation of the projects would result in permanent and minor impacts on the surrounding communities.

5.1.12 Safety

We evaluated the safety of the proposed LNG terminal, the related LNG vessel transit, and the pipeline facilities. As part of our evaluation of the LNG terminal, we reviewed existing regulations, including assessments of hazards, preliminary engineering design, siting, emergency response, and security systems.

We also analyzed whether the LNG terminal would be sited consistent with federal regulations. Magnolia would be regulated by the FERC, DOT, Coast Guard, EPA, and OSHA. As a cooperating agency, the DOT assisted FERC staff in evaluating whether Magnolia's proposed design would meet the DOT siting requirements. In a September 17, 2014 letter to FERC staff, the DOT stated that it had no objection to Magnolia's methodology for determining a single accidental leakage source to establish the siting for its proposed LNG export facility. In addition, we are recommending that, prior to the end of the draft EIS comment period, Magnolia file concurrence from the DOT regarding the design spill selections. On January 13, 2015, the DOT determined Magnolia's proposal to comply with the EPA's RMP and OSHA's PSM would also satisfy the siting requirements of NFPA 59A (2001) section 2.1.1(d) for the anhydrous ammonia refrigerant system. Magnolia has submitted a preliminary RMP as part of its application to satisfy these regulations. Magnolia would comply with the comprehensive EPA RMP and OSHA PSM programs as well as the DOT's requirements under Part 193 and NFPA 59A. Under EPA's RMP, the worst-case releases of anhydrous ammonia would result in toxic concentrations that could potentially affect up to 1,429 people.

While toxic concentrations would extend beyond the property line that could be built upon and onto populated areas, this is not abnormal for EPA RMP regulated facilities. We have consulted with

EPA staff on the preliminary RMP to address identified gaps in order to comply with all EPA RMP requirements and guidance. In addition, we identified specific recommendations to be addressed by Magnolia 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 facilities. We would also conduct inspections during construction and operation of the facility to ensure that the installed design is consistent with the safety and operability characteristics of the FEED, and that the facility is operated and maintained in accordance with the filed design throughout the life of the facility. In addition, the DOT, Coast Guard, EPA, and OSHA remain responsible for enforcing their regulations covering design, construction, and operation. All four agencies have some oversight and responsibility for inspection and compliance during the facility's operation. Therefore, based on the federal regulations and oversight of the Magnolia LNG Project and our technical review of the preliminary engineering design, we conclude that with the incorporation of our recommendations, Magnolia's LNG terminal would include acceptable layers of protection or safeguards to reduce the risk of a potentially hazardous scenario from developing into an event that could significantly impact the safety of the public.

For LNG carrier transit, the Coast Guard issued its LOR for the project on February 12, 2015, which stated that the Calcasieu Ship Channel is considered suitable for LNG marine traffic in accordance with the guidance in the Coast Guard's NVIC 01-2011. The WSA review focused on the navigation safety and maritime security aspects of LNG vessel transits along the affected waterway. Based on the LOR issued by the Coast Guard and our review of LNG ship simulations, we conclude that with the incorporation of our recommendations, the LNG carrier transit would include acceptable mitigation measures or safeguards to reduce the risk of a potentially hazardous scenario from developing into an event that could significantly impact the safety of the public.

KMLP would design, construct, operate, and maintain its proposed pipeline and aboveground facilities in accordance with 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 pipelines from corrosion. We conclude that the KMLP facilities would have a very small incremental increase in the risk of a pipeline accident; however, KMLP's compliance with the DOT's safety standards would ensure that KMLP's construction and operation of the facilities would not have a significant impact on public safety.

Based on our engineering design analysis and recommendations; the DOT siting requirements and recommendations; the LOR issued by the Coast Guard concluding the LNG vessel transit is suitable for LNG marine traffic; and the regulatory requirements for the design, construction, and operation of the pipeline and terminal; we conclude that the project would not result in significantly increased public safety risks.

5.1.13 Cumulative Impacts

Three types of projects (past, present, and reasonably foreseeable) could potentially contribute to a cumulative impact when considered with the proposed projects. Such projects include existing LNG terminals and future liquefaction projects, oil and gas facilities, other industrial facilities, utility and transportation projects, commercial and residential developments, and government facilities/activities. Our assessment considered the impacts of the proposed projects combined with the impacts of the other projects on resources within all or part of the same area and time.

We provide a detailed discussion about potential cumulative impacts by resource in section 4.13. We conclude that the proposed projects' contributions to cumulative impacts on resources affected by the other projects occurring in the vicinity during the same time frame would not be significant, and that the potential cumulative impacts of the Magnolia LNG and Lake Charles Expansion Projects and the other projects considered would be moderate, minor, or insignificant.

The construction period for the Magnolia LNG and Lake Charles Expansion Projects is expected to coincide with at least some of the other major Lake Charles area projects. Groundwater withdrawals from the Chicot aquifer are causing lowered water levels and saltwater encroachment in some areas. The rate of decline is due primarily to industrial use in the Lake Charles area and rice irrigation, where intense pumping of the 500-foot sand has resulted in the water level declining by as much as 1 to 2 feet per year. Cumulative groundwater requirements from construction of other projects in the area are expected to result in an increase of approximately 1 percent over current daily withdrawals from the Chicot aquifer. During operation, cumulative groundwater requirements are expected to increase groundwater withdrawals from the Chicot aquifer by less than 1 percent over current daily withdrawals. While there would be localized effects on groundwater, such as the lowering of the water table near the points of withdrawal, we conclude that the cumulative impact on groundwater or municipal water systems during construction and operation of these facilities would be permanent, but minor.

A large workforce for the simultaneously constructed projects would have a beneficial cumulative effect on revenues for the state and for Calcasieu, Cameron, and Jefferson Davis Parishes due to expenditures for services and materials for the projects, increased expenditures by local workers, and expenditures by the non-local workforce and any family members accompanying the non-local workers. The parishes would also receive a substantial increase in property taxes from the projects.

In total, the projects constructed in Southwest Louisiana are expected to employ over 31,000 construction workers during the peak construction years, which are anticipated to conclude between 2018 and 2020. Construction labor requirements for the LNG terminal and KMLP facilities in 2017 and 2018, when employment associated with construction would be highest, would represent between 9 and 14 percent of the projected regional construction jobs for those years, respectively. Following the completion of construction, collectively, the projects in Southwest Louisiana are expected to result in the addition of 18,000 or more permanent jobs due to direct and induced growth.

To increase the number of qualified local workers, several regional programs have been developed in coordination with and through the Associated Builders and Contractors, Pelican Southwest Chapter in Westlake, Calcasieu Parish School Board, SOWELA Technical Community College, and Central Louisiana Technical Community College. The SWLA Economic Development Alliance is also collaborating with educational facilities and industry in the development of a *Workforce Resource Guide*, which provides residents with step-by-step instructions for finding employment and includes a description of the types of training required for each profession, as well as the training centers in Southwest Louisiana that offer the relevant certifications. Given that the planned construction projects would likely have staggered timelines for specific labor needs, it is likely that some construction personnel could work on multiple projects, which would have the effect of decreasing the overall labor requirement. In addition, some of the projects included in the cumulative impact analysis may not be built, which would further reduce the overall labor need. The cumulative effect would be a substantial reduction in unemployment in the area and potentially the need to train and hire construction workers from outside Southwest Louisiana.

The influx of non-local workers would affect the availability of housing in Southwest Louisiana. The cumulative impact on local housing may result in increased rental rates and housing shortages for lodging if all of the proposed and planned projects are implemented according to the expected timeframes. This would benefit the local housing market, but could adversely affect those seeking housing. Some members of the workforce may be forced to commute longer distances to obtain housing in adjacent parishes or Texas. To accommodate the anticipated influx of construction workers, two worker housing developments (Pelican Lodge and Moss Lake) are being developed that would accommodate up to 6,500 of the 13,500 anticipated workers. In addition to worker housing developments, a number of residential housing developments are planned or under construction in the Lake Charles area. New housing units, which include single-family dwellings, multi-family dwellings, hotels, and various residential projects, could total 8,070 if all publicly announced projects are permitted and constructed according to current plans. Therefore, we conclude that cumulative impacts on housing would be moderate.

The combined construction workforces of the projects listed in table 4.13.2-1 would increase the need for some public services, such as police, medical services, and schools. The need for these services would generally be spread throughout the parishes that house the workforce (Acadia, Calcasieu, Cameron, Evangeline, and Jefferson Davis Parishes), but there may be an increased need for medical and emergency services in Cameron and Calcasieu Parishes where the proposed project facilities and construction workers are expected to be concentrated. Magnolia would provide its own on-site security, and the Calcasieu Parish Sheriff's Office indicated that it believes it has sufficient resources available to provide protection services by adjusting patrol schedules or hiring additional staff with revenues allocated by the parish. In addition, Magnolia is currently in discussions with the Lake Charles Fire Department to identify measures for providing fire protection at the LNG terminal site. Options include funding fire-fighting services either independently or by entering into a mutual aid agreement with future industrial neighbors for the purpose of employing an industrial firefighting team trained in fighting fires at industrial facilities. With the increase in local taxes and government revenue associated with the proposed projects, the anticipated overall cumulative impact on public services would be minor.

Between early 2016 and the end of 2017, three facilities adjacent to and within the Industrial Canal could be constructed if they receive the necessary regulatory approvals. These include the proposed LNG terminal, Lake Charles Liquefaction Project, and G2X Energy Lake Charles gasoline facility. Magnolia, the Lake Charles LNG companies, and G2X Energy commissioned a *Traffic Impact Study* to assess potential impacts of vehicular traffic associated with both construction and operation of the three projects, and to develop measures to mitigate impacts on local users of area roadways, which found that the existing roadway network does not have sufficient capacity to accommodate the expected peak hour traffic volumes associated with construction of the three facilities. Based on the results of the study, and to minimize impacts on area roadways, the Lake Charles LNG companies would provide off-site parking for 1,000 construction workers, temporary parking facilities near its proposed liquefaction facility site, right-turn and left-turn lanes at the seven driveways, and would utilize buses to transport construction workers from the off-site and near-site parking facilities to the construction site. In addition improvements would be made at three intersections in the vicinity of the Industrial Canal. With implementation of the planned mitigation measures, roadways would approach unstable flow; with speeds slightly decreasing as traffic volumes increase. Magnolia has agreed to implement the recommended mitigation measures within the *Traffic Impact Study*. Therefore, we conclude that cumulative impacts on roadway traffic during construction would be temporary and moderate.

Traffic within the Calcasieu Ship Channel is expected to markedly increase over the next 10 years. In 2018, traffic within the channel is expected to be 1,668 vessels per year; in 2023, traffic within the channel is expected to be 2,183 vessels per year, more than twice the 2013 level. For this reason, the Port of Lake Charles commissioned a simulation to investigate the impact of increased traffic on the operations of the channel and to assess the need for changes to channel infrastructure and regulations. The results of the simulation indicate that although the Calcasieu Ship Channel has the capacity to accommodate the cumulative increase in vessel traffic, the median wait time is expected to increase by 2.3 hours per vessel. The study further notes that LNG carriers would experience the highest increase in median wait time (8.9 hours). The wait times are expected to vary seasonally, and would be higher during the winter months and lower during the summer months. In addition, the simulation indicated that 4 to 10 additional pilots and 1 or 2 additional sets of tugs would be required to accommodate vessel traffic without further increasing wait times. To minimize impacts on other users of the Industrial Canal and Calcasieu Ship Channel, it is anticipated that vessels would be organized in convoys to be handled in the most efficient manner. Due to the expected increase in the median wait time by 2.3 hours per vessel, we expect that cumulative impacts on marine traffic within the Calcasieu Ship Channel and Industrial Canal during operation of the proposed projects as well as other projects along the waterways would be permanent and moderate.

Based on the cumulative modeling analysis and the required emission controls at the LNG terminal, compressor station, and other facilities requiring an air emission permit, we conclude that cumulative impacts on regional air quality as a result of the operation of these facilities would be permanent, but minor. There is no current methodology or policy guidance to determine how the projects' incremental contribution to GHGs would translate into physical effects on the global environment. The emissions would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources, and contribute incrementally to climate change that produces the impacts described above. However, it cannot be determined whether or not the projects' contribution to cumulative impacts on climate change would be significant.

The potential for cumulative noise impacts during construction of the proposed projects would be greatest during pile driving activities associated with construction of the LNG terminal, which have the potential to produce sound levels of up to 72 dBA L_{max} at the nearest NSAs. Therefore, we are including a recommendation that outlines measures to reduce pile driving noise (L_{eq}) to no greater than 10 dBA over ambient levels at the nearest NSA. Although construction of G2X Energy's natural gas to gasoline facility, the Lake Charles Liquefaction Project, the LDWF's Fisheries Research Center, and the utilities associated with these projects could overlap with the construction of the LNG terminal and contribute to noise levels in the area, all of these projects, except for the LDWF's Fisheries Research Center, are farther from the nearest NSA. Because noise decreases logarithmically with increasing distance from a noise source, we conclude that construction of the LNG terminal along with the projects other than LDWF's Fisheries Research Center would result in a temporary and insignificant cumulative impact on noise levels at the nearest NSA. If construction activities at the Fisheries Research Center were to coincide with pile driving activities at the LNG terminal, cumulative noise impacts at the nearest NSAs could occur. However, due to the distance between the proposed aboveground facilities within the Fisheries Research Center and the LNG terminal (approximately 1 mile), these impacts are expected to be temporary and minor.

5.1.14 Alternatives

As alternatives to the proposed action, we evaluated the No-Action Alternative, system alternatives for the proposed LNG terminal and KMLP's pipeline system, alternatives sites for the proposed aboveground facilities, alternative liquefaction processes, and alternative power sources for the LNG terminal and Compressor Station 760. While the No-Action Alternative would eliminate the short- and long-term environmental impacts identified in the EIS, the stated objectives of the proposed action would not be met.

We evaluated system alternatives for the LNG terminal, including 7 operating LNG import terminals with approved, proposed, or planned expansions to provide liquefaction and export capabilities, and 19 approved, proposed, or planned stand-alone (greenfield) liquefaction projects along the Gulf Coast in the southern United States. All of these were eliminated from further consideration as viable alternatives for reasons that include incompatible timeframes with in-service dates that would not meet

Magnolia's customer commitments and environmental impacts that were considered comparable to or greater than those of the proposed LNG terminal.

We evaluated three system alternatives to KMLP's pipeline system. To serve as a viable system alternative to KMLP, the system would have to transport all or a part of the volume of natural gas required for liquefaction at the proposed terminal and cause less impact on the environment than the proposed pipeline system modifications. All three systems were eliminated from further consideration because they would require construction of additional pipeline looping or greenfield construction to provide the 1.4 Bcf/d required by the Magnolia LNG Project (the Magnolia LNG Project would have the capacity to export an LNG volume equivalent up to 1.08 billion cubic feet per day).

We evaluated five sites for the LNG terminal, including the proposed site and four alternatives. In order to meet the stated objectives of the Magnolia LNG Project, we applied screening criteria to identify sites that would be reasonable and most likely to provide some environmental advantage over the proposed terminal site. The screening criteria included waterfront access, property size, existing land use, site availability, proximity to natural gas pipelines and transmission lines, distance from population centers and residences, distance to the interstate highway system, and presence of wetlands within the site. The alternatives analysis concluded that the proposed site represents an acceptable site for the proposed LNG terminal because it is currently zoned for heavy industrial use, and is sufficiently sized to allow optimal facility layout design. The proposed site also contains the lowest acreage of wetlands of the alternatives considered; therefore, the loss of habitat diversity and function resulting from facility development would be generally less than that anticipated at the other sites. Additionally, from a visual impact perspective, the new LNG terminal would be consistent with the existing industrial development along the Industrial Canal.

We evaluated three sites for Compressor Station 760, including the proposed site and two alternatives. KMLP indicated that the location of the proposed site offers engineering and hydraulic benefits and would limit the amount of new facilities required to meet the stated purpose of the project. As a result, we limited our review of alternatives to sites in close proximity to the proposed site. Our alternatives analysis concluded that the proposed site represents an acceptable site for the compressor station because it has the lowest number of natural gas and crude oil pipelines within or crossing the site. Although seven residences are within 1,200 feet of the proposed site, six are on the western side of the site. Therefore, KMLP has proposed to place the compressor station within the eastern half of the parcel to increase the distance between the compressor station and the nearest residence. We conclude that the Coulee Road site is an acceptable location for Compressor Station 760 and find no environmental reason to recommend one of the alternate sites over the proposed site.

The proposed meter station modifications would occur within and adjacent to existing facilities, which would minimize the footprint and associated environmental impacts. The new meter station would be constructed within the LNG terminal site in a location designed to minimize the length of interconnect pipeline. The header pipelines would be wholly collocated with KMLP's existing 42-inch-diameter mainline. We did not identify any environmental concerns that require the need to identify and evaluate alternative meter station sites or header pipeline routes, nor were any alternatives suggested during the public scoping period.

We evaluated four sites for dredge material placement, including the proposed site and three alternatives. The proposed site, which is currently zoned for heavy industrial use, is outside of the 2012 Louisiana Coastal Zone and is currently used for construction staging and laydown. Because Magnolia would be required to raise the existing containment dikes if either of the two existing CDFs were selected, we determined that these sites were not preferred locations for dredge material disposal. Because it is within the 2012 Louisiana Coastal Zone and is a beneficial use site, selection of the Turner

Bay site would involve additional agency coordination under the Coastal Wetlands Planning, Protection and Restoration Act Program and the Louisiana Coastal Protection and Restoration Authority. While this would be a disadvantage from a regulatory process perspective compared to the proposed dredge placement site, it would not negate the potential use of the site. Therefore, we conclude that both the proposed site and one potential alternative, the Turner Bay site, represent acceptable sites for dredge material placement.

We evaluated a total of eight liquefaction technologies, which are currently available, including the proposed liquefaction process. The proposed OSMR® Process is based on the single mixed refrigerant process, but uses aero-derivative gas turbines, combined heat and power technology, and ammonia auxiliary refrigeration to increase efficiency and reduce air emissions by approximately 30 percent. The use of anhydrous ammonia includes safety hazards due to its toxicity and farther dispersion distances to irreversible toxic effects. However, the hazards associated with anhydrous ammonia are well understood, can be mitigated to safe levels with additional mitigation measures, and would be subject to the regulation of a number of federal agencies. Therefore, while there would be viable liquefaction processes that provide inherently safer alternatives, there would not be a significant environmental or safety advantage in the selection of those liquefaction processes when considering the additional mitigation measures Magnolia would implement during operation of the terminal.

We evaluated and ruled out the use of electric-driven motors as an alternative to gas-fired turbines at the proposed LNG terminal due to the excessive amount of electrical power required. To use electric-powered motors, power would either have to be generated on site or imported from the municipal power grid, neither of which would be a feasible alternative supply source.

We performed an alternative review of four power sources for compression at Compressor Station 760, including gas-fired turbine driven (proposed), reciprocating gas-driven, electric motor-driven, and waste heat electric generation. Our alternatives analysis concluded that the proposed power source (gas-fired turbine driven compressors) for Compressor Station 760 is acceptable. The use of reciprocating gas-driven compressor units would result in a larger number of units being required to provide the same amount of power as the proposed gas-fired, turbine-driven compressor units, which would result in both higher costs and a larger facility footprint. The use of electric-motor driven compressors would require an electric load of a magnitude serviceable only by a high-voltage transmission system, which would require construction of two new 138 kV cross-country transmission lines and a new electrical substation located at the compressor station. KMLP has stated that Compressor Station 760 would likely not operate when the LNG terminal is not producing LNG, which could greatly reduce the economic feasibility of using waste heat electric generation.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission authorizes the Magnolia LNG and Lake Charles Expansion Projects, 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 proposed projects.

1. Magnolia and KMLP shall follow the construction procedures and mitigation measures described in their applications and supplements (including responses to staff data requests) and as identified in the EIS, unless modified by the Order. Magnolia and KMLP must:

   a. request any modification to these procedures, measures, or conditions in a filing with the Secretary;

b. justify each modification relative to site-specific conditions;

c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and

d. receive approval in writing from the Director of OEP **before using that modification**.

2. For LNG facilities, the Director of OEP has delegated authority to take all steps necessary to ensure the protection of life, health, property, and the environment during construction and operation of the project. This authority shall include:

   a. stop-work authority and authority to cease operation; and

   b. the design and implementation of any additional measures deemed necessary to assure continued compliance with the intent of the conditions of the Order.

3. For KMLP's pipeline facilities, the Director of OEP has delegated authority to take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the project. This authority shall allow:

   a. the modification of conditions of the Order; and

   b. the design and implementation of any additional measures deemed necessary (including stop-work authority) to assure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from construction and operation of the project.

4. **Prior to any construction**, Magnolia and KMLP each shall file affirmative statements with the Secretary, certified by senior company officials, that all company personnel, EIs, and contractor personnel will be informed of the EIs' authority and have been or will be trained on the implementation of the environmental mitigation measures appropriate to their jobs **before** becoming involved with construction and restoration activities for the projects.

5. The authorized facility locations shall be as shown in the EIS, as supplemented by filed alignment sheets. **As soon as they are available and before the start of construction**, Magnolia and KMLP shall file with the Secretary any revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by the Order. All requests for modifications of environmental conditions of the Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

   KMLP's exercise of eminent domain authority granted under NGA section 7(h) in any condemnation proceedings related to the Order must be consistent with these authorized facilities and locations. KMLP's right of eminent domain granted under NGA section 7(h) does not authorize it to increase the size of its natural gas pipeline or facilities to accommodate future needs or to acquire a right-of-way for a pipeline to transport a commodity other than natural gas.

6. Magnolia and KMLP shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations, and staging areas, pipe storage yards, new access roads, and other areas that would be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, documentation of landowner approval,

whether any cultural resources or federally listed threatened or endangered species would be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. All areas must be approved in writing by the Director of OEP **before construction in or near that area**.

This requirement does not apply to extra workspace allowed by the FERC Plan and/or minor field realignments per landowner needs and requirements that do not affect other landowners or sensitive environmental areas such as wetlands.

Examples of alterations requiring approval include all route realignments and facility location changes resulting from:

a. implementation of cultural resources mitigation measures;

b. implementation of endangered, threatened, or special concern species mitigation measures;

c. recommendations by state regulatory authorities; and

d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

7. **Within 60 days of the acceptance of the Order and before construction begins**, Magnolia and KMLP shall file Implementation Plans with the Secretary for review and written approval by the Director of OEP. Magnolia and KMLP must file revisions to the plans as schedules change. The plans shall identify:

a. how Magnolia and KMLP 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 Magnolia and KMLP will incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to on-site construction and inspection personnel;

c. the number of EIs assigned per spread and/or facility, and how Magnolia and KMLP 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 Magnolia and KMLP will give to all personnel involved with construction and restoration (initial and refresher training as the project progresses and personnel changes), with the opportunity for OEP staff to participate in the training session(s);

f. the company personnel (if known) and specific portion of Magnolia's and KMLP's organizations having responsibility for compliance;

g. the procedures (including use of contract penalties) Magnolia and KMLP 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 on-site personnel;
iii. the start of construction; and
iv. the start and completion of restoration.

8. Magnolia and KMLP shall employ a team of EIs, including at least one EI for the LNG terminal and one or more EIs for the KMLP facilities. The EIs shall be:

a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or other authorizing documents;

b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 7 above) and any other authorizing document;

c. empowered to order correction of acts that violate the environmental conditions of the Order, and any other authorizing document;

d. a full-time position, separate from all other activity inspectors;

e. responsible for documenting compliance with the environmental conditions of the Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and

f. responsible for maintaining status reports.

9. Beginning with the filing of the Implementation Plans, Magnolia and KMLP shall file updated status reports with the Secretary on a **monthly** basis for the LNG terminal and a **bi-weekly** basis for the KMLP facilities until all construction and restoration activities are complete. On request, these status reports will also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:

a. an update on Magnolia’s and KMLP’s efforts to obtain the necessary federal authorizations;

b. the current construction status of the LNG terminal and KMLP facilities, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;

c. a listing of all problems encountered and each instance of noncompliance observed by the EIs during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);

d. a description of the corrective actions implemented in response to all instances of noncompliance, and their cost;

e. the effectiveness of all corrective actions implemented;

f. a description of any landowner/resident complaints that 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 Magnolia or KMLP from other federal, state, or local permitting agencies concerning instances of noncompliance, and Magnolia's or KMLP's response.

10. **Prior to receiving written authorization from the Director of OEP to commence construction of any project facilities**, Magnolia and KMLP shall file with the Secretary documentation that they have received all applicable authorizations required under federal law (or evidence of waiver thereof).

11. Magnolia must receive written authorization from the Director of OEP **prior to introducing hazardous fluids into the LNG terminal facilities**. Instrumentation and controls, hazard detection, hazard control, and security components/systems necessary for the safe introduction of such fluids shall be installed and functional.

12. Magnolia and KMLP must each receive written authorization from the Director of OEP **before placing into service** the LNG terminal and the KMLP facilities. Such authorization will only be granted following a determination that the facilities have been constructed in accordance with FERC approval and applicable standards, can be expected to operate safely as designed, and the rehabilitation and restoration of the right-of-way and other areas affected by the project are proceeding satisfactorily.

13. **Within 30 days of placing the authorized facilities in service**, Magnolia and KMLP each shall file an affirmative statement with the Secretary, certified by a senior company official:

    a. that the facilities have been constructed in compliance with all applicable conditions, and that continuing activities will be consistent with all applicable conditions; or

    b. identifying which of the conditions of the Order Magnolia and KMLP have 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.

14. **Prior to construction,** Magnolia shall file with the Secretary the following information, stamped and sealed by the professional engineer-of-record:

    a. site preparation drawings and specifications;
    b. LNG storage tank and foundation design drawings and calculations;
    c. LNG terminal structures and foundation design drawings and calculations;
    d. seismic specifications for procured equipment; and
    e. quality control procedures to be used for civil/structural design and construction.

    In addition, Magnolia shall file, in its Implementation Plan, the schedule for producing this information. *(Section 4.1.6.4)*

15. **Prior to construction,** Magnolia shall file with the Secretary, for review and written approval by the Director of OEP, its *Spill Prevention Plan* for construction and SPCC Plan for operation of the project. *(Section 4.2.3.2)*

16. **Within 30 days of placing the Lake Charles Expansion Project facilities in service**, KMLP shall file with the Secretary a report identifying all public or private water supply wells/systems damaged by construction and a description of how they were repaired. The report shall also include a discussion of any other complaints concerning well yield or water quality and how each problem was resolved. *(Section 4.3.1.4)*

17. **Prior to construction**, Magnolia shall file with the Secretary, for review and written approval by the Director of OEP, its final *Dredging Water Quality Monitoring Plan*. *(Section 4.3.2.2)*

18. **As soon as they are available and prior to the start of construction**, Magnolia shall file with the Secretary, for review and written approval by the Director of OEP, the results of the wetland and waterbody surveys within areas associated with the transport and placement of dredge materials. *(Section 4.4.1)*

19. **Prior to filing its Implementation Plan,** Magnolia shall file with the Secretary its *Compensatory Mitigation Plan* and documentation of COE approval of the plan. *(Section 4.4.4)*

20. **Prior to construction**, Magnolia shall file with the Secretary, for review and written approval by the Director of OEP, its *Facility Lighting Plan* for operation of the LNG terminal. *(Section 4.6.1.3)*

21. **Prior to the end of the draft EIS comment period**, Magnolia shall file with the Secretary a *Pile Driving Noise Impact Mitigation Plan*, which describes the hydroacoustic monitoring methods that will be used to determine representative sound pressure levels associated with in-water pile driving as well as mitigation measures to be implemented to reduce sound pressure levels. The plan shall include a description of the locations where monitoring will occur in relation to the pile being driven, and the maximum impact energy used on the pile during monitoring. *(Section 4.6.2.2)*

22. **Prior to the end of the draft EIS comment period**, Magnolia and KMLP shall file with the Secretary, for review and written approval by the Director or OEP, a *Fugitive Dust Control Plan* that specifies the precautions that will be taken to minimize fugitive dust emissions from construction activities, including additional mitigation measures to control fugitive dust emissions of Total Suspended Particulates and PM_{10}. Each plan shall clearly explain how Magnolia and KMLP will implement measures, such as:

    a. watering the construction workspace and access roads;

    b. providing measures to limit track-out onto the roads;

    c. identifying the speed limit that Magnolia and KMLP will enforce on unsurfaced roads;

    d. covering open-bodied haul trucks, as appropriate;

    e. clarifying that the EI has the authority to determine if/when water or a palliative needs to be used for dust control;

f. describing inspection procedures to identify and abate visible dust plumes; and

g. clarifying the individuals with the authority to stop work if the contractor does not comply with dust control measures. *(Section 4.11.1.4)*

23. **Prior to the end of the draft EIS comment period**, Magnolia and KMLP shall provide further details regarding commitments to reduce NO_X, CO, PM, and SO_2 from mobile and stationary construction equipment including:

    a. feasibility of leasing new, clean equipment meeting the most stringent of applicable federal or state standards, if practicable. In general, commit to the best available emissions control technology;

    b. feasibility of using electric vehicles, natural gas, biodiesel, or other alternative fuels during construction and operation phases to reduce the projects' criteria and greenhouse gas emissions;

    c. commitments to limit idling of heavy equipment to less than 5 minutes and verify through unscheduled inspections;

    d. commitments to maintain and tune engines per manufacturer's specifications to perform at CARB and/or EPA certification levels, prevent tampering, and conduct unscheduled inspections to ensure these measures are followed; and

    e. clarify how it would manage construction traffic and parking in order to maintain traffic flow and minimize vehicle trips. *(Section 4.11.1.4)*

24. **Prior to the end of the draft EIS comment period**, Magnolia shall include in its *Pile Driving Noise Impact Mitigation Plan* (required by recommended condition 21) measures to reduce pile driving noise (L_{max}) to no greater than 10 dBA over L_{eq} ambient levels at the three nearest NSAs. *(Section 4.11.2.3)*

25. Magnolia shall make all reasonable efforts to ensure that predicted noise levels during operation of the LNG terminal are not exceeded at nearby NSAs and shall file with the Secretary a full load noise survey **no later than 60 days** after each of the first three liquefaction trains is placed into service. If the noise attributable to the operation of the LNG terminal exceeds an L_{dn} of 55 dBA at any nearby NSAs, Magnolia shall reduce operation of the LNG terminal or install additional noise controls until a noise level below an L_{dn} of 55 dBA at nearby NSAs is achieved. Magnolia shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. *(Section 4.11.2.4)*

26. Magnolia shall file a noise survey with the Secretary **no later than 60 days** after placing the entire LNG terminal into service. If a full load condition noise survey is not possible, Magnolia shall provide an interim survey at the maximum possible horsepower load **within 60 days** of placing the LNG terminal into service and provide the full load survey **within 6 months**. If the noise attributable to the operation of all of the equipment at the LNG terminal under interim or full horsepower load conditions exceeds an L_{dn} of 55 dBA at any nearby NSAs, Magnolia 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. Magnolia shall confirm compliance with the above requirement by filing an additional noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. *(Section 4.11.2.4)*

27. KMLP shall file a noise survey with the Secretary **no later than 60 days** after placing Compressor Station 760 in service. If a full load condition noise survey is not possible, KMLP shall provide an interim survey at the maximum possible horsepower load **within 60 days** of placing the station into service and provide the full load survey **within 6 months**. If the noise attributable to the operation of all of the equipment at Compressor Station 760 under interim or full horsepower load conditions exceeds an L_{dn} of 55 dBA at any nearby NSAs, KMLP 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. KMLP shall confirm compliance with the above requirement by filing an additional noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. *(Section 4.11.2.4)*

28. **Prior to the end of the draft EIS comment period,** Magnolia shall file with the Secretary concurrence from the DOT as to whether full guillotine ruptures of connections less than 6 inches in diameter should be considered for LNG design spills. *(Section 4.12.5.3)*

29. **Prior to the end of the draft EIS comment period**, Magnolia shall file with the Secretary concurrence from the DOT as to whether full guillotine ruptures of connections less than 6 inches in diameter should be considered for mixed refrigerant and other hazardous fluid design spills. *(Section 4.12.5.3)*

30. **Prior to the end of the draft EIS comment period,** Magnolia shall file with the Secretary concurrence from the DOT that the restriction of property use between Lake Charles Harbor and Terminal District and Magnolia would satisfy the exclusion zone requirements of 49 CFR 193.2057. *(Section 4.12.5.5)*

Recommendations 31 through 105 apply to the LNG terminal facilities. Information pertaining to these specific recommendations shall be filed with the Secretary for review and written approval by the Director of OEP either: **prior to initial site preparation; prior to construction of final design; prior to commissioning; prior to introduction of hazardous fluids; or prior to commencement of service**, as indicated by each specific condition. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 683 (Docket No. RM06-24-000), including security information, shall be submitted as CEII pursuant to 18 CFR 388.112. See Critical Energy Infrastructure Information, Order No. 683, 71 Fed. Reg. 58,273 (October 3, 2006), FERC Stats. & Regs. ¶31,228 (2006). Information pertaining to items such as: off-site emergency response; procedures for public notification and evacuation; and construction and operating reporting requirements, would be subject to public disclosure. All information shall be filed **a minimum of 30 days** before approval to proceed is requested.

31. **Prior to initial site preparation**, Magnolia shall provide procedures for controlling access during construction. *(Section 4.12.3)*

32. **Prior to initial site preparation**, Magnolia shall file the issued for construction quality assurance and quality control procedures for construction activities. *(Section 4.12.3)*

33. **Prior to initial site preparation**, Magnolia shall file an overall project schedule, which includes the proposed stages of the commissioning plan. *(Section 4.12.3)*

34. **Prior to initial site preparation**, Magnolia shall file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems. *(Section 4.12.3)*

35. **Prior to initial site preparation**, Magnolia shall develop an *Emergency Response Plan* (including evacuation) and coordinate procedures with the Coast Guard; state, county, and local emergency planning groups; fire departments; state and local law enforcement; and appropriate federal agencies. This plan shall include at a minimum:

    a. designated contacts with state and local emergency response agencies;

    b. scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;

    c. procedures for notifying residents and recreational users within areas of potential hazard;

    d. evacuation routes/methods for residents and public use areas that are within any transient hazard areas along the route of the LNG marine transit;

    e. locations of permanent sirens and other warning devices; and

    f. an "emergency coordinator" on each LNG carrier to activate sirens and other warning devices.

    Magnolia shall notify the FERC staff of all planning meetings in advance and shall report progress on the development of its *Emergency Response Plan* **at 3-month intervals**. *(Section 4.12.9)*

36. **Prior to initial site preparation**, Magnolia 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. In addition to the funding of direct transit related security/emergency management costs, this comprehensive plan shall include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. Magnolia shall notify the FERC staff of all planning meetings in advance and shall report progress on the development of its *Cost-Sharing Plan* **at 3-month intervals**. *(Section 4.12.9)*

37. The **final design** shall include information/revisions pertaining to Magnolia's response to numbers 5, 10, 11, 12, 13, 16, 19, 20, 22, 24, 31, 33, 37, 38, 40, 41, 43, 44, 45, 50, 52, 53, 55, 56, 57, 64, 65, 66, 67, 70, 72, 73, 74, 76, 78, 82, 85, 90, and 92 of its December 29, 2014 filing, which indicated features to be included or considered in the final design. *(Section 4.12.3)*

38. The **final design** shall include change logs that list and explain any changes made from the FEED provided in Magnolia's application and filings. A list of all changes with an explanation for the design alteration shall be provided and all changes shall be clearly indicated on all diagrams and drawings. *(Section 4.12.3)*

39. The **final design** shall provide up-to-date Process Flow Diagrams with heat and material balances and P&IDs. 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. piping with line number, piping class specification, size, and insulation type and thickness;

e. piping specification breaks and insulation limits;

f. all control and manual valves numbered;

g. valve high pressure side and cryogenic ball valve internal and external vent locations;

h. relief valves with set points; and

i. drawing revision number and date. *(Section 4.12.3)*

40. The **final design** shall include the car seal philosophy with a list of all car-sealed and locked valves consistent with the P&IDs. *(Section 4.12.3)*

41. The **final design** shall provide an up-to-date complete equipment list, process and mechanical data sheets, and specifications. *(Section 4.12.3)*

42. The **final design** EPC contractor shall conduct a HAZID to review and verify that the recommendations from the FEED Design HAZID are complete and consistent with the requirements of the final design as determined by the EPC contractor. *(Section 4.12.3)*

43. The **final design** shall include a hazard and operability review and a LOPA of the completed design prior to issuing the P&IDs for construction. These reviews shall include initial startup as well as shutdown operations. A copy of each review with a list of recommendations, and actions taken on the recommendations, shall be filed. *(Section 4.12.3)*

44. The **final design** hazard and operability review shall include participants with years of relevant design and operating experience and an evaluation of past incidents, such as dynamic surge associated with hydraulic shock. *(Section 4.12.3)*

45. The **final design** hazard and operability review shall include consideration of basket strainers at the bottom outlet of the Molecular Sieve Vessels to prevent molecular sieve and support material from entering the piping system. *(Section 4.12.3)*

46. The **final design** shall include an updated fire protection evaluation of the proposed facilities carried out in accordance with the requirements of NFPA 59A 2001, chapter 9.1.2 as required by 49 CFR §193.2801. A copy of the evaluation, a list of recommendations and supporting justifications, and actions taken on the recommendations shall be filed. *(Section 4.12.3)*

47. The **final design** shall provide complete drawings and a list of the hazard detection equipment. Plan drawings shall clearly show the location and elevation of all detection equipment. The list shall include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment. *(Section 4.12.3)*

48. The **final design** shall install 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 will isolate or shut down any combustion or HVAC equipment whose continued operation could add to or sustain an emergency. *(Section 4.12.3)*

49. The **final design** of the hazard detectors shall account for the calibration gas when determining the lower flammable limit set points for flammable refrigerants, NGL, and LNG. Include a list of alarm and shutdown set points for each hazard detector. *(Section 4.12.3)*

50. The **final design** of the hazard detectors shall account for the calibration gas when determining the set points for toxic components such as ammonia, NGL, and hydrogen sulfide. Include a list of alarm and shutdown set points for each hazard detector. *(Section 4.12.3)*

51. The **final design** shall provide complete plan drawings and a list of the fixed and wheeled dry-chemical, hand-held fire extinguishers, and other hazard control equipment. Drawings shall clearly show the location by tag number of all fixed, wheeled, and hand-held extinguishers. The list shall include the equipment tag number, type, capacity, equipment covered, discharge rate, and automatic and manual remote signals initiating discharge of the units. *(Section 4.12.3)*

52. The **final design** shall provide facility plans and drawings that show the location of the firewater and any foam systems. Plan drawings shall clearly show: firewater and foam piping; post indicator valves; and the location, and area covered by, each monitor, hydrant, deluge system, foam system, water-mist system, and sprinkler. The drawings shall also include piping and instrumentation diagrams of the firewater and foam system. *(Section 4.12.3)*

53. The **final design** of the water spray and deluge systems shall specify a water density of 0.4 gallon per minute per square foot to mitigate ammonia releases. *(Section 4.12.3)*

54. The **final design** shall provide calculations for the firewater spray systems sized to provide cooling for mitigation of BLEVEs. *(Section 4.12.3)*

55. The **final design** of the firewater system shall include the water required for foam generation in calculating the total water required for 2 hours of supply. *(Section 4.12.3)*

56. The **final design** shall specify that two firewater jockey pumps are to be installed. *(Section 4.12.3)*

57. The **final design** shall specify a 2-hour fire duration for passive fire protection systems. *(Section 4.12.3)*

58. The **final design** shall include the 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. *(Section 4.12.3)*

59. The **final design** shall specify an alarm management program to ensure effectiveness of process alarms. *(Section 4.12.3)*

60. The **final design** shall include a drawing showing the location of the emergency shutdown buttons. Emergency shutdown buttons shall be easily accessible, conspicuously labeled, and located in an area which would be accessible during an emergency. *(Section 4.12.3)*

61. The **final design** shall specify emergency shutdown valve closure time and release volumes. Include an analysis that describes the time to detect an upset condition, notify plant personnel, and close the emergency shutdown valve. *(Section 4.12.3)*

62. The **final design** shall specify the bypass valves around the ESDV-11001 to be locked closed. *(Section 4.12.3)*

63. The **final design** shall provide the safe operating limits (upper and lower), alarm and shutdown set points for all instrumentation (i.e., temperature, pressures, flows, and compositions). *(Section 4.12.3)*

64. The **final design** shall evaluate the voting logic and voting degradation for flammable and toxic gas detectors. *(Section 4.12.3)*

65. The **final design** shall provide 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; shall alarm the hazardous condition; and shall shutdown the appropriate systems. *(Section 4.12.3)*

66. The **final design** shall provide electrical area classification drawings. *(Section 4.12.3)*

67. The **final design** shall provide spill containment system drawings with dimensions and slopes of curbing, trenches, and impoundments. *(Section 4.12.3)*

68. The **final design** shall specify that for hazardous fluids, piping and piping nipples 2 inches or less in diameter are to be no less than schedule 160 for carbon steel and no less than schedule 80 for stainless steel, and are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and operator live loads in areas accessible by operators. *(Section 4.12.3)*

69. The **final design** shall specify welded connections on ammonia piping to minimize flange leaks or provide justification for the use of flanges with mitigation to reduce likelihood and consequences from flange leaks. *(Section 4.12.3)*

70. The **final design** shall include a piping flexibility and valve dynamic surge analysis to consider the impact forces caused by external (i.e., thermal cycling, equipment vibration) and internal conditions (i.e., hammer effects) when designing the nozzles and selecting the piping schedules for the ammonia system. *(Section 4.12.3)*

71. The **final design** shall include 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 required by 49 CFR 193, and shall provide justification if not using an inert or non-flammable gas for clean-out, dry-out, purging, and tightness testing. *(Section 4.12.3)*

72. The **final design** shall provide the procedures for pressure/leak tests which address the requirements of ASME VIII and ASME B31.3. *(Section 4.12.3)*

73. The **final design** shall include the sizing basis and capacity for the flare stacks and the pressure and vacuum relief valves for major process equipment, vessels, and storage tanks. *(Section 4.12.3)*

74. The **final design** of the ammonia relief valves shall include a relief discharge collection header with knockout drum for safe discharge of ammonia vapors to the atmosphere. An evaluation of the vapor dispersion shall be provided to demonstrate the ammonia vapors can be safely discharged to the atmosphere. *(Section 4.12.3)*

75. The **final design** shall include provisions to vent the heavy hydrocarbon iso-container to the flare system. *(Section 4.12.3)*

76. The **final design** shall provide a human error/reliability analysis. This analysis shall include human machine interface considerations, fatigue prevention guidelines, alarm management, and healthy work environments (i.e., bright lighting, glare, eye strain) to increase operator awareness and reduce risk of hazardous conditions. *(Section 4.12.3)*

77. The **final design** shall provide appropriate operator camera coverage to enable rapid monitoring of the facility from the control room. *(Section 4.12.3)*

78. The **final design** shall include complete plan drawings of the security fencing and of facility access and egress. *(Section 4.12.3)*

79. The **final design** shall include an analysis of the structural integrity of the outer containment of the full containment storage tanks when exposed to a roof tank top fire or adjacent tank top fire. *(Section 4.12.3)*

80. The **final design** shall include the details of the LNG storage tank structural design that demonstrate the tanks can withstand overpressures from ignition of design spills. *(Section 4.12.3)*

81. The **final design** shall specify the forward pressure regulating valves PV-11001 and PV-11002 shall be provided with an automatic shutoff activated interlock through PAHH-11004/5/6. *(Section 4.12.3)*

82. The **final design** shall specify isolation valves at the base of each loading arm. *(Section 4.12.3)*

83. The **final design** shall specify an automatic shutoff valve in the liquid line to the heavy hydrocarbon iso-container. *(Section 4.12.3)*

84. The **final design** shall specify double isolation valves at the suction and discharge of all ammonia pumps. *(Section 4.12.3)*

85. The **final design** shall specify that the ball valve upstream of the hose connection to the ammonia truck be a shutoff valve closed by local and remote actuation. *(Section 4.12.3)*

86. The **final design** shall specify that the Reboiler Steam Condensate Pot, V-1307, shall have the same pressure rating as the 6C2 piping specification. *(Section 4.12.3)*

87. Magnolia shall certify that the **final design** is consistent with the information provided to the DOT as described in the design spill determination letter dated September 17, 2014 (Accession Number 20140918-4009). In the event that any modifications to the design alter the candidate design spills on which the 49 CFR 193 siting analysis was based, Magnolia shall consult with the DOT on any actions necessary to comply with Part 193. *(Section 4.12.5.2)*

88. The **final design** shall include procedures to maintain and inspect the vapor barriers provided to meet the siting provisions of 49 CFR §193.2059. *(Section 4.12.5.3)*

89. **Prior to commissioning**, Magnolia shall provide 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. Magnolia shall file documentation certifying that each of these milestones has been completed before authorization to commence the next phase of commissioning and startup would be issued. *(Section 4.12.3)*

90. **Prior to commissioning**, Magnolia shall file plans and detailed procedures for: testing the integrity of on-site mechanical installation; functional tests; introduction of hazardous fluids; operational tests; and placing the equipment into service. *(Section 4.12.3)*

91. **Prior to commissioning**, Magnolia shall maintain a detailed training log to demonstrate that operating staff has completed the required training. *(Section 4.12.3)*

92. **Prior to commissioning**, Magnolia shall file results of the LNG storage tank hydrostatic test and foundation settlement results. At a minimum, foundation settlement results shall be provided thereafter annually. *(Section 4.12.3)*

93. **Prior to commissioning**, Magnolia shall label piping with fluid service and direction of flow in the field in addition to the pipe labeling requirements of NFPA 59A. *(Section 4.12.3)*

94. **Prior to commissioning**, Magnolia shall tag all equipment, instrumentation and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves. *(Section 4.12.3)*

95. **Prior to commissioning**, Magnolia shall file a tabulated list and drawings of the proposed hand-held fire extinguishers. The list shall include the equipment tag number, extinguishing agent type, capacity, number, and location. The drawings shall show the extinguishing agent type, capacity, and tag number of all hand-held fire extinguishers. *(Section 4.12.3)*

96. **Prior to commissioning**, Magnolia shall file the operation and maintenance procedures and manuals, as well as safety procedures, hot work procedures and permits, abnormal operating conditions reporting procedures, and management of change procedures and forms. *(Section 4.12.3)*

97. **Prior to introduction of hazardous fluids**, Magnolia shall complete a prestartup safety review to ensure that installed equipment meets the design and operating intent of the facility. The prestartup safety review shall include any changes since the last hazard review, operating procedures, and operator training. A copy of the review with a list of recommendations, and actions taken on each recommendation, shall be filed. *(Section 4.12.3)*

98. **Prior to introduction of hazardous fluids**, Magnolia shall complete a firewater pump acceptance test and firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant shall be shown on facility plot plan(s). *(Section 4.12.3)*

99. **Prior to introduction of hazardous fluids**, Magnolia shall complete all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the Distributed

Control System and the Safety Instrumented System that demonstrate full functionality and operability of the system. *(Section 4.12.3)*

100. **Prior to introduction of hazardous fluids**, Magnolia shall specify the personal protective equipment required to minimize disabling of personnel from ammonia releases. *(Section 4.12.3)*

101. **Prior to commencement of service**, Magnolia shall include a preventative and predictive maintenance program that performs periodic or continuous equipment condition monitoring. *(Section 4.12.3)*

102. **Prior to commencement of service**, Magnolia shall develop procedures for off-site contractors' responsibilities, restrictions, and limitations and for supervision of these contractors by Magnolia staff. *(Section 4.12.3)*

103. **Prior to commencement of service**, Magnolia shall notify FERC staff of any proposed revisions to the security plan and physical security of the facility. *(Section 4.12.3)*

104. **Prior to commencement of service**, Magnolia shall file progress on the construction of the proposed systems in **monthly** reports filed with the Secretary. Details shall include a summary of activities, problems encountered, contractor non-conformance/deficiency logs, remedial actions taken, and current project schedule. Problems of significant magnitude shall be reported to the FERC **within 24 hours**. *(Section 4.12.3)*

105. **Prior to commencement of service**, Magnolia shall receive written authorization from the Director of OEP. Such authorization will only be granted following a determination by the Coast Guard, under its authorities under the Ports and Waterways Safety Act, the Magnuson Act, the Maritime Transportation Security Act of 2002, and the Safety and Accountability For Every Port Act, that appropriate measures to ensure the safety and security of the facility and the waterway have been put into place by Magnolia or other appropriate parties. *(Section 4.12.8)*

In addition, recommendations 106 through 109 apply throughout the **life of the LNG facility**:

106. 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, Magnolia 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 piping and instrumentation diagrams reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, shall be submitted. *(Section 4.12.3)*

107. Semi-annual operational reports shall be filed with the Secretary to identify changes in facility design and operating conditions, abnormal operating experiences, activities (including ship arrivals, quantity and composition of imported and exported LNG, and liquefied, boil-off/flash gas, etc.), plant modifications, including future plans and progress thereof. Abnormalities shall include, but not be limited to: unloading/loading/shipping problems, potential hazardous conditions from off-site vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, hazardous fluids releases, fires involving hazardous

fluids and/or from other sources, negative pressure (vacuum) within a storage tank and higher than predicted boil-off rates. Adverse weather conditions and the effect on the facility also shall be reported. Reports shall be submitted **within 45 days after each period ending June 30 and December 31**. In addition to the above items, a section entitled "Significant Plant Modifications Proposed for the Next 12 Months (dates)" also shall be included in the semi-annual operational reports. Such information would provide FERC staff with early notice of anticipated future construction/maintenance projects at the LNG facility. *(Section 4.12.3)*

108. In the event the temperature of any region of any secondary containment, including imbedded pipe supports, becomes less than the minimum specified operating temperature for the material, the Commission shall be notified **within 24 hours** and procedures for corrective action shall be specified. *(Section 4.12.3)*

109. Significant non-scheduled events, including safety-related incidents (e.g., hazardous fluid 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 FERC staff. In the event 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 FERC staff **within 24 hours**. This notification practice shall be incorporated into the LNG facility's emergency plan. Examples of reportable hazardous fluids related incidents include:

a. fire;

b. explosion;

c. estimated property damage of $50,000 or more;

d. death or personal injury necessitating in-patient hospitalization;

e. release of hazardous fluids for five 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 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 a facility that contains or processes hazardous fluids that constitutes an emergency;

j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;

k. any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20-percent reduction in operating pressure or shutdown of operation of a pipeline or a facility that contains or processes hazardous fluids;

l. safety-related incidents to hazardous material transportations 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, FERC staff would determine the need for a separate follow-up report or follow-up in the upcoming semi-annual operational report. All company follow-up reports shall include investigation results and recommendations to minimize a reoccurrence of the incident. *(Section 4.12.3)*

APPENDIX A

DISTRIBUTION LIST

APPENDIX A
DISTRIBUTION LIST

Federal Government Agencies

Advisory Council on Historic Preservation, Office of Federal Programs, Charlene D. Vaughn, DC

Council on Environmental Quality, Horst Greczmiel, DC

Council on Environmental Quality, Manisha Patel, DC

Federal Energy Regulatory Commission, Division of Gas, Environment, and Engineering, Terry Turpin, DC

U.S. Army Corps of Engineers, Calix MVN, LA

U.S. Army Corps of Engineers, Darrell S. Barbara, LA

U.S. Army Corps of Engineers, Ed Creef, LA

U.S. Army Corps of Engineers, James Little, LA

U.S. Army Corps of Engineers, Lieutenant Colonel Nathan Joseph, LA

U.S. Army Corps of Engineers, Martin Mayer, LA

U.S. Army Corps of Engineers, New Orleans District, Pete Serlo, LA

U.S. Army Corps of Engineers, Planning and Policy Division, John Furry, DC

U.S. Army Corps of Engineers, Tracy Falk, LA

U.S. Coast Guard, Commandant (CG-OES-4) Chief (Acting), Deepwater Ports Standards Division, Curtis E. Borland, DC

U.S. Coast Guard, Department of Homeland Security, Captain George (Joe) Paitl, TX

U.S. Coast Guard, Leon McClain, LA

U.S. Coast Guard, Lieutenant Anthony Walter, LA

U.S. Coast Guard, Lieutenant Jennifer Andrews, LA

U.S. Coast Guard, Lieutenant Tom Moore, LA

U.S. Coast Guard, Lieutenant Trey Gonzales, LA

U.S. Coast Guard, Marine Safety Unit Lake Charles, Commander Will E. Watson, LA

U.S. Coast Guard, Marine Safety Unit Lake Charles, Facilities and Waterways, Lieutenant (junior grade) Dimitri Wiener, LA

U.S. Coast Guard, Prevention Department, Clint Smith, LA

U.S. Department of Agriculture, Conservation, and Environmental Program Division, Farm Service Agency, Nell Fuller, DC

U.S. Department of Agriculture, Forest Service, Ecosystem Management Coordination, Joe Carbone, DC

U.S. Department of Agriculture, Natural Resources Conservation Service, Andree DuVarney, DC

U.S. Department of Commerce, National Oceanic and Atmospheric Administration National Marine Fisheries Service, Steve Leathery, MD

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Tim Osborn, LA

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Steve Kokkinakis, MD

U.S. Department of Commerce, Richard Hartman, LA

U.S. Department of Defense Siting Clearinghouse , Office of the Deputy Assistant Secretary of the Air Force (Installations), Liaison, DC

U.S. Department of Defense Siting Clearinghouse, Office of the Deputy Assistant Secretary of the Army (Energy and Sustainability), Liaison, DC

U.S. Department of Defense Siting Clearinghouse, Steve Sample, DC

U.S. Department of Defense, Office of the Assistant Secretary of the Army for Civil Works, Assistant for Environment, Tribal and Regulatory Affairs, DC

U.S. Department of Defense, Office of the Assistant Secretary of the Navy (Energy, Installations and Environment), DC

U.S. Department of Defense, Office of the Deputy under Secretary of Defense (Installations and Environment), Chief, Mission Evaluation Branch, DC

Federal Government Agencies (cont'd)

U.S. Department of Energy, John Anderson, DC

U.S. Department of Energy, Office of Environmental Management, Mark Whitney, DC

U.S. Department of Energy, Office of Fossil Energy, Edward Le Duc, DC

U.S. Department of Energy, Office of Fossil Energy, James Ward, DC

U.S. Department of Energy, Office of Fossil Energy, John A. Anderson, DC

U.S. Department of Energy, Office of Fossil Energy, Kyle Moorman, DC

U.S. Department of Energy, Office of National Environmental Policy Act Policy and Compliance, Carol M. Borgstrom, DC

U.S. Department of Health and Human Services, Edward Pfister, DC

U.S. Department of Health and Human Services, National Center for Environmental Health, Centers for Disease Control and Prevention, Sharunda Buchanan, GA

U.S. Department of Homeland Security, Customs and Border Protection, Christopher Oh, DC

U.S. Department of Interior, Director, DC

U.S. Department of Justice, Environment and Natural Resources Division, Beverly Li, DC

U.S. Department of State, Bureau of Oceans and International Environmental and Scientific Affairs, Alexander Yuan, DC

U.S. Department of the Interior, Bureau of Land Management, Kerry Rogers, DC

U.S. Department of the Interior, Bureau of Ocean Energy Management, James F. Bennett, VA

U.S. Department of the Interior, Bureau of Safety and Environmental Enforcement, Charles B. Barbee, VA

U.S. Department of the Interior, National Park Service, Patrick Walsh, CO

U.S. Department of Transportation, Office of Assistant Secretary for Transportation Policy, Camille Mittelholtz, DC

U.S. Department of Transportation, Office of Assistant Secretary for Transportation Policy, Helen Serassio, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Bryn Karaus, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Kenneth Y. Lee, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Bill Lowry, TX

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Magdy El-Sibaie, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Karen Lynch, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Jeffrey Wiese, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Sherri Pappas, DC

U.S. Department of Transportation, Surface Transportation Board, Victoria Rutson, DC

U.S. Environmental Protection Agency, Cliff Rader, DC

U.S. Environmental Protection Agency, Cynthia Giles, DC

U.S. Environmental Protection Agency, Jerome Blackman, DC

U.S. Environmental Protection Agency, Region 6, Debra A. Griffin, TX

U.S. Environmental Protection Agency, Region 6, John Blevins, TX

U.S. Environmental Protection Agency, Region 6, Raul Gutierrez, Ph.D., TX

Federal Government Agencies (cont'd)

U.S. Environmental Protection Agency, Susan E. Bromm, DC

U.S. Fish and Wildlife Service, Josh Marceaux, LA

U.S. Fish and Wildlife Service, Lafayette Ecological Services Field Office, Jeff Welier, LA

U.S. Geological Survey, Esther Eng, VA

U.S. Housing and Urban Development Department, Office of Environment and Energy, Danielle Schopp, DC

Federal Senators and Representatives

U.S. House of Representatives, Representative Ralph Abraham, DC

U.S. House of Representatives, Representative Charles W. Boustany, Jr, M.D., DC

U.S. House of Representatives, Representative John Fleming, LA

U.S. House of Representatives, Representative Cedric Richmond, LA

U.S. House of Representatives, Representative Steve Scalise, LA

U.S. Senate, Senator Jeff Sessions, DC

U.S. Senate, Senator Richard Shelby, DC

U.S. Senate, Senator Bill Cassidy, DC

U.S. Senate, Senator Lisa Murkowski, DC

U.S. Senate, Senator David Vitter, LA

State Senators and Representatives

Louisiana House of Representatives, District 33, Representative Mike Danahay, LA

Louisiana House of Representatives, District 34, Representative A.B. Franklin, LA

Louisiana House of Representatives, District 35, Representative Brett Geymann, LA

Louisiana House of Representatives, District 36, Representative Chuck Kleckley, LA

Louisiana House of Representatives, District 38, Representative H. Bernard LeBas, LA

Louisiana House of Representatives, District 41, Representative Mickey J. Guillory, LA

Louisiana State Senate, District 25, Senator Dan Morrish, LA

Louisiana State Senate, District 27, Senator Ronnie Johns, LA

Louisiana State Senate, District 28, Senator Eric LaFleur, LA

State Government Agencies

Alabama Public Service Commission, Secretary, AL

Coastal Protection and Restoration Authority, Garret Graves, LA

Coastal Protection and Restoration Authority, Science Director, Natalie Snider, LA

Coastal Protection Restoration Authority, Bill Feazel, LA

Louisiana Department of Agriculture and Forestry, Commissioner Michael G. Strain, LA

Louisiana Department of Conservation, Commissioner Jim Welsh, LA

Louisiana Department of Culture, Recreation and Tourism, State Archaeologist and Director, Dr. Charles McGimsey, LA

Louisiana Department of Environmental Quality, Assistant Secretary, Waste Permits Division, Sanford Phillips, LA

Louisiana Department of Environmental Quality, Bryan Johnston, LA

Louisiana Department of Environmental Quality, Jamie Phillippe, LA

Louisiana Department of Environmental Quality, Jennifer Sheppard, LA

Louisiana Department of Environmental Quality, Regional Manager, Billy Eakin, LA

Louisiana Department of Environmental Quality, Secretary, Peggy Hatch, LA

Louisiana Department of Environmental Quality, Special Assistant to the Secretary, Paul Miller, LA

State Government Agencies (cont'd)

Louisiana Department of Environmental Quality, Tegan Treadaway, LA

Louisiana Department of Natural Resources, Administrator, Karl Morgan, LA

Louisiana Department of Natural Resources, Conservation / Engineering, Brent Campbell, LA

Louisiana Department of Natural Resources, Conservation / Pipeline Division, James Mergist, LA

Louisiana Department of Natural Resources, Office of Coastal Management, Jessica Williamson, LA

Louisiana Department of Natural Resources, Office of Coastal Management, Kelley Templet, LA

Louisiana Department of Natural Resources, Office of Coastal Management, Ontario James, LA

Louisiana Department of Natural Resources, Office of Coastal Management, Regina Stone, LA

Louisiana Department of Natural Resources, Secretary, Stephen Chustz, LA

Louisiana Department of Transportation and Development, Secretary, Sherri Lebas, LA

Louisiana Department of Wildlife and Fisheries, Amity Bass, LA

Louisiana Department of Wildlife and Fisheries, Assistant Secretary, Randall Pausina, LA

Louisiana Department of Wildlife and Fisheries, Biologist Program Manager, Kyle Balkum, LA

Louisiana Department of Wildlife and Fisheries, Chris Davis, LA

Louisiana Department of Wildlife and Fisheries, Dave Butler, LA

Louisiana Department of Wildlife and Fisheries, Secretary, Robert Barham, LA

Louisiana Office of Cultural Development, State Historic Preservation Officer, Pamela Breaux, LA

Louisiana State Police, Sean LeFleur, LA

Louisiana State Police, Superintendent, Colonel Mike Edmonson, LA

Secretary of State, Tom Schedler, LA

State of Alabama, Governor Robert J. Bentley, AL

State of Louisiana, Attorney General James D. Caldwell, LA

State of Louisiana, Governor Bobby Jindal, LA

State of Louisiana, Governor's Office of Homeland Security and Emergency Preparedness, Kevin Davis, LA

State of Louisiana, Lieutenant Governor Jay Dardenne, LA

Local Government Agencies

Acadia Parish Clerk of Court, Robert Barousse, LA

Calcasieu Parish Homeland Security and Emergency Preparedness, Dick Gremillion, LA

Calcasieu Parish Police Jury, Administrator, Bryan Beam, LA

Calcasieu Parish Police Jury, Director of Economic Development, Clair Hebert, LA

Calcasieu Parish Police Jury, District 1, Shannon Spell, LA

Calcasieu Parish Police Jury, District 2, Marshall Simien, Jr., LA

Calcasieu Parish Police Jury, District 3, Elizabeth C. Griffin, LA

Calcasieu Parish Police Jury, District 4, Tony Guillory, LA

Calcasieu Parish Police Jury, District 5, Nicholas Hunter, LA

Calcasieu Parish Police Jury, District 6, Dennis Scott, LA

Calcasieu Parish Police Jury, District 7, Chris Landry, LA

Calcasieu Parish Police Jury, District 8, Guy Brame, LA

Calcasieu Parish Police Jury, District 9, Kevin Guidry, LA

Local Government Agencies (cont'd)

Calcasieu Parish Police Jury, District 10, Tony Stelly, LA

Calcasieu Parish Police Jury, District 11, Sandy Treme, LA

Calcasieu Parish Police Jury, District 12, Ray Taylor, LA

Calcasieu Parish Police Jury, District 13, Francis Andrepont, LA

Calcasieu Parish Police Jury, District 14, Hal McMillin, LA

Calcasieu Parish Police Jury, District 15, Les Farnum, LA

Calcasieu Parish Police Jury, President, Nicholas E. Hunter, LA

Calcasieu Parish Sheriff Department, Community/Media Relations Director, Kim Myers, LA

Calcasieu Parish Sheriff Department, Sheriff Tony Mancuso, LA

Calcasieu Parish, Assessor, Wendy Curphy Aguillard, LA

Calcasieu Parish, Clerk of Court, Lynn Jones, LA

Calcasieu Parish, Coroner, Terry Welke, LA

Calcasieu Parish, Fourteenth Judicial District, District Attorney, John DeRosier, LA

Calcasieu Parish School Board, Superintendent, Karl Bruchaus, LA

Calcasieu Parish, School Board, District 2, Fred Hardy, LA

Calcasieu Parish, School Board, District 3, Clara F. Duhon, LA

Calcasieu Parish, School Board, District 4, Annette Ballard, LA

Calcasieu Parish, School Board, District 5, Dale Bernard, LA

Calcasieu Parish, School Board, District 6, Bill Jongbloed, LA

Calcasieu Parish, School Board, District 7, Mack Dellafosse, Jr., LA

Calcasieu Parish, School Board, District 8, Jim Schooler, LA

Calcasieu Parish, School Board, District 15, Bryan Larocque, LA

Cameron Parish Chamber of Commerce, LA

Cameron Parish Office of Emergency Preparedness, Danny Lavergne, LA

Cameron Parish Office of Emergency Preparedness, Secretary, Cassandra Duhon, LA

Cameron Parish Police Jury, Administrator, Tina Horn, LA

Cameron Parish School Board, Superintendent, Stephanie Rodrique, LA

City of DeQuincy, Mayor Lawrence Henagan, LA

City of Lake Charles, Clerk of the City Council, Lynn Thibodeaux, LA

City of Lake Charles, District A, Councilwoman Mary Morris, LA

City of Lake Charles, District B, Councilwoman Luvertha August, LA

City of Lake Charles, District C, Councilman Rodney Geyen, LA

City of Lake Charles, District D, Councilman John Leyoub, LA

City of Lake Charles, District E, Councilman Stuart Weatherford, LA

City of Lake Charles, District F, Councilman Dana Carl Jackson, LA

City of Lake Charles, District G, Councilman Mark Eckard, LA

City of Lake Charles, Mayor Randy Roach, LA

City of Lake Charles, Police Chief Don Dixon, LA

City of Sulphur, Mayor Christopher L. Duncan, LA

Evangeline Parish Clerk of Court, Randy Deshotel, LA

Lake Charles Fire Department, Fire Chief, Keith Murray, LA

Lake Charles Harbor and Terminal District, Commissioner Barbara McManus, LA

Local Government Agencies (cont'd)

Lake Charles Harbor and Terminal District, Commissioner Daryl Burckel, LA

Lake Charles Harbor and Terminal District, Commissioner Dudley Dixon, LA

Lake Charles Harbor and Terminal District, Commissioner Elcie Guillory, LA

Lake Charles Harbor and Terminal District, Commissioner Harry Hank, LA

Lake Charles Harbor and Terminal District, Commissioner John LeBlanc, LA

Lake Charles Harbor and Terminal District, Commissioner Mike Eason, LA

Lake Charles Harbor and Terminal District, Commissioner Walter Sanches, LA

Lake Charles Harbor and Terminal District, Director of Navigation and Security, Channing Hayden, LA

Lake Charles Harbor and Terminal District, Executive Director, William Rase III, LA

Lake Charles School Board, District 1, Shannon Spell, LA

Lake Charles School Board, District 2, Marshall Simien, Jr., LA

Lake Charles School Board, District 3, Elizabeth C. Griffin, LA

Lake Charles School Board, District 4, Tony Guillory, LA

Lake Charles School Board, District 5, Nicholas Hunter, LA

Lake Charles School Board, District 6, Dennis Scott, LA

Lake Charles School Board, District 7, Chris Landry, LA

Lake Charles School Board, District 8, Guy Brame, LA

Lake Charles School Board, District 9, Kevin Guidry, LA

Lake Charles School Board, District 10, Tony Stelly, LA

Lake Charles School Board, District 11, Sandy Treme, LA

Lake Charles School Board, District 12, Ray Taylor, LA

Lake Charles School Board, District 13, Francis Andrepont, LA

Lake Charles School Board, District 14, Hal McMillin, LA

Lake Charles School Board, District 15, Les Farnum

West Calcasieu Port, Port Director, E Lynn Hohensee, LA

West Cameron Port, Port Director, Stephen Broussard, LA

Native American Groups

Alabama Coushatta Tribe of Texas, Chairman Kyle Williams, TX

Alabama Coushatta Tribe of Texas, Chief Oscola Clayton Sylestine, TX

Alabama Coushatta Tribe of Texas, Historic Preservation, Bryant Celestine, TX

Alabama Coushatta Tribe of Texas, Principal Chief Clem Sylestine, TX

Caddo Nation, Chairperson Brenda Shemayme Edwards, OK

Caddo Nation, Bobby Gonzalez, OK

Chitimacha Tribe of Louisiana, Chairman John Paul Darden, LA

Chitimacha Tribe of Louisiana, Cultural Director, Kimberly Walden, LA

Choctaw Nation of Oklahoma, Chief Gregory Pyle, OK

Choctaw Nation of Oklahoma, Senior Section 106 Reviewer, Lindsey D. Bilyeu, OK

Choctaw Nation of Oklahoma, Tribal Historic Preservation, Ian Thompson, OK

Coushatta Tribe of Louisiana, Chairman, Kevin Sickey, LA

Native American Groups (cont'd)

Coushatta Tribe of Louisiana, Chairman, Lovelin Poncho, LA

Jena Band of Choctaw Indians, Chief B. Cheryl Smith, LA

Jena Band of Choctaw Indians, Deputy Tribal Historic Preservation Officer, Alina J. Shively, LA

Jena Band of Choctaw Indians, Tribal Historic Preservation Officer, Dana Masters, LA

Mississippi Band of Choctaw Indians, Chief Phyllis J. Anderson, MS

Mississippi Band of Choctaw Indians, Tribal Historic Preservation Officer/ Archaeologist, Kenneth Carleton, MS

Tunica-Biloxi Tribe of Louisiana, Chairman Earl Barbry, LA

Tunica-Biloxi Tribe of Louisiana, Earl J. Barbry, Sr., LA

Libraries

Acadia Parish Library, Crowley Headquarters, LA

Calcasieu Parish Public Library, LA

Evangeline Parish Library, LA

Southwest Louisiana Genealogical and Historical Library, LA

Media

American Press, LA

Crowly Post-Signal, LA

Fox29, LA

KPLC-TV, LA

Sulphur Daily News, LA

Ville Platte Gazette, LA

Companies and Organizations

3N75 Trust, LA

4-T Investments, Brian Tanner, LA

Alcoa Carbon Products, Mack Whittaker, LA

Alleghany Defense Project, Ryan Talbott, OR

Alliance for Affordable Energy, LA

Allied Barton Security Services, Suzanne Chisholm, TX

American Red Cross of Southwest Louisiana, Bobbi Zaunbrecher, LA

ASCO, LA

Audubon Louisiana, LA

Basden Agencies Inc., Alan Basden, LA

BG LNG Services, Lisa Yoho, TX

BG LNG Services, Scott Ervin, TX

BG LNG Services, Marc Hopkins, TX

Bollinger Calcasieu, L.L.C., LA

Boudreau-Calhoun LLC, Patricia B. Calhoun, LA

Boyer Properties, LLC, LA

Calcasieu Council on Aging, Rosalind Berry, LA

Calcasieu Land and Minerals, LLC, LA

Calcasieu League for Environmental Action Now, LA

Cameron LNG, LLC, Randy Oakley, LA

Cameron LNG, Steve Trahan, LA

Cashin Family Offices, Bonnie Cashin Englert, CA

Cashin Family Offices, D'Arcy Michael Cashin, CA

Cashin Family Offices, Emmet J. Cashin III, CA

CDI Engineering Solutions, Mario Espinosa, LA

Center for Biological Diversity, AZ

CH2M Hill, Allen Dupont, LA

Cheniere LNG, Inc., James Ducote, LA

CITGO, Ken Rodericks, LA

CITGO, Alirio Zambrano, LA

CITGO, Captain Thomas Fanning, TX

CITGO, Charles Harper, LA

CITGO, Steve Newman, TX

CITGO, Winston Ebarb, TX

Clark Real Estate Enterprises, Inc., LA

Clatrax, Inc., LA

CLM Equipment Co., Inc., Tony Colletta, LA

Companies and Organizations (cont'd)

Conoco Phillips, Willie Tempton, LA

ConocoPhillips, Captain Kurt Hallier, TX

CPRA, Natalie Peyronnin, LA

Crowe Property Investments, LLC, LA

Crowley Marine Services, Captain Stephen Porter, LA

Crowley Marine Services, Rick Bastian, LA

CSRS, INC, Lyles Budden, LA

Devall Towing, Joe Devall, LA

Diocese of Lake Charles, Daniel Torres, LA

Dorothy Colletta House, Oscar J. Colletta, LA

Dunham Price Group, LLC, Dav Godsey, LA

Dynamic Industries, Inc., Don Darbonne, LA

Dynamic Industries, Inc., Ralph Clements, LA

Dynamic Industries, Inc., Robert Ward, LA

Ecology and Environment, Bill Daughdrill, FL

Empire of the Seed, Rick Richard, LA

Environmental Defense Fund, NY

Environmental Response Services, Neil Clark, LA

Erwin Heirs, Inc., Elliot Godwin, LA

Farley Testamentary Trusts et al., Richard Michael Farley, TX

First Church of Christ, LA

Gayle Brothers, LLC, LA

Gulf Intracoastal Canal Association, Jim Stark, LA

Gray Law Firm, Jack Gray, LA

Gulf Coast Environmental Labor Coalition, LA

Gulf Restoration Network, LA

Halco-Kisatchie Properties, Inc., LA

Harbor Docking and Towing, Dwayne Chatoney, LA

Holiday Inn Express, Rhonda Colletta, LA

Hotels of Lake Charles, Nimesh Zaver, LA

Hottel Family Partnership, CT

IFG Port Holdings, LLC, Kabir Ahmad, NY

Imperial Calcasieu Museum, LA

Inchcape Shipping Services, Mark Pippin, LA

ISC Constructors, LLC, Craig Messer, TX

Jats Real Estate, LLC, LA

John and Sallye Hammett Trust, Richard Hammett, TX

K&L Gates, David Wochner, DC

K&L Gates, Sandra Safro, DC

King Minerals, LLC, LA

Kisatchie Title Management, Inc., LA

Knights of Columbus, Donald Laurent, LA

Lake Area Industry Alliance, Larry DeRoussel, LA

Lake Charles Pilots, Brett Palmer, LA

Lake Charles Pilots, Captain Charles Morrison, LA

Lake Charles Pilots, Dan Morrish, LA

Lake Charles Pilots, Dave Trent, LA

Lake Charles Pilots, George Mowbray, LA

Landry Granger Estate, Pauline Sonnier, TX

Lawrence Granger Estate, Howard Wayne Granger, LA

LEEVAC, Richard Ortego, LA

Leucadia National Corporation, Cliff Kerr, TX

Locke Lord LLP, James Moriarty, ESQ., DC

Locke Lord LLP, Thomas Knight, DC

Louise Solari, Ivy Benoit Fruge, LA

Louisiana Bucket Brigade, LA

Louisiana Economic Development, Secretary, Stephen Moret, LA

Louisiana Economic Development, Senior Director of Business Development, Don Pierson, LA

Louisiana Environmental Action Network, Michael Orr, LA

Louisiana Environmental Justice Program, Darryl Malek Wiley, LA

Companies and Organizations (cont'd)

Louisiana Farm and Livestock Co., Robert O. Gayle, LA

Louisiana State University, Ag Center, SW Region, Kevin Savoie, LA

Louisiana Wildlife Federation, Fred Borel, LA

Magnolia LNG, Ernie Megginson, LA

Magnolia LNG, Lincoln Clark, LA

Marine Spill Response Corp., LA

Mayo Realty Company Inc., Bob Mayo, LA

MCPC, LLC, LA

Mixing and Process Equipment Company, Ward Howard, LA

MJL Louisiana, LLC, CA

Montell USA, Inc., LA

Moran-Gulf Shipping Agency, Alan Courmier, LA

Moreno Group LLC, John Alford, LA

Morris Revocable Living Trust, Charles William and Barbara Pizanie, LA

Morton Group LLC,, LA

Mossville Environmental Action Now, Dorothy Felix, LA

Natural Gas Pipeline Company of America LLC, Bruce Newsome, IL

Natural Gas Pipeline Company of America LLC, Maria Kyres Pavlou, ESQ, IL

Natural Resources Defense Council, NY

Oil Spill Response Vessel Gulf Coast Responder, Fred Eason, LA

Panhandle Energy Pipelines, Frazier King, Jr., TX

Panhandle Energy Pipelines, Michael T. Langston, TX

Panhandle Energy Pipelines, Stephen Veatch, TX

Panhandle Energy, Dennis Odum, LA

Pine Island Oil Corporation, LA

Port Aggregates, Andrew Guinn, LA

Port Aggregates, Tim Guinn, LA

Powell Land Holdings, LLC, LA

PPG Chlor-Alkali and Derivatives, Terri Angelini, LA

Prairie Land Company, LA

Raymond Klumpp Farms, Inc., Hilda Ortego, LA

Recon, Bob Emerson, TX

Reynolds Metals Co. Alcoa Inc., PA

Reynolds Metals, LA

Salvation Army, Major David Craddock, LA

Seabulk Towing, Inc., Aaron Andrus, LA

Seabulk Towing, Inc., Brian Kennedy, LA

Sempra Energy, Mark Nelson, TX

Ship to Shore, Sheron Faulk, LA

Sierra Club, Delta Chapter, LA

Sierra Club, Hayward Martin, LA

Sierra Club, Kathleen Krust, CA

Sierra Club, Natalie Spiegel, CA

Sierra Club, Nathan Matthews, CA

Southwest Louisiana Economic Development Alliance, George Swift, LA

Texas Gas Transmission, LLC, David Hardesty, KY

The Nature Conservancy, Southwest Louisiana, Rick Jacob, LA

The People's Advocate Southwest Louisiana, Director, Beth Zilbert, LA

Thomas Barr IV Louisiana Properties, LLC, NY

Total Gas and Power NA, Fundi Mwamba, TX

Tower Land Company, LLC, LA

Trunkline LNG, Jeffrey Brightwell, LA

Trunkline LNG, Property Tax Department, TX

Trunkline LNG, Scott Hancock, LA

Trunkline LNG, Steven Couch, LA

Union of Concerned Scientists, MA

United Way of Southwest Louisiana, Inc., Denise Durel, LA

Van Ness Feldman, LLP, Michael Pincus, DC

Companies and Organizations (cont'd)

Van Ness Feldman, LLP, Robert Francis Christin, DC

Venco, LA

Vessel Traffic Service, Frank LaBarbera, LA

Vessel Traffic Service, Michael Measells, TX

Vinson and Elkins LLP, David Tavares Andril, DC

Vinson and Elkins LLP, Elizabeth Kade, DC

West Calcasieu Chamber of Commerce, Stuart A. Moss, LA

West Gulf Maritime Association, Niels Aalund, TX

West Gulf Maritime Association, Niels Lyngso, TX

Westlake Polymers Corporation, Mike Shell, LA

Willis Noland Testamentary Trust ET AL, LA

Wingate by Windham, Jay Kumar, LA

Wingate Hotel, Heather Jabusch, LA

Individuals

Alfred Devall and Fausta Devall, LA

Allan C. House, LA

Amelia Nell Fuselier and Mitchell Fuselier, LA

Ann Crowe Lindsay, LA

Azima Benoit Granger and George Lee LaGrange, AL

Barbara Jean Stevenson Levine, MD

Bea Morrison Thibodeaux, LA

Belvin L. Fontenot and Louise Solari, LA

Benson Lyons Palmer Jr., TX

Berna Dean Veillon Johnson, LA

Billie Jewel Trahan Goux and John A. Trahan, LA

Boyd Smith, LA

Brenda E. Bell Roberts, LA

Brenda Sue Sumpter ET VIR, LA

Cameron Boyd Barr, LA

Carol Sonnier, LA

Cary Ross McKee, LA

Charlie Atherton, LA

Clarence Benoit Estate and Louise Solari, LA

Clarence L. Cooper, TX

Curtis Claude Benoit, LA

Curtis Conkle, TX

Dalton Ray Sonnier, LA

Darcy Jean Owens, CA

Darryl Altalies, LA

Dave Benoit Estate and Judith B. Sonnier, LA

David and Jean Harris, LA

David Wayne Bertrand, LA

Donald Lee Benoit, LA

Donna Blackwell LaGrange Turner, AL

Doris Dey Taylor, TX

Elizabeth Ann Fontenot Oliver and Paul Chamerlain, LA

Ernest F. Clooney Jr., LA

Evelyn Devall Reed, LA

Glenda Benoit Oliver, LA

Glenn C. House Jr. et al., TX

Gloria Lone Kiplinger Brown et al., LA

Grace Davison, LA

James Ray Clooney III, LA

James Richard Smith, LA

James T. Quinn, LA

Janet Mayo, NY

Jennie Sue Pearson et al., MD

Jeremie Wayne Veillon, LA

John Arthur Fleig, LA

John F. Hennessey et al., LA

John Lemeur and Lorrain Jackson, OH

Joseph B. Powell et al., and J. Brent Powell, LA

Joseph David Painter, LA

Kathryn House, LA

Kerry Arthur House, LA

Kevin Anthony and Anita Richard, LA

Lena Benoit King and Michelle Koonce, LA

Linda Cooper, TX

Lois Meril Cassidy Benoit et al., LA

Major V W Humphrey, Helen Clooney Humphrey Esq., AR

Margaret A. Garlinghouse and David Pettus, CA

Marjorie Nalley Campbell, LA

Mary Benoit Ortego and Louise Solari, LA

Mary Beth Russell, TX

Mary Leonise Broussard Perrin, LA

Matt Young, LA

Murphy and Rosette Bellard, LA

Nancy Tugwell, LA

Natalie Lewis Miciotto, LA

Individuals (cont'd)

Natalie Rogers Murphy, NY

Necil Benoit LeBouef and Brenda Foreman, LA

Patrick Fusilier, LA

Philip Anthony Gayle et al. and W.J. Gayle and Sons, LA

R Brooks Fleig and Catherine Fleig Sharpe, LA

Ray Sonnier, LA

Raymond Klumpp, LA

Simon and Sonja Davidson, LA

Stephen Brown III, LA

Stephen Robert Bollich, LA

Terry Fontenot, Jr, LA

Thomas McClelland, LA

Thomas Raymond Howell Jr. et al., CA

Tom Miller, LA

Vera Watkins House, TX

Vernon W. Humphrey et al., AR

Vito A. Tramonte, LA

Wilda Rose K. Fontenot, LA

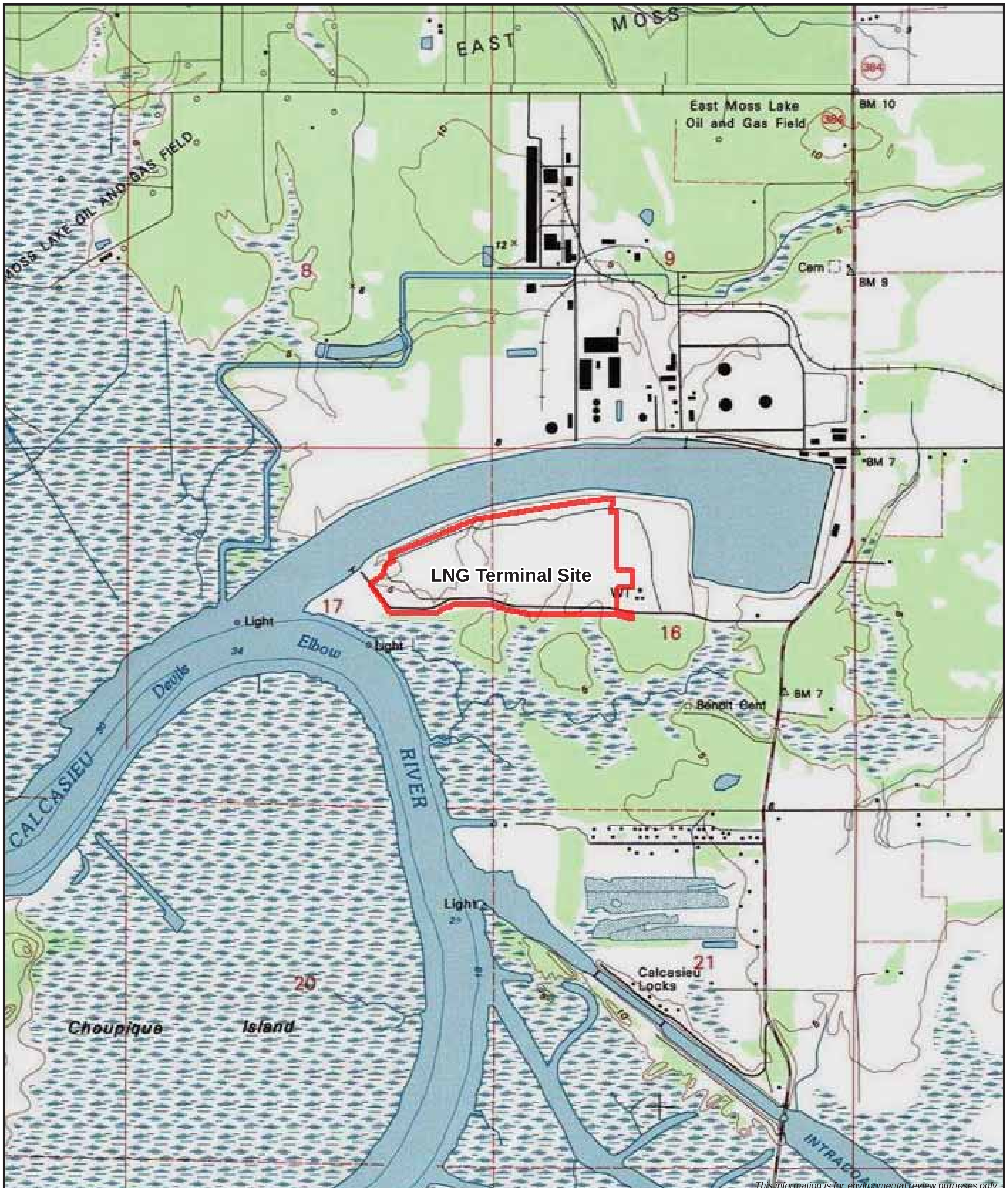
William Richard Neff, PA

Winifred Vetha Adkins Hutchinson and Clif Walters, TX

Winston Frey, et ux, LA

APPENDIX B

PROPOSED FACILITIES MAPS



LNG Terminal Site

0 500 1,000
Feet

Figure 1 of 29

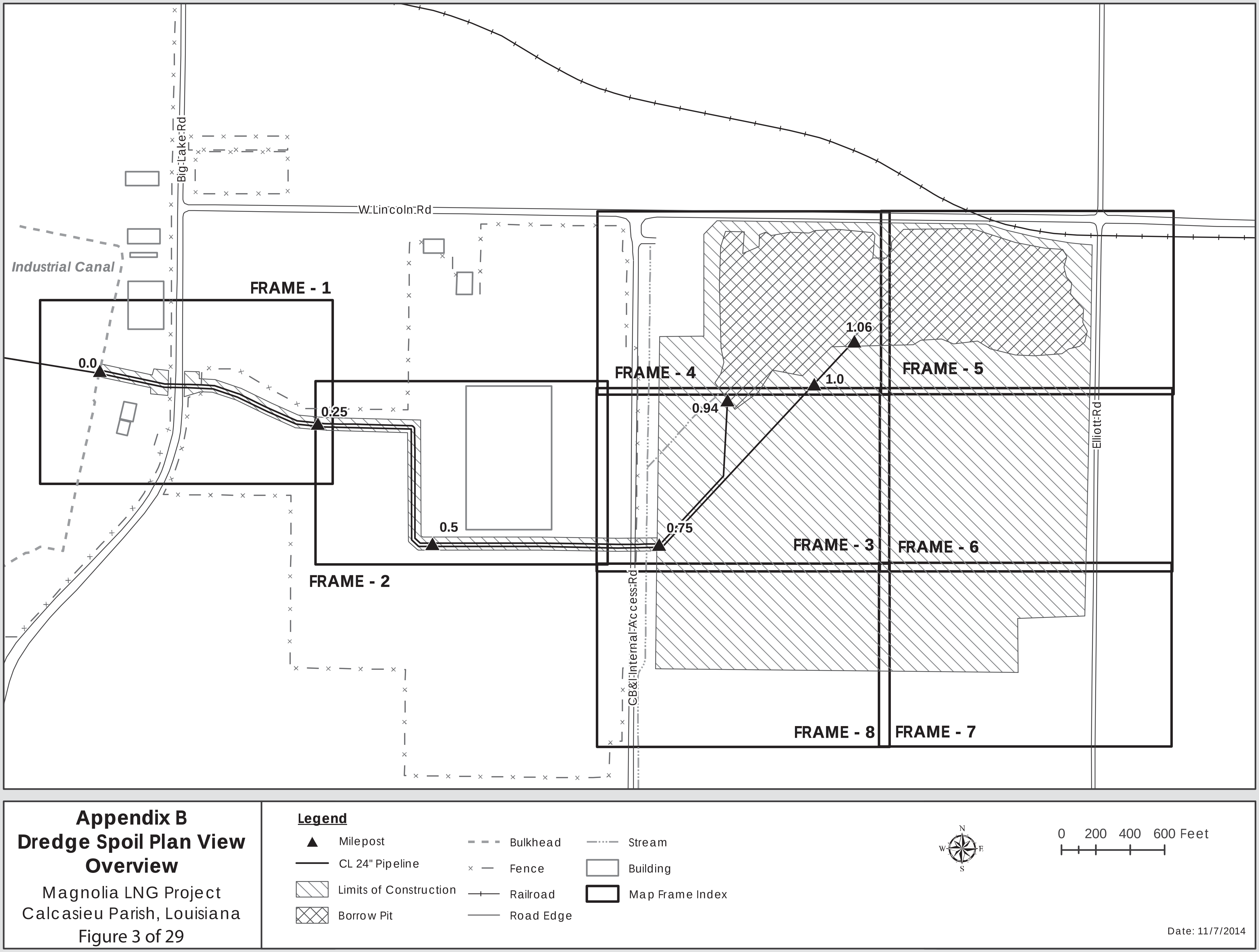
Appendix B
Overview Topographic Map
Magnolia LNG Project
Calcasieu Parish, Louisiana

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Overview\MLP_Overview_Topo.mxd | REVISED: 04/16/2015 | SCALE: 1:24,000 DRAWN BY: JSSuess

Figure 2 of 29

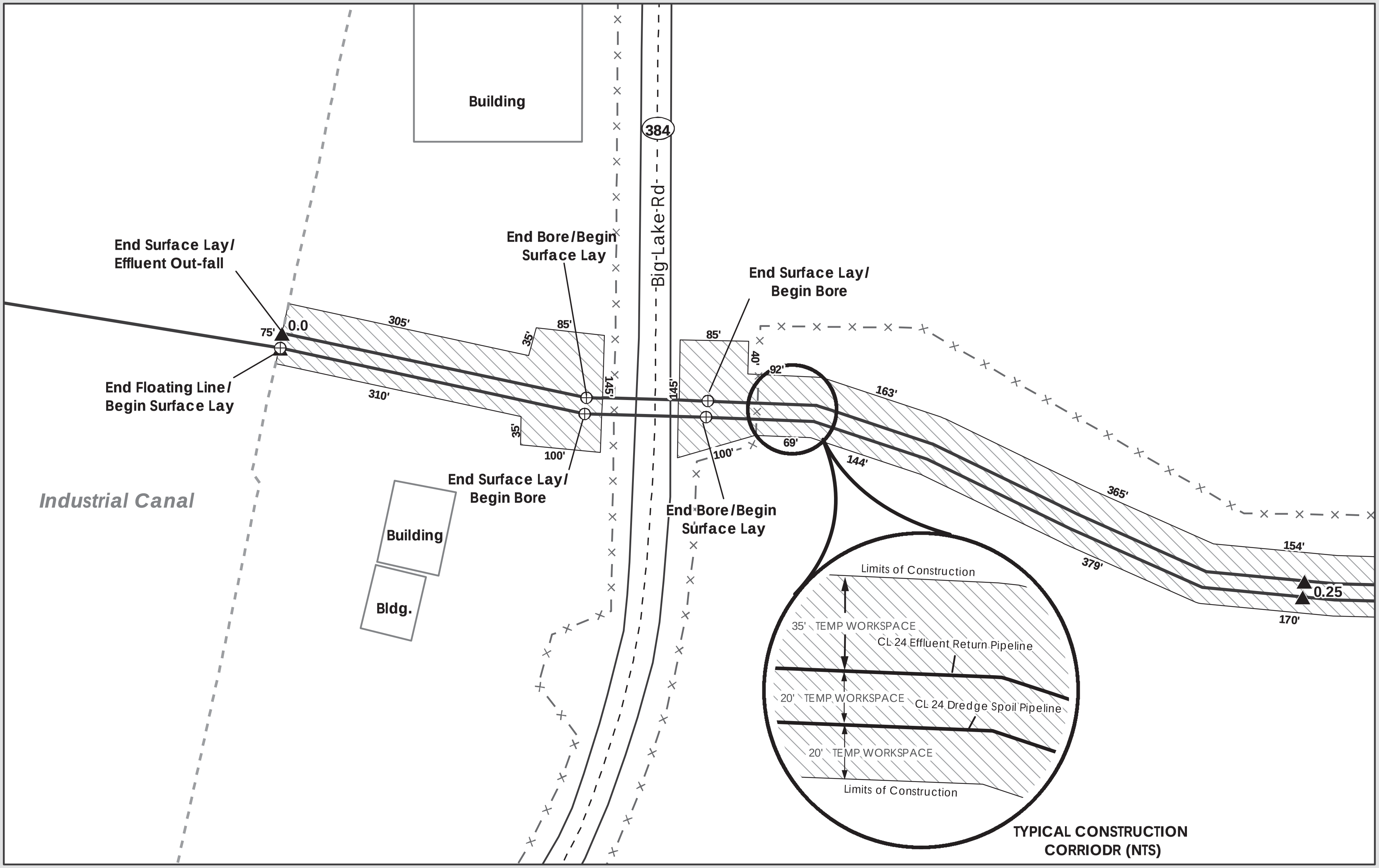
Appendix B
Overview Aerial Map
Magnolia LNG Project
Calcasieu Parish, Louisiana

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Overview\MLP_Overview_Aerial.mxd | REVISED: 04/16/2015 | SCALE: 1:24,000 DRAWN BY: JSSuess



Appendix B
Dredge Spoil Plan View Overview
Magnolia LNG Project
Calcasieu Parish, Louisiana
Figure 3 of 29

Document Path: C:\GIS\Moore_Support\DredgeSoilPlan\Maps\mxd\LNG_Drawings_Sept2014\Frame1.mxd



Appendix B
Dredge Spoil Plan View
Frame 1

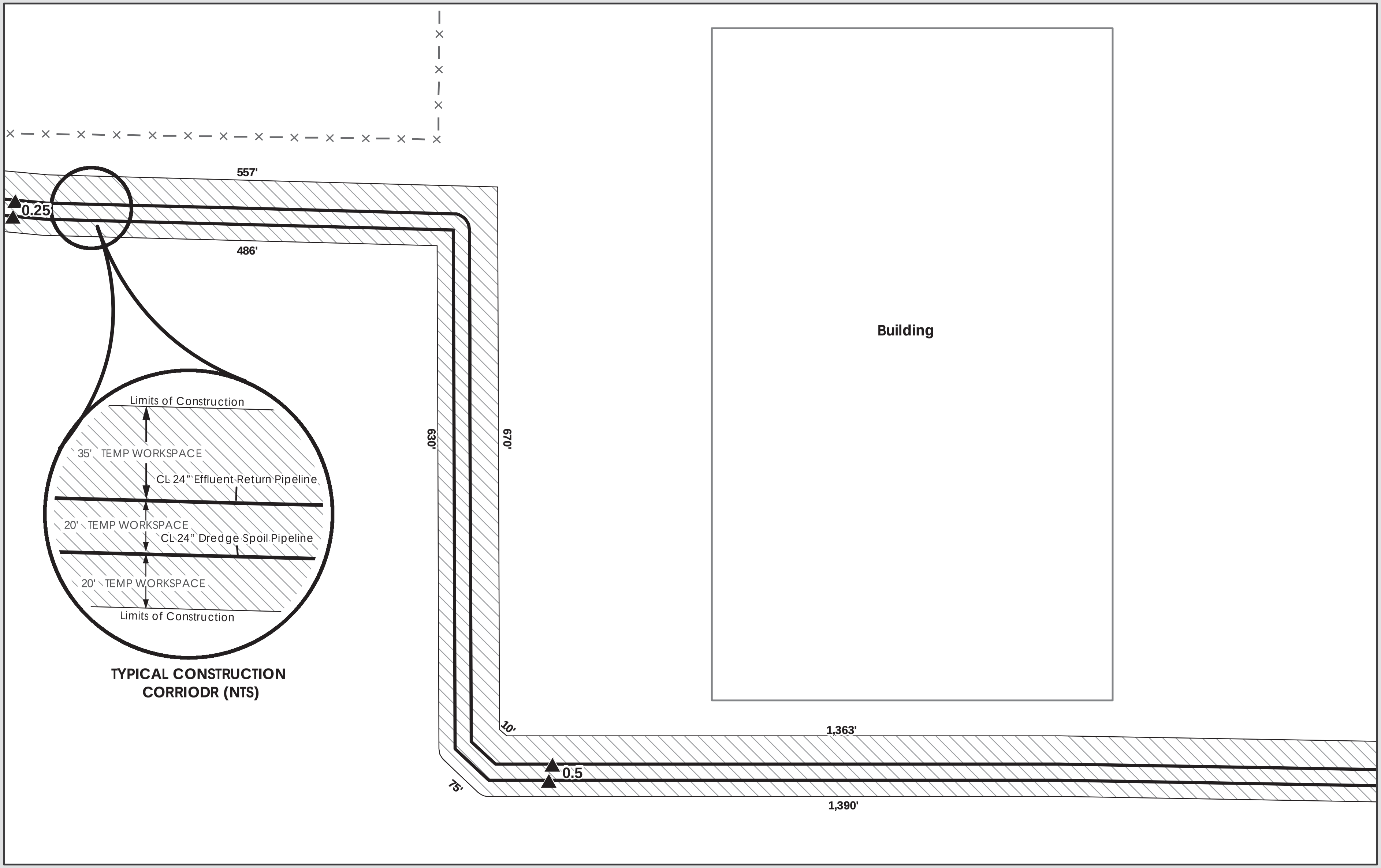
Magnolia LNG Project
Calcasieu Parish, Louisiana
Figure 4 of 29

Legend

- ▲ Milepost
- ⊕ Pipeline Transition
- CL 24" Pipeline
- Limits of Construction
- Borrow Pit
- Bulkhead
- Fence
- Railroad
- Stream
- Road Edge
- Road Centerline

0 50 100 150 Feet

Date: 11/7/2014



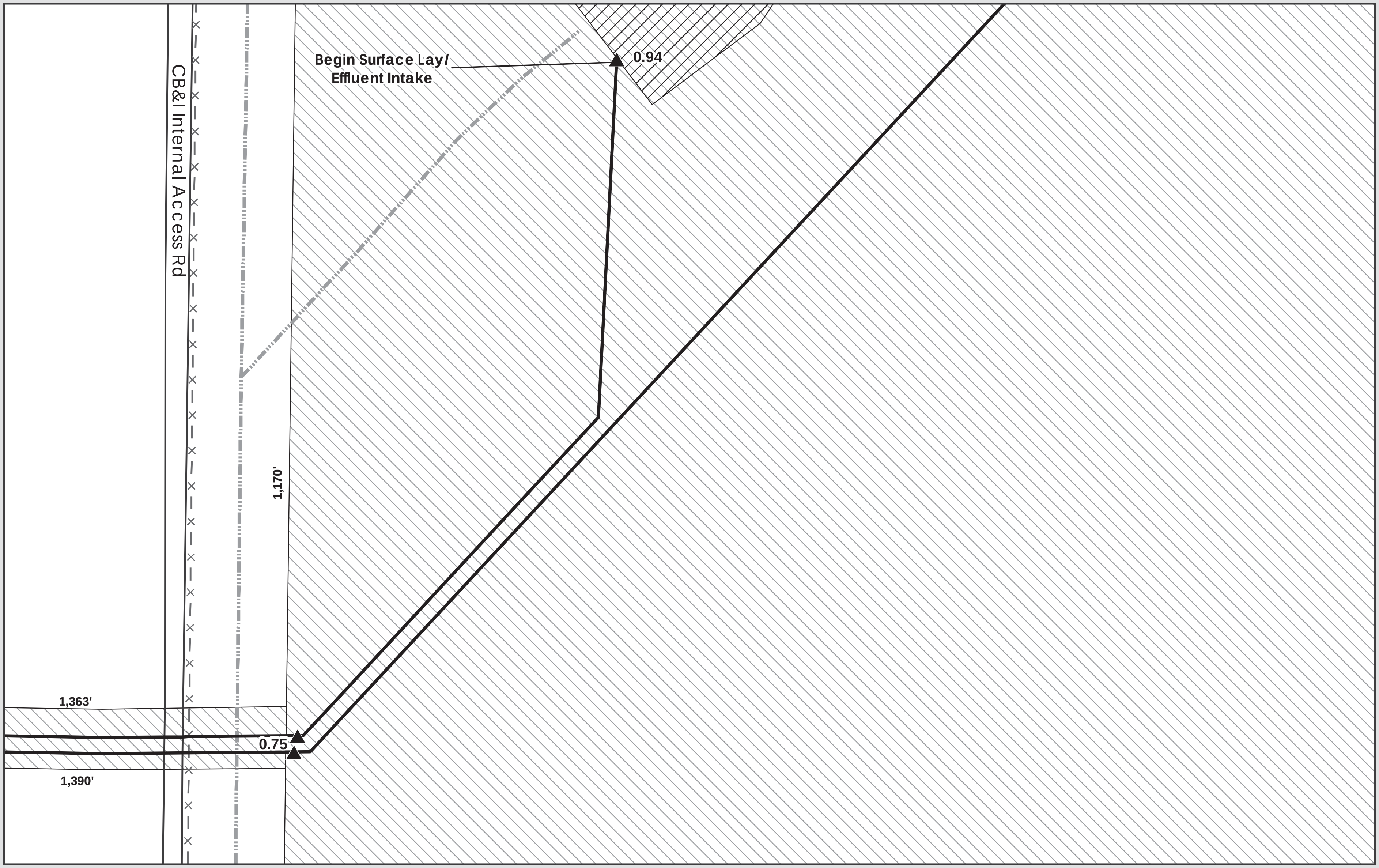
Appendix B
Dredge Spoil Plan View
Frame 2
Magnolia LNG Project
Calcasieu Parish, Louisiana
Figure 5 of 29

Legend

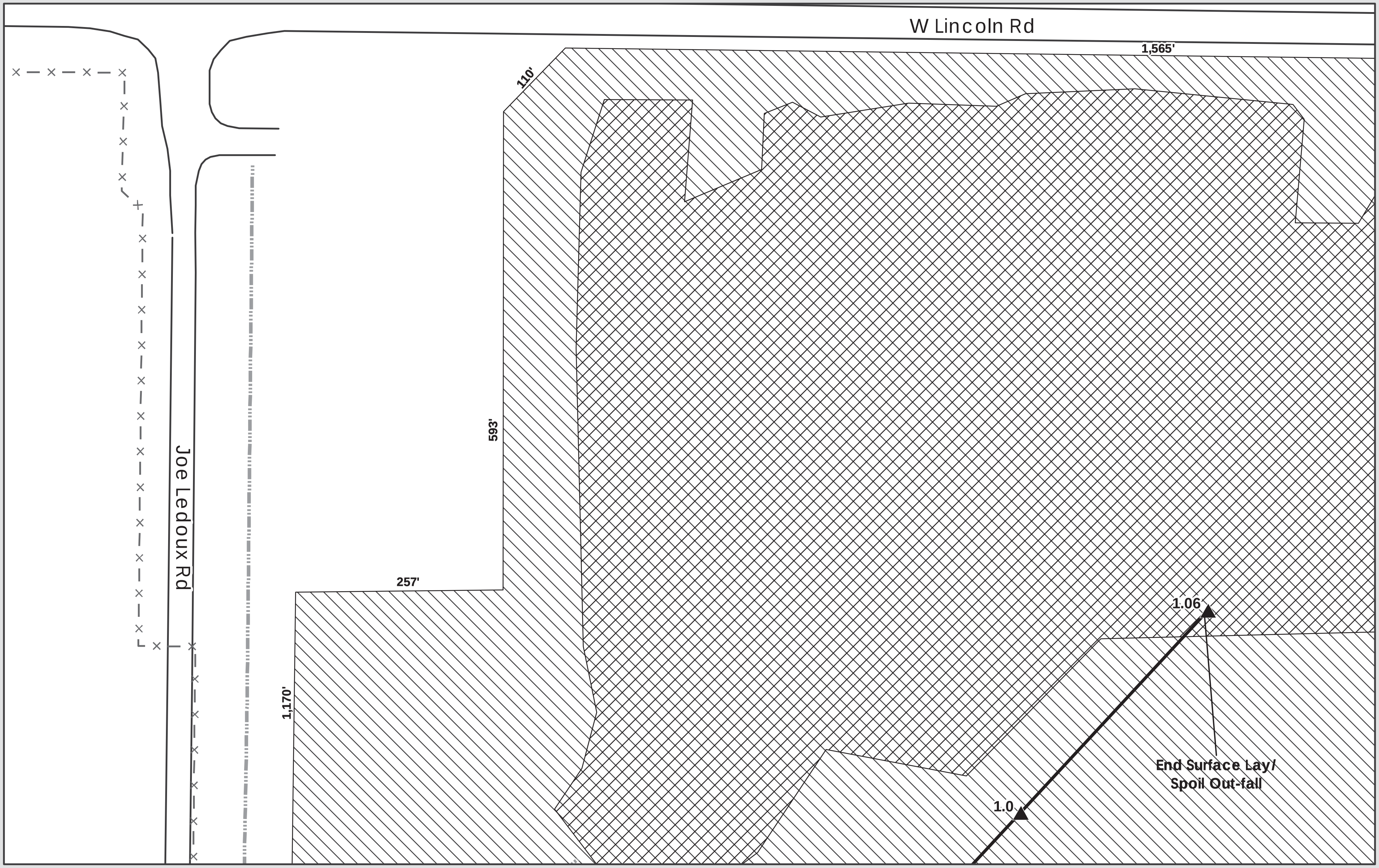
- Milepost
- Pipeline Transition
- CL 24" Pipeline
- Limits of Construction
- Borrow Pit
- Bulkhead
- Fence
- Railroad
- Stream
- Road Edge
- Road Centerline

0 50 100 150 Feet

Date: 11/7/2014



Appendix B
Dredge Spoil Plan View
Frame 3
Magnolia LNG Project
Calcasieu Parish, Louisiana
Figure 6 of 29



Appendix B
Dredge Spoil Plan View
Frame 4

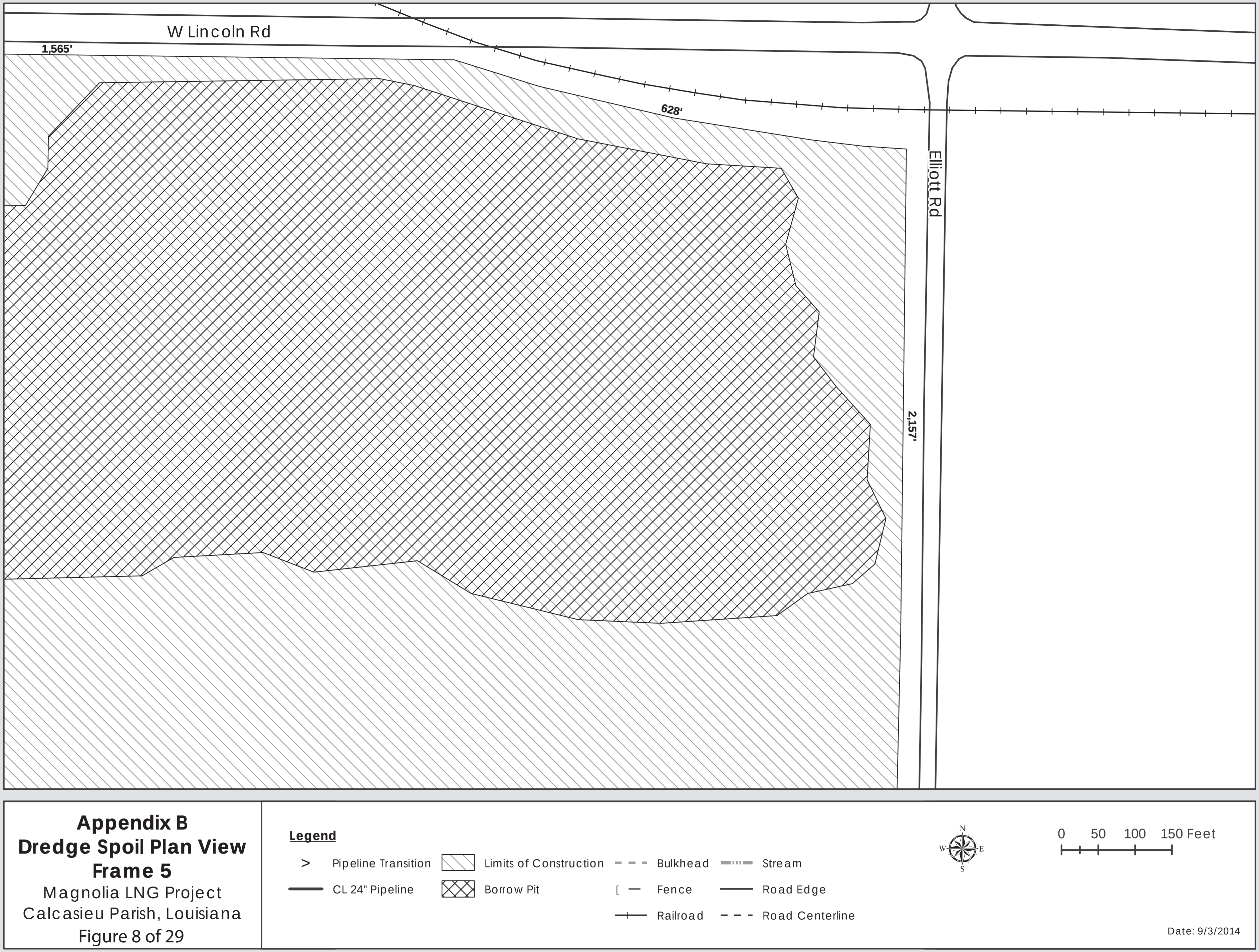
Magnolia LNG Project
Calcasieu Parish, Louisiana
Figure 7 of 29

Legend

- ▲ Milepost
- ⊕ Pipeline Transition
- CL 24" Pipeline
- Limits of Construction
- Borrow Pit
- Bulkhead
- Fence
- Railroad
- Stream
- Road Edge
- Road Centerline

0 50 100 150 Feet

Date: 11/7/2014



Appendix B
Dredge Spoil Plan View
Frame 5
Magnolia LNG Project
Calcasieu Parish, Louisiana
Figure 8 of 29

Appendix B
Dredge Spoil Plan View
Frame 6
Magnolia LNG Project
Calcasieu Parish, Louisiana
Figure 9 of 29

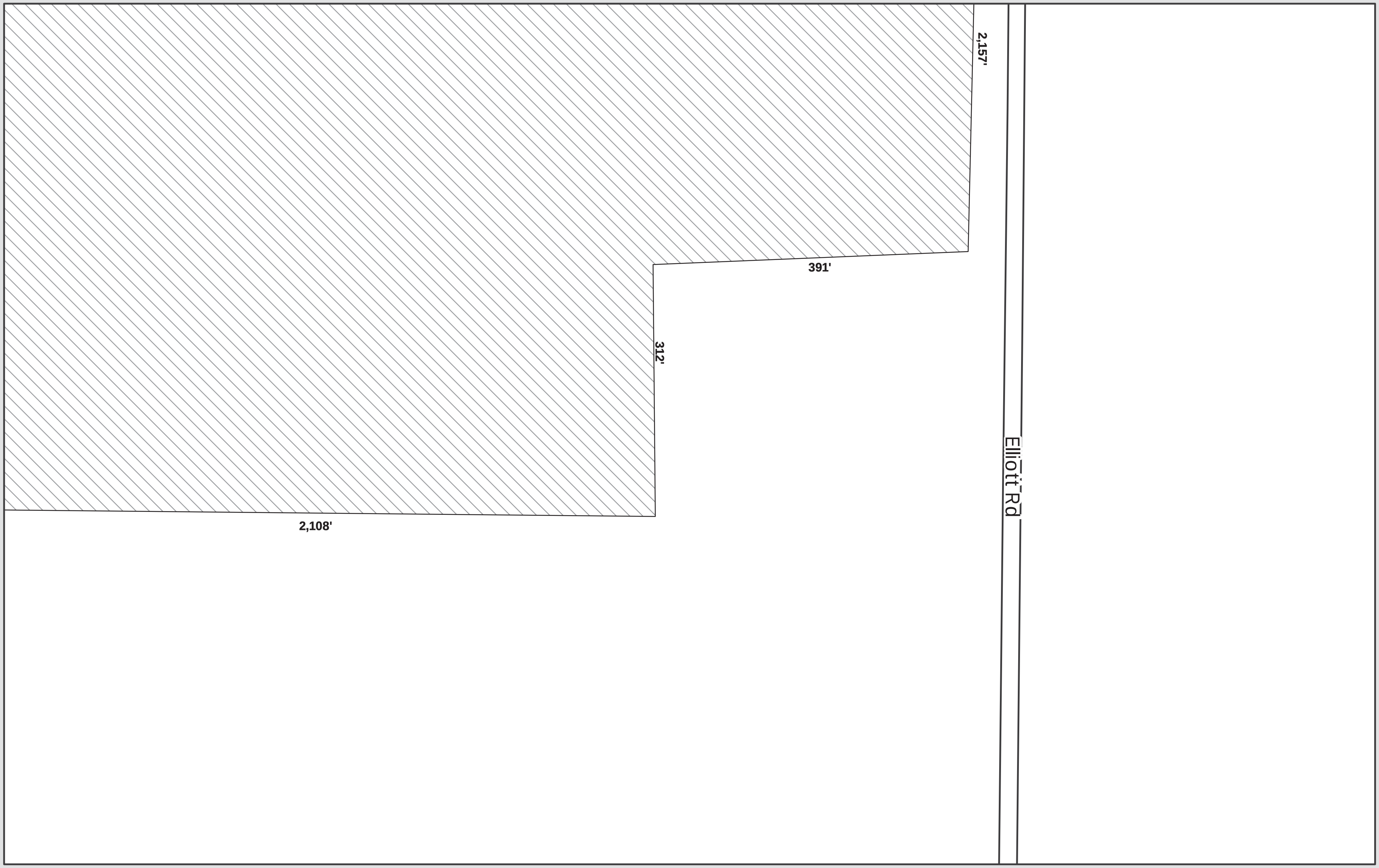
Legend

- > Pipeline Transition
- CL 24" Pipeline
- Limits of Construction
- Borrow Pit
- Bulkhead
- Fence
- Railroad
- Stream
- Road Edge
- Road Centerline

N E S W

0 50 100 150 Feet

Date: 9/3/2014



Appendix B
Dredge Spoil Plan View
Frame 7

Magnolia LNG Project
Calcasieu Parish, Louisiana
Figure 10 of 29

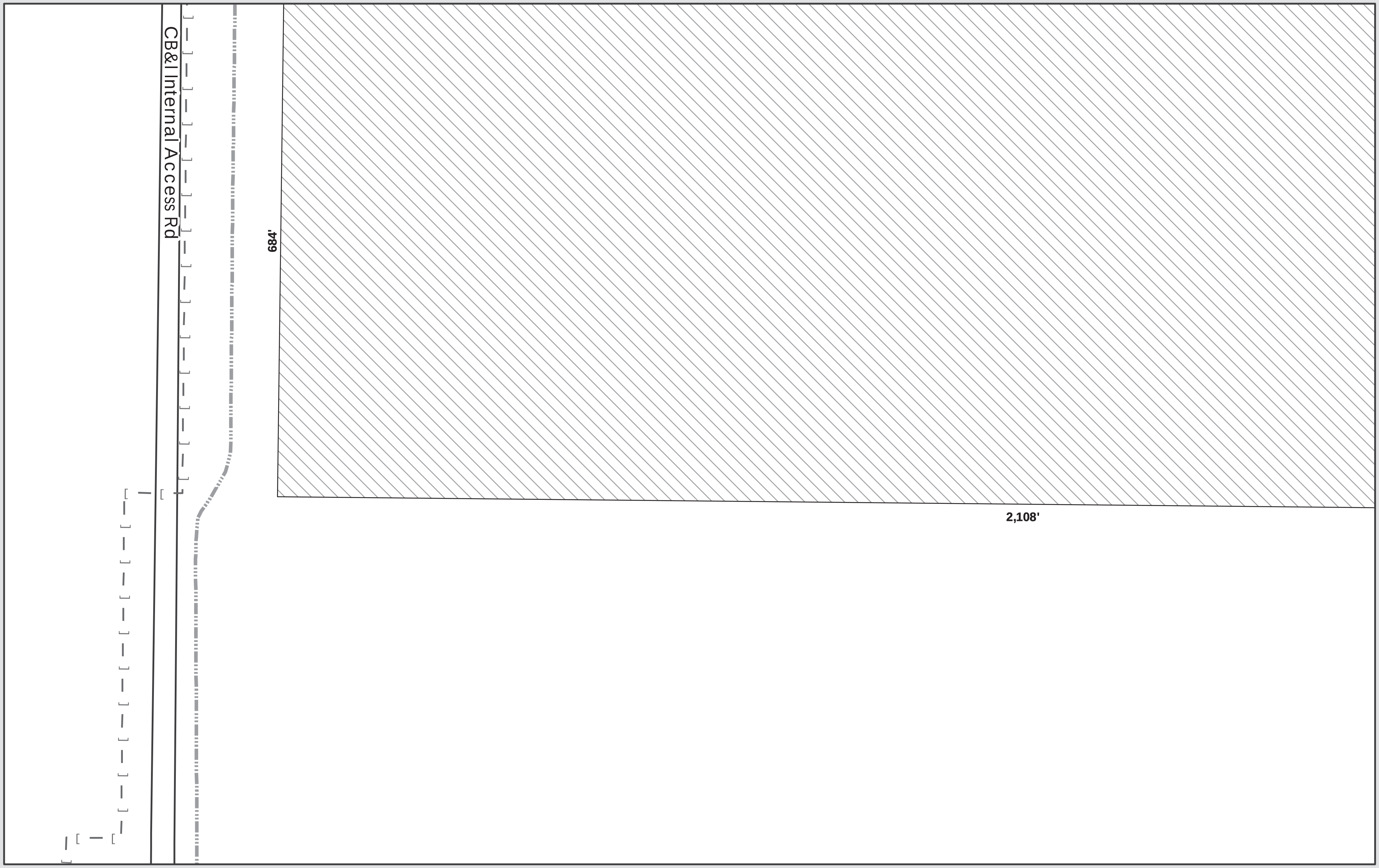
Legend

> Pipeline Transition
CL 24" Pipeline
Limits of Construction
Borrow Pit
Bulkhead
Fence
Railroad
Stream
Road Edge
Road Centerline

N E S W

0 50 100 150 Feet

Date: 9/3/2014



Appendix B
Dredge Spoil Plan View
Frame 8
Magnolia LNG Project
Calcasieu Parish, Louisiana
Figure 11 of 29

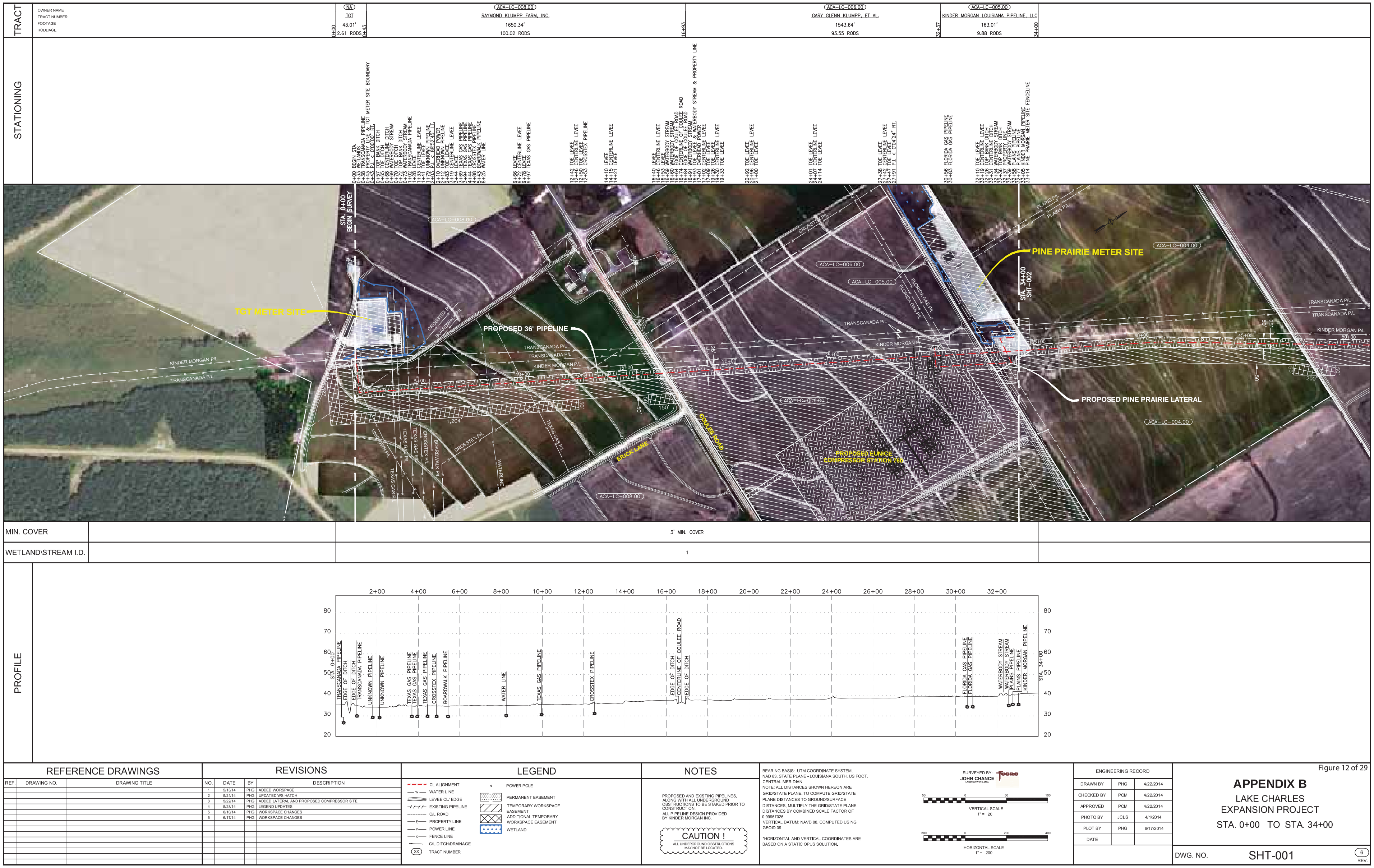
Legend

> Pipeline Transition
CL 24" Pipeline
Limits of Construction
Borrow Pit
Bulkhead
Fence
Railroad
Stream
Road Edge
Road Centerline

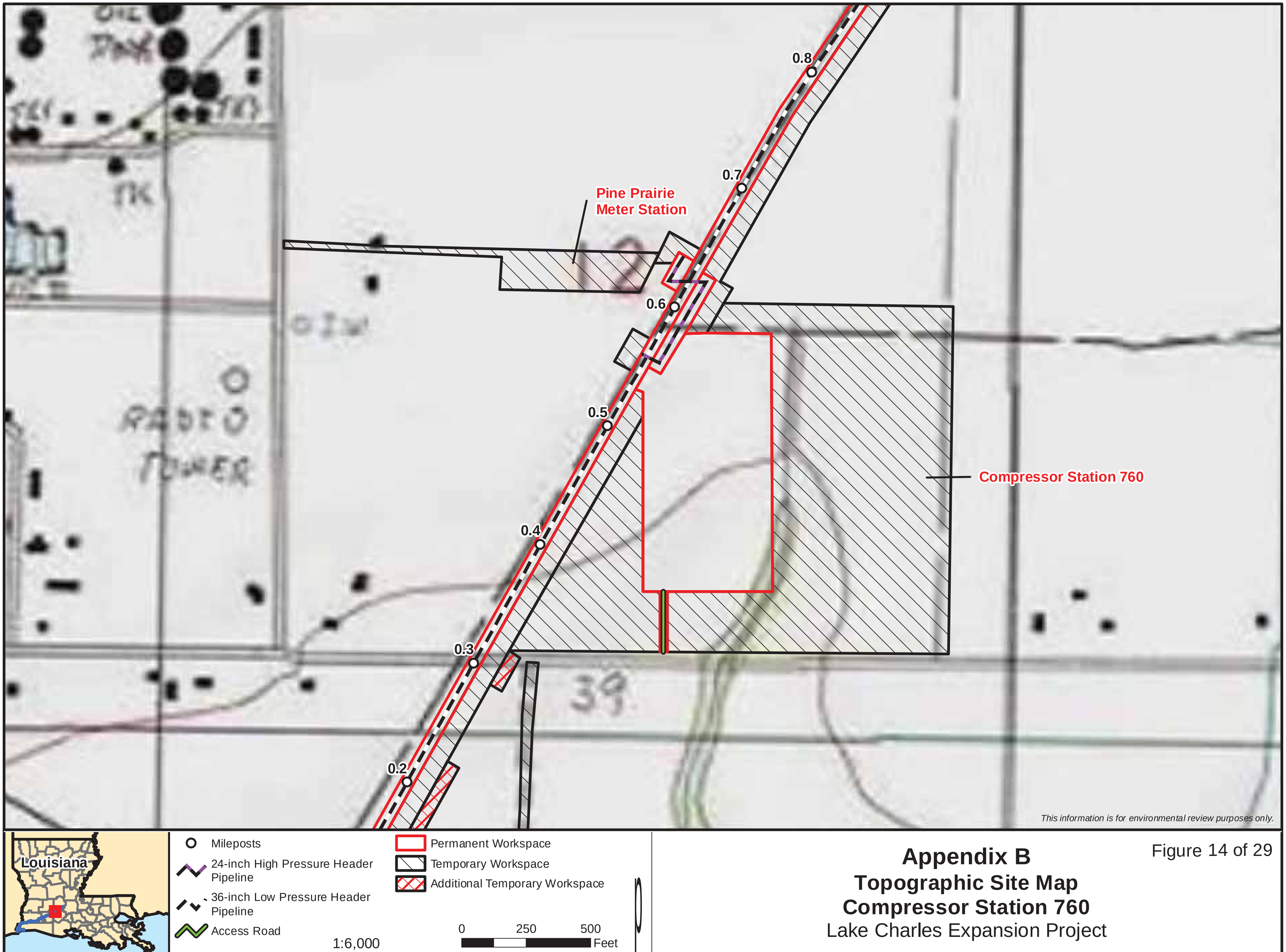
N E S W

0 50 100 150 Feet

Date: 9/3/2014


TRACT
STATIONING
PROFILE
MIN. COVER
WETLAND\STREAM I.D.
3' MIN. COVER
RAYMOND KLUMPP FARM, INC.
GARY GLENN KLUMPP, ET AL.
KINDER MORGAN LOUISIANA PIPELINE, LLC
TGT METER SITE
PROPOSED 36" PIPELINE
PINE PRAIRIE METER SITE
PROPOSED PINE PRAIRIE LATERAL
PROPOSED EUNICE COMPRESSOR STATION 760
COULEE ROAD
ERICK LANE
STA. 0+00 BEGIN SURVEY
STA. 34+00 SHT-002
REFERENCE DRAWINGS
REVISIONS
LEGEND
NOTES
PROPOSED AND EXISTING PIPELINES, ALONG WITH ALL UNDERGROUND OBSTRUCTIONS TO BE STAKED PRIOR TO CONSTRUCTION.
ALL PIPELINE DESIGN PROVIDED BY KINDER MORGAN INC.
CAUTION !
ALL UNDERGROUND OBSTRUCTIONS MAY NOT BE LOCATED.
BEARING BASIS: UTM COORDINATE SYSTEM, NAD 83, STATE PLANE - LOUISIANA SOUTH, US FOOT, CENTRAL MERIDIAN
SURVEYED BY: JOHN CHANCE
VERTICAL SCALE 1" = 20
HORIZONTAL SCALE 1" = 200
ENGINEERING RECORD
Figure 12 of 29
APPENDIX B
LAKE CHARLES
EXPANSION PROJECT
STA. 0+00 TO STA. 34+00
DWG. NO.
SHT-001
6
REV.

TRACT
OWNER NAME
TRACT NUMBER
FOOTAGE
RODDAGE
ACA-LC-005.00
KINDER MORGAN LOUISIANA PIPELINE, LLC
61.32'
3.72 RODS
ACA-LC-004.00
LOTTIE ROSE YOUNG KEITH, ET AL.
1292.61'
78.34 RODS
ACA-LC-003.00
4-T INVESTMENTS, INC.
1583.81'
95.99 RODS
34+00
34+61
47+54
63+38
STATIONING
34+59 PINE PRAIRIE METER SITE FENCELINE
34+61 PROPERTY LINE
40+78 P.I. < 4°23'06" RT.
47+54 TOP BANK DITCH & PROPERTY LINE
47+58 FENCELINE & TOE DITCH
47+59 WATERBODY STREAM
47+60 CENTERLINE DITCH
47+63 TOE DITCH
47+66 WATERBODY STREAM
47+70 TOP BANK DITCH
47+80 CENTERLINE LEVEE
47+88 TOE LEVEE
54+41 TOE LEVEE
54+56 CENTERLINE LEVEE
54+72 TOE LEVEE
63+08 OVERHEAD POWER
63+10 TOP BANK DITCH
63+15 CENTERLINE DITCH
63+19 TOP BANK DITCH
63+21 WATERBODY STREAM
63+23 WATERBODY STREAM
63+27 EDGE OF FOURNERAT ROAD
63+38 CENTERLINE OF FOURNERAT ROAD & PROPERTY LINE
63+49 EDGE OF FOURNERAT ROAD
63+51 END OF LINE AT ANR METER SITE
PINE PRAIRIE METER SITE
ANR METER SITE
PROPOSED PINE PRAIRIE LATERAL
PROPOSED 36" PIPELINE
PROPOSED EUNICE COMPRESSOR STATION 760
FOURNERAT ROAD
STACY LANE
COULEE ROAD
TRANSCANADA P/L
KINDER MORGAN P/L
FLORIDA GAS P/L
ACA-LC-006.00
STA. 63+38 END OF SURVEY
MIN. COVER
3' MIN. COVER
WETLAND\STREAM I.D.
1
PROFILE
36+00
38+00
40+00
42+00
44+00
46+00
48+00
50+00
52+00
54+00
56+00
58+00
60+00
62+00
80
70
60
50
40
30
20
STA. 34+00
EDGE OF DITCH
EDGE OF DITCH
EDGE OF DITCH
EDGE OF DITCH
CENTERLINE OF FOURNERAT ROAD
STA. 63+51
REFERENCE DRAWINGS
REF.
DRAWING NO.
DRAWING TITLE
REVISIONS
NO. DATE BY DESCRIPTION
1 5/13/14 PHG ADDED WORKSPACE
2 5/21/14 PHG UPDATED WS HATCH
3 5/22/14 PHG ADDED LATERAL AND PROPOSED COMPRESSOR SITE
4 5/28/14 PHG LEGEND UPDATES
5 6/10/14 PHG WORKSPACE CHANGES
6 6/17/14 PHG WORKSPACE CHANGES
LEGEND
C/L ALIGNMENT
WATER LINE
LEVEE C/L EDGE
EXISTING PIPELINE
C/L ROAD
PROPERTY LINE
POWER LINE
FENCE LINE
C/L DITCH/DRAINAGE
TRACT NUMBER
POWER POLE
PERMANENT EASEMENT
TEMPORARY WORKSPACE EASEMENT
ADDITIONAL TEMPORARY WORKSPACE EASEMENT
WETLAND
NOTES
PROPOSED AND EXISTING PIPELINES, ALONG WITH ALL UNDERGROUND OBSTRUCTIONS TO BE STAKED PRIOR TO CONSTRUCTION.
ALL PIPELINE DESIGN PROVIDED BY KINDER MORGAN INC.
CAUTION !
ALL UNDERGROUND OBSTRUCTIONS MAY NOT BE LOCATED.
BEARING BASIS: UTM COORDINATE SYSTEM, NAD 83, STATE PLANE - LOUISIANA SOUTH, US FOOT, CENTRAL MERIDIAN
NOTE: ALL DISTANCES SHOWN HEREON ARE GRID/STATE PLANE. TO COMPUTE GRID/STATE PLANE DISTANCES TO GROUND/SURFACE DISTANCES, MULTIPLY THE GRID/STATE PLANE DISTANCES BY COMBINED SCALE FACTOR OF 0.99967026
VERTICAL DATUM: NAVD 88, COMPUTED USING GEOID 09
*HORIZONTAL AND VERTICAL COORDINATES ARE BASED ON A STATIC OPUS SOLUTION.
SURVEYED BY: JOHN CHANCE LAND SURVEYS, INC.
VERTICAL SCALE 1" = 20
HORIZONTAL SCALE 1" = 200
ENGINEERING RECORD
DRAWN BY PHG 4/22/2014
CHECKED BY PCM 4/22/2014
APPROVED PCM 4/22/2014
PHOTO BY JCLS 4/22/2014
PLOT BY PHG 6/17/2014
DATE
Figure 13 of 29
APPENDIX B
LAKE CHARLES
EXPANSION PROJECT
STA. 34+00 TO STA. 63+51
DWG. NO.
SHT-002
6
REV.
L:\2014\1401391\CAD\Alignment\KM_Lake_Charles_Expansion.dwg Plotted By: guidryp on Tuesday, June 17, 2014 - 09:16am



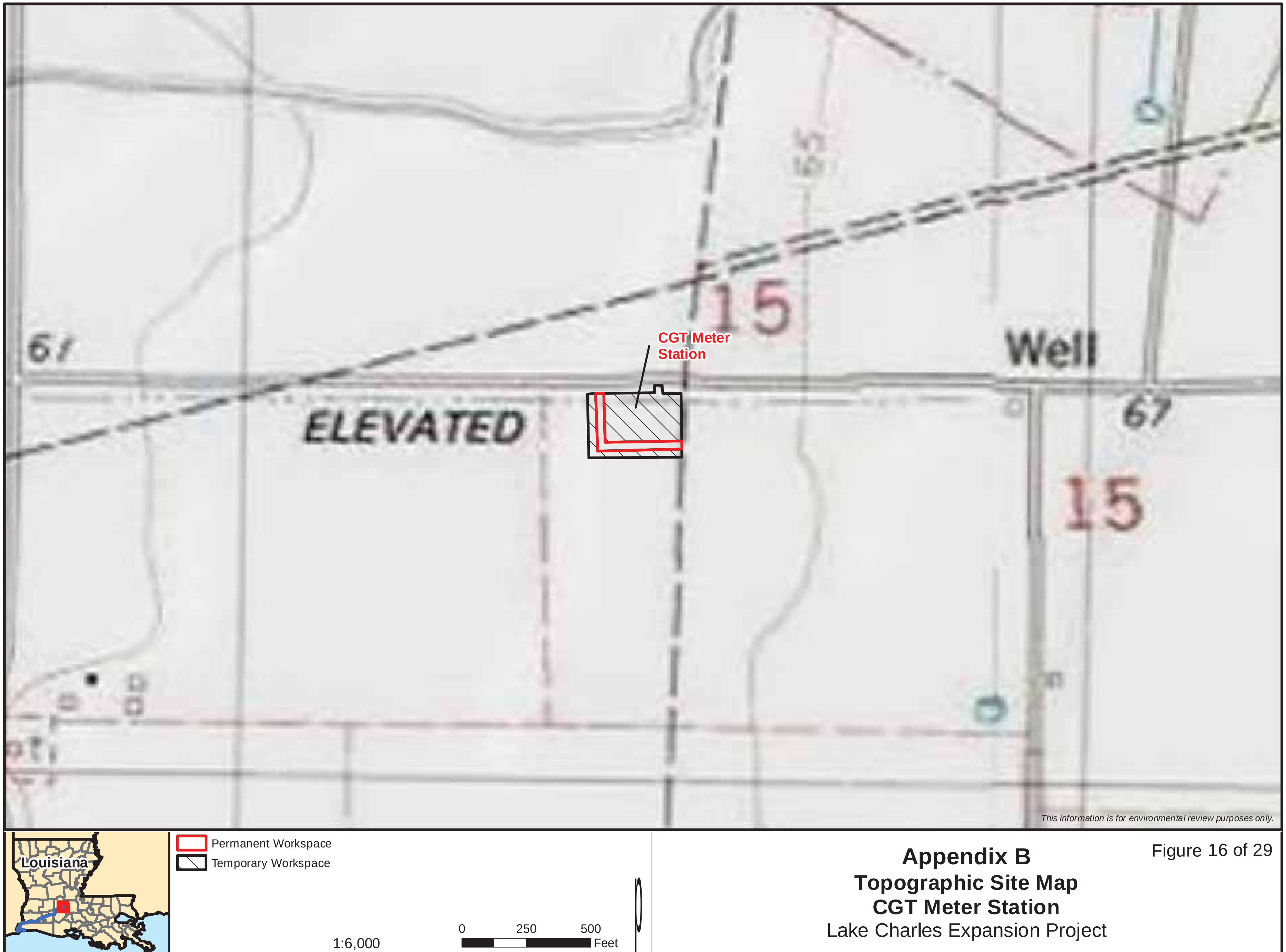
Appendix B
Topographic Site Map
Compressor Station 760
Lake Charles Expansion Project

Figure 14 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Topo_Series.mxd | REVISED: 04/16/2015 | SCALE: 1:6,000

DRAWN BY: JSSuess


Par Rd
0.8
0.7
Pine Prairie
Meter Station
Leroy Ln
0.6
Refinery Rd
0.5
Compressor
Station 760
0.4
0.3
Coulee Rd
0.2
Erick Ln
This information is for environmental review purposes only.
Louisiana
Mileposts
24-inch High Pressure Header Pipeline
36-inch Low Pressure Header Pipeline
Access Road
1:6,000
Permanent Workspace
Temporary Workspace
Additional Temporary Workspace
0
250
500
Feet
Appendix B
Aerial Site Map
Compressor Station 760
Lake Charles Expansion Project
Figure 15 of 29
FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Aerial_Series.mxd | REVISED: 04/16/2015 | SCALE: 1:6,000
DRAWN BY: JSSuess

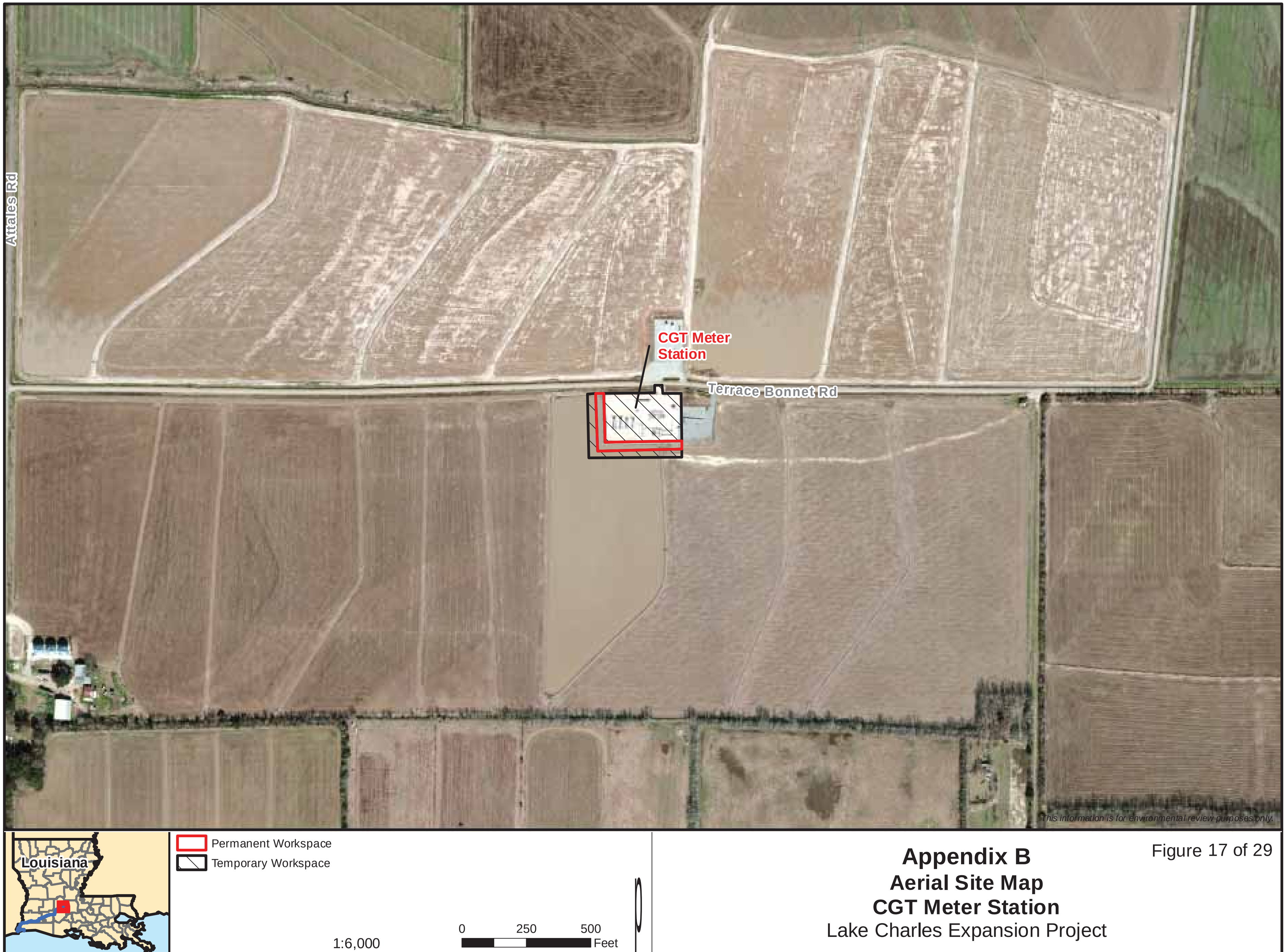


Appendix B
Topographic Site Map
CGT Meter Station
Lake Charles Expansion Project

Figure 16 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Topo_Series.mxd | REVISED: 04/15/2015 | SCALE: 1:6,000

DRAWN BY: JSSuess

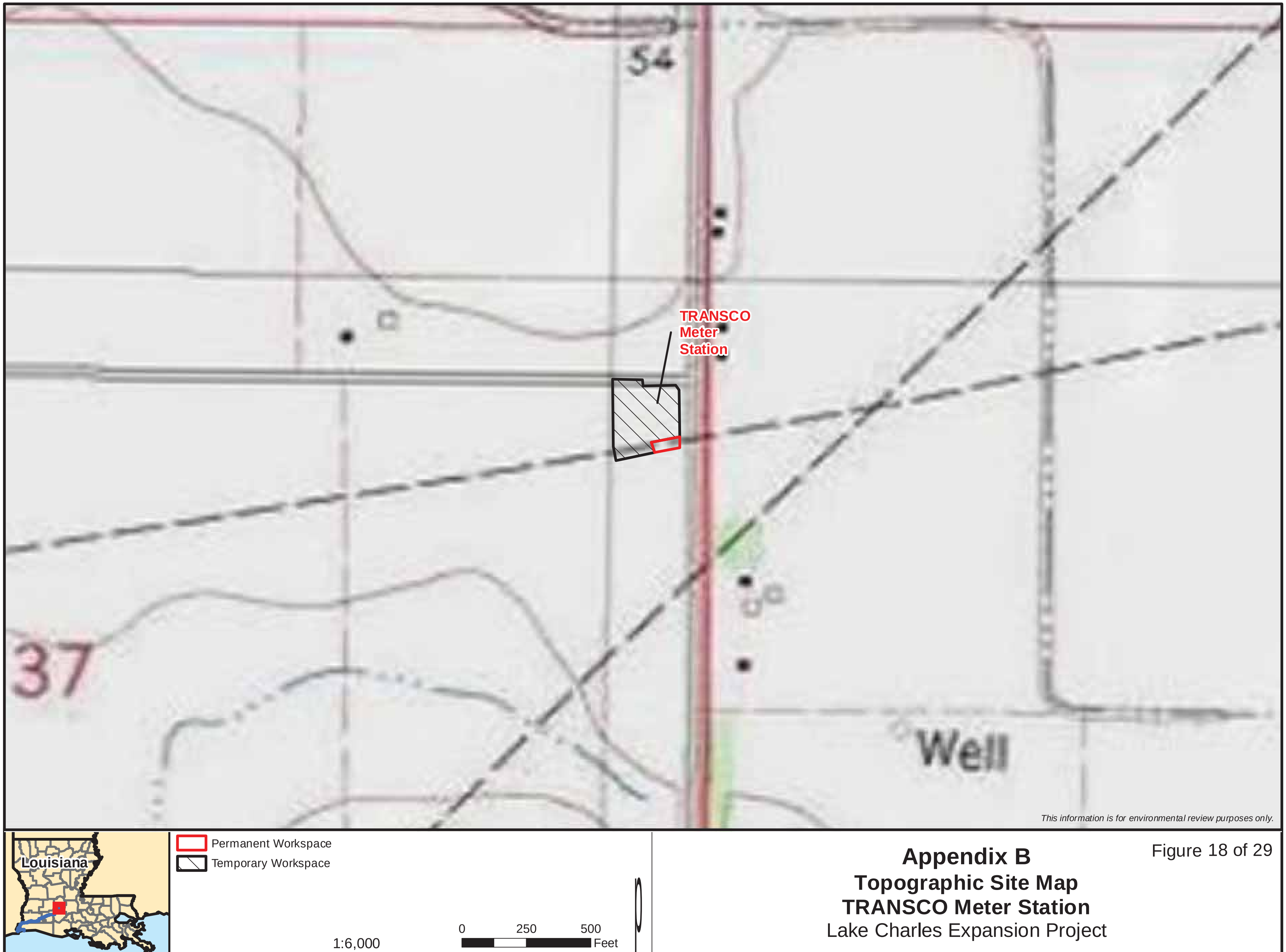


Appendix B
Aerial Site Map
CGT Meter Station
Lake Charles Expansion Project

Figure 17 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Aerial_Series.mxd | REVISED: 04/15/2015 | SCALE: 1:6,000

DRAWN BY: JSSuess



Appendix B
Topographic Site Map
TRANSCO Meter Station
Lake Charles Expansion Project

Figure 18 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Topo_Series.mxd | REVISED: 04/15/2015 | SCALE: 1:6,000

DRAWN BY: JSSuess

Appendix B
Aerial Site Map
TRANSCO Meter Station
Lake Charles Expansion Project

Figure 19 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Aerial_Series.mxd | REVISED: 04/15/2015 | SCALE: 1:6,000

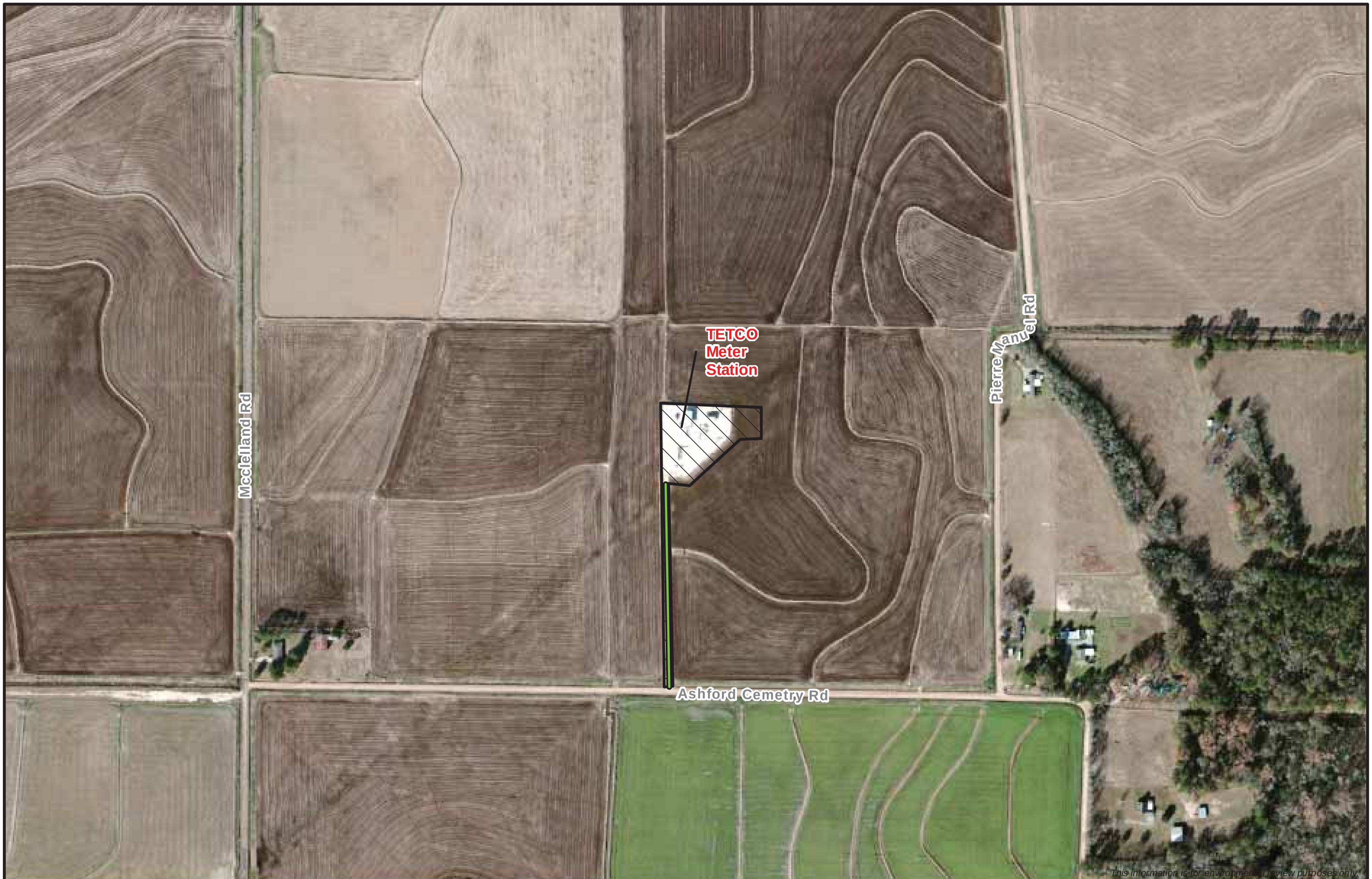
DRAWN BY: JSSuess

Appendix B
Topographic Site Map
TETCO Meter Station
Lake Charles Expansion Project

Figure 20 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Topo_Series.mxd | REVISED: 04/15/2015 | SCALE: 1:6,000

DRAWN BY: JSSuess



Access Road
Temporary Workspace

1:6,000

0 250 500 Feet

Appendix B
Aerial Site Map
TETCO Meter Station
Lake Charles Expansion Project

Figure 21 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Aerial_Series.mxd | REVISED: 04/15/2015 | SCALE: 1:6,000
DRAWN BY: JSSuess

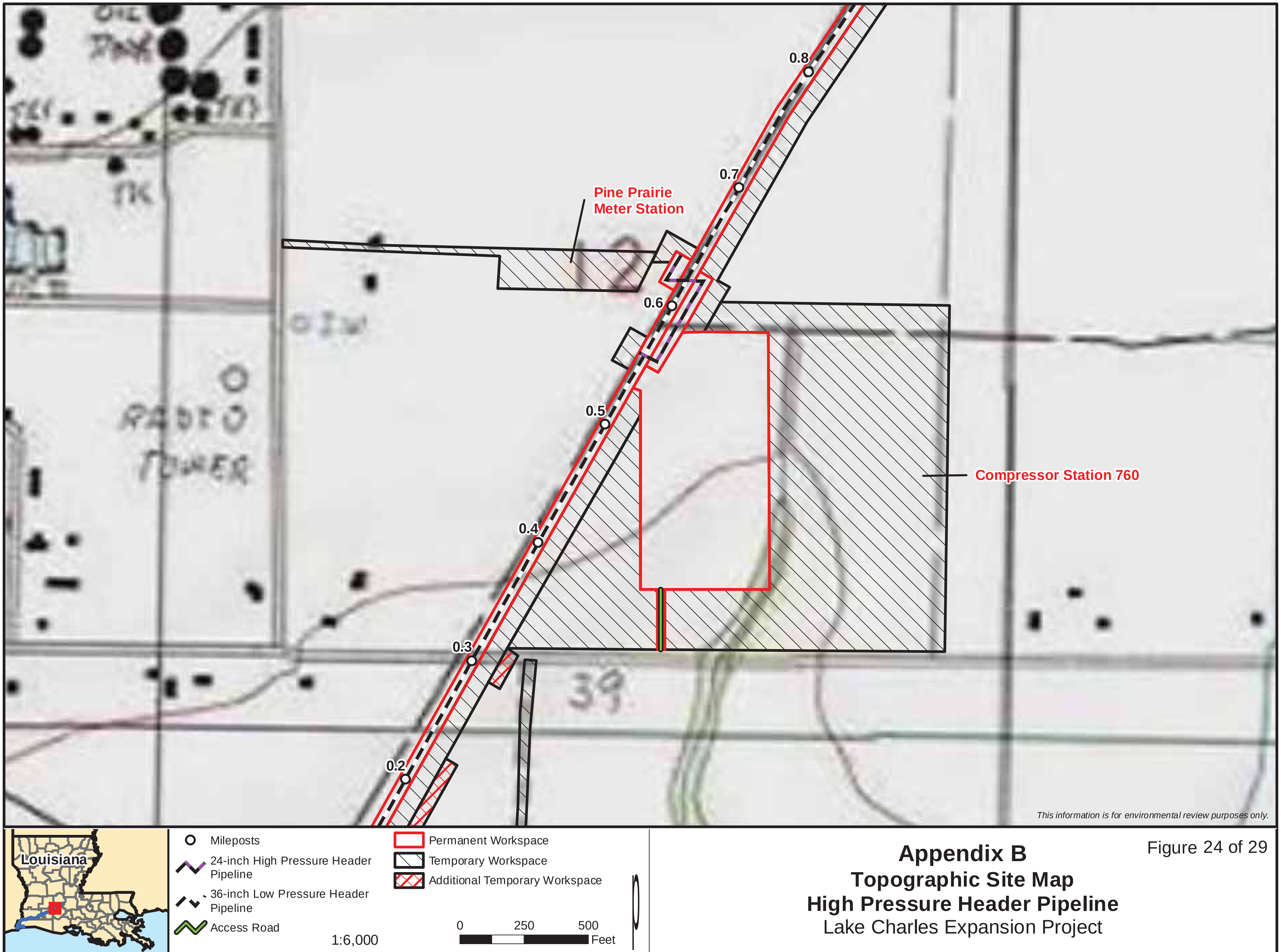
Appendix B
Topographic Site Map
ANR Meter Station
Lake Charles Expansion Project

Figure 22 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Topo_Series.mxd | REVISED: 04/15/2015 | SCALE: 1:6,000

DRAWN BY: JSSuess


Unatex Rd
Stacy Ln
Fournerat Rd
ANR Meter Station
Valse Dr
Par Rd
1.2
1.1
1
0.9
0.8
This information is for environmental review purposes only.
Louisiana
Mileposts
36-inch Low Pressure Header Pipeline
Permanent Workspace
Temporary Workspace
Additional Temporary Workspace
1:6,000
0 250 500 Feet
Appendix B
Aerial Site Map
ANR Meter Station
Lake Charles Expansion Project
Figure 23 of 29
FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Aerial_Series.mxd | REVISED: 04/15/2015 | SCALE: 1:6,000
DRAWN BY: JSSuess



Appendix B

Topographic Site Map

High Pressure Header Pipeline

Lake Charles Expansion Project

Figure 24 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Topo_Series.mxd | REVISED: 04/16/2015 | SCALE: 1:6,000

DRAWN BY: JSSuess

Mileposts
24-inch High Pressure Header Pipeline
36-inch Low Pressure Header Pipeline
Access Road
Permanent Workspace
Temporary Workspace
Additional Temporary Workspace

1:6,000

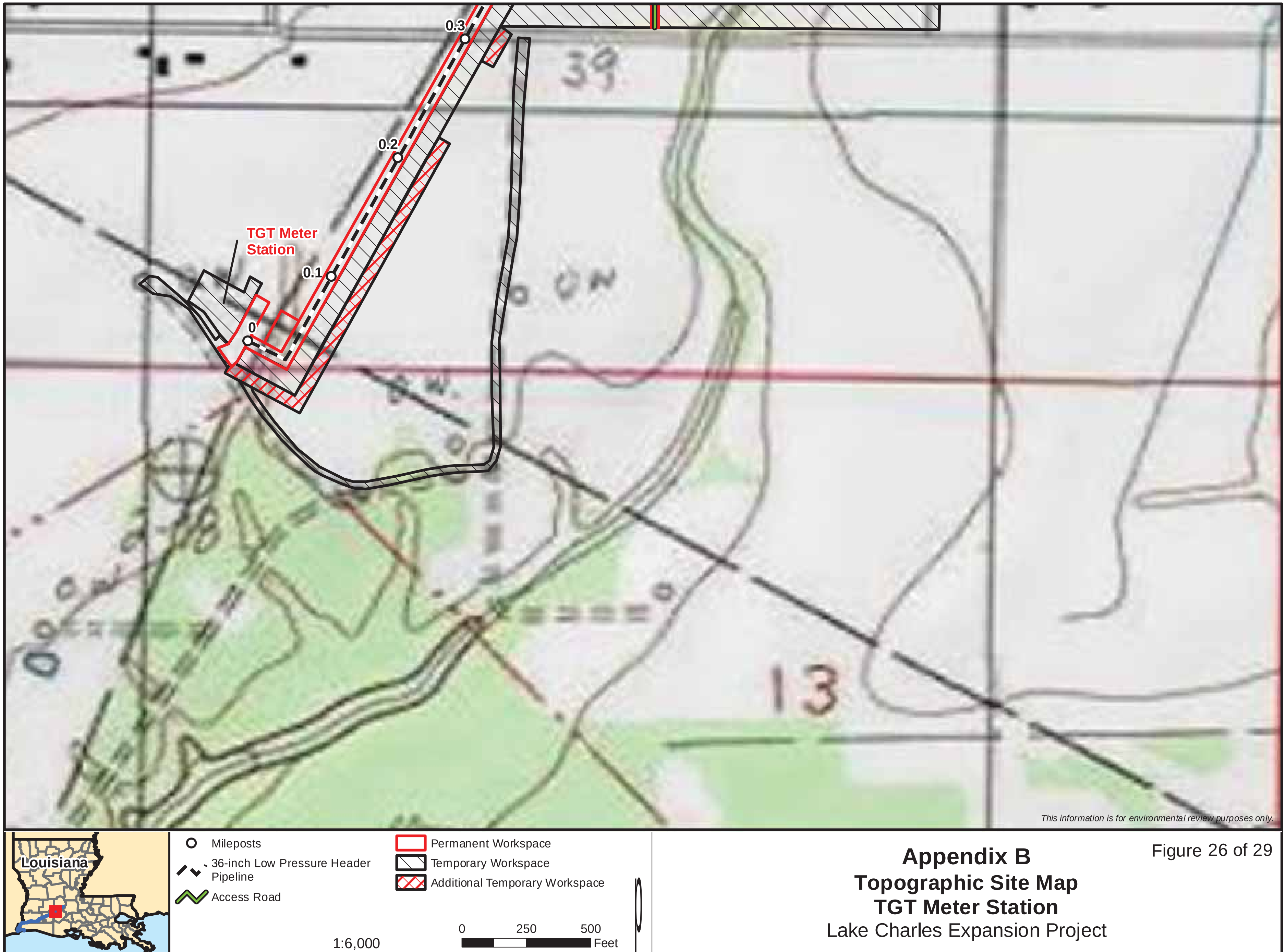
0 250 500 Feet

Appendix B
Aerial Site Map
High Pressure Header Pipeline
Lake Charles Expansion Project

Figure 25 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Aerial_Series.mxd | REVISED: 04/16/2015 | SCALE: 1:6,000

DRAWN BY: JSSuess



Appendix B
Topographic Site Map
TGT Meter Station
Lake Charles Expansion Project

Figure 26 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Topo_Series.mxd | REVISED: 04/15/2015 | SCALE: 1:6,000

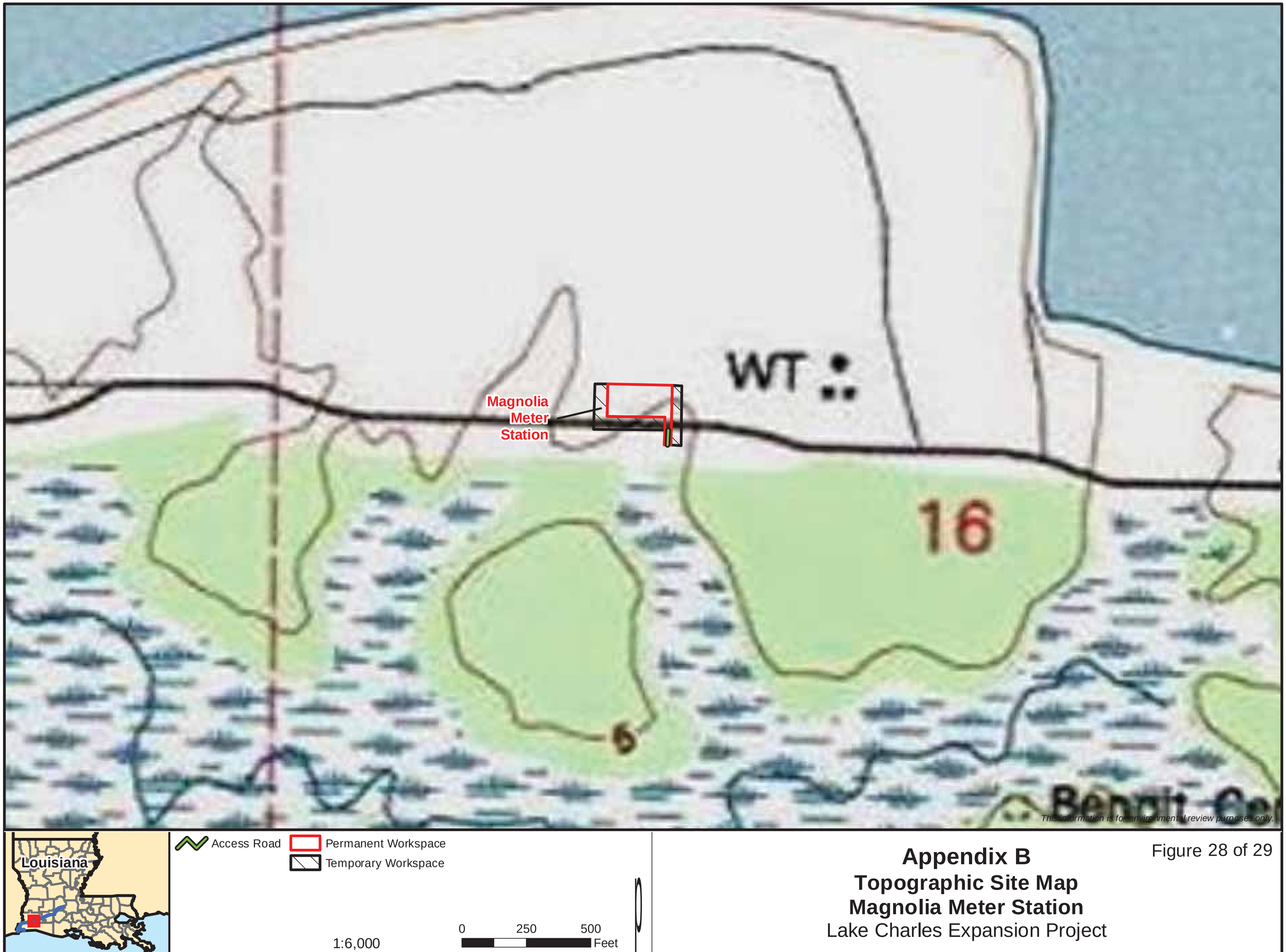
DRAWN BY: JSSuess

Appendix B
Aerial Site Map
TGT Meter Station
Lake Charles Expansion Project

Figure 27 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Aerial_Series.mxd | REVISED: 04/15/2015 | SCALE: 1:6,000

DRAWN BY: JSSuess



Appendix B
Topographic Site Map
Magnolia Meter Station
Lake Charles Expansion Project

Figure 28 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Topo_Series.mxd | REVISED: 04/15/2015 | SCALE: 1:6,000

DRAWN BY: JSSuess

Appendix B
Aerial Site Map
Magnolia Meter Station
Lake Charles Expansion Project

Figure 29 of 29

FILE: M:\Clients\M-O\MLP\Terminal_ArcGIS\2015\04\Topo_Aerial_Maps\Aerial_Series.mxd | REVISED: 04/15/2015 | SCALE: 1:6,000

DRAWN BY: JSSuess

APPENDIX C

BIRDS OF CONSERVATION CONCERN POTENTIALLY OCCURRING IN THE VICINITY OF THE LNG TERMINAL AND KMLP FACILITIES

APPENDIX C

Birds of Conservation Concern Potentially Occurring in the Vicinity of the LNG Terminal and KMLP Facilities

Common Name	Scientific Name	Colonial Waterbird	Breeds in Region	Nesting Habitat [a]		
				Ground	Shrub	Tree
American bittern	*Botaurus lentiginosus*	X	X	X	o	o
American oystercatcher	*Haematopus palliates*	-	X	X	o	o
Audubon's shearwater	*Puffinus iherminieri*	X	-	-	-	-
Bald eagle	*Haliaeetus leucocephalus*	-	X	o	o	X
Band-rumped storm-petrel [b]	*Oceanodroma castro*	X	-	-	-	-
Black rail	*Laterallus jamaicensis*	X	X	X	o	o
Black skimmer	*Rynchops niger*	X	X	X	o	o
Botteri's sparrow	*Peucaea botterii*	-	X	X	o	o
Buff-breasted sandpiper	*Tryngites subruficollis*	-	-	-	-	-
Dickcissel	*Spiza americana*	-	X	o	X	o
Grasshopper sparrow	*Ammodramus savannarum*	-	X	X	o	o
Gull-billed tern	*Gelochelidon nilotic*	X	X	X	o	o
Henslow's sparrow	*Ammodramus henslowii*	-	-	-	-	-
Hudsonian godwit	*Limosa haemastica*	-	-	-	-	-
Least bittern	*Ixobrychus exilis*	X	X	X	o	o
Least tern	*Sternula antillarum*	X	X	X	o	o
LeConte's sparrow	*Ammodramus leconteii*	-	-	-	-	-
Lesser yellowlegs	*Tringa flavipes*	-	-	-	-	-
Loggerhead shrike	*Lanius ludovicianus*	-	X	o	o	X
Long-billed curlew	*Numenius americanus*	-	X	X	o	o
Marbled godwit	*Limosa fedoa*	-	-	-	-	-
Mountain plover	*Caradrius montanus*	-	-	-	-	-
Nelson's sharp-tailed sparrow	*Ammodramus nelson*	-	-	-	-	-
Painted bunting	*Passerina ciris*	-	X	o	X	o
Peregrine falcon	*Falco peregrinus*	-	-	-	-	-
Prothonotary warbler	*Protonotaria citrea*	-	X	o	o	X
Red knot	*Calidris canutus roselaari*	-	-	-	-	-
Red knot [c]	*Calidris canutus rufa*	-	-	-	-	-
Reddish egret	*Egretta rufescens*	X	X	o	o	X
Sandwich tern	*Thalasseus sandvicensis*	X	X	X	o	o
Seaside sparrow	*Ammodramus maritimus*	-	X	o	X	o
Sedge wren	*Cistothorus platensi*	-	-	-	-	-
Short-billed dowitcher	*Limnodromus griseus*	-	-	-	-	-
Short-eared owl	*Asio flammeus*	-	-	-	-	-
Snowy plover	*Charadrius nivosus*	-	X	X	o	o
Solitary sandpiper	*Tringa solitary*	-	-	-	-	-
Sprague's pipit	*Anthus spragueii*	-	-	-	-	-
Swainson's warbler	*Limnothlypis swainsonii*	-	X	o	X	o
Swallow-tailed kite	*Elanoides forficatus*	-	X	o	o	X
Upland sandpiper	*Bartramia longicauda*	-	-	-	-	-
Whimbrel	*Numenius phaeopus*	-	-	-	-	-
White-tailed hawk	*Geranoaetus albicaudatus*	-	X	o	o	X
Wilson's plover	*Charadrius wilsonia*	-	X	X	o	o
Yellow rail	*Coturnicops noveboracensis*	X	-	-	-	-

Note: "-" = not applicable; "o" = does not nest in habitat type

[a] Nesting habitat type is only provided for those species who breed in Bird Conservation Region 37.

[b] Candidate species under the Endangered Species Act.

[c] Species recently listed as threatened under the Endangered Species Act and discussed further in section 4.7.

Sources: U.S. Fish and Wildlife Service, 2008; Cornell Lab of Ornithology, 2015.

APPENDIX D

REFERENCES AND CONTACTS

APPENDIX D
REFERENCES AND CONTACTS

Abbott, R., and E. Bing-Sawyer. 2002. Assessment of Pile-Driving Impacts on the Sacramento Blackfish (*Othodon microlepidotus*). Draft report prepared for the California Department of Transportation, District 4.

Adrian, M. and J. Icaza. 2015. Estimations for Job Growth in the Tertiary and Quaternary Sectors in Southwest Louisiana: Predicting Permanent "Post Boom" Employment Based Upon Anticipated Population Growth. Available online at http://allianceswla.org/Images/Interior/PageDisplay.asp?p1=2645estimations%20for%20job%20growth%20in%20the%20tertiary%20and%20quaternary%20sectors%20in%20southwest%20louisiana-%20predicting%20permanent%PageDisplay.asp?p1=264520post%20boom%20employment%20(2nd%20.pdf. Accessed April 2015.

Advanced Materials Services, LLC. 2014. Calcasieu Point Traffic Mitigation Pavement Analysis. Prepared for Lake Charles LNG, Magnolia LNG, and G2X Energy.

Air Liquide. 2013. Air Liquide Gas Encyclopedia. Available online at http://encyclopedia.airliquide.com/encyclopedia.asp. Accessed June 2015.

Audubon. 2014. Christmas Bird Count. Available online at http://www.audubon.org/conservation/science/christmas-bird-count. Accessed April 2015.

Ausenco. 2015. Port of Lake Charles, Calcasieu Ship Channel Traffic Study. Final Report. Report 100218-01-RPT-0001. January 6, 2015.

Barnes et al. 1977. Power Plant Construction Noise Guide. Bolt, Beranek and Newman, Incorporated.

Black & Veatch. 2015. LNG. Available online at http://bv.com/home/capabilities/market/Energy/Oil-AND-Gas/LNG. Accessed January 2015.

Bosma, P. and R.K. Nagelvoort. 2009. Liquefaction Technology; Developments through History. Shell Global Solutions International BV. Proceedings of the 1st Annual Gas Processing Symposium.

Bradley, A., H. Duan, W. Elion, E. Soest-Vercammen, and R.K. Nagelvoort. 2009. Innovation in the LNG Industry: Shell's Approach. Shell Global Solutions International BV.

C.H. Fenstermaker and Associates, LLC. 2014. Traffic Impact Study. Prepared for Lake Charles LNG, Magnolia LNG, and G2X Energy.

Calcasieu Parish Police Jury. 2015. Calcasieu Parish Mapping Application for Zoning. Available online at http://cppj.totaland.com/. Accessed March 2015.

Cameron Parish Police Jury. 2015. Hospital. Available online at http://www.parishofcameron.net/PageDisplay.asp?p1=2645. Accessed March 2015.

Cameron Parish Tourist Commission. 2014. Hotels/Motels. Available online at http://cameronparishtouristcommission.org/sleep/. Accessed May 2014.

Carter, L. 2015. Email communication on April 1, between L. Thomas (Natural Resource Group, LLC) and L. Carter (Parks Superintendent, Calcasieu Parish Police Jury, Lake Charles, Louisiana).

Caterpillar. 2007. VM 20 C Project Guide: Generator Set. Caterpillar Motorem Gmblt & Co. KG. Kiel Germany. April 2007.

Caterpillar. 2011. VM 25 C Project Guide: Generator Set. Caterpillar Motorem Gmblt & Co. KG. Kiel Germany. August 2011.

Caterpillar. 2012. VM 32 C Project Guide: Generator Set. Caterpillar Motorem Gmblt & Co. KG. Kiel Germany. August 2012.

ConocoPhillips. 2014a. Kenai LNG Plant and North Cook Inlet Fact Sheet. Available online at http://alaska.conocophillips.com/Documents/Fact%20Sheet_Kenai%20LNG_CURRENT.pdf. Accessed August 2014.

ConocoPhillips. 2014b. Optimized Cascade Process. Available online at http://lnglicensing.conocophillips.com/what-we-do/lng-technology-licensing/Pages/optimized-cascade-process.aspx. Accessed April 2015.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Prepared for the U.S. Fish and Wildlife Service. FWS/OBS-79/31. December 1979.

Crone, A.J. and R.L. Wheeler. 2000. Data for Quaternary faults, liquefaction features, and possible tectonic features in the Central and Eastern United States, east of the Rocky Mountain front. U.S. Geological Survey Open-File Report 00-260. Geological Hazards Team, Denver, Colorado.

Cropley, P. and Eberwine, J. 2014. Negative Findings: Phase I Cultural Resources Survey of the Proposed Lake Charles Expansion Project in Acadia, Calcasieu, and Evangeline Parishes, Louisiana. R. Christopher Goodwin & Associates, Inc., New Orleans, Louisiana.

Davis, Lucas. 2010. The Effect of Power Plants on Local Housing Values and Rents. Available online at http://faculty.haas.berkeley.edu/ldavis/pp.pdf. Accessed May 2015.

Ecology and Environment Inc. 2013a. Baseline Noise Study Report. Prepared for Magnolia LNG, LLC. November 2013.

Ecology and Environment, Inc. 2013b. Dredge Area Sampling Summary Report for the Magnolia LNG Berth Area. Baton Rouge, Louisiana.

Environmental Laboratory. 1987. U.S. Army Corps of Engineers Wetland Delineation Manual. Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station. Vicksburg, Mississippi.

Environmental Resources Management. 2015. Air Dispersion Modeling Report. Prepared for Magnolia LNG, LLC. January 2015.

Epstein, J.B., D.J. Weary, R.C. Orndorff, Z.C. Bailey, and R.C. Kerbo. 2002. National Karst Map Project. Available online at http://water.usgs.gov/ogw/karst/kig2002/jbe_map.html. Accessed April 2014.

Esslinger, C.G., and B.C. Wilson. 2003. North American Waterfowl Management Plan, Gulf Coast Joint Venture: Chenier Plain Initiative. North American Waterfowl Management Plan. Albuquerque, New Mexico. Available online at http://www.gcjv.org/docs/ChenierPlainpub.pdf. Accessed May 2014.

Federal Emergency Management Agency. 2014. Flood Insurance Rate Maps. Available online at https://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView?storeId=10001&catalogId=10001&langId=-1&userType=G. Accessed April 2014.

Fontenot, T. 2013. Email communication on September 11, between K. Welder (Ecology and Environment Inc.) and T. Fontenot (Executive Assistant, Jefferson Davis Parish Economic Development Commission).

Frey, R.C. and R.D. Kaiser. 1984. Surface exposures of Late Cretaceous strata at the Rayburns Dome, Bienville Parish, Louisiana. Gulf Coast Association of Geological Societies Transactions (34):357–361.

Fugro Consultants, Inc. 2014a. Geotechnical Investigation for Magnolia LNG Project. Prepared for CH-IV International, LLC. Port of Lake Charles, Louisiana. Report No. 04.10130048. April 23, 2014.

Fugro Consultants, Inc. 2014b. Seismic Studies for Magnolia LNG Facility, Port of Lake Charles, Louisiana. Prepared for CH-IV International, LLC. Report No. 04.10130048-1. October 7, 2014.

Fugro Consultants, Inc. 2015. Geotechnical Investigation for Magnolia LNG Project. Prepared for CH-IV International, LLC. Port of Lake Charles, Louisiana. Report No. 04.10130048. January 8, 2015.

Fuller, D.A., A.M. Tappan, and M.C. Hester. 1987. Sea Turtles in Louisiana's Coastal Waters. Prepared for Coastal Fisheries Institute and Louisiana Sea Grant College Program, Louisiana State University. August 1987. Available online at http://www.seagrantfish.lsu.edu/pdfs/seaturtles.pdf. Accessed April 2015.

Google. 2014. Goople Maps. Available online at https://maps.google.com/. Accessed May 2014.

Google. 2015. Google Earth aerial photography. March 2015.

Gulf of Mexico Fishery Management Council. 2005. FINAL Generic Amendment Number 3 for Addressing Essential Fish Habitat Requirements, Habitat Areas of Particular Concern, and Adverse Effects of Fishing in the following Fishery Management Plans of the Gulf of Mexico: Shrimp Fishery of the Gulf of Mexico, United States Water; Red Drum Fishery of the Gulf of Mexico; Reef Fish Fishery of the Gulf of Mexico; Coastal Migratory Pelagic Resources (Mackerels) in the Gulf of Mexico and South Atlantic; Stone Crab Fishery of the Gulf of Mexico; Spiny Lobster in the Gulf of Mexico and South Atlantic; Coral and Coral Reefs of the Gulf of Mexico. Available online at http://www.gulfcouncil.org/Beta/GMFMCWeb/downloads/FINAL3_EFH_Amendment.pdf. Accessed April 2015.

Gulf of Mexico Fishery Management Council. 2010. Fishery Management Plans and Amendments. Available online at http://www.gulfcouncil.org/fishery_management_plans/index.php. Accessed April 2014.

HotelsMotels.info. 2015. Hotels and Motels in Louisiana. Available online at http://www.hotelmotels.info/Louisiana/. Accessed March 2015.

Hunt, C.B. 1967. Physiography of the United States. W. H. Freeman and Company, San Francisco, California.

Hunt, E.C., G. Bourneuf. 2003. Modern Engineer's Manual, Volume 1, 3rd Edition. Eds. D. Augustine and J. Tiratto. Cornell Maritime Press, Inc. Centreville, Maryland.

ICF Jones and Stokes. 2012. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Updated October 2012. Available online at http://www.dot.ca.gov/hq/env/bio/files/Guidance_Manual_2_09.pdf. Accessed March 2015.

IMCAL. 2013. Traffic Counts, 2008 – 2013. Available online at https://sites.google.com/site/countsimcal/2008---2013. Accessed March 2015.

International Energy Agency. 2012a. World Energy Outlook 2012, Executive Summary. Available online at http://www.iea.org/publications/freepublications/publication/English.pdf. Accessed August 2014.

International Energy Agency. 2012b. World Energy Outlook 2012, Renewable Energy Outlook. Available online at http://www.worldenergyoutlook.org/publications/weo-2012/. Accessed August 2014.

International Energy Agency. 2014a. Hydropower. Available online at http://www.iea.org/topics/renewables/subtopics/hydropower/. Accessed August 2014.

International Energy Agency. 2014b. World Energy Outlook 2014 Factsheet - How will global energy markets evolve to 2040? Available online at http://www.worldenergyoutlook.org/media/weowebsite/2014/WEO2014FactSheets.pdf. Accessed January 2015.

Interstate Natural Gas Association of America. 2001. Natural Gas Pipeline Impact on Land Values. INGAA Foundation. Houston, Texas. Available online at http://www.ingaa.org/Foundation/Studies/FoundationReports/207.aspx. Accessed March 2015.

Kent, J.D. 2012. Assessing the Long-term Impact of Subsidence and Global Climate Change on Emergency Evacuation Routes in Coastal Louisiana: A report of findings for the Gulf Coast center for evacuation and transportation resiliency. Gulf Coast Center for Evacuation and Transportation Resiliency. Report No. 11-09. Baton Rouge, Louisiana.

Louisiana Department of Environmental Quality. 2004. Basin Subsegments from LDEQ Source Data, 200406, Geographic NAD83, LOSCO [basin_subsegments_LDEQ_2004]. Baton Rouge, Louisiana. Available online at https://catalog.data.gov/dataset/basin-subsegments-from-ldeq-source-data-geographic-nad83-losco-2004-basin-subsegments-ldeq-2004#. Accessed January 2015.

Louisiana Department of Environmental Quality. 2008. Water Quality Management Plan: Volume 4. Basin and Subsegment Boundaries. Available online at http://www.deq.louisiana.gov/portal/Portals/0/planning/WQMP_Vol4_Rev_Final.pdf. Accessed October 2014.

Louisiana Department of Environmental Quality. 2009a. Chicot Aquifer Summary, 2008. Appendix 10 to the 2009 Triennial Summary Report. Baton Rouge, Louisiana. Available online at http://www.deq.louisiana.gov/portal/Portals/0/evaluation/aeps/10ChicotAquiferSummary09-1.pdf. Accessed December 2014.

Louisiana Department of Environmental Quality. 2009b. Mississippi River Alluvial Aquifer Summary, 2008. Appendix 10 to the 2009 Triennial Summary Report. Baton Rouge, Louisiana.

Louisiana Department of Environmental Quality. 2013a. 2012 Louisiana Water Quality Inventory: Integrated Report (305(b)/303(d)) Final. Available online at http://www.deq.louisiana.gov/portal/DIVISIONS/WaterPermits/WaterQualityStandardsAssessment/WaterQualityInventorySection305b/2012IntegratedReport.aspx. Accessed February 2015.

Louisiana Department of Environmental Quality. 2013b. Emissions Inventory and Reporting Center. Available online at http://business.deq.louisiana.gov/Eric/EricReports/ParishReportSelector/AmbientAirMonitoringDataandReports.aspx. Accessed April 2015.

Louisiana Department of Environmental Quality. 2014. Email dated August 29, 2014, from Melinda Molieri (Louisiana Department of Environmental Quality) to Mike Buckless (Natural Resource Group, LLC).

Louisiana Department of Health and Hospitals. 2006. Louisiana Surface Drinking Water System Intake Locations. Available online at https://catalog.data.gov/dataset/louisiana-surface-drinking-water-system-intake-locations-geographic-nad83-ldhh-2006-drinki-2006. Accessed January 2015.

Louisiana Department of Natural Resources, Office of Conservation. 2014a. Oil/Gas Fields. SONRIS Database. Baton Rouge, Louisiana. Available online at http://www.sonris.com/. Accessed May 2014.

Louisiana Department of Natural Resources, Office of Conservation. 2014b. Oil/Gas Wells. SONRIS Database. Baton Rouge, Louisiana. Available online at http://www.sonris.com/. Accessed May 2014.

Louisiana Department of Natural Resources. 2012a. Coastal Zone Boundary. Available online at http://dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=928. Accessed March 2015.

Louisiana Department of Natural Resources. 2012b. Managing Louisiana's Groundwater Resources with Supplemental Information on Surface Water Resources. An interim report to the Louisiana Legislature. Louisiana Groundwater Resources Commission. Baton Rouge, Louisiana. Available online at http://dnr.louisiana.gov/assets/docs/conservation/groundwater/12.Final.GW.Report.pdf. Accessed December 2014.

Louisiana Department of Natural Resources. 2014c. Office of Conservation Update on Statewide Groundwater Management. Letter from J. Walsh (Commissioner of Conservation) dated December 8, 2014.

Louisiana Department of Natural Resources. 2014d. Strategic Online Natural Resource Information System - database of registered water wells in the state of Louisiana. October 2013. Available online at http://sonris.com/. Accessed December 2014.

Louisiana Department of Transportation and Development and U.S. Geological Survey. 1999. Distribution of Saltwater in the Chicot Aquifer System of Southwestern Louisiana, 1995-96. Water Resources Technical Report No. 66. Baton Rouge, Louisiana.

Louisiana Department of Transportation and Development and U.S. Geological Survey. 2004. Thickness of the Chicot Aquifer System Surficial Confining Unit and Location of Shallow Sands, Southwestern Louisiana. Water Resources Technical Report No. 73. Baton Rouge, Louisiana.

Louisiana Department of Transportation and Development and U.S. Geological Survey. 2011. Water Use in Louisiana, 2010. Water Resources Special Report No. 17. Revised December 2012. Baton Rouge, Louisiana. Available online at http://la.water.usgs.gov/WaterUse/references.html. Accessed December 2014.

Louisiana Department of Wildlife and Fisheries. 2005. Louisiana Comprehensive Wildlife Conservation Strategy (Wildlife Action Plan). Available online at http://www.wlf.louisiana.gov/sites/default/files/pdf/document/32892-western-longleaf-pine-savannah/western_longleaf_pine_savannah.pdf. Accessed June 2015.

Louisiana Department of Wildlife and Fisheries. 2012. Louisiana Natural and Scenic Rivers Descriptions and Map. Available online at http://www.wlf.louisiana.gov/louisiana-natural-and-scenic-rivers-descriptions-and-map. Accessed February 2015.

Louisiana Department of Wildlife and Fisheries. 2014a. Birds of Louisiana. Available online at http://www.wlf.louisiana.gov/wildlife/birds-louisiana. Accessed July 2014.

Louisiana Department of Wildlife and Fisheries. 2014b. Email dated November 10, 2014, from C. Gothreaux (Fisheries Extension, Louisiana Department of Wildlife and Fisheries) to J. Rieland (Natural Resource Group, LLC).

Louisiana Department of Wildlife and Fisheries. 2014c. Mammals of Louisiana. Available online at http://www.wlf.louisiana.gov/wildlife/mammals-louisiana. Accessed July 2014.

Louisiana Department of Wildlife and Fisheries. 2014d. Snakes of Louisiana. Available online at http://www.wlf.louisiana.gov/resource/snakes-louisiana. Accessed July 2014.

Louisiana Department of Wildlife and Fisheries. 2014e. Rare Animals of Louisiana, Brown Pelican. Available online at http://www.wlf.louisiana.gov/sites/default/files/pdf/fact_sheet_animal/32252-Pelecanus%20occidentalis/pelecanus_occidentalis.pdf. Accessed July 2014.

Louisiana Department of Wildlife and Fisheries. 2014f. Rare Animals of Louisiana, Kemp's Ridley Sea Turtle. Available online at http://www.wlf.louisiana.gov/sites/default/files/pdf/fact_sheet_animal/32231-Lepidochelys%20kempii/lepidochelys_kempii.pdf. Accessed June 2014.

Louisiana Department of Wildlife and Fisheries. 2014g. Rare Animals of Louisiana, Manatee. Available online at http://www.wlf.louisiana.gov/sites/default/files/pdf/fact_sheet_animal/32310-Trichechus%20manatus/trichechus_manatus.pdf. Accessed July 2014.

Louisiana Department of Wildlife and Fisheries. 2014h. Species by Parish List. Available online at http://www.wlf.louisiana.gov/wildlife/species-parish-list. Accessed April 2014.

Louisiana Geological Survey. 2002a. Lake Charles 30 x 60 Minute Geologic Quadrangle. Louisiana State University, Baton Rouge, Louisiana.

Louisiana Geological Survey. 2002b. Ville Platte 30 x 60 Minute Geologic Quadrangle. Louisiana State University, Baton Rouge, Louisiana.

Louisiana Geological Survey. 2003. Crowley 30 x 60 Minute Geologic Quadrangle. Louisiana State University, Baton Rouge, Louisiana.

Louisiana Hospital Association. n.d. Find a Hospital. Available online at http://www.lhaonline.org/displaycommon.cfm?an=1&subarticlenbr=143. Accessed September 2013.

Louisiana Natural Heritage Program. 2009. Natural Communities of Louisiana. Louisiana Department of Wildlife and Fisheries. Available online at http://www.wlf.louisiana.gov/sites/default/files/pdf/page_wildlife/6776-Rare%20Natural%20Communities/LA_NAT_COM.pdf. Accessed May 2014.

Louisiana Natural Heritage Program. 2013. Letter dated September 13, 2013, from C. Michon (for Amity Bass, Coordinator) to B. Daughdrill (Ecology and Environment, Inc.).

Louisiana Natural Heritage Program. 2014. Letter dated March 26, 2014, from C. Michon (for Amity Bass, Coordinator) to B. Daughdrill (CH2M HILL).

Louisiana Office of State Fire Marshal. 2015. Louisiana Fire Department online Registry. Available online at http://sfm.dps.louisiana.gov/fdr/FDInfoReport.aspx. Accessed March 2015.

Louisiana Workforce Commission. 2014. Labor Force Data Series. Available online at http://lwc.laworks.net/sites/LMI/Pages/LaborForceSeries.aspx. Accessed March 2015.

Lovelace, J.K. 1999. Water Levels and Movement in the "200-foot" sand in Calcasieu Parish, Louisiana. Prepared for the U.S. Environmental Protection Agency. Project Proposal LA-99F. Available online at http://la.water.usgs.gov/proposals/wl200.html. Accessed December 2014.

Lovelace, J.K., J.W. Fontenot, and C.P. Frederick. 2004. Withdrawals, Water Levels, and Specific Conductance in the Chicot Aquifer System in Southwestern Louisiana, 2000-03: U.S. Geological Survey Scientific Investigations Report 2004-5212.

Maekawa, Z and Lord, P. 1994. Environmental and Architectural Acoustics. Suffolk, Great Britian: St. Edmundsbury Press.

Magnolia LNG, LLC. 2014a. Conference call between C. Znati (Chemical Engineer, Coast Guard Office of Hazardous Materials Division) and B. Daughdrill (Environmental Scientist, Ecology & Environment, Inc.) held November 10, 2014.

Magnolia LNG, LLC. 2014b. Conference call between J. Marceaux (Biologist, U.S. Fish and Wildlife Service) and D. Trimm (Biologist, Ecology & Environment, Inc.) held February 3, 2014.

Marcell, M.H. and S. Beal. No Date. Louisiana Scenic Byways. Prepared for the Louisiana Department of Culture, Recreation, and Tourism. Available online at http://www.crt.state.la.us/Assets/documentarchive/impact-report/Scenic%20Byways.pdf. Accessed March 2015.

Moffatt & Nichol. 2013. Magnolia LNG LLC Storm Surge Analysis. Prepared for CH-IV International.

Moffatt and Nichol. 2014. Magnolia LNG Export Terminal Project - Marine Facilities Feed Calcasieu Parish, Louisiana; Scour and Shoreline Protection.

National Oceanic and Atmospheric Administration, National Geodetic Survey. 2014. Vertical Datums. Available online at http://www.ngs.noaa.gov/datums/vertical/. Accessed March 2015.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 1991. Recovery Plan for the Humpback Whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 105 pp. Available online at http://www.nmfs.noaa.gov/pr/pdfs/recovery/whale_humpback.pdf. Accessed March 2015.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 1998. Recovery Plan for the Blue Whale (*Balaenoptera musculus*). Prepared by Reeves R.R., P.J. Clapham, R.L. Brownell, Jr., and G.K. Silber for the National Marine Fisheries Service, Silver Spring, Maryland.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2010a. Recovery Plan for the Fin Whale (*Balaenoptera physalus*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 121 pp. Available online at http://www.nmfs.noaa.gov/pr/pdfs/recovery/finwhale.pdf. Accessed March 2015.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2010b. Recovery Plan for the Sperm Whale (*Physeter macrocephalus*). National Marine Fisheries Service, Silver Spring, Maryland. 165 pp. Available online at http://www.nmfs.noaa.gov/pr/pdfs/recovery/final_sperm_whale_recovery_plan_21dec.pdf. Accessed March 2015.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2011a. Final Recovery Plan for the Sei Whale (*Balaenoptera borealis*). Available online at http://www.nmfs.noaa.gov/pr/pdfs/recovery/seiwhale.pdf. Accessed April 2015.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2011b. Gulf of Mexico Essential Fish Habitat. Available online at http://ccma.nos.noaa.gov/products/biogeography/gom-efh/. Accessed February 2015.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2012. An Overview of Protected Species in the Gulf of Mexico. Available online at http://sero.nmfs.noaa.gov/protected_resources/outreach_and_education/documents/protected_species_gom.pdf. Accessed July 2014.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2013a. Hawksbill Turtle (*Eretmochelys imbricata*). Available online at http://www.fisheries.noaa.gov/pr/species/turtles/hawksbill.htm. Accessed April 2015.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2013b. Kemp's Ridley Turtle (*Lepidochelys kempii*). Available online at http://www.fisheries.noaa.gov/pr/species/turtles/kempsridley.htm. Accessed April 2015.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2013c. Leatherback Turtle (*Dermochelys coriacea*). Available online at National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2013e. Loggerhead Turtle (*Caretta caretta*). Available online at http://www.fisheries.noaa.gov/pr/species/turtles/loggerhead.htm. Accessed July 2014.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2013d. NOAA Habitat Conservation-Habitat Protection-EFH Text Descriptions & GIS Data Inventory. Available online at http://www.habitat.noaa.gov/protection/efh/newInv/index.html. Accessed April 2014.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2013f. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2012. Volume I. G.T. Waring, E. Josephson, K. Maze-Foley, P.E. Rosel (eds.). Available online at http://www.nmfs.noaa.gov/pr/sars/pdf/ao2012.pdf. Accessed March 2015.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2014a. Atlantic Spotted Dolphin (*Stenella frontalis*). Available online at http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spotteddolphin_atlantic.htm. Accessed July 2014.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2014b. Bottlenose Dolphin (*Tursiops turncatus*). Available online at http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/bottlenosedolphin.htm. Accessed July 2014.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2014c. Sperm Whales (*Physeter macrocephalus*). Available online at http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.htm. Accessed July 2014.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2015. NMFS Pile Driving Calculations. Available online at http://www.dot.ca.gov/hq/env/bio/files/NMFS%20Pile%20Driving%20Calculations.xls. Accessed March 2015.

National Oceanic and Atmospheric Association, National Marine Fisheries Service. 2013e. Regional Climate Trends and Scenarios for the U.S. National Climate Assessment Part 2. Climate of the Southeast U.S. Available online at http://www.sercc.com/NOAA_NESDIS_Tech_Report_Climate_of_the_Southeast_U.S.pdf. Accessed April 2014.

National Oceanic and Atmospheric Association. 1998. Climatic Wind Data for the United States. Available online at http://www.ncdc.noaa.gov/sites/default/files/attachments/wind1996.pdf. Accessed May 2014.

National Oceanic and Atmospheric Association. 2011. State of the Climate. Available online at http://www.ncdc.noaa.gov/sotc/. Acessed April 2014.

National Park Service. 2007. Nationwide Rivers Inventory – Louisiana Segments. Available online at http://www.nps.gov/ncrc/programs/rtca/nri/states/la.html. Accessed March 2015.

National Park Service. 2009. National Registry of Natural Landmarks. National Natural Landmarks Program, National Park Service, Washington, DC. Available online at http://www.nature.nps.gov/nnl/docs/NNLRegistry.pdf. Accessed March 2015.

National Park Service. 2010. National Parks and National Trail Systems Map. U.S. Department of the Interior National Park Service, Washington DC. Available online at http://www.nps.gov/hfc/carto/PDF/TRAILSmap1.pdf. Accessed March 2015.

National Weather Service. 2014a. National Hurricane Center, Tropical Cyclone Climatology. Available online at http://www.nhc.noaa.gov/climo/. Accessed April 2014.

National Weather Service. 2014b. Weather Fatalities. Available online at http://www.nws.noaa.gov/om/hazstats.shtml. Accessed April 2015.

Observ'ER. 2013. Worldwide Electricity Production from Renewable Energy Sources – Facts and Figures Series. Fifteenth Inventory. Available online at http://www.energies-renouvelables.org/observ-er/html/inventaire/pdf/15e-inventaire-Chap01-Eng.pdf. Accessed August 2014.

Orr, T., S. Herz, and D. Oakley. 2013. Evaluation of Lighting Schemes for Offshore Wind Facilities and Impacts to Local Environments. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Herndon, Virginia. Available online at http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5298.pdf. Accessed April 2014.

Patillo, M., L.P. Rozas, and R.J. Zimmerman. 1995. A Review of Salinity Requirements for Selected Invertebrates and Fishes of U.S. Gulf of Mexico Estuaries. National Marine Fisheries Service. Southeast Fisheries Service Center. Galveston, Texas.

Popper, A.N., M.C. Hastings. 2009. The Effects of Anthropogenic Sources of Sound on Fishes. Journal of Fish Biology 75:455-489. Available online at http://www.wsdot.wa.gov/NR/rdonlyres/0B027B4A-F9FF-4C88-8DE0-39B165E4CD94/61427/BA_AnthroSoundonFish.pdf. Accessed March 2015.

Port of Lake Charles. 2015a. Port of LC Reveals Finding of Final Calcasieu Ship Channel Traffic Study. Available online at http://portlc.com/about/news/. Accessed March 2015.

Port of Lake Charles. 2015b. The Port of Lake Charles. Available online at http://portlc.com/about/. Accessed March 2015.

Public School Review. 2015. Louisiana Public Schools. Available online at http://www.publicschoolreview.com/search.php?q=jefferson+davis+parish&cx=016015916617632982569%3Awui1qgj1s2y&ie=UTF-8&siteurl=www.publicschoolreview.com&sa=Search. Accessed March 2015.

Richardson, W.J., C.R. Greene, Jr., C.I. Malme, and D.H. Thomson. 1995. Marine Mammals and Noise. New York: Academic Press.

Roberts, M.J., J.M. Petrowski, Y.N. Liu, and J.C. Bronfenbrenner. 2002. Large Capacity single Train AP-X Hybrid LNG Process. Air Products and Chemicals, Inc. Available online at http://www.airproducts.com/~/media/files/pdf/industries/lng-large-capacity-single-train-ap-xtm-hybrid-lng-process.pdf. Accessed January 2015.

Soil Survey Staff. 1993. Soil Survey Manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. Washington, DC.

Soil Survey Staff. 2014. Web Soil Survey. Natural Resources Conservation Service, United States Department of Agriculture. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed December 2014.

Southwest Louisiana Economic Development Alliance. 2013. 2012-2018 SWLA Projects Summary Report 9.4.13. Available online at http://allianceswla.org/Images/Interior/2012-2018%20swla%20projects%20summary%20report%20%209%204%2013.pdf. Accessed June 2014.

Southwest Louisiana Economic Development Alliance. 2015a. 2015 Estimated Workforce Needs Report. Available online at http://allianceswla.org/Images/Interior/2015%20swla%20estimated%20workforce%20needs%202.12.15.pdf Accessed March 2015.

Southwest Louisiana Economic Development Alliance. 2015b. Personal communication on March 6, 2015 between D. Conner (Planning Board Member, Ward 3) and J. Rieland (Natural Resource Group, LLC).

Stadlar, J.H. and D.P. Woodbury. 2009. Assessing the Effects to Fishes from Pile Driving: Application of new hydroacoustic criteria. Inter-noise 2009. August 23-26, 2009, Ottawa, Canada.

Stevenson, D.A. and R.P. McCulloh. 2001. Earthquakes in Louisiana. Public Information Series 7. Louisiana Geological Survey, Baton Rouge, Louisiana.

Stoeser, D.B., G.N. Green, L.C. Morath, W.D. Heran, A.B. Wilson, D.W. Moore, and B.S. Van Gosen. 2005. Preliminary Integrated Geologic Map Databases for the United States Central States: Montanta, Wyoming, Colorado, New Mexico, Kansas, Oklahoma, Texas, Missouri, Arkansas and Louisiana. USGS Open-File Report. 2005-1351. Denver, Colorado. Available online at http://pubs.usgs.gov/of/2005/1351/. Accessed April 2014.

Terracon Consultants, Inc. 2015. Geotechnical Engineering Report. Terracon Project No. EU155016. Baton Rouge, Louisiana. February 2015.

Texas Tech University. 1997. The Mammals of Texas – Online Edition. Available online at http://www.nsrl.ttu.edu/tmot1/copyrigh.htm. Accessed March 2015.

Tolunay-Wong Engineers, Inc. 2013. Phase II Geologic Fault Study for the Magnolia LNG Project Site. TWE Project No. 13.43.027/Report No. 1710. November 25, 2013.

Transportation Research Board. 2010. Highway Capacity Manual. Available online at http://hcm.trb.org/?qr=1. Accessed March 2015.

U.S. Army Corps of Engineers. 2010a. Final Calcasieu River and Pass, Louisiana Dredged Material Management Plan and Supplemental Environmental Impact Statement. November 22, 2010. Available online at http://www2.mvn.usace.army.mil/pd/projectslist/ProjectData/108769/reports/DMMP_SEIS%20Main%20Report-November%2022%202010.pdf. Accessed January 2015.

U.S. Army Corps of Engineers. 2010b. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0), eds. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. U.S. Army Engineer Research and Development Center. Vicksburg, Mississippi.

U.S. Army Corps of Engineers. 2013a. Calcasieu Lock Louisiana Feasibility Study, Appendix A Biological Assessment. Available online at http://www.mvn.usace.army.mil/Portals/56/docs/PD/Projects/Calcasieu%20Lock/CalcasieuLockDraftMainReportwithIntegratedEISAPPENDICESSep2013.pdf. Accessed March 2015.

U.S. Army Corps of Engineers. 2013b. Mississippi Valley Division Navigable Waters (Section 10) of the United States. Available online at http://www.mvd.usace.army.mil/Portals/52/docs/11_MVD_navigable_waters.pdf. Accessed July 2014.

U.S. Army Corps of Engineers. 2013c. Sampling and Analysis Guidance, Dredge Material Assessments for Non-Federal Entities. Corps of Engineers Mississippi Valley New Orleans Operations Division - Technical Support Branch.

U.S. Army Corps of Engineers. 2014a. Letter dated May 14, 2014 from M. Mayer (Chief, Regulatory Branch) to B. Daughdrill (Ecology and Environment).

U.S. Army Corps of Engineers. 2014b. Letter dated September 10, 2014 from M. Mayer (Chief, Regulatory Branch) to B. Amos (CH2M Hill).

U.S. Army Corps of Engineers. 2014c. Letter dated September 10, 2014 from M. Mayer (Chief, Regulatory Branch) to B. Amos (CH2M Hill).

U.S. Army Corps of Engineers. 2015a. The Calcasieu Saltwater Barrier. Available online at http://www.mvn.usace.army.mil/Portals/56/docs/PAO/Brochures/CalcasieuSWB.pdf. Accessed February 2015.

U.S. Army Corps of Engineers. 2015b. Projects – Calcasieu River & Pass. Available online at http://www.mvn.usace.army.mil/About/Projects/CalcasieuRiverPass,LA.aspx. Accessed February 2015.

U.S. Census Bureau. 2010a. ACS Employment Status Data by Block Group, 2006-2010. Available online at http://www.census.gov/people/laborforce/about/acs_employ.html. Accessed March 2015.

U.S. Census Bureau. 2010b. Households and Families: 2010. Available online at http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF. Accessed March 2015.

U.S. Census Bureau. 2010c. 2010 Census Interactive Population Search. Available online at http://www.census.gov/2010census/popmap/. Accessed August 2014.

U.S. Census Bureau. 2010d. Statistical Abstract of the United States: 2010: The National Data Book (129th Edition). Washington, DC.

U.S. Census Bureau. 2014a. State and County QuickFacts (2010 Census). Available online at http://quickfacts.census.gov/qfd/states/22000.html. Accessed March 2015.

U.S. Census Bureau. 2014b. Community Facts: 2012 Business Patterns. Available online at http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF. Accesed March 2015.

U.S. Census Bureau. 2014c. Selected Housting Characteristics: 2009-2013 American Community Survey 5-year Estimates. Available online at http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk. Accessed March 2015.

U.S. Climate Change Science Program. 2008. Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase I. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research Savonis, M. J., V.R. Burkett, and J.R. Potter (eds.). Department of Transportation, Washington, D.C., 445 pp.

U.S. Coast Guard. 2014. Liquefied Gas Carrier Center of Excellence, Design of LNG Barges. Available online at http://www.uscg.mil/hq/cg5/lgcncoe/designLNGfuel.asp. Accessed March 2015.

U.S. Coast Guard. 2015a. Design of Ships Using LNG as Fuel. Available online at http://www.uscg.mil/hq/cg5/lgcncoe/designLNGfuel.asp. Accessed March 2015.

U.S. Coast Guard. 2015b. Draft Policy Letter 01-15 (Draft CG-OES Policy Letter No. previously 01-14) - Guidelines for Liquefied Natural Gas Fuel Transfer Operations and Training of Personnel on Vessels Using Natural Gas as Fuel. Available online at http://www.regulations.gov/#!documentDetail;D=USCG-2013-1084-0002. Accessed March 2015.

U.S. Coast Guard. 2015c. Draft CG-OES Policy Letter No. 02-15 (Draft CG-OES Policy Letter No. previously 02-14)- Guidance Related to Vessels and Waterfront Facilities Conducting Liquefied Natural Gas (LNG) Marine Fuel Transfer (Bunkering) Operations. Available online at http://www.regulations.gov/#!documentDetail;D=USCG-2013-1084-0002. Accessed March 2015.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2015. Introduced, Invasive, and Noxious Plants, Federal Noxious Weed List. Available online at http://plants.usda.gov/java/AdvancedSearchServlet?pfa=l48&statefips=US22&fed_nox_status_ind=nw&Synonyms=all&viewby=sciname. Accessed February 2015.

U.S. Department of Labor, Bureau of Labor Statistics. 2015. Consumer Price Index Inflation Calculator. Available online at http://www.bls.gov/data/inflation_calculator.htm. Accessed March 2015.

U.S. Department of the Interior. 2014. Programmatic and Phase III Early Restoration Plan and Early Restoration Programmatic Environmental Impact Statement.

U.S. Department of the Navy, Office of Naval Research. 2015. Ocean Water: Salinity. Available online at http://www.onr.navy.mil/focus/ocean/water/salinity1.htm. Accessed January 2015.

U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration. 2014a. Facts and Stats. Available online at http://opsweb.phmsa.dot.gov/pipelineforum/factsandstats/pipeline-101/. Accessed October 2014.

U.S. Department of Transportation, Maritime Administration. 2014. Liquefied Natural Gas (LNG) Bunkering Study. Available online at http://www.marad.dot.gov/documents/NVLNGBunkeringStudy3Sep14.pdf. Accessed January 2015.

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration. 2014b. Pipeline Incidents Reports. Available online at http://primis.phmsa.dot.gov/comm/reports/safety/PSI.html?nocache=9681. Accessed October 2014.

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration. 2015. Pipeline Incidents 20 Year Trends. Available online at http://www.phmsa.dot.gov/pipeline/library/datastatistics/pipelineincidenttrends. Accessed March 2015.

U.S. Energy Information Administration. 2014a. Annual Energy Outlook 2014. Report No. DOE/EIA-0383ER(2014). Available online at http://www.eia.gov/forecasts/aeo/pdf/0383(2014).pdf. Accessed January 2015.

U.S. Energy Information Administration. 2014b. U.S. Wood Pellet Exports Double in 2013 in Response to Growing European Demand. Available online at http://www.eia.gov/todayinenergy/detail.cfm?id=16391. Accessed April 2015.

U.S. Environmental Protection Agency. 1971. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. Office of Noise Abatement and Control. December 1971.

U.S. Environmental Protection Agency. 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. Office of Noise Abatement and Control. March 1974.

U.S. Environmental Protection Agency. 2005. 2005 National Emissions Inventory Data & Documentation. Available online at http://www.epa.gov/ttn/chief/net/2005inventory.html. Accessed April 2015.

U.S. Environmental Protection Agency. 2006. 2004 Toxic Release Inventory Sites in Louisiana, Geographic NAD83 (2006). Available online at https://catalog.data.gov/dataset/2004-toxic-release-inventory-sites-in-louisiana-geographic-nad83-epa-2006-toxic-release-in-2004. Accessed January 2015.

U.S. Environmental Protection Agency. 2008. Sole Source Aquifers. EPA Region 6. Dallas, Texas. Available online at http://www.epa.gov/region6/water/swp/ssa/maps.htm. Accessed May 2015.

U.S. Environmental Protection Agency. 2012. Sole Source Aquifer Protection Program. Available online at http://www.epa.gov/region6/water/swp/ssa/factshee.htm. Accessed April 2014.

U.S. Environmental Protection Agency. 2013a. Clean Energy. Available online at http://www.epa.gov/cleanenergy/energy-and-you/affect/natural-gas.html. Accessed August 2014.

U.S. Environmental Protection Agency. 2013b. Level III and IV Ecoregions of the Continental United States. Available online at http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm. Accessed April 2014.

U.S. Environmental Protection Agency. 2014a. Climate Impacts in the Southeast. Available online at http://www.epa.gov/climatechange/impacts-adaptation/southeast.html. Accessed April 2014.

U.S. Environmental Protection Agency. 2014b. Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act. Available online at http://www.epa.gov/climatechange/endangerment/index.html. Accessed April 2014.

U.S. Environmental Protection Agency. 2014c. National Ambient Air Quality Standards (NAAQS). Available online at http://www.epa.gov/air/criteria.html. Accessed April 2014.

U.S. Environmental Protection Agency. 2014d. Prevention of Significant Deterioration (PSD) Basic Information. Available online at http://www.epa.gov/NSR/psd.html#best. Accessed April 2014.

U.S. Environmental Protection Agency. 2015a. Access to monitored air quality data from EPA's Air Quality System (AQS) Data Mart. Available online at http://www.epa.gov/airdata/. Accessed May 2015.

U.S. Environmental Protection Agency. 2015b. Natural Gas. Available online at http://www.epa.gov/cleanenergy/energy-and-you/affect/natural-gas.html. Accessed April 2015.

U.S. Fish and Wildlife Service 2012d. Kemp's Ridley Sea Turtle Factsheet. Available online at http://www.fws.gov/northflorida/seaturtles/turtle%20factsheets/kemps-ridley-sea-turtle.htm. Accessed June 2014.

U.S. Fish and Wildlife Service. 2002. Colonial-Nesting Waterbirds, A Glorious and Gregarious Group. Arlington, Virginia. Available online at http://www.fws.gov/birds/waterbird-fact-sheet.pdf. Accessed May 2014.

U.S. Fish and Wildlife Service. 2007. West Indian Manatee (*Trichechus manatus*) 5-Year Review: Evaluation and Summary. Available online at http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A007. Accessed June 2014.

U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. Arlington, Virginia. Available online at http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf. Accessed April 2014.

U.S. Fish and Wildlife Service. 2009. Gulf Sturgeon (*Acienser oxyrinchus desotoi*) 5-Year Review: Summary and Evaluation. Available online at http://ecos.fws.gov/docs/five_year_review/doc2620.pdf. Accessed July 2014.

U.S. Fish and Wildlife Service. 2012a. East Cove Unit National Wildlife Refuge. Available online at http://www.fws.gov/swlarefugecomplex/cameronprairie/eastcove/. Accessed March 2015.

U.S. Fish and Wildlife Service. 2012b. Green Sea Turtle Factsheet. Available online at http://www.fws.gov/northflorida/seaturtles/turtle%20factsheets/green-sea-turtle.htm. Accessed June 2014.

U.S. Fish and Wildlife Service. 2012c. Hawksbill Sea Turtle Factsheet. Available online at http://www.fws.gov/northflorida/seaturtles/turtle%20factsheets/hawksbill-sea-turtle.htm. Accessed June 2014.

U.S. Fish and Wildlife Service. 2012e. Leatherback Sea Turtle Factsheet. Available online at http://www.fws.gov/northflorida/seaturtles/turtle%20factsheets/leatherback-sea-turtle.htm. Accessed June 2014.

U.S. Fish and Wildlife Service. 2012f. Loggerhead Sea Turtle Factsheet. Available online at http://www.fws.gov/northflorida/seaturtles/turtle%20factsheets/loggerhead-sea-turtle.htm. Accessed June 2014.

U.S. Fish and Wildlife Service. 2013. Letter dated September 27, from Deborah Fuller (Acting Supervisor) to Bill Daughdrill (Ecology & Environment).

U.S. Fish and Wildlife Service. 2014a. Letter dated July 25, from Deborah Fuller (Acting Supervisor) to Blake Amos (CH2MHILL).

U.S. Fish and Wildlife Service. 2014b. Email correspondence on May 16, between J. Weller (Field Supervisor) and H. Herod (DWH Case Management Office, ESA Coordinator).

U.S. Fish and Wildlife Service. 2014c. West Indian Manatee (*Trichechus manatus*). Available online at http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A007. Accessed July 2014.

U.S. Fish and Wildlife Service. 2015. Sabine National Wildlife Refuge. Available online at http://www.fws.gov/refuges/profiles/index.cfm?id=43640. Accessed March 2015.

U.S. Geological Survey and Louisiana Department of Natural Resources. 2013. Louisiana Water Use 2012. Available online at http://la.water.usgs.gov/WaterUse/default.asp. Accessed December 2014.

U.S. Geological Survey. 1955. Moss Lake Quadrangle, Louisiana, 7.5-Minute Series [map]. 1:24,000. Reston, Virginia.

U.S. Geological Survey. 1998. Ground Water Atlas of the United States: Arkansas, Louisiana, Mississippi. Hydrologic Investigations Atlas 730-F. Robert A. Renken. Reston, Virginia.

U.S. Geological Survey. 2000. Chinese Tallow: Invading the Southeastern Coastal Plain. Available online at http://www.nwrc.usgs.gov/factshts/154-00.pdf. Accessed December 2014.

U.S. Geological Survey. 2003. Principal Aquifers of the 48 Conterminous United States, Hawaii, Puerto Rico, and the U.S. Virgin Islands: U.S. Geological Survey, Madison, Wisconsin.

U.S. Geological Survey. 2006. ShakeMap Manual: Technical Manual, Users Guide, and Software Guide. Available online at http://pubs.usgs.gov/tm/2005/12A01/. Accessed April 2014.

U.S. Geological Survey. 2008. National Seismic Hazard Maps. Available online at http://earthquake.usgs.gov/hazards/apps/map/. Accessed April 2014.

U.S. Geological Survey. 2009a. 2009 Minerals Yearbook: Louisiana. Available online at http://minerals.usgs.gov/minerals/pubs/state/2009/myb2-2009-la.pdf. Accessed April 2014.

U.S. Geological Survey. 2009b. 2009 Minerals Yearbook: Mississippi. Available online at http://minerals.usgs.gov/minerals/pubs/state/2009/myb2-2009-ms.pdf. Accessed April 2014.

U.S. Geological Survey. 2009c. Significant United States Earthquakes, 1568-2009. Available online at http://nationalatlas.gov/mld/quksigx.html. Accessed July 2014.

U.S. Geological Survey. 2012. Moss Lake Quadrangle, Louisiana, 7.5-Minute Series [map]. 1:24,000. Reston, Virginia.

U.S. Geological Survey. 2013a. Active Mines and Mineral Processing Plants in the United States. Available online at http://mrdata.usgs.gov/mineral-resources/active-mines.html. Accessed April 2014.

U.S. Geological Survey. 2013b. Mineral Resource Data System. Available online at http://mrdata.usgs.gov/mineral-resources/mrds-us.html. Accessed April 2014.

U.S. Geological Survey. 2013c. South Central Amphibian Research and Monitoring Initiative Guide to Louisiana Amphibians, Frogs and Toads (Order Anura). Available online at http://www.nwrc.usgs.gov/topics/sc_armi/frogs_and_toads/index.html. Accessed February 2015.

U.S. Global Change Research Program. 2014. Climate Change Impacts in the United States, U.S. National Climate Assessment. Available online at http://nca2014.globalchange.gov/report. Accessed May 2015.

USA Cops. 2015. Parish Police and Sheriff's Departments. Available online at http://www.usacops.com/la/. Accessed March 2015.

USA.com. 2015. 2010 County Census Tract Data. Available at http://www.usa.com/. Accessed March 2015.

Whale and Dolphin Conservation Society. 2004. Oceans of Noise 2004 – A WDCS Science Report. Eds. M. Simmonds, S. Dolman, and L. Weilgart. Wiltshire, England.

Yellow Pages. 2015. Louisiana, RV Park. Available online at http://www.yellowpages.com/search?search_terms=rv+park&geo_location_terms=Lake+Charles%2C+LA. Accessed March 2015.

APPENDIX E

LIST OF PREPARERS

APPENDIX E
LIST OF PREPARERS

<u>Federal Energy Regulatory Commission</u>

Cefalu, Janine – Environmental Project Manager, Proposed Action, Water, Wetlands, Fisheries, Wildlife, Vegetation, Special Status Species, Socioeconomics
M.E.S., Environmental Studies, 2005, The Evergreen State College
B.A., International Relations, 1996, San Francisco State University

Kopka, Robert – Deputy Project Manager, Alternatives, Land Use, Recreation, Visual Resources, Cumulative Impacts
M.S., Soil Science, 1990, Cornell University
B.S., Agronomy, 1987, Delaware Valley College of Science and Agriculture

Anis, Shahid – Air Quality and Noise, Pipeline Reliability and Safety
M.S., Energy, Resources, and Environment, 1977, George Washington University
B.S., Mechanical Engineering, 1974, University of Maryland

Armbruster, Ellen – Cultural Resources
M.A., Anthropology, 1986, University of Pennsylvania
B.A., Anthropology, 1979, Bryn Mawr College

Glaze, James – Geology, Soils
B.S., Geology, 1975, California Lutheran University

Patel, Ghanshyam – Liquefied Natural Gas (LNG) Reliability and Safety
B.S., Chemical Engineering, 2004, Pennsylvania State University

Silvera, Liliana – LNG Reliability and Safety
B.S., Chemical Engineering, 2003, University of Maryland

<u>Natural Resource Group, LLC</u>

Rieland, Janelle – Project Manager, Quality Assurance Review, Introduction, Proposed Action
B.S., Wildlife and Fisheries, 2002, University of Minnesota, Twin Cities

Piper, Erin – Deputy Project Manager, Special Status Species, Fisheries, Wildlife
M.S., Oceanography, 2010, Texas A&M University, Texas
B.S., Ocean and Coastal Resources, 2007, Texas A&M University, Galveston, Texas

Brown, Larry – Cumulative Impacts
B.S., Biology, 1981, Bates College

Buckless, Michael – Geology, Soils
B.S., Environmental Soil Science and Management, 2013, University of Rhode Island

D'Auben, Dan, P.E. – Air Quality
B.S., Mechanical Engineering, 1973, University of Illinois, Urbana, Illinois

Enright, Troy – Noise
B.S., Environmental Science, 2003, University of Minnesota, Twin Cities

Hacker, Miriam – Air Quality
M.S., Civil and Environmental Engineering, 1995, University of Wisconsin
B.A., Mathematics, 1991, Skidmore College

Holden, Steve – Groundwater, Geology, Soils
M.S., Natural Resources, 2004, University of Rhode Island, Kingston
B.S., Water and Soil Science, 2001, University of Rhode Island, Kingston

Jensen, Bart – Alternatives
B.S., Natural Resources and Environmental Studies, 1992, University of Minnesota, Twin Cities

Koester, Mike – Pipeline Reliability and Safety
B.S., Environmental Management, 2001, University of South Alabama

Lyons, Tina – Quality Assurance Review, Technical Editor, Socioeconomics
B.S., Genetics and Cell Biology, 1999, University of Minnesota, Twin Cities
B.S., Ecology, Evolution, and Behavior, 1996, University of Minnesota, Twin Cities

Pincoske, Jeremy – Cultural Resources
B.A., Anthropology, 1988, State University of New York, Stony Brook

Thomas, Lindsay – Land Use, Recreation, Visual Resources, Socioeconomics
B.S., Biological Engineering, 2007, Louisiana State University, Baton Rouge, Louisiana

Throndson, Sara – Surface Water, Wetlands, Vegetation
M.S., Soil Science, 2007, University of Minnesota, Twin Cities
B.S., Environmental Studies, 2002, Northland College, Ashland, Wisconsin