Office of
Energy Projects

February 2016

Elba Liquefaction Company, L.L.C.
Southern LNG Company, L.L.C.
Elba Express Company, L.L.C.

Docket Nos. CP14-103-000
CP14-115-000

Elba Liquefaction Project

Environmental Assessment

Cooperating Agencies:

U.S. Department of Transportation

U.S. Coast Guard

Office of Fossil Energy
DOE Docket No. FE 12-100-LNG

Washington, DC 20426

This environmental assessment was prepared by the staff of the Federal Energy Regulatory Commission to assess the potential environmental impacts of the Elba Liquefaction Project (Docket Nos. CP14-103-00 and CP14-115-000) proposed for construction in Georgia. The cooperation and assistance of the U.S. Coast Guard, U.S. Department of Transportation and U.S. Department of Energy was greatly appreciated.

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas 2
Elba Liquefaction Company, LLC
Southern LNG Company, LLC
Elba Express Company, LLC
Elba Liquefaction Project
Docket Nos. CP14-103-000
CP14-115-000

TO THE PARTY ADDRESSED:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared an environmental assessment (EA) for natural gas facilities proposed by Elba Liquefaction Company, LLC (ELC), Southern LNG Company, LLC (SLNG), and Elba Express Company, LLC (EEC) (collectively referred to as "Companies") in the above-referenced dockets. The proposed Elba Liquefaction Project and EEC Modification Project are collectively referred to as the Elba Liquefaction Project, or Project. The Companies request authorization to add natural gas liquefaction and exporting capabilities to SLNG's existing Elba Island liquefied natural gas (LNG) terminal (LNG Terminal) and abandon SLNG's existing LNG truck loading facilities at the LNG Terminal in Chatham County, Georgia. In addition, the Companies propose to construct and operate new and modified compression and metering facilities in Hart, Jefferson, and Effingham Counties, Georgia, and in Jasper County, South Carolina. The Project would enable SLNG to export approximately 2.5 million tons per annum (MTPA) of LNG via the existing LNG Terminal on the Savannah River.

The EA assesses the potential environmental effects of the construction and operation of the Project in accordance with the requirements of the National Environmental Policy Act (NEPA). The FERC staff concludes that approval of the proposed Project, with appropriate mitigating measures, would not constitute a major federal action significantly affecting the quality of the human environment.

The U.S. Department of Energy – Office of Fossil Energy (DOE-FE), U.S. Department of Transportation (DOT), and U.S. Coast Guard (USCG) participated as cooperating agencies in the preparation of the EA. Cooperating agencies have jurisdiction by law or special expertise with respect to resources potentially affected by the proposal and participate in the NEPA analysis.

ELC and SLNG propose to construct and operate liquefaction and export facilities in two phases at the LNG Terminal. Phase I of the proposed facilities associated with the LNG Terminal includes installation of three liquefaction system units; installation of a flare system and a marine flare; modifications to the LNG Terminal; and ancillary facilities and support system modifications. Project facilities associated with the LNG Terminal in Phase II include installation of seven additional liquefaction system units, ancillary support systems, and potential additions or upgrades to systems installed as part of Phase I.

ECC proposes to construct and operate facilities on its existing pipeline system in three phases. The Phase I compression and metering facilities would include the addition of 31,800 horsepower (hp) at the existing Hartwell Compressor Station; construction of a new 15,900 hp compressor station in Jefferson County, Georgia; construction of a new 15,900 hp compressor station in Effingham County, Georgia; installation of new metering facilities at existing sites in Chatham and Effingham County, Georgia and Jasper County, South Carolina; and modifications to segregate the two pipelines that currently extend from Elba Island to Port Wentworth, Georgia.

Phase II would include the addition of approximately 15,900 hp of compression at the existing Hartwell Compressor Station. Phase III would include the addition of approximately 15,900 hp at each of the Hartwell, Jefferson and Rincon Compressor Stations.

The FERC staff mailed copies of the EA to federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners and other interested individuals and groups; libraries in the Project area; and parties to these proceedings. In addition, the EA has been placed in the public files of the FERC and is available for public viewing on the FERC's website at www.ferc.gov using the eLibrary link. A limited number of copies of the EA are also 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 EA may do so. Your comments should focus on the potential environmental effects, reasonable alternatives, and measures to avoid or lessen environmental impacts. The more specific your comments, the more useful they will be. To ensure that your comments are properly recorded and considered prior to a Commission decision on the proposal, it is important that the FERC receives your comments in Washington, DC on or before **March 7, 2016.**

For your convenience, there are three methods you can use to submit your comments to the Commission. In all instances please reference the Project docket numbers (CP14-103-000 and CP14-115-000) 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 by using the eComment feature, which is on the Commission's website at www.ferc.gov under the link to Documents and Filings. This is an easy method for interested persons to submit brief, text-only comments on a project;

(2) You can file your comments electronically by using the eFiling feature on the Commission's website at 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." You must select the type of filing you are making. A comment on a particular project is considered a "Comment on a Filing"; or

(3) You may file a paper copy of your comments at the following address:

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

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

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

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 excluding the last three digits in the Docket Number field (i.e., CP14-103 and/or CP14-115). Be sure you have selected an appropriate date range. For assistance, please contact FERC Online Support at FercOnlineSupport@ferc.gov or toll free at (866) 208-3676 or for TTY contact (202) 502-8659. The 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, which 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 http://www.ferc.gov/docs-filing/esubscription.asp.

TABLE OF CONTENTS

Elba Liquefaction Project
Environmental Assessment

Page

1.0 PROPOSED ACTION 1-1
1.1 INTRODUCTION 1-1
1.1.1 LNG Terminal History 1-2
1.1.2 Elba Express Pipeline Facilities History 1-2
1.2 PROPOSED FACILITIES 1-3
1.2.1 Liquefaction Facilities 1-3
1.2.2 Compression and Metering Facilities 1-9
1.2.3 On-site and Off-site Temporary Workspace 1-11
1.2.4 Access Roads 1-12
1.3 NONJURISDICTIONAL FACILITIES 1-12
1.4 PROJECT PURPOSE AND NEED 1-13
1.5 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT 1-14
1.5.1 Federal Energy Regulatory Commission 1-15
1.5.2 U.S. Department of Energy Role 1-15
1.5.3 U.S. Coast Guard Role 1-15
1.5.4 U.S. Department of Transportation Role 1-16
1.6 PUBLIC REVIEW AND COMMENT 1-16
1.7 CONSTRUCTION, OPERATION, AND MAINTENANCE 1-19
1.7.1 General Procedures 1-19
1.7.2 Liquefaction Facilities 1-20
1.7.3 Compression and Metering Facilities 1-24
1.8 ENVIRONMENTAL COMPLIANCE, INSPECTION, AND MONITORING 1-26
1.9 LAND REQUIREMENTS 1-27
1.10 PERMITS, APPROVALS, AND REGULATORY CONSULTATIONS 1-28

2.0 ENVIRONMENTAL ANALYSIS 2-1
2.1 GEOLOGY AND SOILS 2-1
2.1.1 Geologic Setting, Mineral Resources, and Natural Hazards 2-1
2.1.2 Design and Construction of the Elba Island Facilities 2-9
2.1.3 Soils 2-12
2.2 WATER RESOURCES, FISHERIES, AND WETLANDS 2-15
2.2.1 Groundwater 2-15
2.2.2 Surface Water 2-19
2.2.3 Fisheries Resources 2-23
2.2.4 Managed Fish Species and Essential Fish Habitat 2-28
2.2.5 Wetlands 2-33
2.3 VEGETATION AND WILDLIFE 2-34
2.3.1 Vegetation 2-34
2.3.2 Wildlife 2-36
2.3.3 Protected and Sensitive Species 2-38
2.4 LAND USE, RECREATION, AND VISUAL RESOURCES 2-45
2.4.1 Existing Land Use 2-45
2.4.2 Recreation and Special Interest Areas 2-48
2.4.3 Existing Residences and Planned Future Developments 2-49

2.4.4 Coastal Zone Management 2-52
2.4.5 Visual Resources 2-52
2.5 SOCIOECONOMICS 2-54
2.5.1 Population, Economy, and Employment 2-55
2.5.2 Housing 2-56
2.5.3 Public Services 2-57
2.5.4 Transportation and Traffic 2-58
2.5.5 Property Values 2-61
2.5.6 Environmental Justice 2-61
2.6 CULTURAL RESOURCES 2-62
2.6.1 Cultural Resource Investigations 2-62
2.6.2 Native American Consultation 2-63
2.6.3 Unanticipated Discovery Plan 2-63
2.6.4 NHPA Compliance 2-64
2.7 AIR QUALITY AND NOISE 2-64
2.7.1 Air Quality 2-64
2.7.2 Noise 2-81
2.8 RELIABILITY AND SAFETY 2-93
2.8.1 Compression Facilities 2-93
2.8.2 Regulatory Oversight 2-94
2.8.3 LNG Facility Hazards 2-96
2.8.4 Past Incidents 2-103
2.8.5 Technical Review of Preliminary Engineering Design 2-104
2.8.6 LNG Facility Siting Requirements 2-116
2.8.7 LNG Facility Siting Analysis 2-119
2.8.8 Emergency Response 2-136
2.8.9 LNG Vessel Safety 2-137
2.8.10 Conclusions on Facility Reliability and Safety 2-137
2.9 CUMULATIVE IMPACTS 2-138
2.9.1 Projects and Activities Considered 2-138
2.9.2 Socioeconomics 2-140
2.9.3 Air Quality 2-140
2.9.4 Noise 2-141
2.9.5 Climate Change 2-142
2.9.6 Safety 2-144
2.9.7 Conclusion 2-144

3.0 ALTERNATIVES 3-1
3.1 NO-ACTION ALTERNATIVE 3-1
3.2 SYSTEM ALTERNATIVES 3-1
3.2.1 Other LNG Terminal Alternatives 3-2
3.2.2 Non-Terminal Facilities Alternatives 3-2
3.2.3 Pipeline System Alternatives 3-3
3.2.4 Compression Alternatives 3-3
3.3 SITE ALTERNATIVES 3-3
3.3.1 Liquefaction Facilities 3-3
3.3.2 Compressor and Metering Facilities Site Alternatives 3-7

4.0 CONCLUSIONS AND RECOMMENDATIONS 4-1

5.0 REFERENCES 5-1

6.0 LIST OF PREPARERS 6-1

LIST OF TABLES

Table 1.6-1	Issues Identified in Scoping Process	1-17
Table 1.9-1	Summary of Land Requirements	1-27
Table 1.10-1	Major Environmental Permits, Licenses, Approvals, and Certificates for Construction, Operation, and Maintenance of the Project	1-28
Table 2.1.1-1	Seismic Risks Associated with the Project	2-5
Table 2.2.3-1	Recreational Fish Species near Liquefaction Project Area	2-23
Table 2.2.4-1	NMFS-managed Fish Species that Could Occur within Savannah River near Elba Island	2-29
Table 2.3.1-1	Project Impacts on Vegetation Communities (acres)	2-35
Table 2.3.3-1	Birds of Conservation Concern Potentially Occurring Within the Project Area	2-39
Table 2.4.1-1	Land Use Affected by Construction and Operation of the Project	2-46
Table 2.5.1-1	Existing Population and Economic Conditions in the Project Area	2-55
Table 2.5.2-1	Housing Characteristics in the Project Area	2-56
Table 2.7.1-1	National Ambient Air Quality Standards	2-65
Table 2.7.1-2	Ambient Air Quality Concentrations	2-67
Table 2.7.1-3	Total Project Construction Emissions Summary	2-76
Table 2.7.1-4	Summary of Existing Equipment Potential to Emit	2-78
Table 2.7.1-5	Summary of Proposed Modifications (New Sources) Potential to Emit	2-78
Table 2.7.1-6	Significant Impact Analysis Summary, LNG Terminal	2-79
Table 2.7.1-7	Summary of Modeled Air Quality Impacts, Elba III Project	2-80
Table 2.7.1-8	Air Toxics Ambient Impact Assessment	2-80
Table 2.7.2-1	Existing Noise Levels	2-83
Table 2.7.2-2	Noise Quality Analysis: Maximum Calculated Construction Noise Levels at nearest residential NSA by LNG Terminal Construction Phase	2-85
Table 2.7.2-3	Noise Quality Analysis: Estimated Construction Noise Levels at nearest NSA	2-86
Table 2.7.2-4	Sound Level Predictions – Liquefaction Facilities	2-87
Table 2.7.2-5	NSA Sound Level Predictions for Project Compressor Stations	2-89
Table 2.7.2-6	Estimated Ambient and Existing LNG Terminal Sound Levels	2-92
Table 2.7.2-7	Predicted Construction and New Operational LNG Terminal Sound Levels	2-92
Table 2.8.2-1	Toxicity Levels of Various Material Components and Exposure Times	2-99
Table 2.8.2-2	Flammable Properties	2-100
Table 2.8.4-1	ELC and SLNG's Responses Indicating Corrections or Modification to FEED	2-108
Table 2.8.6-1	Impoundment Area Sizing	2-120
Table 2.8.6-2	LNG Design Spills	2-124
Table 2.8.6-3	Other Hazardous Fluid Design Spills	2-129
Table 2.8.6-4	Vapor Dispersion Scenarios from Refrigerants and Stabilized Condensate Releases	2-129
Table 2.8.6-5	Distance (in feet) to ½ AEGL 1, 2, and 3	2-130
Table 2.8.6-6	Thermal Radiation Exclusion Zones	2-134
Table 3.3.2-1	Comparison of Jefferson County Compressor Station Alternatives	3-8
Table 3.3.2-2	Comparison of Rincon Compressor Station Alternatives	3-9

LIST OF FIGURES

Figure 1.2-1 General Proposed Overview: Liquefaction, Compression, and Metering Facilities 1-4
Figure 2.2.1-1 The Floridan and Southeastern Coastal Plain Aquifers and Confining Layers.....2-16
Figure 2.8.6-1 LNG Liquid Spill Release from the LNG Rundown Line 2-124
Figure 2.8.6-2 LNG Liquid Spill Release from the LNG Rundown Line 2-125
Figure 2.8.6-3 Jetting and Flashing Scenario from the LNG Rundown Line at the Center of the Liquefaction Process Area 2-125
Figure 2.8.6-4 Jetting and Flashing Scenario from the LNG Rundown Line at MMLS Unit Closest to the Property Line Adjacent to the South Channel 2-126
Figure 2.8.6-5 Jetting and Flashing Scenario from the LNG Rundown Line at Liquefaction Unit Closest to the Property Line Adjacent to the South Channel with Vapor Fencing ...2-126
Figure 2.8.6-6 Jetting and Flashing Scenario from the LNG Rundown Line at MMLS Unit Closest to the Property Line Adjacent to the South Channel Modeled with Two Check Valves 2-128
Figure 2.8.6-7 ½ AEGL 1, 2, and 3 for Ammonia.....2-131
Figure 2.8.6-8 Ethylene Overpressure Scenarios within the Liquefaction Process Area 2-132
Figure 2.8.6-9 Thermal Radiation Zones.....2-135
Figure 2.8.6-10 Thermal Heat Fluxes for a Jet Fire from a Mixed Refigerant Release.....2-135
Figure 3.3.2-1 Jerfferson County Compression Station Alternatives 3-10
Figure 3.3.2-2 Rincon Compression Station Alternatives 3-11

LIST OF APPENDICES

Appendix A LNG Terminal Facility Maps
Appendix B Compression and Metering Facility Maps
Appendix C Oversized Tables

TECHNICAL ACRONYMS AND ABBREVIATIONS

AAIW	Alternate Atlantic Intracoastal Waterway
AEGL	Acute Exposure Guidance Level
AMLW	above mean low water
AMSL	above mean sea level
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
BCC	Birds of Conservation Concern
bcf	billion cubic feet
BCR	Bird Conservation Regions
bgs	below ground surface
bhp	brake horsepower
BLEVE	Boiling-liquid-expanding-vapor explosion
BMLW	below mean low water
BMP	best management practices
BOG	boil-off gas
Btu/ft^2-hr	British thermal units per square foot-hour
CAA	Clean Air Act
Certificate	Certificate of Public Convenience and Necessity
CFR	Code of Federal Regulations
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
COE	U.S. Army Corps of Engineers
Commission	Federal Energy Regulatory Commission
Companies	Elba Liquefaction Company, LLC; Southern LNG Company, LLC; and Elba Express Company, LLC (collectively)
CWA	Clean Water Act
cy	cubic yards
CZMA	coastal zone management area
dB	decibel
dBA	A-weighted decibel scale
DMCA	dredge material containment area
DOE-FE	U.S. Department of Energy, Office of Fossil Energy
DOT	U.S. Department of Transportation
EA	environmental assessment
EEC	Elba Express Company, LLC
EEC Pipeline	Elba Express Pipeline
EFH	Essential Fish Habitat
EI	environmental inspector
EIS	Environmental Impact Statement
ELC	Elba Liquefaction Company, LLC
EPA	U.S. Environmental Protection Agency
EPD	Environmental Protection Division

ERP	Emergency Response Plan
ERPG	Emergency Response Planning Guidelines
ESA	Endangered Species Act
ESD	Emergency Shutdown Device
FEED	Front End Engineering Design
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FOPU	Fort Pulaski National Monument
ft^3	standard cubic feet
FTA	Free Trade Agreement
FWS	U.S. Fish and Wildlife Service
g	gravitational rate of acceleration
GDNR	Georgia Department of Natural Resources
GDOT	Georgia Department of Transportation
GEPD	Georgia Environmental Protection Division
GHG	greenhouse gas
GHGRR	Greenhouse Gas Reporting Rule
gpd	gallons per day
gpm	gallons per minute
H_2O	water
H_2S	hydrogen sulfide
HAZOP	hazard and operability
Hg	mercury
hp	horsepower
IBC	International Building Code
IEA	International Energy Agency
IPCC	International Panel on Climate Change
ISA	International Society of Automation
kV	kilovolt
L_{dn}	Day-night Average Sound Level
LFL	lower flammable limit
LNG	liquefied natural gas
LNG Terminal	Elba LNG Terminal
LNGC	liquefied natural gas carrier
LOR	Letter of Recommendation
MAOP	maximum allowable operating pressure
mg/L	milligrams per liter
MLW	mean low water
MMLS	Movable Modular Liquefaction System
MP	milepost
mph	miles per hour
MTPA	million tons per annum
MVA	megavolt-amperes
NAAQS	National Ambient Air Quality Standards

NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NGA	Natural Gas Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	*Notice of Intent to Prepare and Environmental Assessment for the Planned Elba Liquefaction Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meetings*
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NWR	National Wildlife Refuge
NSA	Noise Sensitive Area
OEP	Office of Energy Projects
OSHA	Occupational Safety and Health Administration
P&ID	piping and instrumentation diagram
Plan	FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan*
ppm-v	parts per million by volume
Procedures	FERC's *Wetland and Waterbody Construction and Mitigation Procedures*
Project	Elba Liquefaction Project
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
psig	pounds per square inch gauge
PSM	Process Safety Management of Highly Hazardous Chemicals; Explosive and Blasting Agents
RPT	Rapid phase transition
SCDHEC	South Carolina Department of Health and Environmental Conservation
Secretary	Secretary of the Commission
SGSC	Snapper-Grouper species complex
SHPO	State Historic Preservation Office
SLNG	Southern LNG Company, LLC
SLOSH	NOAA Sea, Lake, and Overland Surges from Hurricane model
SNG	Southern Natural Gas Company, LLC
SPCC Plan	Spill Prevention, Control, and Countermeasures Plan
SWPPP	Stormwater Pollution Prevention Plan
Twin 30s	two parallel 30-inch-diameter pipelines
UFL	upper flammable limit
USC	U.S. Code
USCG	U.S. Coast Guard
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VOC	volatile organic compound
WMA	Wildlife Management Area
WSA	Waterway Suitability Assessment

1.0 PROPOSED ACTION

1.1 INTRODUCTION

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared this environmental assessment (EA) to assess the potential environmental impact of the construction and operation of natural gas facilities in Georgia and South Carolina by Elba Liquefaction Company, LLC (ELC); Southern LNG Company, LLC (SLNG); and Elba Express Company, LLC (EEC) (collectively referred to as "Companies"). The Elba Liquefaction Project and EEC Modification Project are collectively referred to as the Elba Liquefaction Project, or Project. We[1] prepared this EA in compliance with the requirements of the National Environmental Policy Act (NEPA) (Title 40 of the Code of Federal Regulations [CFR], Parts 1500-1508), and the Commission's implementing regulations under 18 CFR 380. The U.S. Department of Energy, Office of Fossil Energy (DOE-FE); U.S. Department of Transportation (DOT); and U.S. Coast Guard (USCG) participated as cooperating agencies in the preparation of this EA.

On March 10, 2014 and March 21, 2014, the Companies filed applications in Docket Nos. CP14-103-000 and CP14-115-000, respectively, with the Commission pursuant to Sections 3(a), 7(b), and 7(c) of the Natural Gas Act (NGA) and Parts 153 and 157 of the Commission's regulations. ELC and SLNG requested authorization to: site, construct, and operate liquefaction and export facilities in two phases and abandon liquefied natural gas (LNG) truck loading facilities at the existing Elba LNG Terminal (LNG Terminal) in Chatham County, Georgia. EEC requested authorization to site, construct, and operate in three phases modified compression facilities in Hart County, Georgia and new compression facilities in Jefferson and Effingham Counties, Georgia; and install new metering facilities at existing sites in Chatham and Effingham Counties, Georgia and Jasper County, South Carolina (EEC Modification Project). Compression and metering facilities would be on the existing Elba Express Pipeline (EEC Pipeline) owned and operated by EEC. The Project would provide the capability to liquefy domestic natural gas supplies for export of approximately 2.5 million tons per annum (MTPA) of LNG. The facilities proposed under sections 3(a) and 7(c) of the NGA are collectively referred to as the Elba Liquefaction Project (Project) and are described in section 1.2. Prior to filing its applications, the Companies participated in the Commission's pre-filing process for this Project under Docket No. PF13-3-000.

On May 15, 2012, SLNG filed an application with the DOE-FE (DOE-FE Docket No. 12-54-LNG) requesting long-term authorization to export up to 4 MTPA[2] of LNG from the LNG Terminal to any country that currently has or develops the capacity to import LNG via an ocean-going carrier and with which the United States currently has, or in the future enters into, a Free Trade Agreement (FTA) requiring national treatment for trade in natural gas. SLNG requested authorization for shipments over a 25-year period, commencing on whichever date comes first: the date of first export or 10 years from the date that the requested authorization is issued. DOE-FE granted this authorization on June 15, 2012 via Order No. 3106.

On August 31, 2012, SLNG also filed an application with the DOE-FE (DOE-FE Docket No. 12-100-LNG) for authorization to export up to 4 MTPA of LNG from the LNG Terminal to any country with which the United States does not have an FTA requiring national treatment for trade in natural gas; which

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1 "We," "us," and "our" refer to the environmental staff of the Commission's Office of Energy Projects (OEP).

2 The 4 MTPA requested in the applications to DOE-FE represent an estimate of the total liquefaction and export potential of the Elba LNG Terminal. At this time, SLNG does not have commercial commitments beyond the 2.5 MTPA requested in this application. In the event that SLNG desires additional capacity beyond the 2.5 MTPA requested in this application, SLNG would have to submit another application to the Commission.

has developed or in the future develops the capacity to import LNG via an ocean-going carrier; and with which trade is not prohibited by U.S. law or policy. The Companies requested authorization for shipments over a 20-year period, commencing on whichever date comes first: the date of first export or 10 years from the date that the requested authorization is issued. DOE-FE intends to review the Companies' application and issue a final order after conducting a public interest review that includes macroeconomic impacts and after DOE fulfills its NEPA requirements, including completion and adoption of this environmental assessment.

1.1.1 LNG Terminal History

The LNG Terminal is on Elba Island, an 840-acre private island near Savannah, Georgia. The LNG Terminal currently imports LNG for storage, vaporization, and direct sendout via pipeline and has a storage capacity of 11.5 billion cubic feet (bcf) of vaporized natural gas. The Federal Power Commission (predecessor to the FERC) authorized siting, construction, and operation of the LNG Terminal in 1972 in Docket No. CP71-264; no environmental document was prepared as part of this authorization as construction of the LNG Terminal preceded NEPA. From 1978 to 1980 the LNG Terminal received shipments of LNG before being taken out of service in 1982. Since initial authorization, FERC has authorized a number of modifications and expansions at the LNG Terminal:

- 2000-2001: Elba I Project. Re-commissioning and expansion to 4.0 bcf of storage capacity (Docket Nos. CP99-579 through CP99-582). The environmental review for this project was documented in the EA issued in April 2001.

- 2003: Elba II Project. Modifications and expansion to 7.3 bcf of storage capacity (Docket Nos. CP02-379 and CP02-380). This expansion included two new marine berths and one additional storage tank. The environmental review for this project was documented in the EA issued in February 2003.

- 2007: Elba III Project. Modifications and expansion of storage capacity in two phases. Approximately 4.2 bcf of storage capacity was installed in the first phase, which included one additional storage tank and removal of river dock unloading facilities. The second phase was vacated in 2011 at SLNG's request (Docket Nos. PF06-14 and CP06-470). The environmental review for this project was documented in the Environmental Impact Statement (EIS) issued in August 2007.

- 2012: Boil-Off Gas (BOG) Project. Addition of a new compressor unit and related facilities (Docket No. CP12-31). The environmental review for this project was documented in the EA issued in March 2012.

1.1.2 Elba Express Pipeline Facilities History

FERC authorized the siting, construction, and operation of the 189-mile-long EEC Pipeline (Docket No. CP06-471) in conjunction with the Elba III Project listed above. The pipeline extends between Port Wentworth, Georgia in Chatham County to interconnections with Transcontinental Pipe Line Company, LLC in Hart County, Georgia and Anderson County, South Carolina. The environmental review for this project was documented in the EIS issued in August 2007. In the EIS, the FERC analyzed the impacts of constructing a new compressor station in Jenkins County, Georgia. EEC filed an amendment application in October 2011 to move the previously approved Jenkins County Compressor Station site to a site in Elbert County, Georgia. In May 2012 EEC again filed an amendment application to move the Elbert County Compressor Station to a site in Hart County, Georgia (now called the Hartwell Compressor Station). The environmental review for the Hartwell Compressor Station was documented in the EA issued in July 2012 (Docket No. CP12-11). The Hartwell Compressor Station was placed in-service in April 2013.

1.2 PROPOSED FACILITIES

The Project would include the construction and operation of two principal facilities. These include new liquefaction facilities that would be constructed in two phases at the LNG Terminal and new compression and metering facilities that would be constructed in three phases along the existing EEC Pipeline and at the LNG Terminal.

Phase I of the liquefaction facilities would include the construction and operation of three Movable Modular Liquefaction System (MMLS) units and associated equipment along with the abandonment of the existing LNG truck loading facilities at the LNG Terminal. Phase II would include an additional seven MMLS units and associated equipment additions or modifications.

Phase I of the compression and metering facilities would include construction and operation of additional compression at the existing Hartwell Compressor Station in Hart County, Georgia; new compression facilities in Jefferson and Effingham Counties, Georgia (Jefferson County Compressor Station and Rincon Compressor Station, respectively); a new meter station on Elba Island in Chatham County, Georgia (Elba Island Interconnect Site); and modified metering facilities at the existing Port Wentworth Meter Station in Chatham County, Georgia (Port Wentworth Site), the EEC North Meter Station in Effingham County, Georgia (EEC North Site), and at the Del Webb Meter Station in Jasper County, South Carolina (Del Webb Site). Phase II would include installation of additional compression at the Hartwell Compressor Station. Phase III would include installation of additional compression at the Hartwell, Jefferson, and Rincon Compressor Stations.

The general locations of the proposed liquefaction and compression/metering facilities are depicted in figure 1.2-1 and are described in more detail in sections 1.2.1 and 1.2.2.

1.2.1 Liquefaction Facilities

The existing LNG Terminal is on Elba Island in Chatham County, Georgia, approximately 8.5 miles upstream from the mouth of the Savannah River. Construction of the liquefaction facilities would generally take place on the island and within the LNG Terminal boundaries; however, the Companies are proposing some dredging work within the South Channel (on the south side of Elba Island), expansion of the access road to the island, and the use of one off-site staging area.

The LNG Terminal currently sends out vaporized LNG from Elba Island to Port Wentworth, Georgia via two parallel 30-inch-diameter pipelines (Twin 30s[3]). The LNG Terminal also contains LNG truck loading facilities. As part of the Project, the LNG Terminal would receive gas from one of the Twin 30s pipelines; treat, liquefy, and send the LNG to one of the five existing LNG storage tanks; and then load it onto LNG carriers (LNGC) berthed at the existing LNG Terminal docks. The other Twin 30s pipeline would continue to transport gas from the island to Port Wentworth. The Companies also would complete upgrades to the LNG Terminal pumps, piping, and control systems to allow for export of LNG. The existing truck loading facilities would be abandoned as part of the first phase of the Project. The liquefaction facilities would share common equipment and infrastructure such as storage and loading/unloading areas for various chemicals, LNG storage tanks, pumps, piping, and dock to support both the import and export of LNG.

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[3] The Twin 30s pipelines currently connect to the EEC Pipeline in a single valve yard near Port Wentworth, Georgia. Currently, both 30-inch-diameter pipelines are operated in common and generally flow natural gas from Elba Island to Port Wentworth. As part of the proposed Project the two pipelines would be segregated, and one line would be dedicated to taking gas from the EEC Pipeline at Port Wentworth to Elba Island and the LNG Terminal. The other line would take gas from Elba Island to Port Wentworth and other markets.



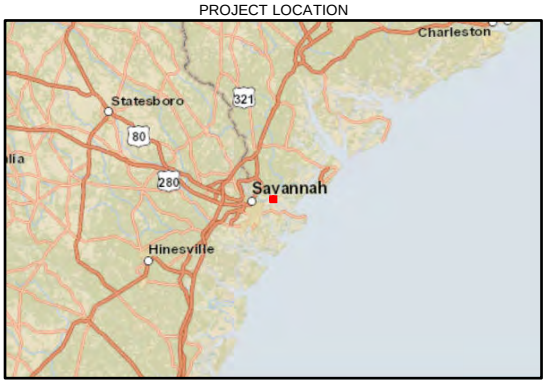
Legend

- Approximate Project Boundary
- Proposed Power Line Modifications

Proposed Terminal Upgrades

- BOG Compressors
- Electric Substation Facility
- Liquefaction Ground Flare System
- MMLS Units
- New Control Room
- New Parking Lot
- New Truck Loading & Unloading Facility[3]
- New Warehouse
- Other Structure Upgrades
- Existing South Channel Barge Loading Facility
- Temporary Electric Substation Facility
- Wareyard Facility
- Marine Flare

PROJECT LOCATION



Notes:
1. Transportation Source: Copyright:© 2013 Esri, DeLorme, NAVTEQ, TomTom
2. Imagery Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
3. To be used for trucks loading/unloading natural gasoline, amine, mixed refrigerants, process waste water, and other materials.

N

0 450 900
Feet

Figure 1.2-1
Proposed Terminal Upgrades
Elba Liquefaction Project
Elba Liquefaction Company, L.L.C.
Southern LNG Company, L.L.C.
Chatham County, Georgia

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CH2MHILL

The Companies propose to use a combination of newly constructed roads and existing access roads on the island during construction and operation. Activities proposed at the LNG Terminal would consist of the components described below and depicted on detailed site location maps provided in appendix A.

1.2.1.1 Movable Modular Liquefaction Systems

The Companies propose to use MMLS technology to liquefy natural gas delivered to the LNG Terminal. Modular system components would be fabricated off-site and delivered to, installed, and placed in service at the LNG Terminal. Each MMLS unit contains a gas treatment and a liquefaction system. As part of the gas treatment system, gas supplied via the Twin 30s pipeline would be heated in a feed gas heater. Liquids would then be removed via separator prior to entering an acid gas removal system. Next, an amine absorption unit, dehydration equipment, and mercury beds would remove hydrogen sulfide (H_2S), carbon dioxide (CO_2), water (H_2O), and mercury. The liquefaction process would occur within the MMLS, where natural gas would be cooled through a multi-stage refrigeration process to the point that it becomes liquefied (-260 degrees Fahrenheit). The MMLS would use nitrogen, methane, ethylene, propane, and isopentane as refrigerants to cool the natural gas and change it to a liquid state. Ethylene, propane, and isopentane would be trucked in and unloaded at their respective storage facilities, while the nitrogen and methane would be provided from within the LNG Terminal. Intermediate hydrocarbon liquids would be sent to the debutanizer where heavy hydrocarbons (i.e., stabilized condensate) would be separated from the lighter components. The lighter components would be routed to the LNG Terminal's BOG system. The stabilized condensate would then be routed to common storage and transported from the LNG Terminal by trucks. LNG would be loaded onto LNGCs.

Phase I of the Project would include installation of three MMLS units equal to a total output capacity of 0.75 MTPA, while Phase II would include installation of seven additional MMLS units equal to a total capacity of 1.75 MTPA (combining for a total liquefaction capacity of 2.5 MTPA). Each MMLS would be controlled by a process control and instrumentation system. Major elements of an MMLS system are described below.

Receiving System

Natural gas for liquefaction would be received from one of the existing Twin 30s pipelines that extend from Port Wentworth to Elba Island. The receiving system would include a feed gas heater, a feed gas filter separator, and a feed gas exchanger that would vaporize any liquids (hydrocarbon or water) and remove any remaining liquids before the gas enters the acid gas removal system. Failure to remove these liquids can cause operational upset in the amine contactor of the acid gas removal system, allowing excessive CO_2 to enter the downstream liquefaction section.

Acid Gas Removal System

The acid gas removal system would consist of an amine contactor and amine regeneration system. The system would remove CO_2 and H_2S from the feed gas because the products would freeze during the liquefaction process.

Dehydration System

The dehydration system would consist of the molecular sieve dryer vessels and the associated dryer regeneration system. The system would remove water to prevent freezing during the liquefaction process.

Mercury Removal System

Mercury guard beds would remove any potential trace amount of mercury in the feed gas before the liquefaction process. The purpose of this system is to remove potential trace mercury to avoid contact with the brazed aluminum heat exchanger.

Liquefaction System

The purpose of this system is to cool the natural gas to the point it becomes a liquid. The natural gas goes through two parallel trains, each with a brazed aluminum heat exchanger. The refrigerant system for each is a mixed refrigerant system consisting of hydrocarbons and nitrogen. The refrigerant system's primary equipment includes a mixed refrigerant compressor, heat exchangers, and separation vessels for vapor/liquid separation of the refrigerant.

1.2.1.2 Ancillary Liquefaction Facilities

The Project would utilize existing and new utilities and other facilities to support LNG export operations. These facilities would be installed during Phase I. Parallel or back-up equipment would be installed during Phase II, where noted.

Pipeline Interconnect and Twin 30s Pipeline Modifications

The Companies would install a new pipeline interconnect for receipt of natural gas into the MMLS units from the Twin 30s Pipeline, including a meter station (described in section 1.2.2) and filter separator.

In order to receive gas from the Twin 30s Pipeline, the Companies would need to segregate the two 30-inch-diameter pipelines that comprise the Twin 30s, which are currently designed to move gas from Elba Island to the EEC Pipeline facilities at Port Wentworth. The modifications would allow one pipeline to be dedicated to taking gas from Port Wentworth to Elba Island, while the other would remain capable of taking gas from Elba Island to Port Wentworth.

Flare System

The Companies would install two flare systems: one to service the liquefaction process and one to service incoming LNGCs (marine flare). The liquefaction flare system would be a ground flare system occupying 1.6 acres adjacent to and west of the existing firewater pond. The flare system would consist of up to 185 burners located 4 feet from the ground surface and would have a projected flame height of 40 to 45 feet. The ground flare system would be surrounded by a 60-foot-tall wind fence. The flames would not be visible from the ground; however, the flare glow may be visible during nighttime flare events. The liquefaction flare would burn off combustible hydrocarbons that are generated during startup and shutdown of the liquefaction processes, from pressure release valves opened during upset conditions, and from vent streams.

The marine flare would be located at the existing dock and would be approximately 75-feet-tall, with a projected flame height of less than 30 feet. The purpose of this flare is to safely burn off inert vapors, mostly nitrogen and CO_2 that are displaced as empty LNGCs are loaded with LNG. Some vaporized LNG also would be vented to the marine flare while ships are being filled. The marine flare system is designed to accommodate up to 12 ships a year, although the Companies estimate only 5 ships a year would require venting of gasses. The flaring of an average ship would take approximately 16 hours,

but some large ships could take up to 3 days. The marine flare would be designed to minimize smoke under normal operational flows.

Ship Loading Facilities

The Companies would modify the LNG loading facilities to allow for export. These modifications would include installation of a new parallel vapor return line from the dock and to the vapor handling system, new loading pumps, additional defeatable check valves to the loading arms, and additions to the control system to control the loading rate and allow for export.

Demineralization Water System

The Companies would install a demineralization water system to produce the low mineral and ion content water required for liquefaction processes. The demineralized water would be used as makeup water for the amine systems in each MMLS, preventing scaling and foaming within the units. The demineralization water system also would remove chloride in the water used for liquefaction, which can lead to corrosion. The demineralized water system would consist of an ion exchange resin to remove the contaminants and/or reverse osmosis equipment. An acid and caustic wash would be routinely used to maintain this system.

Amine Storage Tanks, Transfer Pumps, and Amine Unloading System

The Companies would install a storage tank for new amine and amine recovered from the MMLS units. New amine would be delivered to the tanks via trucks; recovered amine can be sent back to the MMLS units for re-use. The Companies expect that amine truck deliveries would be needed mainly for initial bulk loading and then infrequently during operation if the MMLS amine quality has degraded and needs to be replaced.

Stabilized Condensate Storage and Unloading Facilities

The Companies would install stabilized condensate (i.e., natural gasoline) storage and loading facilities to store the heavy hydrocarbon components that would be separated from the natural gas during liquefaction. The stabilized condensate would be routed to the truck loading station for removal from the facility for commercial uses. The frequency of these truck loadings would be dependent on the content of heavy hydrocarbons in the natural gas feed supply but could be up to two truckloads per day for 10 MMLS units (peak Phase I/Phase II operation).

Mixed Refrigerant Storage and Distribution Equipment and Nitrogen System Modifications

The Companies would install four individual components of the mixed refrigerant storage and distribution equipment as well as a new third-party nitrogen generation system that would tie into the existing nitrogen injection storage system. Nitrogen would be used for the MMLS mixed refrigerant compressor seal as a brazed aluminum heat exchanger purge, for startup needs of MMLS compressors, for tank/vessel nitrogen purges or blankets, and for removing air from process equipment to allow safe introduction of hydrocarbons. During operations, ethylene, propane, and isopentane deliveries are anticipated at a frequency of up to two trucks per day. Nitrogen deliveries would be infrequent, and only needed to replenish the nitrogen generation unit.

Boil-Off Gas System

The Companies would expand existing vapor handling systems to include two new compressors each providing an additional 3,000 horsepower (hp) of BOG compression.

Process Waste Water Truck Loading Station

The Companies would install a process waste water truck loading station to receive water that has come in contact with the gas treatment and liquefaction process. This truck loading station also would receive the LNG Terminal's liquid decontamination streams. The Companies anticipate that the volume of process waste water trucked out would be small, at an estimated one to two trucks per month, for proper disposal.

Other Systems

The Companies would install a variety of additional support systems for the liquefaction process. These include an acid gas thermal oxidizer, natural gas liquid debutanizer system, hot oil system, and a new instrument air and fuel gas system. The Companies also plan to expand the firewater and safety systems, modify the stormwater and septic systems, and enhance the potable water system to accommodate the anticipated increase in workers and employees at the facility as a result of the Project (e.g., washing, cleaning, cooking, and safety showers). A second acid gas thermal oxidizer may be installed during Phase II. In addition, the hot oil system, firewater and safety systems, stormwater runoff, and instrument air and fuel gas systems could also be upgraded as part of Phase II. These upgrades would include adding a second hot oil system heater and circulation pump; adding additional firewater monitors, extinguishers, eye wash, and showers; and connecting the stormwater system for the additional MMLS units to the primary stormwater system. In addition, the Companies could potentially install air emission add-on control devices to control nitrogen oxide (NO_x) emissions.

New Buildings and Building Modifications

The Companies would relocate, modify, or construct a variety of buildings to support the new liquefaction facilities. New buildings would include a warehouse, heavy equipment storage shelter, hazardous materials storage building, control building, pipeline compressor shelter, firewater pond pump house, laboratory building, truck loading shelter and driver break room, electrical equipment room, chromatograph buildings, and maintenance building. Modified and upgraded buildings would include the LNG Terminal maintenance and shop building, training center building, and Security Post.

1.2.1.3 Other Modifications to LNG Terminal Site

Storm Surge Wall

The Project would include construction of an approximately 6,500- to 7,000-foot-long storm surge wall with a height of 24 feet above mean low water (AMLW) and range from 5.5 to 11 feet in elevation above the interior ground surface. The storm surge wall would likely be constructed of steel sheet piling, local soil, and/or riprap supported by pile foundations and new wall sections would be constructed to connect the existing dredge material containment area (DMCA) and LNG tank containment walls. The storm surge wall is designed to protect the LNG Terminal and liquefaction facilities from a 500-year flood event and Category 3 hurricane (100-year storm event). The final design of the new storm surge wall would incorporate recommendations from the final Geotechnical Engineering Report.

South Channel Barge Loading Facility Modifications and Dredging

To reduce construction traffic on Elba Island Road, the Companies would utilize the existing South Channel Barge Loading Facility (South Channel barge dock) to transport materials and equipment to the island via barges. The Companies would modify the South Channel barge dock area by installing 30 timber fender piles along the existing 150-foot-long sheet pile wall to buffer the wall from barges.

Each fender pile would be up to 18 inches in diameter and spaced approximately 5 feet apart. Three breasting dolphins would also be constructed in the South Channel to absorb the energy generated during berthing and mooring of barges. Each breasting dolphin would consist of three steel piles 18 inches in diameter. All piles would be installed by vibratory hammer. The timber fender piles would remain in place after construction, while the steel breasting dolphins would be removed by vibratory hammer after construction is complete. In addition, six existing isolated piles and pile clusters would be removed from the South Channel barge dock area by vibratory hammer.

Due to an accumulation of sediment near the South Channel barge dock since it was last used several decades ago, the Companies would dredge an area adjacent to the South Channel barge dock to allow barges to dock at the island. Dredging would be conducted via hydraulic cutterhead within a trapezoidal area approximately 592 feet x 347 feet x 816 feet x 729 feet, with a maximum anticipated initial dredge volume of 45,000 cubic yards (cy). Annual maintenance dredging (up to 20,000 cy annually) would be conducted on an as needed basis during the 5-year construction period to maintain the 8 feet of depth below mean low water (BMLW).

Dredge Containment Area Modifications

The Companies would move the eastern edge of the dike for DMCA 2 approximately 155 feet to the west and stabilize the portion of the dike that would border the new liquefaction facilities area. To stabilize the dike, the Companies would modify the existing slope of the dike by increasing the horizontal to vertical ratio from 2:1 to 3:1. The Companies would also add structural fill along the edge of the DMCA and place an access road on the fill.

Electric Distribution Facilities Modifications

The Companies would modify the existing electric distribution system to supplement existing power delivery to Elba Island. During construction of the liquefaction facilities, a temporary substation would be constructed by the utility company in order to supply electrical power to the LNG Terminal and construction activities while the existing substation is demolished. This temporary substation would remain operational until a new permanent substation is constructed and placed into service. The new permanent substation would be constructed on approximately 2.4 acres south of and adjacent to MMLS Units 8 and 9. Electrical distribution systems modifications during Phase II would include the installation of power cables within MMLS Units 4-10, unit-specific transformers, lighting, and grounding.

LNG Truck Loading Facility Abandonment

The Companies would abandon the existing LNG truck loading facility. The LNG Terminal, as initially authorized in 1972, included two stations and ancillary equipment to fill trucks with LNG. The Companies would remove the LNG truck loading facilities and utilize the area for construction and operation of the proposed MMLS units.

1.2.2 Compression and Metering Facilities

To deliver the inlet gas to the LNG Terminal[4], the Companies would construct new and modified compression and metering facilities. The new and modified compression and metering facilities would be constructed at the following sites in Georgia and South Carolina. Site maps for each facility site are provided in appendix B.

[4] The EEC Pipeline connects with the Twin 30s Pipeline in a single valve yard near Port Wentworth, Georgia.

1.2.2.1 Compression Facilities

Hartwell Compressor Station

During Phase I, the Companies would install two additional gas turbines rated up to 31,800 hp within the existing 10,000 hp Hartwell Compressor Station Site in Hart County, Georgia. This would also include installation of a standby generator, fuel gas heater, filter separator, gas cooler, pig[5] launcher/receiver, and blowdown silencer.

During Phase II, the Companies would install one additional gas turbine rated up to 15,900 hp within the existing facility footprint. The new compression would be connected to the existing 36-inch suction and discharge headers. The Companies would also install a blowdown silencer and a standby generator, fuel gas heater, filter separator, and gas cooler.

During Phase III, the Companies would install one additional gas turbine rated up to 15,900 hp, re-wheel the existing 10,000 hp compressor within the existing facility footprint, install a blowdown silencer, and install a standby generator, fuel gas heater, filter separator, and gas cooler.

Jefferson County Compressor Station

During Phase I, the Companies would construct one new compressor station at a site in Jefferson County, Georgia. This site would include a new gas turbine rated up to 15,900 hp, a standby generator, fuel gas heater, filter separator, gas cooler, pig launcher/receiver, and blowdown silencer. In addition, the Companies would install less than 100 feet of 42-inch-diameter suction and discharge pipeline laterals; side gates to interconnect to the existing EEC Pipeline; an acoustically insulated compressor building; compressor turbine auxiliary equipment and controls; an auxiliary building with office and control facilities; and a shop/warehouse. All of the facilities would be surrounded by a chain-link fence. One new permanent gravel access road would be constructed.

No facilities would be constructed at the Jefferson County Compressor Station during Phase II. During Phase III, the Companies would install one additional gas turbine rated up to 15,900 hp within the existing facility footprint, a blowdown silencer, and a standby generator, fuel gas heater, filter separator, and gas cooler. The new compression would be connected to the existing 42-inch suction and discharge headers.

Rincon Compressor Station

During Phase I, the Companies would construct one new compressor station in Effingham County, Georgia. This facility would include a new gas turbine rated up to15,900 hp, fuel gas heater, filter separator, gas cooler, pig launcher/receiver, blowdown silencer, and a standby generator. In addition, the Companies would install less than 100 feet of 42-inch-diameter suction and discharge pipeline laterals; side gates to interconnect with the existing EEC Pipeline; an acoustically insulated compressor building; compressor turbine auxiliary equipment and controls; an auxiliary building with office and control facilities; a shop/warehouse; and a stormwater pond. All facilities would be surrounded by a chain-link fence. One new permanent gravel access road would be constructed.

No facilities would be constructed at the Rincon Compressor Station during Phase II. During Phase III, the Companies would install an electric-motor driven compressor turbine rated up to 15,000 hp

[5] A "pig" is a tool that is inserted into and moves through a pipeline and is used for cleaning the pipeline, internal inspections, and other purposes.

and re-wheel the existing 15,900 hp compressor within the existing facility footprint, install a blowdown silencer, and install a standby generator, fuel gas heater, filter separator, and gas cooler. The new compression would be connected to the existing 42-inch suction and discharge headers.

1.2.2.2 Metering Facilities

The Companies would construct and modify existing metering facilities during Phase I, as discussed below. Where new metering facilities are constructed, each site would comprise meters, flow control, taps, and valves; a chromatograph building; and associated piping, valves, and electronic equipment for measuring gas.

EEC North Meter Station

The Companies would construct new pressure/flow control facilities at the existing EEC North Meter Station in Effingham County, Georgia, at approximately milepost (MP) 9.8 of the EEC Pipeline.

Port Wentworth Meter Station

The Companies would construct two new meter stations at the existing Port Wentworth Meter Station in Chatham County, Georgia, at MP 0.0 of the EEC Pipeline. One station would measure gas movement from the EEC Pipeline to the Carolina Gas Transmission Corporation system. The other would measure gas movement from the EEC Pipeline to the Southern Natural Gas Company, LLC (SNG) pipeline system.

Del Webb Meter Station

The Companies would remove a check valve at the existing Del Webb Meter Station in Jasper County, South Carolina, at approximately MP 4.8 of the west line of the Twin 30s Pipeline.

Elba Island Interconnect

The Companies would construct one new meter station and potentially modify the existing meter station at Elba Island in Chatham County, Georgia. The new meter station would be at MP 0.0 of the Twin 30s Pipeline, within the proposed Elba Island Interconnect Site near the proposed MMLS units, and would meter gas coming from the EEC Pipeline. If necessary, the Companies would also modify the existing Elba Island meter station at MP 0.0 of the Twin 30s Pipeline to ensure accurate flow measurement and interaction with the new facilities by replacement or addition of meter or flow control components.

1.2.3 On-site and Off-site Temporary Workspace

1.2.3.1 Liquefaction Facilities

The Companies would use both on-site and off-site wareyards during construction of the liquefaction facilities. This would include an undeveloped area on Elba Island, immediately south of the marine berth, to be used as a staging area and one laydown area off-site, near the junction of Elba Island Road and Kerr McGee Road, for employee parking, training, human resources, and temporary placement of construction supplies and equipment. The on-site wareyard would be converted to include a new warehouse, parking area, and road upon conclusion of construction staging.

1.2.3.2 Compression and Metering Facilities

No off-site workspaces would be used for construction of the compression, metering, and pipeline facilities. Temporary workspaces would be utilized within the site boundaries adjacent to the existing or proposed permanent (fenced-in) facility footprints at the Hartwell, Jefferson County, Rincon, Port Wentworth, EEC North, and Del Webb Sites (see figures in appendix B).

1.2.4 Access Roads

1.2.4.1 Liquefaction Facilities

The Companies would construct both temporary and permanent roads on Elba Island to support the construction and operation of liquefaction facilities. Currently, there are approximately 13,200 linear feet of existing roads at the LNG Terminal. Approximately 6,294 feet of existing road would be removed during construction of the new facilities and approximately 9,527 feet of new road would be added to provide temporary and permanent access to the new facilities. In some areas, the new roads would use the same alignment as existing unpaved roads; where possible the Companies would use unpaved road as part of the pavement sub-base for the new asphalt pavement.

In addition, approximately 700 feet of Elba Island Road would be widened at the approach to the LNG Terminal Security Post to provide additional traffic lanes to augment and expedite security activities. The road is currently two lanes wide and would be widened by one lane from approximately 700 feet south of the existing Security Post to 280 feet south of the Security Post to provide space for security personnel to create access badges and perform surveillance activities of incoming vehicles. At approximately 280 feet from the Security Post to the Security Post, the road would be widened to four lanes to allow for security processing and to provide sufficient room for a truck turn-around to allow unauthorized trucks to exit the property.

Due to concerns raised during scoping, the Companies conducted a traffic impact analysis and have been working with the City of Savannah Fire Chief and Chatham Emergency Management Agency regarding trucking routes through Savannah that would minimize the impacts on the community. Impacts related to traffic are analyzed in sections 2.5.4 (socioeconomics) and 2.9.6 (cumulative impacts), and transportation alternatives are evaluated in section 3.3.1.3.

1.2.4.2 Compression and Metering Facilities

The Companies would use existing permanent access roads to access the Hartwell, Elba Island Interconnect, Port Wentworth, EEC North, and Del Webb Sites. New permanent access roads would be constructed to access the new compressor station sites. The Jefferson County Compressor Station would be accessed by a new, approximately 75-foot-long access road that intersects Middle Ground Road. The Rincon Compressor Station would be accessed by a new, approximately 40-foot-long access road that intersects the entrance road to the wastewater treatment plant off of Low Ground Road.

1.3 NONJURISDICTIONAL FACILITIES

Under Section 7(c) of the NGA, the Commission is required to consider, as part of its decision to approve facilities under Commission jurisdiction, all factors bearing on the public convenience and necessity. Occasionally, proposed projects have associated facilities that do not come under the jurisdiction of the FERC. These "nonjurisdictional" facilities may be integral to the needs of a project (e.g., a new or expanded power plant at the end of a pipeline that is not under the jurisdiction of the FERC) or they may be merely associated as a minor, non-integral component of the jurisdictional

facilities that would be constructed and operated as part of a project. We identified two non-jurisdictional facilities associated with the Project: an upgrade to the power line servicing Elba Island and an upgrade to the electrical power line in the vicinity of the Jefferson County Compressor Station.

The Companies would need additional electric power to supply the liquefaction facilities. The electrical power demand for the Elba Liquefaction Project is estimated at 250 megavolt-amperes (MVA). The existing transmission system in the area of the Elba Liquefaction Project is rated at 115 kilovolts (kV), 60 Hertz. The Companies would upgrade this line, construct a new substation at the LNG Terminal, and add a capacitor bank either at the LNG Terminal or at the expanded Deptford Substation. In addition, the existing substation at the LNG Terminal would be expanded to accommodate a bus-tie breaker and a second 115 kV line to Elba Island. Electric power upgrades to the LNG Terminal also would require the reconfiguration of the 115 kV lines into the existing substation to best accommodate the new load as well as the installation of an additional 60 MVA reactive capacitor. Additional right-of-way would be required to construct the new 115 kV line to Elba Island and to rebuild the existing 115 kV line to 250 MVA. In addition, the existing transmission line would be relocated to the opposite side of Elba Island Road, requiring some new right-of-way near the Deptford Substation end of the line. This new line would cross approximately 12,000 linear feet of wetlands and up to three waterbodies, and would require approximately 10 acres of construction workspace over the 3.4-mile-long route from the Deptford Substation to the LNG Terminal Substation. Regulatory approvals for associated wetland and waterbody impacts would be required by the U.S. Army Corps of Engineers (COE) and by the Georgia Environmental Protection Division (GEPD) for stormwater runoff. All these activities would be completed by Georgia Power, the LNG Terminal's electric service provider.

The Companies also anticipate that an existing, approximately 3.5-mile-long single-phase electric power line would be upgraded to a three-phase power line to serve the Jefferson County Compressor Station. This work would be completed by Georgia Power and would not require regulatory approvals.

Cumulative impacts associated with these non-jurisdictional facilities are addressed in section 2.9.

1.4 PROJECT PURPOSE AND NEED

The Companies' stated purpose of the Elba Liquefaction Project is to liquefy domestically produced natural gas for export. The purpose of the EEC Modification Project is to increase compression along the EEC Pipeline, which connects the LNG Terminal to Transcontinental Gas Pipeline Company's pipeline, in order to increase the capacity of the EEC Pipeline to support the Elba Liquefaction Project.

The Companies assert that improvements in natural gas drilling and extraction technologies and a better understanding of available resources and responsible development ensure that a long-term market exists for domestically produced gas overseas. During an open season conducted from July 24, 2013 through August 7, 2013, EEC received binding bids for all of the proposed incremental firm transportation capacity that would result from construction of the proposed facilities, including supplying natural gas to the LNG Terminal for liquefaction as well as to markets in the southeastern United States. Consistent with these supply and demand conditions, the Companies determined that there is a need for the Project.

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 the importation or exportation, the FERC shall authorize the proposal unless it finds that the proposed facilities would not be consistent with the public interest.

Section 7(b) of the NGA specifies that no natural gas company shall abandon any portion of its facilities subject to the Commission's jurisdiction without the Commission first finding that the abandonment will not negatively affect the present or future public convenience and necessity. Under Section 7(c) 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 of Public Convenience and Necessity (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.

The Companies assert that the Project would benefit the public interest by stimulating job creation directly attributable to the Project (meanwhile facilitating development of natural gas supplies and jobs in the United States), enhancing U.S. energy security, stabilizing the overall U.S. balance of trade, increasing ties with foreign nations, and helping to achieve global greenhouse gas (GHG) targets through the promotion of clean-burning natural gas.

A number of commenters questioned the need for the Project on the assertion that the United States should not export its natural gas resources, and that doing so would result in adverse economic and environmental impacts. As discussed in sections 1.1 and 1.5.2, the DOE-FE determines whether the proposed import or export of natural gas is consistent with the public interest. DOE-FE's orders issued in response to applications seeking authority to export LNG to non-FTA countries address the public interest of the proposed exports, including economic impacts. This EA addresses the environmental impacts of the facilities proposed before the Commission. The addition of the proposed facilities are a connected action in the Companies DOE-FE application to export LNG.

1.5 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

The topics addressed in this EA include alternatives; geology; soils; groundwater; surface waters; wetlands; vegetation; wildlife and aquatic resources; special status species; land use, recreation, special interest areas, and visual resources; socioeconomics (including transportation and traffic); cultural resources; air quality and noise; reliability and safety; and cumulative impacts. The EA describes the affected environment as it currently exists, discusses the environmental consequences of the Project, and compares the Project's potential impact with that of various alternatives. The EA also presents our recommended mitigation measures.

The Energy Policy Act of 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 EA. This effort was undertaken with the participation and assistance of the DOE-FE, USCG, and DOT as "cooperating agencies" under NEPA. Cooperating agencies have jurisdiction by law or special expertise with respect to environmental impacts involved with a proposal. The roles of the FERC, DOE-FE, USCG, and DOT in the Project review process are described below. The EA 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 EA in approving or issuing permits for all or part of the proposed Project. Federal, state, and local permits, approvals, and consultations for the proposed Project are discussed in section 1.10.

1.5.1 Federal Energy Regulatory Commission

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

As the lead federal agency for the Project, the FERC is required to comply with Section 7 of the Endangered Species Act (ESA), as amended, the Magnuson-Stevens Fishery Conservation and Management Act, Section 106 of the National Historic Preservation Act (NHPA), and Section 307 of the Coastal Zone Management Act. Each of these statutes has been taken into account in the preparation of this EA. The FERC will use this document to consider the environmental impacts that could result if it authorizes the Project.

1.5.2 U.S. Department of Energy Role

The DOE-FE must meet its obligation under Section 3 of the NGA to authorize the import and export of natural gas, including LNG, unless it finds that the import or export is not consistent with the public interest. For the Project, DOE-FE has authorized Companies to export LNG to FTA nations in accordance with section 3(c) of the NGA as amended by Section 201 of the Energy Policy Act of 1992, and is conducting its review to determine whether the Companies' proposal to export LNG to any country with which the United States does not have a FTA and with which trade is not prohibited by U.S. law or policy is consistent with the public interest. Additionally, NEPA requires DOE-FE to consider the environmental impacts of its decisions on non-FTA export applications. In this regard, DOE-FE acts as a cooperating agency with the FERC as the lead agency in this EA pursuant to the requirements of NEPA.

As discussed in section 1.1, the DOE-FE has granted conditional authorization for export to FTA nations from the Project facilities. The DOE-FE would not make a final decision on applications to export LNG to non-FTA countries until DOE-FE has met all of its statutory responsibilities. In accordance with 40 CFR 1506.3, after an independent review of the EA, the DOE-FE may adopt it prior to issuing a Record of Decision on the Companies' application for authority to export LNG.

1.5.3 U.S. Coast Guard Role

The USCG exercises regulatory authority over LNG facilities that affect the safety and security of port areas and navigable waterways under Executive Order 10173; the Magnuson Act (50 U.S. Code [USC] 191); the Ports and Waterways Safety Act of 1972, as amended (33 USC 1221, et seq.); and the Maritime Transportation Security Act of 2002 (46 USC 701). The USCG is responsible for matters related to navigation safety, vessel engineering and safety standards, and all matters pertaining to the safety of facilities or equipment in or adjacent to navigable waters up to the last valve immediately before the receiving tanks. The USCG also has authority for LNG Facility Security Plan review, approval, and compliance verification as provided in 33 CFR 105, and siting as it pertains to the management of vessel traffic in and around the LNG facility.

As required by its regulations, the USCG is responsible for issuing a Letter of Recommendation (LOR) as to the suitability of the waterway for LNG marine traffic. The Companies submitted correspondence to the USCG, dated August 29, 2012 and September 6, 2012, that detailed the proposed Project modifications. In a letter dated September 11, 2012, the USCG stated that the proposed modifications would not alter the loading operations in a way that would result in an increased capacity of 160 vessels per year. Therefore, the Companies would not be required to submit a new Letter of Intent or Waterway Suitability Report, and the current LOR for the facility would remain valid.

1.5.4 U.S. Department of Transportation Role

Under 49 USC 60101, the DOT has prescribed the minimum federal safety standards for LNG facilities. 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 a 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 LNG import/export facilities, the DOT participates as a cooperating agency and assists in assessing any mitigation measures that may become conditions of approval for any project. DOT staff have reviewed FERC staff's analysis and provided comments on our conclusions regarding compliance with Part 193 regulations. In a July 30, 2015 letter to FERC, the DOT Pipeline and Hazardous Materials Safety Administration stated that it had reviewed the criteria used by ELC and SLNG to identify design spill scenarios and establish siting for the LNG storage facility to confirm compliance with 49 CFR Part 193, and it had no objections to ELC and SLNG's methodologies.[6] The DOT would also monitor the construction and operation of the natural gas facilities to determine compliance with its design and safety standards.

1.6 PUBLIC REVIEW AND COMMENT

On December 5, 2012, the Companies filed a request to utilize our pre-filing process; we approved the Companies' request on March 1, 2013, in Docket No. PF13-3-000. We participated in four public open houses sponsored by the Companies in the Project area in March and September 2013 to explain our environmental review process to interested stakeholders. On April 22, 2013, we issued a *Notice of Intent to Prepare an Environmental Assessment for the Planned Elba Liquefaction Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meetings* (NOI). The NOI was published in the Federal Register[7] and was sent to over 280 parties including federal, state, and local officials; agency representatives; Native American groups; and property owners affected by the proposed facilities. On October 9, 2013, we issued a letter to 84 landowners and stakeholders that provided notification of the Companies' intent to add new facilities to the scope of the Project; specifically, a new compressor station in Effingham County, Georgia and metering facilities in Chatham County, Georgia. On November 5, 2013, August 4, 2014, and January 30, 2015, we issued a *Project Update for the Elba Liquefaction Project* to 368 parties (all parties on the current Project mailing list as of the date of the publication) that provided an update on the Commission's environmental review of the Project, explained the environmental review process, and identified issues gathered during scoping.

We conducted two public scoping meetings in the Project area to provide an opportunity for agencies and the general public to learn more about the Project and to participate in the environmental analysis by identifying issues to be addressed in the EA. A total of 15 speakers presented comments at the meetings held on May 7, 2013, in Hartwell, Georgia and on May 9, 2013, in Savannah, Georgia. Forty-one individuals attended these meetings. The transcripts of the public scoping meetings and all written scoping comments are part of the public record for the Project and are available for viewing on the FERC Internet website (http://www.ferc.gov).[8] An interagency meeting was held at the LNG Terminal

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6 This letter was filed in the FERC public record under Docket Number CP14-103-000 on July 31, 2015. Accession Number 20150731-4001.

7 78 Fed. Reg. 25074 April 29, 2013.

8 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., PF13-3, CP14-103, and CP14-115). Select an appropriate date range.

on May 9, 2013 and was attended by the U.S. Fish & Wildlife Service (FWS), the COE, National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS), and Georgia Department of Natural Resources (GDNR). We also held a meeting with the Savannah Mayor, Fire Department, and Emergency Management Authority on May 9, 2013. An on-site environmental review of Elba Island and the Hartwell and Jefferson County Compressor Stations was conducted while participating in the Companies' open houses in March 2013. In addition, while participating in the Companies' open house in September 2013, we conducted a review of the Rincon, EEC North, and Port Wentworth Sites, and visited points within Fort Pulaski and Old Fort James Jackson to assess visibility of the LNG Terminal from each fort.

Table 1.6-1 summarizes the environmental issues identified during the scoping process. Substantive environmental issues raised by commenters are addressed in applicable sections of the EA.

TABLE 1.6-1

Issues Identified in Scoping Process

Issue/Summary of Comment	EA Section Addressing Comment
GENERAL/PROJECT DESCRIPTION	
Project requires preparation of an Environmental Impact Statement	1.6
Project's relationship to increased shale gas development, production, and fracking	1.6, 2.9.1
End-use of the by-products generated at the LNG Terminal	1.7.2.2
Timing of LNG Terminal expansion; why Project was not previously built to accommodate future demand	1.4
GEOLOGY AND SOILS	
Presence of granite in the Project area and the impacts of blasting on these resources	2.1
WATER RESOURCES, FISHERIES, AND WETLANDS	
Source water, water intakes, discharge pipes, water use volume/flow, and thermal impacts on the Savannah River	2.2.1, 2.2.2
Entrainment and impingement of fish, crab, and shrimp larvae	2.2.3.3
Impacts on migratory fisheries, spawning areas (esp. Ogeechee River, portions of Williamson Swamp and Rocky Comfort Creek), and Essential Fish Habitat	2.2.3
Impacts on estuarine emergent vegetation and unconsolidated bottom wetlands	2.2.5
Vegetative buffers between impervious surfaces and salt marshes	2.2.5
Impacts on surface water quality, including the Savannah River	2.2.2
Shoreline erosion from increased shipping and barge traffic, especially along the north shore of Cockspur Island and Cockspur Lighthouse	2.2.3.3
Impacts from ballast water discharge, including the introduction of invasive species	2.2.3.3
Impacts from increased occurrence of future dredging activities	2.9.3
Building modification compliance with Chatham County wetland setback requirements	2.2.5.3
Increased pollution and sediment runoff into surface waterbodies	2.2.2
Need for wetland delineations to determine Project impacts	2.2.5
Potential for dike expansion at the LNG Terminal	2.9.1
VEGETATION	
Impacts on forested areas due to tree removal	2.2.5.3, 2.3.1.1
Introduction of invasive species	2.3.1
WILDLIFE AND THREATENED AND ENDANGERED SPECIES	
Habitat fragmentation	2.3.2
Impacts from ship traffic on marine mammals	2.2.3, 2.2.4
Project impact on federally listed species and habitat	2.3.3.2

TABLE 1.6-1

Issues Identified in Scoping Process

Issue/Summary of Comment	EA Section Addressing Comment
LAND USE, VISUAL RESOURCES, AND RECREATION	
Visual impacts from the Hartwell Compressor Station and LNG Terminal	2.4.5
Visual impacts on scenery, increased light pollution, and increased industrial noise at Fort Pulaski National Monument and Old Fort James Jackson	2.4.5.1, 2.7.2
Need for a visual resource impact analysis due to nearby historically significant resources	2.4.5
Landowner impacts from appurtenant pipeline facilities	2.4.3
Light pollution from Hartwell Compressor Station and LNG Terminal	2.4.5
SOCIOECONOMICS	
Project will benefit foreign countries, not local communities	1.4, 1.5.2
Project will benefit the United States, the State of Georgia, and local communities through employment and increased tax revenue	2.5.1
Project will increase domestic gas prices	2.5
Project will result in lowered property values from nearby compressor stations	2.5.5
Impacts on local tax base distribution	2.5.1
Project's use of local hires	2.5
Details on how and when trucks would be routed through the City of Savannah	2.5
Off-site traffic concerns related to construction	2.5
Construction traffic concerns related to travel on rural roads	2.5
CULTURAL RESOURCES	
Project impacts on historic and culturally significant sites	2.6
AIR QUALITY AND NOISE	
Project's contribution to global greenhouse gas emissions	2.7.1
Air pollution related to the amount of coal used for domestic electricity production due to Project's export of LNG	2.7.1
Local air impacts and emissions	2.7.1
Noise from operation of the Hartwell Compressor Station and blowdown activities	2.7.2
Noise from operation of the liquefaction facilities	2.7.2
Impact and mitigation of noise at Fort Pulaski and Old Fort Jackson	2.7.2
RELIABILITY AND SAFETY	
Impacts from a hazardous liquid spill	2.8.2
Concern regarding safety of blowdown activity at compressor station	2.8
Level of training provided to first responders/fire personnel	2.8.4
Procedures for emergency shutdown and the timeline for initiation of shutdown procedures	2.8.4
Concern about pipeline safe operating pressure and internal corrosion	2.8
Noxious gas emissions from Hartwell Compressor Station	2.8
Explosion safety at Hartwell Compressor Station	2.8
Pipeline design capacity safety concerns	2.8
Types of products going to and from the LNG Terminal	1.7.2.2
CUMULATIVE IMPACTS	
Environmental impacts resulting from increased gas production	1.6
Cumulative impacts must be considered in a cumulative impacts analysis	2.9
Project's relationship to increased trucking in the area	2.9.10
ALTERNATIVES	
Consider potential for reduction in trucking distance	3.3.1.3
Consider the No Action Alternative	3.1
Consider an alternative to reduce operating footprints of the facilities	3.3.2
Consider alternatives to mitigate pollution	3.2

We received comments during the scoping period recommending that an EIS, rather than an EA, be prepared to assess the impact of the Project. An EA is a concise public document for which a federal agency is responsible that serves to provide sufficient evidence and analysis for determining a finding of no significant impact. The Commission's regulations under 18 CFR 306(b) state: "If the Commission believes that a proposed action … may not be a major federal action significantly affecting the quality of the human environment, an EA, rather than an EIS, will be prepared first. Depending on the outcome of the EA, an EIS may or may not be prepared." In preparing this EA, we are fulfilling our obligation under NEPA to consider and disclose the environmental impacts of the Project. As noted above, this EA addresses the impacts that could occur on a wide range of resources should the Project be approved and constructed. Also, the COE, USCG, DOE-FE, and DOT have special expertise with respect to certain environmental impacts associated with the Companies' proposal and assisted in preparing this EA. Based on our analysis, the extent and content of comments received during the scoping period, and considering that the Project facilities would be largely collocated with existing facilities, we conclude in section 4 that the impacts associated with this Project can be sufficiently mitigated to support a finding of no significant impact and, thus, an EA is warranted.

Commenters also assert that authorization to export natural gas would spur the development of natural gas derived from shale formations and, therefore, the environmental impacts associated with shale gas development should be included in the environmental review of the Project. Whereas the Project could export natural gas derived from shale formations, the Companies could procure their gas supplies from anywhere in the gas market and transporting such supplies to the LNG Terminal for liquefaction and export. In addition, specific details, including the timing, location, and number of additional production wells that may or may not be drilled, are speculative. As such, impacts associated with the production of natural gas that may be sourced from various locations and methods for export by the Project are not reasonably foreseeable or quantifiable. Furthermore, our authority under the NGA and NEPA review requirements relate only to natural gas facilities that are involved in interstate commerce. Thus, the facilities associated with the production of natural gas are not under FERC jurisdiction.

On April 22, 2013, FERC staff issued a letter to the U.S. Department of Defense requesting comments on whether the Project could potentially have an impact on the testing, training, or operational activities of any active military installation. The U.S. Department of Defense responded in a letter dated July 3, 2013 that the Project would have a minimal impact on the military operations in the Project area.

1.7 CONSTRUCTION, OPERATION, AND MAINTENANCE

1.7.1 General Procedures

The Companies have committed to design, construct, operate, and maintain the liquefaction facilities in accordance with DOT regulations in 49 CFR 193, which apply to LNG facilities; NFPA Standard 59A, "*Standard for the Production, Storage, and Handling of Liquefied Natural Gas*;" USCG regulations in 33 CFR 127 and Executive Order 10173; and applicable federal and state environmental regulations. The Companies also committed that the compression facilities would be designed, constructed, operated, and maintained to conform to the requirements of the DOT in 49 CFR 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards* and applicable federal and state environmental regulations.

The Companies would construct, restore, and maintain the Project in conformance with the measures described in FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) and Wetland and Waterbody Construction and Mitigation Procedures (Procedures), which were developed to minimize the environmental impact of construction and operation of interstate natural gas transmission facilities. The Companies also would develop a Project-specific Stormwater Pollution Prevention Plan

(SWPPP) to control erosion and sedimentation from stormwater events using best management practices (BMP) in accordance with GDNR's National Pollutant Discharge Elimination System (NPDES) General Permit No 100001, and other permit conditions specified for construction of the liquefaction and compression facilities. The Companies also would design and implement a Project-specific Spill Prevention, Control, and Countermeasures Plan (SPCC Plan) that would specify procedures and measures to avoid and minimize potential impacts from spills of fuel or other hazardous substances during Project construction and operation. Further, the Companies would implement the facility design, operating, and security procedures specified in 40 CFR 112.

In the original application submitted with the Commission in March 2013, the Companies anticipated beginning construction of the Phase I liquefaction facilities in February 2015 and to place the facilities in service by February 2017, with Phase II construction starting approximately two months later. Construction of the compression facilities was proposed to begin in September 2015 and end by June 2016. Due to delays in the regulatory review of the project, the Companies would need to provide an updated schedule for review and approval prior to construction. This updated schedule would be provided as part of the Implementation Plan they would file per recommendation number 6 in section 4 of this EA.

1.7.2 Liquefaction Facilities

1.7.2.1 Construction

Construction for the liquefaction facilities would primarily occur within the existing LNG Terminal footprint and at the LNG loading berth and South Channel barge dock. One off-site wareyard would also be used. Construction personnel would assemble at an off-site location and be bussed to and from Elba Island on a daily basis. Construction personnel would number approximately 575 people for the initial mobilization of the Project, ramp up to an approximate peak of 1,300 workers a year later, and then gradually taper off to 110 by the time Phase II Commissioning begins.

The land requirements for construction of the liquefaction facilities are summarized in section 1.9. Construction of the liquefaction facilities would include the following activities, some of which would occur simultaneously (e.g., during site preparation), or in sequence, as indicated.

Site Clearing, Grading, Filling, and Excavation

During site preparation, the construction areas would be cleared, grubbed (if trees are present), filled, and graded to prepare project areas for construction and to provide adequate surface drainage. Approximately 374,400 cy of loose fill material would be required to prepare the project areas for construction. Fill would be used to fortify the area around the MMLS units, the on-site staging area, new warehouse location, roadways, and the area within the storm surge wall where the liquefaction facilities would be located. Areas to be filled may be improved with an aggregate surface and underlain by a geotextile fabric, as necessary. Ships carrying materials for fill would moor at the existing LNG loading berth to unload their cargo.

Stormwater Drainage and Spill Containment

During site preparation, the Companies would construct local drainage networks for the liquefaction facilities. LNG storage areas would be partially drained to newly constructed spill containment systems. Each of these spill containment systems would terminate into spill impoundments that have sump pumps to remove any uncontaminated stormwater from the impoundment to the separate stormwater drainage network. Liquefaction facility areas that do not drain into these spill containment

systems would be graded to drain into drainage ditches that are isolated from the spill containment systems. These drainage ditches would be routed and sloped as required for drainage. Final drainage configurations would tie into existing outfalls on Elba Island, which are protected by tidal gates. If new outfalls are required, they would also be protected by tidal gates.

Building Demolition and Construction

During site preparation, the LNG truck loading facilities, warehouse, and other buildings listed in section 1.2.1.2 would be removed to accommodate other Project elements. New buildings would be constructed in accordance with the American Society of Civil Engineers (ASCE) 7-05 and International Building Code (IBC) 2012.

Road Removal, Construction, and Improvement

During site preparation, select roads at the LNG Terminal would be removed for new facility construction. New permanent access roads would be constructed for truck access to the expanded facilities and MMLS units. In some areas, the new roads would use the same alignment and sub-base as the existing unpaved roads, if possible.

South Channel Barge Loading Facility Improvements

During site preparation, the Companies would make improvements to the South Channel barge dock area to deliver site foundation pilings and some large equipment via barge. The South Channel barge dock has not been used since the mid-1970s and accumulated sediment would be dredged from a roughly 7.5-acre area that is perpendicular to the South Channel barge dock bulkhead, upstream of the bridge, and northeast of the northern limits of the Alternate Atlantic Intracoastal Waterway (AAIW) route within the South Channel. No dredging would be performed within the limits of the AAIW. The area would be dredged to 8 feet BMLW with a 2-foot allowable overdredge using a hydraulic cutterhead. An estimated 45,000 cy of material would be dredged to facilitate initial deliveries and up to 20,000 cy annually to maintain access to the dock for the duration of the COE permit (5 years). Dredged material would be deposited directly into the existing Elba Island DMCAs and managed as specified in the facility's Dredged Material Maintenance Plan.

The duration of initial dredging activities at the South Channel barge dock area would range from 7 to 14 days. Maintenance dredging would be completed as necessary during construction. Each maintenance dredging event is anticipated to take less than 7 days, depending on the amount of material to be dredged.

Approximately 40 dolphin and fender piles would be installed in the South Channel and along the South Channel barge dock to facilitate barge deliveries. Three steel breasting dolphins (consisting of three piles each) would be installed to absorb the energy generated during berthing and mooring of the barges during material unloading. Approximately 30 timber fender piles would be installed in front of the existing sheet pile wall to prevent impact of the barges against the bulkhead. A vibratory hammer would be used to complete pile driving. The timber fender piles would remain in place after construction. The steel dolphins would be removed by vibratory hammer after construction is complete, along with six existing isolated piles and pile clusters in the South Channel barge dock area.

Site Foundations

Concurrent with site preparation, facility foundation work would occur consisting of pile installations and concrete pouring. Equipment and structures, including pipe racks, would be supported

by pile and concrete foundations. Approximately 9,000 displacement-augured, cast-in-place piles would be installed to support the MMLS units and other facility structures. An additional 1,500 steel H-piles of various sizes and lengths would be installed to support the storm surge wall. It is estimated that pile driving would be accomplished in 55 to 60 weeks. Foundations would be constructed in accordance with engineered specifications.

Material and Equipment Delivery

As the site preparations are completed, materials and equipment for the Elba Liquefaction Project would be transported to the construction area via ship, truck, and barge. The construction and installation of the MMLS units would be based on modular construction, and materials and equipment would be delivered in sequence. Trucks would deliver materials and equipment using existing public and LNG Terminal roads for access. Prior to delivery of large or heavy items, road transport routes would be studied for any obstacles, such as power utilities, trees, bridge heights and weight restrictions, sharp turns, low-hanging traffic lights, etc. Large and heavy shipments would be transported within federal and state transportation guidelines and according to necessary permits. Some large materials and equipment items would be delivered by barge to the South Channel barge dock. Ships carrying aggregate materials to Elba Island for fill would moor at the north dock of the existing marine berth to unload their cargo. From there a system of conveyors and on-site trucks would be used to move the fill to the requisite areas.

Assembly and Construction

Once the facility sites have been prepared and equipment and materials have been delivered, the MMLS units, buildings, ship loading facilities, piping modifications, flares, pumps, surge drums, fire water system modifications, and other facilities would be constructed. Buildings to be constructed would be designed in accordance with the ASCE 7-05 and IBC 2012.

The installation of the new MMLS units would require the removal of the existing firewater pumps and pump house at the firewater pond. New pumps and a new pump house would be installed at a new location on the east side of the firewater pond. The new pumps would be equipped with suction strainers and installed in a wet pit equipped with an intake screen per the requirements of NFPA 20. No changes would be made to the pumps at the Savannah River. The new firewater pumps would serve as the primary system while the retained fire water pumps at the river would act as a standby system.

Testing, Commissioning, and Startup

Once the Project facilities have been constructed, appropriate testing would be completed to ensure the integrity and safety of the various systems including hydrostatic or pneumatic testing of piping, surge analyses, and equipment calibrations. The various systems would be commissioned and started in accordance with detailed plans to ensure their readiness.

Final Cleanup, Stabilization, and Restoration

Final cleanup, grading/stabilization, revegetation, and installation of permanent stormwater controls would be completed once the Project facilities are operational.

1.7.2.2 Operation and Maintenance

The Companies would update the existing LNG Terminal Operations Manuals (including emergency procedures and security plans) for the modified facilities and would submit amendments to the appropriate regulatory agencies prior to commissioning the liquefaction facilities.

The Companies also would update the existing maintenance programs to include corrective and preventative maintenance plans for the new facilities. The plans would include written procedures consistent with corporate policy and federal standards, including regulations at 33 CFR Part 127.401 and 39 CFR Part 193 subpart G relating to maintenance and safety standards, respectively, for waterfront facilities handling LNG. Trained maintenance technicians would implement the maintenance plans and report to the Maintenance Supervisor.

The Companies are currently exploring various options associated with workforce development to train the operational workforce in the region. The Companies would work with the City of Savannah and the Savannah Economic Development Authority to develop the Workforce Development Plan. The Companies anticipate that an additional 75 permanent staff would be required at the LNG Terminal when the liquefaction facilities are operational. The Companies have training programs in place for new operating personnel that address routine operations and monitoring procedures as well as safe startup and shutdown processes. The Companies would develop new training protocols to ensure that all new and existing personnel understand the operating and safety procedures related to the liquefaction facilities.

The liquefaction units would be designed with an Emergency Shutdown Device (ESD), which is incorporated to safely shut down the facility in the event of an emergency. Emergency shutdown and depressurization of the units could be initiated immediately, dependent on the emergency. The timeline for an emergency shutdown can be a matter of seconds. The Companies would supplement LNG firefighting training for fire personnel who serve the LNG Terminal (Savannah Fire Department and Southside Fire Department) following construction of the Project.

Materials Delivery and Disposal

During scoping, comments were received expressing concern about the trucking of hazardous materials through Savannah during operations. The operation of the liquefaction facilities would be dependent on receipt and removal of various substances via truck. These substances include stabilized condensate, refrigerant components, process waste water, and amine. Trucks would carry these products at various frequencies as discussed below.

- Stabilized condensate (i.e., natural gasoline) would be trucked from the LNG Terminal at a rate of approximately two trucks per day. Stabilized condensate has multiple commercial uses and would be transported via trucks similar to those that service the local gas stations.

- Refrigerant components for liquefaction include nitrogen, methane, ethylene, propane, and isopentane. The ethylene, propane, and isopentane would be trucked in and unloaded at their respective storage facilities, whereas the nitrogen and methane would be provided from within the LNG Terminal. The truck frequency for ethylene, propane, and isopentane is estimated to be two trucks each month per refrigerant when 10 MMLS units are operating, for a total of six trucks per month. The truck frequency for nitrogen would be infrequent and only required to replenish the nitrogen regeneration unit.

- Amine associated with the acid gas removal system would be trucked in approximately one to two trucks per year.

- Process waste water would be primarily derived from residual water in the pipeline gas and the water used in the amine treater along with any water used for decontamination of equipment. Within the MMLS, equipment would exist to recycle this water. It is expected that the reject and regeneration water from the demineralized water unit would normally be routed to the stormwater effluent, assuming it meets effluent specifications. The final disposition and disposal method for the process waste water would be determined depending on the quality of the water. The Companies estimate that waste water would need to be removed at a rate of one to two trucks per month.

At this time, no trucking routes have been finalized. The Companies have been working with the City of Savannah Fire Chief and Chatham Emergency Management Agency regarding trucking routes that would minimize impacts on the community. Because the trucks would carry various products, the exact routes may differ depending on the products being delivered and location of the customer, supplier, or end user. See additional discussions about traffic and transportation in sections 2.5.4 and 3.3.1.3.

1.7.3 Compression and Metering Facilities

1.7.3.1 Construction

Construction of the compression facilities would generally proceed according to the sequence of activities listed below. Construction of Phases I, II, and III compression facilities are estimated to take 9 months, and require up to 50 personnel at each site and for each phase. Construction of the Elba Island Interconnect Site is estimated to take approximately 4 months, and require up to 20 personnel. Construction of the Port Wentworth Site is estimated to take approximately 7 months, and require up to 20 personnel. Construction of the EEC North Site is estimated to take approximately 3 months, and require up to 15 personnel. Construction of the Del Webb Site is estimated to take approximately 3 months, and require up to 15 personnel. Land requirements for each of the compression and metering facilities are summarized in section 1.9.

Construction Boundary Marking

Land survey crews would mark the boundaries of the construction area to show the approved work areas. Prior to construction and grading, the Companies would stake site boundaries and install a silt fence and other erosion control devices around the perimeter, which would be maintained throughout construction.

Clearing, Grading and Fencing

Construction of the Hartwell Compressor Station modifications would involve clearing and grading of from 100 to 225 feet on the west side of the existing fenced operational area, and up to 75 feet within the existing EEC pipeline corridor on each side of the existing pipeline lateral. At the Jefferson County and Rincon Compressor Stations, clearing and grading would be required along the new access roads, pipeline laterals, and temporary workspaces for the facility footprints. Clearing would be accomplished through the use of mechanical and manual (hand tool) means. The Companies would employ the measures described in our Plan and applicable permits to minimize erosion during grading and construction activities. The Companies would install fencing and temporary gates around the perimeter of the facilities and avoidance areas.

Buildings

Buildings would be designed and constructed in accordance with industry standards and state and local building codes.

Trenching and Pipe Installation

Equipment would be used to excavate the trench for pipeline laterals at the Jefferson County and Rincon Compressor Stations. The Companies would meet or exceed DOT requirements for the depth of trench and would employ BMPs described in our Plan and the Project-specific SWPPP to minimize erosion during trenching operations and construction activities. Pipeline would be delivered to the sites by truck and strung on-site. If necessary, pipe would be bent to conform to changes required for pipeline alignment and to conform to natural ground contours. After the pipe has been bent, aligned, and welded, each weld would be inspected by qualified inspectors. All bending, welding, and coating in the field would comply with 49 CFR 192. Trench dewatering, if required, would be performed in accordance with our Procedures. After lowering the pipe into the trench, the trench would be backfilled and the pipe would be hydrostatically tested to ensure integrity and its ability to withstand operating pressures.

Commissioning and Startup

Once the compression and metering systems have been constructed and tested, the facilities would be commissioned and started in accordance with detailed plans to ensure their readiness.

Final Cleanup, Stabilization, and Restoration

Once the facilities are operational, final cleanup, grading/stabilization, revegetation, and installation of permanent stormwater controls would proceed in accordance with our Plan and Procedures and other approved plans.

1.7.3.2 Operation and Maintenance

Operations at the compression facilities would be monitored electronically on a continuous basis, and ESD equipment would be installed. When activated, the ESD System would stop the engines, 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 in a remote area of the plant yard. The ESD system would react when it detects preset or predetermined high operating temperatures, high natural gas pressures, high flow rate, and low flow rate. The system also would react when fire or gas is detected within the compressor building or facility area. Detection systems would respond to and initiate a total ESD of the facilities.

The Companies would 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 operating company (i.e., EEC) would 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. EEC would provide the appropriate training to local emergency service personnel before the facilities are placed in service, and would conduct annual training during operation of the facilities.

The Companies anticipate that one permanent employee would be required at the Jefferson County and Rincon Compressor Stations (for a total of two new employees) when operational. Companies have training programs in place for new operating personnel that address routine operations

and monitoring procedures as well as safe startup and shutdown processes. Vegetation maintenance and inspection and maintenance of permanent erosion control measures would be conducted in accordance with our Plan and Procedures and the site-specific plans.

1.8 ENVIRONMENTAL COMPLIANCE, INSPECTION, AND MONITORING

The Companies would obtain all the necessary environmental permits and approvals as summarized in section 1.10 and would construct, operate, and maintain the proposed facilities in compliance with permit conditions and other applicable federal and state regulations and guidelines. Prior to construction, the Companies would be required to submit an Implementation Plan to the FERC for review and approval. The Implementation Plan would describe how the Companies would maintain environmental compliance with applicable regulations and permit requirements; detail the environmental training program for workers; and identify the role and responsibilities of environmental inspectors (EI), which would include:

- ensuring compliance with the requirements of the Plan and Procedures, environmental conditions of the FERC approval, applicable mitigation measures, other environmental permits and approvals, and environmental requirements in landowner agreements;
- verifying that the limits of authorized construction work areas and locations of access roads are properly marked before clearing;
- verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;
- identifying erosion and sediment control and soil stabilization needs in all areas;
- ensuring restoration of contours and topsoil;
- determining the need for and ensuring that erosion controls are properly installed, as necessary to prevent sediment flow into wetlands, waterbodies, and sensitive areas, and onto roads;
- inspecting and ensuring the maintenance of temporary erosion control measures at least on a daily basis in areas of active construction or equipment operation, on a weekly basis in areas with no construction or equipment operation, and within 24 hours of each 0.5 inch of rainfall;
- keeping records of compliance; and
- identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase.

The Companies would conduct training for their construction personnel, including EIs, contractors, and their employees, regarding proper field implementation of erosion and sediment control measures, the Project-specific SPCC Plan, and other Project-specific plans and mitigation measures. The training would cover Project environmental documents and all Project-specific conditions contained in any Commission authorization and other applicable federal, state, and local permits and approvals.

We would conduct routine inspections during construction of the Project facilities to ensure environmental compliance. In addition, annual inspections of the LNG Terminal would be conducted during the operating life of the facilities.

After construction, the Companies would conduct follow-up inspections of all disturbed upland areas after the first and second growing seasons to determine the success of restoration. To ensure the restoration of all areas affected by the Project, we would continue to conduct oversight inspection and monitoring following construction. If it is determined that any of the proposed monitoring timeframes are not adequate to assess the success of restoration, the Companies would be required to extend their post-construction monitoring programs.

1.9 LAND REQUIREMENTS

Construction of liquefaction and compression facilities would impact a total of approximately 206.0 acres of land, including offsite support areas and access roads. Operation of the facilities would permanently impact a total of 107.1 acres of land. Table 1.9-1 identifies the land requirements for each Project facility, and land use is further discussed in section 2.4.

TABLE 1.9-1

Summary of Land Requirements

County/Facility	Land Affected During Construction (acres)	Land Affected During Operation (acres)
CHATHAM COUNTY, GEORGIA		
Liquefaction Facilities		
MMLS Units and Associated Facilities	37.8	37.8
Liquefaction Process Flare	1.7	1.7
Marine Flare	N/A [a]	N/A [a]
South Channel Barge Docking Facility	7.7	7.7
BOG Compressor	0.2	0.2
Temporary Electric Substation Facility	0.5	0.0
Electric Substation Facility	2.4	2.4
Active Terminal Upgrades/Modifications	29.3	5.3
Access Roads (new)	5.1	5.1
Access Roads (removed)	4.2	4.2
LNG Terminal Security Post	2.8	2.8
Ship Loading Modifications	2.9	2.9
On-site Wareyard, including warehouse, marine flare	10.2	10.2
Refrigerant/Stabilized Condensate/Wastewater Truck Loading Facility	0.2	0.2
Elba Island Interconnect Facilities	0 [b]	0 [c]
Off-site Wareyard	58.2	0.0
Liquefaction Subtotal	163.2	80.5
Port Wentworth Metering Facilities	3.7	1.6
Port Wentworth Metering Access	0.5	0 [d]
Elba Island Interconnect Facilities	4.1 [b]	0.8 [c]
Chatham County Subtotal	**171.5**	**82.9**

TABLE 1.9-1

Summary of Land Requirements

County/Facility	Land Affected During Construction (acres)	Land Affected During Operation (acres)
HART COUNTY, GEORGIA		
Hartwell Compressor Station	10.2	8.5
Hartwell Compressor Station Access	0.9	0
Pipeline Pig Launcher/Receiver	1.6	1.0
Hart County Subtotal	**12.8**	**9.6**
JEFFERSON COUNTY, GEORGIA		
Jefferson County Compressor Station	8.9	6.9
Jefferson County Compressor Station Access	0.3	0.2
Pipeline Lateral	0.5	0.4
Pipeline Pig Launcher/Receiver	1.2	1.1
Jefferson County Subtotal	**10.9**	**8.5**
EFFINGHAM COUNTY, GEORGIA		
Rincon Compressor Station	6.7	6.1
Rincon Compressor Station Access	0.1	0.1
Pipeline Lateral	0.3	0.2
Pipeline Pig Launcher/Receiver	0.8	0.7
EEC North Metering Facilities	2.0	0.2
EEC North Metering Access	0.3	0 [c]
Effingham County Subtotal	**10.2**	**7.3**
JASPER COUNTY, SOUTH CAROLINA		
Del Webb Metering Facilities	0.2	0 [c]
Del Webb Metering Access	0.5	0 [c]
Jasper County Subtotal	**0.7**	**0 [c]**
Project Total	**206.1**	**108.3**

[a] Impacts from the Marine Flare are included in the impacts associated with the on-site wareyard.

[b] Approximately 3.1 acres of 4.1 acres needed for construction of the Elba Island Interconnect Facilities overlap workspace that will also be used for construction of the liquefaction units or other liquefaction facility upgrade areas. This acreage is accounted for as part of the EEC Project to avoid double counting.

[c] Approximately 0.7 acre of 0.8 acre needed for operation of the Elba Island Interconnect Facilities overlap land that will also be used for operation of the liquefaction units or other liquefaction facility areas. This acreage is accounted for as part of the EEC Project to avoid double counting.

[d] No new permanent land required. Facilities would be operated within existing permanent operational footprint.

Note: Totals in this table may not equal the sum of addends due to rounding.

1.10 PERMITS, APPROVALS, AND REGULATORY CONSULTATIONS

Table 1.10-1 identifies the major federal, state, and local environmental permits, approvals, and regulatory clearances for the Project.

TABLE 1.10-1

Major Environmental Permits, Licenses, Approvals, and Certificates for Construction, Operation, and Maintenance of the Project

Agency	Permit/Approval/Clearance	Status
FEDERAL		
Federal Energy Regulatory Commission	Certificate of Public Convenience and Necessity	Application for liquefaction facilities submitted March 10, 2014; Application for compression and metering facilities submitted March 21, 2014

TABLE 1.10-1

Major Environmental Permits, Licenses, Approvals, and Certificates for Construction, Operation, and Maintenance of the Project

Agency	Permit/Approval/Clearance	Status
U.S. Department of Energy	Authorization to export LNG to Free Trade Agreement Countries	Application submitted May 15, 2012; authorization granted by DOE-FE on June 15, 2012 under Docket No. 12-54-LNG
	Authorization to export LNG to Non-Free Trade Agreement Countries	Application submitted August 31, 2012; authorization under review in Docket No. 12-100-LNG
U.S. Army Corps of Engineers	Clean Water Act (CWA) section 404 and Rivers and Harbors Act section 10 permits	Application submitted March 28, 2014 and withdrawn on October 13, 2014. Pending re-initiation of COE review to correspond with this EA.
U.S. Fish & Wildlife Service	ESA section 7 consultation	Informal consultations for liquefaction facilities initiated on June 21, 2013, clearance pending; Informal consultations for compression facilities initiated on September 24, 2013, clearance provided on October 28, 2013; Clearance for the metering facilities provided on July 29 and August 28, 2014
U.S. Department of Commerce, National and Atmospheric Administration, National Marine Fisheries Service – Charleston Branch Office	ESA section 7 consultation, and Magnuson-Stevens Fishery Conservation and Management Act consultation	Informal consultations for liquefaction facilities initiated on June 24, 2013, concurrence pending
National Marine Fisheries Service – Southeast Regional Office	ESA section 7 consultation, and Magnuson-Stevens Fishery Conservation and Management Act consultation	Informal consultations for liquefaction facilities initiated on January 2, 2014, concurrence pending
U.S. Coast Guard	Waterway Suitability Assessment (WSA)	Waterway Suitability Assessment letter submitted August 29, 2012; USCG response and recommendation issued September 11, 2012
Federal Emergency Management Agency, Region IV	Construction within a Floodplain	Consultations for liquefaction facilities initiated on December 7, 2012
STATE		
Georgia Department of Natural Resources	Coastal Zone Management Consistency Certification	Consultations for liquefaction facilities initiated on December 7, 2012; consultations for compression facilities initiated on August 27, 2013 and consistency determination provided on September 20, 2013
	State-Listed Species Consultation	Consultations for liquefaction facilities initiated on March 28, 2013; clearance pending; Consultations for compression facilities initiated December 7, 2012, clearance provided on November 7, 2013 and March 12, 2014; Clearance for metering facilities provided on September 18, 2014
	Section 401 Water Quality Certification	Application submitted March 27, 2014 under joint section 404/10 application process; certification for compression and metering facilities is not applicable; certification for liquefaction facilities issued December 1, 2014
	25-foot Stream Buffer Variance	Application submitted August 18, 2014; currently under review

TABLE 1.10-1

Major Environmental Permits, Licenses, Approvals, and Certificates for Construction, Operation, and Maintenance of the Project

Agency	Permit/Approval/Clearance	Status
	Clean Air Act, Prevention of Significant Deterioration Review, Title V (Liquefaction Facilities)	Application submitted on December 30, 2013; deficiency letter received on February 10, 2014; response submitted on April 30, 2014; authorization issued June 23, 2015
	Clean Air Act, Title V Operating Permit (Hartwell Compressor Station)	Existing Air Quality Permit No. 4922-147-00029-E-02-0 modified on November 17, 2014 to authorize construction and operation of new equipment
	Clean Air Act, Title V Operating Permit (Jefferson County Compressor Station)	Application submitted May 20, 2014
	Clean Air Act, Title V Operating Permit (Liquefaction Facilities)	Application submitted September 5, 2014; authorization issued June 23, 2015
	Minor Source Air Quality Permit (Rincon Compression Facilities)	Application submitted September 5, 2014; authorization pending
	NPDES Permit for Stormwater Discharges from Construction Activities (General Permit No. GAR 1000001 and 1000002)	Application to be submitted prior to construction
	NHPA section 106 Consultation	Consultation initiated April 17, 2013; GDNR concurrences received April 24, July 19, August 23, and September 10, 2013, and March 12, and June 11, 2014
South Carolina Department of Natural Resources	Listed Species Consultation	Clearance provided on July 11, 2014
South Carolina Department of Health and Environmental Conservation	CWA section 401 Water Quality Certification	Application submitted March 27, 2014 under joint section 404/10 application process
	South Carolina Coastal Zone Management Program	Not required
	NPDES Permit for Discharge of Hydrostatic Test Water	Application to be submitted prior to construction
	NPDES Permit for Discharge from Construction Activities	Application to be submitted prior to construction
South Carolina Department of Archives and History, State Historic Preservation Office	NHPA section 106 Consultation	Consultation initiated May 29, 2014; final concurrence June 2, 2014
LOCAL		
Chatham County Engineer	Chatham County Development Permit	Application to be submitted prior to construction
	Chatham County Land Disturbing Activities Permit	Application to be submitted prior to construction

2.0 ENVIRONMENTAL ANALYSIS

The environmental consequences of constructing and operating the Project would vary in duration and significance. Four levels of impact duration were considered: temporary, short-term, long-term, and permanent. Temporary impact generally occurs during construction with the resource returning to preconstruction condition immediately after restoration or within a few months. Short-term impact could continue for up to 3 years following construction. Long-term impacts would last more than 3 years, but the affected resource would recover to pre-construction conditions. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the Project, such as the construction of aboveground facilities. An impact would be considered 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 impacts, and proposed mitigation measures for each resource. We also discuss the design and construction of the facility to resist natural hazards. The Companies, as part of this proposal, committed to implementing certain measures to reduce impacts on environmental resources. We evaluated the proposed mitigation measures to determine whether additional measures would be necessary to reduce impacts. Where we identified the need for additional mitigation, the measures appear as bulleted, boldfaced paragraphs in the text. We will recommend that these measures be included as specific conditions to authorizations that the Commission may issue to the Companies. Conclusions in this EA are based on our analysis of the environmental impact and the following assumptions:

- the Companies would comply with all applicable federal laws and regulations;
- the proposed facilities would be constructed as discussed in section 1.0 of this document; and
- the Companies would implement the mitigation measures included in the applications and supplemental filings to the FERC.

2.1 GEOLOGY AND SOILS

2.1.1 Geologic Setting, Mineral Resources, and Natural Hazards

2.1.1.1 Geologic Setting

Elba Island Facilities

The liquefaction facilities and Elba Island Interconnect Site to be constructed on Elba Island are located in the Atlantic Coastal Plain Physiographic Province (Hunt, 1974) and specifically within the Barrier Island Sequence District (University of Georgia, 2013). This area was influenced by rising and falling sea levels during the Pleistocene Epoch which created extensive barrier islands generally parallel to the current coast. Presently, the area exhibits a range of elevations associated with the remnant barrier islands, with decreasing altitudes moving seaward (Clark and Zisa, 1976). The Atlantic Coastal Plain strata consist of unconsolidated to semi-consolidated layers of sand and clay and semi-consolidated layers of limestone and dolomite.

The Atlantic Coastal Plain sediments range in age from the late Cretaceous to Holocene, and lie unconformably over igneous intrusive rocks and low-grade metamorphic rocks of Paleozoic Age (Clarke et al., 1990). These sediments were deposited as a wedge of sediment dipping and thickening in a

seaward direction, and were derived from the erosion of igneous and metamorphic rocks in the Piedmont and Blue Ridge Provinces.

Elba Island is in the Holocene Shoreline Complex—Marsh and Lagoonal Facies (Lawton et al., 1976), consisting of unconsolidated sands. Elevations on Elba Island currently range up to 18 feet AMLW, which corresponds to approximately 14.4 feet above mean sea level (AMSL).[9] The island topography has been influenced by deposition of dredged material from the COE maintenance dredging of the Savannah Harbor channel from the 1800s to mid-1900s. The dredged material is comprised primarily of sands, silts, and clays ranging in thickness from 3 to greater than 18 feet. The dredge spoils at the site are underlain by un-indurated clays and sands that range in age from Eocene to Pleistocene. These sediments in turn are underlain by Oligocene to Eocene limestone. Based on geotechnical borings and groundwater well installation boring logs, the depth to the limestone bedrock layer underlying Elba Island is between approximately 140 to 160 feet below the land surface. Therefore, no blasting is anticipated.

The off-site wareyard is in the Princess Anne Shoreline Complex – Island Sequence District (University of Georgia, 2014), and underlain by the Marsh and Lagoonal Facies, which consist of unconsolidated sedimentary deposits of Pleistocene age (Georgia Geologic Survey, 1977). The property is largely surrounded by man-made berms that contain stockpiled gypsum. Gypsum was stockpiled throughout the property to elevations up to 20 feet and down to 30 feet below current grade, and subsequently excavated and removed from the site for use as a soil amendment, resulting in numerous steep-sided depressions up to 15 feet deep scattered across the site. In order to utilize the site, the Companies would level working areas and, where necessary, install geotextile fabric and aggregate materials to provide suitable parking, driving, and working surfaces.

The majority of the new facilities would be in or adjacent to areas previously modified for industrial use. Construction, restoration, and operation of the facilities, including use of the off-site wareyard, would comply with the erosion control, revegetation, and restoration provisions of our Plan, and Procedures, as well as the Companies' Project-specific SWPPP to be approved by the GDNR. As a result, construction and operation of these facilities would not be expected to have a significant impact on existing geologic conditions.

Hartwell Compressor Station

The Hartwell Compressor Station is in southern Hart County, Georgia, just north of the Hart-Elbert County line. The Hartwell Compressor Station is in the Winder Slope District of the larger Piedmont Physiographic Province of Georgia. The Winder Slope District is characterized by gently rolling topography that slopes gradually downward from an elevation of 1,000 feet AMSL in the north to 700 feet AMSL at the southern edge of the district. The district is dissected by the headwater tributaries of the major streams draining to the Atlantic Ocean. Numerous dome-shaped, granitic mountains are in the interfluves in the southern and western portion of this district. The stream valleys, which are fairly deep and narrow, occur at an elevation approximately 100 to 200 feet below the narrow, rounded stream divides. The western boundary follows the drainage divide that separates streams draining into the Atlantic Ocean from those draining to the Gulf of Mexico. The southern boundary approximates the 700-foot elevation contour where a break in regional slope occurs (Clark and Zisa, 1976).

One commenter expressed concern that bedrock at the Hartwell Compressor Station may need to be blasted to facilitate construction. However, no blasting would be required because bedrock at the

[9] Based on the 3.6 feet of difference between AMLW and AMSL at the Fort Pulaski, Georgia tide station (NOAA, 2014), which is located approximately 7 miles downstream from Elba Island.

Hartwell Compressor Station is partially weathered rock characterized by metamorphic terrane consisting of schist, gneiss, and amphibolite. This partially weathered rock is not expected to require blasting based on construction of the current facilities, and extends to a depth of approximately 47 feet. These units are Pre-Cambrian to Triassic in age and generally trend in a northeasterly direction. The piedmont of Georgia also is dissected by numerous northwesterly trending Triassic-age diabase dikes that are associated with rifting during the Triassic period (Lawton et al., 1976).

The new facilities at the Hartwell Compressor Station would be primarily within the fenced area previously modified for industrial use and would also be constructed and restored in compliance with the measures in our Plan and Procedures. Therefore, minimal impact on geological resources is expected at the Hartwell Compressor Station.

Jefferson County Compressor Station

The Jefferson County Compressor Station is in southern Jefferson County, Georgia, just north of the Jefferson-Burke County line. The Jefferson County Compressor Station is in the Vidalia Upland District of the Coastal Plain Physiographic Province of Georgia. The Vidalia Upland District is a moderately dissected area with a well-developed dendritic stream pattern on gravelly, clayey sands. Floodplains are narrow except along the principal rivers, which have a wide expanse of swamp bordering both sides of the channel. Relief varies from 100 to 150 feet. Elevations in the district range from 500 feet AMSL in the northwest to 100 feet AMSL in the southeast, reflecting the regional dip. The northern and northwestern boundary of the Vidalia Upland District approximates the northernmost occurrence of the undifferentiated Neogene geologic unit. The southwestern and southern boundary is the base of the Pelham Escarpment and the southern drainage divide of the Altamaha River. The southeastern boundary follows the Orangeburg Escarpment at approximate elevation 150 feet AMSL. The escarpment rises 50 to 70 feet above the Barrier Island Sequence District (Clark and Zisa, 1976).

The Irwinton Sand geologic unit comprises the surficial geology at the Jefferson County Compressor Station (Lawton et al., 1976), and is underlain by layers of clastic rock, comprised of Eocene-aged unconsolidated sand. A geotechnical investigation performed by EEC (S&ME, 2014) of the site encountered clayey sands and sandy clays to depth of approximately 18 feet below ground surface (bgs). This is underlain by clayey sand and sand with clay to the maximum depth explored (40 feet bgs). The relative densities of the sediments typically varied from very loose to medium dense (for sands) and soft to very stiff (for clays). The liquefaction analysis concluded that the potential for soil liquefaction at the site is very low. The S&ME report concluded that that the site is suitable for the proposed construction provided that their recommendations are incorporated into the final design.

The new facilities at the Jefferson County Compressor Station would also be constructed and restored in compliance with the measures in our Plan and Procedures to ensure sediment stability. Minimal impact on geological resources is expected at the Jefferson County Compressor Station.

Rincon Compressor Station; EEC North, Port Wentworth and Del Webb Sites

The Rincon Compressor Station and the EEC North and Port Wentworth Sites are in the Barrier Island Sequence District of the larger Coastal Plain Physiographic Province of Georgia. The Barrier Island Sequence is comprised primarily of a series of six roughly parallel prehistoric terraces, as well as the present-day shoreline. The terraces were formed as old shorelines in response to advancing and retreating Pleistocene sea levels. The former, higher sea levels existed as barrier island-salt marsh environments similar to the present coast and left shoreline deposit complexes parallel to the present coastline (Clark and Zisa, 1976).

The Rincon Compressor Station, and EEC North and Port Wentworth Sites are within the Penholoway Shoreline Complex—Marsh and Lagoonal Facies (Lawton et al., 1976), which generally consists of unconsolidated Pleistocene sand deposits. A geotechnical investigation performed by EEC at the Rincon Compressor Station encountered loose to medium dense sand to 18 feet bgs. This is overlain by approximately 10 feet of medium stiff silt, clay, and sand. Medium dense to dense sand and silty sand were encountered from 28 feet to the maximum depth explored of 60 feet bgs (Terracon, 2014). Groundwater is anticipated to be relatively shallow at the three sites and was encountered at 3 to 5 feet bgs during the investigation at the Rincon Station.

The Del Webb Site is in south Jasper County, South Carolina, less than 4 miles west-northwest of Elba Island. The Geologic Map of South Carolina indicates that this site is in the "Tidal Marsh" geologic unit, which consists of peat and muck deposits located along tidal margins of estuaries and back bays. Deposits can range from 2 feet to over 60 feet in thickness (Horton and Dicken, 2001).

The new facilities at these metering sites would be primarily within the fenced areas previously modified for industrial uses and would also be constructed and restored in compliance with the measures in our Plan and Procedures. Therefore, minimal impact on geological resources is expected at the metering sites.

2.1.1.2 Mineral Resources

Georgia is the leading clay-producing state in the United States, accounting for more than 24 percent of total U.S. clay production in 2000 (U.S. Geological Survey [USGS], 2000). Kaolin is the state's foremost non-fuel mineral commodity, accounting for 54 percent of Georgia's estimated total non-fuel mineral value and, of that, 92 percent of its clay value. Crushed stone accounted for more than 28 percent of the state's non-fuel mineral production in 2000. Based on USGS estimates of U.S. production during 2000, Georgia remained first in the country in kaolin, fuller's earth, and iron oxide pigments; second in mica; fourth in common clay and feldspar; and ninth in masonry cement. Additionally, Georgia is a significant producer of industrial sand and gravel (USGS, 2000). In 2005, Portland and masonry cement (by value) represented South Carolina's leading nonfuel mineral commodities, followed by crushed stone and construction sand and gravel (USGS, 2007). Together, these mineral resources comprised 95 percent of the state's non-fuel mineral production in 2005, with sand and gravel representing 10 percent of that total.

The primary mineral resources in the vicinity of liquefaction, Elba Island Interconnect, Del Webb, EEC North, and Port Wentworth Sites in coastal Georgia and South Carolina are sand, gravel, and phosphorus (USGS, 2013a), along with the export of gypsum through the Port of Savannah. The state Mineral Resource Map (Lawton et al., 1976) shows the Hartwell Compressor Station is in an area that is favorable for heavy minerals, kaolin, fuller's earth, phosphate, crushed stone, and mica mining; the Jefferson County Compressor Station is in an area that is favorable for kaolin, fuller's earth, and iron oxide mining; and the Rincon Compressor Station is in an area that is favorable for silica, sand, and gravel mining. No active or planned mines are at or within one mile of any of the facility sites. As a result, the Project is not expected to have any impact on mineral resources.

2.1.1.3 Geologic and Other Natural Hazards

Potential geologic hazards associated with the Project include earthquake ground motions (and associated soil liquefaction) and surface faulting, landslides, subsidence, and tsunamis. Other natural hazards include wind, flooding/storm surge, and sea level rise, as discussed in the following subsections.

Earthquakes and Seismic Faulting

Seismic earthquakes are the result of sudden movement along a fault, which can result in damaging ground motions or secondary effects including landslides and soil liquefaction. Seismic faults can also result in offsets at the ground surface that can cause damage to structures or pipelines that cross them. There are no known faults present in the areas surrounding the Project facility sites (USGS, 2013c; USGS, 2013d; Lawton et al., 1976), and no faults were observed during previous field investigations. Accordingly, no impacts on the Project facilities from faults are expected.

Seismic Ground Motion Risk

Seismic ground motion risk was assessed by reviewing two USGS Peak Ground Acceleration Maps, one representing a 2 percent probability and one representing 10 percent probability of exceedance within a 50-year period (USGS, 2013e). The results of this evaluation are summarized in table 2.1.1-1, and are expressed in percent of gravitational acceleration (9.78 meters per second per second). The USGS estimates the peak horizontal ground acceleration with a 2 percent chance of being exceeded within 50 years ranges from 12 to 20 percent g for the Project sites. Similarly, the peak horizontal ground acceleration with a 10 percent chance of being exceeded in 50 years for all the Project sites is 5 to 6 percent g.

TABLE 2.1.1-1

Seismic Risks Associated with the Project

Project Site	Peak Horizontal Acceleration With a 2 Percent Probability of Exceedance in 50 Years (percent g [a])	Peak Horizontal Acceleration With a 10 Percent Probability of Exceedance in 50 Years (percent g [a])
Elba Island Facilities [b]	18 – 20	5 - 6
Hartwell Compressor Station	16 – 18	5 - 6
Jefferson County Compressor Station	12 – 14	5 - 6
Rincon Compressor Station	18 – 20	5 - 6
Port Wentworth Site	18 – 20	5 - 6
EEC North Site	18 – 20	5 - 6
Del Webb Site	18 – 20	5 - 6

[a] g: gravitational acceleration
[b] Includes liquefaction facilities and Elba Island Interconnect facilities

The USGS peak horizontal ground accelerations presented above are for a bedrock site condition. However, surface ground motion accelerations on soft soil sites (including unconsolidated sediments) can be amplified significantly by a factor of 2 or more. With the exception of the Hartwell Compressor Station, all of the Project facilities are underlain by unconsolidated sediments.

A geotechnical study and an assessment of seismic risk (Terracon, 2014) completed at the proposed Rincon Compressor Station indicated peak ground acceleration values of approximately 19 percent g for an earthquake that has a 2 percent chance of being exceeded in 50 years (as determined by data provided by the IBC 2012 and ASCE 7-10 Standards). For the other EEC Modification Project facilities underlain by unconsolidated sediments, actual peak ground acceleration values would also be expected to be greater than those listed, and would depend largely on the density and stiffness of the underlying sediments, the depth to competent bedrock, and the nature of the interface between the sediments and the bedrock.

USGS earthquake probability mapping was also used to quantify the seismic risk for the compression and metering sites. Based on calculations generated in the USGS Earthquake Probability Mapping application, the probability of an earthquake with a magnitude of 5 or larger in a 50-year period is 2 to 3 percent at the Hartwell Compressor Station, 1 to 2 percent at the Jefferson County Compressor Station, and less than 1 percent at the Rincon, Elba Island Interconnect, Port Wentworth, EEC North, and Del Webb Sites (USGS, 2013g).

No adverse impacts on the Hartwell Compressor Station from seismic activity are anticipated, due to the low probability of significant earthquake activity, low seismic potential, and lack of faults. Though the probability of significant earthquake activity at the other compression and metering sites is also very low, the seismic potential is larger than that at the Hartwell Compressor Station, due to the presence of unconsolidated sediments overlying competent bedrock. Design criteria and construction methods at all of the EEC Modification Project areas would be based on site-specific geotechnical and seismic hazard studies. While mapped bedrock ground motion acceleration values are low, the amplification caused by the soft soil site conditions increase the seismic hazard level to moderately high for all soft soil sites. Therefore, appropriate seismic design measures will be taken to mitigate the seismic risk at each site. Considering the use of these construction methods, adverse impacts on any Project sites from seismic activity are not expected.

Soil Liquefaction

Liquefaction is a phenomenon in which saturated or partially saturated soil loses strength and stiffness in response to an applied stress, such as an earthquake, causing it to behave like a liquid. Soil liquefaction occurs in granular soils when excess pore pressure generated by earthquake shaking reaches or exceeds the effective stress. In the event that an earthquake would occur in the vicinity of any of the Project sites, those underlain by unconsolidated, saturated, sandy sediment would be most prone to soil liquefaction, which includes all sites except the Hartwell Compressor Station.

Geotechnical analysis of site-specific data from Elba Island determined the soil liquefaction potential and post-liquefaction settlement would possibly occur in localized sand layer zones. Estimated maximum settlements in these areas ranged from 1 to 4 inches for maximum considered earthquake ground motions. Since the settlements in these areas are relatively insignificant compared to consolidation settlements due to static loads, no mitigation measures were subsequently proposed other than placing all major equipment and structures on pile foundations. The risk for liquefaction in the sandy soils at the Rincon Compressor Station is considered relatively high, partly due to the shallow depth of groundwater. Terracon (2014) estimated the liquefaction-induced settlements of the ground surface at the Rincon Compressor Station would be approximately 7 to 8 inches, and differential liquefaction-induced settlements would be approximately one-half of that. Therefore, for critical structures at the Rincon Compressor Station, either a combination of shallow foundations and earthquake drains, or a combination of driven pile supports and earthquake drains would be utilized as a mitigation measure for liquefaction settlements. As a result, the Rincon Compressor Station is not expected to be at risk from soil liquefaction. Liquefaction analysis conducted as part of the geotechnical investigation of the Jefferson County Compressor Station indicated that the potential for soil liquefaction at the site was very low. The other sites have soil conditions that are prone to soil liquefaction (e.g., the EEC North, Port Wentworth, and Del Webb Sites). However, the work at these sites would be sufficiently minor, or constructed on foundations of piles of suitable size, length, and quantity to mitigate potential liquefaction risk. In addition, steep topography is not a factor at those sites, which can exacerbate the effects of seismic activity. Therefore, adverse impacts on Project sites from seismic activity and soil liquefaction are not expected.

Landslides

Landslides refer to the gravity-induced downward and outward movement of slope-forming materials, and pose the greatest risk to facilities on or near steep slopes or on soil materials that are susceptible to failure particularly in response to earthquakes or heavy precipitation. A map developed by the USGS that illustrates the regional potential for the occurrence of landslides indicated that the landslide incidence and susceptibility are low for all the sites, except the Hartwell Compressor Station, which is depicted in a region of moderate susceptibility and low level of incidence (USGS, 2013f); however, the Hartwell Compressor Station is generally flat with slopes varying from 2 to 10 percent. Therefore, the potential for landslides is low.

Subsidence

Ground subsidence may be caused by the dissolution of certain types of strata that creates subsurface voids (such as karst), sediment compaction, oil and gas extraction, underground mines, and groundwater pumping, with the latter being the main cause of subsidence (USGS, 1999). Underground mines are not located near any of the Project sites, therefore there is no potential for subsidence to occur as a result mine collapse.

The Hartwell, Jefferson County, and Rincon Compressor Stations, and EEC North Site, are not in areas where ground subsidence related to groundwater pumping has been known to occur (USGS, 1999). The Port Wentworth, Del Webb, and Elba Island Facilities Sites are all in or near Savannah, Georgia, which has not undergone significant subsidence – approximately 8 inches maximum since 1918 (Davis and Counts, 1976; Davis, 1987). Therefore, the Project sites likely would not be affected by or contribute significantly to subsidence resulting from groundwater extraction.

Karst geologic terrain is characterized by water solution features that typically form in carbonate rocks. Typical features of karst include sinkholes, caves and cave systems, and underground drainage. Slightly acidic groundwater dissolves soluble minerals from carbonate rocks and causes voids to form (USGS, 2013g).

The EEC North, Port Wentworth, Del Webb, and Elba Island Sites fall within a band of karst terrain that extends from the southwestern portion of the state northeast along the fall line, the geologic boundary between the Piedmont and the Coastal Plain, towards Augusta, Georgia. Fissures, tubes, and caverns associated with this karst band are typically less than 1,000 feet in length with a vertical extent of 50 feet or less (USGS 2013g; USGS 2013h). However, no surface evidence of sinkholes, swallets, collapsed areas, or other solution features was observed during reconnaissance of the sites. Additionally, soil borings placed at the Rincon Compressor Station and Elba Island Facilities did not encounter any voids, cavities or other evidence of karst features. Since the Hartwell and Jefferson County Compressor Stations would not be over any near-surface or surficial karst features, no impacts are anticipated. Since no karst features were observed or are likely to be present at any of the Project sites, impacts on karst features are not expected.

Tsunami

The most common cause of tsunamis is sea floor vertical offset associated with a devastating earthquake. Typically, devastating tsunamis occur in subduction zones, areas where a tectonic plate is forced downward under another tectonic plate due to tectonic forces. This can result in very powerful earthquakes (magnitude 7.0 or greater). The Atlantic Basin plate boundary occurs at the mid-Atlantic ridge which is a tectonic spreading center and tends to produce smaller magnitude earthquakes; hence there is little probability of generating tsunamis along the plate boundaries. Since the U.S, Atlantic coasts

are considered non-subduction seismic zones, the risk for a tsunami along the Atlantic coast is considered rather low. Furthermore the maximum tsunami wave runups that have been measured along the U.S. Atlantic coast during the past 200 years have not exceeded 0.5 meters based on USGS research. Therefore, the risk of a tsunami generated by an undersea earthquake is very low and the resulting tsunami waves, if generated, would be minimal when compared to hurricane storm surge which is further described below.

Wind

Primary Project facilities at the Elba Liquefaction Site (liquefaction process facilities and associated buildings, LNG transfer piping, LNG storage tanks, LNG containment and associated impounding systems, LNG pumps, firewater system for LNG storage tanks, containment and impounding systems, and diesel powered generators for the firewater systems) would be designed per 49 CFR 193, which establishes performance design criteria for withstanding hurricane force winds (in this case, sustained wind velocity of 150 miles per hour (mph) for 1 minute or a 183-mph 3-second gust). The secondary facilities will be designed per ASCE 7-05 procedures.

Flooding, Including Coastal Storms Associated with Hurricanes

The Port Wentworth, Del Webb and Elba Island Sites are within a 100-year floodplain. The Flood Insurance Study for Chatham County, Georgia (Federal Emergency Management Agency [FEMA], 2008a) indicates that the Port Wentworth Site is near the outer edge of Flood Zone AE, with a base flood elevation of approximately 11 feet AMSL. The Del Webb Site is in Flood Zone A7, with a base flood elevation of 12 feet AMSL (FEMA, 1986). The 100-year flood elevation for Elba Island is 18 feet AMSL (FEMA, 1987). None of the other compression or metering sites are within a 100-year floodplain, as defined by FEMA.

The Port Wentworth Site is an existing facility that is at an approximate elevation of 3 feet AMSL. This facility experiences periodic flooding and the new facilities would be constructed at the same elevation and to be tolerant of periodically wet conditions, and to allow flood waters to flow around any necessary aboveground piping with minimal obstruction. The Del Webb Site is also an existing facility, at an estimated elevation of 5 to 8 feet AMSL. This facility and its access road from Highway 17 have been elevated above the surrounding tidal marsh providing adequate flood protection, and none of the existing aboveground facilities would be impacted by the proposed work.

The Elba Island facilities have potential to be impacted by both river flooding and coastal storm surges given their location on Elba Island in the Savannah River estuary and its proximity to the coast. Elevations of potential impact at the Project sites from flooding and storm surges were calculated using FEMA 500-year flood event data, modeling data provided by the NOAA's Sea, Lake, and Overland Surges from Hurricane (SLOSH) model, and the Chatham Emergency Management Agency requirement that the storm surge for the Project site be evaluated utilizing a Saffir/Simpson Scale Category 3 hurricane. The Flood Insurance Study of Chatham County and unincorporated areas (FEMA, 2008b) identifies the base flood elevation, equivalent to that of the 500-year flood, which corresponds to an elevation in the Elba Island area of approximately 18.7 feet AMLW (approximately 15.1 feet AMSL). Application of the SLOSH model predicts that a flooding/storm surge elevation equivalent to 21.8 feet AMLW (approximately 18.2 feet AMSL) for a Category 3 hurricane that hits at high tide.

The facilities to be constructed on Elba Island would be constructed in accordance with applicable regulations (e.g., the Chatham County, Georgia Flood Damage Prevention Ordinance). Fill material would be placed to raise the existing Project ground elevation to elevations ranging from 13.5 to 18 feet AMLW (9.9 to 14.4 feet AMSL). Additionally, a storm surge wall, consisting of certain existing

structures (containment walls) and newly constructed wall sections, would be constructed to form a continuous barrier approximately 7,000 feet in total length. The entire Project area would be constructed at an elevation above the 500-year flood elevation, or within and protected by a storm surge wall with a height that exceeds that elevation. Together, the existing berms, dredge material containment area dike and sheet pile wall, and storm surge wall would provide a continuous water barrier around all of the existing and proposed liquefaction facilities as well as the Elba Island Interconnect Site to a minimum height of 23 feet AMLW (approximately 19.4 feet AMSL), which exceeds the water elevation predicted for a 500-year flood event or a Category 3 hurricane.

Sea Level Rise

Based on values provided on a NOAA, the predicted sea level rise during the 25 year design life of the LNG facility is three inches. The Companies have incorporated a six inch height increase in the proposed storm surge wall to conservatively account for sea level rise in the design.

2.1.2 Design and Construction of the Elba Island Facilities

The geotechnical conditions at the liquefaction facility site are described in this section along with the planned site preparation, planned foundation design, proposed structure design criteria, and recommended submittal design requirements. Based on the Geotechnical Engineering Report prepared by Terracon (2014) for the facilities located on Elba Island, the soils and sediments have been characterized and divided into nine geographical areas of the site containing two basic soil profiles with varying subsurface layer thicknesses.

The two soil profiles for the site are similar except for the top layer. Soil Profile 1, which applies to a majority of the site, contains a surface crust (Layer 1) of 2 to 4 feet of dredge fill. Soil Profile 2, which applies to a small portion of the site, has a top layer (Layer 1) that contains 10 to 19 feet of recent sandy fill material.

A generalized description of Layers 2 through 7 is provided below and is representative of both soil profiles encountered at the site: Layer 2 contains 20 to 40 feet of very soft organic clays with embedded sand lenses. Soils in this layer are highly compressible and have low strength. Layer 3 contains 10 to 35 feet of medium dense sands with variable thicknesses and relative densities. This layer is susceptible to soil liquefaction. This layer is also known to cause densification when many piles are driven in close spacing. Layer 4 contains 35 to 50 feet of very stiff sand clay, locally referred to as "marl." Pile foundations are planned to be supported in this layer. This layer is not susceptible to liquefaction effects due to it being a Miocene-aged deposit with a high clay content and high overall stiffness. Layer 5 consists of 10 feet of very dense clay-like sand. Layer 6 consists of 35 feet of very dense silty sand. Layer 7 consists of limestone with a thickness greater than 230 feet.

Prior to commencing the cut and fill process, clearing and grubbing would be required across the entire Project area. Any organic or plant matter removed in the process would be disposed of following local, state, and federal regulations. Any top soil obtained during this operation would be stockpiled for final landscaping.

2.1.2.1 Foundations

All foundations for major equipment and structures would be placed on pile foundations. The foundation systems would consist of engineered piles with pile caps. The piles would extend to into Layer 4 of the soil profile to depths of approximately 65 to 80 feet. The foundation design criteria are based upon the recommendations of the Geotechnical Engineering Report prepared by Terracon (2014).

The new sections of the Storm Surge Wall which would have a height of 23 feet above mean low water would be comprised of steel sheet piles vibrated into the ground a minimum of 12 feet below grade. The sheet pile sections are joined together to form water-tight vertical joints by interlocking edge shapes and caulking. Lateral support of the Storm Surge Wall is provided by steel H-piles, driven or vibrated vertically into the dense soil layer (marl) that exists approximately 65 feet below the ground surface. The H-piles would be installed at maximum intervals of 30 feet. The lateral loads from the sheet piles would be distributed to the vertical H-piles by horizontal steel H shaped beams. The Storm Surge Wall design is based upon the recommendations of the Geotechnical Engineering Report prepared by Terracon (2014).

2.1.2.2 Facility and Structure Design

The liquefaction facilities would be constructed to satisfy the design requirements of 49 CFR 193, NFPA 59A-2001, 2009 International Building Code and 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 including the MMLS units' piping, pumps, compressors, structural steel, and buildings would be designed to withstand a sustained wind speed of 150 mph, which converts to 183 mph with a 3-second gust duration, per 49 CFR 193.2067(b)(2)(i).[10] The wind forces on shop-fabricated containers of LNG or other hazardous fluids with a capacity of not more than 70,000 gallons would be based on applicable wind load data in ASCE/SEI/7-05 per 49 CFR 193.2067(b)(1). Therefore, the MMLS unit equipment, such as pressure vessels and heat exchangers, would be designed to withstand a wind speed of 124 mph with a 3-second gust duration (i.e., 157 mph 3-second gust duration Ultimate Strength Design[11]), which would be consistent with application of ASCE-7 as incorporated by reference in 49 CFR 193.2067(b)(1).[12] As part of its role as a cooperating agency on this document, the DOT reviewed the design wind speed and determined that the selection of wind speeds for the design of the proposed facility would comply with the requirements of 49 CFR 193.2067.

Seismic Design Ground Motions

Geotechnical investigations of the liquefaction facilities site determined that the site is classified as Site Class F (soft clay) in accordance with the International Building Code and standard ASCE 7-05 based on a site average shear wave velocity V_s that ranged between 385 and 693 feet/sec (Terracon, 2014). Sites with soil conditions of this type would experience significant amplifications of surface earthquake ground motions.

Terracon performed a site-specific seismic hazard study for the site. The study concluded that earthquake ground motions at ground surface at the site that have 2 percent probability of being exceeded in 50 years have a peak ground acceleration value of 0.302 g, a 0.2-second spectral acceleration value of 0.660 g, and a 1.0-second spectral acceleration at the site of 0.377 g (Terracon, 2014). These predicted spectral accelerations result in the LNG facility being assigned Seismic Design Category D in

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[10] A 150-mph sustained wind speed would correspond to a 183-mph, 3-second gust using the Durst Curve in ASCE 7-05. This wind speed is equivalent to approximately 100,000-year mean return interval or 0.05 percent probability of exceedance in a 50-year period for the site based on ASCE 7-05 wind speed return period conversions.

[11] The 157-mph Ultimate Strength Design was derived by multiplying the 124-mph wind speed by the square root of 1.6, because wind loads are a function of the square root of the wind speed.

[12] A 157-mph, 3-second gust duration wind speed is equivalent to approximately 13,000-year mean return interval or 0.38 percent probability of exceedance in a 50-year period for the site based on ASCE 7-05 wind speed return period conversions.

accordance with the 2009 IBC and ASCE 7-05, which is moderately high compared to other locations in the United States.

2.1.2.3 Submittal of Final Design and Construction Documents

The design of the facility is currently at the Front End Engineering Design (FEED) level of completion. The Companies have proposed a feasible design and committed to conducting a significant amount of detailed design work for the 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 of the liquefaction facilities address the requirements identified in the FEED. Further, the timing of the production of this information should occur as indicated below. Therefore, **we recommend that:**

- **Prior to construction of the LNG terminal, ELC and SLNG should file with the Secretary of the Commission (Secretary) the following information, stamped and sealed by the professional engineer-of-record, registered in Georgia:**

  a. site preparation drawing and specifications prior to construction;

  b. pile installation drawings and specifications prior to construction;

  c. LNG liquefaction facility structures and foundation design drawings and calculations (including prefabricated and field-constructed structures) prior to their construction;

  d. seismic specifications for procured equipment prior to the issuing of requests for quotations; and

  e. quality control procedures to be used for civil/structural design and construction early in the design phase.

Because we recognize the project area is located in an area of high seismicity, our regulations in 18 CFR 380.12(h)(5)[13] recommend that a special inspector be contracted by the Companies to observe the work performed to ensure the quality and performance of the seismic resisting systems. The Companies did not indicate in their submittals that a special inspector would be employed by them to observe construction of the facilities. Therefore, **we recommend that:**

- **The Companies should employ a special inspector during construction and a copy of the inspection reports should be included in the monthly status reports filed with the Secretary. The special inspector should be responsible for:**

  a. observing the construction of the liquefaction facility to be certain it conforms to the design drawings and specifications;

[13] NBSIR84-2833, Data Requirements for the Seismic Review of LNG Facilities.

b. furnishing inspection reports to the engineer- or architect-of-record, and other designated persons. All discrepancies should be brought to the immediate attention of the contractor for correction, then if uncorrected, to the engineer- or architect-of-record; and

c. submitting a final signed report stating whether the work requiring special inspection was, to the best of his/her knowledge, in conformance with approved plans and specifications and the applicable workmanship provisions.

2.1.3 Soils

2.1.3.1 Soil Resources

Elba Island Facilities

Construction activities for the liquefaction and Elba Island Interconnect facilities would occur primarily within the existing footprint of the LNG Terminal, the majority of which has already been prepared for industrial use and consists of Savannah River dredge spoil with some structural and/or non-structural fills. A total of 163.2 acres of land would be temporarily affected by the construction of the liquefaction and Elba Island Interconnect facilities. This includes 102.2 acres on Elba Island proper associated with the new facilities, 58.2 acres associated with the off-site wareyard, and 2.8 acres associated with the Security Post improvements. Soils impacted on Elba Island are designated as Made Land on soil series maps (USDA, 2013a). The soils impacted at the Security Post are designated as Tidal Marsh. The soils at the off-site wareyard are designated as Made Land, Ellabelle Loamy Sand, Capers Soils, and Tidal Marsh; however, due to the former industrial use and gypsum storage at the off-site wareyard, the soil survey data should be considered outdated and the portions of the off-site wareyard that would be utilized should be classified as Made Land.

Because of inherent variability of fill and dredge spoil, the National Resources Conservation Service (NRCS) does not set standard ratings for the soil map unit Made Land. The Made Land map unit consists of the original dredge spoil, dewatered and graded, and dredge spoil that has been filled with structural and non-structural fill to create a suitable area to support industrial uses, including excavated ponds, buildings, storage tanks, and roads. Made Land soils are highly variable and consist of discontinuously stratified coarse sands to clays, and some soil areas may be filled with structural fill of unknown composition (USDA, 2013b). Based on previous construction history with similarly situated soils on Elba Island, most Made Land soils are characterized by low susceptibility to wind and water erosion hazards, moderate to high compaction potential, and minimal revegetation concerns. Clay texture Made Land soils typically have high porosity and low bulk density, can be compacted to high levels, and are thus very susceptible to compaction. However, soil borings at several sites within the existing facilities indicated the presence of surficial dense sands that would not have a compaction limitation, and may be droughty with correspondingly poor revegetation potential. Depth to bedrock is not a limitation because bedrock is generally between 140 feet and 160 feet below the land surface.

Tidal Marsh soils are nearly level, wet soils that because of their landscape position and typical high moisture content are rated as least susceptible to wind erosion and are not strongly susceptible to sheet and rill erosion by water. Tidal Marsh soils consist of slightly-to-moderately saline, very poorly drained silty clay soils that were deposited in a marine environment influenced by tidal flooding. Tidal Marsh soils that have a surface texture of sandy clay loam or finer and a somewhat poorly, poorly, or very poorly drainage class can be classified as susceptible to high compaction when moist. Tidal Marsh soils are not considered to be prime farmland. The depth to bedrock is greater than 6.5 feet.

Hartwell Compressor Station

Construction at the Hartwell Compressor Station would occur primarily within the fence line and areas disturbed for the existing facilities. Approximately 12.8 acres would be temporarily impacted for construction and operations would permanently impact approximately 9.6 acres. A review of the Project footprint overlaid onto recent high resolution aerial photography (see appendix B) indicates that the majority of temporarily affected areas within the proposed construction footprint are currently in industrial/road use on probable Made Land soil inclusions. Permanent impacts on soils would be confined to the area of nearly level to moderately sloping Cecil sandy loam soils currently planted with trees that are outside of the existing station footprint. These soils would be cleared, graded, filled and converted to Made Land to support industrial use. Soils within the footprint of the existing station are considered to be inclusions of Made Land soils with unknown soil characteristics within the Cecil map units.

Jefferson County Compressor Station

Construction of the Jefferson County Compressor Station would temporarily impact approximately 10.9 acres of land and operations would permanently impact approximately 8.5 acres. The Jefferson County Compressor Station would be a new facility constructed on land currently in silviculture with minor acreage associated with the maintained right-of-way for the EEC Pipeline. The soil map units (Dothan, Faceville, and Nankin soils) within the Jefferson County Compressor Station are all prime farmland. These soils are loamy sands and sandy loams that are deep to bedrock, have good revegetation potential, are not subject to excessive compaction and are not hydric. Site soils are subject to wind but not water erosion. Because less than six acres of prime farmland would be converted to industrial use, and similar land uses and soil types are abundant near the site, the limited loss of prime farmland would have minimal impact on availability of prime farmland in the area.

Rincon Compressor Station

Construction of the Rincon Compressor Station would temporarily impact approximately 7.7 acres of land and operations would permanently impact approximately 5.8 acres. The Rincon Compressor Station would be a new facility constructed on land currently in silviculture with a minor acreage associated with the adjacent road right-of-way. Soils on the Rincon Compressor Station are designated within the Ridgeland-Boulogne complex and are nearly level, deep to bedrock, not prime farmland or hydric, have good revegetation potential, and are subject to wind but not water erosion. Most soils currently contain planted trees with a minor amount of open land where adjacent to roads.

EEC North Site

Construction of the EEC North Site would temporarily impact approximately 2.3 acres and operations would permanently impact approximately 0.2 acre. The northern portion of the EEC North Site (see figures in appendix B) is designated as Pickney (PkA) soils, which is a mucky sand that has been filled (converted to Made Land soils), is in industrial use, and would be permanently impacted. Construction would utilize an existing access road between the northern and southern portions of the EEC North Site. The road is considered a Made Land inclusion in Pickney (PkA) and Leon (LnA) soils. The southern portion of the EEC North Site is designated as Leon soils and has been substantially filled (also converted over to Made Land soils). Leon soils are not prime farmland, not hydric, are deep to bedrock, and not subject to water erosion. However, the soils are subject to wind erosion. A small area adjacent to the southern portion of the meter station is proposed for temporary impacts only and may or may not have been filled/graded to prepare the site for industrial use.

Port Wentworth Site

Construction of the Port Wentworth metering facilities would temporarily impact approximately 4.2 acres and operations would permanently impact approximately 1.6 acres. Permanent impacts would be confined to existing infrastructure including roads, parking lots, and buildings associated with the existing facility site. Temporary impacts would be confined to Made Land inclusions in Ocilla complex soils that include the existing facility site, but may extend into a minor amount of native Ocilla complex soils. Ocilla soils are prime farmland when drained, deep to bedrock, and hydric. The soils also have good revegetation potential and are not subject to wind or water erosion.

Del Webb Site

Construction of the Del Webb metering facilities would temporarily impact approximately 0.7 acre and no additional land would be required for permanent operations. The temporary impacts would be confined to the existing access road and existing metering facilities constructed on filled and graded Made Land inclusions in Fluvaquents and Udipsamments (FA) and Levy (LE) soils and would extend into a minor amount of adjacent acreage of FA and LE soils that appears to have also been filled/graded (see figures in appendix B).

2.1.3.2 Soil Resource Impacts and Mitigation

Construction and operation impacts on soils may include increased potential for compaction, loss of productivity, and poor revegetation following construction. These impacts would not be specific concerns to the previously disturbed Project sites or areas that would be maintained as permanent commercial/industrial facilities, including the dredge spoil material containment areas. The temporary and permanently disturbed acreage at these sites would not accrue additional adverse soil impacts during construction and post-construction reclamation because the new facilities would be generally incorporated into the existing industrial facilities. Construction activities associated with site preparation (e.g., aggregate fill delivery, site grading) have the greatest potential to result in temporary exposure of soils to erosion. To avoid and reduce impacts on soils at the Project sites, construction of the Project would be in compliance with our Plan and the Project-specific SWPPP that would be developed in compliance with the Georgia and South Carolina NPDES stormwater discharge requirements. These efforts would include minimizing the area and duration of soil exposure; protecting critical areas during construction by redirecting the velocity of runoff; installing and maintaining erosion and sediment control measures during construction; re-establishing vegetation where practicable as soon as possible following construction; and inspecting the facility boundaries and maintaining erosion and sediment controls until final stabilization is achieved in areas requiring revegetation.

Revegetation efforts would comply with the requirements of our Plan, and the Companies would utilize a seed mix suitable for the Project setting, soils, and climate. On Elba Island, where marine-derived clay soils are often characterized as acidic (low pH), the use of lime amendments may be used to increase the pH of soils in the event that revegetation efforts are not successful. Where prime farmland would be impacted at the Jefferson County Compressor Station, the Companies would limit the prime farmland conversion to only that which would be needed to operate the station. The portions of the temporary construction footprint associated with prime farmland or farmland of statewide importance would be appropriately restored to agricultural/silvicultural use.

The addition of fill material to widen Elba Island Road at the Security Post would permanently impact a narrow, adjacent strip of native Tidal Marsh soils. This fill material would be temporarily subject to wind and water erosion and wave action, where it would extend into the tidal marsh. To protect against wind and water erosion, and to minimize the amount of fill required, the Companies would install a retaining wall at the base of the slope. In addition, disturbed areas would be protected using standard

erosion control BMPs and planted with a seed mixture recommended by the NRCS. Erosion control BMPs would be maintained until successful revegetation. As a result, the potential for erosion would be minimized.

2.2 WATER RESOURCES, FISHERIES, AND WETLANDS

2.2.1 Groundwater

2.2.1.1 Existing Groundwater Resources

Elba Island Facilities Site

The proposed facilities on Elba Island are located within the Atlantic Plain Aquifer Province and are underlain by two regional aquifer systems, including the Floridan Aquifer and the Southeastern Coastal Plain Aquifer systems (USGS, 2005). Additionally, a surficial aquifer system is present and can serve as a significant groundwater source. These aquifers are further characterized below.

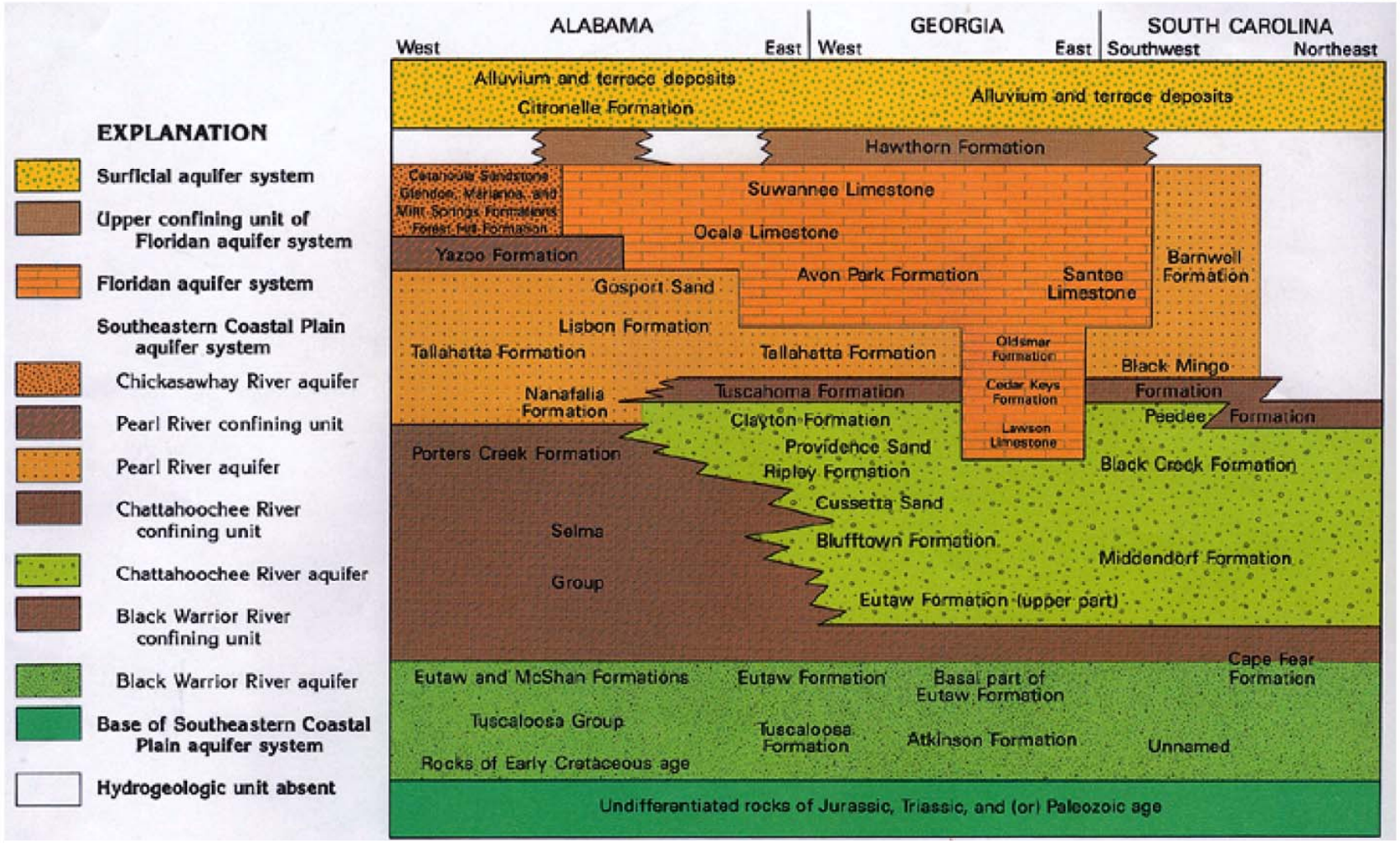
The Floridan Aquifer system consists of a thick sequence of carbonate rock (limestone and dolomite) of Tertiary age (Miller, 1986) that forms the most productive aquifer in the region. The Upper and Lower Florida Aquifers, which together comprise the Floridan Aquifer, are separated by a middle confining unit, which varies in lithology, but generally restricts movement of groundwater between them. The Floridan Aquifer system supplies potable water for a number of large cities, and where accessible, is a principal public water supply source, yielding an average of about 3 billion gallons per day in 1985. It supports several large municipalities, including Savannah, Georgia. The USGS (2005) indicated that, of the total groundwater extracted in 2000 from this aquifer, approximately half was used from agriculture and one third for public water supply. The Floridan Aquifer system is approximately 800 feet thick in the Elba Island area (Miller, 1990).

The Hawthorn Formation serves as an upper confining layer to the Floridan Aquifer and consists of sand, clay, mud, and some dolomite at its base (Miller, 1990). The transition into the Floridan Aquifer strata at Elba Island appears to occur somewhere between 140 to 220 feet bgs.

The Southeastern Coastal Plain Aquifer system underlies an area of approximately 90,000 square miles in the coastal plain of Alabama, Georgia, South Carolina, and northern Florida and in the Elba Island area extends from the base of the Floridan Aquifer system to a depth of between 3,500 and 4,000 feet below sea level (Miller, 1990). It consists of four regional aquifers: the Chickasawhay River Aquifer, the Pearl River Aquifer, the Chattahoochee River Aquifer, and the Black Warrior Aquifer (Figure 2.2.1-1). These aquifers are predominantly sand, but also contain layers of gravel and limestone, all ranging in age from Cretaceous to late Tertiary. In 1985, of the approximately 574 million gallons of groundwater withdrawn per day from this aquifer, Miller (1990) summarizes the usage as follows:

- 37 percent public supply;
- 15 percent domestic and commercial;
- 26 percent agricultural; and
- 22 percent industrial, mining, and thermoelectric power.

Figure 2.2.1-1 is a regional schematic stratigraphic column that illustrates the general hydrostratigraphy of the Floridan and underlying Southeastern Coastal Plain Aquifer systems in Alabama, Georgia, South Carolina, and northern Florida. The lack of a confining unit between the Floridan Aquifer and Southeastern Coastal Plain Aquifer over much of their common area results in direct hydraulic communication between the two aquifer systems. However, the Southeastern Coastal Plain Aquifer is generally less permeable than the Floridan Aquifer (USGS, 1990).



Modified from Miller and Renken, 1966
Source: Miller (1990)

The large number of geologic formations that comprise the Southeastern Coastal Plain aquifer system can be grouped into four regional aquifers, which are named after major rivers that cross their outcrop areas. Three regional confining units separate the aquifers. This chart is not intended to show exact correlations of the geologic units.

Figure 2.2.1-1
Elba Liquefaction Project
The Floridan and Southeastern Coastal Plain Aquifers and Confining Layers

In addition to the major confined aquifers, there is also a system of surficial aquifers in the Project area comprised primarily of unconsolidated sand, shelly sand, and shell (coquina) materials typically less than 100 feet thick although that can vary greatly (Miller, 1990). Complex layering of the sediments is typical as a result of variable depositional environments under both marine and terrestrial conditions.

The surficial aquifers are typically phreatic (unconfined), but confined or semi-confined conditions may occur locally where the presence of impermeable or semi-permeable clay beds or lenses create such conditions. Water quality and yield of the surficial aquifers varies widely. Despite seasonal fluctuations in water level, and variable water quality and yield, surficial aquifers can locally serve as a significant water source for domestic and other small-demand supplies, with yields that exceed 500 gallons per minute (gpm) in some areas (Miller, 1990).

Since 2006, the GDNR has prohibited permitting of new water withdrawals from the upper Floridan Aquifer in Chatham, Bryan, and Liberty Counties and part of Effingham County in order to control saltwater intrusion into the upper portion of the aquifer (GDNR, 2006). New studies demonstrating hydraulic connection between the upper and lower portions of the Floridan Aquifer prompted the GDNR to impose a moratorium in May 2013 on all future withdrawals beyond currently permitted levels from the entire aquifer in these counties (GDNR, 2013). Other than saltwater intrusion, no known aquifer contamination is known to occur near Elba Island.

Hartwell Compressor Station

The Hartwell Compressor Station is unique among all the sites in that it is underlain by the crystalline rock aquifers of the Piedmont and Blue Ridge Province Aquifers (USGS, 2013i). Although groundwater occurs in fractures throughout these rocks, the majority of water is stored in the regolith layer.

Depth to water in these aquifers varies considerably as a function of the regolith thickness, and can range from tens to hundreds of feet below land surface (Miller, 1986). Well yield also varies based on the regolith thickness, the rock type, and the amount and orientation of fractures in the bedrock, but averages 15 to 20 gpm (Miller, 1986). In general, Piedmont and Blue Ridge Province Aquifers are unconfined and produce water of sufficient quality to be considered potable. There are no known sources of groundwater contamination in the immediate vicinity of the Hartwell Compressor Station. Due to the surficial nature of groundwater in the Piedmont and Blue Ridge Province Aquifers, and the general lack of underlying rocks that would be expected to yield sufficient quantities of potable water, these aquifers appear isolated from other hydrostratigraphic units.

Jefferson County Compressor Station

The Jefferson County Compressor Station is located within the Coastal Plain Aquifer system, which is comprised of layers of sand and gravel with some areas of limestone (USGS, 2013j). Public water supply is the principal use of groundwater extracted from this aquifer. Other uses include agricultural, industrial, and other domestic/commercial purposes (Miller, 1986). There are no known sources of groundwater contamination in the immediate vicinity of the proposed Jefferson County Compressor Station. Groundwater in the area of the proposed Jefferson County Compressor Station is expected to be relatively shallow and unconfined. Water wells in Wrens, Georgia, approximately 8 miles northwest of the proposed Jefferson County Compressor Station, were completed to a depths between 150 and 200 feet bgs and provided yields ranging from 100 to 175 gpm (Husted and others 1978).

Rincon, Port Wentworth, EEC North, and Del Webb Sites

The proposed Rincon, Port Wentworth, EEC North, and Del Webb Sites are underlain by the Floridan Aquifer and Southeastern Coastal Plain Aquifer systems (USGS, 2013j), which are described above.

The most significant aquifer beneath these sites is the Floridan Aquifer as discussed above. In this area, the Floridan Aquifer is estimated to be between 500 and 600 feet thick and covered by an unbreached confining unit greater than 100 feet thick (Miller, 1986). There are no known sources of groundwater contamination in the immediate vicinity of any of the proposed sites.

2.2.1.2 Sole Source Aquifers

There are no U.S. Environmental Protection Agency (EPA) designated sole source aquifers in Georgia or South Carolina (EPA, 2013). Therefore, the proposed Project would not affect any sole source aquifers.

2.2.1.3 Public and Private Water Supply Wells

A review of the USGS National Water Information System and field surveys did not identify any public water supply wells within 150 feet of the proposed construction work areas at any of the Project sites (USGS, 2013k). SLNG operates two private wells on Elba Island that provide water to the LNG Terminal and are used as a daily source of potable and process water. EEC operates a low volume, private well at the Hartwell Compressor Station. Logs for the wells on Elba Island (completed at depths of 307 and 329 feet) indicate that they are screened in the Floridan Aquifer system and were installed and permitted prior to the GDNR moratorium on withdrawals from the Floridan acquifer, which is discussed in the following sections. They have a historic well yield of at least 250 gpm each (360,000 gallons per day [gpd] per well). A drinking water well permit was issued August 15, 2007 and expires August 14, 2017. The well permit does not specify a withdrawal rate limit and does not disallow use of water for non-potable purposes. However, the GDNR indicated that the normal permitting threshold limits withdrawals to under 100,000 gpd (GDNR, 2013).

2.2.1.4 Groundwater Impacts and Mitigation

Construction could potentially impact groundwater resources through groundwater extraction, inadvertent spills of fuel and other fluids from construction equipment, and installation of piles to support the new facilities. Potential impacts on groundwater resources during plant operation would be from groundwater extraction for potable and industrial uses.

Approximately 700,000 gallons of water would be used for hydrostatic testing of the liquefaction facilities, including 500,000 gallons of filtered groundwater for hydrostatic testing of facility piping and 200,000 gallons for testing the MMLS units. The hydrostatic test water would be pumped from the two existing Floridan Aquifer wells on Elba Island at a rate not to exceed 30,000 gpd on a rolling monthly average. GDNR's moratorium on withdrawals from the Floridan aquifer would not apply to the use of the existing wells, since they were permitted prior to the implementation date of the moratorium, and the withdrawals would be below the normal permitting threshold of 100,000 gpd on a monthly rolling average. The water requirements for construction would not exceed these thresholds and are not expected to significantly impact the groundwater supply of that aquifer. The marginal increase in groundwater extraction rates is not expected to affect the local groundwater table or public or private water supplies.

Surficial aquifers have the potential to be impacted by spills. Any spills that might occur during construction activities are not expected to impact the Floridan Aquifer, given that it lies at least 140 feet below the Project site and is overlain by the competent Hawthorn Formation confining layer. To minimize the potential of impacts on shallow groundwater, all construction activities would adhere to the Project-specific SPCC Plan. The SPCC Plan contains provisions to ensure timely and appropriate response to unforeseen potential impacts on groundwater resources from spills and to ensure that appropriate remedial actions are employed. The SPCC Plan and related Procedures for facility operations would be updated to include the proposed facilities prior to beginning operation.

Displacement-augere, cast-in-place piles would be installed to depths between 65 and 90 feet to support the MMLS units and other structures on the island. These piles would be installed into surficial aquifers that may occur under Elba Island but are not expected to affect the flow within these aquifers or their normal discharge to the Savannah River. The piles would be installed into the Hawthorn Formation to a depth approximately 50 feet above the Floridan Aquifer and are not expected to affect normal infiltration from the surficial aquifers to the Floridan Aquifer. Based on the geotechnical engineering report prepared by the Companies, the piles installed into the confining layer above the Floridan aquifer would not be likely to cause contamination from saltwater intrusion, because their depth would not extend through the confining layer of very stiff clay (marl) and/or dense to very dense clayey sand.

During operations, withdrawals for the liquefaction process would be approximately 900 gpd per MMLS unit (2,700 gpd after Phase I and 9,000 gpd after Phase II) and would be intermittent. Potable water withdrawals by personnel for miscellaneous uses would be periodic over the long term and essentially the same as current withdrawals.

The Project would adhere to all federal and state water quality standards (e.g., CWA, sections 401, 402, and 404, and the Safe Drinking Water Act) to ensure that there would be no adverse effects on the quality of groundwater resources. No blasting would be required to construct the Project. Through use of the measures discussed above, we conclude that there would be no significant impacts on groundwater resources from construction and operation of the proposed Project.

2.2.2 Surface Water

2.2.2.1 Liquefaction Facilities

Elba Island is within Savannah Harbor, approximately 5 miles east of the City of Savannah, Georgia, and 8.5 miles upstream from the mouth of the Savannah River. The portion of the Lower Savannah River that would be affected by the Project is a part of a major shipping port and has been extensively channelized and dredged (approximately 500 feet wide and 42 feet deep) throughout the extent of the Project area. Much of the Lower Savannah River within Chatham County is tidally influenced. During ebb tide, some of the flow from the main Savannah River Channel is diverted down the South Channel, on the south side of Elba Island (see figures in appendix B). The South Channel has depths ranging from 3 to 14 feet.

Water and sediment quality within the Lower Savannah River have been and continue to be impacted by point source discharges including municipal waste water treatment plant discharges, industrial wastewater discharges, sewer overflows, land application systems and leachate from landfills. Other sources of pollutants include non-point source contributions from stormwater run-off, fertilizers, animal waste, pesticides, herbicides, septic systems, and underground storage tanks. The Savannah River has the fourth-highest toxic discharge in the country (Environment America, 2009).

Although portions of the Savannah River are listed on the Nationwide River Inventory by the National Park Service (NPS), the Project area is not within the Nationwide River Inventory-designated reach of the river. The GDNR has designated the Savannah River and South Channel as "Coastal Fishing" under the state's Water Quality Classification and Water Quality Standards Program. The Savannah River also contains federally listed species and has been designated Essential Fish Habitat (EFH) for several species (see section 2.3.3). No potable water intakes are within 3 miles downstream of Elba Island.

Surface water resources on Elba Island include a firewater pond and a series of four drainage ditches that are part of the LNG Terminal's existing stormwater management system designed to collect, treat, and discharge stormwater to the Savannah River.

Five waterbodies were identified at the off-site wareyard site that would be used to support construction of the liquefaction facilities. They all are generally adjacent to the existing access roads that would be used at the site.

2.2.2.2 Compression and Metering Facilities

No waterbodies would be affected by Project activities at the Hartwell, Jefferson County, Rincon, Elba Island Interconnect, EEC North, or Del Webb Sites.

The Port Wentworth Site contains two regularly maintained drainage ditches that comprise the existing stormwater drainage system at the site. The drainage ditches are approximately 4 feet wide and 0.5 to 1 foot in depth. No water flow was observed in these ditches during the February 2014 field survey. Based on a review of the Georgia Environmental Protection Division (EPD) drinking and public water system database, no surface water withdrawal points are three miles downstream of the Port Wentworth Site (Georgia EPD, 2013) and the site is not within a public watershed area (EPA, 2013d).

2.2.2.3 Surface Water Impacts and Mitigation

Liquefaction Facilities

Construction of the liquefaction facilities would require modifications and improvements to the existing effluent collection and stormwater management system, which would increase the amount of impervious surface within the facility by approximately 21 acres. Effluent discharges related to liquefaction operations are described in section 1.2. To accommodate additional stormwater runoff and new effluent discharges, the Companies propose to construct a network of new water containment basins, drainage channels, and detention ponds at the terminal facility. Effluent wastewater from equipment washdowns or equipment leaks would be collected in containment basins and transported to a licensed facility for treatment and disposal. Effluent from the generation of demineralized water would be discharged to the firewater pond or the storm water management system. The Companies would acquire and comply with any necessary state and federal permits to discharge, treat, and transport effluent wastewater from the facility.

To minimize impacts on surface waters and manage stormwater during construction of the Project, construction activities would be conducted in accordance with the measures contained in our Plan and Procedures. The Procedures include requirements for preconstruction planning, environmental inspection, sediment and erosion control, restoration, decompaction, and post-construction maintenance of wetlands and waterbodies. Additionally, the Companies' SWPPP developed in compliance with the GDNR's NPDES General Permit No. GAR 100001 would address stormwater runoff and dewatering procedures and requirements.

Surface water quality could be adversely affected by a spill, leak, or other release of hazardous materials during construction. To minimize these risks and to establish procedures for handling a spill or release during construction, the Companies would implement the Project-wide SPCC Plan, which would include spill prevention measures, response training for construction personnel, regular inspection of construction equipment for leaks, prohibition of fueling and lubricating activities and hazardous material storage in or adjacent to sensitive areas, and spill response and notification procedures.

New piping for the liquefaction facilities would be hydrostatically tested to ensure its integrity before being placed into service. Test water would be obtained from existing wells at the LNG Terminal. Only new pipe free of chemicals or lubricants would be tested and no water additives would be utilized, with the possible exception of oxygen scavenger. Once testing is complete, the test water would be either collected and transported to water treatment facilities for disposal or discharged to energy dissipating devices and filtered through hay bale or sediment fence filter structures and allowed to percolate into the ground.

As discussed in section 1.2.1.3, the Companies propose to modify and maintain the South Channel barge dock during construction of the liquefaction facility. The initial dredging of the proposed barge slip and associated maintenance dredging would stir up sediment and temporarily degrade water quality in the immediate vicinity of the dredging activities. Suspended sediment from dredging activities could contain pollutants from upstream point and non-point sources and be deposited elsewhere in the river; however, the proposed dredge site is not known to have elevated concentrations of contaminants when compared to other river locations. The Companies have applied for and would comply with permit conditions from the COE for all dredging and dredge disposal activities. Due to short duration of dredging activities and the small volume and area of the South Channel that would be dredged, dredging activities would not have any noticeable, long-term impact on the South Channel or the Savannah River.

The Companies would deliver aggregate fill materials to the existing north dock. The Companies anticipate six aggregate ships would be required to deliver the necessary fill material. For aggregate shipping, ballast and cooling water would be withdrawn from the Savannah River to stabilize each ship as it unloads cargo at the north dock. Water withdrawals and discharges could result in impingement and entrainment of aquatic organisms (refer to section 2.2.3 for a discussion on aquatic resource impacts), removal of water from the river system, and increased water temperatures. We do not anticipate the limited volume of ballast water removed from the river would have any noticeable effect on river flows. The temperature of cooling water that would be discharged back to the river would increase by approximately 3.6 degrees Fahrenheit. We do not anticipate the small discharge volume and slight increase in water temperature would affect the Savannah River or aquatic species.

During the LNG transfer process, LNGCs would discharge ballast water to the Savannah River to maintain a constant draft at berth. LNGCs that discharge ballast water must comply with several laws, regulations, and policies to manage LNGC ballast discharges in U.S. waters, including:

- USCG regulations (33 CFR 151, subpart D);
- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990;
- National Invasive Species Act of 1996;
- National Aquatic Invasive Species Act of 2003;
- National Ballast Water Management Program;
- Navigation and Vessel Inspection Circular 07-04, Change 1; and
- Shipboard Technology Evaluation Program.

The USCG has inspection and regulatory enforcement jurisdiction over all shipping in U.S. waters. To minimize and avoid potential impacts on wildlife species that could result from ballast water discharges, the USCG implements mandatory ballast water management requirements for all ships entering U.S. waters from outside the Exclusive Economic Zone of the U.S. and has developed and enforces a nationwide Ballast Water Management Program. Under the current Ballast Water Management Program, international ships entering U.S. ports and intending to discharge ballast water must either carry out ballast water exchange at least 200 nautical miles offshore or retain ballast water on board.

Despite the laws, regulations, and policies that LNGCs must comply with when discharging ballast water, the discharge of ballast water into the Savannah River could have minor, short-term impacts on salinity, dissolved oxygen, water temperature, and pH concentrations. Depending on its source, discharged ballast water could have a higher or lower salinity than the Savannah River. Salinity at the COE dock in Savannah, approximately 6 miles upstream of Elba Island, ranges between 7 to 22 parts per thousand (ppt) depending on tidal influences and water flows volumes. More dense, higher salinity discharges would sink to the bottom of the river and naturally mix with the lower density water in the river. Conversely, lower salinity discharges would remain at the surface of the river and naturally mix with the higher density waters of the river. Because the released water would be limited in flow, compared to river flow, and would be subject to tidal mixing, we conclude that changes in salinity would not affect the Savannah River or aquatic resources.

Dissolved oxygen levels in the discharged ballast water may differ from the ambient dissolved oxygen levels in the Savannah River. Storage of ballast water in LNGC storage tanks during transit could reduce dissolved oxygen levels. We anticipate any change in dissolved oxygen levels due to ballast discharges would be localized and temporary. Once released, the discharged water would quickly mix with the river water, which would attenuate any differences in dissolved oxygen.

The introduction of ballast water should not significantly affect water temperature and pH levels in the Savannah River. Because ballast water is stored in the ship's hull below the waterline, water temperatures are not expected to deviate much from ambient temperatures of the Savannah River. The pH of the ballast water may vary slightly from that of the Savannah River, but its variation would dissipate quickly due to river current and tidal mixing.

The potential variation of salinity, dissolved oxygen, water temperature, and pH between the ballast water and the Savannah River is not expected to have any measurable effect on water resources or existing aquatic organisms because the discharged water would mix with the river water (due to flow and tidal mixing) minimizing any differences in water chemistry. Additionally, compliance with laws, regulations, and policies regarding ballast water discharges would minimize potential impacts on the Savannah River. Therefore, ship traffic and ballast water discharges would not have any noticeable, long-term effect on the Savannah River. Impacts on water chemistry from ship traffic and ballast water discharges would be localized and minimal.

The Companies' use of the off-site wareyard would be designed to avoid impacts on the five waterbodies this area. Additionally, the Companies would implement mitigation measures and best-management practices in our Procedures, the Project-specific SPCC Plan, and provisions of the SWPPP that would be approved by the GDNR. Therefore, minimal impacts on these waterbodies are anticipated.

Compression and Metering Facilities

No waterbodies would be within the footprint of the Hartwell, Jefferson County, and Rincon Compressor Stations, or the Elba Island Interconnect, EEC North, or Del Webb Sites. The two ephemeral drainage ditches at the Port Wentworth Site would be temporarily impacted during construction and would remain in the permanent footprint of the site. The drainage ditches have been previously maintained, are ephemeral, and activities would be short-term and temporary. To minimize impacts on the two drainage ditches at the Port Wentworth site and any waterbodies downgradient from the other compression and metering facilities, the Companies would comply with our Procedures, the Project-specific SPCC Plan, and provisions of the SWPPP that would be submitted to the GDNR. Therefore, we conclude that Project-related impacts on the two drainage ditches and downstream water quality would be minimal.

2.2.3 Fisheries Resources

2.2.3.1 Liquefaction Facilities

The Savannah River and South Channel are intertidal estuarine or mesohaline environments that support a warm water estuarine fishery. The artificial stormwater ditches on Elba Island do not support fisheries. Typical recreational fish species in the Savannah River and South Channel are listed in table 2.2.3-1.

TABLE 2.2.3-1

Recreational Fish Species near Liquefaction Project Area

Common Name	Scientific Name	Classification
Spotted Sea Trout	*Cynoscion nebulosus*	Warmwater/Recreational
Red Drum	*Sciaenops ocellatus*	Warmwater/Recreational
White Shrimp	*Penaeus setiferus*	Warmwater/Recreational
Brown Shrimp	*Penaeus aztecus*	Warmwater/Recreational
Blue Crab	*Callinectes sapidus*	Warmwater/Recreational
Striped Bass	*Morone saxatilis*	Recreational
Cobia	*Rachycentron canadum*	Recreational
Spanish Mackerel	*Scomberomorus maculatus*	Recreational
Bluefish	*Pomotomus saltatrix*	Recreational
Summer Flounder	*Paralichthys dentatus*	Recreational
Atlantic Sharpnose Shark	*Rhizoprionodon terraenovae*	Recreational
Snapper/Grouper	*Lutjanus/Epinephelus, Mycteroperca*	Recreational

2.2.3.2 Compression and Metering Facilities

No waterbodies would be directly impacted by Project activities at the Hartwell, Jefferson County, and Rincon Compressor Stations, or the Elba Island Interconnect, EEC North, or Del Webb Sites. The two ephemeral drainage ditches that would be temporarily affected at the Port Wentworth Site may support a limited number of small fishes and invertebrates when water is present. Within the open water portion of the drainage ditch near the southern access road entrance from Jimmy DeLoach Parkway, several small fish of unknown species were observed during field surveys.

2.2.3.3 Fisheries Impacts and Mitigation

Liquefaction Facilities

Expansion of Elba Island Road

The widening of Elba Island Road at the Security Post would fill approximately 0.25 acre of tidal marsh adjacent to the existing road. Tidal marsh is generally utilized by juvenile fish species and shrimp and provides important habitat for prey species. Less mobile species such as shrimp could be smothered by the road widening activities. More mobile fish and prey species would likely leave the construction area when construction starts and would utilize the thousands of acres of adjacent tidal marsh during and after the expansion of Elba Island Road.

The Companies propose to mitigate for the permanent loss of tidal marsh by creating 0.29 acre of new tidal marsh, along with 0.5 acre of upland buffer adjacent to the new tidal marsh, on the south shore of Elba Island. This proposed mitigation area is adjacent to an existing tidal marsh mitigation site that was approved by the COE and NMFS in 2012 (see section 2.2.4.3). Because only a small amount of non-mobile aquatic biota would be affected by the road expansion, substantial habitat is available for displaced aquatic biota, and the loss of marsh habitat would be appropriately mitigated, impacts on fisheries resources would be minimal.

Dredging and Pile Installation in the South Channel

Dredging of the temporary barge slip would remove up to 45,000 cy, or 7.5 acres, of unconsolidated sub-tidal substrate in the South Channel. Additionally, annual maintenance dredging of the barge slip would remove an additional 20,000 cy of river substrate during the 5 years the barge slip would be utilized during construction of the liquefaction facilities. Initial dredging would occur over a 7- to 14-day period and could occur at any time of the year. Each maintenance dredging event is anticipated to take less than 7 days, depending on the amount of material to be dredged, and could also occur at any time of the year. No additional dredging in the South Channel would be conducted after the Project is completed.

Dredging would be completed utilizing a 12-inch cutterhead hydraulic dredge, and dredged materials would be discharged to the DMCA on Elba Island. Dredging activities could result in temporary turbidity and sedimentation, release of contaminants within the sediment, altered dissolved oxygen levels, and entrainment of less mobile benthic species. Increases in turbidity can affect fish physiology and behavior. Potential physiological effects include mechanical abrasion of surface membranes, delayed larval and embryonic development, reduced bivalve pumping rates, and interference with respiratory functions. Possible behavioral effects from increased turbidity include interference with feeding for sight-foraging fish and area avoidance. Alternately, the reduced visibility of predatory fish could lower vulnerability to predation for prey species. Turbidity also interferes with light penetration and thus reduces photosynthetic activity by phytoplankton. Turbidity affects would be localized around the immediate area of the dredging activities and would be limited to the duration of the sedimentation plume.

The existing South Channel barge dock was constructed in the early-1970s and was last dredged in the mid-1980s; therefore, an existing benthic community has likely become established and dredging would adversely affect any infaunal or non-motile epifaunal benthic species that may be present. Due to the temporary nature of the dredging activities, the relatively small area of impact within the South Channel, and former benthic repopulation studies that suggest rapid recolonization of bentic communities

(Clarke and Miller-Way, 1992; Van Dolah et al., 1984), we anticipate repopulation of the unconsolidated substrate could be expected within a few weeks to 6 months.

The Savannah River has naturally high background suspended sediment concentrations that vary with tide range, river flow, storm effects, and the location within the estuary (MGA, 2011a). Based on studies performed on a hydraulic cutterhead dredge operating in Savannah Harbor, average suspended sediment concentrations within 1,600 feet of the dredge were generally raised less than 200 milligrams/Liter (mg/L) in the lower water column and less than 100 mg/L and 50 mg/L in the middle and upper water column, respectively (Hayes et al., 2000). Comparatively, the suspended sediment load in the Savannah River increases well beyond 200 mg/L during storm events (COE, 2012). Additionally, studies completed by MG Associates (MGA, 2011b), Applied Technology and Management (ATM, 2002), and Clarke (2011) concluded hydraulic cutterhead dredging within the Savannah River had no observable effect on dissolved oxygen or turbidity levels. Based on these studies, we expect that dredging activities would not increase suspended sediment and turbidity concentrations to levels that would adversely impact aquatic species.

The Tier I sediment analysis conducted by Geosyntec for the Elba Liquefaction Project identified several metals in the sampled sediment; however, the concentration of metals is consistent with other known concentrations of metals from other sediment analysis in the Savannah River. Therefore, suspension and deposition of river sediment containing heavy metals would be minimal.

The Companies propose to install approximately 40 dolphins/piles for tying off and fendering barges in the South Channel barge dock slip. Pile driving could generate underwater sound pressure waves that can adversely affect aquatic organisms, including fish. Depending on the sound frequency and intensity associated with this activity, it could cause a change in aquatic species behavior in proximity to the work area, species to avoid the area, or injury to fish in close proximity, such as hemorrhaging or organ damage. The Companies propose to utilize a vibratory hammer to install the piles, which is an agency-recommended technique to minimize acoustic impacts on aquatic species. The Companies would also use timber fender piles and install all piles within 7 days or less, which further limits acoustic impacts on aquatic species. Dredging activities would be conducted before piles and mooring dolphins are installed; therefore, few fish or prey species are expected near the pile driving activities. Because the Companies propose to utilize the least damaging pile driving techniques and it is anticipated limited aquatic resources would be present near the pile driving activities, aquatic resources would not be adversely affected by pile driving activities.

Barge and Ship Transit

Ballast and cooling water would be withdrawn from the Savannah River to stabilize each aggregate ship (six ships are anticipated) as it unloads cargo, and could result in impingement or entrainment of aquatic species. The impingement or entrainment of juvenile or adult fish would be insignificant as most species would be able to avoid water withdrawals. The entrainment of eggs and larvae, however, is more likely during water withdrawals. Surface plankton net tows conducted in 2003 downstream of Elba Island near the confluence of the intracoastal waterway and the Savannah River yielded a dominance of mysid shrimp, ctenophores, anchovies, and jellyfish, with occasional spotted seatrout, croaker, weakfish, spot, menhaden, and sea robin larvae.

Based on previous information obtained from NMFS (SLNG, 2006), the presence of egg and larval life stages for most managed and protected fish species is unlikely in the vicinity of Elba Island, since these species typically spawn in waters that are less saline or deeper than that found near Elba Island. However, according to a 2-consecutive-year field study conducted by the USGS and the University of Georgia, five fish species (Atlantic croaker, Atlantic menhaden, bay anchovy, naked goby,

and spot) have been documented to dominate the ichthyoplankton assemblage in the waters at the west end of Elba Island (Jennings and Weyers, 2003) and would be the most likely species to be entrained during ballast and cooling water uptakes.

The total impact on larvae and eggs in the river from ballast water uptake is unknown and would depend upon many factors, including the intake velocity, water volume, depth of water withdrawal, and biodensity, which is influenced by the time of day and time of year, etc. Due to the very high natural mortality rate of eggs and larvae, the abundance of naturally occurring eggs and larvae, and the intermittent nature of the ballast water intake activities, the potential effect on eggs and larvae from ballast water intakes is expected to be minimal and temporary. Additionally, in the final EIS for the Elba III Project (see section 1.1), we concluded that entrainment for the Elba III Project represents a "fraction of the overall entrainment affect [sic] resulting from all the ships transiting in and out of the various Savannah River ports. Therefore, impingement and entrainment resulting from the Elba III Project would not jeopardize any species or year class of fishes, nor their prey." The proposed Project would result in substantially less water withdrawal (estimated 500 million gallons annually) than the Elba III Project (maximum 2 billion gallons); therefore, we conclude that ballast water uptake during construction of the Elba Liquefaction Project would not have a significant impact on larvae and eggs

Barge, aggregate ship and LNGC traffic could result in a minor increase to shoreline erosion caused by vessels wakes or prop wash. However, marine traffic would travel at a slow speed within the Savannah River transit corridor and increased sedimentation due to hull sheer stress or propeller wash would be expected to be consistent with other transiting vessels and would not significantly increase shoreline erosion. Only 6 aggregate ship and 8 barge deliveries would be required during construction of the Project, which is a minimal number of vessels when compared to typical ship traffic in the Savannah River which can range up to 30 commercial vessels arriving or departing each day. Further, the major contributors to shoreline erosion are water level variations, wind-generated waves, and currents. The sedimentation and erosion impacts associated with the proposed marine traffic are consistent with the existing marine traffic in the Savannah River transit corridor, and we have determined that the proposed marine traffic would not significantly increase shoreline erosion or sedimentation along the transit corridor.

Ballast Water Discharges

As previously discussed, ballast water discharges from LNGCs are not expected to significantly affect water quality because the released water would be limited in flow when compared to river flow, and would be subject to river current and tidal mixing. The ballast water may be higher in salinity than the waters adjacent to the Elba Liquefaction Project area, but otherwise would be similar with respect to pH, dissolved oxygen, and water temperature. The discharges would be temporary, localized, and expected to quickly dissipate into the surrounding water column.

Ballast water discharges from LNGCs have the potential to harbor nonindigenous species, which have the potential to cause economic and ecological degradation to affected near-shore areas. These nonindigenous species could also arrive on the hulls and exterior equipment (e.g., anchors and anchor chains) of LNGCs. The Port of Savannah is the fourth largest and fastest growing container port in the United States. It receives ships from all over the world and has been in operation since soon after the founding of Savannah in 1733. Given such history, there is a high potential that local waters have been exposed to nonindigenous species since the port was established. Consequently the local biotic community likely has adapted to a regular influx of nonindigenous species, the introduction of which likely would have predated current regulations designed to prevent their spread. Notwithstanding these factors, and in recognition of the potential for introduction of nonindigenous species to Savannah Harbor, LNGCs would be required to adhere to the USCG's 2012 rules (Federal Register Vol. 77, No. 57) that

outline standards for eliminating various sizes and concentrations of organisms in discharged ballast water. These new standards must be achieved by shippers in a phased timeframe. For newly constructed ships, the new rules became effective in December 2013. For existing vessels greater than 5,000 cubic meters ballast water capacity, the new rules become effective in 2016, which is prior to the in-service date of the proposed Project. The new rules and discharge standards provide more consistent control over the concentrations of organisms than the current ballast water exchange program and would significantly minimize the introduction and establishment of nonindigenous species. For example, Smithsonian Environmental Research Center (SERC) (after Minton et al. 2005 and Ruiz et al. 2005) estimates that ballast water exchange can replace up to 99 percent of initial coastal water with ocean water and remove over 90 percent of the coastal zooplankton trapped in the ballast tank (SERC 2013). Most of the open ocean species that would be discharged in the ballast water during LNGC loading at the terminal would not tolerate the freshwater/salinity composition or other water quality characteristics of the Savannah River, or would be cosmopolitan and occur there anyway (SERC 2013). When the Ballast Water Management Program is used, the potential for ballast water to introduce invasive species is substantially minimized. However, we acknowledge the potential still exists for nonindigenous species to be introduced into the Savannah River during ballast water discharges.

Every LNGC has the potential to transport nonindigenous species on its hull or exterior equipment (e.g., anchors and anchor chains). The USCG has developed responses to exotic/invasive species associated with foreign vessels and its Office of Operating and Environmental Standards developed mandatory practices for all vessels with ballast tanks on all waters of the United States. These mandatory practices include requirements to rinse anchors and anchor chains during retrieval to remove organisms and sediments at their place of origin and to remove fouling organisms that may be affixed to ship hulls, piping, and tanks. The removal of organisms would be conducted on a regular basis and the disposal of any removed substances would be in accordance with local, state, and federal regulations. However, we acknowledge the potential still exists for nonindigenous fowling organisms to arrive on the exterior of LNGCs.

In summary, the Companies propose to implement low impact dredging and pile driving techniques in an area that has been previously disturbed by dredging activities. The area is expected to recover quickly, resulting in only short-term impacts on the soft bottom benthic community. In addition, the impacts of ballast water uptake and discharge would be minimized by the proposed mitigation measures and adherence to federal permits. Therefore, we conclude that the Liquefaction facilities would not have significant impacts on aquatic resources.

Port Wentworth Site

At the Port Wentworth Site, the drainage ditches are currently maintained and ephemeral, and construction activities would be short-term and temporary. If fish are present at the time of construction, they could be exposed to sediment-laden runoff and/or habitat could be degraded, which could impact benthic species or insects that provide a source of food. Because there are no waterbodies directly impacted by Project activities at the Hartwell, Jefferson County, and Rincon Compressor Stations, or the Elba Island Interconnect, EEC North, or Del Webb Sites, no direct impacts on fisheries could occur at those locations. The Companies would comply with the measures in our Procedures, the Project-specific SPCC Plan, and provisions of the SWPPP that would be approved by the GDNR. Therefore, we conclude that Project activities would have minimal impact on fisheries within or downstream of the Port Wentworth drainage ditches and other facility sites.

2.2.4 Managed Fish Species and Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act, as amended in 1996, was established, along with other goals, to promote the protection of EFH in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

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

- Notification – The action agency should clearly state the process being used for EFH consultations (e.g., incorporating EFH consultation into the EIS).

- EFH Assessment – The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH Assessment should include: a description of the proposed action; an analysis of the effects (including cumulative effects) of the proposed action on EFH, the managed fish species, and major prey species; the Federal agency's views regarding the effects of the action on EFH; and proposed mitigation, if applicable.

- EFH Conservation Recommendations – After reviewing the EFH Assessment, NMFS would provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.

- Agency Response – The action agency must respond to NMFS within 30 days of receiving recommendations from NMFS. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH.

The FERC proposes to incorporate EFH consultations and assessments for the Project with the interagency coordination procedures required under NEPA. As such, we are requesting that NMFS consider this EA as our EFH Assessment.

The FERC previously conducted EFH assessments to assess construction, modification, and operational impacts from the Elba Island LNG Terminal on EFH and EFH species. In 2003 the FERC consulted NMFS regarding the construction of two new marine berths at the existing Terminal and the impacts the activity would have on EFH and EFH species. We and the COE determined and the NMFS agreed that construction and operation of the marine berths, which included the excavation of 3.3 million cy of material from the Savannah River, would not adversely impact EFH or EFH species. The FERC then consulted NMFS in the 2007 regarding an additional Terminal expansion project which included the expansion of the marine berths, LNGC transit to the terminal, ballast and cooling water intakes, LNG spills, hydrostatic test water discharges, and pile driving impacts on EFH and EFH species. We determined and the NMFS agreed that these activities would have only minor, temporary impacts on EFH and EFH species. Accordingly, we have limited our EFH assessment to project activities that have not been previously assessed and are unique to the proposed Project, which include the expansion of Elba Island Road at the Security Post, dredging and pile installation in the South Channel, aggregate ship and barge transit within the Savannah River and South Channel, and ballast water discharges from LNGCs.

2.2.4.1 EFH Characterization

EFH is separated into estuarine and marine components. The estuarine component is generally defined as all estuarine waters and substrates, including the sub-tidal vegetation, and adjacent inter-tidal vegetation. Specific habitats included in this definition include, but are not limited to, emergent wetlands, scrub/shrub wetlands, submerged aquatic vegetation, oyster reefs and shell banks, intertidal flats, tidal creeks, palustrine emergent and forested wetlands, and aquatic beds. The marine component is generally defined as all waters and substrates from the shoreline to the seaward limit of the Exclusive Economic Zone between U.S. territorial waters and international waters. Specific habitats included in this definition are live/hard bottom, coral and coral reefs, artificial and manmade reefs, *Sargassum*, and the marine water column.

Based on consultation with NMFS, estuarine marsh and unconsolidated sub-tidal substrate EFH would be affected by these project activities. The subtidal substrate in the South Channel consists predominantly of mud and sand, which can provide foraging habitat for demersal fish that eat worms and mollusks living on and in the sediments. The tidally influenced estuarine marsh that surrounds Elba Island Road is largely comprised of smooth cordgrass, with big cordgrass and saltmeadow cordgrass found within the highest elevations of the marsh. No Habitat Areas of Particular Concern are designated in the Project area.

According to historic species diversity and life stage information that has been collected within the Savannah River, 18 federally managed fish species have the potential to occur within estuarine marsh or unconsolidated sub-tidal substrate EFH. The life stages and seasonal distribution of these managed species are presented in table 2.2.4-1.

TABLE 2.2.4-1

NMFS-managed Fish Species that Could Occur within Savannah River near Elba Island

Species	Utilized EFH	Life Stages and Seasonal Presence			
		Eggs	Larvae	Juvenile	Adult
Spanish mackerel (*Scomberomorous maculatus)*	USS	Apr-Sep	Apr-Sep	Mar-Oct	
Cobia (*Rachycentron canadum*)	USS	Jun-Aug	Jun-Aug	Mar-Oct	
Crevalle jack (*Caranx hippos)*, SCSC	USS			All Year	All Year
Black sea bass (*Centropristis striata)*, SCSC	USS			All Year	
Sheepshead (*Archosargus probatocephalus)*, SCSC	USS		June-Feb	All Year	All Year
Gray snapper *(Lutjanus griseus)*, SCSC	EM			All Year	
Lane snapper *(Lutjanus synagris)*, SCSC	EM			Mar-Sep	
Brown shrimp *(Farfantepenaeus aztecus)*	USS, EM			All Year	Aug-Oct
White shrimp *(Lytopenaeus setiferus)*	USS, EM			All Year	All Year
Pink shrimp *(Farfantepenaeus duorarum)*	USS, EM			Mar-Oct	June-Feb
Bluefish (*Pomatomus saltatrix*)	USS		Mar-Dec	Mar-Dec	May-Jan
Summer flounder (*Paralicthys dentatusi*)	USS		Nov-May	All Year	June-Oct
Blacknose shark *(Carcharhinus acronotus)*	USS (rarely)		Mar-Oct		
Finetooth shark *(Carcharhinus isodon)*	USS (rarely)		Mar-Oct	Mar-Oct	Mar-Oct
Bull shark (*Carcharhinus leucas*)	USS (rarely)			Mar-Oct	Mar-Oct
Blacktip shark (*Carcharhinus limbatus*)	USS (rarely)				Mar-Oct
Atlantic sharpnose shark (*Rhizoprionodon terraenovae*)	USS (rarely)			Mar-Oct	Mar-Oct
Bonnethead shark (*Sphyrna tiburo*)	USS (rarely)		Mar-Oct	Mar-Oct	Mar-Oct

SCSC = Snapper-Grouper species complex
USS = Unconsolidated Sub-tidal Substrate
EM = Estuarine Marsh

2.2.4.2 Managed Species Descriptions

Spanish Mackerel and Cobia

Spanish mackerel and cobia spend their adult life in the coastal and open ocean. Their larval and juvenile life stages use estuaries as nursery grounds, and many of their prey species are also estuarine dependent. All estuaries within the species' latitudinal range are considered EFH for these species. Fisheries studies have identified one Spanish mackerel in a tidal creek in the brackish section of the Savannah River, but it is not known whether Spanish mackerel occur near Elba Island (Jennings and Weyers, 2002). Nelson et al. (1991) list cobia and Spanish mackerel as rare in all seasons in the Savannah River coastal mixing zone; therefore, it is unlikely these species would be impacted by the Project.

Snapper-Grouper Complex

The snapper-grouper species complex (SGSC) includes 73 species, some of which spend part of their juvenile life stage in estuaries. Of the 73 SGSC species, NMFS has indicated the crevalle jack, black sea bass, sheepshead, gray snapper, and lane snapper may occur in the Project area. The SGSC generally spawns offshore, but the adults and juveniles can tolerate freshwater and use estuaries such as the Savannah River for rearing and feeding. EFH for this assemblage includes brackish and salt marshes and unconsolidated bottom habitats.

Studies on estuarine dependent species in the Savannah River have identified larval or juvenile gag grouper, crevalle jack, and gray snapper in the Savannah River watershed, but it is not known whether they utilize the Project area (Jennings and Weyers, 2002). Nelson et al. (1991) confirmed black sea bass, gray snapper, and sheepshead occur in the Savannah River mixing zone.

Juvenile snapper and grouper eat crustaceans, fish, mollusks, and other invertebrates, while the adults eat mostly fish, shrimp, and crabs. These prey species utilize the salt marshes and unconsolidated bottom habitats within the Project area.

Shrimp

Brackish and salt marshes (especially the edges) and unvegetated unconsolidated bottom EFH are utilized by post larval and juvenile white, brown, and pink penaeid shrimp. While these shrimp spend their fastest growth phases in estuarine waters, the large adults migrate to coastal and offshore waters in April and May to spawn and grow. Accordingly, adults are least common in the fall and early winter after this migration occurs.

Brown and white shrimp are the most common in the Project area (Collins, 2001c). These species prefer a more unconsolidated muddy substrate than pink shrimp, which prefer harder substrates such as sand and shell bottom. All three species eat a variety of other invertebrates, decaying plant matter, and other types of organic debris.

Bluefish

EFH for bluefish includes the mixing and seawater zones of the Savannah River (and all other major estuaries between Maine and north Florida) from March through December for juveniles, and May through January for adults (MGA, 2011a). During the summer and fall, juveniles use high salinity tidal creeks and rivers for nursery areas, but avoid areas with salinity below 10 ppt (Shipman personal communication in MAFMC et al., 1998). Adults and juveniles seek prey such as Atlantic menhaden

during the summer and fall in the estuary. Nelson et al. (1991) indicate that bluefish juveniles are the only life stage found at significant levels in the Savannah River mixing zone, with rare occurrence from December to April and common occurrence from May to November. Substantial impacts on bluefish are unlikely to occur since only juveniles have the potential to be present in the project vicinity and would likely avoid Project activities.

Summer Flounder

Summer flounder are benthic dwellers whose EFH includes the mixing and seawater zones of the Savannah River for the larval, juvenile, and adult life stages. While this species typically goes offshore during the fall and winter, fisheries studies have identified summer flounder in the Savannah River from April to May. Eggs are pelagic and buoyant, and larvae feed and grow near the ocean surface. Juveniles use a combination of swimming and tidal currents to reach estuarine, shallow marsh nursery habitat. For juveniles, small invertebrates such as grass shrimp, mysids, copepods, and polychaetes make up a large portion of their prey (Wenner et al., 1990). As with many opportunistic feeders, prey size increases with body size and the adults graduate to eating fish such as bay anchovies and mummichogs as well as grass shrimp as their size increases (Wenner et al., 1990). Adults are ambush predators and prefer sandy habitats but may also be found in mud substrates, particularly at the edges of eelgrass beds (Packer et al. 1999). Impacts on summer flounder may include clogging of gills and temporary loss of prey from dredging related activities.

Highly Migratory Species

Five species of tuna, five of billfish, and twenty-five species of shark are protected under the Highly Migratory Species Management Plan. Billfish and tuna species are pelagic and are not expected to be present in the estuarine waters around Elba Island. Six shark species may use the Savannah River estuary during their life stages, but most would be limited to the mixing zone near the mouth of the river. The Atlantic sharpnose and bull shark may be the exception, as various life stages of these species can withstand the salinity levels near Elba Island, and both have been identified near Elba Island during previous studies (Collins et al. 2000; MGA 2011a).

2.2.4.3 EFH Impacts and Mitigation

Expansion of Elba Island Road

Tidal marsh is utilized by shrimp and snapper and provides important habitat for prey species of other managed species. Shrimp that are present in the tidal marsh within the construction work area could be smothered when the marsh is filled. Juveniles of red drum and SGSC species would likely leave the construction area when construction starts and are expected to utilize the adjacent tidal marsh during and after construction.

As previously stated, the Companies propose to mitigate for the loss of tidal marsh by creating new tidal marsh and an upland buffer on the south shore of Elba Island. Creation of new marsh habitat would mitigate for the permanent marsh impacts associated with the road expansion, and the temporary construction impacts on tidal marsh are not expected to significantly affect populations of shrimp, snapper, or other managed fish species or their prey. Because only minimal managed species would be affected by the road expansion, substantial habitat is available adjacent to the Project area, and the loss of marsh habitat would be appropriately mitigated, impacts on EFH and managed species would be insignificant.

Dredging in the South Channel

Dredging of the temporary barge slip has the greatest potential to impact EFH, managed fish, and prey species. Dredging would remove up to 7.5 acres of unconsolidated sub-tidal substrate EFH in the South Channel, and annual maintenance dredging of the barge slip would further impact EFH and managed fish during construction of the liquefaction facilities. Dredging is anticipated to take 7-14 days, with annual maintenance dredging lasting up to 7 days, and could occur at any time during the year, subject to construction timing. Any infaunal or non-motile epifaunal benthic species in the dredge area that are used as forage by managed fish would be removed by dredging activities.

As shown in table 2.2.4-1, various life stages for most of the managed fish species could be present at any given time during the year when dredging activities would occur. The majority of juvenile and adult fish would likely avoid dredging activities and relocate to adjacent habitat; however, the entrainment of adult fish by cutterhead dredging has been documented and is not completely unavoidable. Turbidity and the temporary loss of forage could also indirectly impact juvenile and adult managed fish. Penaeid shrimp are particularly vulnerable to the effects of dredging during their post-larval and juvenile life stages, which are typically from May to July (white shrimp) and February to July (brown shrimp). The eggs and larvae of Spanish mackerel, cobia, sheepshead, and bluefish could be entrained by dredging activities, smothered by sedimentation adjacent to the dredging activities, or indirectly impacted by turbidity. However, as discussed in section 2.2.3.3, studies have shown that cutterhead hydraulic dredging would not significantly increase sedimentation and turbidity impacts within the Savannah River. Due to the temporary and minor nature of the dredging activities, the relatively small area of impact within the South Channel, and the anticipated rapid recovery of unconsolidated sub-tidal substrate EFH and benthic populations within the dredged area after construction is completed, impacts on EFH, managed species, and prey species would be minor.

Pile Installation in the South Channel

The Companies would minimize noise impacts from pile driving by using a vibratory hammer, using timber fender piles, and limiting the duration of the pile driving activities to seven days or less. Dredging activities would be conducted before piles and mooring dolphins are installed; therefore, few fish or prey species are expected near the pile driving activities. Because the Companies propose to utilize the least damaging pile driving techniques, limited aquatic resources would be present near the pile driving activities, a minimal amount of unconsolidated sub-tidal substrate EFH would be permanently impacted where piles are installed, and activities would be completed within 7 days or less, we do not anticipate pile installation would noticeably affect EFH, managed species, or their prey.

Barge and Ship Transit

As discussed in section 2.2.3.3, we previously concluded in the final EIS for the Elba III Project that entrainment impacts from water withdrawals represents a "fraction of the overall entrainment affect [sic] resulting from all the ships transiting in and out of the various Savannah River ports. Therefore, impingement and entrainment resulting from the Elba III Project would not jeopardize any species or year class of fishes, nor their prey." Because the proposed Project would result in substantially less water withdrawal (estimated 500 million gallons annually) than the Elba III Project (maximum 2 billion gallons), we conclude that the same conclusion applies to the Elba Liquefaction Project.

2.2.4.4 EFH Conclusions

We reviewed species life history traits, fisheries data collected from the Savannah River, the Companies EFH assessment that was filed with FERC in March 2014, and consulted with NMFS to determine which managed species could be present near Elba Island. We also utilized previously conducted EFH assessments near the Project area to assess potential EFH impacts and the measures that were previously implemented to avoid or minimize impacts on EFH and EFH species. Based on this information and the construction measures that are proposed for the proposed Project, we conclude the effects on EFH and EFH species in and near the Project area would be localized and temporary, especially when compared to the everyday use of the Savannah River. Therefore, we conclude that the Project would not have a significant impact on EFH or EFH species in the area.

2.2.5 Wetlands

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, 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 regulated at the federal, state, and local levels. On the federal level, the COE has authority under section 404 of the CWA to review and issue permits for activities that would result in the discharge of dredged or fill material into waters of the United States, including wetlands. Section 401 of the CWA requires that proposed dredge and fill activities under section 404 be reviewed and certified by the designated state agency (the GDNR in Georgia and the South Carolina Department of Natural Resources in South Carolina) to ensure that the proposed project would meet state water quality standards. Local government units can also implement zoning or building standards to protect wetland and waterbody resources.

2.2.5.1 Liquefaction Facilities

Wetland surveys identified a wetland-upland mosaic where the on-site wareyard, marine flare and associated access road would be constructed. The wetland mosaic contains multiple pockets of low-quality palustrine forested and palustrine emergent wetlands. Dominant wetland species include Chinese tallow tree (*Triadica sebifera*), Pennsylvania smartweed (*Persecaria pensylvanica*), fox sedge (*Carex vulpinoidea*), and sugar berry (*Celtis laevigata*). The southwestern portion of the wetland mosaic is separated from the tidal marsh and the South Channel by a berm that functioned as the original dike (circa 1960s) for containment of dredge material. Accordingly, the wetland area represents an atypical situation and was incidentally created during development of Elba Island. The COE conducted a field visit of the wetland area on February 4, 2014. On February 25, 2014, COE staff verified the transect methods used to delineate the wetland-upland mosaic was accurate and confirmed 3.5 acres of jurisdictional wetland is present within the mosaic. Wetland surveys also identified tidal marshes around the perimeter of Elba Island. These tidal marshes are outside the Project boundary and would not be affected by Project activities.

Tidal marsh also surrounds Elba Island Road and is largely comprised of smooth cordgrass (*Spartina alterniflora*), with big cordgrass (*Spartina cynosuroides*) and saltmeadow cordgrass (*Spartina patens*) found within the highest elevations of the marsh and along the toe of slopes leading up to the existing road. Additional occurrences of Olney's three-square bulrush (*Schoenoplectus americanus*) were also observed, typically within the ecotone between high and low marsh.

One scrub shrub and three emergent wetlands were identified at the off-site wareyard site. The Companies would avoid impacts on these wetlands by installing appropriate BMPs (e.g., silt fence) along the perimeter and by implementation of our Procedures, the Project-specific SPCC Plan, and provisions of the SWPPP that would be approved by the GDNR. Therefore, no impacts on these wetlands are anticipated.

2.2.5.2 Compressor and Metering Station Facilities

Wetlands were identified adjacent to the Rincon, EEC North, Port Wentworth, and the Del Webb Sites; however, the Project has been designed to avoid impacts on these wetlands. No wetlands were identified near the Hartwell or Jefferson County Compressor Stations. Because the Companies would implement the measures in our Procedures, the Project-specific SPCC Plan, and provisions of the SWPPP that would be approved by the GDNR, construction related activities at the compressor and metering station facilities should not affect adjacent wetland areas.

2.2.5.3 Wetland Impacts and Mitigation

Construction of the on-site wareyard, marine flare, and associated access road would result in the permanent loss of approximately 3.5 acres of low-quality, emergent and forested wetland that was incidentally created on Elba Island during its construction. To compensate for this wetland loss, the Companies propose to purchase 15.2 acres of wetland mitigation credits from a COE-approved wetland mitigation bank within the Lower Savannah River watershed.

Widening of Elba Island Road would result in the permanent loss of 0.3 acre of tidal marsh. To compensate for this wetland loss, the Companies propose to create and/or restore tidal marsh on the south shore of Elba Island. The proposed mitigation/restoration site is adjacent to an existing tidal marsh mitigation area that was approved by COE and NMFS in 2012 (SAS-20016-00650) for the expansion of DMCA 2. The proposed mitigation wetland would restore approximately 0.3 acre of tidal marsh and establish a 50-foot, approximately 0.5 acre upland buffer adjacent to the mitigation wetland.

The Companies submitted an application to COE in March 2014 regarding the wetland impacts and proposed mitigation described above. In October 2014, the COE suspended review of the application at the Companies' request and stated the COE would restart review upon issuance of the FERC Notice of Schedule for completion of the EA. However, the GEPD issued its Water Quality Certification and Coastal marshland Protection Act Permit for the Project in December 2014. The Companies also submitted an application to the GDNR in August 2014 for the 25-foot vegetation buffer encroachment, and the GDNR review is pending. However, based on our review, the Companies have designed the Project to minimize and avoid wetland impacts on the extent practicable, and have proposed mitigation to offset unavoidable wetland impacts. Although COE review is pending, the Companies have taken the appropriate steps taken to comply with section 404(b)1 guidelines that restrict discharges of dredge and fill material where less environmentally damaging alternatives exist, and we conclude that wetland impacts would be adequately minimized. In addition, recommendation number 11 in section 4 of this EA requires that we confirm that the Companies have received all required authorizations under federal law, prior to beginning construction of the Project.

2.3 VEGETATION AND WILDLIFE

2.3.1 Vegetation

Three upland vegetation communities would be affected by the Project: maintained herbaceous vegetation, upland planted pine forest and hardwood forest. Wetland vegetation communities that would

be affected by the Project are described in section 2.2.4. Table 2.3.1-1 summarizes the approximate acreage of vegetation communities that would be affected by the Project. No managed or vegetation communities of special concern would be impacted by the Project.

TABLE 2.3.1-1

Project Impacts on Vegetation Communities (acres)

	Maintained Herbaceous Vegetation		Upland Planted Pine Forest		Hardwood Forest	
Project Site	Construction [a]	Operation [b]	Construction [a]	Operation [b]	Construction [a]	Operation [b]
Liquefaction Facilities (including the Elba Island Interconnect Site)	32.1	32.1			11.5 [c]	11.5 [c]
Off-site Wareyard [d]	0.0	0.0				
Elba Island Road Expansion	2.1	2.1				
Port Wentworth Site	0.4	0.0				
Hartwell Compressor Station	2.7	0.6	3.4	3.2		
Jefferson County Compressor Station	1.4	1.2	9.6	7.3		
Rincon Compressor Station	2.4	2.1	5.5	5.0		
EEC North Site	0.6	0.0				
Del Webb Site	0.6	0.0				
Project Total	**42.3**	**38.1**	**18.5**	**15.5**	**11.5**	**11.5**

[a] Construction Impacts. Includes all areas that would be impacted during construction or modification of the facilities.

[b] Operation Impacts. Includes areas that would be converted to industrial use after construction or modification of the facilities.

[c] Includes wetland hardwood, which comprise the upland/wetland mosaic described in section 2.2.4.1.

[d] The off-site wareyard is a former industrial facility consisting of gypsum piles. No significant vegetation communities are present at this site.

2.3.1.1 Vegetation Impacts and Mitigation

Maintained Grassland

Approximately 42.3 acres of mowed grass would be affected during construction of the Project facilities. Of this, approximately 38.1 acres would be permanently converted to compression or liquefaction facilities while the remaining would revert to a mowed grass condition. The Companies would use erosion controls and restore the temporary work areas according to our Plan, and would also consult with the NRCS to ensure the use of proper restoration and reseeding strategies for the local area. Mowed grass areas would be seeded with an appropriate grass/lawn seed mixture and mulched as necessary to minimize erosion. Mowed grass areas are expected to restore within one to three years after construction is complete.

Hardwood Forest at On-site Wareyard

Approximately 11.5 acres of Chinese tallow hardwood forest would be permanently removed during construction of the on-site wareyard at the Liquefaction Facility. Chinese tallow tree is listed as a Category 1 exotic species in Georgia that poses a serious threat to natural communities (GEPPC, 2014). Removal of this low-quality vegetation community would not diminish habitat quality on Elba Island.

Upland Planted Pine Forest

Portions of the Jefferson County and Rincon Compressor Stations, as well as the new construction areas at the Hartwell Compressor Station, are currently managed for loblolly pine timber production. These areas generally exhibit a pine monoculture with little understory vegetation. As presented in table 2.3.1-1, approximately 18.5 acres of planted pine forest would be removed by construction of the Hartwell, Jefferson County, and Rincon Compressor Stations. Of the 18.5 acres that would be cleared, 3 acres would be allowed to revert to pine production after construction is complete, and 15.5 acres would be permanently converted to natural gas infrastructure or maintained grassland within the compressor station facilities. The Companies would use erosion controls and restore the temporary work areas in compliance with our Plan, and would also consult with the NRCS to ensure the use of proper restoration and reseeding strategies for the local area. These measures would provide soil stability and minimize erosion and soil loss. In accordance with the measures in our Plan and Procedures, the Companies would monitor all disturbed and restored areas to determine the post-construction success of revegetation for a minimum of two growing seasons, and report any restoration problems that are identified during monitoring or by landowners to the FERC. The permanent conversion of 15 acres of planted pine forest to natural gas facilities is negligible, considering the abundance of planted pine forest and similar habitat available adjacent to these sites. We conclude that impacts on upland vegetation communities would be minor.

Exotic or Invasive Plant Species 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. Chinese tallow trees, a Category 1 exotic species in Georgia, are present at the proposed on-site wareyard. Chinese tallow trees establish easily, grow quickly, and produce large quantities of seeds that are long-lived and are spread by water, birds, and mammals. This species can re-sprout quickly from crown and root buds when top growth is mechanically removed. No management of Chinese tallow trees would be needed at the Terminal Expansion, as the entire area would be permanently maintained as an industrial site.

The Companies would implement the measures in our Plan and Procedures, which requires coordination with appropriate agencies to minimize and control the spread of invasive species and noxious weeds from entering the construction area. We conclude that these measures would adequately minimize and control the spread of noxious and invasive species.

2.3.2 Wildlife

Wildlife habitat within Elba Island has been degraded due to construction and operation of the LNG Terminal since the 1970s. Approximately 51.6 acres of the LNG Terminal consists of LNG infrastructure, support buildings and roads and is not considered wildlife habitat. The remaining Terminal site consists of 32.1 acres of mowed grassland, 11.5 acres of invasive Chinese tallow hardwood, and four man-made drainage ditches. Representative wildlife species that could occur within the existing LNG Terminal facility include small rodents, lizards, snakes, insects, and possibly alligator and some passerine species of birds. In addition, the hardwood forest portion of the Elba Liquefaction Project area may be utilized by frogs, turtles, otter, gray squirrels, raccoons, Virginia opossums, bobcat, and deer. Bird species typically found around Elba Island include Anhinga, belted kingfisher, brown pelican, clapper rail, common moorhen, mourning dove, northern mockingbird, osprey, red-tailed hawk, snowy egret, marsh wren, turkey vulture, yellow-rumped warbler, and several tern and gull species.

Tidal marsh that surrounds Elba Island Road and the Del Webb Site supports a large diversity of wildlife species, including birds, raccoons, and other species that prey on crabs, oysters, shrimp and other fish and shellfish that inhabit tidal marsh.

Wildlife habitat near the Hartwell, Jefferson County, and Rincon Compressor Stations consists of oak-hickory-pine, mixed deciduous forest, and planted pine. Mammals such as raccoons, armadillos, opossums, white-tailed deer, striped and spotted skunks, cottontail rabbits, gray foxes, bobcats, coyotes and bats are common, as are a variety of rodents and amphibians. A wide variety of songbirds use forest and edge habitats, as do wild turkeys, mourning doves, cardinals, bobwhite quail, and vultures. However, managed pine plantations, including those the proposed compressor station sites, provide marginal habitat for most wildlife species, as the monotypic tree composition and limited understory vegetation provide minimal sheltering, denning, and foraging habitat.

The EEC North, Port Wentworth, and off-site wareyard sites are developed industrial sites that lack suitable wildlife habitat.

2.3.2.1 Sensitive or Designated Wildlife Habitats

No wildlife management areas would be directly affected by the Project. The nearest designated wildlife protection area is the Tybee National Wildlife Refuge on the Savannah River approximately 3.5 miles downstream of Elba Island. This refuge is an important resting and feeding area for migratory birds, including gulls, terns, neotropical migratory songbirds, and shorebirds (FWS, 2011a).

2.3.2.2 Wildlife Impacts and Mitigation

Construction and operation of the Project would result in permanent alteration of the various wildlife habitat types listed above. The 32.1 acres of maintained grass areas at the LNG Terminal, which is considered low quality habitat, would be converted to industrial use and would no longer provide wildlife habitat. Construction activities would result in the displacement of the small rodents, reptiles, amphibians, and invertebrates and may result in mortality of less mobile forms of wildlife, such as small rodents and reptiles. Wildlife species that utilize the 11.5 acres of Chinese tallow hardwood area would also be displaced as construction activities approach. These animals would be forced to relocate into already limited and marginal habitat on Elba Island, which would increase population densities and potentially reduce reproductive and survival success.

Dredging, pile driving, and barge activities in the South Channel and expansion activities along Elba Island Road would likely cause wildlife to avoid these areas during construction. Due to the abundance of similar habitat adjacent to these project sites and the relative short-term and localized nature of the disturbances, effects on the wildlife species that utilize these areas would be minor. The 0.3 acre of tidal marsh habitat that would be permanently impacted by expansion of the Security Gate would be mitigated by the creation of similar marsh habitat on Elba Island; therefore, no long term impacts on marsh habitat are anticipated.

Installation and operation of liquefaction and marine flares could affect migratory birds. Depending on the bird species and weather conditions, birds could be attracted to or avoid the light generated by the marine flare. Light emitted from the marine flare could cause migratory birds to temporarily alter their migration course. Heat generated from either flare could result in injury or mortality to birds that fly close to the heat source. Because these flares would be used intermittently during facility operation, these effects would be minor and intermittent.

The clearing and removal of pine habitat at the compressor station sites would have the greatest effect on wildlife. Clearing would reduce cover, nesting, and foraging habitat for some species and may result in mortality to smaller, less mobile forms of wildlife. It is expected that most wildlife, such as birds and larger mammals, would temporarily relocate to adjacent available habitat as construction begins. This displacement could increase competition between species for forage, cover, and nesting habitat; however, the abundance of similar pine habitats adjacent to the compressor station sites should reduce competition. Potential effects on migratory birds are further discussed in section 2.3.3.1

In summary, a minimal amount of low to marginal quality wildlife habitat would be permanently affected by the Project. Habitat fragmentation impacts are not anticipated as the LNG Terminal, metering facilities, and the Hartwell Compressor Station are existing facilities, and the Jefferson County and Rincon Compressor Stations are located in silviculture areas that are periodically cleared and located along existing roads and rights-of-way. Impacts on wildlife species would be minor and temporary as most species would relocate to similar habitat in the Project area.

2.3.3 Protected and Sensitive Species

2.3.3.1 Migratory Birds

Migratory birds are species that nest in the United States during the summer and make short- or long-distance migrations for the non-breeding season. Neotropical migrants migrate south to the tropical regions of Mexico, Central and South America, and the Caribbean for the non-breeding season. Migratory birds are protected under the Migratory Bird Treaty Act (16 USC 703-711). The Migratory Bird Treaty Act, as amended, prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, or nests unless authorized under a FWS permit. Bald and Golden Eagles are additionally protected under the Bald and Golden Eagle Protection Act (16 USC 668-668d). Executive Order 13186 (66 Federal Register 3853) directs federal agencies to identify 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.

A variety of migratory bird species, including songbirds, raptors, and waterfowl utilize the habitat found within the Project area. The FWS identified Birds of Conservation Concern (BCC) for various regions in the country in response to the 1988 amendment to the Fish and Wildlife Conservation Act, which mandated the FWS to identify migratory nongame birds that, without additional conservation actions, were likely to become candidates for listing under the ESA. The BCC lists, last updated in 2008, are divided by Bird Conservation Regions (BCR). The Hartwell Compressor Station is within the Piedmont BCR; the remaining facility sites are within the Southeastern Coastal Plain BCR (FWS, 2008). As outlined in table 2.3.3-1, a total of 35 BCC species are known to breed within their respective BCR.

The greatest potential to impact migratory birds would occur if Project construction activities such as grading, tree clearing, and construction noise take place during the breeding and nesting season. This could result in failed courtship, destruction of nests, and mortality of eggs and young birds that have not fledged. Construction would also reduce the amount of habitat available for foraging and predator protection for migratory birds. Competition for food and other resources may occur if birds are dispersed into adjacent, utilized habitats.

Bird habitat that would be directly impacted at the Project sites consists of 11.5 acres of low quality Chinese tallow on Elba Island and 3.4, 9.6, and 5.5 acres of planted pine at the Hartwell, Jefferson County, and Rincon Compressor Stations, respectively. Foraging habitat immediately surrounding the compressor station sites is similarly limited to planted pine. Because of the low quality habitat at Elba Island and the planted pine, silviculture land uses at and adjacent to the compressor stations, we conclude that construction and operation of the Project facilities would not have noticeable effects on migratory birds in the region.

TABLE 2.3.3-1

Birds of Conservation Concern Potentially Occurring Within the Project Area

Bird of Conservation Concern [a]	Piedmont BCR	Southeastern Coastal Plain BCR	Preferred Habitat and Potential Presence at Project Areas
Red-throated Loon		X	Low tundra wetlands, bogs, and ponds in forests. In migration, flocks stage on large lakes. Winters in relatively shallow, sheltered marine habitat. Habitat not impacted by Project.
Least Bittern		X	Freshwater or brackish marshes with tall emergent vegetation. Potential habitat along Elba Island Road.
Swallow-tailed Kite		X	Forested regions, often bottomland, or riverine forest, also open pine woodland. Marginal foraging habitat present.
Bald Eagle	X	X	Forest (riparian). Habitat present. No bald eagle nests identified within 660 feet of project areas during field surveys.
American Kestrel		X	Open areas with short ground vegetation and sparse trees. Marginal foraging habitat present.
Peregrine Falcon	X	X	Cliffs or man-made structures (riparian). Habitat not present.
Black Rail	X	X	Coastal salt and brackish marshes. Habitat present.
Limpkin		X	Open freshwater marshes, swamp forests, and shores of rivers, lakes, and ponds. Habitat not present.
Snowy Plover		X	Barren to sparsely vegetated sand beaches, dry salt flats in lagoons, dredge spoils deposited on beach or dune habitat, levees and flats at salt-evaporation ponds, river bars, along alkaline or saline lakes, reservoirs, and ponds. Habitat not present.
Wilson's Plover		X	Ocean beaches, lagoons, and salt flats. Potential habitat along Elba Island Road.
American Oystercatcher		X	Ocean shores and salt marshes. Potential habitat along Elba Island Road.
Least Tern		X	Seacoasts, beaches, bays, estuaries, lagoons, lakes and rivers. Habitat not present.
Gull-billed Tern		X	Gravelly or sandy beaches, salt marshes, and estuaries. Potential habitat along Elba Island Road.
Sandwich Tern		X	Seacoasts, bays, estuaries, and mudflats, occasionally ocean far from land. Habitat not present.
Black Skimmer		X	Open sandy beaches, gravel or shell bars, or mats of sea wrack. Habitat not present.
Common Ground-Dove		X	Arid, open woodlands in the early stages of development, including pine woods, hammocks, lake shores, forest edges, coastal dunes, mesquite flats, river bottom woodlands, deserts, desert scrublands, oak scrublands, and savannas. Habitat not present.
Chuck-Will's Widow		X	Pine, oak-hickory, and other woods. Marginal habitat present.
Whip-poor-will	X	X	Open woodlands. Marginal habitat present.
Red-headed Woodpecker		X	Open woodlands with scattered trees. Habitat not present.
Loggerhead Shrike	X	X	Pasture and cropland with scattered trees and hedgerows. Habitat not present.

TABLE 2.3.3-1

Birds of Conservation Concern Potentially Occurring Within the Project Area

Bird of Conservation Concern [a]	Piedmont BCR	Southeastern Coastal Plain BCR	Preferred Habitat and Potential Presence at Project Areas
Brown-headed Nuthatch	X	X	Mature pine stands. Habitat not present.
Bewick's Wren	X	X	Open woodlands (riparian). Marginal habitat present.
Sedge Wren	X		Moist upland sedge meadow. Habitat not present.
Wood Thrush	X	X	Moist, lowland deciduous forest. No habitat present.
Blue-winged Warbler	X	X	Abandoned fields, swamp, wetlands. No habitat present.
Black-throated Green Warbler		X	Boreal coniferous forest and transitional coniferous-deciduous forest. Habitat not present.
Prairie Warbler	X	X	Old fields/pastures with young trees. Habitat not present.
Cerulean Warbler	X	X	Mature upland oak woods (wooded hillsides along streams and rivers). Habitat not present.
Prothonotary Warbler		X	Wooded swamps and other bottomland forests. Habitat not present.
Swainson's Warbler	X	X	Bottomland forests (cove hardwoods with dense deciduous understory). Habitat not present.
Kentucky Warbler	X	X	Deciduous woods of floodplains, swamps, and ravines. Habitat not present.
Bachman's Sparrow	X	X	Open pine forest. Marginal habitat present.
Henslow's Sparrow	X	X	Ephemeral grasslands. Habitat not present.
Seaside Sparrow		X	Salt marshes. Potential habitat along Elba Island Road.
Painted Bunting		X	Semi-open habitats with scattered shrubs or trees; scrub communities, wooded back dunes, palmetto thickets, edges of maritime hammocks, hedges, yards, fallow fields, and old citrus groves. Marginal habitat present.

[a] This list does not include Birds of Conservation Concern that are non-breeding in the respective bird conservation region.

Source: FWS, 2008

2.3.3.2 Federal Threatened and Endangered Species

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 endangered or threatened species, or result in the destruction or adverse modification of the designated critical habitat of a federally listed species. As the lead federal agency authorizing the Project, the FERC is required to consult with the FWS and/or NMFS to determine whether federally listed endangered or threatened species or designated critical habitat are found in the vicinity of the Project, and to evaluate the proposed action's 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 report its findings to the FWS and/or NMFS in a Biological Assessment for those species that may be affected. If it is determined that the action is likely to adversely affect a listed species, the federal agency must submit a request for formal consultation to comply with section 7 of the ESA. In response, the FWS and/or NMFS would issue a Biological Opinion as to whether the federal action would jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat. We have determined that the Project would not adversely affect federally listed endangered or threatened species or designated critical habitat as discussed in the following sections.

Acting as our non-federal representative for the purposes of initiating informal consultation under section 7 of the ESA, the Companies consulted with the FWS and NMFS regarding the presence of federally listed or proposed endangered and threatened species or their critical habitats. Additionally, the Companies have assisted the Commission in meeting its section 7 obligations by conducting surveys for federally listed threatened or endangered species and their critical habitats in the Project area. Through informal consultations, 24 federally protected species, including the bald eagle, have potential to occur in the Project area. These species are summarized in table 2.3.3-2 in appendix C. federally protected species, including the bald eagle, have potential to occur in the Project area. These species are summarized in table 2.3.3-2 in appendix C.

Based on review of available literature, habitat preferences, and the results of field surveys conducted by the Companies, we conclude that the projects would have *no effect* on 9 of the federally protected species identified in table 2.3.3-2 in appendix C. These 9 species are not addressed further in this EA. The 14 federally protected species that have the potential to be affected by Project activities are discussed below.

Whales and Sea Turtles

Six whales (blue, fin, humpback, North Atlantic right, sei, and sperm) and five sea turtles (loggerhead, green, Kemp's Ridley, leatherback and hawksbill) may occur along shipping routes and could potentially be impacted by collisions with LNGCs, aggregate ships, or barges that are transiting to and from the LNG Terminal. To reduce the risk associated with vessel strikes or disturbance of protected whales and sea turtles, the Companies would adhere to the NMFS's Vessel Strike Avoidance Measures and Reporting for Mariners policy (NMFS, 2008) as part of its Terminal Use Agreement with LNG vessel operators. This policy includes recommendations to minimize vessel strikes, such as using a reference guide to identify protected species that may be encountered during ship transit; maintaining a vigilant watch for marine mammals and turtles; maintaining a 100-yard distance from whales; maintaining a 50-yard distance from sighted small cetaceans and sea turtles whenever possible; maintaining a parallel direction to an animal's course and avoiding excessive speed or abrupt changes in direction when protected species are in the area; reducing vessel speeds to 10 knots or less when mother/calf pairs, groups or large assemblages of cetaceans are observed near an underway vessel, when safety permits; and reducing speed and shifting engines to neutral when protected species are sighted in the vessel's path or near a moving vessel. In addition, the policy requires that crews immediately report sightings of any injured or dead protected species.

To the extent they have control, the Companies would implement, enforce, or promote additional measures for the protection of marine animals as outlined previously in the final EIS for the Elba III Project, including implementing the U.S. Mandatory Ship Reporting Systems (WHALESNORTH and WHALESSOUTH) and following NMFS's Steps Mariners Can Take To Avoid Collisions with Critically Endangered Right Whales. NOAA has also implemented specific regulations to protect the North Atlantic right whale, which requires all marine vessels greater than 65 feet in length to travel 10 knots or less, during specific seasonal timeframes, in right whale management zones along the East Coast. Since the vessel speed restrictions went into effect in 2008, no known fatal ship strikes of North Atlantic right whales have occurred in the management zones. Because LNGCs and aggregate ships would be required to comply with this regulation, and the Companies would require LNGCs, aggregate ships and barges to comply with NMFS's Vessel Strike Avoidance Measures and Reporting for Mariners policy, the mandatory ship reporting system, and steps to avoid collisions with North Atlantic right whales, we conclude that ship traffic *may affect, but is not likely to adversely affect* protected whales and sea turtles.

West Indian Manatee

According to the FWS, the West Indian manatee is known to occur in waterways within the vicinity of the Project area. Though infrequent observations of manatees have been reported as far upstream as the King's Island Turning Basin (Rathbun et al., 1981), the Savannah River estuary is only considered to support a small summer resident population of manatees (COE, 2012). A large percentage of manatee mortality is attributed to human-related causes, particularly collision with watercrafts (COE, 2012). Another significant factor in the reported decline of manatees is the loss of sea grass beds and other submerged, floating, and emergent vegetation. The Elba Liquefaction Project would not affect any submerged aquatic vegetation or aquatic beds since none are present in or near Elba Island (COE, 2012). The potential impact on manatees would be from vessel traffic.

To minimize potential vessel impacts on manatees, the Companies would adhere to the measures contained in the "Standard Manatee Conditions" that are set forth in the Companies' existing COE permit conditions. These protection measures include, but are not limited to, manatee training for all Project personnel; having a manatee observer on site for all in water work; posting idle speed/no wake signage during Project activities; ceasing in-water work and vessel operations if a manatee is sighted within 50 feet of Project activities; and operating vessels at idle speed when the vessels draft is less than 4 feet. Additionally, the Vessel Strike Avoidance Measures and Reporting for Mariners policy that would be implemented to protect whales and sea turtles would also aid in identifying and protecting manatees during ship transit. By implementing these conditions and policies, and the small potential for manatees to occur near the Project, we conclude that the Project *may affect, but is not likely to adversely affect* the West Indian manatee.

Atlantic Sturgeon

The South Atlantic Distinct Population Segment of Atlantic sturgeon is known to support a reproducing subpopulation in the Savannah River (Collins and Smith, 1997). Eggs, larvae, and pre-spawn juveniles are confined to fresh water and are not expected to be present around Elba Island. Juvenile and adult Atlantic sturgeon remain in upper estuarine habitat, where they frequently congregate around the saltwater/freshwater interface. Atlantic sturgeon reside in estuarine areas for 1 to 6 years and eventually migrate to the marine environment (NMFS, 2013). Adult Atlantic sturgeon return to natal spawning sites in February to March (Greene et al., 2009). In their 2013 Biological Opinion for maintenance dredging at Elba Island, NMFS states that "any Atlantic sturgeon encountered in the action area are likely to be spawning adults or were recently spawned juveniles" (NMFS, 2013).

According to the shortnose sturgeon recovery plan (NMFS 1998) and Atlantic sturgeon status review (ASSRT 2007), dredging is identified as an activity that may adversely affect sturgeon. In the 2013 NMFS Biological Opinion for SLNG's Elba Island LNG Maintenance Dredging Project, NMFS determined that dredging of approximately 1,250,000 cy of material from the main channel of the Savannah River was "likely to adversely affect sturgeon." Though considered unlikely to jeopardize the continued existence of the Atlantic sturgeon, NMFS anticipated that incidental take for SLNG's Elba Island LNG Maintenance Dredging Project "by injury or mortality, will consist of one Atlantic sturgeon mortality during the life of the permit as a result of interaction with the dredge (NMFS 2013)." The Savannah Harbor Expansion Project was also determined by the COE and confirmed by the NMFS as "likely to adversely affect sturgeon," due to the extent and volume (13 million cy) of dredged material.

Sturgeon generally prefer the deeper, cooler sections of the main channel and their presence in the shallow portions of the South Channel that would be impacted by dredging and pile driving activities would be limited. Should sturgeon be present in the shallow areas of the South Channel, the navigation and set-up activities of the dredge and pile driving vessels would likely cause these sturgeon to vacate the

immediate Project area before the actual dredging and pile driving activities commence and relocate to unaffected adjacent areas or the deeper portions of the main and south channel for foraging and migration. Therefore, unlike the previous dredging projects that occurred in the more utilized and deeper portion of the main channel, we do not anticipate the proposed dredging activities would entrain or capture individual sturgeon and result in a species take.

Pile driving and initial dredging activities were proposed to occur in July and August 2015, which is within the NMFS's and COE's preferred May 15 to November 15 timeframe for minimizing dredging impacts on sturgeon in the Savannah River. Due to regulatory review delays, the construction timeframe originally proposed by the Companies will change. To ensure pile driving and initial dredging activities do not adversely affect sturgeon, **we recommend that:**

- **ELC and SLNG should limit in-water pile driving and initial dredging to occur between May 15 and November 15. If these activities cannot be conducted within this time window, no activities are authorized without further consultation from the NMFS and COE and further approval from the Commission.**

Maintenance dredging would be conducted within the preferred dredging window, unless rapid sedimentation of the slip would prohibit barge docking. If maintenance dredging outside of the timing window is needed, the NMFS and COE would be consulted regarding avoidance and mitigation measures, and dredging would not occur until NMFS and COE approvals are obtained and consultation is completed. Because dredging and pile driving activities would be limited in scale and duration, would not directly impact sturgeon or its preferred habitat in the Savannah River, would not disrupt migration corridors, and with our recommendation above, we conclude that Project *may affect, but is not likely to adversely affect* the Atlantic sturgeon.

Shortnose Sturgeon

Shortnose sturgeon spawn many miles upstream of Elba Island in deep freshwater at or near the New Savannah Bluff Lock and Dam (MGA, 2012). Eggs and larvae remain in fresh water, and juvenile shortnose sturgeon spend their first year in the upper, freshwater reaches of the river. After the first year, juvenile shortnose sturgeon become migratory, traveling downriver to the salt-freshwater interface in winter and returning upstream to fresh water in the summer (Collins et al., 2002a). Telemetry data from Collins et al. (2002b) show that the downstream range of juvenile shortnose sturgeon ends approximately 9 miles upriver from Elba Island. More recent telemetry data (Post, 2011; and Post personal communication, cited in MGA, 2012) indicate one adult shortnose sturgeon sighting adjacent to Elba Island and nine sightings within 5 miles upstream and 4 miles downstream of Elba Island. Most of the adult sightings are much farther upstream, suggesting that adult shortnose sturgeon spend more time in freshwater reaches of the Savannah River than previously thought (Post, 2011). Adult shortnose sturgeon may occasionally migrate through the Lower Savannah Harbor, but are rarely found in the Elba Island area (Post et al., 2013, cited in NMFS, 2013). If present near Elba Island, adult shortnose sturgeon prefer deep areas of the main river channel with soft substrate and vegetated bottoms, if present. In the Biological Opinion prepared by NMFS for the 2013 maintenance dredging at Elba Island, NMFS determined that "the likelihood of shortnose sturgeon being affected by the proposed action is discountable" (NMFS, 2013). Therefore, we conclude that Project activities *are not likely to adversely affect* the shortnose sturgeon.

As noted in table 1.10-1, clearance letters from the FWS (dated October 28, 2013 and July 29 and August 28, 2014) were received for the compression and metering facilities. However, because these clearance letters are more than one year old, these clearances should be updated with the FWS to confirm

that no new species have been listed that could be present in the Project area. In addition, concurrence has not yet been received from the FWS for the Liquefaction Facilities. Therefore, **we recommend that**:

- **EEC should not begin construction activities of the compression and metering facilities <u>until</u>:**

  a. the staff receives comments from the FWS regarding the proposed action;

  b. the staff completes formal consultation with the FWS, if required; and

  c. EEC has received written notification from the Director of OEP that construction or use of mitigation may begin.

and,

- **ELC and SLNG should not begin construction activities of the LNG Terminal facilities <u>until</u>:**

  a. the staff receives comments from the FWS/NMFS regarding the proposed action;

  b. the staff completes formal consultation with the FWS/NMFS, if required; and

  c. ELC and SLNG have received written notification from the Director of OEP that construction or use of mitigation may begin.

2.3.3.3 State Threatened and Endangered Species

A list of state-listed species potentially occurring in the Project area is provided in table 2.3.3-2 in appendix C. Based on habitat preferences and site-specific surveys conducted by Project sites, two state-listed species could be affected by Project activities: the hooded pitcherplant and the diamondback terrapin. No other state-listed species were identified during field surveys.

<u>Hooded Pitcherplant</u>

Three clusters of hooded pitcherplant were documented during the Rincon Compressor Station survey in July 2013. The largest occurrence (six clusters of pitchers) was observed in the maintained pipeline right-of-way adjacent to the proposed site. The other two occurrences were of single clumps and were found near the boundary of the palustrine forested wetland. Upon discovery of the hooded pitcherplant, the Companies redesigned the Rincon Compressor Station to avoid the plant clusters and wetlands that are present along the southern portion of the site. Based on the new site design, the GDNR stated in a March 12, 2014 letter to the Companies that potential impacts on the hooded pitcherplant and wetland have been properly avoided.

<u>Diamondback Terrapin</u>

The diamondback terrapin lives exclusively in brackish water habitats such as tidal marshes, estuaries and lagoons. Most terrapins hibernate during the winter by burrowing into the mud of marshes and prefer sandy beach nesting sites. Terrapins generally live in the same area for most or all of their lives, and do not make long distance migrations. The tidal marsh along Elba Island Road could be utilized by the diamondback terrapin. Expansion of Elba Island Road was proposed to occur during a

period when the terrapins would be active and a qualified biologist would perform a pre-construction survey of the 0.3 acre tidal marsh impact area one day prior to the start of construction to minimize potential impacts on the diamondback terrapin. If any terrapins are discovered in the Project area, they would be removed to another area of the marsh according to the appropriate wildlife permit requirements. In addition, a trained EI would monitor the road expansion area on a daily basis to ensure that no terrapins have entered the construction area. We conclude that implementation of these measures would effectively avoid effects on the diamondback terrapin.

2.4 LAND USE, RECREATION, AND VISUAL RESOURCES

2.4.1 Existing Land Use

Four land use types would be affected by the Project, including open land, forest/woodland, commercial/industrial/disturbed land, and open water/wetland. The definitions of each land use type are as follows:

- Open Land – includes mowed and maintained vegetation or agricultural fields, maintained utility right-of-way, and old field/shrub lands.
- Forest/Woodland – includes tree stands consisting primarily of planted pine and low-quality hardwood around the edge of Elba Island.
- Commercial/Industrial/Disturbed Land – includes the existing developed portions of the Elba Island LNG Terminal, compressor station sites, metering facilities, and access roads.
- Open Water/Wetland – includes open water and areas of salt or tidal marsh partially surrounding Elba Island and the Security Post.

Impacts on land uses would result from clearing of the construction work area for the installation of Project facilities and from permanent operation of the new facilities. Table 2.4.1-1 summarizes the land use requirements associated with construction and operation of the Project.

2.4.1.1 Liquefaction Facilities

The proposed construction activities at the liquefaction facilities would occur predominately within the 285-acre footprint of the existing LNG Terminal, which is on the southeastern portion of Elba Island in the Savannah River. Modifications would also be made to the existing Security Post immediately south of the island and an adjacent 700 feet of Elba Island Road, which provides access to Elba Island, and one off-site area would be temporarily used as a wareyard. The existing LNG Terminal consists of primarily commercial/industrial land use, with some forested/woodland wetland, and open water areas. Construction of the liquefaction facilities would affect approximately 51.6 acres of commercial/industrial/disturbed land, 34.1 acres of open land, 11.5 acres of forest land/woodland, and 7.8 acres of open water/wetland. During operations, approximately 27.1 acres of commercial/industrial/ disturbed land, 34.1 acres of open land, 11.5 acres of forest land/woodland, and 7.8 acre of open water/wetland would be retained and the remaining land would revert to its previous use.

The off-site wareyard is a 58.2-acre site approximately 2.3 miles southwest of the LNG Terminal in an area previously disturbed and used as a commercial/industrial site (gypsum plant) that contains buildings and infrastructure from its previous use. The off-site wareyard would be used temporarily during construction and would be restored to landowner specifications after construction.

TABLE 2.4.1-1

Land Use Affected by Construction and Operation of the Project

State/County/Facility [a]	Open Land		Forest/Woodland		Commercial/ Industrial/ Disturbed		Open Water/Wetland		Total	
	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.
GEORGIA										
Chatham County										
Liquefaction Facilities	34.1	34.1	11.5	11.5	51.6 [b]	27.1	7.8 [c]	7.8	105.0	80.5
Off-site Wareyard [d]	0.0	0.0	0.0	0.0	58.2	0.0	0.0	0.0	58.2	0.0
Elba Island Interconnect Site	0.0	0.0	0.0	0.0	4.1	0.8	0.0	0.0	4.1	0.8
Port Wentworth Site	0.4	0.0	0.0	0.0	3.8	1.6	0.0	0.0	4.2	1.6
Hart County										
Hartwell Compressor Station	2.7	0.6	3.4	3.2	6.7	5.8	0.0	0.0	12.8	9.6 [e]
Jefferson County										
Jefferson County Compressor Station	1.4	1.2	9.6	7.3	0.0	0.0	0.0	0.0	10.9	8.5
Effingham County										
Rincon Compressor Station	2.4	2.1	5.5	5.0	0.0	0.0	0.0	0.0	7.9	7.1
EEC North Site	0.6	0.0	0.0	0.0	1.7	0.2	0.0	0.0	2.3	0.2
SOUTH CAROLINA										
Jasper County										
Del Webb Site	0.6	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.7	0.0
Project Total	**42.1**	**38.0**	**30.0**	**27.0**	**126.2**	**35.5**	**7.8**	**7.8**	**206.1**	**108.3**

[a] Acreages of access roads and existing pipeline rights-of-way associated with the liquefaction facilities, the off-site wareyard, and the Hartwell, Jefferson County, Rincon, Elba Island Interconnect, Port Wentworth, EEC North, and Del Webb Sites are included in the construction and operations totals of the respective facilities.

[b] Includes 22.3 acres of upgrades/modifications to existing/active LNG Terminal operational facilities.

[c] Includes 7.5 acres of open water that would be dredged in the South Channel to allow equipment and materials to be delivered by barge, plus 0.6 acre associated with the LNG Terminal Security Post modifications.

[d] The off-site wareyard would be on land previously used for commercial/industrial activities and would not be used during the operation of the liquefaction facilities.

[e] The Hartwell Compressor Station currently occupies 5.8 acres within the compressor station property. Phase I expansion of the site would permanently convert 3.8 acres of open land and planted pine to industrial usage, increasing the overall footprint to 9.6 acres.

Note: The totals shown in this table may not equal the sum of addends due to rounding.

2.4.1.2 Compression and Metering Facilities

Hartwell Compressor Station

The proposed activities at the Hartwell Compressor Station would be conducted within EEC's existing 30-acre property boundary, and primarily within the footprint of the existing compressor station, access road, and pipeline lateral. However, the existing compressor station footprint would be expanded to the west of the existing compressor facility (toward Turner Road), and the existing pipeline lateral footprint would be expanded to the north and south near where it intersects the EEC mainline pipeline corridor. Approximately 6.7 acres of commercial/industrial/disturbed land, 3.4 acres of forested land/woodland, and 2.7 acres of open land would be required for construction, including the existing access road. Following construction, approximately 5.8 acres of commercial/industrial/disturbed land, 3.2 acres of forested land/woodland, and 0.6 acre of open land would be retained for operation of the expanded compressor station facilities. Remaining land affected by construction would be allowed to revert to its previous use.

Jefferson County Compressor Station

The proposed activities at the Jefferson County Compressor Station would be conducted primarily within a new 30-acre site that would partly overlap the existing EEC/SNG pipeline right-of-way (open land) and planted pine. Construction would affect approximately 9.6 acres of forested land/woodland and 1.4 acres of open land. Following construction, approximately 7.3 acres of forested land/woodland and 1.2 acres of open land would be retained for operation of the compressor station facilities, including a new graveled access road that would be constructed off Middle Ground Road. The remaining land affected by construction would be allowed to revert to its previous use.

Rincon Compressor Station

The proposed activities at the Rincon Compressor Station would be conducted within a new 32-acre site that would abut the existing EEC/SNG pipeline right-of-way, Low Ground Road, and the existing Effingham County Wastewater Treatment Plant. Construction at the Rincon Compressor Station would affect approximately 5.5 acres of forested land/woodland and 2.4 acres of open land. Following construction, approximately 5.0 acres of forested land/woodland and 2.1 acres of open land would be retained for operations. One new graveled access road would be constructed off Low Ground Road and one off of the existing graveled access road to the wastewater treatment plant. The remaining land affected by construction would be allowed to revert to its previous use.

Elba Island Interconnect Site

The proposed activities at the Elba Island Interconnect Site would occur within the footprint of the existing LNG Terminal and affect approximately 4.1 acres of commercial/industrial/disturbed land. Following construction, approximately 0.8 acre of commercial/industrial/disturbed land would be retained for operation of the interconnect facilities. The remaining land affected by construction would be allowed to revert to its previous use.

Port Wentworth Site

The proposed activities at the Port Wentworth Site would be conducted primarily within the facility footprint and EEC's pipeline right-of-way. Construction would affect approximately 3.8 acres of commercial/industrial/disturbed land and 0.4 acre of open land. The site would be accessed using the existing gravel roads off Highway 21 and Jimmy Deloach Parkway. Following construction, approximately 1.6 acres of commercial/industrial/disturbed land would be retained for operation of the metering facilities. The remaining land affected by construction would be allowed to revert to its previous use.

EEC North Site

The proposed activities at the EEC North Site would be conducted primarily within the facility footprint and EEC's pipeline right-of-way. Construction would affect approximately 1.7 acres of commercial/industrial/disturbed land and 0.6 acre of open land. The site would be accessed using the existing gravel road off Blue Jay Road. Following construction, approximately 0.2 acre of commercial/ industrial/disturbed land would be retained for operation of the metering facilities, and the remaining land affected by construction would be allowed to revert to its previous use.

Del Webb Site

The proposed activities at the Del Webb Site would be conducted primarily within the facility footprint and EEC's pipeline right-of-way. Construction would affect approximately 0.6 acre of open land and 0.1 acre of commercial/industrial/disturbed land, and the site would be accessed using the existing gravel road off Speedway Boulevard. Following construction, there would be no additional permanent land use impacts required for operation of the metering facilities.

2.4.2 Recreation and Special Interest Areas

2.4.2.1 Liquefaction Facilities

Elba Island is constructed from dredge material as a result of regular maintenance activities by the COE along the Savannah River's navigation channel. The island is primarily open land used for dredge spoil storage and commercial/industrial areas associated with the existing LNG Terminal. Other land uses include low quality forest/woodland areas and emergent salt marshes along the edges of the island. There are no recreation or special interest areas (e.g., federal or state forests or parks), including scenic or wilderness areas or sensitive wildlife habitat, directly on the island. The Project would not affect any parts of the National Wild and Scenic Rivers System or the National Trails System.

Marine use of the Savannah River consists primarily of commercial shipping traffic and a small percentage of recreational boats. The shipping lane is both wide and deep enough to allow ships to pass each other during low tide. In-water work may temporarily affect shipping traffic in the Southern Channel; however, the Northern Channel would remain open. LNG shipping traffic would not exceed the currently approved frequency to the LNG Terminal as a result of the Project. Nearby ports and shipping facilities are upstream of the liquefaction facilities and include the Liberty Terminals, East Coast Terminal, and the Port of Savannah.

Recreational fishing occurs in the Savannah River and its tidal creeks and marshes, in and around the Savannah National Wildlife Refuge (NWR), in and around Tybee Island, and in the coastal waters of the Atlantic Ocean. Recreational shellfish harvesting is permitted in the area surrounding Oyster Creek on the south side of the Savannah River approximately 5.8 miles away from the LNG Terminal. Recreational bait fishing occurs in the channels in and around the Savannah NWR between Highway 25 and Highway 17 (approximately 5 miles from the LNG Terminal), and in the Wilmington and Skidaway rivers and surrounding estuaries (approximately 4.7 miles from the LNG Terminal). Recreational bait shrimping occurs in the creeks and waterbodies of the estuaries between the Savannah River and the Wilmington River, which are approximately 1.2 miles away at its nearest point.

There are no parks, golf courses, recreational, and/or special interest areas within 1 mile of the liquefaction facilities, except for the northernmost part of McQueen's Island within the Fort Pulaski National Monument boundaries, which is approximately 0.4 mile from Elba Island. However, this portion of the island consists almost entirely of wetland and marshes that would not be easily accessible by the public except by boat. The nearest special interest or recreation areas to the liquefaction facilities include McQueen's Island Historic Trail (1.2 miles southeast), Old Fort Jackson (2 miles southwest), Frank W. Spencer Boat Ramp (2.1 miles south), Oatland Island Wildlife Center of Savannah (2.4 miles south), the Savannah Golf Club (3.4 miles southwest), Tybee NWR (3.5 miles southeast), The Club at Savannah Harbor (golf course) (4 miles west), Turtle Island Wildlife Management Area (WMA) (4.3 miles east), and the Savannah NWR (5 miles northwest). Beaches and swimming areas nearest to the LNG Terminal are along the edges of Tybee Island, which is more than 8.7 miles from the liquefaction facilities.

Construction-related noise and visual impacts resulting from the liquefaction facilities could occur on nearby recreational users but would be limited to the time of construction. Operation of the liquefaction facilities could also result in visual and noise impacts on nearby recreational users; however, construction and operation of the liquefaction facilities would occur within an existing industrial facility and would be consistent with the operation of the existing facilities. As discussed in section 2.7.2, the Companies would be required to operate the facility in compliance with minimum noise criteria. Visual resources are discussed further in section 2.4.5.

No conservation or natural, recreational, or scenic areas occur within 0.25 mile of the proposed off-site wareyard. The nearest recreational or special interest areas include Old Fort Jackson (0.8 mile away), the Frank W. Spencer Boat Ramp (1 mile away), the Savannah Golf Club (1.2 miles away), and the Oatland Island Wildlife Center of Savannah (1.6 miles away).

2.4.2.2 Compression and Metering Facilities

No conservation or natural, recreational, or scenic areas are at or within 0.25 mile of compression and metering facility sites. Therefore, compression and metering facilities are not expected to have an impact on conservation, recreation, or scenic resources.

2.4.3 Existing Residences and Planned Future Developments

2.4.3.1 Liquefaction Facilities

There are no residences or planned residential, commercial, or industrial developments within 0.25 mile of the proposed liquefaction facilities due to the isolated location of Elba Island in the Savannah River. The nearest residences are approximately 0.2 mile to the south and southeast of the off-site wareyard location, which is approximately 2.3 miles southeast of Elba Island. Those residences are on the south (opposite) side of Islands Expressway and the east (opposite) side of Elba Island Road from the wareyard. Potential impacts could include dust and noise (discussed further in section 2.7 of this EA) resulting from the earthwork and operation of equipment required to prepare the site; however, these impacts would be temporary during the period of construction. No tree clearing is anticipated during construction of the yard, which would leave a 200- to 500-foot-wide forested buffer between residences and the off-site wareyard, and construction activities would be limited to daylight hours. Therefore, no significant impacts on nearby residences would be expected during construction and use of the liquefaction facilities.

2.4.3.2 Compression and Metering Facilities

<u>Hartwell Compressor Station</u>

The nearest residence to the Hartwell Compressor Station is off St. James Road, approximately 1,650 feet east of the existing compressor unit, and four other residences range from 1,800 feet to 3,500 feet away. There are currently no other planned or future residential, commercial, or industrial developments within 0.25 mile of the Hartwell Compressor Station. Potential construction impacts could include dust and noise resulting from the earthwork and operation of equipment required to prepare the site; however, these impacts would be temporary during the period of construction. Clearing and grading activities associated with the pipeline lateral and tie-in between the facility site and the existing EEC Pipeline corridor would remove approximately half of the existing buffer of planted pine and other trees between the residence and the Hartwell Compressor Station. However, the Companies would leave an approximately 100-foot buffer of trees and would not disturb the existing 300-foot buffer of trees between the residence and Hartwell Compressor Station on the east side of the EEC Pipeline corridor.

Construction activities would also be limited to daylight hours. Therefore, no significant impacts on nearby residences would be expected during construction and use of the Hartwell Compressor Station.

During the scoping process we received comments from residents expressing concern about the existing and potential for additional or increased noise generated by the Hartwell compression and blowdown operations. The new compression would be constructed to the west side of the existing compressor unit in an expanded building, and the blowdown facilities would be constructed near the existing blowdown facilities on the south side of the existing building. Noise impacts from these facilities would be mitigated through a variety of noise control measures including building insulation, use of silencers, and modifications in design location of piping, fans and venting. With incorporation of these control measures, the estimated sound levels would increase slightly but would remain below allowable limits at all nearby noise sensitive areas (NSA). As a result, we conclude that the impact from operational noise would not be significant. Additional analysis of noise impacts are provided in section 2.7.2.

Jefferson County Compressor Station

The nearest residence to the Jefferson County Compressor Station is off Middle Ground Road, approximately 0.4 mile west of the property boundary. There are currently no planned or future residential, commercial, or industrial developments within 0.25 mile of the Jefferson County Compressor Station. Potential impacts on the surrounding area could include dust and noise resulting from the earthwork and operation of equipment required to prepare the site; however, these impacts would be temporary during the period of construction. Approximately 300 feet of planted pine and other trees would remain in place between the temporary workspace and the nearest residence and, as noted previously, construction activities would be limited to daylight hours. Therefore, no significant impacts on nearby residences would be expected during construction and use of the Jefferson County Compressor Station.

During operation of the Jefferson County Compressor Station facilities, it is anticipated that nearby residences may notice a perceptible increase in noise above ambient levels; however, the increase would be below allowable levels. As a result, we conclude that the impact from operational noise would not be significant. Additional analysis of noise impacts are provided in section 2.7.2.

Rincon Compressor Station

The nearest residence to the Rincon Compressor Station is off Low Ground Road, approximately 0.5 mile southwest of the property boundary. There is no information available regarding potential planned or future residential, commercial, or industrial developments within 0.25 mile of the Rincon Compressor Station. Potential impacts on the surrounding area could include dust and noise resulting from the earthwork and operation of equipment required to prepare the site; however, these impacts would be temporary during the period of construction. Large, wooded areas separate the temporary workspace and the nearest residence and, as noted previously, construction activities would be limited to daylight hours. Therefore, no significant impacts on nearby residences would be expected during construction and use of the Rincon Compressor Station.

During operation of the Rincon Compressor Station facilities, it is anticipated that nearby residences may notice a perceptible increase in noise above ambient levels; however, the increase would be below allowable levels. As a result, we conclude that the impact from operational noise would not be significant. Additional analysis of noise impacts are provided in section 2.7.2.

Elba Island Interconnect Site

There are no residences within 0.25 mile of the Elba Island Interconnect Site or within 0.5 mile of Elba Island. Construction would be confined to the footprint of the proposed liquefaction facilities. Potential impacts on the surrounding area could include dust and noise resulting from the earthwork and operation of equipment required to prepare the site; however, these impacts would be temporary during the period of construction. Therefore, no significant impacts on nearby residences would be expected during construction and use of the Elba Island Interconnect Site.

There are currently no potential planned or future residential, commercial, or industrial developments within 0.25 mile of the Elba Island Interconnect Site due to the isolated location of Elba Island in the Savannah River.

Port Wentworth Site

Multiple residences and businesses are within several hundred feet to the north and south of the Port Wentworth Site, with the closest being a residence approximately 230 feet south of the temporary workspace along Jimmy Deloach Parkway. Potential impacts on the surrounding area could include dust and noise resulting from the earthwork and operation of equipment required to prepare the site; however, these impacts would be temporary during the period of construction and limited to daylight hours. Therefore, no significant impacts on nearby residences would be expected during construction and use of the Port Wentworth Site.

The Port Wentworth Site is an existing facility, which would already be taken into account by developments proposed in the area; therefore, potential planned or future residential, commercial, or industrial developments within 0.25 mile would not be affected.

EEC North Site

The nearest residence to EEC North Site is on Blue Jay Road, approximately 200 feet west of the temporary workspace at the southern end of the site. Potential impacts on the surrounding area could include dust and noise resulting from the earthwork and operation of equipment required to prepare the site; however, these impacts would be temporary during the period of construction and would be limited to daylight hours. Therefore, no significant impacts on nearby residences would be expected during construction and use of the EEC North Site.

Staffordshire Estates, a residential subdivision, is being developed north of the EEC North Site, and the nearest property line is approximately 0.2 mile away from the EEC North Site. The area between the development and the Project site consists of densely wooded forest. There are currently no other future residential, commercial, or industrial developments within 0.25 mile of the EEC North Site. Therefore, no significant impacts on future developments are likely.

Del Webb Site

There are no residences within 0.25 mile of the Del Webb Site and work would not expand the facility footprint. Therefore, no impacts on residences or future developments would be expected.

2.4.4 Coastal Zone Management

Construction activities associated with the liquefaction facilities, off-site wareyard, Rincon Compressor Station, Elba Island Interconnect Site, Port Wentworth Site, and EEC North Site would be in the coastal zone management area (CZMA) managed by GDNR's Coastal Resources Division. The Del Webb Site would be in the CZMA managed by the South Carolina Department of Health and Environmental Control (SCDHEC). The Companies initiated CZMA consultations with the GDNR and SCDHEC for liquefaction and compression facilities on December 7, 2012 and received a consistency determination from GDNR on September 20, 2013 stating that the compressor stations are not likely to impact coastal uses or resources. The Companies subsequently modified the scope of work to include the proposed modifications at existing metering sites plus the South Channel barge dock dredging activities, Security Post modifications, and wareyard activities. These activities would be evaluated by the GDNR during the COE section 404/401 permit review which would resume upon issuance of this EA, and agency responses would be submitted to FERC upon receipt. The GDNR would provide its CZMA consistency determination as part of its section 404/401 permit review and the SCDHEC stated it would only comment on the liquefaction facilities if dredge materials would be placed in South Carolina. Documentation that the remaining Project facilities would be consistent with the CZMA has not been yet been provided; therefore, **we recommend that:**

- **Prior to construction, the Companies should file with the Secretary documentation of concurrence from the GDNR and SCDHEC (if applicable) that the metering facilities, South Channel barge dock dredging activities, Security Post modifications, and wareyard activities are consistent with each state's respective CZMA.**

2.4.5 Visual Resources

2.4.5.1 Liquefaction Facilities

The proposed construction activities at the liquefaction facilities would occur predominately within the 285-acre footprint of the existing LNG Terminal, with additional modifications made to the Security Post and a 700-foot-section of Elba Island Road. Construction of the liquefaction facilities would result in visual impacts associated with site and tree clearing within the existing property boundary. Potential visual impacts associated with operation of the liquefaction facilities would occur from the increase of industrial facilities, flares, and lighting within the site.

Visually sensitive areas near the liquefaction facilities include Fort Pulaski National Monument, McQueen's Island Historic Trail, Old Fort Jackson, Oatland Island Wildlife Center of Savannah, Tybee NWR, Turtle Island WMA, and the Savannah NWR. Views of the existing facility are screened from the majority of these sites by existing forests, industrial or commercial areas, and topography. Existing facilities would be visible from the northernmost part of McQueen's Island within the Fort Pulaski National Monument boundaries; however, this portion of the island consists almost entirely of wetland and marshes that are not easily accessible by the public, except by boat. The current LNG Terminal is visible at various points along the McQueen's Island Historic Trail, as well as from some residences within the Causton Harbor gated community (1.8 miles southwest of the LNG Terminal) and the two bridges on Islands Expressway that connect Oatland Island with Savannah. The new liquefaction facilities would be obscured by existing tanks and buildings at the terminal and would be consistent with the industrial nature of the existing facility and, therefore, would not represent a significant change in the viewshed during operation. As such, we conclude that construction of the liquefaction facilities would not result in significant or adverse visual impacts.

Additional nighttime lighting would be installed in conjunction with operation of the liquefaction facilities. The Companies would minimize nighttime visual impacts by employing a lighting design that limits the potential for light pollution outside of its property boundaries. Lighting would typically be positioned downward toward the work areas, and utilized only where necessary for operations, safety, and security. Use of the ground and marine flares associated with the liquefaction facilities would potentially increase the amount of light produced at the LNG Terminal; however, the Companies propose to build an enclosure around the ground flare that would direct any light skyward. The marine flare would not be enclosed and would be visible to surrounding areas, but is expected to only be operated a maximum of five nights per year. The McQueen's Island Historic Trail is open during daytime hours and, therefore, nighttime viewers would not be affected by lighting at the LNG Terminal. Residents living on the northeastern edge of the Causton Harbor gated community have an unobstructed view of the LNG Terminal; however, additional nighttime lighting installed for the liquefaction facilities would be negligible compared to that already at the existing terminal which is fully illuminated at night, and the infrequent operation of the marine flare is not expected to have a significant impact on the community. Based on these assumptions, we determined the Companies' lighting design would reduce potential visual impacts on the surrounding areas.

Visual impacts associated with the use of the off-site wareyard during construction would include earthwork and grading associated with site preparation. No visually sensitive areas, including scenic roads or rivers, are in the vicinity of the off-site wareyard. The Companies do not anticipate removal of existing forest vegetation and would maintain the 60- to 100-foot buffer of trees already surrounding the proposed site. In addition, use of the site would be temporary and limited to the period of construction; therefore, we determined that the use of the off-site wareyard would not result in significant visual impacts.

2.4.5.2 Compression and Metering Facilities

Compression Facilities

Expansion of the Hartwell, Jefferson County, and Rincon Compressor Stations would occur entirely within the existing fence line and proposed new property boundaries and maintained pipeline right-of-way. No visually sensitive areas, including scenic roads or rivers, are in the vicinity of these facilities. Although some tree clearing would be required to the west and east of the Hartwell Compressor Station and within the Jefferson County Compressor Station, those sites are almost entirely surrounded by planted pine. Upon completion of construction, the minimum width of the tree buffer between Turner Road and the northwest corner of the Hartwell Compressor Station, and to the northeast of the Jefferson County Compressor Station, would be 75 feet wide. As such, no significant changes to the current visual aspects of the surrounding areas would be expected. The Rincon Compressor Station would be surrounded by planted pine along its eastern and southern borders; however, some trees would be removed such that the station would be visible from Low Ground Road and agricultural land to the north of the site. In order to reduce the visual impact along Low Ground Road, the Companies would install fence slats in the chain link fence to be constructed along Low Ground Road. The Companies also committed to work with landowners at each site to identify painting, fencing, landscaping, and lighting schemes to further minimize long-term visual impacts related to the compression facilities. At this time, the Companies have not yet identified the specific mitigation measures that would be implemented at the compression facilities as a result of their ongoing consultations with landowners. Therefore, **we recommend that:**

- **<u>Prior to construction</u> EEC should file with the Secretary for the review and written approval by the Director of OEP a visual screening plan for the new and existing compression facilities that incorporates the specific measures developed in consultation with nearby property owners.**

The Companies would minimize nighttime visual impacts by employing a lighting design that would limit the potential for off-site light pollution. Lighting would typically be positioned downward toward the work areas, utilized only where necessary for operations and safety, and controlled by a separate circuit for nighttime work. Additional lighting would be installed on the perimeter of the compressor building to allow safe entry and operation during nighttime hours.

With implementation of these measures combined with the distance of the views, we determined that operation of the compression facilities would not result in significant or adverse visual impacts.

<u>Metering Facilities</u>

Construction of facilities at the Elba Island Interconnect, Port Wentworth, EEC North, and Del Webb Sites would generally occur entirely within or directly adjacent to existing facility sites and be operated consistent with the existing facilities. No visually sensitive areas, including scenic roads or rivers, are in the vicinity of the Elba Island Interconnect Site. The Companies would minimize nighttime visual impacts by employing a lighting design that would limit the potential for off-site light pollution. Lighting would typically be positioned downward toward the work areas and utilized only where necessary for operations and safety.

With implementation of these measures combined with the distance of the views, we determined that operation of the metering facilities would not result in significant or adverse visual impacts.

2.5 SOCIOECONOMICS

Several potential socioeconomic effects may result from construction and operation of the proposed facilities. Many of these effects are related to construction of the Project and are associated with the number of local and non-local construction workers who would work on the Project, and the corresponding impacts this workforce would have on local populations, public service demands, jobs, temporary housing, and traffic during the construction period. Potential economic benefits associated with operation of the Project include increased property tax revenue, increased job opportunities and income, and ongoing local expenditures by the Companies.

The primary potential socioeconomic effects of the Project would be from construction and operation of the liquefaction and compressor station facilities. The proposed modifications at the EEC North, Port Wentworth, and Del Webb Sites would occur within existing developed facilities and consist of relatively minor modifications. Construction and operation of the metering facilities would not have a significant socioeconomic impact and, therefore, they are not discussed further in this section.

We received a number of comments in support of the Project based primarily on socioeconomic impacts, including increased employment, increased tax revenue, improved U.S. trade balance, and improved access to market for domestically produced natural gas. Comments in support of the Project were filed by U.S. Senators Isakson (R-GA) and Chambliss (R-GA), U.S. Congressman Kingston (R-GA), two members of the Georgia Senate, one member of the Georgia House of Representatives, City of Wrens, Georgia, Jefferson County Board of Commissioners, City of Louisville, Georgia, Savannah Area Chamber of Commerce, Georgia Chamber of Commerce, along with various individuals.

2.5.1 Population, Economy, and Employment

Table 2.5.1-1 provides a summary of select population and demographic statistics for the Project area.

TABLE 2.5.1-1

Existing Population and Economic Conditions in the Project Area

State/County	Estimated Census Population 2013 [a]	Population Density (persons/sq. mile) (2010) [a]	Per Capita Income (2008-2012) [a]	Civilian Workforce (2008-2012) [b]	Unemployment Rate (percent) (2008-2012) [b]	Top Three Industries (2007-2011) [b, c]
Georgia	9,992,167	168.4	$25,309	4,789,521	10.7%	E, R, P
Chatham County	278,434	621.7	$25,245	128,941	8.9%	E, A, R
City of Savannah	142,022	1,321.2	$19,835	72,315	10.5%	E, A, R
Effingham County	54,456	109.4	$24,943	25,754	7.4%	E, M, R
Jefferson County	16,320	32.2	$15,131	6,882	15.3%	E, M, R
Hart County	25,446	108.5	$19,854	10,568	9.3%	E, M, R

[a] Source: U.S. Census Bureau, 2014.

[b] Source: U.S. Census Bureau, 2008 - 2012.

[c] E = Educational services, and health care and social assistance
R = Retail trade
P = Professional, scientific, and management, and administrative and waste management services
A = Arts, entertainment, and recreation, and accommodation and food services
M = Manufacturing

Construction of the liquefaction facilities is expected to occur over a 26 month period, and the required workforce would likely increase the population in and around Savannah. The Companies would hire qualified, local workers for construction of the Project when possible, but would likely need to hire skilled mechanical, electrical, and control tradesmen from outside Savannah, Georgia due to the specialized experience necessary to construct the liquefaction facility. The Companies estimate an average workforce of 698 personnel, with a peak workforce of 1,300 personnel in early 2016. Assuming the entire workforce would temporarily move to the Project area and additional family members would accompany them, the maximum number of people that would temporarily or permanently move to the Savannah area is 1,839 (average workforce) and 3,419 (peak workforce)(assuming an average household size of 2.63 individuals). This represents a 1.2 and 2.4 percent increase in the total population of Savannah, respectively. Following construction, 75 permanent employees would be required to maintain and operate the new liquefaction facilities. The Companies are currently exploring various options associated with workforce development to train the operational workforce in the region. The Companies would work with the City of Savannah and the Savannah Economic Development Authority to develop the Workforce Development Plan.

At the Hartwell, Jefferson County, and Rincon Compressor Stations, the Companies estimate an average workforce of 35 personnel at each site, with a peak workforces of 50 personnel at each site. One permanent employee would be hired at both the Jefferson County and Rincon Compressor Stations to maintain the facilities during operation. We do not anticipate these small workforces would significantly affect local populations.

Construction of the Project facilities would increase economic activity within the Project area through the sum of three effects: 1) the direct effect – hiring of local construction workers and purchases of goods and service from local businesses; 2) the indirect effect – the additional demands for goods and

services, such as replacing inventory from the firms that sell goods and services directly to the Project; and 3) the induced effect – the spending of disposable income by the construction workers at local businesses, which in turn order new inventory from their suppliers. The temporary increase in economic activity resulting from these three effects would provide a positive economic impact for the region.

Based on an assessment by Navigant Economics, an average of 807 full-time jobs would be created during construction of the liquefaction facilities, equating to an annual average earning of $30 million. The estimated average annual value added by the jobs in Chatham County is $64.5 million. Operation and maintenance of the liquefaction facility would create 421 new full-time equivalent jobs in Chatham County. Similarly, employee earnings and value added would be $20.7 million higher and $73.2 million higher, respectively, in Chatham County than without the facility.

Construction and operation of the Hartwell, Jefferson County, and Rincon Compressor Stations would also result in additional earnings, which are estimated at $32 million, $8 million, and $8 million, respectively. It is reasonable to assume portions of these earnings would be spent locally and benefit the local economy. Additionally, the Companies estimate they would spend an additional $46.5 million, $11 million, and $11 million, respectively, for construction materials and fuel during construction of the Hartwell, Jefferson County, and Rincon Compressor Stations, which would have a positive impact on the local economy.

During construction, sales and use tax would be paid on materials used for the Project and once in service, operation of the facilities would contribute additional property taxes. These additional tax revenues would benefit the local and regional economy.

2.5.2 Housing

Table 2.5.2-1 provides a summary of housing statistics for the Project area, as well as the state of Georgia.

TABLE 2.5.2-1

Housing Characteristics in the Project Area

State/County	Total Housing Units	Occupied Housing Units	Owner Occupied (percent)	Renter Occupied (percent) [c]	Owner Vacancy Rate (percent) [d]	Renter Vacancy Rate (percent)
Georgia [a]	4,107,554	3,532,908	2,248,702	1,284,206	2.9	9.5
Chatham County [a]	120,965	104,634	57,852	46,782	2.8	7.3
City of Savannah [b]	68,733	57,621	27,453	30,168	4.0	10.4
Effingham County [c]	19,976	17,871	13,690	4,181	2.2	9.6
Jefferson County [b]	7,295	6,180	4,173	2,007	3.2	4.7
Hart County [c]	12,984	10,508	7,737	2,771	2.6	5.8

[a] Source: U.S. Census Bureau, 2012. 2012 American Community Survey 1-Year Estimates.

[b] Source: U.S. Census Bureau, 2008 - 2012x. 2008 - 2012 American Community Survey 5-Year Estimates.

[c] Source: U.S. Census Bureau, 2010 - 2012. 2010 - 2012 American Community Survey 3-Year Estimates.

[d] Source: USA.com. 2013. Chatham County housing. http://www.usa.com/chatham-county-ga-housing.htm.

2.5.2.1 Liquefaction Facilities

The Savannah region attracts millions of tourists annually, which has resulted in a large supply of short-term housing, apartment, and hotel infrastructure. Some temporary impacts on local housing markets in the greater Savannah area are anticipated during construction, as construction personnel move into the area. Locally hired workers would commute from their homes, while non-local workers would likely chose to stay in motels, apartments, and campgrounds within the Savannah area and commute to the Project. This impact is expected to be temporary and the most noticeable at the peak of the construction period.

Based on 2012 census estimate, there were 16,331 vacant housing units for sale or rent in Chatham County, Georgia. Accordingly, Savannah and the surrounding communities have adequate temporary housing options available for the construction workforce and new permanent employees and their families to relocate to Chatham County, even under the maximum population scenario assumptions. Additionally, the Savannah Area Chamber Economic Development states there were 15,026 total lodging rooms (hotels/motels) in the Savannah area in 2013 with an average room night demand of 3.343 million per year. Under the maximum workforce scenario, it is anticipated that the proposed workforce would exert a room night demand of approximately 281,400 per year or an 8 percent increase in current demand. Because of the ample housing and motel/hotel options near Savannah, we conclude that the anticipated workforce would not have a significant impact on the local housing markets.

2.5.2.2 Hartwell, Jefferson County and Rincon Compressor Stations

As workers move into the compressor station areas, it is anticipated the workforce would reside in temporary housing, hotels or campgrounds in the towns/areas surrounding the construction sites. Most temporary workers for the Hartwell Compressor Station would likely choose to reside in Hartwell, approximately 8.2 miles northwest of the site, or in Elberton, approximately 12.4 miles southwest of the site. Temporary workers for the Jefferson County Compressor Station would likely choose to reside in Wrens (approximately 8.0 miles west of the site), Waynesboro (approximately 16.1 miles east southeast of the site), or in Louisville (approximately 12.6 miles southwest of the site). Temporary workers for the Rincon Compressor Station would likely choose to reside in Rincon, approximately 3.4 miles east of the Rincon Compressor Station. Each of these communities have sufficient motels, apartments and campgrounds to accommodate the housing necessary for the Projects workforce. Impacts on these communities would be temporary and would last only for the duration of construction, which is approximately 27 months for the Hartwell Compressor Station and 18 months for the Jefferson County and Rincon Compressor Stations.

2.5.3 Public Services

2.5.3.1 Liquefaction Facilities

A wide range of public services and facilities are offered in Chatham County, Georgia, including full-service law enforcement (339 officers and 70 civilians); 8 fire departments including paid and volunteer firefighters; 3 acute care medical centers containing a total of 1,246 beds; 62 schools; and an emergency management agency with the lead role in preparing for and responding to both natural and manmade major emergencies and disasters. Construction of the Elba Liquefaction Project could increase demand on local agencies such as increased enforcement activities associated with vehicle and trucking transit to and from the facility, local police assistance during construction at road crossings to facilitate traffic flow, and emergency medical services to treat injuries resulting from construction accidents. There is currently 24-hour on-site security at the LNG Terminal and the Companies would make arrangements

for additional contracted security during construction of the Project. The LNG Terminal also has an on-site firewater pond and pumps with sufficient capacity to respond to fire events.

During operation of the liquefaction facility, the Companies would continue to coordinate with emergency service providers closest to Elba Island (e.g., USCG, Savannah-Chatham Metropolitan Police Department, Chatham Emergency Management Agency, Savannah Fire Department, and Southside Fire Department). These emergency service providers would be provided an updated Emergency Response Plan (ERP) to account for any change in emergency needs at the liquefaction facility, and additional training and facility drills would be conducted by the Companies and the emergency service providers. We anticipate there would be minimal effect on public services during operation of the proposed Project. The operational workforce is not large enough to increase the cost of or ability to provide public services such as fire, police, schools, and emergency care. We conclude that demand for police, fire, and medical services would not exceed the existing capabilities in the Project area because these services would only be used on an emergency basis.

2.5.3.2 Hartwell, Jefferson County and Rincon Compressor Stations

Construction and operation of the compression facilities could result in minor, short-term, or no incremental impact on law enforcement, fire departments, medical centers, and schools due to the influx of workers. However, because the construction and operational workforce is not large, the costs would likely be offset by the economic benefits described in section 2.5.1. EEC would provide the appropriate training to local emergency service personnel before the facilities are placed in service, and would conduct annual training during operation of the facilities. Therefore, no short-term or long-term effects on public services are anticipated as a result of the Project.

2.5.4 Transportation and Traffic

2.5.4.1 Liquefaction Facilities

Access for transporting equipment, materials and personnel to Elba Island would be provided by existing roads and marine access points. The entrance to the LNG Terminal is on Elba Island Road from its intersection with the Islands Expressway (East President Street) across from Runaway Point Road. The Islands Expressway is classified as a four-lane divided highway and has 12-foot-wide turning lanes at the intersection of Elba Island Road. Traffic volumes along Islands Expressway averaged 20,700 vehicles per day in 2012 (Georgia Department of Transportation [GDOT] 2013a, 2013b), and it is estimated that 20,900 vehicles would likely travel on Islands Expressway daily by the start of construction (Thomas & Hutton, 2013). The daily capacity of Islands Expressway is 33,900 vehicles per day.

We received comments concerning truck traffic during construction and operations, including concerns related to the potential routes through Savannah, the number of vehicles, the materials that would be transported, and safety risks. During construction, the Companies would need to transport aggregate fill material, the MMLS modules, and various other equipment and materials to Elba Island. In addition, personnel would need to travel to the site each day. Trucking for operations would be infrequent (see section 1.7.2.2) and limited to stabilized condensate, refrigerant components, amine, and process waste water.

Construction Traffic

Construction traffic would generally arrive at and leave Elba Island Road from the west on Islands Expressway. Inbound vehicles would turn left from eastbound Islands Expressway onto Elba Island Road and outbound vehicles would turn right from Elba Island Road onto westbound Islands

Expressway. Personnel traffic would likely arrive and depart from both directions on Islands Expressway. The maximum number of vehicles generated by construction activity, if all materials and equipment were delivered by roadway, is estimated at 15,407 vehicles, or approximately 670 vehicles per day assuming 5 day work weeks. This amount would not exceed the capacity of Island Expressway but could increase congestion at certain locations depending on the timing and direction of the construction traffic relative to other traffic.

During the months of the highest construction activity, delays on the side street approaches to Islands Expressway could become excessive during the morning and afternoon peak hours. Based on a traffic impact analysis completed by the Companies, vehicles turning left from Runaway Point Road onto Islands Expressway could experience delays of approximately 8 minutes longer than current conditions during the morning commute, while right turning vehicles and traffic movements during non-commuter timeframes would see relatively little delays (Thomas & Hutton, 2013). This worst case scenario assumes that all of the aggregate fill and pilings required for construction would be delivered via truck instead of barge. Dump trucks hauling aggregate fill would be the primary traffic generator, accounting for approximately 54 percent of the peak traffic volume. The addition of this traffic without mitigation would likely cause the residents along Runaway Point Road to make some minor shifts in their travel patterns. However, these shifts would be temporary, during the period of construction, and based on a traffic count showing only 16 left turning vehicles coming from Runaway Point Road in the morning peak hour, these pattern shifts would be relatively insignificant.

While there are multiple possible routes traffic could take through Savannah to reach Islands Expressway and access Elba Island, 3 primary routes were evaluated from Interstate highways to the east of Savannah including:

- Route 1: I-16 to I-516 to East Bay Street to Islands Expressway
- Route 2: I-16 to Lynes Parkway to DeRenne Avenue to Truman Parkway to Islands Expressway
- Route 3: I-95 to Abercorn Street to Truman Parkway to Islands Expressway

Route 1 is the shortest route at 6 miles from the nearest Interstate to Elba Island. It has historically been the preferred route used by trucks accessing industrial areas off of Island Expressway, but has the highest crash rate of the three routes. Route 2 is slightly longer than Route 1, has the second highest crash rates, and has the highest traffic volumes of any of the routes. Route 3 has lower collision and injury rates than the other routes, but is significantly longer in terms of distance (over 20 miles) and segments along Abercorn Street have the second highest traffic volumes of the routes studied.

The State of Georgia designates specific truck routes related to oversize trucks. Oversize trucks are those that either have longer dimensions or heavier weights than those allowable by the five-axle, 80,000-pound federal truck weight limit. The routes considered are included on the GDOT truck route network and delivery of oversize or heavy loads would be evaluated on a case by case basis and routing would be based on the load transported.

In order to minimize construction impacts associated with trucking through Savannah and during commuter times, the Companies propose to deliver the majority of aggregate fill via ships, and to deliver the MMLS modules and pilings via barge. This would reduce the peak construction traffic count by approximately 65 percent. The Companies would also work with the construction contractor, City of Savannah, local law enforcement, and other regulatory agencies to minimize impacts from trucking on area roadways and residents. When and if needed, traffic control personnel would be utilized to manage

traffic in areas of active construction. We conclude that these measures would minimize construction traffic impacts on residents and businesses in Savannah. The cumulative impact of construction traffic and other projects, including road improvements that would occur during the same timeframe as construction, are evaluated in section 2.9.6. Other transportation alternatives are evaluated in section 3.3.1.3.

Operations Traffic

We also received comments concerning truck traffic during operation of the liquefaction facility, particularly regarding the nature and safety of the products being trucked to and from the LNG Terminal through the City of Savannah. Trucking of stabilized condensate (a byproduct of the liquefaction process), refrigerants (ethylene, propane, isopentane and nitrogen), amine, and process wastewater would be required during operation of the facility; all products that do not typically require any specific restrictions for transporting. However, the GDOT does provide evacuation distances ranging from approximately 1,000 to 2,650 feet for the refrigerants in the event of a fire or spill emergency.

Stabilized condensate would be transported from the LNG Terminal by approximately two trucks per day. Ethylene, propane, and isopentane would be transported by up to two trucks each per month. Nitrogen would be delivered infrequently to the facility. Amine transport would require approximately one to two trucks per year to remove and resupply spent amine. Process waste water would be recycled to the extent possible, or discharged to the stormwater effluent if it meets discharge quality standards, and would be infrequently trucked away for disposal. Under the maximum trucking scenario (all deliveries occurred on the same day), Islands Expressway would experience an increase of approximately eight trucks or 0.04 percent, in traffic volume, and the trucks would likely use one of the three routes described above. The Companies have not identified any specific routes that would be used for operational trucking, but have been working with the City of Savannah Fire Chief and Chatham Emergency Management, and would continue to work with them, to identify measures to minimize potential impacts on the community. As a result, we do not expect traffic problems would arise as a result of the stabilized condensate and refrigerant transport.

Marine Traffic

Savannah Port marine traffic data indicates that a total of approximately 577 vessel typically arrive and depart along the Savannah River over a 30 day period (MarineTraffic.com 2013). During construction, approximately 374,400 cy of fill material would be delivered to Elba Island by aggregate ships (six ships anticipated). These ships would dock at the existing marine berth at the LNG Terminal on the north side of Elba Island, and offload material. In addition, approximately 8 barge deliveries would occur over a 34-month period at the South Channel barge dock to deliver materials and equipment to Elba Island. Utilizing the existing marine berth and South Channel barge dock would greatly reduce the incremental cumulative impacts from delivering materials and equipment to Elba Island on local roadway traffic, and have been estimated to have a negligible effect (less than 5 percent volume increase) on marine traffic in the Savannah River. During operations, there would be no increase in the number of LNGC's already authorized to access the LNG Terminal. As a result, Project impacts on marine traffic are expected to be insignificant.

2.5.4.2 Hartwell, Jefferson County and Rincon Compressor Stations

The roadways in the vicinity of the Hartwell, Jefferson County and Rincon Compressor Stations are paved and in average condition. The rural areas surrounding these sites are generally pasture land and planted pine and experience very little traffic. The Companies estimate equipment delivery trucks would make approximately 3 round-trips per day at each site, and personnel would make approximately 5 to 20

vehicle trips per day for each site. These Project vehicles would likely be encountered during morning and evening peak times, corresponding to normal workday hours. However, the existing roadway networks in the vicinity of the sites provide adequate alternate access, and the effects on traffic and transportation routes are expected to be minimal. During operation of these facilities, a minimal amount of personnel would be required for routine maintenance activities at each location, which would have a negligible effect on traffic and transportation routes.

2.5.5 Property Values

We received comments expressing concern about the devaluation of properties as a result of facility construction. Because the Hartwell, EEC North, Port Wentworth, Elba Island Interconnect and Del Webb Sites are existing facilities and Project activities would essentially be limited to existing facility footprints, we conclude that property values near these facilities would not be affected by the Project. The effect construction of the Jefferson County and Rincon Compressor Stations may have on nearby property values, including resale ability, is not a wholly quantifiable issue. Because the Companies would purchase the Jefferson County and Rincon Compressor Stations outright, the potential impacts on property values would be on adjacent or nearby properties and would likely be attributable to noise, visual impacts, and/or negative public perception. Due to negative public perception sometimes associated with energy infrastructure, certain prospective homebuyers may find the compressor station to be a detractor and could influence a potential buyer to not purchase a property. Nevertheless, each potential purchaser would make a decision to purchase based on his or her planned use of the property in question (e.g., principal residence, vacation home, agriculture or grazing, business, future subdivision), with each purchaser considering differing factors that affect the purchasing decision.

2.5.6 Environmental Justice

An environmental justice analysis is conducted in accordance with Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations" to consider disproportionately high and adverse impacts on minority or low-income populations in the surrounding community resulting from programs, policies, or activities of federal agencies. Issues considered include human health or environmental hazards, the natural or physical environment, and associated social, economic, and cultural factors.

The majority of impacts associated with the liquefaction facilities would occur on Elba Island, which is owned entirely by SLNG and has no resident population, and would not affect populations residing off-site. Additionally, no minority or low-income residential areas would be impacted through the use of the temporary off-site wareyard, and associated construction traffic would not pass through any residential areas during construction of the Project. No residential areas or communities would be impacted directly by construction or operation of the compression or metering sites. These proposed sites are not in residential or minority residential areas as adjacent and nearby properties are primarily used for agricultural (crops, pasture, and planted pine) production, are forested areas, or are currently being utilized as existing natural gas facilities. Therefore, we do not anticipate that construction and operation of the Project would disproportionately affect any population group, including low-income and minority populations, and no environmental justice issues would occur as a result of construction or operation of the Project. The Project is anticipated to have a positive socioeconomic effect on the populations in the Project area, because it would generate new temporary jobs and economic activity in the region and provide continuing and increased tax revenues during its operational life.

2.6 CULTURAL RESOURCES

Section 106 of the NHPA, as amended, requires the FERC to take into account the effect of its undertakings on properties listed, or eligible for listing, on the National Register of Historic Places, and to afford the Advisory Council on Historic Properties an opportunity to comment. The Companies, as non-federal parties, assisted us in meeting our obligations under section 106 and the implementing regulations found in 36 CFR 800.

2.6.1 Cultural Resource Investigations

2.6.1.1 Liquefaction Facilities

The Companies completed a cultural resources survey of approximately 64 acres at 6 previously unsurveyed locations at the existing LNG Terminal, including the Elba Island Interconnect facilities, and provided a Phase I report to the FERC and Georgia's State Historic Preservation Office (SHPO). No cultural resources were identified, and no further investigations were recommended. In a letter dated June 17, 2013, the SHPO concurred that the project would have no effect on historic properties, and requested a minor revision to the report. We also requested a minor revision to the report. The Companies provided a revised report, which we find acceptable, and which was accepted by the SHPO in a letter dated July 19, 2013.

An addendum report was submitted to the FERC and the SHPO that included results of survey at three additional locations encompassing 4.4 acres. No cultural resources were identified, and no further investigations were recommended. In a letter dated January 13, 2014, the SHPO concurred that the project would have no effect. We concur also.

In a letter dated June 24, 2014, the Companies consulted with SHPO regarding the potential to encounter cultural resources at the off-site wareyard. In a letter dated July 3, 2014, the SHPO stated that a Phase I archaeological survey is not required due to the industrial and disturbed nature of the majority of the property. We agree.

The Companies provided the FERC and the SHPO with the results of archival research and preliminary assessment of the potential for cultural resources at the South Channel barge dock location. No further cultural resources investigations were recommended as a result of this research. In a letter dated February 25, 2014, the SHPO concurred that the project would have no effect. Subsequently, the Companies re-contacted the SHPO regarding an expansion of the docking area. In a letter dated March 12, 2014, the SHPO concurred that the project would have no effect. We concur also.

2.6.1.2 Compression Facilities

The Companies completed a cultural resources survey for the proposed Jefferson County Compressor Station. A Phase I cultural resources report, which also summarized the results of the previous survey for the existing Hartwell Compressor Station, was submitted to the FERC and the Georgia SHPO. No cultural resources were identified, and no further investigations were recommended. In a letter dated April 24, 2013, the SHPO concurred that the Project would have no effect on historic properties. Subsequently, an addendum report was submitted for the Rincon Compressor Station. No cultural resources were identified, and no further investigations were recommended. In a letter dated September 10, 2013, the SHPO concurred that the Project would have no effect on historic properties. We concur also.

2.6.1.3 Metering Facilities

The Companies contacted the Georgia SHPO regarding construction activities at the EEC North Site, Port Wentworth Site, and Elba Island Interconnect Site, and the South Carolina SHPO regarding construction activities at the Del Webb Site. In a letter dated June 11, 2014, the Georgia SHPO indicated that these Georgia project components would have no effect on historic properties. In a letter dated June 2, 2014, the South Carolina SHPO indicated that "no properties…will be affected" by the Del Webb Site, but added that if improvements or modification were made to the gravel access road outside the fenced facility area, the SHPO would have concerns about an archaeological site in the vicinity. In a September 9, 2014 data response to the FERC, the Companies stated that no improvements to the Del Webb access road are planned. Accordingly, we conclude that no historic properties would be affected at the Del Webb Site.

We received comments regarding potential cultural resources that may be directly or indirectly affected by the Project, including Fort Jackson, Fort Pulaski, and historic downtown Savannah. The Companies prepared a visual resource analysis and determined that because construction would occur within the boundaries of the existing facility footprint, existing trees along the island perimeter would afford a visual screen, and access to walking trails would be limited to daytime hours thus flares would not be visible to trail users, the visual effects of the Project would be minimal. Visual resources are discussed further in section 2.4.5, and traffic and noise are discussed in sections 2.5.4.1 and 2.7.2, respectively.

2.6.2 Native American Consultation

We sent our NOI to the Catawba Indian Nation, Creek Nation of Oklahoma, Eastern Band of Cherokee, Muscogee (Creek) Nation of Oklahoma, Poarch Band of Creek Indians, Lower Muscogee Creek Tribe, Georgia Tribe of Eastern Cherokee, and Cherokee of Georgia Tribal Council. The Catawba Indian Nation responded to the NOI and requested additional project information, which we provided. We sent our Project Update Notice to the same tribes and agencies listed above, as well as the Delaware Tribe of Indians, Delaware Nation, Tuscarora Nation of New York, Shawnee Tribe of Oklahoma, and Eastern Shawnee Tribe of Oklahoma. No further responses have been received to date.

In addition to our contacts with the tribes, the Companies contacted the Catawba Indian Nation, Eastern Band of Cherokee, Muscogee (Creek) Nation of Oklahoma, Poarch Band of Creek Indians, Lower Muscogee Creek Tribe, Georgia Tribe of Eastern Cherokee, and Cherokee of Georgia Tribal Council in a letter dated March 27, 2013, to introduce the proposed Project and request comments regarding the potential for the Project to affect resources of tribal concern. A follow-up letter was sent to the afore-mentioned tribes on August 15, 2013 for the proposed Rincon Compressor Station. The Catawba Indian Nation and Cherokee of Georgia Tribal Council responded and indicated that they had no objection to the Project. The Catawba Indian Nation also requested to be consulted on any findings during construction. No further responses have been received from the tribes.

2.6.3 Unanticipated Discovery Plan

The Companies provided an Unanticipated Discovery Plan to deal with the unanticipated discovery of cultural resources and human remains during construction to the FERC and the Georgia and South Carolina SHPOs. We reviewed the plan and find it acceptable.

2.6.4 NHPA Compliance

Cultural resource surveys, where required, have been completed for the Project. The Georgia and South Carolina SHPOs and the FERC agree that no historic properties would be affected. Therefore, the process of complying with section 106 of the NHPA has been completed for the Project.

2.7 AIR QUALITY AND NOISE

2.7.1 Air Quality

Air quality would be affected by construction and operation of the Project. Air emissions would temporarily be generated during construction of the aboveground facilities; however, most air emissions associated with the Project would result from the long-term operation of the liquefaction and compression facilities. Modifications occurring at meter stations and on pipeline valves would not affect any sources of air emissions. This section of the EA describes existing air quality at the Project locations; identifies the construction and operating emissions and projected air quality impacts; and outlines methods of compliance with regulatory requirements. This analysis has been performed based on the latest available information, and further analysis might be required if updates to the facility design occur.

2.7.1.1 Existing Air Quality

Regional Climate

Project activities would occur in four counties in northeastern Georgia and one county in southern South Carolina. The Project area has a typically humid subtropical climate with some moderation by proximity to the Atlantic Ocean occurring in the eastern portion of the Project area. The area experiences high temperatures in the summer and short, mild winters. In 2013, Savannah, Georgia experienced 56 days above 90 degrees Fahrenheit and 15 days below 32 degrees Fahrenheit, with an annual average of 62.9 degrees Fahrenheit. Between 40 and 50 inches of precipitation are experienced annually, with more than half of this occurring between June and October. No dry season occurs, and only rarely does the area experience snowfalls. Thunderstorms are common between May and October but can occur any time of the year. Wind speeds range from 0 to 21 mph (fresh breeze), usually averaging under 10 mph. The greatest winds are experienced in March, with an average daily max of 15 mph. In July, predominant winds are from the south and southwest. In October, predominant winds are from the north and northeast.

Ambient Air Quality Standards

Ambient air quality is protected by federal and state regulations. Under the Clean Air Act (CAA) and its amendments, the U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone, particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), and sulfur dioxide (SO_2). The NAAQS include primary standards, which are designed to protect human health, including the health of sensitive subpopulations such as children and those with chronic respiratory problems. The NAAQS also include secondary standards designed to protect public welfare, including economic interests, visibility, vegetation, animal species, and other concerns not related to human health.

Individual states may set air quality standards that are at least as stringent as the NAAQS. Georgia has adopted all of the NAAQS in Chapter 391-3-1-.2(4) of the Georgia Administrative Code. South Carolina has adopted all of the NAAQS in Chapter 61-62.5 of the SC Code of Regulations. In addition, South Carolina has promulgated a state standard for gaseous fluorides. The NAAQS are summarized in table 2.7.1-1 below.

TABLE 2.7.1-1

National Ambient Air Quality Standards

Criterial 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
	Primary	1-hour	35 ppm (40.000 μg/m^3)	Not to be exceeded more than once per year
Pb	Primary	Rolling 3-month average	0.15 μg/m^3 [a]	Not to be exceeded
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)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
	Primary and secondary	1-hour	0.12 ppm (235 μg/m^3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
$PM_{2.5}$	Primary	Annual	12 μg/m^3	Annual mean, averaged over 3 years
	Secondary	Annual	15 μg/m^3	Annual mean, averaged over 3 years
	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[d] (195 μg/m^3)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3-hour	53 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, the 1978 standard 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, 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.

Note: ppm = parts per million; μg/m^3 = micrograms per cubic meter; ppb = parts per billion

Source: EPA

Air Quality Control Regions and Attainment Status

The Air Quality Control Regions (AQCRs) were established in accordance with section 107 of the CAA as a means to implement the CAA and to comply with the NAAQS through State Implementation Plans (SIPs). The AQCRs are intra- and interstate regions such as large metropolitan areas where the improvement of the air quality in one portion of the AQCR requires emission reductions throughout the AQCR. Each AQCR, or portion thereof, is designated as attainment, unclassifiable, maintenance, or nonattainment. Areas where an ambient air pollutant concentration is determined to be below the applicable ambient air quality standard are designated attainment. Areas where no data are available are designated unclassifiable. Unclassifiable areas are treated as attainment areas for the purpose of permitting a stationary source of pollution. Areas where the ambient air concentration is greater than the applicable ambient air quality standard are designated nonattainment. Areas that have been designated nonattainment but have since demonstrated compliance with the ambient air quality standard(s) are designated maintenance for that pollutant.

Project activities would impact areas of Chatham, Hart, Jefferson, and Effingham Counties in Georgia and Jasper County in South Carolina. Each of these counties is designated as in attainment or unclassifiable for all six NAAQS pollutants.

Air Quality Monitoring and Existing Air Quality

The EPA and state and local agencies have established a network of ambient air quality monitoring stations to measure and track the background concentrations of criteria pollutants across the United States. To characterize the background air quality in the region surrounding the Project, data were obtained from representative air quality monitoring stations. These monitoring stations are located near the proposed liquefaction facility site and proposed compressor station sites and provide information on regional ambient air quality conditions. For some criteria pollutants, ambient air quality monitoring data in the vicinity of the Project were not available. Therefore, the best available data were used to represent the air quality at those stations. A summary of the regional ambient air quality monitoring data for the Project area is presented in table 2.7.1-2 below.

On December 7, 2009, the EPA updated the definition of air pollution to include six well-mixed GHGs as subject to regulation under the CAA as regulated New Source Review (NSR) pollutants, finding that the presence of these GHGs in the atmosphere endangers public health and public welfare currently and in the future: CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

As with any fossil-fuel fired project or activity, the Project would contribute GHG emissions. The principle GHGs that would be produced by the Project are CH_4, CO_2, and N_2O. No fluorinated gases would be emitted by the Project. Emissions of GHGs are typically estimated as carbon dioxide equivalents (CO_2e).

GHGs are ranked by their global warming potential (GWP). The GWP is a measurement relative to CO_2 that is based on the properties of a GHG's ability to absorb solar radiation and its residence time in the atmosphere. Thus, CO_2 has a GWP of 1, CH_4 has a GWP of 25, and N_2O has a GWP of 298.[14] The CO_2e of a GHG is equal to the product of the mass of the particular chemical multiplied by its corresponding GWP. Total GHG emissions are equal to the sum of the individual CO_2e values. In

[14] Because the emission calculations for the LNG Terminal were created prior to the optimization update, the more conservative N_2O GWP measure of 310 was used in the information provided by the Companies. However, our analysis utilizes the updated GWP measures adopted by the EPA.

compliance with EPA's definition of air pollution to include GHGs, we have provided estimates of GHG emissions for construction and operation, as discussed throughout this section. Impacts from GHG emissions (climate change) are discussed in more detail under Cumulative Impacts in section 2.9.8.1.

TABLE 2.7.1-2

Ambient Air Quality Concentration

Pollutant	Averaging Period	Rank	Monitor[a]	2013[b]	Units
SO_2	1-hour	2nd High	A	118	ppb
	3-hour	2nd High	ND	ND	ppb
	1-hour	2nd High	B	71	ppb
	3-hour	2nd High	ND	ND	ppb
CO	1-hour	2nd High	ND	ND	ppm
	8-hour	2nd High	ND	ND	ppm
NO_2	1-hour	2nd High	C	39	ppm
	1-hour	2nd High	D	50	ppm
O_3	1-hour	2nd High	E	0.079	ppm
	8-hour	4th High	E	0.064	ppm
$PM_{2.5}$	24-hour	98th Percentile	F	18	$\mu g/m^3$
	Annual	Arithmetic Mean	ND	ND	$\mu g/m^3$
	24-hour	98th Percentile	E	16.2	$\mu g/m^3$
	Annual	Arithmetic Mean	ND	ND	$\mu g/m^3$
PM_{10}	24-hr blk	2nd High	D	29	$\mu g/m^3$

[a] A = Lathrop and Augusta Avenue, Savannah, Chatham County, Georgia (Monitor 130511002)
B = 2500 E. President St, Savannah, Chatham County, Georgia (Monitor 130510021)
C = 4830 Jenkins Ave, North Charleston, Charleston County, South Carolina (Monitor 450190003)
D = 133 Perry Ave, Greenville, Greenville County, South Carolina (Monitor 450450015)
E = 5645 Riggins Mill Road, Macon, Bibb County, Georgia (Monitor 130210012)
F = 2216 Bungalow Rd, Augusta, Richmond County, Georgia (Monitor 132450091)

[b] Source: EPA AirData, 2013

ND = No data available within 50 miles of the project.

2.7.1.2 Regulatory Requirements for Air Quality

The CAA, as amended in 1977 and 1990, is the basic federal statute governing air pollution. The provisions of the CAA that are potentially relevant to the Project include the following and are discussed further below:

- New Source Review (NSR);
- Prevention of Significant Deterioration (PSD);
- Nonattainment New Source Review (NNSR);
- Title V Operating Permits;
- New Source Performance Standards (NSPS);
- National Emission Standard for Hazardous Air Pollutants for Source Categories (NESHAP);
- Chemical Accident Prevention Provisions;
- General Conformity;
- GHG Reporting Rule; and
- State Regulations

For the purposes of air permitting, the new and modified liquefaction facilities and existing equipment at the LNG Terminal are considered a single stationary source for determining the regulatory applicability. Similarly, the new and modified units and the existing equipment at the Hartwell Compressor Station are treated as a single source for purposes of determining regulatory applicability.

The Project would not involve any new operational air emission sources or emission increases at the meter stations, interconnect sites, or the Elba Island off-site wareyard. Therefore, regulatory applicability is only evaluated for the LNG Terminal, the modified Hartwell Compressor Station, and the new Jefferson County and Rincon Compressor Stations.

New Source Review

Proposed new or modified air pollutant emissions sources must undergo a NSR permitting process prior to construction or operation. Through the NSR permitting process, local, state, and federal regulatory agencies review and approve project construction plans, regulated pollutant increases or changes, emissions controls, and other details. The agencies then issue construction permits that include specific requirements for emissions control equipment and operating limits. The three basic categories of NSR permitting are PSD, NNSR, and minor source NSR. Federal preconstruction review for affected sources in attainment areas is called PSD. Federal preconstruction review for affected sources in nonattainment areas is called NNSR and contains stricter thresholds and requirements.

The LNG Terminal; Hartwell, Jefferson County, Rincon Compressor Station Sites; and Elba Island Interconnect, Port Wentworth, EEC North, and Del Webb Sites are located in areas designated attainment or unclassifiable and, therefore, the Project is potentially subject to PSD regulations and NNSR would not apply.

Prevention of Significant Deterioration

The PSD regulations, codified in 40 CFR 52.21, apply 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 regulations, a major source is any source type belonging to a list of 28 named source categories that emit or have the potential to emit (PTE) 100 tons per year (tpy) or more of any regulated pollutant. Additionally, source categories not named on this list are considered major if the facility emits or has the PTE 250 tpy or more of any criteria pollutants. Natural gas compressor stations and liquefaction facilities are not among the 28 listed source categories; therefore, the 250 tpy major source threshold would apply to the Project.

A major modification is a physical change or a change in the method of operation at an existing major source facility that causes emissions of criteria pollutants to increase in excess of any of the following Significant Emission Rates (SER): 100 tpy for CO; 40 tpy for NO_X; 40 tpy for volatile organic compounds (VOC); 40 tpy for SO_2; 15 tpy for PM_{10}; or 10 tpy for $PM_{2.5}$. At an existing minor source facility, PSD review is triggered if the SER is exceeded by the project-related emissions increase.

On May 13, 2010, the EPA tailored the applicability criteria for stationary sources and modification projects, resulting in the PSD GHG Tailoring Rule. However, on June 23, 2014, the Supreme Court ruled that the EPA cannot require PSD permitting based solely on GHG emissions, striking down a portion of the rule. For existing PSD major sources, the major modification threshold would be 75,000 tpy CO_2e.

The LNG Terminal is currently a PSD major source. Emissions increases resulting from the Project would be above the SER for CO, resulting in a major modification at the facility. The PSD permitting process has been completed by the GEPD in parallel with our environmental review. The Company's PSD application was included in its FERC application and is summarized in this EA. The proposed modification to liquefaction facilities is projected to have CO_2e emissions above 75,000 tpy. The Companies included a Best Available Control Technology (BACT) Analysis for CO and GHG as part of its PSD permit modification.

The Hartwell Compressor Station Site is not currently subject to PSD. Increases in potential annual emissions resulting from the Project would be below 250 tpy. Therefore, the station would not be considered a major source. However, after the proposed modification the Hartwell Compressor Station would become subject to PSD. The PTE of all criteria pollutants from the proposed Jefferson County and Rincon Compressor Stations would be below the 250 tpy threshold; therefore, these stations would not be subject to PSD permitting.

During the PSD review process, the potential impact of the Project on protected Class I areas must also be considered. Areas of the country are categorized as Class I, Class II, or Class III, where Class I areas are designated specifically as pristine natural areas or areas of natural significance, including wilderness areas and national parks, and are afforded special protection under the CAA. If a facility is subject to PSD 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 Project on the Class I area to ensure pristine air quality is maintained. The Federal Land Managers' Air Quality Related Values Work Group (2010) guidance states that a ratio of visibility-affecting emissions to distance (Q/d) value of 10 or less indicates that Air Quality Related Values analyses should not be required. Visibility-affecting pollutants are defined by the Federal Land Managers as SO_2, NO_2, PM_{10}, and sulfuric acid mist.

The Wolf Island National Wildlife Refuge is located approximately 53 miles south of the LNG Terminal in Georgia. Based on this distance, the Q/d for Wolf Island National Wildlife Refuge from the cumulative net emissions increases at the LNG Terminal is below the screening criteria of 10. The Jefferson County and Rincon Compressor Stations are located over 62 miles from the nearest Class I area; therefore, no additional analysis of Class I area impacts was required. The FWS is the designated Federal Land Manager responsible for oversight of all three of these Class I areas. The FWS has been involved with this Project through interagency meetings and biological consultations.

Title V Operating Permits

The Title V Operating Permit program, as discussed in 40 CFR Part 70, requires major stationary sources of air emissions to obtain an operating permit within 1 year of initial facility startup. Under Title V, a stationary source of air emissions is considered a major source if it emits 100 tpy or more of any criteria pollutant, 10 tpy of any individual hazardous air pollutant (HAP), or 25 tpy in aggregate.

On May 13, 2010, the EPA issued the Title V GHG Tailoring Rule, which established Title V permitting requirements and thresholds for GHG. On June 23, 2014, the U.S. Supreme Court ruled that a facility may not be required to obtain a Title V permit based solely on GHG emissions; however, if a project is a major stationary source based on the PTE of other regulated pollutants, a Title V permit may include permit requirements for GHG, such as BACT limits or compliance assurance monitoring.

The LNG Terminal is an existing Title V major source and currently operates under Title V permit number 4922-051-0003-v-04. The facility would remain subject to the Title V program upon completion of the Project. A SIP construction permit application was submitted to GEPD on December

30, 2013. The LNG Terminal received PSD Permit Number 4922-051-0263-V-01-0 on June 23, 2015 authorizing construction and operation of the proposed new and modified units.

The Hartwell Compressor Station is currently a minor source under Title V. After modification, the facility's PTE for NO_x and CO would exceed the applicable Title V major source threshold. Therefore, the station would be subject to Title V permitting for GHG as well. An Application for the Authorization to Construct was submitted to GEPD on September 5, 2014. Georgia rules require that a Title V operating permit application be submitted within 1 year of a facility becoming a major source. The Companies would be required to submit a Title V permit application within this timeline.

Emissions of NO_x and CO from the Jefferson County Compressor Station would exceed the applicable Title V major source thresholds. Therefore, the Jefferson County Compressor Station would be subject to Title V permitting, which would include GHG requirements. An Application for the Authorization to Construct was submitted to GEPD on September 5, 2014. Georgia rules require that a Title V operating permit application be submitted within 1 year of commissioning. EEC would be required to submit a Title V permit application within this timeline.

Emissions from the Rincon Compressor Station would be below the Title V major source thresholds for all criteria pollutants. Therefore, the station would not be subject to Title V. An Application for the Authorization to Construct was submitted to GEPD on September 5, 2014 to obtain a minor source operating permit.

New Source Performance Standards

The NSPS, codified in 40 CFR Part 60, govern emission rates and provide other requirements for new or significantly modified sources. NSPS requirements include emission limits, monitoring, reporting, and record keeping. The following NSPS requirements were identified as potentially applicable to the Project.

NSPS Subpart Dc, *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units*, applies to all steam generating units with a heat capacity of 29 MW (100 MMBtu/hr) or less and greater than 2.9 MW (10 MMBtu/hr). The two indirectly fired heaters to be installed at the LNG Terminal would be subject to the requirements of NSPS Subpart Dc. Currently, no unit meeting these criteria would be installed or modified at the Hartwell, Jefferson County, or Rincon Compressor Stations. Similarly, no unit meeting these criteria would be installed or modified at the metering stations.

NSPS Subpart Kb, *Standards of Performance for Volatile Organic Liquid Storage Vessels, (Including Petroleum Liquid Storage Vessels)*, applies to storage vessels that are constructed, reconstructed, or modified after July 23, 1984, with a capacity greater than 75 cubic meters (19,800 gallons) that would store volatile organic liquids. The final design of the LNG Terminal is currently underway and may include tanks that would be subject to this subpart. Any vessel meeting the criteria of this subpart would be required to be designed and operated pursuant to the specifications of this subpart. No storage vessel meeting these criteria would be installed or modified at the Hartwell, Jefferson County, or Rincon Compressor Stations. Similarly, no unit meeting this definition would be installed or modified at the metering stations.

NSPS Subpart KKK, *Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants for Which Construction, Reconstruction, or Modification Commenced After January 20, 1984, and on or before August 23, 2011*, sets VOC limits as well as recordkeeping and reporting requirements for onshore natural gas processing plants and compressors in VOC service.

Construction of the proposed MMLS units at the LNG Terminal, the new and modified compressors at the Hartwell Compressor Station, and the new compressors at the Jefferson County and Rincon Compressor Stations would be installed after August 23, 2011. The Project would not be subject to this subpart based on applicability dates.

Subpart IIII, *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines*, would apply to two proposed emergency generators and one proposed firewater pump engine at the LNG Terminal. Any affected engines installed as a part of the Project would be required to comply with the emission standards and work practice requirements of this regulation.

NSPS Subpart JJJJ, *Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*, applies to manufacturers and owner/operators of spark-ignition internal combustion engines manufactured after the applicability date stated in the rule for the particular type and size engine. The proposed engines at the LNG Terminal would be compression ignition and would not be subject to this subpart. One proposed emergency generator at each of the Hartwell, Jefferson County, and Rincon Compressor Stations would meet the applicability requirements of this subpart. Any affected engine installed as part of the Project would be required to comply with this subpart by installing units that are certified by the manufacturer to be compliant or would demonstrate compliance through performance testing if any non-certified unit is purchased.

NSPS Subpart KKKK, *Standards of Performance for Stationary Combustion Turbines*, applies to manufacturers and owner/operators of gas turbines with heat input rating exceeding 10 MMBtu/hr that were constructed, reconstructed, or modified after February 18, 2005 for the particular type and size gas turbine. Subpart KKKK regulates emissions of NO_x and SO_2. Turbines meeting these criteria would be installed at the Hartwell, Jefferson County, and Rincon Compressor Stations. To comply with the NO_x emission limit set in Subpart KKKK, the turbines would utilize $S_oL_oNO_x$ lean premixed combustion technology. The SO_2 emission limit would be achieved through the combustion of only pipeline quality natural gas with a maximum total sulfur concentration of 20 grains per dry standard cubic feet.

National Emissions Standards for Hazardous Air Pollutants

The NESHAPs, codified in 40 CFR Parts 61 and 63, regulate the emissions of HAPs from existing and new sources. Part 61 was promulgated prior to the 1990 CAA Amendments and regulates eight types of hazardous substances: asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. As a result of the Project, the Companies are not expected to operate any processes that are regulated by Part 61.

The 1990 CAA Amendments established a list of 189 HAPs, resulting in the promulgation of Part 63. Part 63, also known as the Maximum Achievable Control Technology (MACT) standards, regulates HAP emissions from major sources of HAP emissions and specific source categories that emit HAPs. Some NESHAPs may apply to non-major sources (area sources) of HAPs. The thresholds for the purpose of NESHAP applicability are 10 tpy of any single HAP or 25 tpy of all HAPs in aggregate.

The existing facilities at the LNG Terminal are not considered major with respect to HAP emissions. The combined proposed and existing LNG Terminal emissions would not exceed the major source threshold for HAP emissions. Therefore, the LNG Terminal is and would remain an area source for HAPs.

The Hartwell Compressor Station is an existing area source for HAPs. After modification, the HAP status of this facility would not change. The proposed facilities at the Jefferson County and Rincon

Compressor Stations would be considered area sources for HAPs. The metering stations would not be a source of HAP emissions.

The following discussion addresses MACT regulations that may be applicable to the LNG Terminal and the Hartwell, Jefferson County, and Rincon Compressor Stations. In addition to the below source type-specific regulations, any source which is subject to a subpart of 40 CFR 63 is also subject to the general provision of NESHAP Subpart A, unless otherwise noted in the applicable subpart.

Subpart Y of Chapter 63, *National Emission Standards for Marine Tank Vessel Loading Operations,* does not apply to marine tank vessel loading operations that exclusively transfer liquids containing organic HAPs as impurities, as defined in 40 CFR 63.561. The marine tank vessel loading operation at the LNG Terminal would only transfer liquids containing HAPs as impurities. No marine loading would occur at the Hartwell, Jefferson County, and Rincon Compressor Stations. Therefore, this rule is not applicable to the Project facilities.

Subpart YYYY, *NESHAP for stationary combustion turbines*, applies to major sources of HAP. The LNG Terminal, the Hartwell, Jefferson County, and Rincon Compressor Stations, and the metering stations would not be major sources for HAP. Therefore, the proposed construction and modifications at these sites would not be subject to this subpart.

Subpart ZZZZ, *NESHAP for reciprocating internal combustion engines (RICE)*, requires new engines located at an area source of HAPs that are subject to NSPS Subpart JJJJ or NSPS Subpart IIII to meet the requirements of the applicable NSPS. The proposed two natural gas-fired emergency generators and one diesel-fired firewater pump engine at the LNG Terminal would be subject to NSPS Subpart JJJJ. The emergency generator engines proposed to be installed at the Hartwell, Jefferson County, and Rincon Compressor Stations would be subject to NSPS Subpart IIII. These engines would be required to comply with all applicable provisions of Subpart ZZZZ.

Chemical Accident Prevention Provisions

The chemical accident prevention provisions, codified in 40 CFR 68, are federal regulations designed to prevent the release of hazardous materials in the event of an accident and minimize potential impacts if a release does occur. The regulations contain a list of substances and threshold quantities for determining applicability to stationary sources, including methane, propane, and ethylene in amounts greater than 10,000 pounds. If a stationary source stores, handles, or processes one or more substances on this list in a quantity equal to or greater than that specified in the regulation, the facility must prepare and submit a risk management plan (RMP). An RMP is not required to be submitted to the EPA until the chemicals are stored on-site at the facility.

If a facility does not have a listed substance on site, or the quantity of a listed substance is below the applicability threshold, the facility does not have to prepare an RMP. In the latter case, the facility still must comply with the requirements of the general duty provisions in section 112(r)(1) of the 1990 CAA Amendments if there is any regulated substance or other extremely hazardous substance on-site. The general duty provision is as follows:

"The owners and operators of stationary sources producing, processing, handling and storing such substances have a general duty to identify hazards which may result from such releases using appropriate hazard assessment techniques, to design and maintain a safe facility, taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur."

The LNG Terminal would use methane, propane, isopentane, and ethylene as refrigerants in the overall process for liquefying the natural gas, and therefore the Project is potentially subject to this regulation.

Stationary sources are defined in 40 CFR 68 as any buildings, structures, equipment, installations, or substance-emitting stationary activities that belong to the same industrial group, that are located on one or more contiguous properties, are under control of the same person (or persons under common control), and from which an accidental release may occur.

The definition of a stationary source does not apply to transportation of any regulated substance or any other extremely hazardous substance. When the EPA issued the final rule for chemical accident prevention provisions (FR, January 6, 1998 [Volume 63, Page 639-645]), it clarified that the transportation exemption applies to LNG facilities subject to oversight or regulation under 49 CFR Part 193. These exempt facilities include those used to liquefy natural gas or those used to transfer, store, or vaporize LNG in conjunction with pipeline transportation. Similarly, the natural gas compressor stations at the Hartwell, Jefferson County, and Rincon Compressor Stations are regulated by the DOT. Therefore, the Project facilities are exempt from 40 CFR Part 68 and the RMP requirement would not apply. We have included an analysis of the proposed design's compliance with Part 193, including overpressure modeling, in section 2.8.3 of this EA.

General Conformity

The General Conformity Rule is codified in Title 40 CFR Part 51, Subpart W and Part 93, Subpart B, Determining Conformity of General Federal Actions to State or Federal Implementation Plans. A conformity determination must be conducted by the lead federal agency if a federal action's construction and operational activities are likely to result in generating direct and indirect emissions that would exceed the conformity threshold for the minimum levels of the pollutant(s) for which an air basin is classified nonattainment or maintenance. According to the conformity regulations, emissions from sources that are major for any criteria pollutant with respect to the NNSR or PSD permitting/licensing are exempt and are deemed to have conformed.

Section 176(c)(1) of the CAA (Title 40 CFR 51.853) states that a federal agency cannot approve or support any activity that does not conform to an approved SIP. Conforming activities or actions should not, through additional air pollutant emissions:

- cause or contribute to new violations of the NAAQS in any area;
- increase the frequency or severity of any existing violation of any NAAQS; or
- delay timely attainment of any NAAQS or interim emission reductions.

As noted earlier, the Project is located in areas classified as being in attainment or unclassifiable. Therefore, Project activities are not subject to General Conformity Regulations.

Greenhouse Gas Reporting Rule

On September 22, 2009, the EPA issued the final Mandatory Greenhouse Gas Reporting Rule (GHGRR). This rule requires reporting of operational GHG emissions from suppliers of fossil fuels and facilities that emit greater than or equal to 25,000 metric tpy of GHG (reported as CO_2e). On November 8, 2010, the EPA signed a rule that finalizes GHG reporting requirements for the petroleum and natural gas industry under Subpart W of 40 CFR Part 98. LNG storage and LNG import and export equipment are considered part of the source category regulated by Subpart W. Onshore natural gas transmission

compression facilities are considered part of the source category regulated by Subpart W. Therefore, the rule applies to the LNG Terminal and Hartwell, Jefferson County, and Rincon Compressor Stations.

The GHGRR does not require emission control devices and is strictly a reporting requirement for stationary sources. If the actual operational emissions from the liquefaction facilities or compressor stations are greater than 25,000 metric tpy, the Companies would be required to comply with all applicable reporting requirements of 40 CFR Part 98.

State Regulations

The GEPD is the lead air permitting authority for the LNG Terminal and the Hartwell, Jefferson County, and Rincon Compressor Stations. Georgia air permitting requirements are codified in Georgia Rules for Air Quality Control (GRAQC), chapter 391-3-1. The Project would be required to obtain an air quality permit prior to initiating construction at each location. The process of obtaining the air permit for each location would involve the review and implementation of state regulations, inclusive of requirements for PSD and NNSR, as applicable. The state regulations summarized below are those that would establish emission limits or other restrictions that may be in addition to those required under federal regulations. State regulations that are not applicable to the Project are not discussed in the following summary.

Project related modifications would occur in South Carolina at the Del Webb Site; however, no emissions increases would result from Project modifications. No South Carolina regulations are applicable to the Project.

Projects trigger review by other states if a project location is within 50 miles of an adjacent state's border. The LNG Terminal is located within 1 mile of the South Carolina state line; therefore, the South Carolina Department of Health and Environmental Control would have the opportunity to review and comment on the application and subsequent permits.

GRAQC 391-3-1-.02(2)(b), *Visible Emissions*, restricts the opacity of emissions from direct sources of emissions to less than 40 percent, except sources that are subject to some other emission limitation in this subpart. The proposed liquefaction process flare system and dock flare would be regulated under this section. The Companies would comply with this regulation by employing best management practices to minimize visible emissions from the flares. This limit would apply to the proposed gas turbine compressor sets, emergency generators, and other fuel burning sources at the Hartwell, Jefferson County, and Rincon Compressor Stations. The Companies would comply with this limit by combusting exclusively pipeline quality natural gas.

GRAQC 391-3-1.02(2)(d), *Fuel-Burning Equipment*, establishes PM, NO_X and opacity limits based on heat input to fuel burning equipment and date of installation. The proposed fuel-burning emission sources at the LNG Terminal and the Hartwell, Jefferson County, and Rincon Compressor Stations would comply with this rule by combusting only pipeline quality natural gas.

GRAQC 391-3-1.02(2)(g), *Sulfur Dioxide*, establishes SO_2 emission limits for large fuel burning sources and sets a limit on the sulfur content of fuels to 2.5 percent by weight for smaller sources. The emission units included in the proposed Project would comply with this rule by combusting only pipeline quality natural gas or other fuel containing sulfur equivalent of less than 2.5 percent by weight. Compliance with this rule is supported by the tariff for the natural gas used in the proposed emission units, which defines a maximum sulfur content of 20 grains per 100 dry standard cubic feet. This concentration is significantly less than 2.5 percent weight limit imposed by this rule; therefore, compliance with this rule would be achieved on a continuous basis.

GRAQC 391-3-1-.02(2)(n), *Fugitive Dust*, requires facilities to take reasonable precautions to prevent fugitive dust from becoming airborne. The Companies would be required to abide by this regulation during both the construction and operational phases of this Project.

GRAQC 391-3-1.03, *Permits*, requires that any project meeting applicability thresholds would be required to obtain air quality permits prior to initiating construction. The Companies have applied for the appropriate SIP permits for the LNG Terminal and the Hartwell, Jefferson County, and Rincon Compressor Stations. A permit has been issued for Project work at the Hartwell Compressor Station and negotiations are ongoing for the LNG Terminal and the Jefferson County and Rincon Compressor Stations.

Georgia's Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions may be imposed at GEPD's discretion. Air toxics analyses were performed for the LNG Terminal and the Hartwell Compressor Station. The results of these analyses are discussed in section 2.7.1.3.

2.7.1.3 Air Quality Impacts and Mitigation

Local air impacts and emissions were identified as a concern during Project scoping. The Project would produce air pollutant emissions from both construction and operation. Construction of the liquefaction facilities would occur over a period of 2 years. Construction at the Harwell, Jefferson County, and Rincon Compressor Stations would occur over a period of 2 years. Construction at metering stations would occur over a period of slightly more than 1 year. Following construction, air quality would not revert back to previous conditions but would transition to operational emissions after commissioning and initial startup of the Project facilities.

Construction Impacts and Mitigation

Construction of the Project facilities would result in intermittent and short-term increases in emissions of air pollutants. These emissions would include combustion emissions from the use of fossil fuel-fired construction equipment and fugitive dust from construction vehicle movement and soil disruption activities such as trenching and backfilling. There also would be some temporary indirect emissions attributable to construction workers commuting to and from work sites during construction; ships, trucks, and barges transporting construction materials; and on-road and off-road construction vehicle traffic.

Large earth-moving equipment and other mobile equipment may be powered by diesel or gasoline and are sources of combustion-related emissions, including criteria pollutants (i.e., NO_x, CO, VOC, SO_2, and PM_{10}) and GHGs. Exhaust emissions from construction equipment at the LNG Terminal; the Hartwell, Jefferson County, and Rincon Compressor Station Sites; the Elba Island Interconnect, Port Wentworth, EEC North, and Del Webb Sites; and the off-site wareyard were calculated using the EPA's NONROAD Model, predicted equipment usage, and emission factors specific to each county affected by the proposed Project. The construction equipment used was assumed to be of Tier 1 quality gasoline engines with 4-stroke overhead valve engines. Construction emissions estimated for the Project are summarized in table 2.7.1-3.

Emissions from on-road commuter vehicles and the ships, barges, and trucks transporting construction materials at the LNG Terminal were estimated using emission factors generated from the EPA Motor Vehicle Emission Simulator (MOVES) model. Emissions from on-road commuter vehicles and trucks transporting construction materials at the Hartwell, Jefferson County, and Rincon Compressor Station Sites; the Elba Island Interconnect, Port Wentworth, EEC North, and Del Webb Sites; and the off-

site wareyard were estimated using emission factors generated from EPA Mobile6.2 model. Project construction emissions estimates are summarized in table 2.7.1-3.

Vehicular, ship, and barge exhaust and crankcase emissions from gasoline and diesel engines would comply with applicable emission standards for non-road diesel engines as outlined in 40 CFR Part 89 by using equipment manufactured to meet these specifications. The Companies would ensure that all gasoline and diesel engines used during construction would be operated and maintained to comply with EPA standards. Fuel used in these engines would meet current EPA standards for sulfur content as outlined in 40 CFR 80 Subpart I.

Fugitive dust would result from land clearing, grading, excavation, concrete work, and vehicle traffic on paved and unpaved roads. The quantity of fugitive dust generated by construction-related activities depends on several factors, including the size of area disturbed; nature and intensity of construction activity; surface properties (such as the silt and moisture content of the soil); wind speed; and the speed, weight, and volume of vehicular traffic. Estimates of fugitive dust emissions were calculated based on EPA AP-42 chapter 13 emission factors for paved roads, unpaved roads, and heavy construction equipment, and include control efficiency. Table 2.7.1-3 includes the emissions associated with estimated fugitive dust generation.

TABLE 2.7.1-3

Total Project Construction Emissions Summary

	Emissions (tons/year)					
Source Type	NO_x	CO	SO_2	VOC	PM_{10}	GHG (CO_2e)
Construction equipment	60.13	29.09	0.061	8.15	3.68	2,646.1
Commuter traffic	2.65	28.67	0.04	1.53	0.538	112,741.0
Delivery vehicles	34.38	125.05	0.201	4.28	2.215	27,849.4
Fugitive Dust	n/a	n/a	n/a	n/a	51.28	n/a
Total	97.16	182.81	0.302	13.96	57.71	143,236.4

n/a Not applicable

The Companies created a Fugitive Dust Control Plan that describes mitigation measures to control fugitive dust emissions. Emission reduction measures identified in the plan include water suppression, covering truckloads during transit, limiting on-site vehicle speed, and measures to reduce track-out on public roads. The plan also identifies methods for how the Companies would implement these measures and provides information about accountability and individuals with authority regarding fugitive dust mitigation. We have reviewed the Fugitive Dust Control Plan and found it acceptable.

Construction of the Project would occur over a 3-year period, resulting in short-term impacts on air quality. Conditions after completion of construction would transition to operational-phase emissions after commissioning and initial startup of the facility.

Operational Impacts and Mitigation

The Project would include the installation and operation of the following stationary point sources of air pollutants at the LNG Terminal:

- two natural gas-fired heat medium heaters, each rated at 98.1 MMBtu/hr and equipped with selective catalytic reduction;
- two diesel-fired emergency generators, each rated at 3,353 hp;
- two thermal oxidizers, each rated at 32.8 MMBtu/hr and equipped with low NO_x burners;
- one process flare system, composed of one high temperature ground flare and one low temperature ground flare;
- one marine flare; and
- one diesel-fired firewater pump engine rated at 493 hp.

In addition, the following potential activities would be non-stationary or infrequent at the LNG Terminal:

- truck loading and unloading of liquids;
- working and breathing losses from storage tanks;
- emergency venting;
- fugitive emissions sources (valves, flanges, connectors, and pump seals);
- maintenance activities;
- temporary fired equipment; and
- laboratory equipment.

The Project would include the installation and operation of the following stationary point sources of air pollutants at the Hartwell Compressor Station:

- four Solar Mars 100 compression units, each with an ISO rating of 15,900 hp;
- one natural gas-fired emergency generator, rated at 1,341 brake horsepower (bhp);
- fugitive emissions sources; and
- other appurtenant activities, including a pig launcher/receiver, blowdown activities, parts washer, shop welding equipment, sand blasting equipment, and spray painting operation using pressurized spray cans.

The Project would include the installation and operation of the following stationary point sources of air pollutants at the Jefferson County Compressor Station:

- two Solar Mars 100 compression units, each with a FERC certificated capacity of 15,900 hp;
- one natural gas-fired emergency generator, rated at 804 bhp;
- one electric fuel gas heater;
- one gas cooler;
- fugitive emissions sources; and
- other appurtenant activities, including a pig launcher/receiver, blowdown activities, parts washer, shop welding equipment, sand blasting equipment, and spray painting operations using pressurized spray cans.

The Project would include the installation and operation of the following stationary point sources of air pollutants at the Rincon Compressor Station:

- one Solar Mars 100 compression unit with a FERC certificated capacity of 15,900 hp;
- one electric turbine with an approximate FERC certificated capacity of 15,900 hp,
- one natural gas-fired emergency generator, rated at 804 bhp;
- one electric fuel gas heater;
- one gas cooler;
- fugitive emissions sources; and
- other appurtenant activities, including a pig launcher/receiver, blowdown activities, parts washer, shop welding equipment, sand blasting equipment, and spray painting operations using pressurized spray cans.

The Project would also include miscellaneous piping and measurement upgrades at the EEC North, Port Wentworth, Elba Island Interconnect, and Del Webb Sites; however, no new emissions sources would be installed and operated at these sites as part of the Project.

Operation of the Project's aboveground facility modifications at the LNG Terminal and Hartwell Compressor Station and the greenfield facilities at Jefferson County and Rincon Compressor Stations would result in air emissions increases over existing emissions levels. Emission calculations have been submitted to GEDP through the air permit application process. The PTE of the currently operating equipment and additional emissions resulting from the proposed Project actions are summarized in tables 2.7.1-4 and 2.7.1-5. The Jefferson County and Rincon Compressor Stations would be new facilities; therefore, there would be no existing emissions associated with these facilities.

TABLE 2.7.1-4

Summary of Existing Equipment Potential to Emit

	Emissions (tons/year)							
Site	NO_x	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	GHG (CO_2e)	HAPs
LNG Terminal	636	708	6	92	16	16	--	--
Hartwell CS	37.82	47.89	1.36	13.12	2.70	2.70	50,805	3.09

TABLE 2.7.1-5

Summary of Proposed Modifications (New Sources) Potential to Emit

	Emissions (tons/year)							
Site	NO_x	CO	SO_2	VOC	PM_{10}	$PM_{2.5}$	GHG (CO_2e)	HAPs
LNG Terminal	39.5	150.3	25.1	29	9.4	9.4	377,490	2.3
Hartwell	231.25	233.19	8.52	80.97	45.13	45.13	305,647	7.65
Jefferson County	115.92	117.18	4.26	40.63	22.57	22.57	158,933	3.82
Rincon	56.1	56.9	2.1	19.7	10.9	10.9	76,590	1.86

As part of the air permit application process, the Companies prepared a BACT for CO and GHGs at the LNG Terminal. Methods for reducing emissions of CO and GHGs from direct heaters, thermal oxidizers, process flare, marine flare, emergency generators, firewater pumps, and fugitive components were evaluated based on technical feasibility. The Companies would reduce normal operating emissions of CO_2e and CO from the direct heaters through the use of low-carbon fuel, such as BOG or natural gas; efficient heater design; implementation of good combustion practices; and good operating and maintenance practice. The thermal oxidizers would utilize low-carbon supplemental fuel, such as BOG or

natural gas; efficient design; implementation of good combustion practices; and good operating and maintenance practice. Emissions from the flares would be reduced through the use of natural gas in pilots and as supplemental fuel only when needed to ensure proper combustion; implementation of good combustion practices; good operating and maintenance practice, and the use of a BOG system to limit the amount of waste gas flared. The emergency generator and firewater pump engines would reduce emissions by utilizing efficient design, implementation of good combustion practices; and good operating and maintenance practices. Fugitive GHG emissions would be reduced by the implementation of the TCEQ 28-VHP Leak Detection And Repair program; use of an audio, visual, olfactory program to monitor for leaks, and constructing the equipment out of high quality components and materials.

A BACT analysis was not required for Project work at the Hartwell, Jefferson County, or Rincon Compressor Stations. Emissions from sources at these sites, however, would also be limited by federal regulations. The turbines at all three sites would be subject to NSPS KKKK, which limits NO_x and SO_2 emissions. SO_2 emissions would be limited through the exclusive combustion of pipeline quality natural gas. Turbines would be outfitted with $S_oL_oNO_x$ technology to reduce NO_x emissions. The emergency generators at each site would be subject to NSPS JJJJ and all units would be designed and manufactured to meet the requirements of this section.

Air dispersion modeling was performed for CO at the LNG Terminal using the EPA's approved AERMOD dispersion modeling program. The Companies modeled the CO emissions from the Project and compared the highest modeled concentration for each pollutant and averaging period to the significant impact levels (SILs). A summary of this significance modeling is provided in table 2.7.1-6.

TABLE 2.7.1-6

Significant Impact Analysis Summary, LNG Terminal

Meteorological Data Year	Pollutant	Averaging Period	Modeled Concentration µg/m3	SIL µg/m3	NAAQS µg/m3
2007	CO	8-hour	100.9	500	10,000
2008			87.3		
2009			92.3		
2010			74.2		
2011			98.9		
2007	CO	1-hour	212.7	2,000	40,000
2008			204.2		
2009			209.3		
2010			215.6		
2011			224.7		

As shown in the table above, the highest modeled concentrations for each averaging period is below the applicable SIL.

To identify the total impact of the facility after completion of the Project, we referenced modeling performed for the Elba III Project.[15] Elba III Project modeling included operational emissions from Terminal equipment, two LNG vessels at berth offloading simultaneously, combustion of heavy fuel oil in the LNG vessel steam turbine operation, and two tug assist vessels for each LNG vessel during berthing and unberthing. Results of the Elba III Project modeling are shown in table 2.7.1-7.

[15] Modeling methods, assumptions, and results for the Elba III Project are documented in the EIS issued August 3, 2007 (Docket Nos. PF06-14 and CP06-470).

TABLE 2.7.1-7

Summary of Modeled Air Quality Impacts, Elba III Project

Pollutant	Averaging Period	Modeled Concentration [a] µg/m3	NAAQS µg/m3
CO	8-hour	2,650.17	10,000
CO	1-hour	4,201.29	40,000

[a] Includes background concentration and impacts from the Elba III Project.

We estimated short-term CO impacts by adding the Project modeling results to the Elba III Project modeling results. This method represents a very conservative approach of estimating total facility emissions. When results from the two projects are summed, the highest modeled concentrations for each averaging period is below the applicable NAAQS; therefore, the LNG Terminal modification would not cause or contribute to an exceedance of the NAAQS and no further modeling is necessary.

An air toxics analysis for hexane, formaldehyde, and benzene was submitted to GEPD in April 2014. Both analyses were updated in September 2014 to incorporate changes to the facility design. GEPD reviewed and approved the modeling protocol and results during the air permitting process. Screening analyses performed at both the Jefferson County and Rincon Compressor Stations demonstrated compliance with the NAAQS. An air toxics analysis for the Hartwell Compressor Station was submitted to GEPD along with the Application to Construct. As shown in table 2.7.1-8, the impacts from Project modifications at the LNG Terminal and the Hartwell Compressor Station are predicted to be insignificant.

TABLE 2.7.1-8

Air Toxics Ambient Impact Assessment

Location	Pollutant	Meteorological Data Year	15-minute H1H µg/m^3	15-minute AAC µg/m^3	Annual H1H µg/m^3	Annual AAC µg/m^3
LNG Terminal	Benzene	2011	1.2	1,600	0.04	0.13
LNG Terminal	Formaldehyde	2009	19.83	245	0.23	0.77
LNG Terminal	Hexane	2011	1.13	17,600	0.027	700
Hartwell Compressor Station	Formaldehyde	2011	0.955	245	0.013	0.77
Hartwell Compressor Station	Acrolein	2011	0.0088	23	0.0001	0.02
Hartwell Compressor Station	Acetaldehyde	2011	0.0537	4,500	0.0007	4.55

Potential impacts on air quality associated with construction and operation of the Project would be minimized by strict adherence to all applicable federal and state regulations. Based on the analysis presented above, operation of the modified LNG Terminal and Hartwell Compressor Station and the new Jefferson County and Rincon Compressor Stations would not have a significant impact on local or regional air quality.

2.7.2 Noise

Construction and operation of the Project facilities would affect the local noise environment in the Project area. The ambient sound level of a region, which is defined by the total noise generated within the specific environment, is usually comprised of sounds emanating from both natural and artificial sources. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week, in part due to changing weather conditions and the impacts of seasonal vegetative 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 (Leq) and the day-night sound level (Ldn). The Leq is an A-weighted sound level with the same sound energy as the instantaneous sound levels measured over a specific time period. Noise levels are perceived differently, depending on length of exposure and time of day. The Ldn takes into account the duration and time the noise is encountered. Specifically, in the calculation of the Ldn, late night to early morning (10:00 p.m. to 7:00 a.m.) noise exposures are penalized +10 decibels (dB), to account for people's greater sensitivity to sound during the nighttime hours. The A-weighted decibel scale (dBA) is used because human hearing is less sensitive to low and high frequencies than mid-range frequencies. For an essentially steady sound source that operates continuously over a 24-hour period and controls the environmental sound level, the Ldn is approximately 6.4 dB above the measured Leq.

In 1974, the EPA published its Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. This document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has indicated that an Ldn of 55 dBA protects the public from indoor and outdoor activity interference. We have adopted this criterion and use it to evaluate the potential noise impacts from the Project at NSAs, such as residences, schools, or hospitals. Due to the 10 dBA nighttime penalty added prior to calculation of the Ldn, for a facility to meet the Ldn 55 dBA limit, it must be designed such that actual constant noise levels on a 24-hour basis do not exceed 48.6 dBA Leq at any NSA. Also, in general, a person's threshold of perception for a perceivable change in loudness on the A-weighted sound level is about 3 dBA, whereas a 5 dBA change is clearly noticeable, and a 10 dBA change is perceived as either twice or half as loud. There are no applicable state noise regulations that apply to the Project area. Local noise ordinances apply to the Project in Chatham County, Georgia and Jasper County, South Carolina which establish specific prohibited activities as well as maximum permissible sound pressure levels based on the receiving area.

Chatham County enforces its Noise Control Ordinance for the Unincorporated Area of Chatham County, Georgia, which establishes specific prohibited activities as well as maximum permissible sound pressure levels based on land use at the noise source property line or the receiving area. The Chatham County noise ordinance (24-304 Noise Disturbance Prohibited) limits sound pressure levels from the LNG Terminal to no greater than 60 dBA during the day (7:00 a.m. to 10:00 p.m.) and 55 dBA at night (10:00 p.m. to 7:00 a.m.) at any residential property lines; less than 55 dBA at any NSA; less than 75 dBA at a receiving Industrial property line; and less than 65 dBA at a business property line. The noise ordinance also establishes that the maximum sound level limits shall be reduced by 5 dBA for any source of sound which emits a pure tone and also prohibits construction during the hours of 10 p.m. and 7 a.m. if it creates a noise disturbance across a residential real property boundary. At any other hours, construction noise levels at NSAs are limited to 75 dBA. Construction activities for the LNG Terminal would occur primarily during daytime hours with the exception of staging materials at the on-site and off-site wareyard locations.

Jasper County, South Carolina maintains a noise ordinance under Article III. Section 10-51 of the Jasper County Code of Ordinances which, in general, prohibits the public from emanating noise in excess of 70 dB during the daytime or in excess of 60 dB during the nighttime. This ordinance does not apply to construction sites during daytime hours (7:00 a.m. to 10:00 p.m.).

Because the construction activities for the Project facilities would be limited to daytime hours, with the exception of staging materials from the LNG Terminal on-site and off-site wareyards, the noise is not expected to exceed the FERC noise guideline or the Chatham County and Jasper County noise ordinances, which are less restrictive.

2.7.2.1 Existing Noise Conditions

The existing noise environment is characterized by determining ambient noise levels, identifying existing noise sources, identifying noise-sensitive receptors, and evaluating local terrain features that may affect noise propagation.

Liquefaction Facilities

The new liquefaction facilities would be located adjacent to the existing LNG Terminal, generally north and west of the currently operating storage tanks, and entirely within the fenced area on Elba Island. Land use in the project area includes a mixture of industrial and commercial land, residential land, and coastal marshlands. Land to the west of Elba Island and immediately across from Elba Island is zoned heavy industrial. Land to the north and east across the Savannah River from Elba Island in Jasper County, South Carolina, consists of COE Dredge Material Disposal Sites. Undeveloped coastal marshlands associated with Fort Pulaski National Monument (FOPU) is located immediately south and southeast of the LNG Terminal, and the nearest residential areas are southwest of Elba Island. Identified NSAs remain unchanged since the latest project at the LNG Terminal, completed in 2013. There are no NSAs within 1-mile of the project area.

We received comments from the NPS requesting that FOPU and Fort James Jackson should be considered NSAs and that Project-related noise levels be restricted to natural ambient levels at the nearest FOPU boundary to the extent possible. We note that the current noise levels are likely above natural ambient due to human activity in the area. The nearest FOPU boundary is located immediately south of Elba Island by approximately 0.3 mile, and the principal FOPU facilities (publicly accessible areas) are approximately 6 miles southeast of Elba Island. Fort James Jackson is located about 1.8 miles west of Elba Island. The NPS commented that the FOPU boundary should receive consideration as an NSA because of its proposed designation as a wilderness area, which the NPS is obligated to protect until the legislative designation process has been concluded. In addition, they commented that Fort James Jackson is considered sensitive due to it being a significant historic place designated by the Secretary of Interior. Estimated noise impacts at these two sites are discussed below in section 2.7.2.2.

Outside of the FOPU boundary, the nearest NSAs are existing residences in subdivisions southwest of the LNG Terminal along the north side of the Islands Expressway and east side of Elba Island Road. These include NSA 1 located on Causton Harbor Road and Bartow Point Road, directly across Elba Island Road from the LNG Terminal, and NSA 2 located on Riverview Road along the east side of the Islands Expressway. Both NSAs are located approximately 10,400 feet southwest of the LNG Terminal. Other NSAs are located farther away from the identified NSAs where noise levels from the LNG Terminal would be further attenuated. The nearest industrial area is located approximately 4,900 feet west of the LNG Terminal but would not be considered an NSA.

The Companies conducted sound survey measurements of the existing LNG Terminal at the two closest residential NSAs on July 22 and 23, 2013 following construction of new BOG compressors. The noise survey was completed without operating in LNG unloading mode, thus the LNG Terminal equipment was operated at less than 100 percent terminal capacity. Based on the noise survey, the highest Ldn levels measured were 51.8 dBA and 52.7 dBA at NSA 1 and NSA 2, respectively. The LNG Terminal's contribution to overall noise was estimated to be an Ldn of 27.5 dBA based on sound measurements collected closer to operating equipment.

Compression and Metering Facilities

Hartwell Compressor Station

The land uses surrounding the Hartwell Compressor Station include mostly undeveloped, privately owned land (primarily forested) with some agricultural land, along with some residences located within 1 mile of the site. The nearest residences are located between approximately 1,650 to 3,500 feet from the station site center.

In May 2013, the Companies conducted a noise survey at the Hartwell Compressor Station property lines and the nearest NSAs during full load operation of the compressor station. Table 2.7.2-1 shows the L_{dn} sound levels measured at the nearest NSAs to the Hartwell Compressor Station.

TABLE 2.7.2-1

Existing Noise Levels (dBA)

Noise-Sensitive Area	Approximate Distance to NSA (feet)	Direction	Equivalent L_{dn} Noise Levels
NSA 1: Residence	1,650	E	36.4
NSA 2: Residence	1,800	NE	40.4
NSA 3: Residence	1,850	SSW	34.4
NSA 4: Residence	2,600	NNE	34.4
NSA 5: Residence	3,500	ESE	51.4

The residence at NSA 5 is the furthest from the Hartwell Compressor Station but also had the highest Ldn reading. According to the sound level survey completed by S&ME, Inc., a chicken farm operation is located within approximately 600 feet of NSA 5. Equipment associated with the chicken farm operation was audible from the NSA. The Leq sound levels for the Hartwell Compressor Station were only audible at the property lines. The compressor station was not audible at the NSAs. Due to the local terrain featuring primarily forested land between the Hartwell Compressor Station and NSA 5, it is probable other existing noise sources in the area impacted the ambient sound levels at this location.

Jefferson County Compressor Station

The land uses surrounding the Jefferson County Compressor Station include mostly undeveloped, privately owned land (primarily planted pine) with some agricultural pasture land along with a few residences located within 1 mile of the site. The nearest residence (referred to as NSA 1) is located approximately 2,900 feet west of the site.

In July 2013, the Companies conducted noise surveys at NSAs near the Jefferson County Compressor Station. The Ldn sound level measured at NSA 1 was 46.8 dBA. Ambient sound levels were only measured at the closest NSA to the Jefferson County Compressor Station since other nearby NSAs are located further from the site.

Rincon Compressor Station

The land uses surrounding the Rincon Compressor Station include mostly undeveloped, privately owned land (primarily forested) with some agricultural land and some industrial facilities, along with a couple residential structures. The nearest residences are 2,700 feet southwest of the site (referred to as NSA 1) and 3,000 feet west-southwest of the site (referred to as NSA 2).

In July 2013, the Companies conducted noise surveys at the two NSAs nearest the Rincon Compressor Station. The Ldn sound levels measured at the nearest NSAs were 41.9 dBA (NSA 1) and 45.2 dBA (NSA 2). Ambient sound levels were only measured near the closest NSAs to the Rincon Compressor Station. Other NSAs are located within 1 mile of the site but further from the site.

2.7.2.2 Noise Impacts and Mitigation

Noise modeling of both construction and operational activities for the Project was performed for the LNG Terminal and the Hartwell, Jefferson County, and Rincon Compressor Stations using SoundPLAN noise modeling software with noise impacts predicted at the nearest NSA to each location using the CONCAWE predication method. A noise quality analysis was provided for temporary construction noise at the new and existing compressor station sites including the metering facilities and the results are provided in the sections below.

Construction Noise

Construction of the Project facilities would involve operation of general construction equipment and noise would be generated during the installation of the Project components. Construction activity, and associated noise levels, would vary depending on the phase of construction in progress at any one time. Measures to mitigate construction noise would include compliance with federal regulations limiting noise from trucks, proper maintenance of equipment, and ensuring that sound muffling devices provided by the manufacturer are kept in good working condition. Noise levels would increase in the immediate vicinity of the construction activities; however, the noise would be localized and temporary. Nighttime noise levels are not expected to increase during construction because most construction activities would be limited to daylight hours with the exception of certain construction activities that could occur at the liquefaction facility described further below.

Liquefaction Facilities

Construction of the liquefaction facilities would take approximately 2 years. Construction noise would be highly variable because of the types of equipment in use would change with the construction phase and the types of activities. Noise from construction activities may be noticeable at nearby NSAs; however, construction equipment would be operated on an as-needed basis during the short-term construction period and therefore no significant noise impact is expected.

Noise generated at the LNG Terminal and off-site wareyard would be attributed to staged construction related to: 1) site preparation, 2) civil works, and 3) construction and installation of the MMLS units. Noise generated from site preparation would be from the use of heavy equipment during clearing, grading, and restoration activities within the limits of disturbance. Noise generated from civil works would be attributed to the installation of foundation structures and onsite roads using pile drivers and heavy equipment. Noise generated from construction and installation of the MMLS units would be generated during unloading equipment and supplies from barges and the transport of material to and from the on-site and off-site wareyards to the LNG Terminal. In order to limit potential impacts on adjacent properties, the Companies would limit site preparation and barge offloading activities to occur from dawn

to dusk. The Company's transport of large equipment would typically occur at night to minimize potential impacts on traffic by the slow moving vehicles. However, the noise generated by the Project-related truck traffic would be short-term, temporary, and intermittent. The Companies would perform the loudest and most persistent noise generating activities (e.g., tree clearing, stump grinding, structure demolition) during daylight hours. Nighttime activities would consist of truck traffic, cleanup, and staging of materials at the on-site and off-site wareyards, which generate less noise than other construction activities.

Site preparation of foundation structures at the LNG Terminal would include pile driving during daylight hours. Pile driving for intermittent periods of time is expected to be the loudest of the construction activities at the LNG Terminal. The initial pile installation would be completed using an impact hammer with a vibratory hammer used to complete pile driving to the required design depth. The pile driving would be performed for intermittent periods of time over a 2- to 3-week period.

Construction noise levels were modeled for the three construction stages as applicable to the phased LNG Terminal construction. The construction noise analysis considered the noise produced by any significant sound sources calculated for the nearest residential NSA location, by phase, which are summarized in table 2.7.2-2. An estimate of noise relative to the FOPU boundary is discussed further below.

TABLE 2.7.2-2

Noise Quality Analysis
Maximum Calculated Construction Noise Levels (L_{dn}) at nearest residential NSA
by LNG Terminal Construction Phase (dBA)

Site Preparation	Civil Works Phase I	Civil Works Phase II	MMLS Construction and Installation Phase I	MMLS Construction and Installation Phase II
32.9	50.4	51.0	32.9	43.3

Potential in-water construction activities including dredging and the construction of offshore breasting dolphins using underwater pile driving would occur along the bulkhead face, north of the Elba Island Road Bridge in the South Channel Barge Dock Area. These construction activities would be of limited scope and short duration and be completed within seven days or less. The Companies would mitigate noise levels generated during pile driving by using timber piles and by using the vibratory pile driving method. Since dredging equipment and underwater pile driving (estimated to last for up to 4 hours per breasting dolphin) would generate maximum shallow underwater sound levels less than 150 dB, impacts on marine fauna should be limited to temporary avoidance of the immediate area for periods of up to 4 hours at a time, and therefore, impacts should be minor and temporary.

Construction activities associated with the liquefaction facility would result in temporary increases in ambient noise levels. Based on the anticipated noise levels attributable to short-term construction activities and with the implementation of the Companies noise mitigation measures, we conclude that noise impact from construction of the liquefaction facilities would be in compliance with applicable noise regulations at the nearest residential NSAs. As noted above, the pile driving would be performed for intermittent periods of time and over a 2- to 3-week period. In addition, as discussed in section 2.3.3.2, we recommend that in-water pile driving activities occur between May 15 and November 15, and if it cannot be conducted within this time window, no activities be authorized without further consultation from the NMFS and COE and further approval from the Commission, which could result in additional recommended mitigation measures.

Compression and Metering Facilities

Construction of the new compression facilities for Phases I, II, and III would generally proceed sequentially and take 9 months to complete at each site and for each phase. Construction of the Elba Island Interconnect Site would take approximately 4 months to complete while construction of the Port Wentworth Site would take approximately 7 months to complete. Construction of the EEC North Site and Del Webb Site would take approximately 3 months to complete.

Noise generated from the construction of the Hartwell, Jefferson County, and Rincon Compressor Stations, and the Elba Island Interconnect, Port Wentworth, EEC North, and Del Webb Sites are not expected to be noticeable at nearby NSAs due to the distances to nearby NSAs and the Companies' implementation of noise mitigation measures including restricting construction activities to daylight hours during the short-term construction periods.

The Companies completed a noise quality analysis to evaluate temporary construction noise impacts associated with the compression and metering facilities. The potential noise impacts were calculated for only the closest NSA since construction noise at other distant NSAs should be equal to or less than the estimated construction noise at the nearest NSA. The noise modeling and analysis results are provided in table 2.7.2-3.

In addition, the Companies completed a noise analysis for each compressor station that evaluated noise impacts when Phase I compressor units would be operating during the construction activities of the Phase II and Phase III facilities. Phase II and Phase III construction would be limited to daytime hours. Based on the evaluation, the total Ldn at each compressor station site during Phase I operation while Phase II and III construction activities are occurring would meet the Ldn 55 dBA limit at each NSA.

TABLE 2.7.2-3

Noise Quality Analysis
Estimated Construction Noise Levels (L_{dn}) at nearest NSA (dBA)

Site	NSA Type	Distance (feet) and Direction of NSA to Station Site Center	Current Ambient Sound Level (L_{dn})	Estimated Sound Level (L_{dn}) of Construction Activities	Construction Noise plus Ambient Sound Level (Total L_{dn})
Hartwell Compressor Station	Residence	1,650 (SW)	36.4	41.0	42.6
Jefferson County Compressor Station	Residence	2,900 (W)	46.8	40.0	47.7
Rincon Compressor Station	Residence	2,700 (SW)	41.9	41.0	44.7
West Line Twin 30s	Residence	600 (SW)	40.0	44.0	45.4
Del Webb Site	Residence	2,250 (N)	40.0	35.0	41.1
Port Wentworth Site	Residence	600 (S)	40.0	50.0	50.2
EEC North Site	Residence	750 (S)	40.0	45.0	46.0
Elba Island Interconnect Site	Residence	12,000 (SW)	38.5	26.0	38.8

Construction activities associated with the Project would result in temporary increases in ambient noise levels. Based on the anticipated noise levels attributable to short-term construction activities and with the implementation of the Companies' noise mitigation measures, we conclude that noise impacts from the construction of the compression and metering facilities would be in compliance with applicable noise regulations.

Operational Noise

Liquefaction Facilities

We received several comments concerning the operational noise impacts from the liquefaction facilities including comments from the NPS (addressed further below). Operation of the liquefaction facilities would involve numerous noise generating sources including, but not limited to, utilities such as pumps, blowers, compressors, cooler fans, condenser fans, and combustion units (heaters, thermal oxidizers, flares and generators). Noise would also be associated with the LNGC loading operations.

Noise level data for the major facility sources were obtained from equipment vendors and/or from measurements of similar sized sources and equipment at other liquefaction projects. The Companies performed computer modeling for two operating scenarios to predict sound levels that would be generated by operation of the Project. The operating scenarios are outlined below. Each operating scenario included an analysis of Phase I and Phase II MMLS operation.

Scenario 1: Predicted noise from operation of the liquefaction facility at full load (including BOG operations and transport of LNG to storage).

Scenario 2: Predicted noise from operation of the liquefaction facility at full load plus simultaneous operation of LNGC loadout equipment.

Based on the noise modeling analysis, the liquefaction facilities would meet the applicable FERC and Chatham county noise requirements. Table 2.7.2-4 details the estimated increase in sound level at the nearest NSA's for both of the proposed operating scenarios and both phases of each operation.

TABLE 2.7.2-4

Sound Level Predictions – Liquefaction Facilities

Residential NSA (distance/ direction)	Existing Sound Level L_{dn} (dBA)	Estimated Facility Sound Level at NSAs L_{dn} (dBA)				Estimated Total Sound Level at NSAs L_{dn} (dBA)				Increase Over Existing Sound Level L_{dn} (dBA)[a]			
		Scenario 1		Scenario 2		Scenario 1		Scenario 2		Scenario 1		Scenario 2	
		Ph 1	Ph 2	Ph 1	Ph 2	Ph 1	Ph 2	Ph 1	Ph 2	Ph 1	Ph 2	Ph 1	Ph 2
1 (10,400 feet SW)	51.8	47.0	51.9	48.0	52.2	47.0	51.9	48.0	52.2	1.2	3.1	1.5	3.2
2 (10,400 feet SW)	52.7	46.1	50.7	47.3	51.1	46.2	50.7	47.3	51.1	0.9	2.1	1.1	2.3

[a] Increase is calculated as the logarithmic addition of existing and predicted noise.
Ph = Phase

As indicated in table 2.7.2-4, the noise attributable to the liquefaction facilities without implementing noise mitigation would be below FERC's criteria of an L_{dn} of 55 dBA and the criteria outlined in the Chatham County, Georgia noise ordinance. As such, no mitigation measures are required. An acoustic package is integrated into the flare system design (wind fence lined with fiberglass insulation), but no other noise mitigation measures are identified for the liquefaction facilities.

Operation of the liquefaction facilities would occur in two phases with Phase I to include installation of three MMLS units, while Phase II would include installation of seven additional MMLS units. Therefore, to ensure that NSAs are not adversely impacted by the phased operation of the LNG Terminal, **we are recommending that:**

- **ELC and SLNG should file a full load noise survey for the LNG Terminal no later than 60 days after Phase I is placed into service. If a full load noise survey is not possible, ELC and SLNG should provide an interim survey at the maximum possible load and provide the full load survey within 6 months. If the noise attributable to the operation of the equipment at the LNG Terminal under interim or full load conditions exceeds an L_{dn} of 55 dBA at the nearby NSA, ELC and SLNG should reduce operation of the liquefaction facilities or install additional noise controls until a noise level below an L_{dn} of 55 dBA at the nearby NSA is achieved. ELC and SLNG should confirm compliance with the above requirement by filing a second noise survey with the Secretary no later than 60 days after they install the additional noise controls.**

In compliance with the condition above, ELC and SLNG would need to complete one noise survey after Phase I is placed in-service to ensure that the phased-in MMLS units are below 55 dBA L_{dn} at the nearest NSAs. If the noise levels reported in any of the noise surveys are over 55 dBA L_{dn}, ELC and SLNG would need to implement the required mitigation to reduce the noise impacts on the nearest NSAs within the time specified in the condition. Once Phase II is completed and placed into service, **we are recommending that:**

- **ELC and SLNG should file a full load noise survey with the Secretary no later than 60 days after placing the LNG Terminal Phase II facilities into service. If a full load noise survey is not possible, ELC and SLNG should provide an interim survey at the maximum possible load 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 load conditions exceeds an L_{dn} of 55 dBA at the nearby NSA, ELC and SLNG should file a report on what changes are needed and should install the additional noise controls to meet the level within 1 year of the in-service date. ELC and SLNG should confirm compliance with the above requirement by filing a second noise survey with the Secretary no later than 60 days after it installs the additional noise controls.**

Compression and Metering Facilities

Operation of the Project at the Hartwell, Jefferson County, and Rincon Compressor Stations would result in long-term, permanent noise impacts on noise receptors. A noise analysis was completed for each compressor station using sound level data for the specific equipment planned for the facility, including noise control measures, as outlined below, to minimize impacts. Noise modeling was not completed for the operation of the metering facilities; however, due to the limited scope of operations at these facilities, noise impacts are expected to be minimal.

The Companies would incorporate noise control measures and equipment sound specifications into the facility design plans to minimize impacts. Noise control measures and equipment sound specifications that have been found to be useful in noise mitigation of similar type of natural gas pipeline facilities and that would be implemented are discussed below:

- acoustically treated compressor building (e.g., insulated wall, roof panels, doors) with exterior silencers on air-supply fans associated with the building forced-air ventilation system;

- muffler on the exhaust of the turbine, as well as acoustic insulation on the exhaust pipe from the building wall to the exhaust muffler inlet flange (including expansion joint);
- air cleaner/silencer on the air intake of the turbine installed in the intake ductwork located inside the compressor building;
- limitations on maximum noise from the gas aftercooler (if needed);
- limitations on maximum noise from the lube oil cooler;
- aboveground sections of the unit suction, discharge and bypass lines (including metal pipe supports) of the turbine compressor unit would be acoustically insulated if required; and
- limitations on the maximum A-weighted sound level from the silenced unit blowdown vent.

Noise would generally be produced on a continuous basis by the compressor units and associated air handling units at the Hartwell, Jefferson County, and Rincon Compressor Stations. Noise level data for the main noise sources are based on vendor quotes, equipment size, power information, and from experiences with similar equipment in compressor station facilities.

A noise analysis for each compressor station was completed using sound level data for the specific equipment planned for the facility and calculations for the noise attenuation over distance. The results of the noise analysis for each site are summarized in table 2.7.2-5 for the impacts at the closest NSAs.

TABLE 2.7.2-5

NSA Sound Level Predictions for Project Compressor Stations

Receiving Area	Distance	Existing Sound Level (dBA)	Calculated L_{dn} attributable to new equipment (dBA)	Total L_{dn} (dBA)	Estimated Increase (dBA)
Hartwell Compressor Station					
NSA 1	1,650 feet (E)	36.4	43.2	44.0	7.6
NSA 2	1,800 feet (NE)	40.4	42.3	44.5	4.1
NSA 3	1,850 feet (SSW)	34.4	42.1	42.7	8.3
NSA 4	2,600 feet (NNW)	34.4	38.6	40.0	5.6
NSA 5	3,500 feet (ESE)	51.4	35.6	51.4	0.1
Jefferson County Compressor Station					
NSA 1	2,900 feet (W)	46.8	47.5	50.2	3.4
Rincon Compressor Station					
NSA2	2,700 feet (SW)	41.9	48.5	49.4	7.5
NSA 2	3,000 feet (WSW)	45.2	47.0	49.2	4.0

The noise analysis for each compressor station assumed that the turbine compressor units would be enclosed in an acoustically designed building with the previously listed noise mitigation measures. Additionally, the Project noise sources that could cause perceptible vibration (i.e., turbine exhaust noise) would be adequately mitigated. Therefore, there should not be any perceptible increase in vibration at any NSA during operation of the compressor stations.

As indicated in the noise analysis completed by Hoover & Keith, Inc. for the Hartwell, Jefferson County, and Rincon Compressor Stations, the noise attributable to each of the compressor stations would be below our criteria of an L_{dn} of 55 and the criteria outlined in the Chatham County, Georgia noise ordinance.

Operation of the Hartwell Compressor Station, as a result of the Project, would occur in three phases with the installation of two natural gas-driven turbine compressor units in Phase I, an additional turbine compressor unit installed in Phase II, and one more turbine compressor unit installed in Phase III. To ensure that NSAs are not adversely impacted by the phased operation of the expanded Hartwell Compressor Station, **we are recommending that:**

- **EEC should file a full load noise survey with the Secretary for the Hartwell Compressor Station no later than 60 days after the applicable compressor units are placed into service for the first, second, and third phases. If a full load noise survey is not possible, EEC should provide an interim survey at the maximum possible load and provide the full load survey within 6 months. If the noise attributable to the operation of the equipment at the Hartwell Compressor Station under interim or full load conditions exceeds an L_{dn} of 55 dBA at the nearby NSA, EEC should reduce operation of the compressor station or install additional noise controls until a noise level below an L_{dn} of 55 dBA at the nearby NSA is achieved. EEC should confirm compliance with the above requirement by filing a second noise survey with the Secretary no later than 60 days after it installs the additional noise controls.**

In compliance with the condition above, EEC would need to complete two noise surveys after the first and second phases are placed in-service to ensure that the phased operation of the compressor station is below 55 dBA L_{dn} at the nearest NSAs. Following in-service of the third phase, EEC would complete a final noise survey to ensure that the entire proposed compressor station, as proposed, is below our noise criteria of 55 dBA L_{dn} at the nearest NSAs. If the noise levels reported in any of the noise surveys are over 55 dBA L_{dn}, EEC would need to implement the required mitigation to reduce the noise impacts on the nearest NSAs within the time specified in the condition.

Operation of the new Jefferson and Rincon Compressor Stations would also occur in phases; however, while additional compression would be installed at the Hartwell Compressor Station during Phase II, no new compression would be installed during this phase at the Jefferson and Rincon Compressor Stations. The new compressor stations would each consist of one natural gas turbine compressor unit during Phase I and EEC would install a second compressor unit at each station during Phase III. with the installation of two natural gas-driven turbine compressor units in Phase I, an additional turbine compressor unit installed in Phase II, and one more turbine compressor unit installed in Phase III. To ensure that NSAs are not adversely impacted by the phased operation of the expanded Hartwell Compressor Station, **we are recommending that:**

- **For each Project phase that adds new or additional compression facilities at the Jefferson and Rincon Compressor Stations, EEC should file full load noise surveys with the Secretary no later than 60 days after placing the facilities into service. If full load condition noise surveys are not possible, the EEC should provide an interim survey at the maximum possible horsepower load and provide the full load survey within 6 months. If the noise attributable to the Phase I operation of the Jefferson and Rincon Compressor Stations under interim or full load conditions exceeds an L_{dn} of 55 dBA at the nearby NSA, EEC should reduce operation of the compressor station(s) or install additional noise controls until a noise level below an L_{dn} of 55 dBA at the nearby NSA is achieved. If the noise attributable to the Phase**

III operation of all of the equipment at the Jefferson and Rincon Compressor Stations, under interim or full horsepower load conditions, exceeds an L_{dn} of 55 dBA at any nearby NSAs, EEC should file a report on what changes are needed and should install the additional noise controls to meet the level within 1 year of the in-service date. EEC should confirm compliance with the above requirement by filing a second noise survey with the Secretary no later than 60 days after it installs the additional noise controls.

Blowdowns

During the scoping process we received comments from residents expressing concern about the existing and potential for additional or increased noise generated by compression and blowdown operations. The new compressor units would utilize a blowdown silencer for blowdown events during maintenance and commissioning activities. These scheduled events may occur multiple times per year. Noise impacts from these facilities would be mitigated through a variety of noise control measures including building insulation, use of silencers, and modifications in design location of piping, fans and venting. With incorporation of these control measures, the estimated sound levels would increase slightly but would remain below allowable limits at all nearby NSAs.

Based on information from the Companies, the blowdowns at each compressor station are typically infrequent and may be silenced or unsilenced. The Companies typically attempt to provide advanced notice to nearby residents before the activity begins. Required testing of the ESD system can occur once or twice per year and may include unsilenced blowdowns. Other activations of the ESD system due to an emergency are very infrequent (on average less than once per year). Unsilenced ESD blowdowns typically last less than 5 minutes. The unit blowdown silencer would attenuate the unsilenced blowdown noise to a level of 60 dBA at 300 feet from the outlet of the silencer, depending on the site location. The noise analysis for each compressor station met the L_{dn} 55 dBA limit at each NSA and included silenced blowdown events. To ensure that the actual noise levels resulting from operation of the compressor stations are not significant, **we recommend that:**

- **Prior to placing the Hartwell Compressor Station modifications and new Jefferson and Rincon Compressor Stations into service, EEC should file a landowner notification plan for planned blowdown events with the Secretary for review and written approval by the Director of the OEP.**

Noise Impacts at NPS-identified NSAs

We received comments from the NPS requesting an assessment of noise levels during the construction and operation of the liquefaction facilities at the FOPU and Fort James Jackson boundaries, including any mitigation actions to reduce or eliminate potential noise impacts on the park area. Based on this request, modeled noise predictions were completed by Hoover & Keith, Inc. at three locations including the FOPU and Fort James Jackson boundaries plus the terminus of the McQueens Island Trail. Table 2.7.2-6 provides a summary of the estimated ambient sound levels and estimated sound contribution of the LNG Terminal at the FOPU and Fort James Jackson boundaries based on an analysis of previous sound survey tests completed in the area. Based on these estimates, the existing LNG Terminal sound levels are below estimated ambient sound levels at each location.

TABLE 2.7.2-6

Estimated Ambient and Existing LNG Terminal Sound Levels (dBA)

Location	Approximate Distance and Direction to LNG Terminal (feet)	Estimated Ambient Sound Level (L_{dn})	Existing LNG Terminal Estimated Sound Level (L_{dn})
Closest Wilderness Boundary of Fort Pulaski National Monument	5,900 (S)	40.0	38.0
Terminus of the McQueens Island Trail (Ft. Pulaski)	10,300 (SE)	42.0	31.9
Fort James Jackson/Park	13,000 (WSW)	50.0	29.4

The predicted sound levels attributable to the Project for maximum noise activity during construction and operational scenarios are summarized in table 2.7.2-7.

Table 2.7.2-7

Predicted Construction and New Operational LNG Terminal Sound Levels (L_{dn}) in dBA

Location	Construction Scenario	Operational Scenario [a]
Closest Wilderness Boundary of Fort Pulaski National Monument	59.1	62.7
Terminus of the McQueens Island Trail (Ft. Pulaski)	49.0	50.1
Fort James Jackson/Park	44.0	45.8

[a] The predicted sound levels include "unattenuated" noise levels within the MMLS Units.

The NPS natural ambient sound levels (Ldn) and estimated ambient sound levels (Ldn) were used to assess the maximum potential noise increase for the operational and construction scenario of the liquefaction facilities and included the unattenuated noise increases over ambient sound levels at the NPS locations. As shown in table 2.7.2-7, construction noise would be above ambient sound levels at the NPS locations, however, this noise increase would be temporary and variable for the duration of the construction period and the Project phases.

Attenuation of the source noise levels related to the MMLS equipment and piping would be expected to lower the indicated Operational Scenario sound levels by approximately 3 to 4 dBA. Based on these predictions, the maximum construction and unattenuated operational sound levels would all exceed ambient sound levels at the NPS-identified NSAs, however, only the wilderness boundary location would exceed the FERC requirement of 55 dBA at NSAs. The exact distance that noise would attenuate to natural ambient levels has not been evaluated at this time because that evaluation would depend on the actual noise attenuation measures to be installed within the MMLS units. The wilderness boundary of the FOPU is only accessible by boat and is not accessible by the general public and, therefore, the noise attributable to the LNG Terminal operation at this location would not likely impact a visitor's experience. Noise from the terminal could potentially impact wildlife near the FOPU boundary. The more likely location visitors may reach, is the terminus of the McQueens Island Trail (also known as the Hiker Biker Trail). However, because the noise would attenuate with distance, affecting only a portion of the wilderness area and FOPU at large, we conclude that the LNG Terminal operational noise impacts on the FOPU and Fort James Jackson would not be significant.

We note that the existing LNG Terminal has been previously authorized, is currently in operation, and is not part of the proposed activities considered herein. While we conclude that the noise impact on the NPS-identified sites would not be significant, a noise survey to confirm our conclusion and disclose the noise impacts on visitors' experiences at the nearest location visitors would more likely reach. Therefore, **we recommend that:**

- **ELC and SLNG should include the terminus of the McQueens Island Trail as a NSA in its full load noise survey for the LNG Terminal.**

2.8 RELIABILITY AND SAFETY

2.8.1 Compression Facilities

The pressurization of natural gas at a compressor station involves some risk to the public in the event of an accident and subsequent release of gas. The greatest hazard is a fire or explosion following a leak or rupture at the facility. The modifications at the Hartwell Compressor Station and the construction and operation of the Jefferson County and Rincon Compressor Stations would represent a minimum increase in risk to the nearby public. With implementation of the required design and safety criteria identified previously, the compressor station sites would be constructed and operated safely.

The DOT is mandated to provide pipeline safety under Title 49, USC Chapter 601. The DOT's Pipeline and Hazardous Materials Safety Administration administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards that set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety. The Pipeline and Hazardous Materials Safety Administration ensures that people and the environment are protected from the risk of pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local levels.

The DOT provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing the federal standards. A state may also act as DOT's agent to inspect interstate facilities within its boundaries; however, the DOT is responsible for enforcement actions. Through an agreement with the DOT, the Georgia Public Service Commission exercises regulatory jurisdiction over natural gas pipeline transportation and safety. The state of Georgia does not have authority to inspect interstate pipeline facilities.

The DOT pipeline standards are published in Parts 190-199 of Title 49 of the CFR. Part 192 specifically addresses natural gas pipeline safety issues.

Under a Memorandum of Understanding on Natural Gas Transportation Facilities 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. Alternatively, an applicant must certify that it has been granted a waiver of the requirements of the safety standards by the DOT in accordance with section 3(e) of the Natural Gas Pipeline Safety Act. The FERC accepts this certification and does not impose additional safety standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the memorandum to promptly alert 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 modifications at the Hartwell Compressor Station and the construction and operation of the Jefferson County and Rincon Compressor Stations must be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. Part 192.163 to 192.173 of 49 CFR specifically addresses design criteria for compressor stations, including emergency shutdowns and safety equipment. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. The DOT specifies material selection and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion.

The DOT prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Each pipeline operator is required to establish an emergency plan that includes procedures to minimize the hazards of a natural gas pipeline emergency. Key elements of the plan include procedures for:

- receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- emergency system shutdown and safe restoration of service;
- making personnel, equipment, tools, and materials available at the scene of an emergency; and
- protecting people first and then property, and making them safe from actual or potential hazards.

The DOT requires that each operator establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials. The Companies would provide the appropriate training to local emergency service personnel before the pipeline is placed in service.

2.8.2 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 that each applicant identify how its proposed design would comply with

the DOT's siting requirements of 49 CFR 193, Subpart B. The level of detail necessary for this submittal requires the 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 that we considered during our review process. As part of the review required for FERC authorization, we use this information from the applicant 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 standards 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 a memorandum of understanding regarding the execution of each agency's respective statutory responsibilities to ensure the safe siting and operation of LNG facilities. In addition to the FERC's existing ability to impose requirements to ensure or enhance the operational reliability of LNG facilities, the memorandum specified that the FERC may, with appropriate consultation with the DOT, impose more stringent safety requirements than those in Part 193.

The USCG 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 USCG's regulations over LNG facilities are codified in 33 CFR Parts 105 and 127. In accordance with 33 CFR 127, the USCG has reviewed the proposed liquefaction facilities and stated that the existing WSA and LOR are adequate for the service associated with the proposed modifications. A copy of the correspondence between ELC and SLNG and the USCG is included in Appendix 1.A of Resource Report 1.[16]

In February 2004, the USCG, 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 USCG participate as cooperating agencies but remain responsible for enforcing their regulations covering LNG facility design, construction, and operation.

Section 2.8.2 discusses the principal properties and hazards associated with LNG, refrigerants, stabilized condensate products, and toxic components; section 2.8.3 provides a brief history on LNG incidents, section 2.8.4 discusses our technical review of the preliminary design; section 2.8.5 discusses siting requirements for ELC and SLNG's facilities; section 2.8.6 discusses the siting analysis of the LNG facility; section 2.8.7 discusses emergency response and evacuation planning; section 2.8.8 discusses LNG vessel safety; and section 2.8.9 provides conclusions regarding LNG facility reliability and safety.

[16] Accession number: 20140310-5158.

2.8.3 LNG Facility Hazards

Before liquefaction, ELC and SLNG would pre-treat the feed gas for the removal of mercury, H_2S, and CO_2. The hazards associated with the removal of these substances from the feed gas stream result from the physical and chemical properties, flammability, and/or toxicity of mercury, H_2S, and amine. ELC and SLNG propose a design capacity to handle up to 1 parts per million by volume (ppm-v) mercury, 34 ppm-v H_2S, and 3 mole percent CO_2. However, much 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. Mercury would be removed from the feed gas stream by adsorption in mercury guard beds. ELC and SLNG would need to replace the mercury guard beds by the end of their service life. Maintenance and safety procedures would cover the proper replacement and disposal of these beds. H_2S and CO_2 would be removed from the feed gas stream in the Acid Gas Removal Unit using 50 percent 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 system. Therefore, the amine solution would be regenerated periodically, where an acid gas stream with concentrations up to 1,450 ppm-v H_2S and 91 mole percent CO_2 would be separated from the contaminated amine solution and routed to an acid gas knockout drum that would separate any condensed liquid in the system before entering the thermal oxidizer for discharge to the atmosphere. The amine solution would primarily be handled at temperatures below the point at which it could produce enough vapors to form a flammable mixture with the exception of a very small portion of the process in which amine would be handled at a temperature in which a flammable mixture could form. A release of amine would form a liquid pool and may produce a flammable cloud. However, its impact would be smaller in comparison to other flammable products stored and handled on-site. In addition, an amine spill would be contained, as discussed under "Impoundment Sizing" in section 2.8.6.1. Therefore, the amine would not pose a significant hazard to the public, which would have no access to the on-site areas.

In addition to the removal of H_2S, CO_2, H_2O, and mercury, ELC and SLNG would remove heavier hydrocarbons that may be present in the feed gas. The stabilized condensate would primarily include pentane and heavier hydrocarbons as well as a small trace of toxic components that include benzene, toluene, and hexane. The stabilized condensate would be stored on-site at atmospheric pressure and temperature. Due to the temperature and pressure conditions under which the stabilized condensate would be produced, stored, and handled, a loss of containment would primarily result in a liquid release.

After removal of the heavy hydrocarbons and other components from the natural gas feed stream, ELC and SLNG would liquefy the natural gas. In this process, the gas would be cooled by thermal exchange with a mixed refrigerant that includes methane, ethylene, propane, isopentane, and nitrogen to achieve the liquefaction temperature. After cooling the natural gas into its liquid form, this LNG would be stored in the existing LNG storage tanks. The principal hazards associated with a release of LNG or refrigerants would be the potential for flammable vapor dispersion, radiant heat from a fire, and the ability to produce damaging overpressures.

Although not a part of the pretreatment or liquefaction process, an aqueous ammonia solution would be used in the utility system to control emission of NO_x. An aqueous ammonia solution (19 percent by weight) would be used in the Selective Catalytic Removal units in the heating medium heaters as the reduction agent used to remove NO_x to a level safe for emission. The aqueous ammonia solution would be stored on-site at atmospheric conditions. A release of aqueous ammonia would form a liquid pool and may produce a flammable or toxic cloud. However, its flammable distance would be smaller in comparison to other flammable products stored and handled on-site. In addition, an aqueous ammonia spill would be contained, as discussed under "Impoundment Sizing" in section 2.8.6.1. The toxic effects of aqueous ammonia are also discussed below under "Vapor Dispersion".

2.8.3.1 Hazardous Release

A release of hazardous fluid from piping or equipment is the initial event that results in all other potential hazards. This initial loss of containment can produce 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.

ELC and SLNG would store the following on-site: LNG at atmospheric pressure and at a cryogenic temperature of approximately -260 degrees Fahrenheit; ethylene at approximately 215 pounds per square inch gauge (psig) and -35 degrees Fahrenheit; propane at ambient temperature and elevated pressures (similar to the conditions typically used in propane storage and distribution); isopentane at ambient temperature and pressure; and stabilized condensate at ambient temperature and pressure.

The mixed refrigerant process stream would consist of methane, ethylene, propane, isopentane, and nitrogen. Cryogenic temperatures as low as -260 degrees Fahrenheit would occur within the mixed refrigerant process stream used to liquefy the feed gas. Loss of containment of LNG or mixed refrigerant liquid 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.

These releases may also quickly cool any materials contacted by the liquid, 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 degrees Fahrenheit) 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[17] have ranged from 0.2 pounds per square inch (psi) to 11 psi. These events are typically limited to the area within the spill and are not expected to cause damage outside the area engulfed by the LNG pool. However, an RPT may affect the rate of pool spreading and the rate of vaporization for a spill on water. Regardless, the proposed facilities would not be expected to produce liquid spills into the Savannah River because the existing marine facilities are equipped with impoundments that drain completely to prevent water collection, as required by 49 CFR 193.2173.

[17] 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.

2.8.3.2 Vapor Dispersion

In the event of a release, LNG, ethylene, propane, and isopentane would vaporize on release from any storage or process facilities. Depending on the size of the release, cryogenic liquids, such as LNG and mixed refrigerant, 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. Ethylene will produce approximately 380 ft^3 of gas for each cubic foot of liquid. Propane will produce approximately 267 ft^3 of gas for each cubic foot of liquid. Isopentane will produce approximately 200 ft^3 of gas for each cubic foot of liquid. In the event of a loss of containment of stabilized condensate, the stabilized condensate would spill primarily as a liquid and form a pool but would vaporize much more slowly than LNG or mixed refrigerant.

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 released and the temperature of the material. For example, an LNG release would initially form a denserthan--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 the ground before the LNG vapor cloud disperses below its lower flammable limit (LFL). An ethylene release would form a denser-than-air vapor cloud that would sink to the ground due to the cold temperature of the vapor. As the ethylene vapor cloud disperses downwind and mixes with the warm surrounding air, the ethylene vapor would become neutrally buoyant. Propane and isopentane releases would form a denser-than-air vapor cloud that would sink to the ground; however, both propane and isopentane remain denser than the surrounding air, even after warming to ambient temperatures.

The vapor cloud would continue to be hazardous until it dispersed below toxic levels and/or flammable limits. Toxicity is primarily dependent on the concentration of the vapor cloud in the air 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 Levels (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.[18] Other federal agencies, such as the DOE, EPA, and NOAA, use AEGLs and ERPGs as the primary measure of toxicity.[19,20,21]

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[18] EPA. *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.

[19] DOE. *Temporary Emergency Exposure Limits for Chemicals: Methods and Practice*. DOE Handbook, DOE-HDBK-1046-2008. August 2008.

[20] EPA. *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.

[21] NOAA. *Public Exposure Guidelines.* http://response.restoration.noaa.gov/oil-and-chemical-spills/chemical-spills/resources/public-exposure-guidelines.html. December 3, 2013.

There are three AEGLs and ERPGs that 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 that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory 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.

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) and AEGLs at varying exposure times (10 minutes, 30 minutes, 1 hour, 4 hours, and 8 hours) for a list of chemicals. The DOT has adopted the use of the ERPG-2 level to define toxicity impacts of released materials. FERC staff uses AEGLs preferentially as they are more inclusive and provide toxicity levels at various exposure times. The DOE and NOAA also use AEGLs preferentially. The toxic properties for the various material components stored and processed on-site are tabulated in table 2.8.2-1.

TABLE 2.8.2-1

Toxicity Levels of Various Material Components and Exposure Times (in ppm)[a,b,b,]

Material Components	Acute Exposure Guideline Level	10 min	30 min	60 min	4 hr	8 hr
Ammonia	AEGL 1	30	30	30	30	30
	ERPG 1	-	-	25	-	-
	AEGL 2	220	220	160	110	110
	ERPG 2	-	-	150		
	AEGL 3	2,700	1,600	1,100	550	390
	ERPG 3	-	-	1,500	-	-
Benzene	AEGL 1	130	73	52	18	9
	ERPG 1	-	-	50	-	-
	AEGL 2	2,000 [c]	1,100	800	400	200
	ERPG 2	-	-	150	-	-
	AEGL 3	9,700 [d]	5,600 [c]	4,000 [c]	2,000 [c]	990
	ERPG 3	-	-	1,000	-	-
Hexane	AEGL 1	NR	NR	NR	NR	NR
	ERPG 1	-	-	-	-	-
	AEGL 2	4,000 [c]	2,900 [c]	2,900 [c]	2,900 [c]	2,900 [c]
	ERPG 2	-	-	-	-	-
	AEGL 3	12,000 [d]	8,600 [d]	8,600 [d]	8,600 [d]	8,600 [d]
	ERPG 3	-	-	-	-	-
Hydrogen sulfide	AEGL 1	0.75	0.60	0.51	0.36	0.33
	ERPG 1	-	-	0.1	-	-
	AEGL 2	41	32	27	20	17
	ERPG 2	-	-	30	-	-
	AEGL 3	76	59	50	37	31
	ERPG 3	-	-	100	-	-

TABLE 2.8.2-1

Toxicity Levels of Various Material Components and Exposure Times (in ppm)[a,b,b,]

Material Components	Acute Exposure Guideline Level	10 min	30 min	60 min	4 hr	8 hr
Toluene	AEGL 1	200	200	200	200	200
	ERPG 1	-	-	50	-	-
	AEGL 2	3,100 [c]	1,600	1,200	790	650
	ERPG 2	-	-	300	-	-
	AEGL 3	13,000 [d]	6,100 [c]	4,500 [c]	3,000 [c]	2,500 [c]
	ERPG 3	-	-	1,000	-	-

[a] U.S. Environmental Protection Agency, Acute Exposure Guideline Levels, http://www.epa.gov/oppt/aegl/pubs/chemlist.htm, December 3, 2013.

[b] American Industrial Hygiene Association, 2013 ERPG/WEEL Handbook, http://www.aiha.org/get-involved/AIHAGuidelineFoundation/EmergencyResponsePlanningGuidelines, 2013.

[c] Greater than or equal to 10 percent LFL.

[d] Greater than or equal to 50 percent LFL.

[e] Greater than or equal to 100 percent LFL.

In addition, methane and heavier hydrocarbons are classified as simple asphyxiates and may pose extreme health hazards, including death, if inhaled in significant quantities within a limited time. Very cold methane and heavier hydrocarbon 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.

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, while 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 2.8.2-2.

TABLE 2.8.2-2

Flammable Properties[a]

Material Component	Flash Point	LFL (percent volume in air)	UFL (percent volume in air)
Methane	-283°F	5.0	15.0
Ethylene	-250°F	2.7	36
Propane	-155°F	2.1	9.5
n-Butane	-76°F	1.8	8.5
i-Butane	-105°F	1.8	8.4
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	11°F	1.4	7.1
Toluene	45°F	1.2	7.1
Mixed Refrigerant[b]	-307°F	1.7	17.1
Hydrogen sulfide	-116°F	4.0	44
Stabilized Condensate[c]	-37°F or less	1.3	8.4
Amine[d]	280°F	1.4	10.0
Hot Oil	295°F	1.0	7.0

[a] Society of Fire Protection Engineers, The SFPE Handbook of Fire Protection Engineering, Fourth Edition, 2008.

[b,c] Project specific – ELC and SLNG Response to Data Request No. 16 filed on September 8, 2015, Accession No. 20150908-5298.

[d] The Dow Chemical Company, Material Safety Data Sheet for n-Methyldiethanolamine (amine) (http://www.dow.com/webapps/msds/ShowPDF.aspx?id=090003e880681294), 2015.

The extent of the affected area and the severity of the impacts on objects within a vapor cloud would primarily depend on the material, quantity, and duration of initial release, the surrounding terrain, and the environmental conditions present during the dispersion of the cloud. Although hydrogen sulfide is a flammable material, it is only present at this facility in small quantities and mixtures with other materials, and always at concentrations less than its lower flammable limit. Therefore, toxicity would be the governing hazard for a release involving hydrogen sulfide. ELC and SLNG have modeled the extent of the potential vapor dispersion hazards for the Project, which is discussed in section 2.8.6.3.

2.8.3.3 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 can cause severe burns and death and can ignite combustible materials within the cloud. ELC and SLNG have modeled the extent of the potential flammable vapor dispersion hazards for the Project, which is discussed in section 2.8.6.3.

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. ELC and SLNG have modeled the extent of the potential overpressure hazards for the Project, which is discussed in section 2.8.6.4.

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 could transition to a fireball and result in a pool or jet fire back at the source. A fireball would 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. The potential radiant heat hazards for the Project are discussed in section 2.8.6.5.

2.8.3.4 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. If 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 USCG in the late 1970s at the Naval Weapons Center in China Lake, California. Using methane, the primary component of natural gas, several experiments were conducted to determine whether unconfined LNG vapor clouds would detonate. Unconfined methane vapor clouds ignited with low-energy ignition sources (13.5 joules) produced flame speeds ranging from 12 to 20 mph. These flame speeds are much lower than the flame speeds associated with a deflagration with damaging overpressures or a detonation.

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.

To examine the potential for detonation of an unconfined natural gas cloud containing heavier hydrocarbons that are more reactive, such as ethane and propane, the USCG conducted further tests on ambient-temperature fuel mixtures of methane-ethane and methane-propane. The tests indicated that the addition of heavier hydrocarbons influenced the tendency of an unconfined natural gas vapor cloud to detonate. Less processed natural gas with greater amounts of heavier hydrocarbons would be more sensitive to detonation.

Although it has been possible to produce damaging overpressures and detonations of unconfined LNG vapor clouds, the feed gas stream proposed for the Project would have lower ethylene 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, ELC and SLNG would take measures to mitigate the vapor dispersion and ignition into confined areas, such as buildings. ELC and SLNG 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.[22] 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. The mixed refrigerant process stream would contain a mixture of components such as the ones discussed above (i.e., methane, ethylene, and 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,

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[22] 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 release and cause a subsequent fireball.

Discussion of these hazards and potential mitigation are in section 2.8.6.4 for the Project facilities. ELC and SLNG have also mitigated the risk for cascading event hazards for the Project, which is discussed in section 2.8.6.6.

2.8.4 Past Incidents

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.[23] 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 the boiler firebox, which subsequently triggered a larger explosion of the hydrocarbon vapors in the immediate vicinity. The resulting fire damaged the adjacent liquefaction process and liquid petroleum gas separation equipment of Train 40 and spread to Trains 20 and 30. Although Trains 10, 20, and 30 had been modernized in 1998 and 1999, Train 40 had been operating with its original equipment since start-up in 1981. To ensure that this potential hazard would be addressed at the proposed Project, ELC and SLNG 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 that led to this incident will be applied to all facilities under the Commission's jurisdiction.

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[23] 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.

2.8.5 Technical Review of 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 a hazardous release of sufficient magnitude to create an off-site hazard as discussed in section 2.8.6. 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 multiple protection systems or safeguards to reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public. These layers of protection should be independent of one another so that each could perform its function regardless of the initiating event or action or failure of any other protection layer. Such design features and safeguards typically include:

- a facility design that prevents hazardous events 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 environmental 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- and off-site emergency response, including hazard detection and control equipment, firewater systems, on-site fire-fighting personnel and equipment, and coordination with local first responders to mitigate the consequences of a release and prevent it from escalating to a larger event.

We believe the inclusion of such protection systems and safeguards in a facility design would 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 on public safety. As discussed in section 2.8.5, DOT's regulations in 49 CFR 193, Subpart B require a siting analysis be performed by ELC and SLNG.

As part of its application, ELC and SLNG provided two FEED's for the Project. The original FEED was provided in the application on March 10, 2014 and an optimized FEED on September 12 and 19, 2014. Both FEED's were reviewed and evaluated. In developing the FEED, ELC and SLNG conducted a preliminary hazard and operability (HAZOP) study on the FEED design to identify potential risk scenarios. This helped to establish the required safety control levels and identify whether additional process and safety instrumentation, mitigation, and/or administrative controls would be needed. We have

analyzed the information filed by ELC and SLNG 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. LNG facilities including the MMLS units' piping, pumps, compressors, structural steel, and buildings would be designed to withstand a sustained wind speed of 150 mph, which converts to 183 mph with a 3-second gust duration, per 49 CFR 193.2067(b)(2)(i).[24] The wind forces on shop-fabricated containers of LNG or other hazardous fluids with a capacity of not more than 70,000 gallons would be based on applicable wind load data in ASCE/SEI/7-05 per 49 CFR 193.2067(b)(1). Therefore, MMLS unit equipment, such as pressure vessels and heat exchangers, would be designed to withstand a wind speed of 124 mph with a 3-second gust duration (i.e., 157 mph 3-second gust duration Ultimate Strength Design[25]), which would be consistent with application of ASCE-7 as incorporated by reference in 49 CFR 193.2067(b)(1).[26] As part of its role as a cooperating agency on this document, the DOT reviewed the design wind speed and determined that the selection of wind speeds for the design of the proposed facility would comply with the requirements of 49 CFR 193.2067.

The existing site elevations for the proposed Project areas range from 10 to 19 feet Mean Low Water (MLW). The majority of the proposed liquefaction facilities would vary based on the location between 11 to 32 feet MLW. The average finished elevations for the MMLS units would range between 13.5 to 18 feet MLW. ELC and SLNG propose to construct a storm surge wall that would be designed to protect the LNG Terminal and proposed liquefaction facilities from the impacts of potential flooding by the 500-year FEMA storm event and 100-year hurricane (i.e., Category 3 event hurricane). The 500-year FEMA storm event is based on the FEMA Flood Insurance Study for Chatham County, Georgia. The resultant still water storm surge elevation at the Project site is 14.7 feet (North American Vertical Datum 1988), which converts to 18.7 feet MLW. The analysis performed with regard to the design requirements of the storm surge wall installation resulted in the application of a 24.5-foot MLW storm surge wall being applied to the site and would range in height from 5.5 to 11 feet above the final elevation of the interior ground surface. The design requirement analysis of the storm surge wall also included a wave impact analysis that determined that a 500-year storm event, which corresponds to the wind speed of a Category 3 event hurricane, would have a maximum wave height of 5 feet. Based on this information, ELC and SLNG included a design wave height of 6.7 feet in the 24.5-foot MLW storm surge wall height. The 24.5-foot MLW also includes a predicted sea level rise, which was estimated to be approximately 3 inches over the Project life. Therefore, ELC and SLNG have conservatively included 6 inches within the 24.5-foot MLW storm surge wall height to account for the predicted sea level height. We believe the design requirements of the 24.5-foot MLW storm surge wall, which includes the 500-year storm surge, design wave height, and predicted sea level rise have been adequately addressed. The seismic and structural design of the storm surge wall and liquefaction facilities are discussed in section 2.1.1.3. In addition, sections 2.1.1 and 2.1.2 discuss FERC staff's examination of the seismic and structural design of the facilities.

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[24] A 150-mph sustained wind speed would correspond to a 183-mph, 3-second gust using the Durst Curve in ASCE 7-05. This wind speed is equivalent to approximately 100,000-year mean return interval or 0.05 percent probability of exceedance in a 50-year period for the site based on ASCE 7-05 wind speed return period conversions.

[25] The 157-mph Ultimate Strength Design was derived by multiplying the 124-mph wind speed by the square root of 1.6, because wind loads are a function of the square root of the wind speed.

[26] A 157-mph, 3-second gust duration wind speed is equivalent to approximately 13,000-year mean return interval or 0.38 percent probability of exceedance in a 50-year period for the site based on ASCE 7-05 wind speed return period conversions.

The closest airport to the Project site is the Savannah/Hilton Head International Airport, which is approximately 11 miles away. The proposed liquefaction facilities do not include any equipment over 200 feet in height, therefore, 14 CFR Part 77, specifically the requirements to provide notice to the Federal Aviation Administration of certain proposed construction, would not apply to the proposed project.

The design of the piping and equipment would use materials of construction suited to the pressure and temperature conditions of the process design. Piping would be designed, fabricated, assembled, erected, inspected, examined, and tested in accordance with American Society of Mechanical Engineers (ASME) B31.3 and B31.5. Pressure vessels would be designed in accordance with ASME Section VIII and storage tanks such as the recovered amine storage tank and the heating medium storage tank would be designed in accordance with American Petroleum Institute (API) Standard 650. Valves and other equipment would be designed to generally accepted good engineering practices such as API 600, 601, and 602 and ASME 16.5, 16.10, 16.20, and 16.34.

ELC and SLNG 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.

ELC and SLNG would expand the existing facility operation procedures to include the liquefaction facilities after completion of the final design; this timing is fully consistent with accepted industry practice. We have made recommendations for ELC and SLNG 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 measures such as labeling of instrumentation and valves, piping, and equipment and car-seals/locks, to address human factor considerations and improve facility safety.

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 generally accepted good engineering practices. We have 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. We have also made a recommendation to ensure an alarm management program would be in place to ensure effectiveness of the alarms.

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, and other 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 safety of the liquefaction facility are in the USCG regulations in 33 CFR 127. ELC and SLNG propose to install perimeter fencing, an access control system, security cameras, and intrusion detection system. Security personnel would also be on-site to respond to an emergency. 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 of 2002, which requires all terminal owners and operators to submit a Facility Security Assessment and a Facility Security Plan to the USCG for review and approval. Some of the responsibilities of the applicant include, but are not limited to:

- designating a Facility Security Officer with a general knowledge of current security threats and patterns, 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, 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 and 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.

The LNG Terminal has an existing Facility Security Plan that has been approved by the USCG. SLNG would update the Facility Security Plan to include the changes in operations and the increased facility footprint associated with the liquefaction project.

In the event of a flammable liquid release, sloped areas and drainage systems at the liquefaction facilities would direct a spill away from equipment 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. 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.

ELC and SLNG performed a preliminary fire protection review to ensure that adequate hazard detection, hazard control, and firewater coverage would be installed to detect and address any flammable releases. Structural fire protection to prevent failure of structural supports of equipment and pipe racks would comply with NFPA 59A and other generally accepted good engineering practices. ELC and SLNG 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. These systems would meet NFPA 72 and ISA 12.13 as well as other generally accepted good engineering practices. Hazard control devices would be installed to extinguish or control incipient fires and releases and would meet NFPA 10, 11, 12, 13, 59A, and generally accepted good engineering practices. ELC and SLNG 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. These systems would be designed to meet and NFPA 14, 15, 16, 17, 20, 22, 24, and 59A requirements. We have made recommendations for ELC and SLNG to provide more details about the design, installation, and commissioning of hazard

detection, hazard control, and firewater systems as ELC and SLNG further develop this information during the final design phase.

ELC and SLNG 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. ELC and SLNG would also be required to develop an ERP in accordance with EPAct 2005. As discussed further in section 2.8.7, an ERP has been in place since the LNG Terminal re-commissioned the import of LNG in 2001; however, ELC and SLNG would need to update the existing ERP to include the proposed liquefaction facilities and emergencies related to refrigerant handling.

As a result of the technical review of the information provided by ELC and SLNG in their application, we identified a number of concerns in data request letters issued on July 1, 2014, August 6, 2014, February 23, 2015, August 18, 2015, and November 20, 2015. ELC and SLNG filed written responses on July 21, 2014, August 26, 2014, September 12, 2014, March 16, 2015, September 8 and 25, 2015, and November 30, 2015. Some of these responses indicated that ELC and SLNG would correct or modify its design to address the identified issues. These responses are referenced in table 2.8.4-1. As a result, **we recommend that:**

- **<u>Prior to construction of the final design</u>, ELC and SLNG should file with the Secretary, for review and approval by the Director of OEP, information/revisions pertaining to ELC and SLNG's response to the Engineering Information Requests identified in table 2.8.4-1 of the EA, which indicated features to be included or considered in the final design.**

TABLE 2.8.4-1

ELC and SLNG's Responses Indicating Corrections or Modifications to FEED

Date of FERC Engineering Information Request	FERC Engineering Information Request	Filing Date of ELC and SLNG Response
July 1, 2014	28	July 21, 2014
August 6, 2014	35, 49, 52, 53, 54, 66, 71, 72, 73, 77, 78 and 79	August 26, 2014 September 12, 2014
February 23, 2015	3, 4, 5, 6, 9, 18, 19, 24, 26, 27, 31 and 36	March 16, 2015
August 18, 2015	15	September 8, 2015
	10	September 25, 2015
November 20, 2015	9, 15, 17	November 30, 2015

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. It is unlikely 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.

A more detailed and thorough HAZOP analysis would be performed by ELC and SLNG during the final design phase to identify the major hazards that may be encountered during the operation of facilities. The HAZOP study would be intended to address hazards of the process, engineering, and administrative controls and would provide a qualitative evaluation of a range of possible safety, health, and environmental effects that may result from the design or operation of the facility. Recommendations to prevent or minimize these hazards would be generated from the results of the HAZOP review.

Once the design has been subjected to a HAZOP review, ELC and SLNG's design development team would track changes in the facility design, operations, documentation, and personnel. ELC and SLNG 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 review would be monitored by FERC staff. We have included a recommendation that ELC and SLNG should file a HAZOP study 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 of 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 ELC and SLNG, 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 ELC and SLNG. Information pertaining to these specific recommendations should 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, should be submitted as critical energy infrastructure information 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, will be subject to public disclosure. All information should be filed a minimum of 30 days before approval to proceed is requested.**

- **Prior to initial site preparation, ELC and SLNG should file an overall Project schedule, which includes the proposed stages of the commissioning plan.**

- **Prior to initial site preparation, ELC and SLNG should provide procedures for controlling access during construction.**

- **Prior to initial site preparation, ELC and SLNG should file the quality assurance and quality control procedures for construction activities.**

- **Prior to initial site preparation, ELC and SLNG should file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.**

- **The final design should include change logs that list and explain any changes made from the FEED provided in ELC and SLNG'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 final design should provide up-to-date process flow diagrams with heat and material balances and piping and instrumentation diagrams (P&ID), which include the following information:**

  a. equipment tag number, name, size, duty, capacity, and design conditions;

  b. equipment insulation type and thickness;

c. storage tank pipe penetration size and nozzle schedule;

d. valve high pressure side and internal and external vent locations;

e. piping with line number, piping class specification, size, and insulation type and thickness;

f. piping specification breaks and insulation limits;

g. all control and manual valves numbered;

h. relief valves with size and set points; and

i. drawing revision number and date.

- **The final design should provide P&IDs, specifications, and procedures that clearly show and specify the tie-in details required to safely connect the Project to the existing facility.**

- **The final design should provide P&IDs that show the control valves, HCV-3701 and HCV-3801, on the Cold Box P&IDs US01-1120-P0037A and US01-1120-P0038A.**

- **The final design should provide an up-to-date complete equipment list, process and mechanical data sheets, and specifications.**

- **The final design should include three-dimensional plant drawings to confirm plant layout for maintenance, access, egress, and congestion.**

- **The final design should include a list of all car-sealed and locked valves consistent with the P&IDs.**

- **The final design should specify that the minimum flow set point of the cooling media to MK-0501 be equipped with an alarm that is active during operation of the motor.**

- **The final design should include a low instrument air pressure alarm and plant-wide shutdown initiated by low-low instrument air pressure. The setting should be above the minimum required to maintain stable operation.**

- **The final design should demonstrate that for hazardous fluids, piping and piping nipples 2 inches or less in diameter are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and operator live loads in areas accessible by operators.**

- **The final design should specify that the 150# piping specification, S1Y, downstream of the restriction orifice and pipe break in the 6-inch-diameter LNG rundown piping to the LNG storage tanks, should be tested to qualify the piping to operate at the specified maximum allowable operating pressure (MAOP) of the piping of 275 psig.**

- **The final design should specify that piping specifications for stainless steel piping capable of operating at cryogenic temperatures should require the inner and outer ring of spiral wound gaskets to be stainless steel.**

- **The final design should provide the procedures for pressure/leak tests that address the requirements of ASME VIII and ASME B31.3, as required by 49 CFR 193.**

- **The final design 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 final design should include drawings and details of how process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system meet the requirements of NFPA 59A.**

- **The final design 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 shut down the appropriate systems.**

- **The final design should provide electrical area classification drawings.**

- **The final design should include a HAZOP review of the completed design prior to issuing the P&IDs for construction. A copy of the review, a list of recommendations, and actions taken on the recommendations should be filed.**

- **The final design 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 final design should include a drawing showing the location of ESD buttons. ESD buttons should be easily accessible, conspicuously labeled, and located in an area accessible during an emergency.**

- **The final design should specify that all ESD valves are to be equipped with open and closed position switches connected to the Distributed Control System and Safety Instrumented System.**

- **The final design should include the sizing basis and capacity for the final design of the flare stacks as well as the pressure and vacuum relief valves for major process equipment, vessels, and storage tanks.**

- **The final design should include an evaluation that confirms remote sensing lines for pilot-operated relief valves are subject to chatter and are required by API 520/521. If sensing lines are used from the main process piping to the pilot relief valves, the sensing lines should be piping in order to ensure mechanical integrity.**

- **The final design should specify that the 1-inch-diameter sensing line from the main process piping should be equipped with a root valve at the nipple from the main line connection to provide isolation of the system in the event the sensing line is damaged or the needle valve malfunctions.**

- **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 Part 193. The evaluation should consider the need for clean agent fire suppression in the new switchgears and motor control centers. 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 spill containment system drawings with dimensions and slopes of curbing, trenches, and impoundments.**

- **The final design should provide complete drawings and a list of the hazard detection equipment. The drawings should clearly show the location and elevation of all detection equipment. The list should include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment.**

- **The final design should include a list of alarm and shutdown set points for all hazard detectors. The set points of the hazard detectors should account for the calibration gas when determining the lower flammable limit set points for flammable components such as refrigerants, natural gas liquids, and LNG.**

- **The final design should include a list of alarm and shutdown set points for all hazard detectors. The set points of the hazard detectors should account for the calibration gas when determining the set points for toxic components such as ammonia, natural gas liquids, and hydrogen sulfide.**

- **The final design should specify that a flammable gas detector with alarm is to be provided to monitor the vent from the seal gas system as shown on P&ID US01-1120-P0048C.**

- **The final design should include flammable gas monitoring and alarm of the vent gas from the heating medium system that flows to the flare system.**

- **The final design should provide complete plan drawings and a list of the fixed, wheeled, and 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 final design should provide facility plans and drawings that show the location of the firewater and foam systems. 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.**

- **<u>Prior to commissioning</u>, ELC and SLNG 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. ELC and SLNG should file documentation certifying that each of these milestones has been completed before authorization to commence the next phase of commissioning and startup will be issued.**

- **<u>Prior to commissioning</u>, ELC and SLNG 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.**

- **<u>Prior to commissioning</u>, ELC and SLNG should tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves.**

- **<u>Prior to commissioning</u>, ELC and SLNG should file updates addressing the liquefaction facilities in the operation and maintenance procedures and manuals as well as in the safety procedures.**

- **<u>Prior to commissioning</u>, ELC and SLNG should maintain a detailed training log to demonstrate that operating staff have completed the required training.**

- **<u>Prior to commissioning</u>, ELC and SLNG 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.**

- **<u>Prior to introduction of hazardous fluids</u>, ELC and SLNG 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 to demonstrate full functionality and operability of the system.**

- **<u>Prior to introduction of hazardous fluids</u>, ELC and SLNG should complete a firewater pump acceptance test and firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant should be shown on facility plot plan(s).**

- **<u>Prior to commencement of service</u>, ELC and SLNG should develop procedures for off-site contractors' responsibilities, restrictions, and limitations and for supervision of these contractors by ELC and SLNG staff.**

- **<u>Prior to commencement of service</u>, ELC and SLNG should label piping with fluid service and direction of flow in the field in addition to the pipe-labeling requirements of NFPA 59A.**

- **<u>Prior to commencement of service</u>, ELC and SLNG should specify an alarm management program to ensure effectiveness of process alarms.**

- **Prior to commencement of service, ELC and SLNG should notify FERC staff of any proposed developments to the Facility Security Plan.**

- **Prior to commencement of service, progress on the construction of the proposed systems should be reported in monthly reports filed with the Secretary. Details should include a summary of activities, problems encountered, contractor nonconformance/deficiency logs, remedial actions taken, and current ELC and SLNG 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, ELC and SLNG should respond to a specific data request, including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed P&IDs reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, should be submitted.**

- **Semi-annual operational reports should be filed 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, liquefied and vaporized quantities, 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)" 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.**

- **Significant non-scheduled events, including safety-related incidents (e.g., LNG, condensate, refrigerant, or natural gas releases, fires, explosions, mechanical failures, unusual over pressurization, and major injuries) and security-related incidents (e.g., attempts to enter site, suspicious activities) should be reported to FERC staff. In the event an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification should be made immediately, without unduly interfering with any**

necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification should be made to FERC staff within 24 hours. This notification practice should be incorporated into the LNG facility's emergency plan. Examples of reportable hazardous fluids-related incidents include:

a. fire;

b. explosion;

c. estimated property damage of $50,000 or more;

d. death or personal injury necessitating in-patient hospitalization;

e. release of hazardous fluids for 5 minutes or more;

f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes hazardous fluids;

g. any crack or other material defect that impairs the structural integrity or reliability of an LNG facility that contains, controls, or processes hazardous fluids;

h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes hazardous fluids to rise above its MAOP (or working pressure for LNG facilities) plus the build-up allowed for operation of pressure limiting or control devices;

i. a leak in an LNG facility that contains or processes hazardous fluids that constitutes an emergency;

j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;

k. any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility that contains or processes hazardous fluids;

l. safety-related incidents to hazardous fluids vessels 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 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. Based on our analysis and recommendations presented above, we conclude that the FEED presented by ELC and SLNG would include acceptable layers of protection or safeguards that would reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public.

2.8.6 LNG Facility Siting Requirements

The principal hazards associated with the substances involved in the liquefaction of LNG result from cryogenic and flashing liquid releases; flammable vapor dispersion; vapor cloud ignition; pool fires; BLEVEs, and overpressures. As discussed in section 2.8.4, 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 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 ELC and SLNG to identify how the proposed design complies with DOT's siting requirements. As part of our review, we used ELC and SLNG's information, developed to comply with 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:

- Four 11,558-gpm LNG loading pumps (two new LNG loading pumps at LNG storage tanks D-4 and D-5) used for ship loading and associated piping and appurtenances – Parts 193.2057 and 2059 require thermal and flammable vapor exclusion zones. NFPA 59A (2001) does not address LNG transfer systems; however, 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.

- Ten liquefaction heat exchangers (one per MMLS unit) and associated piping and appurtenances, including LNG rundown piping per MMLS unit – 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 addressed some of these issues in a March 2010 letter of interpretation. In that letter, 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 determined that an exclusion zone analysis of the marine cargo transfer system is required.

In the 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 generally recommend containment for all LNG transfer piping within a plant's property lines.

Federal regulations issued by the Occupational Safety and Health Administration (OSHA) under 29 CFR 1910.119 (Process Safety Management of Highly Hazardous Chemicals; Explosives and Blasting Agents [PSM]), and the EPA under 40 CFR 68 (Risk Management Plans) cover hazardous substances, such as methane, ethylene, propane, and isopentane at many facilities in the United States. However, OSHA and EPA regulations are not applicable to facilities regulated under 49 CFR 193. On October 30, 1992, shortly after the promulgation of the OSHA PSM regulations, OSHA issued a letter of interpretation that precluded the enforcement of PSM regulations over gas transmission and distribution facilities. In a subsequent letter on December 9, 1998, OSHA further clarified that this letter of interpretation applies to LNG distribution and transmission facilities.

In addition, EPA's preamble to its final rule in Federal Register, Volume 63, Number 3, 639 645, clarified that exemption from the requirements in 40 CFR 68 for regulated substances in transportation, including storage incident to transportation, is not limited to pipelines. The preamble further clarified that the transportation exemption applies to LNG facilities subject to oversight or regulation under 49 CFR 193, including facilities used to liquefy natural gas or used to transfer, store, or vaporize LNG in conjunction with pipeline transportation. Therefore, the above OSHA and EPA regulations are not applicable to facilities regulated under 49 CFR 193. As stated in Section 193.2051, LNG facilities must be provided with the siting requirements of NFPA 59A (2001). The siting requirements for flammable liquids within an LNG facility are contained in NFPA 59A, Chapter 2:

- 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.

- NFPA 59A 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 Section 2.2.3.2 requires provisions to minimize the damaging effects of fire from reaching beyond a property line, and requires provisions to prevent a radiant heat flux level of 1,600 British thermal units per square foot-hour (Btu/ft^2-hr) from reaching beyond a property line that can be built upon. The distance to this flux level is to be calculated with the LNGFIRE thermal radiation model 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 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 the DEGADIS gas dispersion model 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. 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 liquefaction facilities that are proposed for the Project, the FERC staff identified that the refrigerant siting requirements from Part 193 and NFPA 59A would be applicable to the following equipment:

- ten liquefaction heat exchangers (one per MMLS unit) and associated piping and appurtenances;
- one 11,340-gallon ethylene storage vessel and associated piping;
- one 13,090-gallon propane storage vessel and associated piping;
- one 10,590-gallon isopentane storage vessel and associated piping;
- one 34,690-gallon stabilized condensate storage tank and associated piping;
- two 1,000-gallon aqueous ammonia tanks and associated piping;
- one 7.7-gpm propane storage pump and associated piping and appurtenances;
- one 12-gpm isopentane storage pump and associated piping and appurtenances;
- one 110-gpm propane transfer pump and associated piping and appurtenances;
- one 98-gpm ethylene transfer pump and associated piping and appurtenances;
- one 98-gpm isopentane transfer pump and associated piping and appurtenances;
- one 103-gpm stabilized condensate transfer pump and associated piping and appurtenances; and
- two 0.04-gpm aqueous ammonia supply pumps and associated piping and appurtenances.

2.8.7 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 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.

We consider it prudent design practice to size impoundments based on the greatest flow capacity from any single pipe for 10 minutes or the capacity of the largest vessel served, whichever is greater, while recognizing that different spill scenarios are used for the single accidental leakage sources for calculation of Part 193 exclusion zones.

2.8.7.1 Impoundment Sizing

Table 2.8.6-1 lists the spill volumes and their corresponding impoundment systems. ELC and SLNG proposes to install two new impoundments: (1) LNG Impoundment and (2) Refrigerant Impoundment. The LNG Impoundment would be 28 feet long, 28 feet wide, and 10 feet deep, with a usable volume of 58,647 gallons. The LNG Impoundment would be lined with perlite concrete and located north of existing LNG storage tank D-5 and south of the liquefaction process area. Potential spills from the liquefaction process area and the LNG rundown line would be sloped into an LNG trench system that would direct spills to the LNG Impoundment. The trench system would be sized to handle the maximum volumetric flow from the largest LNG spill volume or the peak rainfall intensity for a 10-year rainfall event. LNG produced by the MMLS units would be routed via a 6-inch-diameter LNG rundown line from each MMLS unit, which would feed into a common 10-inch-diameter LNG rundown header located north of the liquefaction process area. The 10-inch-diameter LNG rundown header would then increase to 12 inches in diameter as it routes the LNG to existing LNG storage tanks D-3 and/or D-5. The total length of the LNG rundown line from the furthest MMLS unit to the LNG Impoundment would span

approximately 5,000 feet. The largest spill into LNG Impoundment would be a guillotine rupture of the LNG rundown line. A 10-minute spill volume including inventory of the LNG rundown line would be approximately 56,616 gallons, which would be contained within the LNG Impoundment.

Once the LNG rundown line enters the LNG storage tank D-5 area, it would tie into existing piping and any spill would be contained within the existing LNG storage tank D-5 impoundment. If the LNG is routed to LNG storage tank D-3, the LNG rundown line would tie into existing piping and any potential leak from the LNG rundown line would drain either to the LNG Impoundment or an existing impoundment system.

LNG can only be loaded onto ships from existing LNG storage tanks D-4 and D-5, therefore ELC and SLNG propose to install four LNG loading pumps (two per existing LNG storage tank D-4 and D-5) to facilitate ship loading. Each new loading pump would have a design capacity of 11,558 gpm and would be located within the LNG storage tank impoundments; therefore any potential leak would be contained within the existing tank impoundment. Ship loading would be achieved by utilizing existing piping, loading arms, and marine facilities. Depending on the location of the potential leak, a spill during ship loading would be contained by existing impoundments, which were considered in the Elba III Expansion Project Final Environmental Impact Statement (Docket No. CP06-470-000).

TABLE 2.8.6-1

Impoundment Area Sizing

Source	Spill Size (gallons)	Impoundment System	Impoundment Size (gallons)
12-inch-diameter LNG Rundown Line (liquefaction to LNG Storage Tanks)	56,616	LNG Impoundment	58,647
Mixed Refrigerant Surge Vessel	19,807	LNG Impoundment	58,647
Stabilized Condensate Storage Vessel	34,690	Refrigerant Impoundment	38,338
Recovered Amine Storage Tank	29,526	Amine Impoundment	49,506
Aqueous Ammonia Storage Tank	1,000	Aqueous Ammonia Impoundment	2,244
Heating Medium (Hot Oil) Storage Tank	41,008	Heating Medium Storage Impoundment	55,610
Heating Medium (Hot Oil) Expansion Tank	24,955	Heating Medium Impoundment	34,223
Acid Gas Knockout Drum	711	Acid Gas Impoundment	898

The Refrigerant Impoundment would be lined with perlite concrete and would be 25 feet long, 20.5 feet wide, and 10 feet deep, with a usable volume of 38, 338 gallons. The Refrigerant Impoundment would be located adjacent to the proposed refrigerant truck loading facilities and north of the liquefaction process area. Any spills from refrigerant and stabilized condensate storage area and truck loading areas would be sloped into a trench system that would direct spills to the Refrigerant Impoundment. The trench system would be sized to handle the maximum volumetric flow from the largest mixed refrigerant spill volume or the peak rainfall intensity for a 10-year rainfall event. The largest spill into the Refrigerant Impoundment would be a spill from the stabilized condensate storage vessel, which would be equivalent to 34,690 gallons. This spill volume would be contained within the Refrigerant Impoundment.

The proposed Recovered Amine Storage Tank Impoundment would be 58 feet long, 43 feet wide, and 3.5 feet deep, with a usable volume of 49,506 gallons. The Amine Impoundment would be located in the pre-treatment area, east of the refrigerant storage area. A spill from the Recovered Amine Storage Tank would be contained in the Amine Impoundment.

ELC and SLNG propose to install two 1,000-gallon Aqueous Ammonia Storage Tanks within a 30-foot-long by 20-foot-wide by 0.5-foot-high diked area. This diked area would have a volumetric capacity of 2,244 gallons and would hold the entire contents of the Aqueous Ammonia Tanks.

2.8.7.2 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 the 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.[27] 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, ELC and SLNG provided the DOT with its design spill criteria and methodology. This information included a description of the methodology used to select design spills including a piping inventory table for the proposed project design. The DOT reviewed ELC and SLNG's methodology 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 flammable fluids. ELC and SLNG's methodology considered the failure probability of all piping segments and process vessels containing hazardous fluids for the purpose for selecting credible design spills using a list of nominal failures 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).

On July 30, 2015, the DOT provided a letter to the FERC staff stating that the DOT had no objection to ELC and SLNG's methodology for determining the single accidental leakage sources for design spills to be used in establishing the Part 193 siting requirements for the proposed LNG liquefaction facilities.[28] On October 2, 2015, ELC and SLNG submitted the design spills that were selected by applying the approved methodology along with a revised hazard modeling analysis. ELC and SLNG also filed design spill modeling information on September 8, 9, 23, and 25, 2015; October 19, 2015; and November 30, 2015.

The DOT's conclusions on the design spill methodology 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 ELC and SLNG's design or operation of the proposed facility differs from the details provided in the documents on which DOT based its review, then the facility may not comply with the siting requirements of Part 193. As a result, **we recommend that:**

- **Prior to the construction of the final design, ELC and SLNG should file with the Secretary for review and written approval by the Director of OEP, certification that**

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[27] 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, OEP. Filed in Docket Number CP13113 on August 13, 2013. Accession- Number 20140813-4011.

[28] July 30, 2015 Letter "Re: Elba Liquefaction, LLC, FERC Docket CP14-103-000" from Kenneth Lee to Terry Turpin. Filed in Docket Number CP14-103-000 on July 31, 2015. Accession Number 20150731-4001.

the final design is consistent with the information provided to the DOT as described in the design spill determination letter dated July 30, 2015 (FERC eLibrary Accession Number 20150731-4001) and supplemental information filed by ELC and SLNG on September 8, 9, 23, and 25, 2015 (FERC eLibrary Accession Numbers 20150908-5298, 20150910-5006, 20150923-5177, and 20150925-5288); October 2 and 19, 2015 (FERC eLibrary Accession Numbers 20151005-5031 and 20151020-5011); and November 30, 2015 (FERC eLibrary Accession Number 20151130-4444). In the event that any modifications to the design alters the candidate design spills on which the Title 49 CFR 193 siting analysis was based, ELC and SLNG 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, toxic or radiant heat), the specific design spills used for the ELC and SLNG siting analysis are discussed under "Vapor Dispersion Analysis" and "Thermal Radiation Analysis" in this section.

2.8.7.3 Vapor Dispersion Analysis

As discussed in section 2.8.2, 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. To address this hazard, 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, structures, and plant equipment, both with respect to plant-specific sites that have a bearing on the safety of plant personnel and surrounding public, including an evaluation of potential incidents and safety measures incorporated in the design or operation of the facility. 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. This is the Part 193 standard that we used in analyzing the siting of the proposed Project.

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 that 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.

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.

As discussed under "Design Spills" in section 2.8.6.2, 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:

1. 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

2. 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.

ELC and SLNG reviewed multiple releases for the liquid scenarios and for the flashing and jetting scenarios. ELC and SLNG used the following conditions, corresponding to 49 CFR 193.2059, for the vapor dispersion calculations: ambient temperature of 66 degrees Fahrenheit, 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 scenarios modeled using FLACS, ELC and SLNG 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 fencing. 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.

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. Design spills from process areas should be single accidental leakage sources for a 10-minute duration.

ELC and SLNG used the failure rate methodology discussed in section 2.8.6.2 to select a guillotine rupture and a 4.5-inch-diameter hole in the 12-inch-diameter LNG rundown line. For the jetting and flashing scenario from this piping segment, ELC and SLNG utilized PHAST Version 6.7 to conduct hole diameter, wind, and height sensitivity studies to determine the worst-case jetting and flashing scenario. The results showed that the longest ½-LFL distance would be from a jetting and flashing scenario from a 4.5-inch hole on the 12-inch-diameter LNG rundown line at a release elevation of 30 feet. FLACS was then used to predict the extent of the ½-LFL vapor cloud from a guillotine rupture and 4.5-inch hole of the 12-inch-diameter LNG rundown line. Table 2.8.6-2 shows the LNG release scenarios considered from the LNG rundown line.

TABLE 2.8.6-2

LNG Design Spills

Scenario	Location	Hole Diameter	Pressure (psig)	Temperature (°F)	Flow Rate (lb/hr)
1	LNG rundown line (liquid scenario)	12-inch	38	–265	6.58E6
2	LNG rundown line (jetting and flashing)	4.5-inch	38	–265	6.58E6

ELC and SLNG submitted simulations that included various release locations, release directions, wind speeds, and wind directions. Figures 2.8.6-1 through 2.8.6-5 show the PHAST and FLACS results to the longest ½-LFL vapor clouds for the LNG liquid release scenario and jetting and flashing scenario from the 12-inch-diameter LNG rundown line.

The vapor dispersion simulation results are shown in figures 2.8.6-1 through 2.8.6-5. The results, in figures 2.8.6-1 and 2.8.6-2, show that the ½-LFL vapor cloud for the liquid spill scenario would remain within the ELC and SLNG property.



Figure 2.8.6-1 – LNG Liquid Spill Release from the LNG Rundown Line (1 m/s)



Figure 2.8.6-2 – LNG Liquid Spill Release from the LNG Rundown Line (1 m/s)



Figure 2.8.6-3 – Jetting and Flashing Scenario from the LNG Rundown Line at the Center of the Liquefaction Process Area



Figure 2.8.6-4 – Jetting and Flashing Scenario from the LNG Rundown Line at MMLS Unit Closest to the Property Line Adjacent to the South Channel



Figure 2.8.6-5 – Jetting and Flashing Scenario from the LNG Rundown Line at Liquefaction Unit Closest to the Property Line Adjacent to the South Channel with Vapor Fencing (1 m/s)

The results for the jetting and flashing scenario for a release from the LNG rundown line at the center of the MMLS units, figure 2.8.6-3, shows that the ½-LFL vapor dispersion results would remain within the ELC and SLNG property. However, since the ½-LFL vapor cloud may reach the existing LNG storage tanks, **we recommend that**:

- **Prior to initial site preparation, ELC and SLNG should file with the Secretary, for review and approval by the Director of OEP, additional analysis that demonstrates the flammable vapor dispersion from design spills would be prevented from dispersing underneath the existing elevated LNG storage tank(s), or the LNG storage tank(s) would be able to withstand an overpressure due to ignition of the flammable vapor dispersion cloud that disperses underneath the existing elevated LNG storage tank(s).**

The results for the jetting and flashing scenario for a release from the LNG rundown line at the MMLS unit located closest to the property line adjacent to the South Channel, figure 2.8.6-4, show that the ½-LFL vapor cloud would extend over the South Channel and the opposite shoreline. As a result, ELC and SLNG has proposed to install an 8-foot slatted vapor fence to confine vapor clouds and limit the extent of the vapor dispersion zones. In figure 2.8.6-5, ELC and SLNG demonstrated that with the use of vapor fencing, the ½-LFL vapor cloud would extend over the South Channel but not reach a property line that can be built upon. In this case, the DOT has stated that LNG vapor extending over a navigable waterway is not considered a violation of 49 CFR 193 exclusion zones. To ensure that the vapor fencing is maintained throughout the life of the facility, **we recommend that:**

- **Prior to construction of the final design, ELC and SLNG should file with the Secretary, for review and written approval by the Director of OEP, the procedures to maintain and inspect the vapor fencing 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.**

Although ELC and SLNG demonstrated that vapor fencing would mitigate vapor dispersion for the jetting and flashing scenario, the vapor fencing would only be effective for a release near the property line adjacent to the South Channel. Therefore, **we recommend that:**

- **Prior to initial site preparation, ELC and SLNG should file with the Secretary, for review and written approval by the Director of OEP, refined modeling that determines whether additional vapor fencing is needed as a mitigation measure for an LNG release located near the property line adjacent to the Savannah River.**

ELC and SLNG has also proposed to add two check valves, instead of vapor fencing, in the LNG rundown line to reduce the amount of LNG in the LNG header by restricting flow from the MMLS units. ELC and SLNG demonstrated that with the use of two check valves, the ½-LFL vapor clouds would extend over the South Channel but not over the opposite shoreline as shown below in figure 2.8.6-6. The DOT is currently reviewing the use of check valves, instead of vapor fencing, to limit the flow of LNG and has not yet determined whether the use of check valves would be an adequate form of mitigation. Therefore, **we recommend that:**

- **Prior to construction of the final design, ELC and SLNG should provide concurrence from the DOT as to whether the use of check valves, instead of vapor fencing, in the LNG rundown line is an acceptable form of mitigation.**



Figure 2.8.6-6 – Jetting and Flashing Scenario from the LNG Rundown Line at MMLS Unit Closest to the Property Line Adjacent to the South Channel Modeled with Two Check Valves

Based on ELC and SLNG's vapor dispersion analysis and proposed mitigation as well as our recommendations, 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's inspection and enforcement program.

Vapor Dispersion Analyses for Other Hazardous Fluids

In addition to the LNG releases evaluated above, ELC and SLNG considered other release scenarios from ethylene, propane, isopentane, mixed refrigerant, and stabilized condensate based on the design spill methodology selected by ELC and SLNG and reviewed by the DOT. Design spills in the refrigerant storage area and liquefaction process area were constant until the inventory was depleted. All releases were modeled in PHAST as a horizontal release at various wind speeds and release elevations. Only the spills that produced the highest release rates and the longest ½-LFL vapor clouds are discussed in this section.

ELC and SLNG would store ethylene, propane, and isopentane in the refrigerant storage area, which is located north of the liquefaction process area. These refrigerants would be used as components of the mixed refrigerant cycle, which would cool natural gas to a liquid state. In the refrigerant storage area, the worst case for an ethylene release would be a guillotine rupture of the 4-inch-diameter ethylene storage make-up line. PHAST calculated a ½-LFL vapor dispersion distance of 1,663 feet. The worst case for a propane release would be a guillotine rupture of the 3-inch-diameter propane storage vapor return line. PHAST calculated a ½-LFL vapor dispersion distance of 850 feet. Lastly, the worst case for an isopentane release would be a guillotine rupture of the 3-inch-diameter isopentane storage vapor return line. PHAST calculated a ½-LFL vapor dispersion distance of 1,299 feet.

In the liquefaction process area, the highest rate of mixed refrigerant release would be from a 4-inch-diameter hole on mixed refrigerant piping from the mixed refrigerant separator to the cold liquid vaporizer. The maximum spill duration was assumed to be the de-inventory time of the entire mixed refrigerant loop. PHAST calculated a ½-LFL vapor dispersion distance of 1,604 feet.

ELC and SLNG also considered a release from the stabilized condensate storage vessel discharge line. PHAST was used to model a 3-inch-diameter hole from stabilized condensate storage vessel discharge line. PHAST calculated a ½-LFL vapor cloud distance of 1,916 feet. However, FERC staff identified that a guillotine of the stabilized condensate storage vessel's 4-inch-diameter discharge line would produce a larger ½-LFL vapor cloud distance of 2,165 feet.

Table 2.8.6-3 shows the release sizes that result in the highest rate of vapor flow for the refrigerant and stabilized condensate scenarios from the refrigerant storage area, liquefaction process area, and stabilized condensate storage area.

TABLE 2.8.6-3

Other Hazardous Fluid Design Spills

Scenario	Location	Release Size	Pressure (psig)	Temperature (°F)	Flow Rate (lb/hr)
1	Ethylene make-up line	4-inch-diameter guillotine	217	–35	1.18E3
2	Propane vapor return line	3-inch-diameter guillotine	105	66	9.64E2
3	Isopentane vapor return line	3-inch-diameter guillotine	12	66	2.60E2
4	MR Separator to cold liquid vaporizer	4-inch-diameter hole	543	85	1.60E5
5	Stabilized condensate storage discharge	3-inch-diameter hole	16	113	2.95E4

ELC and SLNG used PHAST to predict the distances to the ½-LFL vapor cloud. Table 2.8.6-4 provides the PHAST results for the ethylene, propane, isopentane, mixed refrigerant, and stabilized condensate release scenarios.

TABLE 2.8.6-4

Vapor Dispersion Scenarios from Refrigerants and Stabilized Condensate Releases

Scenario	Material	Release Location	Approximate Downwind Distance to ½-LFL (feet)
1	Ethylene	Refrigerant storage	1,663
2	Propane	Refrigerant storage	850
3	Isopentane	Refrigerant storage	1,299
4	Mixed Refrigerant	Liquefaction process	1,604
5	Stabilized Condensate	Condensate storage	2,165

As ELC and SLNG's calculations show, the vapor dispersion would extend over the South Channel but not over the opposite shoreline. In this case, the DOT has not objected to the other flammable vapor dispersion hazards extending over a navigable waterway. Based on ELC and SLNG's vapor dispersion analysis and proposed mitigation, 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 other flammable 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 stabilized condensate would contain toxic products such as benzene, hexane, and toluene, ELC and SLNG used PHAST Version 6.7 to calculate the dispersion distances to toxic threshold exposure limits based on the AEGLs. Additionally, ELC and SLNG calculated the AEGLs for other toxic components such as hydrogen sulfide in the acid gas stream and aqueous ammonia in the aqueous ammonia storage vessel for emission control. ELC and SLNG used PHAST to calculate the dispersion distances to toxic threshold exposure limits based on toxicity levels that were at or below ½ AEGLs. Table 2.8.6-5 shows the distances to the ½ AEGLs for liquid releases of benzene, hexane, toluene, and ammonia with a 60-minute exposure time and ½ AEGLs for gaseous release of hydrogen sulfide with a 10-minute exposure time.

TABLE 2.8.6-5

½ AEGL 1, 2, and 3AEGL 1, 2, and 3

Substance	Exposure Time (minutes)	½ AEGL 1 (feet)	½ AEGL 2 (feet)	½ AEGL 3 (feet)
Benzene	60	2,930	577	33
Hexane	60	N/A	2,779	1,667
Toluene	60	2,201	551	33
Ammonia	60	9,967	3,133	545
Hydrogen sulfide	10	3,471	33	33

The maximum toxic dispersion distance was found to be the ½ AEGL 1 for ammonia, which would extend approximately 9,967 feet as shown in figure 2.8.6-7. ELC and SLNG stated that the ½ AEGL 1 for ammonia would extend across the South Channel and over portions of the Savannah Acid Plant (a former titanium dioxide facility and currently active sulfuric acid plant) located off East Kemira Road. The ½ AEGL 1 would also extend across the Savannah River and over portions of the COE dredge material containment areas and wetlands located in South Carolina. The toxic vapor cloud would remain outside public areas containing residences, schools, hospitals, parks, and other sensitive areas. ELC and SLNG will update its ERP to notify the Savannah Acid Plant and the COE in the event of an emergency that involves an aqueous ammonia release.

The distances to the ½ AEGL 2 for ammonia and hexane would extend over the South Channel and Savannah River but would not reach a property line that can built upon. Similarly, the distances to the ½ AEGL 1 for benzene, toluene, and hydrogen sulfide would extend over the South Channel and Savannah River but would not reach the opposite shorelines. The toxicity effects associated with AEGL 1 are non-disabling and reversible. As a result, we conclude that the siting of the proposed Project would not present a significant impact to the public with respect to the presence of the toxic components. As discussed above, ELC and SLNG will update its EPR to notify the Savannah Acid Plant and the COE in the event of an emergency that involves an aqueous ammonia release. 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.

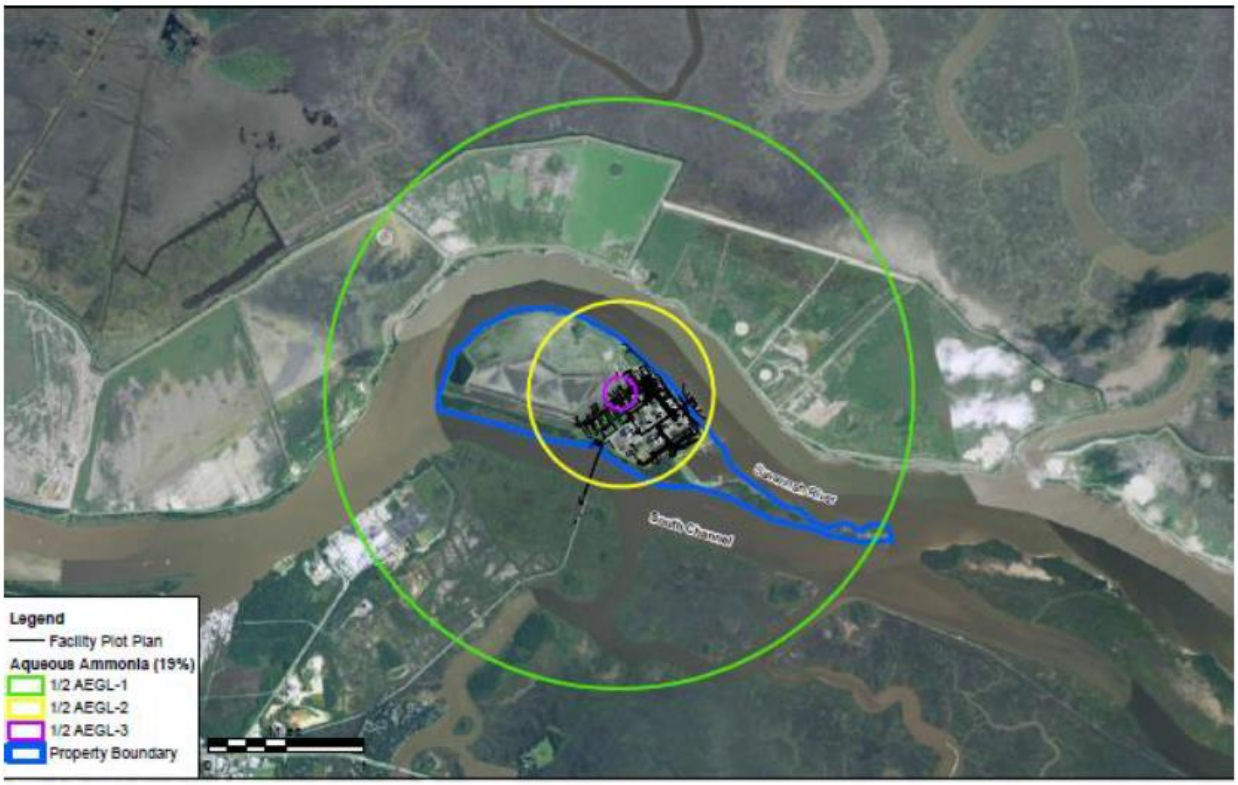


Figure 2.8.6-7 – ½ AEGL 1, 2, and 3 for Ammonia

2.8.7.4 Overpressure Analysis

As discussed in section 2.8.2, 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 2.8.3, unconfined LNG vapor clouds would not be expected to produce damaging overpressures.

Ignition of a confined LNG vapor cloud could result in higher overpressures. To prevent such an occurrence, ELC and SLNG 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 devices 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 unconfined propane clouds to produce damaging overpressures, and an even higher potential for unconfined ethylene vapor clouds to produce damaging overpressures. This has been shown by multiple experiments conducted by the

Explosion Research Cooperative to develop predictive blast wave models for low, medium, and high reactivity fuels and varying degrees of congestion and confinement. The experiments used methane, propane, and ethylene, as the respective low, medium, and high reactivity fuels. In addition, the tests showed that if methane, propane, and ethylene is ignited within a confined space, such as in a building, they all have the potential to produce damaging overpressures. The refrigerant streams would contain all three of these components (i.e., methane, propane, and ethylene) including isopentane. Therefore, a potential exists for unconfined vapor clouds that could produce damaging overpressure in the event of a release of refrigerant.

To evaluate this hazard, ELC and SLNG used FLACS to perform an overpressure analysis. ELC and SLNG used the vapor dispersion scenarios previously discussed in "Vapor Dispersion Analysis." A release of the 4-inch-diameter ethylene storage make-up line from the refrigerant storage area dispersing to the most confined and congested regions of the liquefaction process area were evaluated in the overpressure analysis. Various ignition locations and times were evaluated to predict the worst-case overpressure distances. Figure 2.8.6-8 show the FLACS results of 1 psi overpressures with an uncertainty factor of 2 (i.e., ½ psi overpressure) for ethylene vapor cloud explosions in the liquefaction process area.



Figure 2.8.6-8 – Ethylene Overpressure Scenarios within the Liquefaction Process Area

The FLACS results indicated that the ½ psi overpressure distance from the liquefaction process area for ethylene would extend into the South Channel but not reach the opposite shoreline or a property line that can be built upon. In addition, all other overpressure scenarios calculated by ELC and SLNG would remain within the ELC and SLNG property.

The FLACS results also indicated that the ethylene overpressure would reach existing LNG storage tank D-5. ELC and SLNG used FLACS to determine the maximum overpressure the existing LNG storage tank D-5 would experience, which would be a reflected pressure near the base of the storage tank of approximately 4 psig. Taking into account the uncertainty factor of 2, this reflected pressure

would correlate to a peak side-on pressure of 2 psig. To ensure the existing LNG storage tank D-5 would be able to withstand this peak-side on pressure of 2 psig, **we recommend that**:

- **<u>Prior to initial site preparation</u>, ELC and SLNG should file with the Secretary, for review and written approval by the Director of OEP, an analysis that determines whether the existing LNG storage tank D-5 would be able to withstand a peak side-on pressure of 2 psig.**

Based on the recommendation above and since the overpressure results would not extend over critical equipment and buildings such as the refrigerant storage vessels, fire water building, and control room, 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's inspection and enforcement program.

2.8.7.5 Thermal Radiation Analysis

As discussed in section 2.8.2, 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). 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 LNG storage tank spills, there are three radiant heat flux levels that 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. ELC and SLNG submitted a thermal radiation analysis that showed the following ambient conditions resulted in the maximum exclusion distances: wind speeds of 15 mph, ambient temperature of 39 degrees Fahrenheit, and 35 percent relative humidity. We agree with ELC and SLNG's selection of atmospheric conditions.

For the proposed liquefaction project, ELC and SLNG used LNGFIRE3 to predict the thermal radiation distances as a result of fires from the LNG Impoundment, Mixed Refrigerant Impoundment, Recovered Amine Impoundment, Heating Medium Impoundments, Slop Oil Impoundment, Waste Oil Impoundment, Acid Gas Impoundment, and Lube Oil Impoundment. 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 ethylene, propane, and isopentane. 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 of the flame, which is an average value of the thermal radiation flux emitted by the fire. The mass burning rate and surface emissive power of an ethylene, propane, isopentane, and stabilized condensate 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 surface emissive power, the thermal radiation distances required for ethylene, propane, isopentane, stabilized condensate, recovered amine, heating medium, and acid gas 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 2.8.6-6 and figure 2.8.6-9. The 1,600-Btu/ft^2-hr heat fluxes from the proposed impoundments would remain within the facility property lines. In addition, the thermal radiation zones would not extend over any critical equipment and buildings such as the refrigerant storage vessels, fire water building, and control room. As a result, we conclude that the siting of the proposed Project would not have a significant impact on public safety with respect to radiant heat from these impoundments.

ELC and SLNG also evaluated jet fires from the design spills using PHAST version 6.7 to calculate the distances to the thermal heat fluxes. The same ambient conditions used for the thermal radiation analysis were used to evaluate jet fires. The results showed that the jet fire radiant heat to 1,600 BTU/ft^2-hr for the design spills would remain within the ELC and SLNG property with the exception of mixed refrigerant, which would marginally extend into the South Channel but not reach the opposite shoreline or a property line that can be built upon, as shown below in figure 2.8.6-10. As a result of our review, we conclude that the siting of the proposed liquefaction facilities would not have a significant impact on public safety due to radiant heat impacts from fires. 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 2.8.6-6

Thermal Radiation Exclusion Zones

	Thermal Flux Level (Btu/ft^2-hr)		
	10,000	3,000	1,600
Distance from LNG Impoundment (feet)	108 (front) 108 (side)	147 (front) 147 (side)	174 (front) 174 (side)
Distance from Mixed Refrigerant Impoundment (feet)	90 (front) 89 (side)	121 (front) 119 (side)	143 (front) 139 (side)
Distance from Recovered Amine Impoundment (feet)	165 (front) 160 (side)	241 (front) 230 (side)	275 (front) 262 (side)
Distance from Heating Medium Vessel (feet)	166 (front) 166 (side)	233 (front) 233 (side)	278 (front) 278 (side)
Distance from Heating Medium Storage (feet)	152 (front) 145 (side)	210 (front) 197 (side)	252 (front) 232 (side)
Distance from Slop Oil Storage (feet)	113 (front) 109 (side)	154 (front) 147 (side)	184 (front) 172 (side)
Distance from Waste Oil Storage (feet)	83 (front) 83 (side)	112 (front) 112 (side)	131 (front) 131 (side)
Distance from Acid Gas Knockout Drum (feet)	70 (front) 70 (side)	94 (front) 94 (side)	109 (front) 109 (side)
Distance from Lube Oil Storage (feet)	54 (front) 53 (side)	71 (front) 66 (side)	83 (front) 80 (side)



Figure 2.8.6-9 - Thermal Radiation Zones

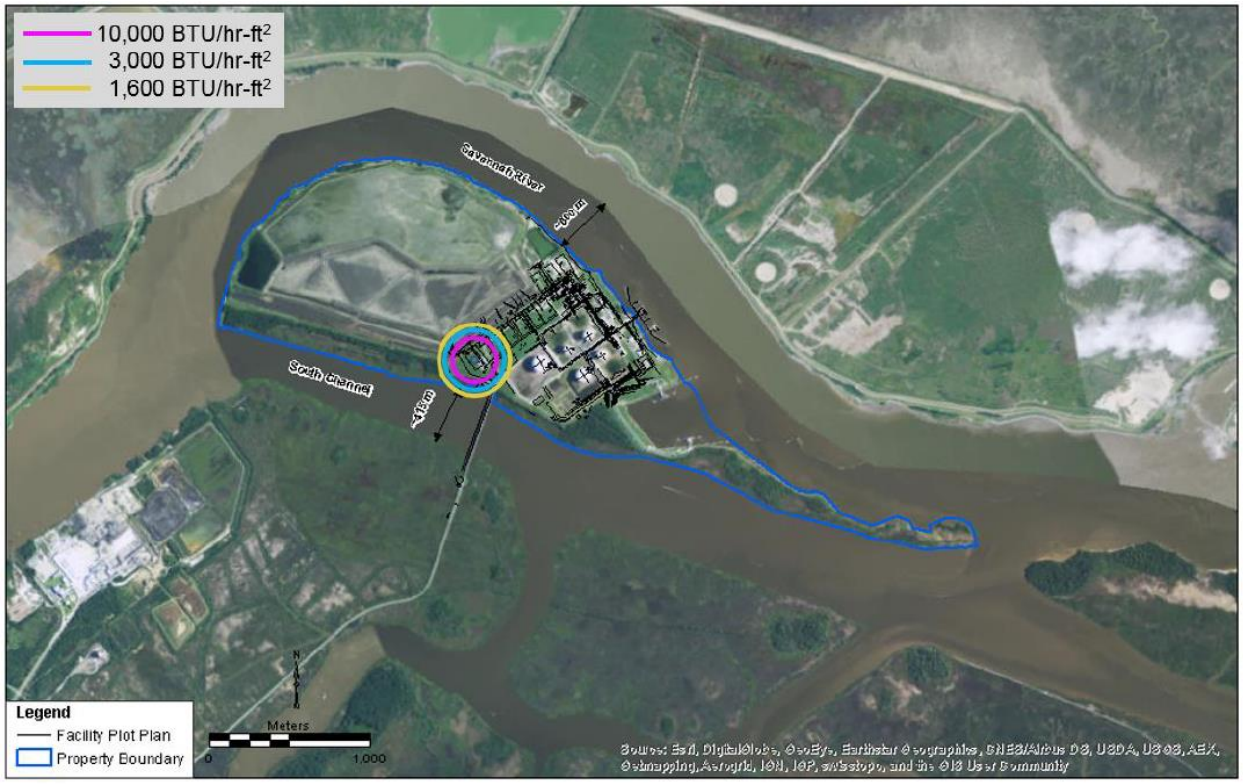


Figure 2.8.6-10 – Thermal Heat Fluxes for a Jet Fire from a Mixed Refrigerant Release

Fires may also cause failures of nearby storage vessels, piping, and equipment if not properly mitigated. The failure of a pressurized vessel could cause fragments of material to fly through the air at high velocities, posing damage to surrounding structures and a hazard for operating staff, emergency personnel, or other individuals in proximity to the event. In addition, failure of a pressurized vessel when the liquid is at a temperature significantly above its normal boiling point could result in a BLEVE. BLEVEs can produce overpressures when the superheated liquid rapidly changes from 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.

ELC and SLNG performed a BLEVE analysis on the pressurized vessels in the proposed design. The BLEVE analysis evaluated the following: 1) extent of overpressures to 1 psi, 2) fireball radiant heat equivalent to a thermal dose of 1,600 Btu/ft^2-hr for 40 seconds, and 3) fragment travel distances. The results showed that the overpressures to 1 psi and fireball radiant heat as a result of a BLEVE would remain within the ELC and SLNG property. The results for potential hazards from fragment travel distances in the event of a BLEVE incident show that 80 to 90 percent of fragments would remain within the ELC and SLNG property. Only in very rare cases could fragments travel off-site, however, these fragments would not reach a property line that can be built upon.

Although ELC and SLNG performed a BLEVE analysis, the proposed facility design would incorporate layers of protection to mitigate the potential for an initiating event to develop into a BLEVE incident. These layers of protection would include trained operations personnel, emergency shutdown valves and system capable of isolating inventory and decreasing pressure, fire and gas detection equipment that would alarm and/or shutdown process equipment, fixed, wheeled, and portable dry chemical systems to extinguish a fire, firewater monitors and hydrants to cool equipment, and an ERP. The layers of protection proposed by ELC and SLNG did not indicate whether passive mitigation would be provided, therefore, **we recommend that:**

- **Prior to initial site preparation, ELC and SLNG should file with the Secretary, for review and written approval by the Director of OEP, additional layers of protection in the form of passive mitigation to mitigate the potential for an initiating event to develop into a BLEVE incident.**

As a result of ELC and SLNG's proposed layers of protection in addition to our recommendations to provide passive mitigation and final design information for the proposed active mitigation in section 2.8.4, we believe these mitigation measures would prevent the likelihood for a BLEVE occurring within the proposed liquefaction facilities. Therefore, we conclude that the siting of the proposed Project would not have a significant impact on public safety.

2.8.8 Emergency Response

Section 3A(e) of the NGA, added by Section 311 of the EPAct, stipulated that in any order authorizing an LNG terminal, the Commission shall require the LNG terminal operator to develop an ERP in consultation with the USCG and state and local agencies. The ERP has been in place since the Elba Island LNG Terminal began operation in 1978 and has been updated as new projects have changed the configuration of the LNG Terminal. The existing ERP would need to be updated to include the proposed liquefaction facilities and emergencies related to refrigerant handling. Therefore, **we recommend that:**

- **Prior to initial site preparation, ELC and SLNG should file its updated ERP to include the liquefaction facilities as well as instructions to handle on-site refrigerant-related emergencies. ELC and SLNG should file the updated ERP with the Secretary for review and written approval by the Director of OEP.**

- **<u>Prior to initial site preparation</u>, ELC and SLNG should file an ERP that includes a Cost-Sharing Plan identifying the mechanisms for funding all Project-specific security and emergency management costs that would be imposed on state and local agencies. In addition to the funding of direct transit-related security and emergency management costs, this comprehensive plan should include funding mechanisms for the capital costs associated with any necessary security and emergency management equipment and personnel base. ELC and SLNG should file the ERP, including the Cost-Sharing Plan, with the Secretary for review and written approval by the Director of OEP.**

2.8.9 LNG Vessel Safety

SLNG reactivated the existing LNG import terminal in 2001 and has been receiving LNG import shipments. Export operations would alter the direction of loaded LNG carrier transits, with ships arriving empty but departing with a full cargo. The proposed Project would require minor modifications to the existing North and South Docks piping system to enable ship loading. However, there would be no changes to the expected number of vessels. The operations for LNG tankers would remain the same regardless of the direction of the shipment. The mooring, connection, and disconnection of the LNG tankers, as well as the shipping routes from/to the offshore pier, would remain the same. Currently, there are no U.S.-flagged LNG vessels used in either import or export service.

In a letter to the USCG dated August 29, 2012, ELC and SLNG detailed the proposed Project modifications and estimated the ship traffic would not exceed the previously approved number of vessels per year in Docket CP06-470-000, et al., and ELC and SLNG would not accept LNG carriers larger than previously authorized in Docket CP06-470-000. In a letter dated September 11, 2012, the USCG stated that the existing WSA and LOR are adequate for the service associated with the proposed Project. However, the USCG specified that the proposed piping system modifications to the existing North and South Docks would need to meet the design criteria in 33 CFR 127.101 and that applicable amendments to the Operations Manual, Emergency Manual, and Facility Security Plan must be made to capture operational changes associated with the Project. As required by 33 CFR 105 and 127, ELC and SLNG would amend these documents and submit them to the USCG prior to operation of the facility as an export terminal.

2.8.10 Conclusions on Facility Reliability and Safety

The principal hazards associated with the substances involved in the liquefaction, storage, and vaporization of LNG result from cryogenic and flashing liquid releases; flammable vapor dispersion; vapor cloud ignition; pool fires; overpressures; and toxicity. As part of the NEPA review, Commission staff must assess whether the proposed facilities would be able to operate safely and securely to minimize potential public safety impacts. Based on our technical review of the preliminary engineering designs, as well as our suggested mitigation measures, we conclude that sufficient layers of safeguards would be included in the facility designs to mitigate the potential for an incident that could impact the safety of the off-site public. 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. 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 ELC and SLNG's FEED. However, we are recommending that the final design be provided for further staff review to ensure it is consistent with the safety and operability characteristics identified in the FEED. In addition, we are recommending that the facility, during

construction and operation, be subject to regular FERC staff technical reviews and site inspections on at least an annual basis.

Siting of the facility with regard to potential off-site consequences from these hazards is also required by the DOT's regulations in 49 CFR 193, Subpart B. As part of its application to FERC, ELC and SLNG identified how its proposed design would comply with DOT's Part 193 siting requirements. We used this information to assess whether or not a facility would have a public safety impact and the DOT, as a cooperating agency, assisted in this evaluation. As provided, ELC and SLNG's siting analysis indicates that the siting of the proposed facility would not have a significant impact on public safety. If this facility is approved and becomes operational, the facility would also be subject to the DOT's inspection program under 49 CFR 193. Final determination of whether a facility is in compliance with the requirements of Part 193 would be made by the DOT staff during those inspections.

2.9 CUMULATIVE IMPACTS

NEPA requires the lead federal agency to consider the potential cumulative impacts of proposals under their 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. Generally, cumulative impacts result from the construction of other projects in the same vicinity and impacting the same resource areas as the proposed facilities. In such a situation, although the impact associated with each project might be minor, the cumulative impact resulting from all projects being constructed in the same general area could be greater.

2.9.1 Projects and Activities Considered

Our cumulative impacts analysis includes the two non-jurisdictional facilities associated with the Project (identified in section 1.3, i.e., a new power line servicing Elba Island and an upgraded power line at the Jefferson County Compressor Station), plus 45 other projects in the vicinity of the Project that could affect the same resources as the Project. Specifically, projects included in our cumulative impact analysis:

- impact a resource potentially affected by the Project;
- cause this impact within all, or part, of the Project area; and
- cause this impact within all, or part, of the time span for the Project.

Of the 47 other projects considered, 26 are in proximity and could have cumulative impacts with the liquefaction facilities and there are 21 projects for the compression and metering facilities, with 5 of those projects being common to both. For the liquefaction facilities, we considered Chatham County, Georgia and Jasper County, South Carolina as the main geographic region of influence in which impacts have the potential to be cumulative. However, we extended our review as necessary to include watersheds, air sheds, and shipping routes that could be impacted by the Project but occur outside the main geographic region. The ongoing or planned projects in proximity to the liquefaction facilities include 2 power line upgrades, 1 rail line spur, 11 road improvement, 5 industrial site development, 5 residential/commercial facilities, and 2 navigational/water-oriented projects, as summarized in table 2.9.1-1 in appendix C.

Actions located outside the regions of influence are generally not evaluated because their potential to contribute to a cumulative impact diminishes with increasing distance from the Project. For example, we received comments recommending that we evaluate the cumulative impacts of the Project and shale gas development, production, and fracking in the other areas of U.S. While shale gas in the

Texas or the northeast U.S. may impact the same resources affected by the Project, these impacts are so far removed from the project area that the effects are not additive with those of the Project. Furthermore, impacts from natural gas production are generally neither caused by a proposed LNG export project nor are they reasonably foreseeable consequences of the Commission's approval of an infrastructure project. Therefore, we do not address those activities in this analysis.

For the compression and metering facilities, the proposed modifications at the EEC North, Port Wentworth, Elba Island Interconnect and Del Webb Sites would occur within existing natural gas facility sites, and as discussed throughout section 2.0, would have negligible temporary or permanent impacts. Consequently, there would be no noticeable cumulative impacts that would result from the modifications proposed at these facilities; therefore, we have not included these facilities in our cumulative impacts analysis.

Our cumulative impacts analysis considered ongoing or planned projects within a reasonable distance of the Hartwell, Jefferson County and Rincon Compressor Stations considering the type, size, nature of impacts, and other factors for projects that would have a reasonable probability of adding to the impacts on environmental resources. In effect, this included projects up to 30 miles away from proposed facilities for impacts on air and water quality, and closer for other environmental factors. Twenty-one projects were considered in proximity of the Hartwell, Jefferson County, and Rincon compressor stations, including two industrial site development projects near Hartwell Compressor Station; five industrial site development and two power line projects near Jefferson County Compressor Station; and one commercial facility, one road improvement, and nine industrial site development projects for the Rincon Compressor Station, of which five were also in proximity to the liquefaction facilities (see table 2.9.1-2 in appendix C).

We are aware of other FERC jurisdictional projects in the larger Georgia region; however, we conclude that these projects lie outside of the region of influence for potential cumulative impacts, primarily due to distance. One of the closest projects, the proposed Zone 3 Expansion Project[29], is under review by the Commission, and the nearest project facility is located approximately 30 miles southwest of the liquefaction facilities. Construction is proposed to place the facilities in-service in 2016. Based on the distance of those facilities from the proposed Project, the potential cumulative impacts of the Zone 3 Expansion Project would be limited to air quality, which is not expected to significantly contribute to cumulative impacts in the area of the proposed Project. In addition, all of the FERC-jurisdictional projects would be constructed and maintained in accordance with our approved procedures and other construction, operation, and mitigation measures that may be required by federal, state, or local permitting authorities, further reducing the potential for cumulative impacts.

As described in the environmental analysis section of this EA, constructing and operating the Project would temporarily and permanently impact the environment. The Project would impact geology and soils; surface waters and wetlands; vegetation, wildlife, and fisheries; cultural resources; and land use, recreation, and visual resources. However, we conclude that nearly all of the project-related impacts to these resources would be contained within or adjacent to the areas directly affected by construction, and that proposed construction mitigation measures would limit impacts to less than significant levels, and therefore are not likely to result in any cumulative impacts and not discussed further here. For example, erosion control measures included in the Companies' construction and restoration plans would keep disturbed soils within work areas. Based on our review, there is potential for cumulative impacts of

[29] Environmental impacts were assessed in an Environmental Assessment for the Zone 3 Expansion Project (Docket No. CP14-493) issued on October 31, 2014. Accession Number 20141031-4006.

some level in terms of socioeconomics, air and noise quality, climate change, and safety, as discussed below.

2.9.2 Socioeconomics

Present and reasonably foreseeable future projects and activities could cumulatively impact socioeconomic conditions in the Project area. Employment, housing, infrastructure, and public services could experience both beneficial and detrimental impacts. No environmental justice issues have been identified.

The proposed Project and cumulative projects would generate temporary employment from construction jobs, as well as provide an influx of associated spending on local goods and services, including temporary housing. This influx would provide a temporary economic benefit to the individuals and communities in which they reside. During operation of the facilities, annual tax revenue income would increase and permanent employment would slightly increase.

The influx of non-local construction workers would temporarily impact housing availability in the area. However, given the vacancy rates, and the number of rental housing units and hotel/motel rooms in the Project area, temporary construction employees should not encounter difficulty in finding temporary housing. If construction occurs concurrently with other projects, temporary housing would still be available but may be slightly more difficult to find and/or more expensive to secure.

Seven roadway improvement projects are planned along one or more of the truck routes that would be used by the Companies to deliver materials and equipment during construction (Thomas and Hutton, 2013). Of those, two are long range or have no date set to be started, while five are scheduled to occur in 2014 and 2015 (prior to the Project) and would not limit the viability of using Bay Street and President Street as a truck route (Route 1), or DeRenne Avenue (Route 2) during construction, or add to traffic congestion if used by construction traffic. Further, in order to avoid and minimize impacts, the Companies have proposed to deliver the majority of materials and equipment to Elba Island by ship and barge, and would work with the City of Savannah to minimize disruption to the community. Additional discussion of construction traffic impacts and mitigation is provided in section 2.5.4.1.

Construction of the SLNG DMCA Expansion Project and Power Upgrade Project would occur within the same timeframe as the Elba Liquefaction Project and would result in cumulative traffic impacts along Islands Expressway and Elba Island Road. Transporting workers by bus and delivering construction materials by barge and ship would reduce traffic impacts along Islands Expressway and Elba Island Road. Conversely, the additional barge and ship traffic would temporarily increase ship traffic in the Savannah River. Operation of the liquefaction facilities would result in an increase in daily vehicle traffic entering and exiting the LNG Terminal (75 new permanent employees); however, this impact is expected to be minor. Construction and operation of the Project sites are not expected to impact traffic. Therefore, we conclude that construction and operation of the Project would have only temporary and minor cumulative effects on traffic when combined with other potential project impacts.

2.9.3 Air Quality

The cumulative impact area for air quality during construction of the Project is the area adjacent to and near the physical boundary of the construction areas. The cumulative impact area for operation of the Project is the area covered by the air dispersion analyses discussed in section 2.7.1.

Air emissions, including fugitive dust, generated during the construction of the Project and any future projects, could potentially result in cumulative impacts on air quality. Emissions from construction

equipment and worker vehicles would be primarily limited to daylight hours and would be minimized through mandated engine emission control equipment. Fugitive dust generated by construction activities would also be primarily limited to daylight hours and minimized through dust mitigation measures such as water suppression. These construction emissions would result in short-term, localized impacts. Cumulative impacts from the construction emissions would only occur if construction of the Project facilities and other projects overlap in schedule and location. For the liquefaction facilities, only the SLNG DMCA Expansion Project, Savannah Harbor Expansion Project, and Power Upgrade are close enough to have construction-related air quality impacts on the same area. For the compression facilities, only the proposed non-jurisdictional power line to the Jefferson County Compressor Station is close enough to have construction-related air quality impacts on the same area. General conformity is a concern in areas of poor air quality; however, the Project area has been classified as good. General conformity does not apply to this Project, so there would be no offsets involved.

Operation of the liquefaction facilities and the compressor equipment at the Hartwell, Jefferson County, and Rincon Compressor Stations would contribute cumulatively to existing air emissions. As discussed in section 2.7.1, dispersion modeling was performed to quantitatively evaluate the impacts from operation of the liquefaction facilities and associated marine vessels. The modeling included nearby existing sources of air emissions in the Project area and background concentrations. Additionally, FERC considered results of total facility modeling performed on existing liquefaction facilities. The cumulative impacts of the FERC Modeling (modeled concentrations plus existing background concentration plus impacts from existing operations) demonstrate that the Project would not cause or significantly contribute to a violation of the NAAQS for any criteria pollutant.

Emissions calculations show that although routine operation of the compressor equipment at the Hartwell, Jefferson County, and Rincon Compressor Stations would result in emissions of several regulated air pollutants, the impact of such emissions on the regional air quality would not be significant. In addition, screening analyses indicate that the potential impact of air emissions associated with these sites on the surrounding air quality is minimal. Each aboveground facility would be required to comply with federal, state, and local air regulations, which may require controls to limit the emission of certain criteria pollutants or HAPs. The Project's associated operating emissions would be mitigated by federal, state, and local permits and approvals. Thus, we do not anticipate significant cumulative air quality impacts as a result of the Project when considered with the past, present, or reasonably foreseeable projects in these areas.

2.9.4 Noise

Noise impacts are particularly localized and attenuate quickly as the distance from the noise source increases. Therefore, cumulative noise impacts would only occur if construction of the Project facilities and other projects in the area overlap in schedule and location. As discussed in section 2.7.2, noise resulting from the various stages of construction and operation of the liquefaction facility would not exceed the FERC criterion of 55 dBA L_{dn} at NSAs. Noise associated with construction of the SLNG DMCA Expansion Project, Savannah Harbor Expansion Project, and Power Upgrade is not expected to increase noise levels at the nearest NSAs; therefore, the construction of the liquefaction facilities would not result in significant cumulative noise impacts.

Construction activities at the Hartwell, Jefferson County, and Rincon Compressor Stations would have a minimum noise effect on the surrounding environments. BMPs and other active measures would be used to reduce noise levels during construction, so that the estimated maximum sound levels at the nearest NSAs would be less than 51.4 dBA (L_{dn}) and less than the FERC sound criterion for use of active controls. Operation of the Hartwell, Jefferson County, and Rincon Compressor Stations would result in long-term acoustical impacts on noise receptors, but these impacts would be minimized by incorporating

noise control measures and equipment sound specifications into the facility design plans. These measures are expected to reduce normal operational noise to below 51.4 dBA (L_{dn}). Occasional blowdown events lasting only a few minutes could increase noise levels at the nearest NSAs to 53 dBA (L_{dn}), which is still below the FERC's threshold. For these reasons, we do not anticipate significant cumulative noise impacts from construction or operation of the compressor stations in their respective vicinity when considered with other nearby past, present, or reasonably foreseeable projects.

2.9.5 Climate Change

Climate change is the change in climate over an extended period of time, whether due to natural variability, human activities, or a combination of both, and cannot be characterized by single annual events or individual weather anomalies. For example, a single large flood event or abnormally hot summer may not be an indication of climate change, but a series of floods or hot summers that statistically change the average precipitation or temperature over 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 studying various aspects of climate change. 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 USGCRP coordinates and supports U.S. participation in the IPCC assessments.

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 the accumulation of GHG;
- anthropogenic GHG emissions are the primary contributing factor to climate change; and
- impacts extend beyond atmospheric climate change alone, and include changes to water resources, transportation, agriculture, ecosystems, and human health.

The Global Change Research Act of 1990 requires that, every four years, the USGCRP prepare and submit to the President and Congress an assessment of the effects of global change in the United States. The USGCRP issued the latest report, Climate Change Impacts in the United States, in May 2014 (Melillo *et al*, 2014). The report summarizes the impacts climate change has already had on the United States and projects future impacts due to continued climate change. The report also describes the effects of global change on different regions of the United States (e.g., Southeast) and on various societal and environmental sectors, such as water resources, agriculture, energy use, and human health. Although climate change is a global concern, for this analysis, the focus is on the cumulative impacts of climate change in the Project area.

The USGCRP's report notes the following observations of environmental impacts that may be attributed to climate change in the Southeast region of the United States:

- temperatures are projected to increase another 4 to 8 degrees Fahrenheit by 2100, resulting in increased harmful algal blooms; increased disease-causing agents; spread of non-native plants; reduced dairy and livestock production; and reduced crop productivity;
- the number of days above 95 degree Fahrenheit are projected to increase, resulting in major human health implications;
- the global sea level has risen by about 8 inches since reliable record keeping began in 1880, and is projected to rise another 1 to 4 feet by 2100;
- coastal water temperature in several regions are likely to continue warming as much as 4 to 8 degrees Fahrenheit by 2100;
- increasing acidification resulting from the uptake of CO_2 by ocean waters threatens corals, shellfish, and other living things that form their shells and skeletons from calcium carbonate;
- substantial increases in the extent and frequency of storm surge, coastal flooding, erosion, property damage, and loss of wetlands;
- the intensity, frequency, and duration of North Atlantic hurricanes, as well as the frequency of Category 4 and 5 hurricanes, have increased since the early 1980s;
- short-term droughts are expected to intensify, resulting in decreased aquifer recharge and groundwater availability;
- the number of days that fail to meet federal air quality standards is projected to increase with rising temperatures if there are no additional controls on ozone-causing pollutants; and
- extreme weather events are affecting energy production and delivery facilities, resulting in supply disruptions of varying lengths and magnitudes.

As discussed in section 2.7.1, detailed modeling was performed to quantitatively evaluate the impacts from construction and operation of the Project and existing facility. The modeling also included other existing sources of air emissions in the Project area. The results of the modeling analysis concluded that there would be no significant impact on air quality from operation of the Project in the region.

Currently, there is no standard methodology to determine how the Project's incremental contribution to GHGs would result in physical effects on the environment, either locally or globally. However, estimated emissions associated with the Project would incrementally increase the atmospheric concentrations of GHGs, in combination with GHG emissions from other sources identified in the cumulative impacts analysis. Because we cannot determine the Project's incremental physical impacts due to climate change on the environment, we cannot determine whether or not the Project's contribution to cumulative impacts on climate change would be significant.

2.9.6 Safety

Impacts on reliability and public safety would be mitigated through the implementation of applicable federal, state, and local rules and regulations and maintained in compliance with the federal safety standards summarized in table 2.7.1-1. These 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.

Some of the present or reasonably foreseeable future projects, including the proposed Project, would involve ship or truck transit of hazardous materials. Accidents involving such materials represent a potential impact on public safety. Continued growth in international commerce is likely to result in increased quantities of hazardous materials being shipped to and from the region. Additionally, it is reasonable to assume that the rate of vessel accidents (including those involving the release of hazardous materials) is likely to rise with more ship or truck traffic, which could cumulatively increase the risk of an accident having an impact on public safety.

The Savannah River Pilots manage vessel traffic to ensure safe transit in the Savannah Harbor navigation channel. The USCG would also enforce a moving safety zone and moored vessel security zone around LNG vessels. These and other operational controls by the USCG and Savannah River Pilots would minimize the risk of accidents involving LNG vessels. Furthermore, the USCG Captain of Port (Savannah) concurred that operation of the proposed liquefaction facilities would not alter the marine transfer area in a way that would result in an increased capacity beyond the existing WSA, and the WSA is adequate for the service associated with the Project. Because the Companies have not requested an increase in the number of LNG carriers calling on the LNG Terminal, the liquefaction facilities would not add to the current risk assessment of public safety on the Savannah River or of an intentional attack on an LNG carrier at berth or in transit to the LNG Terminal.

Emergency response time is a key aspect of public health and safety. The Companies stated they would modify the LNG Terminal's ERP and coordinate training with local emergency planning groups, fire departments, state and local law enforcement, the USCG, and other appropriate federal agencies regarding potential incident events. No significant cumulative impacts on emergency services are expected during construction or operation of the proposed cumulative projects.

2.9.7 Conclusion

Past, present, and reasonably foreseeable actions could potentially contribute to a cumulative impact when considered with the proposed Project. Each of the projects considered would result in temporary and minor effects during construction, but each project would be designed to avoid or minimize impacts on water quality, forest, and wildlife resources. Additionally, potential impacts on sensitive resources resulting from these projects would be mitigated, as appropriate, and mitigation generally leads to the minimization of cumulative impacts.

3.0 ALTERNATIVES

In accordance with NEPA and FERC policy, we identified and evaluated a range of alternatives to the Project to determine whether they would be reasonable and environmentally preferable to the proposed action. These alternatives include the No-Action Alternative, system alternatives, and alternative off-site locations to support construction of the proposed facilities. The criteria used to evaluate potential alternatives included whether they:

- offer a significant environmental advantage over the proposed Project;
- are technically and/or economically feasible and practical;
- could be permitted within the same general timeframe of the proposed Project; and
- meet the Companies stated purpose to liquefy domestically produced natural gas for export to accommodate growing natural gas production and provide an outlet for increasing domestic natural gas supplies.

The Companies participated in our pre-filing process during the preliminary design stage for the Project (see section 1.6). This process emphasized identification of potential stakeholder issues, as well as identification and evaluation of alternatives that could avoid or minimize impacts. We analyzed Project alternatives based on published information, comments, and suggestions from regulatory agencies; analyses prepared for similar projects; public comments; and data and analyses provided on the public record by the Companies. The results of the alternatives analyses are provided in the following sections.

3.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, the Companies would not construct the Project, and neither the adverse or beneficial environmental effects identified in this EA would occur. As noted in section 1.1, the DOE has authorized SLNG to export to FTA nations; therefore, the No-Action Alternative would result in the export of the authorized volume from an alternatives site and not meet the identified purpose and need for the Project. As a result, the No-Action Alternative is not a practical alternative.

It is speculative and beyond the scope of this analysis to predict what action might be taken by policy makers or end users in response to the No Action Alternative. It is possible that without the proposed Project, energy needs may be met by alternate energy sources.

Commenters have suggested generally that LNG export projects could be replaced by renewable energy resources alternatives. Renewable energy resources include, but are not limited to, wind power, solar power, tidal power, and hydropower. All of these alternatives represent alternative means of producing electrical power. Because the Project's purpose is to prepare natural gas for export to foreign markets, development or use of renewable energy technology would not be a reasonable alternative to the proposed action.

3.2 SYSTEM ALTERNATIVES

System alternatives would make use of other existing, modified, or proposed systems to meet the stated objectives of the Project. A system alternative could make it unnecessary to construct all or part of the Project, although some modifications or additions to the alternative system may be required. Such modifications or additions could result in environmental effects that may be less than, comparable to, or greater than those associated with the Project.

3.2.1 Other LNG Terminal Alternatives

There are 11 existing LNG terminals in the lower 48 states of the United States, including 6 on the Gulf Coast and 2 on the East Coast (including the LNG Terminal at Elba Island). All six of the existing Gulf Coast facilities and one east coast facility, in addition to the Project, have received or are seeking LNG export authorization. In addition, 1 new LNG terminal has been approved on the Gulf Coast and 20 other new LNG terminals have been proposed in the lower 48 states of the United States.

The Companies are proposing to export LNG to FTA and non-FTA countries, and the volume of gas for FTA countries has already been approved by the DOE (and therefore is determined to be in the public interest). The DOE determination for non-FTA countries is pending. Of the other approved, planned, or proposed LNG export facilities, 24 have obtained DOE approval for the export of LNG associated with the production capacity in the respective Project plans/proposals. Therefore, for the Companies' customers to obtain LNG from other facilities that have DOE approval for export, those facilities would need to construct additional liquefaction facilities to meet the export capacity proposed by the Companies, and as approved by the DOE authorizations. We recognize that liquefaction capacity may not be fully subscribed at all facilities based on contracts executed as of the writing of this EA. However, because the DOE's export approval is a determination that the export is in the public interest, we will not speculate that any portion of other LNG terminals' liquefaction capacity is in "excess" or available for use by the Companies to meet their project objectives.

The Companies state that existing interconnects with the EEC Pipeline would allow feed gas for the Project to be sourced from a wide range of domestic supply sources in the United States, depending on market forces and circumstances at any given time, and presumes that the Project customers selected the Companies' facility as their location for export due to its proximity to natural gas supplies in the Gulf coast and northeast United States supply regions. In addition, the planned export capacity of existing, approved, and proposed LNG terminals in the south and eastern United States, including Cheniere/Sabine Pass LNG and Cove Point LNG, are fully subscribed by their customers. The use of other approved and proposed facilities to meet the Project objectives would be unlikely to offer an environmental advantage over the Project, as the alternate facilities would require construction and operation of similar, if not greater, pipeline, LNG production, storage, and marine facilities.

With the absence of technically and economically feasible and practicable LNG Terminal alternatives with available capacity and that provide an environmental advantage over the proposed Project which is an expansion of an existing LNG facility, we eliminated other potential LNG Terminal alternatives from further consideration.

3.2.2 Non-Terminal Facilities Alternatives

Because the primary destination for LNG exportation is global gas markets where it would likely be used for heating and power generation, exportation options via pipeline is not a reasonable alternative. Additional technologies and processes that convert natural gas into other products exist, and include gas-to-liquids, compressed natural gas, and natural gas hydrates (NGH). However, due to either the significant modifications that would have to be made to the existing LNG Terminal, the lack of transport vessels, the lack of existing infrastructure, and/or insufficient technological development, we eliminated the aforementioned technologies from further consideration.

3.2.3 Pipeline System Alternatives

The Twin 30s Pipeline is the only pipeline that extends to Elba Island, and interconnects the Elba LNG Terminal with SNG, Carolina Gas Transmission Corporation, and EEC Pipeline facilities at Port Wentworth. Three existing SNG pipelines are adjacent to the EEC Pipeline between Port Wentworth and Wrens, Georgia, including one continuous 14-inch pipeline, one continuous 20-inch pipeline and a partial 14-inch pipeline. Incorporation of these pipelines cannot meet the Project objectives of providing additional capacity to Elba Island at the required pressures, as all three lines are fully subscribed by SNG's shippers. Due to a lack of available capacity and limitations in the MAOP, the three SNG pipelines would not provide a viable alternative to the proposed Project without substantial expansion of facilities, incurring greater environmental impacts. The EEC Pipeline is the only pipeline that connects the Transcontinental Gas Pipeline Company, L.L.C. (Transco) system with the Elba Terminal via the Twin 30s Pipeline.

The SNG Cypress Pipeline (Cypress) diverges from the EEC Pipeline at approximately MP 10, and the flow on Cypress is from north to south into Florida. Cypress does not directly connect with the Transco system or any other interstate natural gas transmission systems with sufficient capacity to provide the LNG Terminal with natural gas supplies required to meet Project objectives. Therefore, the Cypress system was also eliminated from further consideration.

In the absence of any other existing pipelines that receive gas at Transco at the capacity required to meet Project objectives, we do not consider any other pipeline systems to be viable alternatives.

3.2.4 Compression Alternatives

To eliminate the addition of multiple compressor stations and their respective environmental impacts, adding compression and looping at only the existing Hartwell Compressor Station was considered as an alternative. While the addition of compression equipment to the station would raise the pressure up to the EEC Pipeline's MAOP, the installation of approximately 71 miles of 42-inch loop and 31 miles of 36-inch loop would be required to meet Project objectives. The environmental impacts of adding more than 100 miles of additional pipeline would far exceed the impact of constructing additional compression facilities. As such, adding compression and looping at only the existing Hartwell Compressor Site is not a viable alternative. An analysis of individual compressor site alternatives is provided in section 3.3.2.

3.3 SITE ALTERNATIVES

3.3.1 Liquefaction Facilities

3.3.1.1 Terminal Site Alternatives

Limitations to using the SLNG property at Elba Island revolve primarily around space, including the limited size of the island, company and industry-required safety spacing between equipment, the required impoundment areas around the LNG storage tanks, and the need for the DMCAs. Several modifications to the existing Terminal would have to be made to meet the objectives of the Project, including the abandonment of existing truck loading facilities, improvements to dock areas, adding fill, and preparation of additional work space.

In spite of the constraints present and the modifications to use Elba Island for liquefaction, the Terminal at Elba Island has many benefits including an established port, the existing Twin 30s Pipeline, and the other existing LNG Terminal facilities footprint that would be in proximity to the new

liquefaction facilities. The Companies designed its Project to take advantage of these synergies. Most environmental effects that would occur with a new, larger liquefaction site would be avoided. As a result, we did not consider alternative liquefaction sites and siting the facilities within the existing Terminal footprint is considered the environmentally preferred alternative.

3.3.1.2 Staging Area Alternatives

The Project's components would maximize use of the existing Terminal site in order to maximize logistical efficiencies associated with construction. This includes establishing one approximately 11.5-acre wareyard in a currently undeveloped area on Elba Island to minimize traffic and risks associated with simultaneous phased construction and operation activities at the facilities. The Phase II facility areas were considered for Phase I laydown, wareyard, and parking requirements, but we determined use of those areas would not be practical because the schedule for Phase II site preparation is less than 3 months after Phase I site work begins. The proposed on-site wareyard area would be used during Phase I construction and then subsequently become the permanent location for a warehouse building following the demolition of an existing warehouse building to make room for the MMLS units.

Approximately 20 acres of additional workspace would be needed offsite for employee parking, safety training, human resources, and temporary placement of construction supplies and equipment. The criteria considered for selection of potential sites included site size, distance from Elba Island, the availability of utilities (i.e., water, electric, lighting, sanitation), suitable access, and sites that are existing or previously disturbed. Based on our review of the five site alternatives identified, we found that all sites are within 4 miles of Elba Island, but none that are closer than the proposed site. Of the 5 sites, 4 are less than 20 acres in size. The 1 alternative site that is greater than 20 acres does not currently have any existing utilities, compared to the proposed site, which has all necessary utilities. Based on our review, none of the alternative sites would be practical or preferable based on the siting criteria.

3.3.1.3 Transportation Alternatives

During scoping, several concerns were expressed about the trucking materials through Savannah for construction and operation of the liquefaction facilities. During construction, large equipment, various construction materials, and potentially large numbers of construction personnel would need to access the LNG Terminal on Elba Island, and would have the potential to impact travel through the city due to increased traffic or infrastructure bottlenecks. Trucking may also pose a safety risk during construction and operations when hazardous materials are being transported. In order to avoid or minimize the risk of these impacts, we evaluated alternatives to truck transport.

Trucking is generally the preferred form of material delivery because the necessary infrastructure is already in place, it is the least expensive transportation method, and offers the greatest amount of flexibility when compared to other transportation methods (e.g., by barge, ship, rail, air, and busing.) Although no single alternative to trucking is likely to be preferable from an environmental, practicability, or economic standpoint, a combination of transportation using some of the aforementioned alternatives to fit the different transportation needs is evaluated in the following subsections. Transporting equipment, materials, and personnel by rail or air is generally not practicable due to the absence of a rail spur or a landing strip on the island. However, the Companies propose to transport some of the fill materials and equipment to the site via barge and ship, and propose to transport construction personnel from the off-site wareyard by bus on a daily basis, thus minimizing impacts.

Barge, Ship, and Port Alternatives

Barge Dock Areas

The Companies propose to deliver some large equipment and pilings to the South Channel barge dock. Four other docking locations were considered on Elba Island to receive materials and equipment. These included: 1) utilization of the abandoned LNG loading arm dock that currently extends into the Savannah River; 2) constructing a new barge dock area near the fire water pond; 3) constructing a new barge dock area between the marine berth and the abandoned LNG loading arm dock; and, 4) utilizing a barge dock area within and on the western side of the marine berth. Because these sites are on the Savannah River, all of them would be exposed to more tidal and wind influence than the South Channel barge dock area. In addition, dock weight limits, safety implications from proximity to existing LNG vaporization equipment, and logistics for truck access all prevent the abandoned LNG loading arm dock on the Savannah River from being a viable alternative for barge deliveries. Stability concerns during offloading of equipment due to existing riprap or bulkhead along the shore that is not submerged at typical low tide result in the other three barge dock areas on the Savannah River being unviable options for barge deliveries. As a result, we do not find any of the alternative barge dock areas to be preferable.

Ship Unloading Areas

The Companies propose that materials, including aggregate materials to be used as fill, be delivered to Elba Island by ship to the North LNG Dock (see maps in appendix A). Two other sites were considered on Elba Island for the utilization of ship unloading to deliver bulk materials and large equipment. These included: 1) the abandoned LNG loading arm docks on the Savannah River, and 2) the bulkhead on the western side of the marine berth. A bathymetric survey was performed on all three possible locations to determine the current feasibility of accepting a dry dock vessel, and any potential upgrades that might be required to do so. The surveys and studies indicated that the abandoned LNG loading arm would require significant dredging to accommodate ships, and more thorough surveys of the existing structures would be required to determine if any structural upgrades of the existing dock would be necessary.

Based on this information, our evaluation determined that the abandoned LNG loading arm dock on the Savannah River was not an option for unloading large vessels. The surveys and studies also indicated that the bulkhead on the western side of the marine berth would require structural modifications to the bulkhead for installation of mooring and fendering apparatus to enable it for ship unloading. No dredging was anticipated in this area, but the bow of a ship might encroach beyond the toe of the 40 foot BLMW. It was also determined that the bulkhead of the western side of the marine berth on the Savannah River was also not an alternative for ship unloading. As a result, we do not find any of the alternative ship unloading areas to be preferable.

Nearby Ports

Off-site ports were considered in the Savannah area (Port of Savannah or Liberty Terminals) that would meet Elba Liquefaction Project objectives if none of the on-site dock options at Elba Island were determined to be suitable for barge or ship deliveries. Both the Port of Savannah and Liberty Terminals have access to the Intracoastal Waterway System, direct access to the Atlantic Ocean, and sufficient depths for both ships and barges. Also, both the Port of Savannah and Liberty Terminals are serviced by major railroad companies, and larger shipments or heavy-lift type of pieces arriving through Liberty Terminals would not require subsequent truck-load shipments from the terminal to Elba Island to pass through downtown Savannah. However, we conclude that utilization of nearby ports is the least desired

marine alternative as it would require that equipment and materials be handled multiple times for transportation from the off-site port via truck or barge to Elba Island.

Rail Alternative

Without rail access to Elba Island, the Port of Savannah is the closest and most feasible location for rail access. Material shipped via rail would be brought into the Port of Savannah and then either trucked to the jobsite via local roads, or for larger/out-of-gauge units, barged directly to the site. Rail shipments typically require multiple handling; cargo is typically loaded onto trucks and delivered to a local rail facility, unloaded from the truck and reloaded onto the railcar. Upon arrival at its destination, the cargo is then unloaded and reloaded onto trucks or barges. Transit time for rail shipments can be difficult to determine. Oversized cargo must receive rail clearances, which in some cases may take up to 8 weeks to obtain prior to loading, and can be moved on special trains to help lower transit times.

It was determined that in the instances of transporting heavy/over-dimensional sized pieces (i.e., vessels, tanks, boilers, super heaters, spool ducts, modules) that are sourced domestically within the central part of the United States, where ocean/barge access is not easily accessible, a combination rail/barge/truck transportation using the Port of Savannah or Liberty Terminals is a viable option. We agree.

Air Alternative

Air shipments also require materials to be handled multiple times. Typically, cargo is loaded onto trucks at their origin, taken to the nearest airport to be unloaded, reloaded onto cargo planes, and upon arrival at its destination airport, unloaded, reloaded onto trucks and taken to site. While transit times are greatly reduced in utilizing air services, the cost of service is extremely high when compared to trucking.

The Savannah Airport is not considered a primary route for shipping material, due to cost efficiency, but would be the primary waypoint for personnel flying into and away from Savannah. The types of cargo that may be shipped via air would be urgent, small, high value cargo, such as computer equipment, personal effects, small electrical components, and others. In most cases, other forms of transportation would be used for shipments of Project material into the project site.

Stabilized Condensate Transfer Alternatives

Due to the relatively small volumes of stabilized condensate (i.e., natural gasoline) that would be moved from the LNG Terminal, the preferred option is by trucking. Transfer via barge loading was considered, but is not optimum due to the larger storage requirements (to be able to fill a barge upon loading) and dock changes associated with that alternative. Rail loading is not preferred because there is no rail link to Elba Island, and this option would require more storage volume than truck loading. Transfer via pipeline is also not preferred as there is no liquid pipeline that services Elba Island. As a result, we conclude that none of the alternatives to trucking are practicable.

3.3.1.4 Security Post Alternatives

As required by the USCG, the Companies maintain a Facility Security Plan for safe and secure LNG Terminal operations. The security plan includes procedures and protocols for monitoring Elba Island, the length of Elba Island Road (a two-lane private road that provides the only access to the island), and for security officers to clear those entering and exiting the island at the Security Post on Elba Island Road. For construction, the Companies would be required to develop a USCG-approved Construction

Security Plan that would govern the security and safety of operations and procedures during construction. In order to efficiently process construction personnel and traffic at the Security Post, the Companies would require adequate area to manage security checks and surveillance on all ingress and egress traffic. This need would be further heightened during construction when security personnel must be able to safely manage those vehicles turning around (including tractor trailers) that are not authorized to access the island.

The location of the Security Post is a critical element of the security plan in that it provides the safest and securest means of controlling access to Elba Island by minimizing the security and safety perimeter to be managed. The Companies considered locating an expanded Security Post near the entrance gate on Elba Island Road near Islands Expressway to avoid impacts on tidal marsh. Our review of that location would avoid impacts on marsh areas, but would substantially increase the security and safety perimeter that would have to be managed, and is not considered practicable because it would create significant traffic congestion on Islands Expressway traffic flow; result in decreased safety for Project site workers, employees, and suppliers traveling to the Project; have negative impacts on businesses in that area; increase risk for security breaches; and not eliminate the need for a Security Post at the existing location. The Companies have minimized the footprint of the area needed for the expanded Security Post, and have configured the truck turnaround to minimize wetland impacts on the extent practicable. As a result, we conclude that no other Security Post site alternatives have been identified that are preferable to the proposed action.

3.3.2 Compressor and Metering Facilities Site Alternatives

During development of the proposed Project, various system configurations were considered to minimize impacts while meeting engineering and hydraulic requirements, and overall Project objectives. As discussed in section 3.3, this included an analysis of system-wide alternatives including use of existing compression facilities to meet the Project purpose and need. Based on those analyses, the Companies determined that to meet projected volume and pressure requirements, two additional compressor stations would be required in addition to modifications at the existing Hartwell Compressor Station. The alternatives considered for each of these sites are evaluated in the subsections below. Alternatives for metering facilities were not evaluated because they would be installed at existing sites and operated for the same purpose.

3.3.2.1 Hartwell Compressor Station

The existing Hartwell Compressor Station currently uses approximately 5.8 acres within a 30-acre tract owned by EEC. The site consists of commercial/industrial land surrounded by planted pines managed for timber production; there are no sensitive environmental features within the station footprint. No new access roads would be required for construction. The Companies propose to modify the existing compressor unit, and subsequently, to install additional compression. By utilizing and modifying the compressor at the existing site, the Companies eliminate the impacts that would be caused by developing a new site. As a result, we did not identify any practicable alternatives.

3.3.2.2 Jefferson County Compressor Station

We evaluated four alternatives to the proposed Jefferson County Compressor Station within the optimal hydraulic range between EEC Pipeline MPs 94 and 105. Locations that would be outside the optimal range were not considered because they would result in additional environmental impacts caused by the necessary installation of pipe, compression, and/or looping, and could potentially result in issues in meeting the pressure requirements to meet Project objectives. Table 3.3.2-1 provides a comparison of the alternatives to the proposed site for various siting factors, such as existing land use, topographic

conditions, the presence of water resources, the distance to NSAs, and the accessibility to existing infrastructure. Figure 3.3.2-1 depicts the alternative sites in comparison to the proposed site.

As shown in table 3.3.2-1, each site has environmental advantages and disadvantages. However, as the proposed site is located the farthest from NSAs, has marginal wildlife habitat, the least topographic variation, and is proximate to the existing EEC Pipeline right-of-way, we conclude that the alternative sites do not provide an environmental advantage when compared to the proposed site.

TABLE 3.3.2-1

Jefferson County Compressor Station Alternatives

	Tract No.				
Factor	0065-026	0100-035	0131-007	0131-005	0131-029 (Proposed Site)
Site Size (acres)	30.0	30.0	30.1	30.1	30.1
Location (milepost)	104.6	100.0	95.1	95.0	94.1
Existing Land Use [a]	Open / Upland Forest	Planted Pine / Upland Forest / Open	Planted Pine	Planted Pine / Open	Planted Pine / Open
Elevation Change within Site (feet)	27	30	25	25	10
Number of Waterbodies on Site	1	3	0	1	1
Number of Wetlands on Site	0	0	0	0	0
Distance to Nearest NSA (feet)	634	2,059	1,373	2,376	3,010
NSAs within 1/2 mile (count)	45	2	8	4	0
Lateral Pipeline Distance (feet)	84	120	651	812	166
Access Road Distance (feet)	107	463	486	202	275

[a] Listed in order of predominance where more than one land use category is identified.

3.3.2.3 Rincon Compressor Station

Four alternatives were identified and evaluated to the proposed Rincon Compressor Station. Hydraulic requirements to meet Project objectives indicate additional compression would be necessary between EEC Pipeline MPs 9.9 and 11.0 in Effingham County. We reviewed a detailed desktop analysis of several proposed alternative sites, based primarily on constraints such as accessibility to and impacts on nearby residences, other NSAs, and sensitive environmental features. Table 3.3.2-2 summarize the impacts of each Effingham County alternative considered and figure 3.3.2-2 depicts the alternative site locations.

As shown in table 3.3.2-2, Tract EF-112.2 has 14 NSAs within a half mile, is dominated by forested wetland compared to planted pine and open land, and has a relatively long access road compared to the proposed site. Therefore, it is not considered to offer a significant environmental advantage and has been eliminated from further consideration. Although 8.8 acres of wetland were identified at the proposed site, the Companies have designed the site to avoid all wetland impacts. Due to the large wetland system that bisects Tract EF-117.2(a), and because the spray field maintained on a portion of the site (by the water treatment plant) must remain in its current location, Tract EF-117.2(a) is not considered a viable alternative and has been eliminated from consideration. Tracts EF-122 and EF-117.2(b) impact forested wetland and uplands, respectively, and both are closer to the nearest NSA and have more NSAs within a half mile, which do not provide a significant environmental advantage. In addition, both are not available for purchase and have therefore been eliminated from further consideration. Based on the aforementioned considerations, we conclude that the proposed site provides an environmental advantage over the alternative sites.

TABLE 3.3.2-2

Comparison of Rincon Compressor Station Alternatives

Factor	Tract No. EF-122	EF-117.2(a)	EF-117.2(b)	EF-112.2	EF-118 (Proposed Site)
Site Size (acres)	22.2	10.2	15.7	13.3	31.2
Location (milepost)	11.5	10.7	10.6	10.0	11.1
Existing Land Use [a]	Planted Pine / Forested Wetland	Forested Wetland / Planted Pine	Planted Pine / Upland Forest	Forested Wetland	Planted Pine / Open Land
Number of Waterbodies on Site	0	0	0	0	0
Acreage of Wetlands on Site	2.7	8.8	0.5	12.9	8.8
Distance to Nearest NSA (feet)	2,640	2,165	2,165	792	2,693
NSAs within 1/2 mile (count)	1	2	2	14	0
Lateral Pipeline Distance (feet)	481	315	315	194	640
Access Road Distance (feet)	1,978	438	319	1,021	256
Purchase Availability	No	Yes	No	Yes	Yes

[a] Listed in order of predominance where more than one land use category is identified.

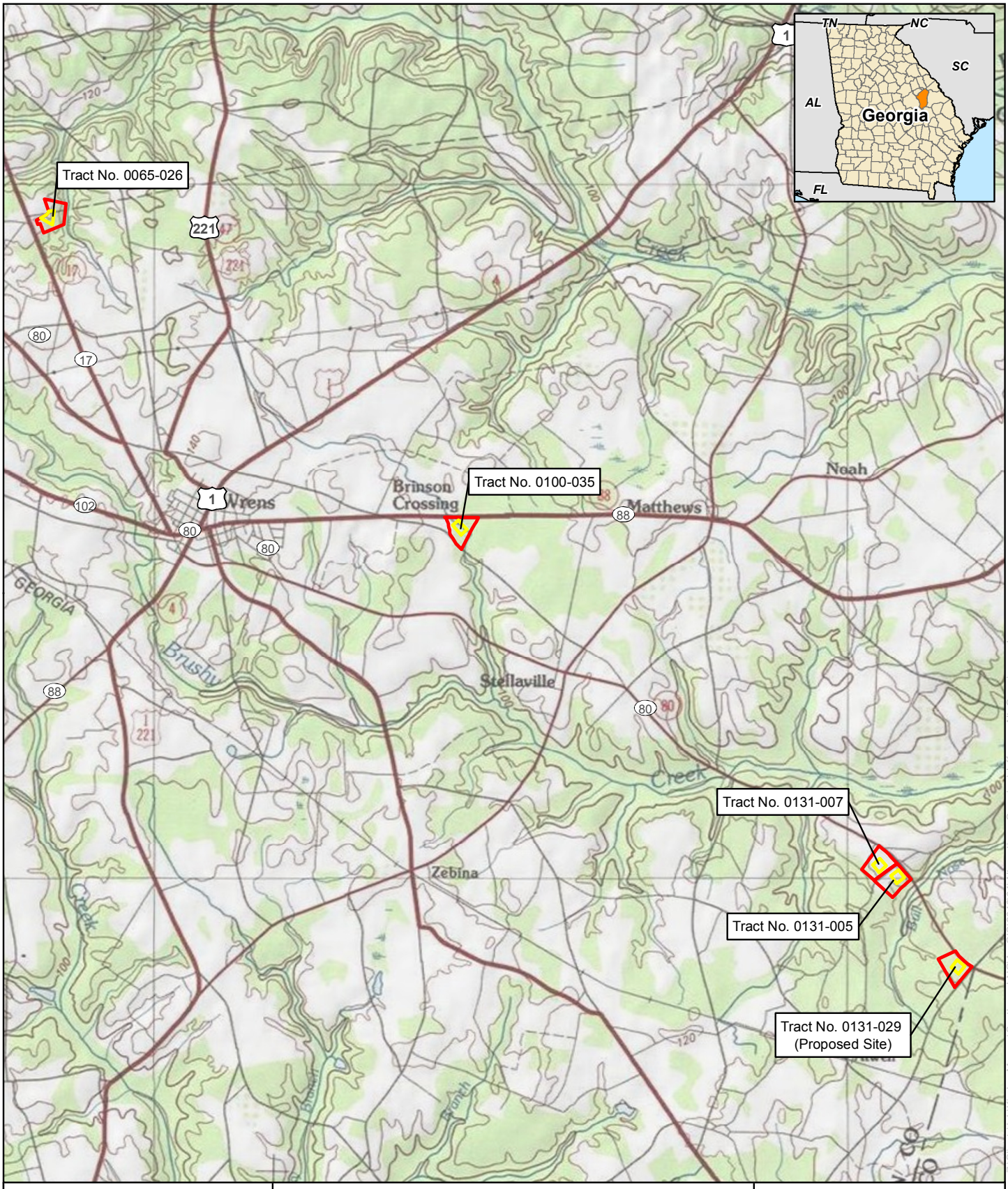


Figure 3.3.2-1
Jefferson County Compressor Station Alternatives
Jefferson County, Georgia

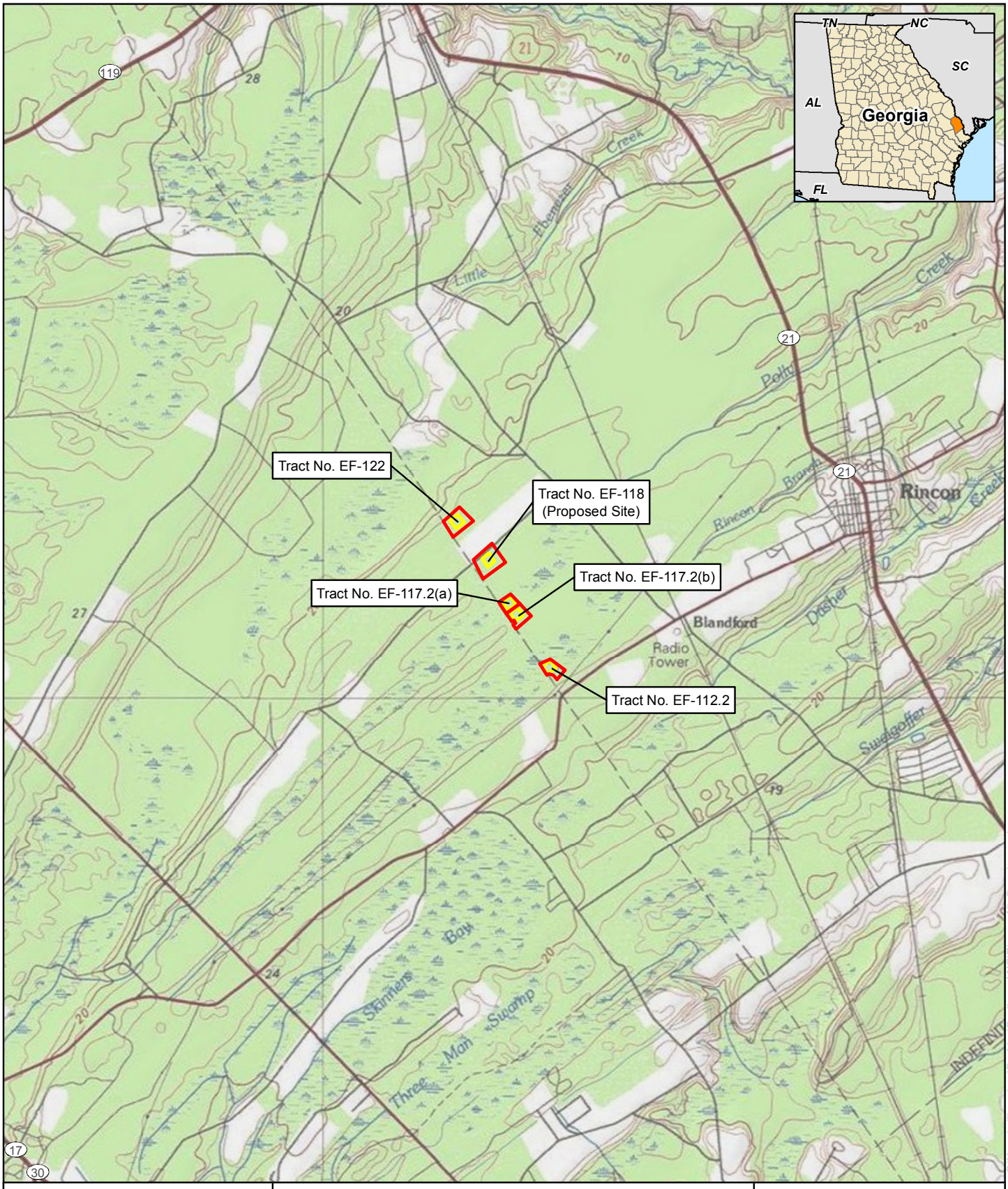


Figure 3.3.2-2

Rincon Compressor Station Alternatives
Effingham County, Georgia

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Date: (1/19/2016)

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon the analysis in this EA, we have determined that if the Companies construct and operate the proposed facilities in accordance with their application, supplements, and our mitigation measures below, approval of this Project would not constitute a major federal action significantly affecting the quality of the human environment. We recommend that the Commission Order contain a finding of no significant impact and include the measures listed below as conditions in any authorization the Commission may issue to the Companies.

1. The Companies shall follow the construction procedures and mitigation measures described in their application and supplements (including responses to staff data requests) and as identified in the EA, unless modified by the Order. The Companies 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 the 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 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 compression and metering 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 the construction and operation of the project.

4. **Prior to any construction**, the Companies shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, EIs, and contractor personnel will be informed of the EI's authority and have been or will be trained on the implementation of the environmental mitigation measures appropriate to their jobs **before** becoming involved with construction and restoration activities.

5. The authorized facility locations shall be as shown in the EA, as supplemented by filed drawings and plans. **As soon as they are available, and before the start of construction**, the Companies shall file with the Secretary any revised detailed drawings or plans 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 drawings or plans.

   The Companies' 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. The Companies' right of eminent domain granted under NGA section 7(h) does not authorize it to increase the size of their natural gas pipeline and facilities to accommodate future needs or to acquire a right-of-way for a pipeline to transport a commodity other than natural gas.

6. The Companies shall file with the Secretary detailed drawings or plans and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments, facility relocations, staging areas, pipe storage yards, new access roads, and other areas that would be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, documentation of landowner approval, whether any cultural resources or federally listed threatened or endangered species would be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. Each area must be approved in writing by the Director of OEP **before construction in or near that area**.

   This requirement does not apply to extra workspace allowed by our Plan and/or minor field realignments per landowner needs and requirements that do not affect other landowners or sensitive environmental areas such as wetlands.

   Examples of alterations requiring approval include all facility location changes resulting from:

   a. implementation of cultural resources mitigation measures;

   b. implementation of endangered, threatened, or special concern species mitigation measures;

   c. recommendations by state regulatory authorities; and

   d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

7. **Within 60 days of the acceptance of the authorization and before construction begins**, EEC shall file an Implementation Plan for the review and written approval by the Director of OEP. EEC must file revisions to the plan as schedules change. The plan shall identify:

   a. how the company will implement the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests), identified in the EA, and required by the Order;

   b. how the company 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 for the facility sites, and how the company will ensure that sufficient personnel are available to implement the environmental mitigation;

d. company personnel, including EIs and contractors, who will receive copies of the appropriate materials;

e. the location and dates of the environmental compliance training and instructions the company will give to all personnel involved with construction and restoration (initial and refresher training as the Project progresses and personnel change), with the opportunity for OEP staff to participate in the training session(s);

f. the company personnel (if known) and specific portion of the company's organization having responsibility for compliance;

g. the procedures (including use of contract penalties) the company 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. **Within 60 days of the acceptance of the authorization and before construction begins**, ELC and SLNG shall file an Implementation Plan for the review and written approval by the Director of OEP. ELC and SLNG must file revisions to the plan as schedules change. The plan shall identify:

a. how the companies will implement the construction procedures and mitigation measures described in their application and supplements (including responses to staff data requests), identified in the EA, and required by the Order;

b. how the companies 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 for the facility sites, and how the companies will ensure that sufficient personnel are available to implement the environmental mitigation;

d. company personnel, including EIs and contractors, who will receive copies of the appropriate materials;

e. the location and dates of the environmental compliance training and instructions the companies will give to all personnel involved with construction and restoration (initial and refresher training as the Project progresses and personnel change), with the opportunity for OEP staff to participate in the training session(s);

f. the company personnel (if known) and specific portion of the companies' organizations having responsibility for compliance;

g. the procedures (including use of contract penalties) the companies 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.

9. The Companies shall employ at least two EIs for the Project, one for the LNG Terminal and one for the EEC Modification Project 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 6 above) and any other authorizing document;

c. empowered to order correction of acts that violate the environmental conditions of the Order and any other authorizing document;

d. a full-time position, separate from all other activity inspectors;

e. responsible for documenting compliance with the environmental conditions of the Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and

f. responsible for maintaining status reports.

10. Beginning with the filing of its Implementation Plan, the Companies shall file updated status reports on a **monthly** basis for the Project 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 the Companies' efforts to obtain the necessary federal authorizations;

b. the construction status of the Project sites, 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 each EI(s) 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 the Companies from other federal, state, or local permitting agencies concerning instances of noncompliance, and the Companies' response.

11. **Prior to receiving written authorization from the Director of OEP to commence construction of any Project facilities**, the Companies shall file with the Secretary documentation that it has received all applicable authorizations required under federal law (or evidence of waiver thereof).

12. ELC and SLNG must receive written authorization from the Director of OEP **before placing into service** the LNG Terminal for each phase of the Project. 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. EEC must receive written authorization from the Director of OEP **before placing into service** each phase of its new Project 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 areas affected by the Project are proceeding satisfactorily.

14. **Within 30 days of placing the authorized facilities in service**, the Companies 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 authorization conditions the Companies has complied with or will comply with. This statement shall also identify any areas affected by the Project where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

15. **Prior to construction of the LNG terminal**, ELC and SLNG shall file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in Georgia:

    a. site preparation drawings and specifications prior to construction;

    b. pile installation drawings and specifications prior to construction;

    c. LNG liquefaction facility structures and foundation design drawings and calculations (including prefabricated and field-constructed structures) prior to their construction;

    d. seismic specifications for procured equipment prior to the issuing of requests for quotations; and

    e. quality control procedures to be used for civil/structural design and construction early in the design phase.

16. The Companies shall employ a special inspector during construction and a copy of the inspection reports shall be included in the **monthly** status reports filed with the Secretary. The special inspector shall be responsible for:

    a. observing the construction of the liquefaction facility to be certain it conforms to the design drawings and specifications;

    b. furnishing inspection reports to the engineer- or architect-of-record, and other designated persons. All discrepancies shall be brought to the immediate attention of the contractor for correction, then if uncorrected, to the engineer- or architect-of-record; and

    c. submitting a final signed report stating whether the work requiring special inspection was, to the best of his/her knowledge, in conformance with approved plans and specifications and the applicable workmanship provisions.

17. ELC and SLNG shall limit in-water pile driving and initial dredging to occur **between May 15 and November 15**. If these activities cannot be conducted within this time window, no activities are authorized without further consultation from the NMFS and COE and further approval from the Commission.

18. EEC shall not begin construction activities of the compression and metering facilities **until**:

    a. the staff receives comments from the FWS regarding the proposed action;

    b. the staff completes formal consultation with the FWS, if required; and

    c. EEC has received written notification from the Director of OEP that construction or use of mitigation may begin.

19. ELC and SLNG shall not begin construction activities of the LNG Terminal facilities **until**:

    a. the staff receives comments from the FWS/NMFS regarding the proposed action;

    b. the staff completes formal consultation with the FWS/NMFS, if required; and

c. ELC and SLNG have received written communication from the Director of OEP that construction or use of mitigation may begin.

20. **Prior to construction**, the Companies shall file with the Secretary documentation of concurrence from the GDNR and SCDHEC (if applicable) that the metering facilities, South Channel barge dock dredging activities, Security Post modifications, and wareyard activities are consistent with each state's respective CZMA.

21. **Prior to construction,** EEC shall file with the Secretary for the review and written approval by the Director of OEP a visual screening plan for the new and existing compression facilities that incorporates the specific measures developed in consultation with nearby property owners.

22. ELC and SLNG shall file with the Secretary a full load noise survey for the LNG Terminal **no later than 60 days** after Phase I is placed into service. If a full load noise survey is not possible, ELC and SLNG shall provide an interim survey at the maximum possible load and provide the full load survey **within 6 months.** If the noise attributable to the operation of the equipment at the LNG Terminal under interim or full load conditions exceeds an L_{dn} of 55 dBA at the nearby NSA, ELC and SLNG shall reduce operation of the liquefaction facilities or install additional noise controls until a noise level below an L_{dn} of 55 dBA at the nearby NSA is achieved. ELC and SLNG shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after they install the additional noise controls.

23. ELC and SLNG shall file a full load noise survey with the Secretary **no later than 60 days** after placing the LNG Terminal Phase II facilities into service. If a full load noise survey is not possible, ELC and SLNG shall provide an interim survey at the maximum possible load 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 load conditions exceeds an L_{dn} of 55 dBA at the nearby NSA, ELC and SLNG shall file a report on what changes are needed and should install the additional noise controls to meet the level **within 1 year** of the in-service date. ELC and SLNG 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.

24. EEC shall file a full load noise survey with the Secretary for the Hartwell Compressor Station **no later than 60 days** after the applicable compressor units are placed into service for the first, second, and third phases. If a full load noise survey is not possible, EEC should provide an interim survey at the maximum possible load and provide the full load survey **within 6 months.** If the noise attributable to the operation of the equipment at the Hartwell Compressor Station under interim or full load conditions exceeds an L_{dn} of 55 dBA at the nearby NSA, EEC shall reduce operation of the compressor station or install additional noise controls until a noise level below an L_{dn} of 55 dBA at the nearby NSA is achieved. EEC 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.

25. For each Project phase that adds new or additional compression facilities at the Jefferson and Rincon Compressor Stations, EEC shall file full load noise surveys with the Secretary **no later than 60 days** after placing the facilities into service. If full load condition noise surveys are not possible, the EEC shall provide an interim survey at the maximum possible horsepower load and provide the full load survey **within 6 months.** If the noise attributable to the Phase I operation of the Jefferson and Rincon Compressor Stations under interim or full load conditions exceeds an L_{dn} of 55 dBA at the nearby NSA, EEC shall reduce operation of the compressor station(s) or install additional noise controls until a noise level below an L_{dn} of 55 dBA at the nearby NSA is

achieved. If the noise attributable to the Phase III operation of all of the equipment at the Jefferson and Rincon Compressor Stations, under interim or full horsepower load conditions, exceeds an L_{dn} of 55 dBA at any nearby NSAs, EEC 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. EEC 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.

26. **Prior to placing the Hartwell Compressor Station modifications and new Jefferson and Rincon Compressor Stations into service,** EEC shall file a landowner notification plan for planned blowdown events with the Secretary for review and written approval by the Director of the OEP.

27. ELC and SLNG shall include the terminus of the McQueens Island Trail as a NSA in its full load noise survey for the LNG Terminal.

Recommendations 28 through 87 shall apply to the ELC and SLNG Liquefaction Project LNG 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 critical energy infrastructure information 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.

28. **Prior to initial site preparation**, ELC and SLNG shall file an overall Project schedule, which includes the proposed stages of the commissioning plan.

29. **Prior to initial site preparation**, ELC and SLNG shall provide procedures for controlling access during construction.

30. **Prior to initial site preparation**, ELC and SLNG shall file the quality assurance and quality control procedures for construction activities.

31. **Prior to initial site preparation**, ELC and SLNG shall file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.

32. **Prior to initial site preparation**, ELC and SLNG shall file additional analysis that demonstrates the flammable vapor dispersion from design spills would be prevented from dispersing underneath the existing elevated LNG storage tank(s), or the LNG storage tank(s) would be able to withstand an overpressure due to ignition of the flammable vapor dispersion cloud that disperses underneath the existing elevated LNG storage tank(s).

33. **Prior to initial site preparation**, ELC and SLNG shall file refined modeling that determines whether additional vapor fencing is needed as a mitigation measure for an LNG release located near the property line adjacent to the Savannah River.

34. **Prior to initial site preparation**, ELC and SLNG shall file an analysis that determines whether the existing LNG storage tank D-5 would be able to withstand a peak side-on pressure of 2 psig.

35. **Prior to initial site preparation**, ELC and SLNG shall file additional layers of protection to mitigate the potential for an initiating event to develop into a BLEVE incident in the form of passive mitigation.

36. **Prior to initial site preparation**, ELC and SLNG shall file its updated ERP to include the liquefaction facilities as well as instructions to handle on-site refrigerant-related emergencies. ELC and SLNG shall file the updated ERP with the Secretary for review and written approval by the Director of OEP.

37. **Prior to initial site preparation**, ELC and SLNG shall file an ERP that includes a Cost-Sharing Plan identifying the mechanisms for funding all Project-specific security and 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 and emergency management equipment and personnel base.

38. The **final design** shall include information/revisions pertaining to ELC and SLNG's response to the Engineering Information Requests identified in table 2.8.4-1 of the EA, which indicated features to be included or considered in the final design.

39. The **final design** shall include change logs that list and explain any changes made from the FEED provided in ELC and SLNG'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.

40. The **final design** shall provide up-to-date process flow diagrams with heat and material balances and P&IDs, which include the following information:

    a. equipment tag number, name, size, duty, capacity, and design conditions;

    b. equipment insulation type and thickness;

    c. storage tank pipe penetration size and nozzle schedule;

    d. valve high pressure side and internal and external vent locations;

    e. piping with line number, piping class specification, size, and insulation type and thickness;

    f. piping specification breaks and insulation limits;

    g. all control and manual valves numbered;

    h. relief valves with size and set points; and

    i. drawing revision number and date.

41. The **final design** shall provide P&IDs, specifications, and procedures that clearly show and specify the tie-in details required to safely connect the Project to the existing facility.

42. The **final design** shall provide P&IDs that show the control valves, HCV-3701 and HCV-3801, on the Cold Box P&IDs US01-1120-P0037A and US01-1120-P0038A.

43. The **final design** shall provide an up-to-date complete equipment list, process and mechanical data sheets, and specifications.

44. The **final design** shall include three-dimensional plant drawings to confirm plant layout for maintenance, access, egress, and congestion.

45. The **final design** shall include a list of all car-sealed and locked valves consistent with the P&IDs.

46. The **final design** shall specify that the minimum flow set point of the cooling media to MK-0501 be equipped with an alarm that is active during operation of the motor.

47. The **final design** shall include a low instrument air pressure alarm and plant-wide shutdown initiated by low-low instrument air pressure. The setting shall be above the minimum required to maintain stable operation.

48. The **final design** shall demonstrate that for hazardous fluids, piping and piping nipples 2 inches or less in diameter are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and operator live loads in areas accessible by operators.

49. The **final design** shall specify that the 150# piping specification, S1Y, downstream of the restriction orifice and pipe break in the 6-inch-diameter LNG rundown piping to the LNG storage tanks, shall be tested to qualify the piping to operate at the specified MAOP of the piping of 275 psig.

50. The **final design** shall specify that piping specifications for stainless steel piping capable of operating at cryogenic temperatures shall require the inner and outer ring of spiral wound gaskets to be stainless steel.

51. The **final design** shall provide the procedures for pressure/leak tests that address the requirements of ASME VIII and ASME B31.3, as required by 49 CFR 193.

52. 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.

53. The **final design** shall include drawings and details of how process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system meet the requirements of NFPA 59A.

54. 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 shut down the appropriate systems.

55. The **final design** shall provide electrical area classification drawings.

56. The **final design** shall include a HAZOP review of the completed design prior to issuing the P&IDs for construction. A copy of the review, a list of recommendations, and actions taken on the recommendations shall be filed.

57. 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.

58. The **final design** shall include a drawing showing the location of ESD buttons. ESD buttons shall be easily accessible, conspicuously labeled, and located in an area accessible during an emergency.

59. The **final design** shall specify that all ESD valves are to be equipped with open and closed position switches connected to the Distributed Control System and Safety Instrumented System.

60. The **final design** shall include the sizing basis and capacity for the final design of the flare stacks as well as the pressure and vacuum relief valves for major process equipment, vessels, and storage tanks.

61. The **final design** shall include an evaluation that confirms remote sensing lines for pilot-operated relief valves are subject to chatter and are required by API 520/521. If sensing lines are used from the main process piping to the pilot relief valves, the sensing lines shall be piping in order to ensure mechanical integrity.

62. The **final design** shall specify that the 1-inch-diameter sensing line from the main process piping shall be equipped with a root valve at the nipple from the main line connection to provide isolation of the system in the event the sensing line is damaged or the needle valve malfunctions.

63. 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 Part 193. The evaluation shall consider the need for clean agent fire suppression in the new switchgears and motor control centers. A copy of the evaluation, a list of recommendations and supporting justifications, and actions taken on the recommendations shall be filed.

64. The **final design** shall provide spill containment system drawings with dimensions and slopes of curbing, trenches, and impoundments.

65. The **final design** shall provide complete drawings and a list of the hazard detection equipment. The drawings shall clearly show the location and elevation of all detection equipment. The list shall include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment.

66. The **final design** shall include a list of alarm and shutdown set points for all hazard detectors. The set points of the hazard detectors shall account for the calibration gas when determining the lower flammable limit set points for flammable components such as refrigerants, natural gas liquids, and LNG.

67. The **final design** shall include a list of alarm and shutdown set points for all hazard detectors. The set points of the hazard detectors shall account for the calibration gas when determining the set points for toxic components such as ammonia, natural gas liquids, and hydrogen sulfide.

68. The **final design** shall specify that a flammable gas detector with alarm is to be provided to monitor the vent from the seal gas system as shown on P&ID US01-1120-P0048C.

69. The **final design** shall include flammable gas monitoring and alarm of the vent gas from the heating medium system that flows to the flare system.

70. The **final design** shall provide complete plan drawings and a list of the fixed, wheeled, and 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.

71. The **final design** shall provide facility plans and drawings that show the location of the firewater and foam systems. 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.

72. ELC and SLNG shall certify that the **final design** is consistent with the information provided to the DOT as described in the design spill determination letter dated July 30, 2015 (FERC eLibrary Accession Number 20150731-4001) and supplemental information filed by ELC and SLNG on September 8, 9, 23, and 25, 2015 (FERC eLibrary Accession Numbers 20150908-5298, 20150910-5006, 20150923-5177, and 20150925-5288), October 2 and 19, 2015 (FERC eLibrary Accession Numbers 20151005-5031 and 20151020-5011), and November 30, 2015 (FERC eLibrary Accession Number 20151130-4444). In the event that any modifications to the design alters the candidate design spills on which the Title 49 CFR 193 siting analysis was based, ELC and SLNG shall consult with DOT on any actions necessary to comply with Part 193.

73. The **final design** shall include procedures to maintain and inspect the vapor fencing provided to meet the siting provisions of 49 CFR 193.2059.

74. The **final design** shall provide concurrence from the DOT as to whether the use of check valves, instead of vapor fencing, in the LNG rundown line is an acceptable form of mitigation.

75. **Prior to commissioning**, ELC and SLNG 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. ELC and SLNG shall file documentation certifying that each of these milestones has been completed before authorization to commence the next phase of commissioning and startup will be issued.

76. **Prior to commissioning**, ELC and SLNG 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.

77. **Prior to commissioning**, ELC and SLNG shall tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves.

78. **Prior to commissioning**, ELC and SLNG shall file updates addressing the liquefaction facilities in the operation and maintenance procedures and manuals as well as in the safety procedures.

79. **Prior to commissioning**, ELC and SLNG shall maintain a detailed training log to demonstrate that operating staff have completed the required training.

80. **Prior to commissioning**, ELC and SLNG 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.

81. **Prior to introduction of hazardous fluids**, ELC and SLNG 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 to demonstrate full functionality and operability of the system.

82. **Prior to introduction of hazardous fluids**, ELC and SLNG 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).

83. **Prior to commencement of service**, ELC and SLNG shall develop procedures for off-site contractors' responsibilities, restrictions, and limitations and for supervision of these contractors by ELC and SLNG staff.

84. **Prior to commencement of service**, ELC and SLNG shall label piping with fluid service and direction of flow in the field in addition to the pipe-labeling requirements of NFPA 59A.

85. **Prior to commencement of service**, ELC and SLNG shall specify an alarm management program to ensure effectiveness of process alarms.

86. **Prior to commencement of service**, ELC and SLNG shall notify FERC staff of any proposed developments to the Facility Security Plan.

87. **Prior to commencement of service**, progress on the construction of the proposed systems shall be reported in **monthly** reports filed with the Secretary. Details shall include a summary of activities, problems encountered, contractor nonconformance/deficiency logs, remedial actions taken, and current ELC and SLNG Project schedule. Problems of significant magnitude shall be reported to the FERC **within 24 hours**.

In addition, recommendations 88 through 90 shall apply throughout the life of the LNG facility:

88. 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, ELC and SLNG shall respond to a specific data request, including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed P&IDs reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, shall be submitted.

89. 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, liquefied and vaporized quantities, 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)" 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.

90. Significant non-scheduled events, including safety-related incidents (e.g., LNG, condensate, refrigerant, or natural gas releases, fires, explosions, mechanical failures, unusual over pressurization, and major injuries) and security-related incidents (e.g., attempts to enter site, suspicious activities) shall be reported to 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 5 minutes or more;

    f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes hazardous fluids;

    g. any crack or other material defect that impairs the structural integrity or reliability of an LNG facility that contains, controls, or processes hazardous fluids;

    h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes hazardous fluids to rise above its MAOP (or working pressure for LNG facilities) plus the build-up allowed for operation of pressure limiting or control devices;

    i. a leak in an LNG facility that contains or processes hazardous fluids that constitutes an emergency;

j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;

k. any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility that contains or processes hazardous fluids;

l. safety-related incidents to hazardous fluids vessels 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.

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Appendix A

LNG Terminal Facility Maps



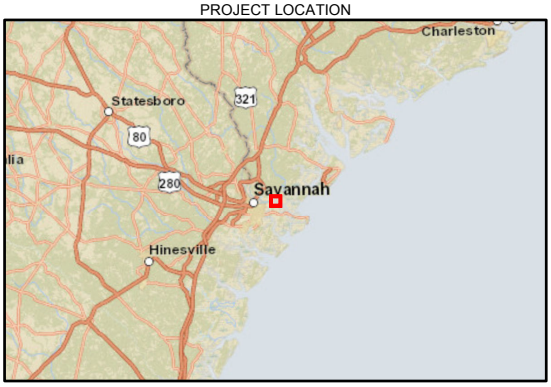
Legend

Approximate Project Boundary

N

0 1,000 2,000
Feet

PROJECT LOCATION



Project Location Map
Elba Liquefaction Project
Elba Liquefaction Company, L.L.C.
Southern LNG Company, L.L.C.
Chatham County, Georgia

Notes:
1. Imagery Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community



Legend

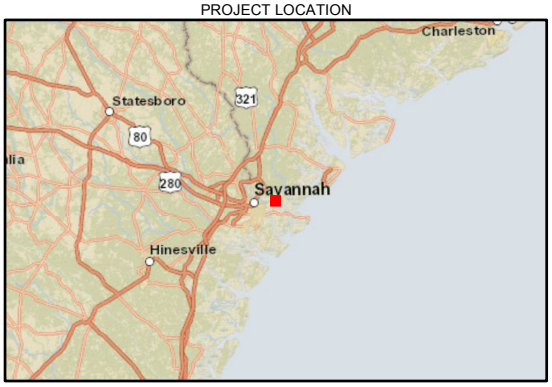
- Ship Loading Modifications
- Substation Facility
- BOG Compressor
- Marine Flare
- Liquefaction Process Flare System
- MMLS Units
- New Truck Loading & Unloading Stations[3]
- Existing South Channel Barge Loading Facility
- Wareyard Facility
- Terminal Security Post
- Approximate Project Boundary

Notes:
1. Transportation Source: Copyright:© 2013 Esri, DeLorme, NAVTEQ, TomTom
2. Imagery Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
3. This is to be used for trucks as they load/unload natural gasoline, amine, mixed refrigerants, and process waste water.

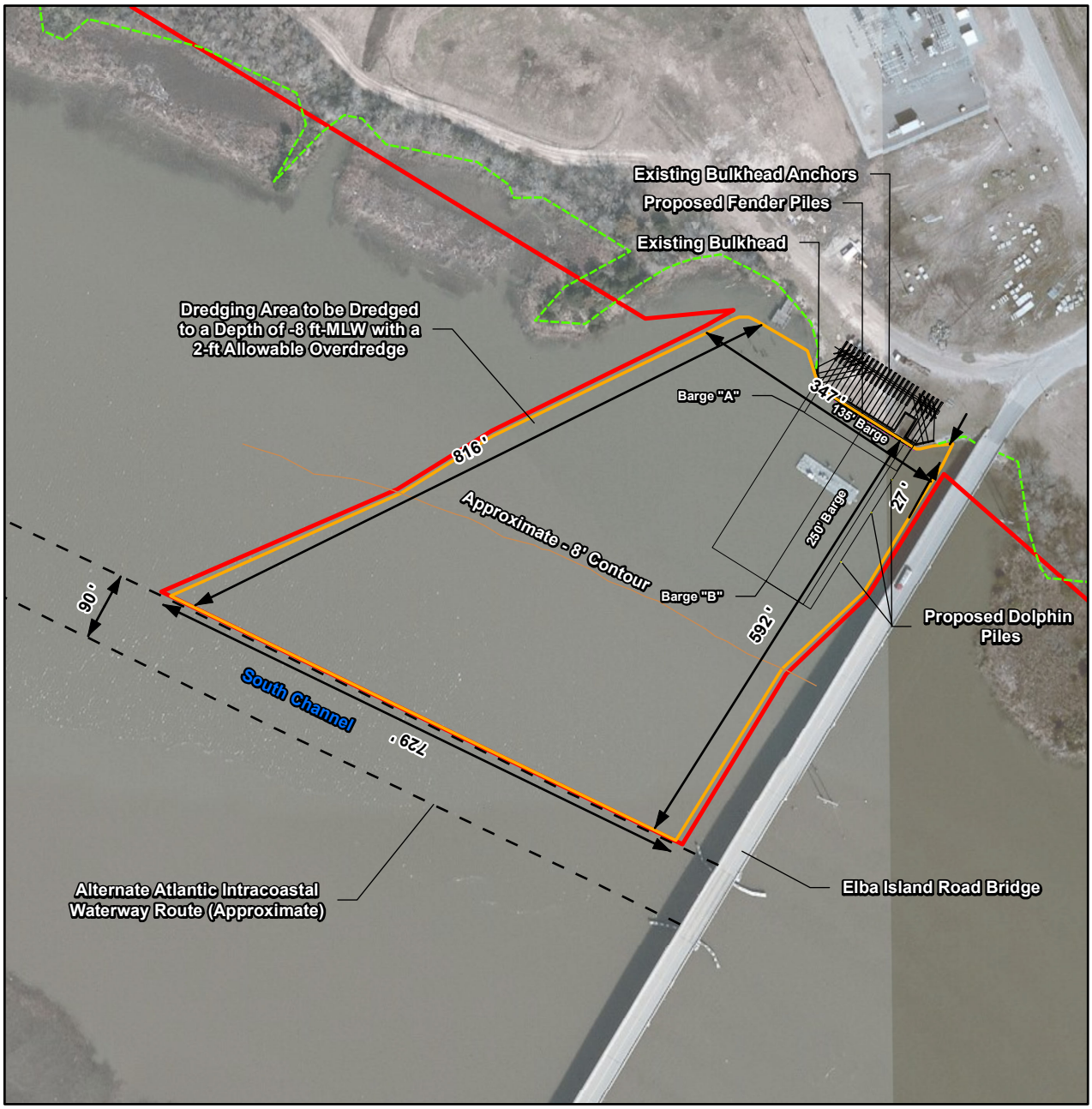
N

0 750 1,500
Feet

PROJECT LOCATION



Elba Island Facilities
Elba Liquefaction Project
Elba Liquefaction Company, L.L.C.
Southern LNG Company, L.L.C.
Chatham County, Georgia



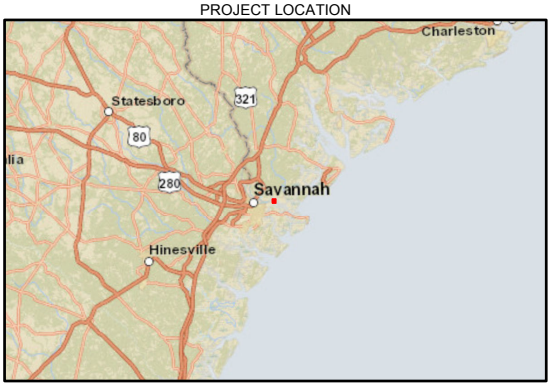
Legend

- CRD Marsh Boundary
- AAIW (Approximate)
- Proposed Dolphin Piles
- Proposed Fender Piles
- Dredging Area
- Approximate Project Boundary

N

0 100 200
Feet

PROJECT LOCATION



Notes:
1. Imagery Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
2. Barge loading facility details provided by CB&I. Elba Liquefaction Project (Common BOP & TU) Dock Area Marine Off-Loading Facility Plan Drawing No. 185251-03511-01 Revision L.
3. Proposed dredging area accounts for extent of dredged side slopes.

Barge Loading Dock
Elba Liquefaction Project
Elba Liquefaction Company, L.L.C.
Southern LNG Company, L.L.C.
Chatham County, Georgia

Appendix B

Compression & Metering Facility Maps



Legend

Hartwell Compressor Station Site

N

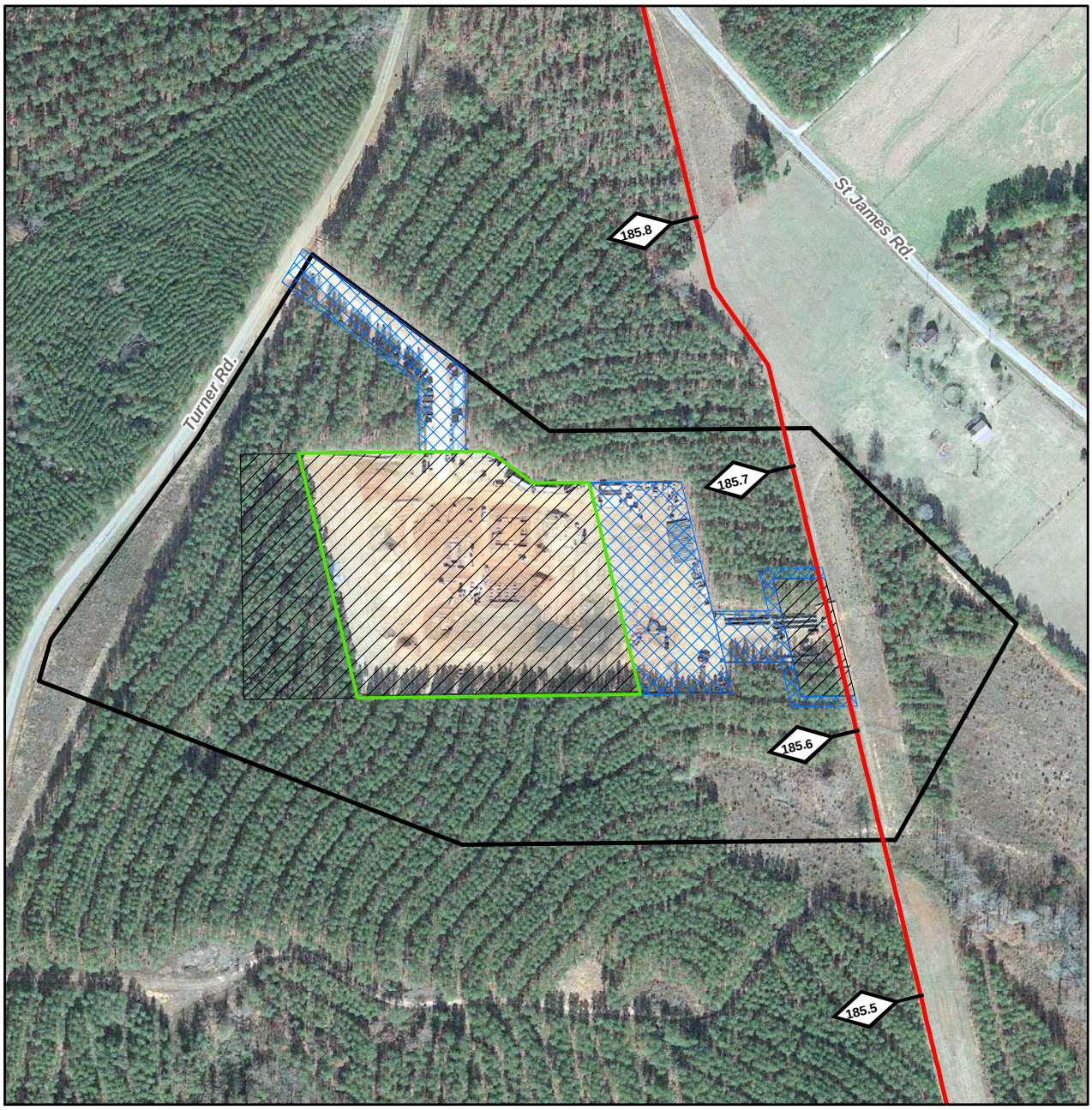
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1 in = 2 miles

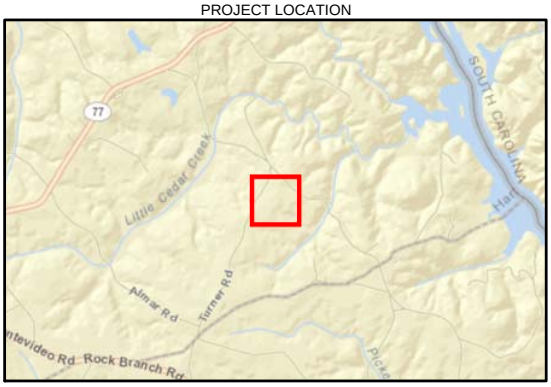
PROJECT LOCATION



USGS Topographic Project Location Map
Elba Express Company L.L.C.
Hart County, Georgia



PROJECT LOCATION



Legend

- Elba Express Pipeline
- Overall Site Boundary
- Existing Hartwell Compressor Station Footprint

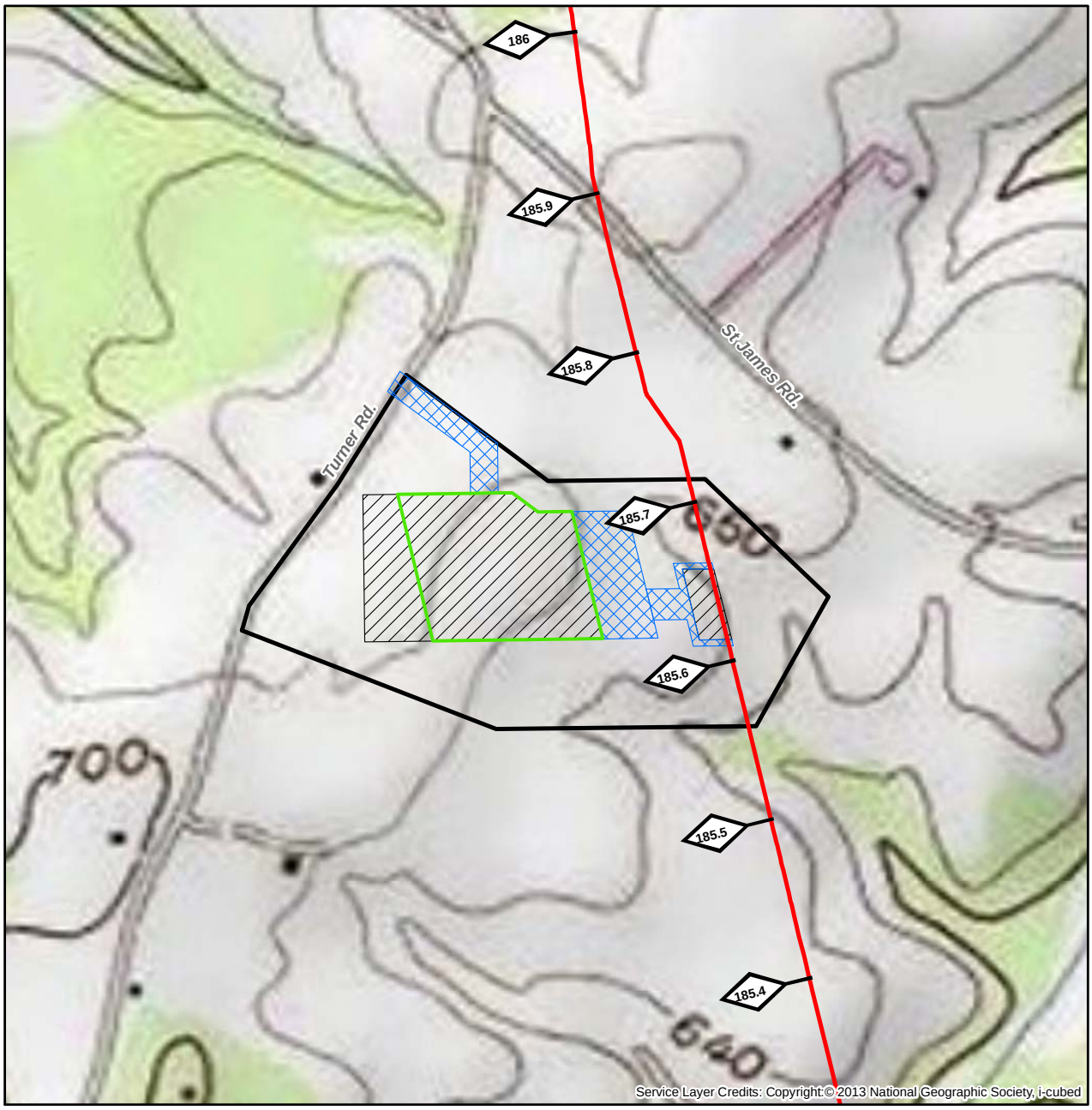
Hartwell Compressor Station

- Permanent Impact Area
- Temporary Impact Area

N

0 150 300
Feet

Aerial Site Map
Hartwell Compressor Station Site
Elba Express Company, L.L.C.
Hart County, Georgia



Legend

- Elba Express Pipeline
- Overall Site Boundary
- Existing Hartwell Compressor Station Footprint

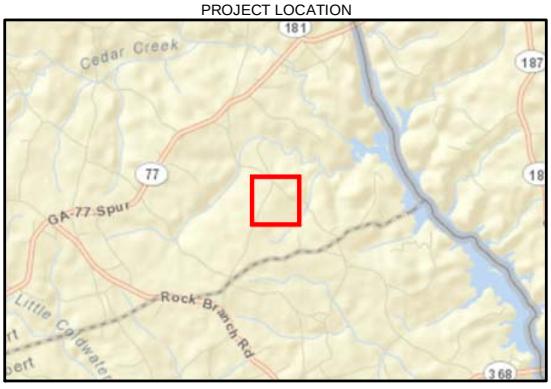
Hartwell Compressor Station

- Permanent Impact Area
- Temporary Impact Area

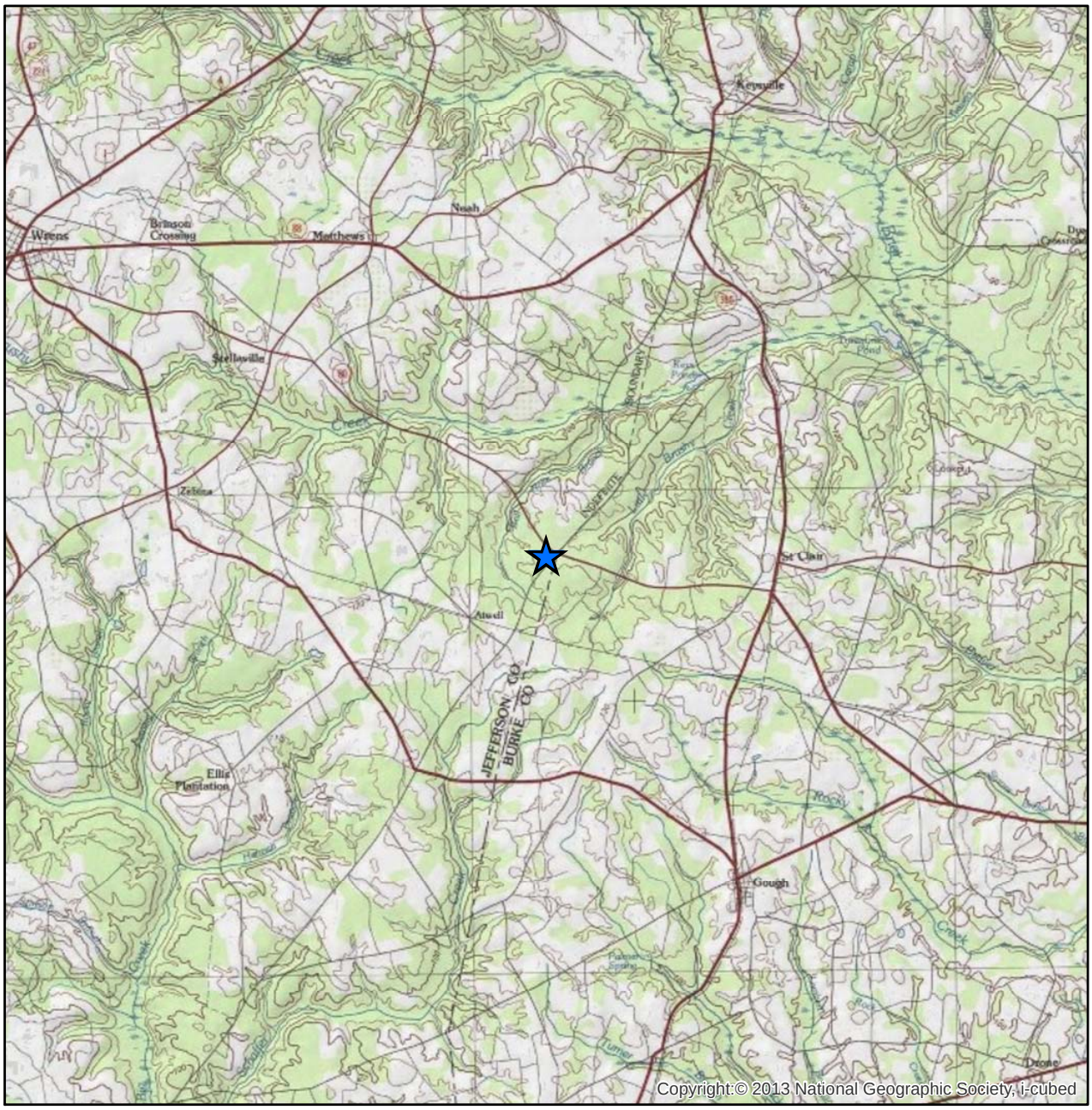
N

0 300 600
Feet

PROJECT LOCATION



Topo Site Map
Hartwell Compressor Station Site
Elba Express Company, L.L.C.
Hart County, Georgia



Legend

Jefferson County Compressor Station Site

N

0 1 2 Miles

1 in = 2 miles

PROJECT LOCATION



USGS Topographic Project Location Map
Elba Express Company L.L.C.
Jefferson County, Georgia



Legend

- Elba Express Pipeline
- Overall Site Boundary

Jefferson County Compressor Station

- Permanent Impact Area
- Temporary Impact Area

N

0 150 300
Feet

Notes:
1. Aerial Imagery courtesy of ESRI World Imagery online mapping service

PROJECT LOCATION



Aerial Site Map
Jefferson County Compressor Station Site
Elba Express Company, L.L.C.
Jefferson County, Georgia



Legend

Elba Express Pipeline

Overall Site Boundary

Jefferson County Compressor Station

Permanent Impact Area

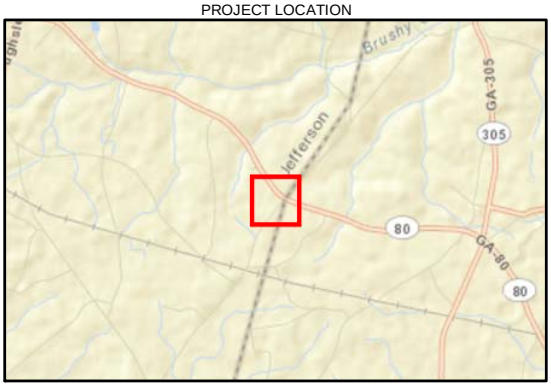
Temporary Impact Area

N

0 300 600

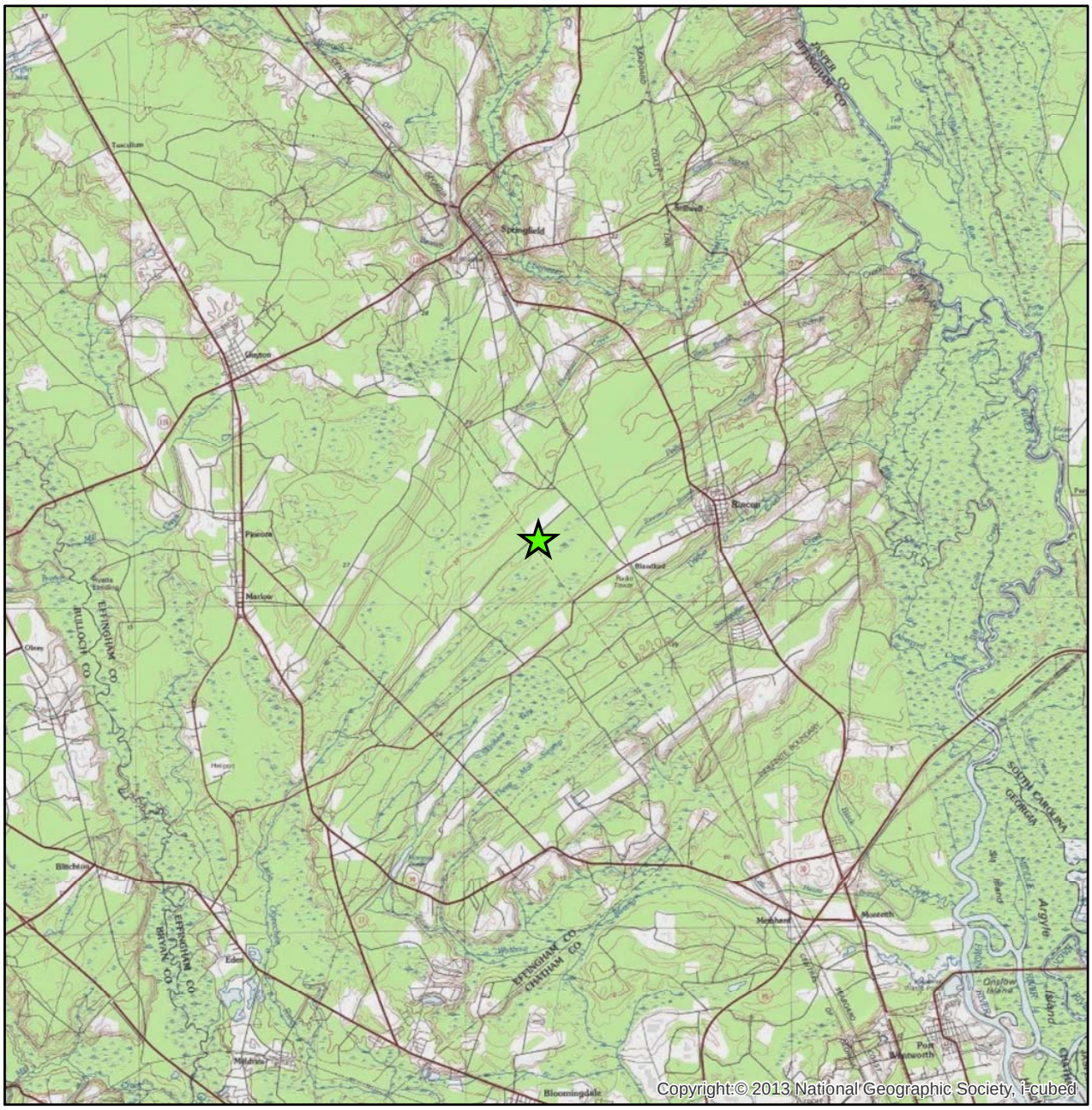
Feet

PROJECT LOCATION



Topo Site Map

Jefferson County Compressor Station Site
Elba Express Company, L.L.C.
Jefferson County, Georgia



Legend

Rincon Compressor Station Site

N

0 1.5 3 Miles

1 in = 3 miles

PROJECT LOCATION



USGS Topographic Project Location Map
Elba Express Company L.L.C.
Effingham County, Georgia



Legend

- Elba Express Pipeline
- Overall Site Boundary

Rincon Compressor Station

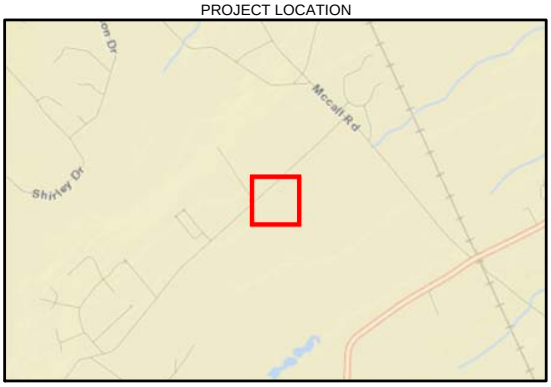
- Permanent Impact Area
- Temporary Impact Area

Source:
ESRI World Imagery online mapping service

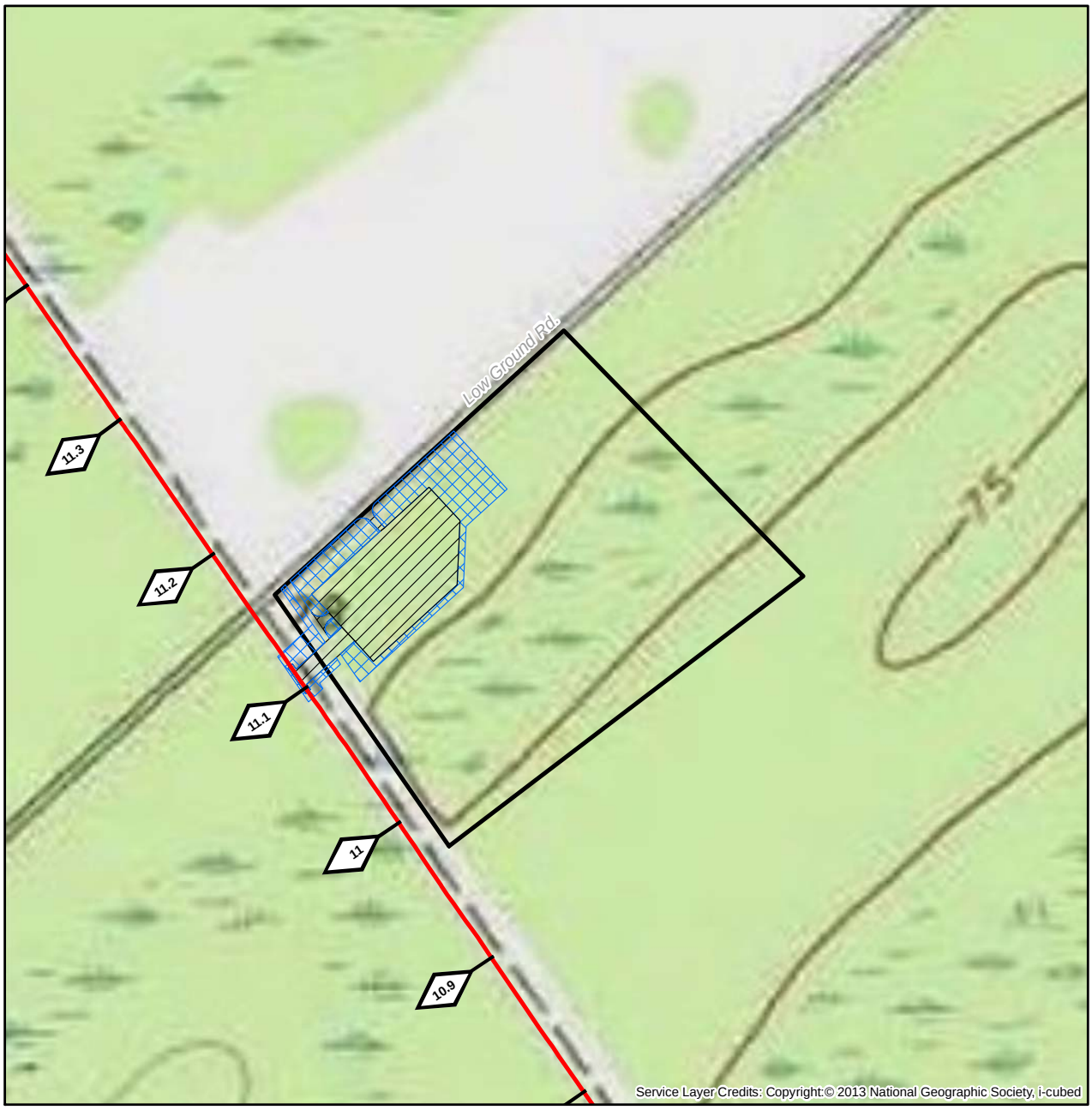
N

0 150 300
Feet

PROJECT LOCATION



Aerial Site Map
Rincon Compressor Station Site
Elba Express Company, L.L.C.
Effingham County, Georgia



Legend

Elba Express Pipeline

Overall Site Boundary

Rincon Compressor Station

Permanent Impact Area

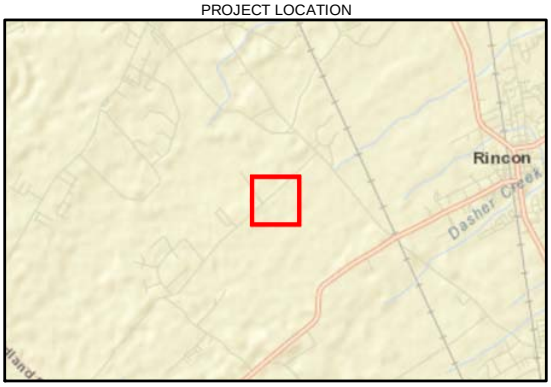
Temporary Impact Area

N

0 300 600

Feet

PROJECT LOCATION

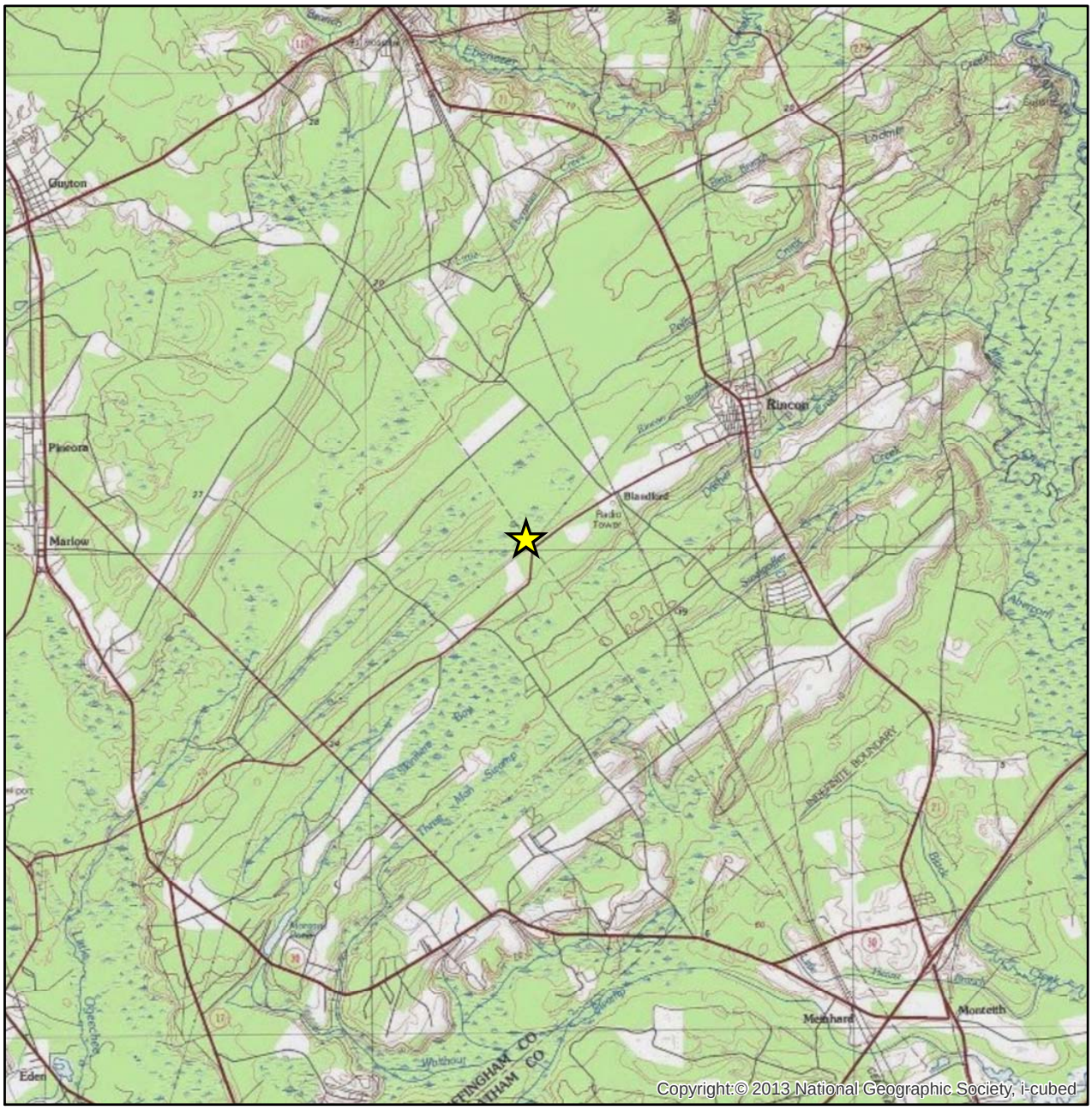


Topo Site Map

Rincon Compressor Station Site

Elba Express Company, L.L.C.

Effingham County, Georgia



Legend

EEC North Meter Station

N

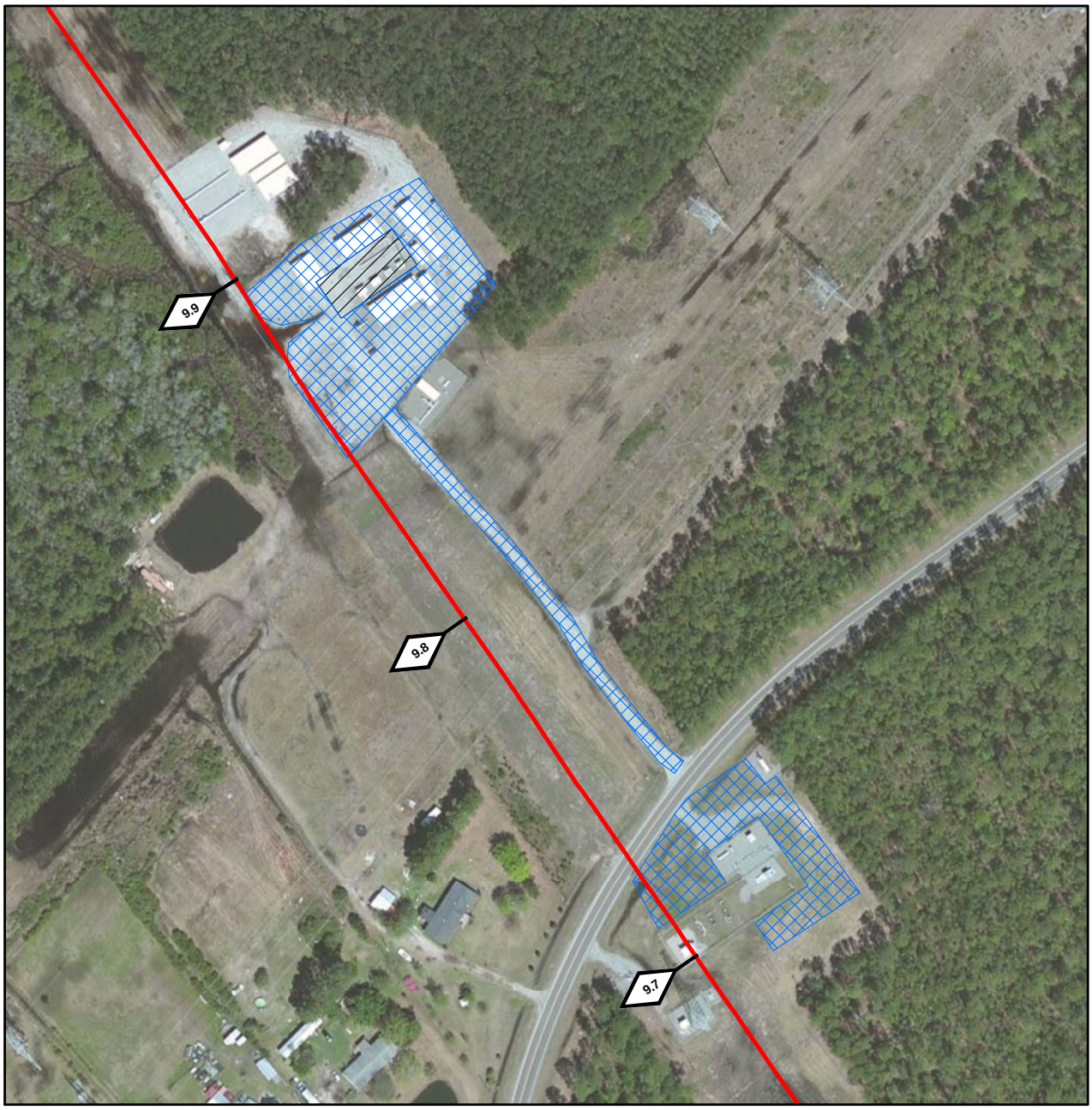
0 1 2 Miles

1 in = 2 miles

PROJECT LOCATION



USGS Topographic Project Location Map
Elba Express Company L.L.C.
Effingham County, Georgia



PROJECT LOCATION



Legend

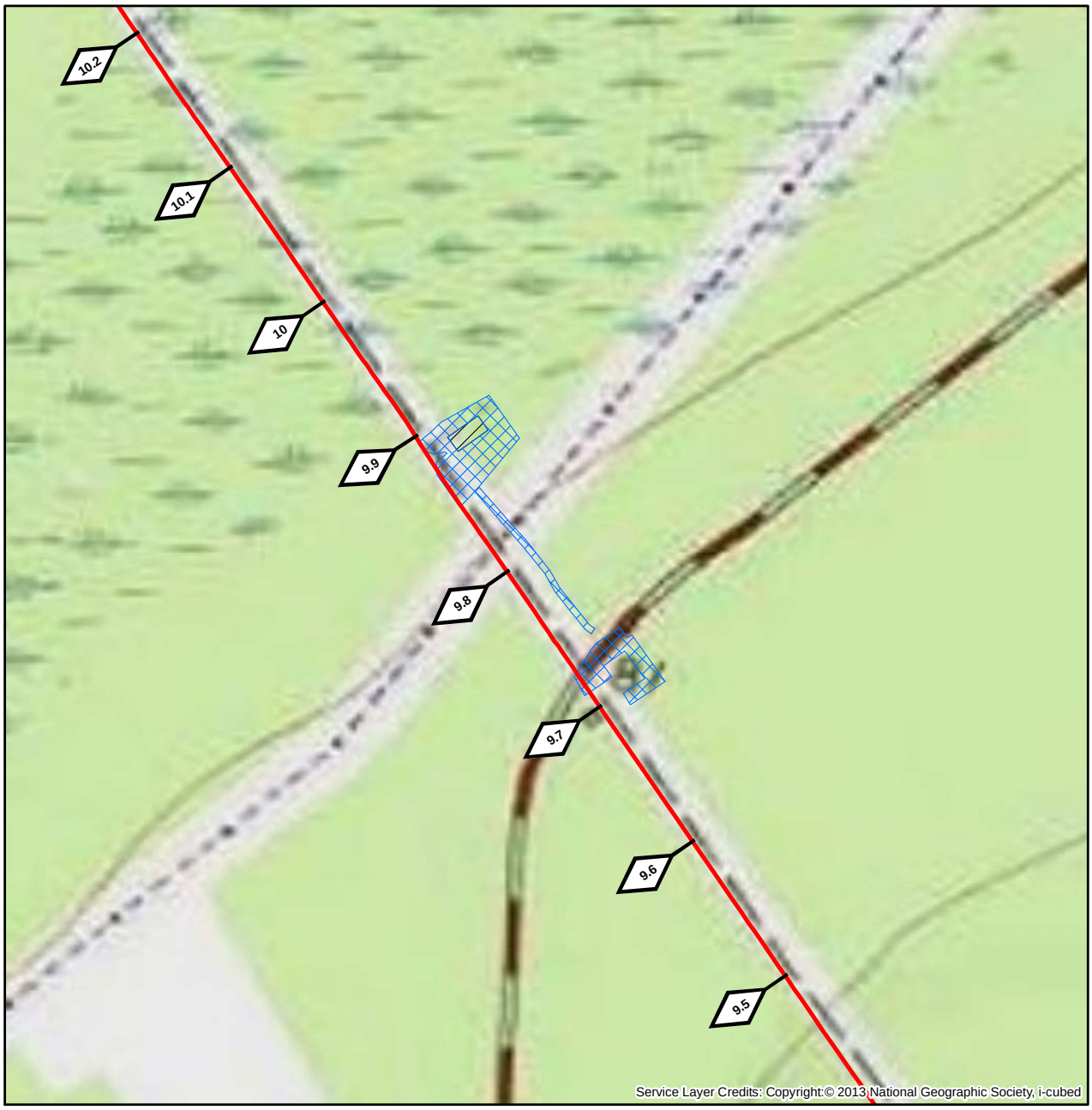
- Elba Express Pipeline
- **EEC North Meter Station**
- Permanent Impact Area
- Temporary Impact Area

N

0 100 200
Feet

Notes:
1. Aerial Imagery courtesy of ESRI World Imagery online mapping service

Aerial Site Map
EEC North Meter Station
Elba Express Company, L.L.C.
Effingham County, Georgia



Legend

Elba Express Pipeline

EEC North Meter Station

Permanent Impact Area

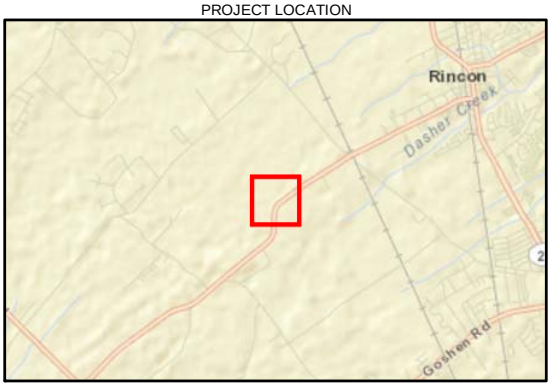
Temporary Impact Area

N

0 300 600

Feet

PROJECT LOCATION



USGS Topo Map
EEC North Meter Station
Elba Express Company, L.L.C.
Effingham County, Georgia



Legend

Port Wentworth Metering Facilities

N

0 1 2 Miles

1 in = 2 miles

PROJECT LOCATION



USGS Topographic Project Location Map
Elba Express Company L.L.C.
Chatham County, Georgia



Legend

Port Wentworth Metering Facilities

Permanent Impact Area

Temporary Impact Area

N

0 75 150

Feet

Notes:
1. Aerial Imagery courtesy of ESRI World Imagery online mapping service

PROJECT LOCATION



Aerial Site Map
Port Wentworth Metering Facilities
Elba Express Company, L.L.C.
Chatham County, Georgia



Legend

Elba Express Pipeline

Port Wentworth Metering Facilities

Permanent Impact Area

Temporary Impact Area

N

0 300 600

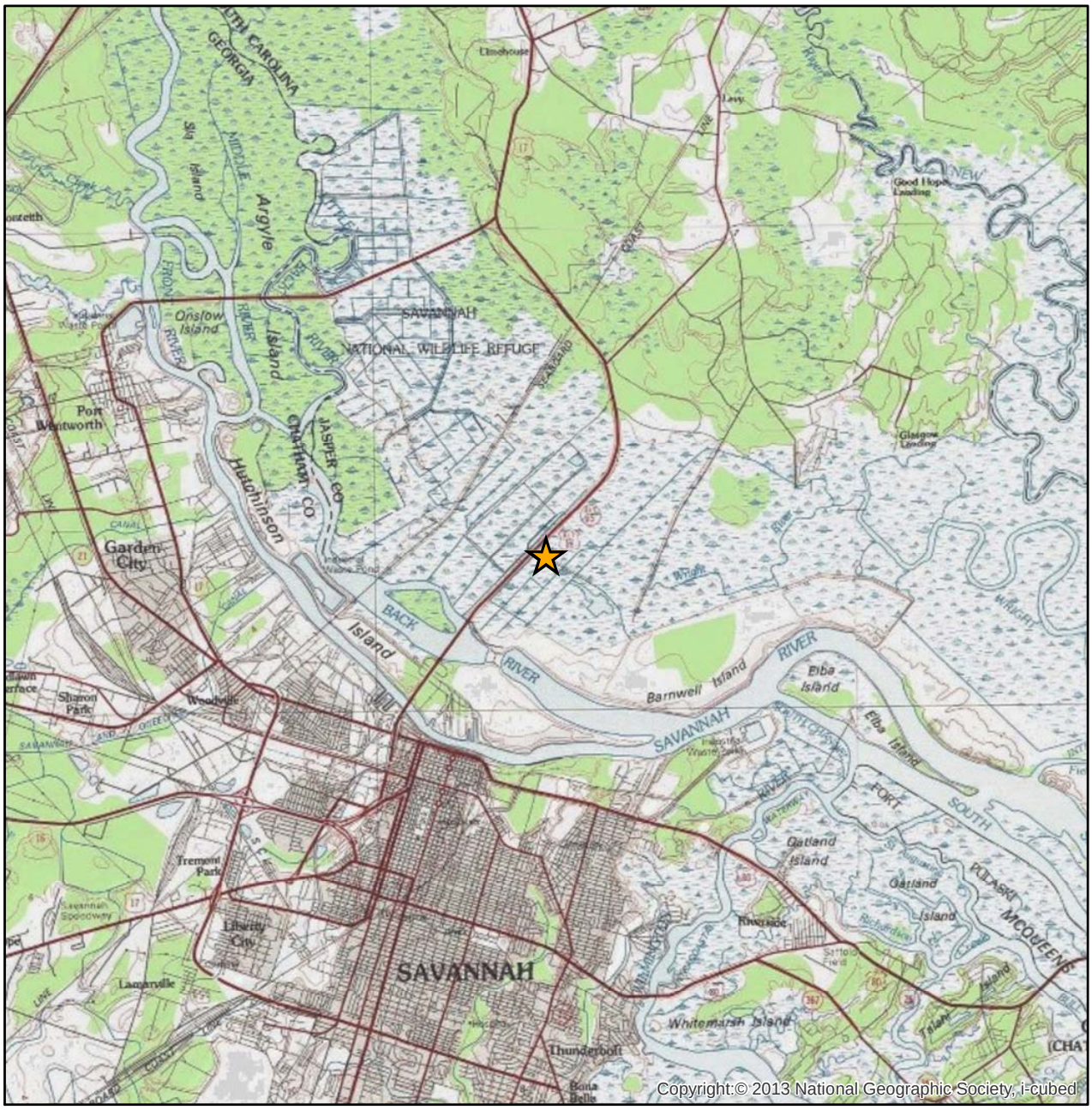
Feet

PROJECT LOCATION



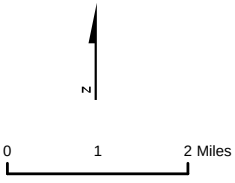
Topo Site Map

Port Wentworth Metering Facilities
Elba Express Company, L.L.C.
Chatham County, Georgia



Legend

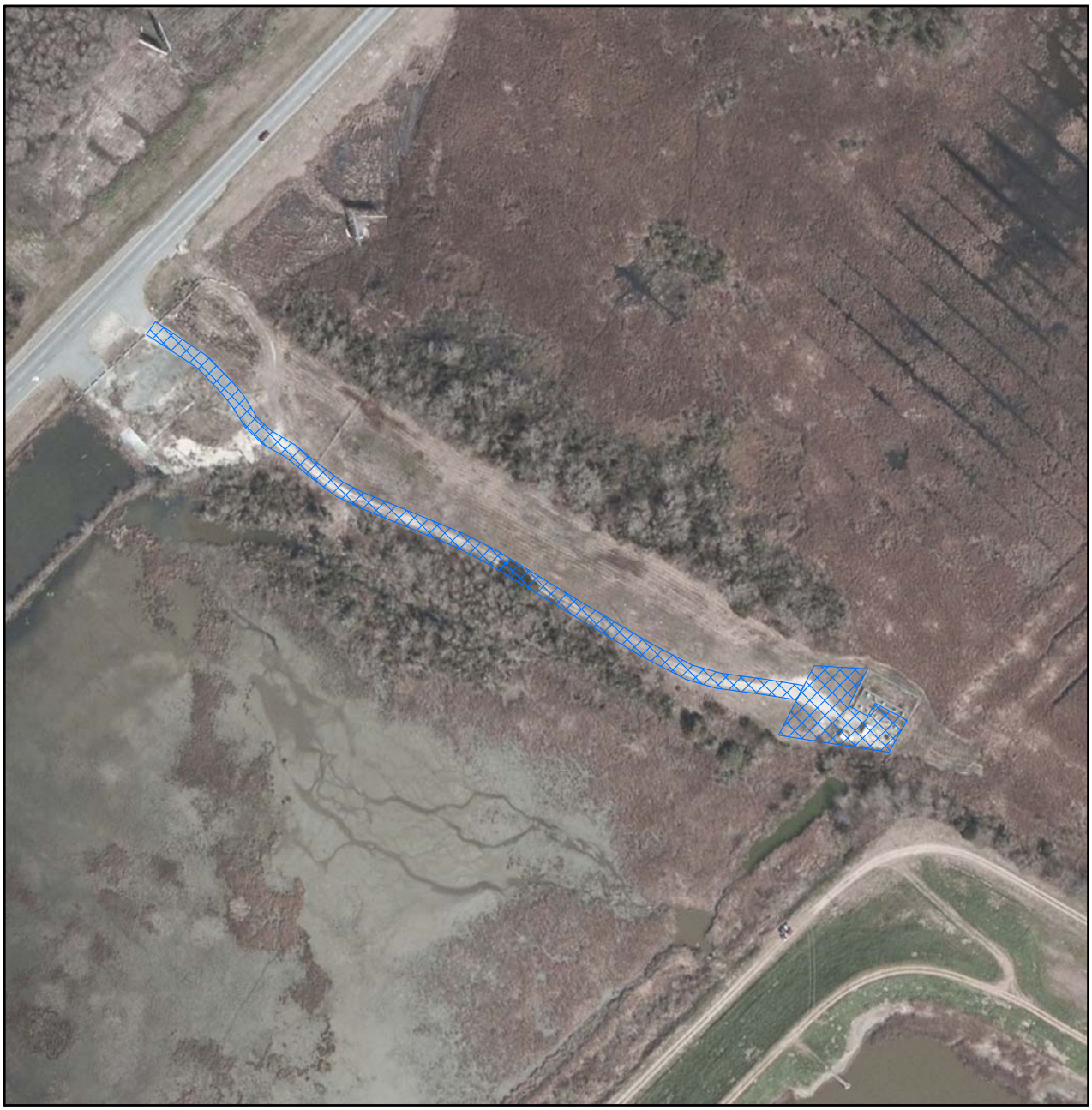
Del Webb Meter Station



PROJECT LOCATION



USGS Topographic Project Location Map
Elba Express Company L.L.C.
Jasper County, South Carolina



PROJECT LOCATION



Legend

Del Webb Meter Station

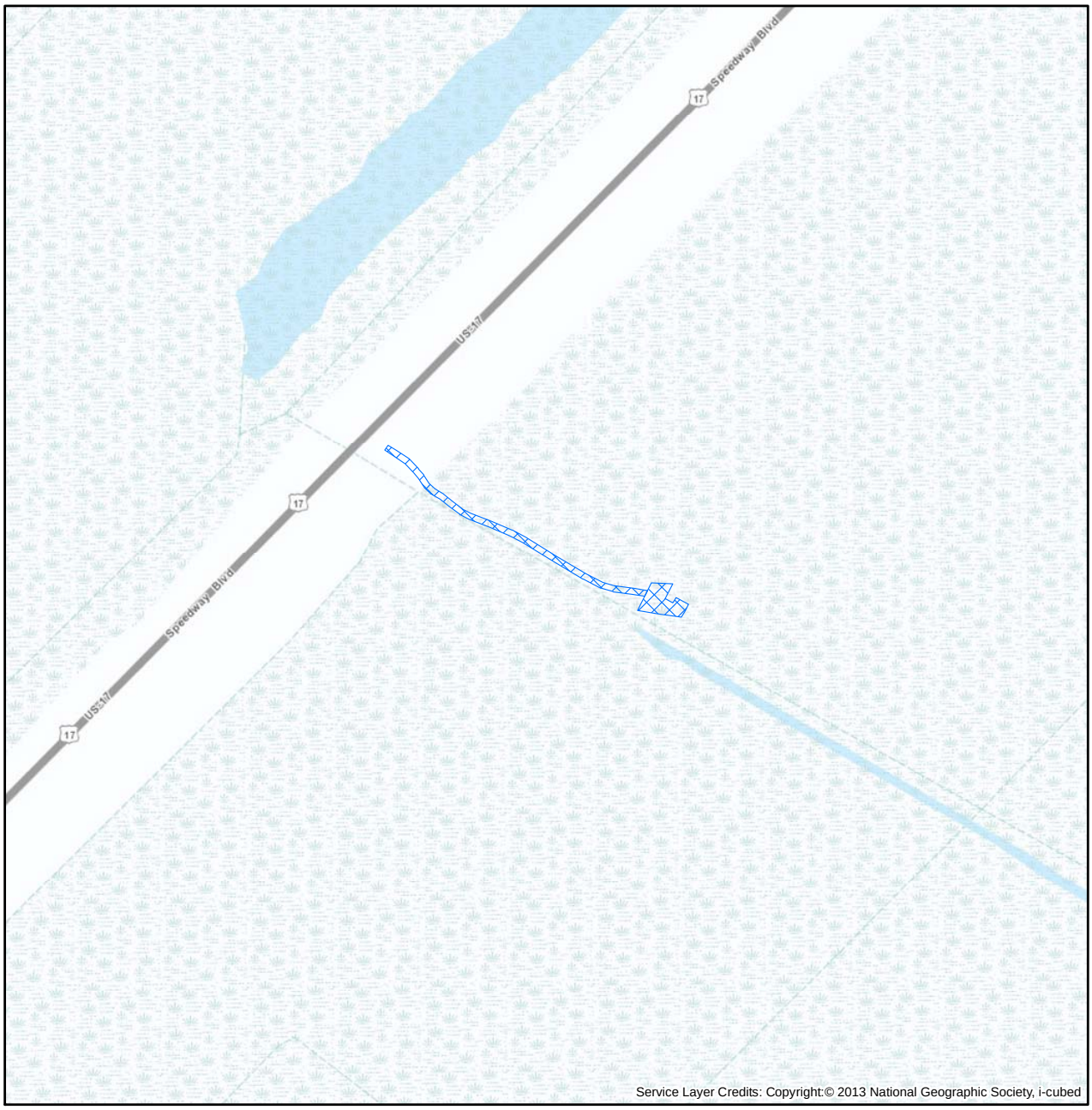
Temporary Impact Area

Notes:
1. Aerial Imagery courtesy of ESRI World Imagery online mapping service

N

0 100 200
Feet

Aerial Site Map
Del Webb Meter Station Site
Elba Express Company, L.L.C.
Jasper County, South Carolina



Legend

Del Webb Meter Station

Temporary Impact Area

N

0 300 600

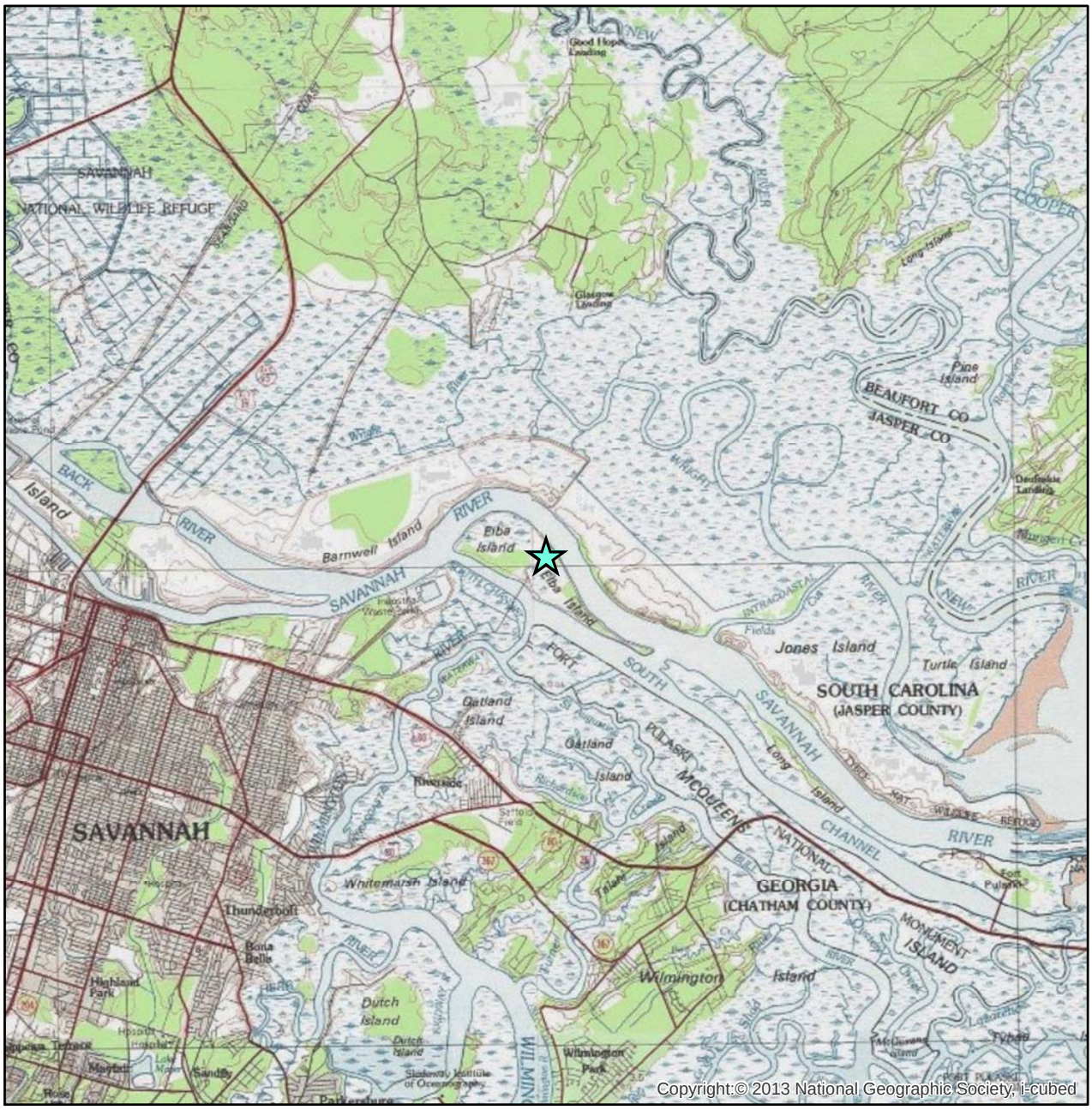
Feet

PROJECT LOCATION



Topo Site Map

Del Webb Meter Station
Elba Express Company, L.L.C.
Jasper County, South Carolina



Legend

Elba Island Interconnect Facilities

N

0 1 2 Miles

1 in = 2 miles

PROJECT LOCATION



USGS Topographic Project Location Map
Elba Express Company L.L.C.
Chatham County, Georgia



PROJECT LOCATION



Legend

Elba Island Interconnect Facilities

Permanent Impact Area

Temporary Impact Area

N

0 100 200

Feet

Notes:
1. Aerial Imagery courtesy of ESRI World Imagery online mapping service

Aerial Site Map
Elba Island Interconnect Facilities
Elba Express Company, L.L.C.
Chatham County, Georgia



Legend

Elba Island Interconnect Facilities

Permanent Impact Area

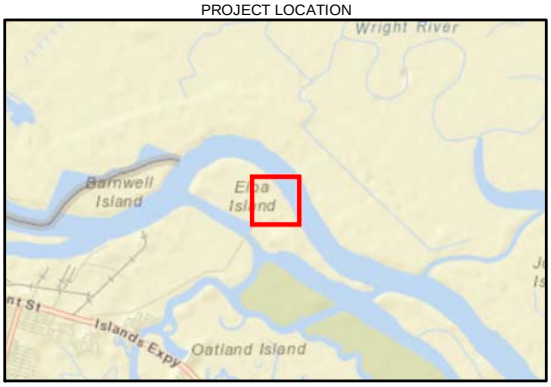
Temporary Impact Area

N

0 300 600

Feet

PROJECT LOCATION



Topo Site Map

Elba Island Interconnect Facilities
Elba Express Company, L.L.C.
Chatham County, Georgia

Appendix C

Oversized Tables

TABLE 2.3.3-2

Federal- and State-Listed Threatened and Endangered Species Identified in the Vicinity of the Project

Species Name	Status [a]	Habitat	Potential Location of Species	Presence or Absence in Project Area
Plant Species				
Greenfly Orchid (*Epidendrum magnolia*)	GAU	Perched high on limbs of deciduous trees in hammocks, low woods, and cypress swamps along coastal areas.	Rincon Site, EEC North Site	No suitable habitat is present. The proposed project would not impact this species.
Florida wild privet (*Forestiera segregate*)	GAR	Dry forests in limestone areas near the coast. Grows best in partial shade, tolerant of drought, salt, and alkaline soils. Competes well with shrubs and herbs and grows in hammocks and pinelands.	Port Wentworth Site, LNG Terminal, Security Post	No suitable habitat is present. The proposed project would not impact this species.
Pondberry (*Lindera melissifolia*)	FE, GAE	Seasonally flooded wetlands, such as floodplain hardwood forests and forested swales. Also along the margins of sinks, ponds, and depressions in pinelands. Usually in shade, but tolerates full sun.	Rincon Site, EEC North Site, Port Wentworth Site, LNG Terminal, Del Webb Site	Potential suitable habitat at Rincon site would be avoided by project activities. No preferred habitat is present at any other project site. The proposed project would have *no effect* on this species.
Pond Spice (*Litsea aestivalis*)	GAR	Edges of swamps, cypress ponds, sandhill depression ponds, and Carolina bays, forming thickets around pond margins.	Rincon Site, EEC North Site,	Potential suitable habitat at Rincon Site would be avoided by project activities. No preferred habitat is present at any other project site. The proposed project would not impact this species.
Indian Olive (*Nestronia umbellule*)	GAR	Dry, open, upland woods with mixed hardwood-pine canopy.	Jefferson Site	No suitable habitat is present. Forested portion of the Jefferson Site consists of maintained planted pine. Species was not observed during survey and is not likely to occur at the Jefferson Site.
Candy's dropword (*Oxypolis canbyi*)	FE	Found in a variety of Coastal Plain habitats prone to long periods of inundation, including pond cypress ponds, grass-sedge dominated Carolina bays, wet pine savannahs, shallow pineland ponds and cypress-pine swamps or sloughs.	Del Webb Site	No suitable habitat is present. The proposed project would have *no effect* on this species.
Cutleaf beartongue (*Penstemon dissectus*)	GAR	Altamaha Grit outcrops and surrounding longleaf pine woodland.	Jefferson Site	No suitable habitat is present. The proposed project would not impact this species.
Climbing buckthorn (*Sageretia minutiflora*)	GAT	Calcareous rocky bluffs, forested shell middens on barrier islands, and evergreen hammocks along streambanks and coastal marshes.	Port Wentworth Site, LNG Terminal	No suitable habitat is present. The proposed project would not impact this species.
Soapberry (*Sapindus marginatus*)	GAR	Prefers wooded canopy habitat. Can tolerate sandy, loamy, clay soils, and requires well-drained soil, is drought tolerant, and can grow in nutritionally poor soil. Can tolerate both acidic and alkaline soils. It cannot grow in the shade.	Port Wentworth Site, LNG Terminal	No suitable habitat is present. The proposed project would not impact this species.

TABLE 2.3.3-2

Federal- and State-Listed Threatened and Endangered Species Identified in the Vicinity of the Project

Species Name	Status [a]	Habitat	Potential Location of Species	Presence or Absence in Project Area
Yellow Pitcherplant (*Sarracenia flava*)	GAU	Wet savannas and pine flatwoods, seepage slopes, and bogs.	Jefferson Site, Rincon Site, EEC North Site	Potential suitable habitat at Rincon Site would be avoided by project activities. No preferred habitat is present at any other project site. The proposed project would not impact this species.
Hooded pitcherplant (*Sarracenia minor)*	GAU	Open and sunny ecotones, bogs, and wet prairies and savannas, and gaps along streams and swamps with moist, acidic soil that is low in nutrients.	Rincon Site, EEC North Site, Port Wentworth Site, LNG Terminal	**No suitable habitat at Port Wentworth Site and LNG Terminal. Species identified within survey area at Rincon Site; however, would not be impacted by proposed project activities. Additional discussion provided in section 2.3.3.3.**
Sweet pitcherplant (*Sarracenia rubra*)	GAT	Bogs, seepy stream banks, wet savannas, Atlantic white cedar swamps, wet pine flatwoods; powerlines and ditches through these habitats.	Jefferson Site	No suitable habitat is present. The proposed project would not impact this species.
American chaffseed (*Schwalbea americana*)	FE	Acidic, sandy or peaty soils in open pine flatwoods, pitch pine lowland forests, seepage bogs, palustrine pine savannahs, and other grass- and sedge-dominated plant communities. Frequently grows in ecotonal areas between peaty wetlands and xeric sandy soils	Del Webb Site	No suitable habitat is present. The proposed project would have *no effect* on this species.
Silky Camellia (*Stewartia malacodendron*)	GAR	Ravine and slope forests with beech, oak, basswood, and spruce pine species. Lower slopes of sandhills above bogs and creek swamps.	Rincon Site, EEC North Site	No suitable habitat is present. The proposed project would not impact this species.
Bird Species				
Piping plover (*Charadrius melodus*)	FT, GAT	Foraging habitats include sand and mud flats along coasts and other tidal zones. Piping plovers nest on sand and pebble beaches on the Atlantic coast.	LNG Terminal, Security Post Site, Del Webb Site	No suitable habitat is present. The proposed project would have *no effect* on this species.
Wilson's plover (*Charadrius wilsonia*)	GAT	Sandy beaches; tidal flats.	LNG Terminal, Security Post Site	May forage or occur as transient individuals, but would avoid active project activities. Nesting habitat would not be impacted. The proposed project would not impact this species.
Swallow-tailed kite (*Elanoides forficatus*)	GAR	Nesting habitat includes trees emerging above surrounding forest, typically large pines on pine islands within floodplains or riparian forests. Foraging habitats include bottomland forests, cypress and mixed cypress-hardwood swamps, hardwood hammocks, pine flatwoods, pine forests bordering riparian areas, freshwater and brackish marshes, wet prairies, sloughs, and pastures.	Rincon Site, EEC North Site	No suitable habitat is present. Species may forage or occur as transient individuals. Species was not observed during site surveys. The proposed project would not impact this species.

TABLE 2.3.3-2

Federal- and State-Listed Threatened and Endangered Species Identified in the Vicinity of the Project

Species Name	Status [a]	Habitat	Potential Location of Species	Presence or Absence in Project Area
American oystercatcher (*Haematopus palliatus*)	GAR	Coastal beaches and tidal flats.	LNG Terminal, Security Post Site	May forage or occur as transient individuals, but would avoid active project activities. Nesting habitat would not be impacted. The proposed project would not impact this species.
Bald eagle (*Haliaeetus leucocephalus*)	BGEPA, GAT	Breeding habitat most commonly includes areas close to (within 2.49 miles) coastal areas, bays, rivers, lakes, or other bodies of water that reflect the general availability of primary food sources, including fish, waterfowl, and seabirds. Wintering areas are commonly associated with open water though in some areas eagles use habitats with little or no open water if other food resources (e.g., rabbit or deer carrion) are readily available. Avoids areas with nearby human activity (boat traffic, pedestrians) and development (buildings).	Hartwell Site, Jefferson Site, Rincon Site, EEC North Site, Port Wentworth Site, LNG Terminal, Del Webb Site	No nests identified within 660 feet of project areas. May forage or occur as transient individuals. The proposed project would not impact this species.
Wood stork (*Mycteria americana*)	FE, GAE, SCE	Inhabits freshwater and brackish marshes, nests primarily in cypress or mangrove swamps. Forages in freshwater marshes, narrow tidal creeks, or flooded tidal pools. Prefers to forage in depressions in marshes or swamps where fish become concentrated during periods of falling water levels. Highly colonial species; nesting period extends from March through August.	Port Wentworth Site, LNG Terminal, Security Post Site, Del Webb Site	May forage or occur as transient individuals, but would avoid active project activities. Nesting habitat would not be impacted. The proposed project would have *no effect* on this species.
Red-Cockaded woodpecker (*Picoides borealis*)	FE, GAE, SCE	Requires mature (80-120 year old) stands of pine with little to no understory (<15 feet tall). Cavities are usually on west-facing side of trees. Nesting and roosting is tied closely to over-mature pines infected with red heart disease. Nest trees include longleaf, loblolly, shortleaf, pond, slash, pitch, and Virginia pines. Foraging habitat includes pine/pine-hardwood stands at least 30 years old.	Hartwell Site, Jefferson Site, Rincon Site,	Preferred habitat is not present at these sites. The proposed project would have *no effect* on this species.
Black skimmer (*Rynchops niger*)	GAR	Primarily coastal waters, including bays, estuaries, lagoons, and mudflats in migration and winter. Also quiet waters of rivers and lakes; rests on mudflats, sandbars, and beaches.	LNG Terminal, Security Post Site	Preferred habitat is not present. The proposed project would not impact this species.
Least tern (*Sterna antillarum*)	GAR	Sea beaches, bays, and large rivers.	LNG Terminal, Security Post Site, Del Webb Site	May forage or occur as transient individuals, but would avoid active project activities. Nesting habitat would not be impacted. Species was not observed during site surveys. The proposed project would not impact this species.

TABLE 2.3.3-2

Federal- and State-Listed Threatened and Endangered Species Identified in the Vicinity of the Project

Species Name	Status [a]	Habitat	Potential Location of Species	Presence or Absence in Project Area
Gull-billed tern (*Sterna nilotica*)	GAT	Sea beaches, bays, and large rivers.	LNG Terminal, Security Post Site	May forage or occur as transient individuals, but would avoid active project activities. Nesting habitat would not be impacted. Species was not observed during site surveys. The proposed project would not impact this species.
Bachman's warbler (*Vermivora bachmanii*)	FE, GAE	Probably extinct; last seen in Georgia in 1976. Moist deciduous woodland and swamp. During migration and in winter, also seen in open woodland, pine, and scrub. Apparently adapted to swampy canebrakes or bamboo thickets.	LNG Terminal	Preferred habitat is not present. The proposed project would have *no effect* on this species.
Insect				
Say's Spiketail (*Cordulegaster sayi*)	GAT	Scrub oak sandhills and breed in mucky seeps adjacent to hardwood forests.	Rincon Site, EEC North Site,	No suitable habitat is present at these sites. The proposed project would not impact this species.
Amphibians				
Flatwoods salamander (*Ambystoma cingulatum*)	FT, GAT, SCE	Post-larval individuals inhabit mesic longleaf pine-wiregrass flatwoods and savannas. Terrestrial habitat is typically flat or slightly rolling wiregrass dominated grassland having little to no midstory and an open overstory of widely scattered longleaf pine and low-growing shrubs, such as saw palmetto, gallberry, and blueberries. Groundcover plant diversity is usually very high. The underlying soil is typically poorly drained sand that becomes seasonally inundated.	Rincon Site, EEC North Site, Port Wentworth Site, LNG Terminal, Del Webb Site	No suitable habitat is present at these sites. The Rincon Site does not contain mesic flatwoods and wiregrass communities. Species was not observed during site surveys. The proposed project would have *no effect* on this species.
Gopher frog (*Rana capito*)	GAR	Primarily lives in upland habitats, particularly longleaf pine with sandhill associations; also pine flatwoods, sand pine scrub, and oak hammocks. Generally occurs only where there are gopher tortoises, but rare or absent at most tortoise colonies; absent from most coastal islands and dunes. Burrows of gopher tortoises or rodents are used for shelter; hides also under logs, under or in stumps, and in sewers.	Jefferson Site, Port Wentworth Site, LNG Terminal	No suitable habitat or soils are present at these sites. The proposed project would not impact this species.
Mollusks				
Atlantic pigtoe (*Fusconaia masoni*)	GAE	Inhabits coarse sand and gravel at the downstream end of riffles, and is rarely found in substrates of fine sand and silt or mud.	Jefferson Site	No suitable habitat would be impacted at this site. The proposed project would not impact this species.
Reptiles				
Loggerhead sea turtle (*Caretta caretta*)	FE, GAE	Nests on Georgia's barrier island beaches. Forages in warm ocean waters and river mouth channels.	LNG Terminal, Security Post Site, Shipping Routes	**Individuals may occur near Elba Island and along the shipping routes. Additional discussion provided in section 2.3.3.2.**

TABLE 2.3.3-2

Federal- and State-Listed Threatened and Endangered Species Identified in the Vicinity of the Project

Species Name	Status [a]	Habitat	Potential Location of Species	Presence or Absence in Project Area
Green sea turtle (*Chelonia mydas*)	FT, GAT	Rarely nests in Georgia; migrates through Georgia's coastal waters.	LNG Terminal, Security Post Site, Shipping Routes	**Individuals may occur near Elba Island and along the shipping routes. Additional discussion provided in section 2.3.3.2.**
Spotted turtle (*Clemmys guttata*)	GAU, SCT	Inhabits mostly unpolluted, shallow bodies of water with a soft bottom and aquatic vegetation, such as small marshes, marshy pastures, bogs, fens, woodland streams, swamps, small ponds, vernal pools, and lake margins. In some areas they occur in brackish tidal streams.	Jefferson Site, Rincon Site, EEC North Site, LNG Terminal, Del Webb Site	No suitable habitat is present at these sites. The proposed project would not impact this species.
Leatherback sea turtle (*Dermochelys coriacea*)	FE, GAE	Rarely nests in Georgia; migrates through Georgia's coastal waters.	LNG Terminal, Security Post Site, Shipping Routes	**Individuals may occur near Elba Island and along the shipping routes. Additional discussion provided in section 2.3.3.2.**
Eastern indigo snake (*Drymarchon corais couperi*)	FT, GAT	High pineland (sandhills, scrub, etc.), flatwoods, and most types of hammock; often near wetlands. Often in association with gopher tortoise burrows. Sandhill regions dominated by mature longleaf pines, turkey oaks, and wiregrass in Georgia. Pineland habitat is maintained by periodic fires. Requires relatively large tracts of suitable habitat.	Rincon Site, EEC North Site, Port Wentworth Site, LNG Terminal	No suitable habitat is present at these sites. The proposed project would have *no effect* on this species.
Hawksbill sea turtle (*Eretmochelys Imbricate*)	FE, GAE	Prefers shallow, hard-bottomed areas such as coral reefs and rock outcroppings. Juveniles are found in oceanic habitat associated with sargassum mats. Hawksbills may occasionally pass through Georgia waters as transients, but only four stranded individuals have been documented since stranding surveys began in 1980.	LNG Terminal, Security Post Site, Shipping Routes	**Individuals may occur near Elba Island and along the shipping routes. Additional discussion provided in section 2.3.3.2.**
Gopher tortoise (*Gopherus polyphemus*)	GAT, SCT	Prefers well-drained sandy soils in forest grassy areas associated with a pine overstory. Commonly found in self-made, unusually long burrows along with other animals.	Jefferson Site, Rincon Site, EEC North Site, Port Wentworth Site, LNG Terminal, Del Webb Site	No suitable habitat is present at these sites. No burrows were observed in the Project area. The proposed project would not impact this species.
Southern Hognose Snake (*Heterodon simus*)	GAT	Prefers well drained, xeric, sandy soils where longleaf pine and/or scrub oaks (especially turkey oak) are the characteristic woody vegetation. Wiregrass is often a significant component of the groundcover. Fallow fields may also be used.	Jefferson Site, Rincon Site, EEC North Site	No suitable habitat or soils are present at these sites. The proposed project would not impact this species.

TABLE 2.3.3-2

Federal- and State-Listed Threatened and Endangered Species Identified in the Vicinity of the Project

Species Name	Status [a]	Habitat	Potential Location of Species	Presence or Absence in Project Area
Kemp's ridley sea turtle (*Lepidochelys kempii*)	FE, GAE	Prefer shallow coastal waters where food is abundant. Habitat of adults primarily includes shallow coastal and estuarine waters, often over sand or muddy bottoms where crab are numerous. Nesting occurs on well-defined elevated dune areas, especially on beaches backed up large swamps or bodies of open water having seasonal, narrow ocean connections.	LNG Terminal, Security Post Site, Shipping Routes	**Individuals may occur near Elba Island and along the shipping routes. Additional discussion provided in section 2.3.3.2.**
Diamondback terrapin (*Malaclemys terrapin*)	GAU	Coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches.	LNG Terminal, Security Post Site	**Potential habitat exists near these sites. Species was not observed during site surveys. Additional discussion provided in section 2.3.3.2.**
Mammals				
Sei whale (*Balaenoptera borealis*)	FE	Generally found in deep water; along edge of continental shelf and open ocean.	Shipping Routes	**Whales may occur along shipping routes. Additional discussion provided in section 2.3.3.2.**
Blue whale (*Balaenoptera musculus*)	FE	In the Atlantic Ocean, blue whale range extends from the subtropics to the Greenland Sea. Generally found in deep water along edge of continental shelf and open ocean.	Shipping Routes	**Whales may occur along shipping routes. Additional discussion provided in section 2.3.3.2.**
Finback whale (*Balaenoptera physalus*)	FE	Pelagic; usually found in largest numbers 25 miles or more from shore. In the western Atlantic, occurs mainly over continental shelf in summer, in water 50-100 fathoms deep. Young are born in the warmer waters of the lower latitudes.	Shipping Routes	**Whales may occur along shipping routes. Additional discussion provided in section 2.3.3.2.**
Rafinesque's Bigeared Bat (*Corynorhinus rafinesquii*)	GAR, SCE	Areas of mature forest, including bottomland and upland hardwoods and pine flatwoods with nearby water. In coastal plain bottomland areas, large hollow cypress and gum trees with openings near the base.	Rincon Site, EEC North Site	No suitable habitat is present at these sites. The proposed project would not impact this species.
Right whale (*Eubalaena glacialis*)	FE, GAE	Mate and calve in shallow coastal waters.	Shipping Routes	**Whales may occur along shipping routes. Additional discussion provided in section 2.3.3.2.**
Southeastern Pocket Gopher (*Geomys pinetis*)	GAT	Pocket gophers require loose, sandy, well-drained soil for burrow construction and an abundant supply of grasses and forbs for food. They are native to areas of upland coastal plain longleaf pine forest, including rolling hills and sandhills, particularly where frequent fires maintain conditions that favor the growth of groundcover plants.	Jefferson Site	No suitable habitat or soils are present at these sites. The proposed project would not impact this species.
Humpback whale (*Megaptera novaeangliae*)	FE, GAE	Coastal waters during migration.	Shipping Routes	**Whales may occur along shipping routes Additional discussion provided in section 2.3.3.2.**

TABLE 2.3.3-2

Federal- and State-Listed Threatened and Endangered Species Identified in the Vicinity of the Project

Species Name	Status [a]	Habitat	Potential Location of Species	Presence or Absence in Project Area
Sperm whale (*Physeter macrocephalus*)	FE	Prefer deep water pelagic environments, sometimes around islands or in shallow shelf waters. Tend to occur in highest densities near productive waters, and often near steep drop-offs or strong oceanographic features, e.g. edges of continental shelves, large islands, and offshore banks and over submarine trenches and canyons. Females generally found in waters over 1000 meters deep. Males primarily prefer deeper water.	Shipping Routes	**Whales may occur along shipping routes. Additional discussion provided in section 2.3.3.2.**
West Indian manatee (*Trichechus manatus*)	FE, GAE	Coastal waters, estuaries, and warm water outfalls.	LNG Terminal, Shipping Routes	**Transient individuals may occur near Elba Island and along shipping routes. Additional discussion provided in section 2.3.3.2.**
Fish				
Shortnose sturgeon (*Acipenser brevirostrum*)	FE, GAE, SCE	Inhabits rivers, estuaries, and the sea; usually, they are most abundant in estuaries, generally within a few miles of land when at sea.	LNG Terminal, Shipping Routes	**Adult shortnose sturgeon could occur near Elba Island. Additional discussion provided in section 2.3.3.2.**
North Atlantic DPS Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)	FE, GAE	Inhabits rivers, estuaries, and the sea; usually, they are most abundant in estuaries, generally within a few miles of land when at sea.	LNG Terminal, Shipping Routes	**Adults and juveniles could occur around Elba Island. Additional discussion provided in section 2.3.3.2.**
Bluebarred pygmy sunfish (*Elassoma okatie*)	GAE	Occupy slow moving to stagnant, heavily vegetated areas within ditches, impoundments, creeks, and rivers. Strongly associated with aquatic plants, including alligator weed, bladderwort, duckweed, grasses, pondweed, rushes, and spatterdock. Preferred waters are typically tea-stained and acidic.	Jefferson Site	No impact. No waterbodies impacted at the site.
Sandbar Shiner (*Notropis scepticus*)	GAR	Found over sandy bottoms in flowing pools near gravel rocky riffles in medium-sized streams. Avoids small headwater tributaries, large rivers and reservoirs.	Hartwell Site	No impact. No waterbodies impacted at the site.

[a] Regulatory Status:

Federal: Species with the statuses of FE (Federal Endangered) or FT (Federal Threatened) are legally protected under the U.S. Endangered Species Act of 1973.

BGEPA: Bald and Golden Eagle Protection Act.

Georgia: Species with the statuses of GAE (State Endangered), GAT (State Threatened), GAR (Rare Species), GAC (Special Concern), and GAU (State Unusual) are legally protected under the Georgia Endangered Wildlife Act (1973) and the Georgia Wildflower Preservation Act (1973).

South Carolina: Species with the statuses of SCE (State Endangered) and SCT (State Threatened) are legally protected under the South Carolina Nongame and Endangered Species Conservation Act (1962).

TABLE 2.9.1-1

Existing or Proposed Projects Evaluated for Potential Cumulative Impacts Associated with the Liquefaction Facilities

Project and Description	Approximate Distance and Direction	Status
SLNG DMCA Expansion Project: Dredge Material Containment Area 2 (DMCA 2) on Elba Island is being expanded. GDNR CRD permit number 643, issued April 15, 2011, authorized the filling and creation of tidal ditches at the Terminal Facility on Elba Island. The filling of two tidally influenced ditches would impact approximately 256,132 sq. feet. (5.88 acres) of jurisdictional coastal marshlands. The creation of new tidally influenced ditches includes constructing, from existing upland, approximately 4,058 linear feet of new ditches (3.45 acres). Subsequently, on November 15, 2012, the COE issued permit number SAS-2006-00650 for the horizontal expansion and raising of the perimeter dikes and counterweights of DMCA 2. The permit authorized the fill of 5.67 acres of salt marsh and 2.23 acres of freshwater non-tidal wetland. Mitigation for the freshwater wetland impacts included the purchase of 10.71 freshwater non-tidal wetland mitigation credits from Black Creek Mitigation Bank (purchase completed) and on-site mitigation (restoration of 1.79 acre of salt marsh) by SLNG for the salt marsh Ditch 2 impacts. The salt marsh restoration has been constructed and planted and would be monitored according to the provisions in the approved mitigation plan. SLNG recently determined that additional expansion of DMCA 2 would be required and would involve filling the remaining 0.44 acres of Ditch 2, thus increasing the total of filled salt marsh ditch to 6.11 acres. The additional expansion also would require an additional 0.14 acre of salt marsh mitigation, using the previously established compensation ratio for the existing permit. SLNG has requested that the COE allow compensation for the 0.44 acres of additional impacts to the salt marsh section of Ditch 2 to be mitigated through increasing the size of the approved 1.79-acre salt marsh mitigation area that is contiguous with a reference marsh on Elba Island. The total acreage would be increased from 1.79-acre to 1.93 acres, a difference of 0.14 acre. SLNG received approval for the permit modification (SAS-2006-00650) on February 3, 2014. Source: COE Savannah District Application # SAS-2006-00650	On Elba Island	Portions completed, portions ongoing
Savannah Harbor Expansion Project: Georgia Ports Authority and the COE propose to deepen the Savannah Harbor and its entrance channel from 42 to 47 feet BMLW. The project extends approximately 21.3 miles upstream of the Savannah River entrance and approximately 18.5 miles offshore of the river entrance (ocean bar channel), for a total of 39.8 miles. Approximately 13 million cubic yards of sediment would be excavated from the Inner Harbor (roughly upstream of the Garden City Terminal to the river entrance) with disposal in the existing upland confined disposal facilities (CDFs) and about 10.6 million cubic yards of sediment for the Entrance Channel (ocean bar channel) with placement in the USEPA approved Ocean Dredged Material Disposal Site or the existing CDFs. Source:http://www.sas.usace.army.mil/Portals/61/docs/SHEP/Reports/EIS/Section%201%20with%20TOC%20SHEP%20FINAL%20EIS.pdf	Adjacent to, upstream, and downstream of Elba Island	Pending approval. Targeted completion date is end of 2016.
Power Upgrade: As described in Section 1.2.1.3, additional electric power would be needed for the proposed Elba Liquefaction Project facilities. It is anticipated that the existing power lines to Elba Island would need to be upgraded to provide this electrical service. In addition, the power provider would likely require additional land for substation upgrades. Source: Initial information provided by the Companies.	0 – 3.1 miles to Southwest along Elba Island Road	Same timeframe as ELP
Epic Midstream, LLC Rail Spur Rehabilitation: Includes the rehabilitation and reactivation of 2,226 linear feet of an existing rail spur from the CSX line to the East Terminal. The reactivated spur would include a 24-foot-wide rail bed with 4:1 slopes per rail industry standards and would maintain existing elevations of 5.0 to 5.4 feet throughout the corridor. Minor modification and increase of bed elevations would occur in several small areas. Estimated fill would total 285 cubic yards and would be composed of fill dirt and gravel. The project area totals 3.40 acres, including 0.03 acre of freshwater wetlands, 1.88 acres of tidal marsh, and 1.69 acres of upland (primarily associated with the rail spur, rail line and Woodcock Road). Source: COE Savannah District Application # SAS-2013-00067	2.7 miles to Northeast	COE Public Notice: January 30, 2013.

TABLE 2.9.1-1

Existing or Proposed Projects Evaluated for Potential Cumulative Impacts Associated with the Liquefaction Facilities

Project and Description	Approximate Distance and Direction	Status
Southern States Phosphate and Fertilizer Company Dock Construction Project: As proposed, the facility would include the installation of a 425-foot x 50-foot concrete pile supported, concrete wharf. Connected to the wharf would be a steel pile fender system. The fender system would consist of two steel HP pile breasting dolphins (one upstream of the wharf and the other downstream of the wharf) and four concrete pile mooring dolphins (two upstream and two downstream of the wharf). To provide personnel access to the mooring dolphins, a concrete pile supported 10-foot-wide concrete walkway would be constructed between each mooring dolphin. Access to the new wharf would be provided by a 70 foot x 50 foot concrete pile supported concrete bridge structure connected to the upland. The eastern end of the structure would be approximately 120 feet from the toe of the Savannah River Federal Channel navigation line, whereas the western end of the structure would be approximately 135 feet from the toe. The applicant also proposing to construct a berth that would be dredged to 36 feet BMLW. Approximately 30,000 cubic yards of material would be removed via a hydraulic cutterhead dredge and pumped to the applicant's proposed upland CDF in the upland immediately adjacent to the proposed wharf. The effluent discharged from the proposed CDF would enter into a tidal creek and then discharge to the Savannah River. To maintain the berth, the applicant proposes to annually remove 8,000 cubic yards of accumulated sediment via agitation dredging. To minimize the quantity of dredging required, a 740 linear foot steel sheet pile cut-off bulkhead would be installed along the landward side of the new wharf. No back fill in jurisdictional waters is required. In addition, the applicant is proposing to remove 33 existing concrete pilings that are in the footprint of the proposed access bridge and portion of the proposed dock. All removed pilings would be recovered to land and recycled where available. Source: COE Savannah District Application # SAS-2007-00748	3.4 miles to West	COE Public Notice: February 20, 2013.
Georgia Power – Transmission Line Upgrades: Georgia Power has recently completed an underground network upgrade project in downtown Savannah. The project included a 40 block area of Savannah's Historic District. Source:http://www.wtoc.com/story/21077846/ga-power-completes-downtown-savannah-network-upgrade	3.8 miles to West	Complete
Hutchinson Island Development: A local Savannah development company and CSX Reality Development is in the preliminary stages of developing a master business plan for a mixed-use development on 56 acres of land on Hutchinson Island. Source: http://www.bizjournals.com/atlanta/morning_call/2012/11/56-acre-mixed-use-development-planned.html	4.1 miles to West, Northwest	Preliminary Stages
President Street/General McIntosh Boulevard Drainage Projects: The proposed project would raise the elevation of President Street and parts of General McIntosh Boulevard 6 to 7 feet in order to address tidal flooding issues. The road's intersection with General McIntosh Boulevard would also be reconfigured and new intersections with planned development on the north and south side of the street would be added. The road improvements would run concurrently with planned drainage improvements to the Bilbo Canal, which is expected to improve drainage both in the area, as well as a wider area extending south. Construction is expected to take 30 months. Source: http://savannahnow.com/news/2013-06-23/city-considering-20-million-loan-president-street-drainage-projects#	4.3 miles to West, Southwest	This project would be constructed at about the same time as the Project.
East River Street Projects: The Savannah Historic District Board of Review approved plans for a hotel to be built on the former Georgia Power Headquarters site. The 162-room hotel, to be on the north side of River Street next to the Georgia Power office building, is part of a larger hotel/retail complex planned by North Point Hospitality. The project would include a second hotel, a parking garage and two retail buildings along the riverfront. The Historic Review Board has approved a general development plan for the complex but has yet to review design plans for the individual buildings. Source: http://savannahnow.com/exchange/2013-06-12/plans-approved-east-river-st-hotel	4.3 miles to West, Southwest	Preliminary Stages (Concept Approved)

TABLE 2.9.1-1

Existing or Proposed Projects Evaluated for Potential Cumulative Impacts Associated with the Liquefaction Facilities

Project and Description	Approximate Distance and Direction	Status
Various Hotel Expansions – Downtown Savannah: Several hotel expansions and renovations have been planned along River Street in downtown Savannah. The Mulberry Inn and Cotton Sail Hotel are currently undergoing and/or planning expansions to meet the increased demand of the tourist industry. Source: http://savannahnow.com/exchange/2013-08-17/mulberry-inn-makeover-begins-Monday http://savannahnow.com/exchange/2013-06-15/savannahs-tourism-evolution-underway	5.1 miles to West, Southwest	Ongoing
Hutchinson Hotel Project: According to the development agreement on file in Chatham County, Georgia (approved by Chatham County in March 2013), the Hutchinson Hotel project would include the development, design and construction of the Hotel and Chatham Conference Center on Hutchinson Island, Georgia. The hotel would have up to 500 rooms would include all necessary utility and road infrastructure to the site, as well as other improvements. Source: http://savannahnow.com/latest-news/2013-03-06/chatham-county-commission-vote-hutchinson-island-hotel	6.1 miles to West, Northwest	Schedule is not available for this project.
Project DeRenne: Project DeRenne is a comprehensive transportation project designed to address the congestion on I-516 (SR 21) and DeRenne Avenue. The project is being sponsored by the City of Savannah with oversight from the Georgia Department of Transportation (P.I. Nos. 0008358, 0008359, and 0010236). The project consists of three different segments: PI 0008358: West DeRenne/Hamsptead Connector "Boulevard Option" would involve the construction of a new four-lane roadway that would connect I-516 to a redirected White Bluff Road via a widened Hampstead Avenue. This roadway is envisioned to be a four-lane median divided roadway with sidewalks and a multi-use path. PI 0010236: SR 21 from CS 346/Mildred Street to SR 24 "West DeRenne Avenue Improvements" would operate in conjunction with the Boulevard Option to improve the portion of DeRenne Avenue between Mildred Street and the intersection of Abercorn Street. PI 0008539: East DeRenne from Abercorn Street to Harry S. Truman Parkway "East DeRenne Avenue Improvements" would improve the segment of DeRenne Avenue between Abercorn Street and Harry S. Truman Parkway. The improvements would include new road alignments as well as enhanced pedestrian accommodations. Source: http://www.savannahga.gov/?nid=885	6.5 – 7.5 miles to Southwest	On April 23, 2013, a Public Information Open House was held to allow the public to view the Engineered Concepts
Tybee Island Road Improvements: The proposed project would raise the level of approximately 520 linear feet of roadway to provide better access to a private residence. The new road would consist of an 8-foot-wide drive at 7.0-foot elevation, with 2-foot-wide grassed shoulders on each side of the drive and slopes of 1.5:1. The new road surface would be constructed of gravel and pervious material. Every 100 feet, the roadway would consist of #57 limestone fill depth for a length of 1 foot to create a "french drain" style conduit from one side of the road to the other to allow tidal flow across the road without inundating it. The majority of the project corridor consists of a single lane dirt road approximately 8 to 10 feet in width. Tidal marsh is immediately adjacent to the existing road way. Due to the existing elevations and the twice daily tide water coverage of the road, the majority of the project corridor, including the existing road, consists of Coastal Marshlands and Section 10 Waters. The roadway falls within upland adjacent to Highway 80 on the northern end of the project corridor and on the southern end of the project corridor, where it enters a hammock. Source: COE Savannah District Application # SAS-2012-00089	9.8 miles to Southeast	COE Joint Public Notice Savannah District/ State of Georgia dated December 26, 2012.

TABLE 2.9.1-1

Existing or Proposed Projects Evaluated for Potential Cumulative Impacts Associated with the Liquefaction Facilities

Project and Description	Approximate Distance and Direction	Status
Jimmy DeLoach Parkway Connector:[1] The Jimmy DeLoach Parkway Connector is a new 3.1 mile roadway alignment planned by the Georgia DOT [Project CSMSL-0008-00(690)] that would begin at Bourne Avenue/SR 307 in Savannah, Chatham County, Georgia, and terminate at the existing eastern end of Jimmy DeLoach Parkway in Savannah. New interchanges would be constructed at both Grange Road and Jimmy DeLoach Parkway. The typical section of the proposed limited access roadway would consist of four 12-foot-wide travel lanes (two in either direction) separated by a 24-foot-wide raised median and 6.5-foot-wide paved outside shoulders on both sides of the roadway. An exception to this typical section would begin just south of Crossgate Road and continue to the existing Jimmy DeLoach Parkway and would include a median barrier with 4-foot-wide inside shoulders. Potential cultural resources along this project include the presence of a historical Cherokee Hill area near the intersection of State Route 21 and Crossgate Road. A revolutionary war encampment of the 60th Royal Regiment might be in the vicinity of the proposed project. There are numerous structures that are over 50 years old and are eligible to be historic. Various wetland resources are between existing Jimmy DeLoach Parkway and the proposed northern tie-in to State Route 21. These include the St. Augustine Creek and large marshy/swamp areas. Source: http://georgiapublicnotice.com/pages/full_story/push?articleGeorgia+Department+++of+Transportation+to+Hold+a+Location+ and+Design+Public+Hearing+++Open+House++for+Project+CSMSL-0008-00-690-+JIMMY+DELOACH+CONNECTOR+FROM+BOURNE+AVENUE+SR+307+TO+EXISTING+JIMMY+DELOACH+PARKWAY+Chatham+County+P%20&id=11522264	10.2 miles to Northwest	Scheduled to be completed in December 2015.
President Street and General McIntosh Boulevard Improvements: The City of Savannah is planning to raise and reconstruct the existing four lanes and realign the existing intersection between these two roads. The two projects combined total approximately 0.65 mile. At the east end of the President Street work a new bridge would be constructed over the Bilbo Canal. During construction the project would be staged to maintain 4 lanes of t raffic at all times.	3.7 miles to Southwest, along designated truck route 1[3]	Scheduled to begin in summer of 2014 and last 30 months.
East Derenne Avenue from Abercon Street to Harry S Truman Parkway Project: A Georgia DOT project (CSSTP-0008-00[359]) to replace the existing two-way left turn land with a landscaped median along with signal improvements, pedestrian improvements and bike lanes.	7 miles to Southwest, along designated truck route 2	No date has been set.
SR 21 from CS 346/Mildred Street to SR 204: A Georgia DOT project (PI No. 0010236) to improve the raised median along DeRenne Avenue between Mildred Street and Abercorn Street to better control access.	7.5 miles to Southwest, along designated truck route 2	Scheduled for fiscal year 2015.
President Street from General McIntosh to Truman: A Georgia DOT project (NH000-0005-05[038]) to widen road from 4 to 6 lanes and separate by a 24 foot raised median, plus grade separation over railroad.	3.7 miles to Southwest, along designated truck routes 1, 2, and 3	Long-range.
SR 25 Connector/Bay Street from I-516 to the Bay Street Viaduct: A Georgia DOT project (HS00-0002-00[923], PI No. 0002923) to improve safety along Bay Street that will include four 12-foot-wide travel lanes with a a raised median, including curb and gutter with 16-foot-wid shoulders and a 5-foot-wide sidewalk.	4.8 miles to West-Southwest, along designated truck route 1	Under design and scheduled for fiscal year 2015 construction

TABLE 2.9.1-1

Existing or Proposed Projects Evaluated for Potential Cumulative Impacts Associated with the Liquefaction Facilities

Project and Description	Approximate Distance and Direction	Status
SR 205 from Rio road to Harry S Truman (HST) Parkway Phase V: A Georgia DOT project (NHS-0002-00[922], PI No. 0002922) to include widening and interchange construction from US 17 to HST, plus Georgia DOT project (No. NH-111-1[24], PI No. 522870) from US 17 to Rio Road.	12 miles to Southwest, along designated truck route 3	PI No. 0002922 is long range; PI No. 522870 is scheduled for fiscal year 2014.
SR 204 from CR975/Veterans Parkway to CS 1201/Rio Road: A Georgia DOT project (PI No. 0010232) to extend the east bound auxiliary lane along SR 204 and providing a westbound auxiliary lane from Veterans Parkway to Rio Road.	13 miles to Southwest, along designated truck route 3	Scheduled to begin in 2014.
Gulfstream Aerospace:[1] Gulfstream Aerospace is currently in the process of expanding its current facility at the Savannah International Airport. The expansion of the existing facility allows for the continued development and pending production of Gulfstream's new long-range model. Source: http://savannahnow.com/exchange/2013-01-08/gulfstream-still-growing-savannah	11.8 miles to West, Northwest	Unknown
Mitsubishi Heavy Industry:[1] Mitsubishi Heavy Industry is planning on expanding its existing facility in Port Wentworth to handle the expanded construction and maintenance of gas turbines. Source:http://savannahnow.com/exchange/2011-05-11/mitsubishi-unveils-state-art-plant-pooler-megasite	13.1 miles West	Plant construction completed in 2011. Additional expansion schedule is unknown.
E-Splost II Project: On November 8, 2011 the Educational Special Purpose Local Option Sales Tax ("ESPLOST") continuation passed in all 89 Precincts of Chatham County. The ESPLOST provides the framework for facilities growth aligned with the Passport to Excellence Plan. On November 8, 2011 the citizens of Savannah-Chatham County approved the continuation of this one percent sales tax. The ESPLOST extension is for a $330 million limit or 5 years (whichever comes first) and would be used to continue the improvement of facilities and equipment, as well as technology resource upgrades for students. Specifically, the Savannah-Chatham County School System proposes to construct 14 new schools within the county and improve nine existing schools/educational campuses within the area. Source: http://ftpcontent.worldnow.com/wtoc/web/esplost2.pdf	2-15 to West, Southwest, South and Southeast	Program was approved in December, 2011. Construction schedule is unknown.
Outlet Mall of Georgia:[1] The Outlet Mall of Georgia is being constructed near the intersection of I-95 and Pooler Parkway. Current plans include 560,000 square feet of retail space, with peripheral retail and hotel sites that can accommodate an additional 500,000 square feet of space. Total size for the development would be approximately 173 acres. Source: http://www.wtoc.com/story/23327316/construction-begins-on-outlet-mall-of-georgia Source:http://www.bizjournals.com/atlanta/morning_call/2013/05/220m-ben-carter-outlet-mall-gets.html	14.5 miles West, Northwest	Ongoing
Nordic Cold Storage:[1] Nordic Cold Storage has recently constructed a new 200,000 square-foot refrigerated warehouse near the Port Wentworth area. The warehouse is in a planned industrial/commercial corridor along the Jimmy DeLoach Parkway, just east of I-95. Additional expansion of is expected to take place in the coming years. Source: http://www.gaports.com/corporate/tabid/379/xmmid/1097/xmid/8278/xmview/2/default.aspx	15.2 miles West, Northwest	Complete, ongoing expansion unknown

TABLE 2.9.1-1

Existing or Proposed Projects Evaluated for Potential Cumulative Impacts Associated with the Liquefaction Facilities

Project and Description	Approximate Distance and Direction	Status
Zone 3 Expansion Project:[2] Southern Natural Gas Company, LLC (SNG) proposes to provide approximately 235 million cubic feet per day of new firm transportation capacity to certain customers in SNG's Zone 3 from new supply sources at the existing Elba Express Company, L.L.C. interconnections with Transcontinental Gas Pipe Line Company in Hart County, Georgia and Anderson County, South Carolina. Proposed facilities include: • 3.3 miles of 36-inch-diameter looping along the south side of SNG's 30-inch-diameter South Main 2nd Loop Line in Marengo County, Alabama; • one new 4,000-horsepower (hp) compressor unit at SNG's existing Thomaston Compressor Station in Upson County, Georgia; • abandonment of a 4,700-hp compressor unit 15 at SNG's Toca Compressor Station in Bernard Parish, Louisiana; • installation/relocation of the before-mentioned 4,700-hp compressor unit 15 along with new gas cooling at SNG's Riceboro Compressor Station in Liberty County, Georgia; • installation of gas cooling at SNG's Brookman Compressor Station in Glynn County, Georgia; • one new Hilliard Compressor Station with a 4,700-hp unit in Nassau County, Florida; • upgrade of the Jessup Meter Station in Wayne County, Georgia; and • installation of up to 3 taps and SCADA systems along SNG's Cypress Line in Nassau/Duval Counties, Florida. SNG proposes to use 137 acres of land for construction and 20 acres of land for operations.	Various; Alabama, Georgia, Florida	Ongoing; in-service planned for 2016

1 Project with potential cumulative impacts also associated with the Rincon Compression Station (see table 2.9.1-2).

2 Project with potential cumulative impacts also associated with the compression and metering facilities (see table 2.9.1-2).

3 Designated truck routes are defined in section 2.5.4.1 of the Elba Liquefaction Project Environmental Assessment.

TABLE 2.9.1-2

Existing or Proposed Projects Evaluated for Potential Cumulative Impacts Associated with the Compression and Metering Facilities

Project and Description	Approximate Distance and Direction	Status
Hartwell Site		
Hartwell Industrial Park: An approximate 200-acre industrial park on Hwy 29 SW of Hartwell, Georgia is being constructed. Source: http://www.hartiba.com/sites-and-buildings.html	9 miles to Northwest	Partially developed
Gateway Industrial Park: An approximate 150-acre industrial park in Hart and Franklin counties east of Lavonia, Georgia, on I-85 on the county line just west of Lake Hartwell is being constructed. Source: http://hartcountyga.gov/gateway.html	19 miles to Northwest	Partially developed
Jefferson County Site		
Proposed power line to the Jefferson County Site: As described in section 1.3, a 3.6-mile-long, 3-phase power line is proposed to provide power to the Jefferson County Site. The power line would be constructed within a 50-foot-wide cleared right of way. Source: Initial information provided by the Companies.	0 – 3.6 miles to North	Same timeframe as EEC Project.
Kings Mill Commerce Park Expansion: Plans have been proposed for a 730-acre industrial park in Wrens, Georgia, just east of Highway 17. Several companies have optioned land within the zoned industrial development with on-line dates of approximately late 2015. Additionally, IMERYS/PyraMax Ceramics currently is within the park and planning to double its capacity and build a 200,000-square-foot facility. Sources: http://www.jeffersoncounty.org/sites.htm http://gov.georgia.gov/press-releases/2012-03-28/energy-industry-supplier-create-60-jobs-jefferson-county	6 miles	Unknown Schedule
Thomson-Vogtle Transmission Line Project: Plans were recently announced for two new nuclear operating units to be constructed at Plant Vogtle nuclear operating plant, near Augusta, Georgia. Building the two new nuclear units would help meet the needs of Georgia Power customers in 2016 and beyond. The two new units are scheduled to come on line by 2017. The Thomson-Vogtle 500 kV transmission line must be built to add the necessary transmission infrastructure to support the two new nuclear units. The line route is 55 miles long and begins at Plant Vogtle in Waynesboro, Georgia, (Burke County) and ends at the Thomson Primary substation, southeast of Thomson, Georgia (McDuffie County). The route runs through Burke, Jefferson, Warren, and McDuffie counties, and existing transmission line corridors were utilized over approximately 13 miles of the line route. The transmission line must be in service by early 2016 to support the new Vogtle units 3 and 4 and is needed to continue to provide customers with reliable service. Source: http://www.georgiapower.com/about-energy/delivering-energy/building-for-thefuture/thomson-vogtle.cshtml	6-8 miles North	Clearing scheduled from February 2013 through May 2014. Construction proposed from October 2013 through December 2015
Louisville Airport Industrial Park: An industrial park in Jefferson County at the Louisville Airport, comprising more than 300 acres is being proposed. Source: http://www.jeffersoncounty.org/sites.htm	13 miles to Southwest	Partially developed
Flint Logistics LLC Site: A 395-acre industrial site in Jefferson County approximately 3 miles northwest of Louisville, Georgia is being proposed. Source: http://georgiafacts.org/net/location/building.aspx?s=330735.0.0.3013&mode=p	15 miles to Southwest	Partially developed
Waynesboro/Burke County Industrial Park: A nominal 300-acre industrial park on the north side of Waynesboro, Georgia, in Burke County is being proposed. Source: http://www.burkecounty-ga.gov/economic-development/industrial-development.php	16 miles to East, Southeast	Partially developed

TABLE 2.9.1-2

Existing or Proposed Projects Evaluated for Potential Cumulative Impacts Associated with the Compression and Metering Facilities

Project and Description	Approximate Distance and Direction	Status
Proposed North Star Jefferson Renewable Energy Facility: North Star Jefferson, LLC, is proposing to construct a biomass and tire derived fuel renewable energy power plant (North Star Jefferson Renewable Energy Facility), which uses renewable resources, such as wood and wood waste, as well as tire derived fuel, to generate electricity, as opposed to fossil fuels like coal or natural gas. The net 21 Megawatt facility would be built in Jefferson County, Georgia. Source: http://northstarrenewable.com/index.php/projects/north-star-jefferson/faqs	22 miles to Southwest	Air permit application filed October 2011. Permit issued in May 2012
Rincon Site		
The Research Forest Tracts: A 2,577-acre industrial site in Effingham County approximately 3 miles southwest of Rincon, Georgia is being proposed. Sources: http://www.ced.uga.edu/pdfs/outreach/charrettes/effinghamfinal.pdf http://savannahnow.com/effingham-now/2012-10-02/effingham-commissionrezones-research-forest-tract	2 miles to Southeast	Rezoned in October 2012; master plan currently being developed
Governor Treutlen Site: An 83-acre industrial site in Effingham County approximately 3 miles north of Rincon, Georgia is being proposed. Source: http://www.effinghamindustry.com/portfolio_posts/governor-treutlen-site/	4 miles to Southwest	Partially developed
Interstate Centre Industrial Park: A 1,074-acre industrial park in Bryan County approximately 4 miles northeast of Ellabell, Georgia is being proposed. Source: http://www.bryancountyga.com/industrial.php?s=a	12 miles to Southwest	Partially developed
I-16 Industrial Tracts A: A 1,698-acre industrial site in Effingham County, approximately 1 mile south of Meldrim, Georgia, adjacent to (NE quadrant) Exit 148 on I-16 is being proposed. Source: http://www.effinghamindustry.com/portfolio_posts/i-16-site/	12 miles to Southwest	Unknown. Completed engineering in 2013.
Coastline Site: A 183-acre industrial site in Effingham County approximately 2 miles south of Meldrim, Georgia, adjacent to (SE quadrant) Exit 148 on I-16 is being proposed. Source: http://www.effinghamindustry.com/portfolio_posts/i-16-coastline-site/	13 miles to Southwest	Unknown, incremental development anticipated.
Compass Business Park: An 828-acre industrial site in Chatham County at the Effingham County Line, south of I-16 and north of John Carter Road is being proposed. Source: http://www.seda.org/savannah/18/available-property.html	13 miles to Southwest	Unknown, incremental development anticipated.
Mitsubishi Heavy Industry:[1] Mitsubishi Heavy Industry is planning on expanding its existing facility in Port Wentworth. Mitsubishi would be increasing the plant to handle the expanded construction and maintenance of gas turbines. Source: http://savannahnow.com/exchange/2011-05-11/mitsubishi-unveils-state-art-plantpooler-megasite	15 miles to South	Plant completed in September 2011. Additional expansion schedule is unknown.
Outlet Mall Of Georgia:[1] The Outlet Mall of Georgia is being constructed near the intersection of I-95 and Pooler Parkway. Current plans include 560,000 square feet of retail space, with peripheral retail and hotel sites that can accommodate an additional 500,000 square feet of space. Total size for the development would be approximately 173 acres. Sources: http://www.wtoc.com/story/23327316/construction-begins-on-outlet-mall-ofgeorgia http://www.bizjournals.com/atlanta/morning_call/2013/05/220m-ben-carter-outletmall-gets.html	11 miles to South	Ground breaking occurred on September 3, 2013. Construction ongoing.

TABLE 2.9.1-2

Existing or Proposed Projects Evaluated for Potential Cumulative Impacts Associated with the Compression and Metering Facilities

Project and Description	Approximate Distance and Direction	Status
Gulfstream Aerospace:[1] Gulfstream Aerospace is currently in the process of expanding its current facility at the Savannah International Airport. The expansion of the existing facility allows for the continued development and pending production of Gulfstream's new long range model. Source: http://savannahnow.com/exchange/2013-01-08/gulfstream-still-growing-savannah	11.8 miles to South	Signed a long-term office space lease in January 2013
Nordic Cold Storage:[1] Nordic Cold Storage has recently constructed a new 200,000-square-foot refrigerated warehouse near the Port Wentworth area. The warehouse is in a planned industrial/commercial corridor along the Jimmy DeLoach Parkway, just east of I-95. Additional expansion of is expected to take place in the coming years. Source: http://www.gaports.com/corporate/tabid/379/xmmid/1097/xmid/8278/xmview/2/default.aspx	8.7 miles to South	Complete
Jimmy DeLoach Parkway Connector:[1] The Jimmy DeLoach Parkway Connector is a new 3.1 mile roadway alignment planned by the Georgia DOT [Project CSMSL-0008-00(690)] that would begin at Bourne Avenue/SR 307 in Savannah, Chatham County, Georgia, and terminate at the existing eastern end of Jimmy DeLoach Parkway in Savannah. New interchanges would be constructed at both Grange Road and Jimmy DeLoach Parkway. The typical section of the proposed limited access roadway would consist of four 12-foot-wide travel lanes (two in either direction) separated by a 24-foot-wide raised median and 6.5-foot-wide paved outside shoulders on both sides of the roadway. An exception to this typical section would begin just south of Crossgate Road and continue to the existing Jimmy DeLoach Parkway and would include a median barrier with 4-foot-wide inside shoulders. Potential cultural resources along this project include the presence of a historical Cherokee Hill area near the intersection of State Route 21 and Crossgate Road. A revolutionary war encampment of the 60th Royal Regiment might be in the vicinity of the proposed project. There are numerous structures that are over 50 years old and are eligible to be historic. Various wetland resources are between existing Jimmy DeLoach Parkway and the proposed northern tie-in to State Route 21. These include the St. Augustine Creek and large marshy/swamp areas. Source:http://georgiapublicnotice.com/pages/full_story/push?articleGeorgia+Department+++of+Transportation+to+Hold+a+Location+and+Design+Public+Hearing+++Open+House++for+Project+CSMSL-0008-00-690-+JIMMY+DELOACH+CONNECTOR+FROM+BOURNE+AVENUE+SR+307+TO+EXISTING+JIMMY+DELOACH+PARKWAY+Chatham+County+P%20&id=11522264	11 miles to Southwest	Scheduled to be completed in December 2015.

TABLE 2.9.1-2

Existing or Proposed Projects Evaluated for Potential Cumulative Impacts Associated with the Compression and Metering Facilities

Project and Description	Approximate Distance and Direction	Status
Zone 3 Expansion Project:[1] Southern Natural Gas Company, LLC (SNG) proposes to provide approximately 235 million cubic feet per day of new firm transportation capacity to certain customers in SNG's Zone 3 from new supply sources at the existing Elba Express Company, L.L.C. interconnections with Transcontinental Gas Pipe Line Company in Hart County, Georgia and Anderson County, South Carolina. Proposed facilities include: • 3.3 miles of 36-inch-diameter looping along the south side of SNG's 30-inch-diameter South Main 2nd Loop Line in Marengo County, Alabama; • one new 4,000-horsepower (hp) compressor unit at SNG's existing Thomaston Compressor Station in Upson County, Georgia; • abandonment of a 4,700-hp compressor unit 15 at SNG's Toca Compressor Station in Bernard Parish, Louisiana; • installation/relocation of the before-mentioned 4,700-hp compressor unit 15 along with new gas cooling at SNG's Riceboro Compressor Station in Liberty County, Georgia; • installation of gas cooling at SNG's Brookman Compressor Station in Glynn County, Georgia; • one new Hilliard Compressor Station with a 4,700-hp unit in Nassau County, Florida; • upgrade of the Jessup Meter Station in Wayne County, Georgia; and • installation of up to 3 taps and SCADA systems along SNG's Cypress Line in Nassau/Duval Counties, Florida. SNG proposes to use 137 acres of land for construction and 20 acres of land for operations.	Various; Alabama, Georgia, Florida	Ongoing; in-service planned for 2016

[1] Project with potential cumulative impacts also associated with the liquefaction facilities (see table 2.9.1-1)