Office of Energy Projects

April 2019

FERC/EIS-0289F

FINAL ENVIRONMENTAL IMPACT STATEMENT

FOR

Eagle LNG Partners Jacksonville, LLC
Jacksonville Project

Docket No. CP17-41-000

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

Cooperating Agencies:

U.S. Army Corps of Engineers | **U.S. Coast Guard** | **U.S. Department of Energy** | **U.S. Department of Transportation**

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas Branch 1
Eagle LNG Partners Jacksonville, LLC
Jacksonville Project
Docket No. CP17-41-000

TO THE INTERESTED PARTY:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared a final environmental impact statement (EIS) for the Jacksonville Project, proposed by Eagle LNG Partners Jacksonville, LLC (Eagle LNG) in the above-referenced docket. Eagle LNG requests authorization to construct and operate a liquefied natural gas (LNG) facility on the north bank of the St. Johns River in Jacksonville, Florida. Eagle LNG's Jacksonville Project would consist of an LNG terminal on about 81.1 acres of a 193.4-acre parcel of land and would produce a nominal capacity of about 1.0 million (metric) tonnes per annum (MTPA) of LNG. The LNG terminal would receive natural gas from a new 120-foot-long non-jurisdictional natural gas pipeline constructed by Peoples Gas (a subsidiary of TECO Energy, Inc.), connected to its existing local gas distribution transmission pipeline, which is immediately adjacent to the proposed terminal site.

The final EIS assesses the potential environmental effects of the construction and operation of the Jacksonville Project in accordance with the requirements of the National Environmental Policy Act (NEPA). The FERC staff concludes that approval of the Jacksonville Project would result in some limited adverse environmental impacts; however, these impacts would be reduced to less-than-significant levels with the implementation of Eagle LNG's proposed mitigation and the additional measures recommended in the EIS.

The U.S. Department of Energy, U.S. Coast Guard, U.S. Army Corps of Engineers, and U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration participated as cooperating agencies in the preparation of the EIS. Cooperating agencies have jurisdiction by law or special expertise with respect to resources potentially affected by the proposal and participate in the NEPA analysis. Although the cooperating agencies provided input to the conclusions and recommendations presented in the EIS, the agencies will present their own conclusions and recommendations in their respective Records of Decision or determinations for the project.

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

- three LNG trains, each with a nominal capacity of 0.33 MTPA of LNG for export, resulting in a total nominal capacity of 1.0 MTPA;
- one LNG storage tank with a net capacity of 45,000 m^3;
- marine facilities with a concrete access trestle and loading platform, and two liquid loading arms capable of docking and mooring a range of LNG vessels with an LNG cargo capacity of up to 45,000 m^3;
- LNG truck loading facilities with a dual bay capable of loading 260 to 520 LNG trucks per year;
- a boil-off gas compression system;
- on-site refrigerant storage;
- ground flare and cold vent systems; and
- utilities and support facilities (e.g., administration, control, and workshop buildings; roads and parking areas; power and communications; water, air, septic, and stormwater systems).

The Commission mailed a copy of the *Notice of Availability* to federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners and other interested individuals and groups; and newspapers and libraries in the project area. The EIS is only available in electronic format. It may be viewed and downloaded from the FERC's website (www.ferc.gov), on the Environmental Documents page (https://www.ferc.gov/industries/gas/enviro/eis.asp). In addition, the final EIS may be accessed by using the eLibrary link on the FERC's website. Click on the eLibrary link (https://www.ferc.gov/docs-filing/elibrary.asp), click on General Search, and enter the docket number in the "Docket Number" field, excluding the last three digits (i.e., CP17-41). 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.

Questions?

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

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

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TECHNICAL ACRONYMS AND ABBREVIATIONS

μPa	micropascal
AAQS	ambient air quality standards
ACHP	Advisory Council on Historic Preservation
ACI	American Concrete Institute
AGRU	Acid Gas Removal Unit
AIChE	American Institute of Chemical Engineers
Annova	Annova LNG Common Infrastructure, LLC, Annova LNG Brownsville A, LLC, Annova LNG Brownsville B, LLC, and Annova LNG Brownsville C, LLC
ANSI	American National Standards Institute
APE	area of potential effects
API	American Petroleum Institute
API RP	American Petroleum Institute Recommended Practice
AQCR	Air Quality Control Regions
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
BA	biological assessment
BCC	Birds of Conservation Concern
Bcf/d	billion cubic feet per day
BCR	Birds of Conservation Concern
bgs	below ground surface
BLEVE	boiling liquid expanding vapor explosion
BMP	best management practices
BOG	boil-off gas
BPVC	Boiler and Pressure Vessel Code
Btu/ft^2-hr	British thermal units per square foot per hour
BWMS	ballast water management system
C3-MR	Propane Mixed Refrigerant
CAA	Clean Air Act
Cameron LNG	Cameron LNG, LLC
CCPS	Center for Chemical Process Safety
CCTV	closed-circuit television
CEB	Comité Euro-International du Béton
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CI ICE	compression ignition internal combustion engines
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO2 equivalents
Coast Guard	U.S. Coast Guard
COE	U.S. Army Corps of Engineers
COI	Certificate of Inspection
Commission	Federal Energy Regulatory Commission
Commonwealth	Commonwealth LNG, LLC
Corpus Christi	Corpus Christi Liquefaction, LLC
COTP	Captain of the Port
CPT	Cone Penetration Tests

CSCWM Plan	Construction Spill Control and Waste Management
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	decibels
dBA	decibels on the A-weighted scale
DCP	Dominion Cove Point LNG, LP
DCS	distributed control system
DHS	Department of Homeland Security
DMMA	dredged material management area
DMR	Dual Mixed Refrigerant
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DPS	distinct population segments
Driftwood	Driftwood LNG, LLC
Eagle LNG	Eagle LNG Partners Jacksonville, LLC
EFH	essential fish habitat
EI	environmental inspector
EIS	environmental impact statement
Elba Companies	Elba Liquefaction Company, LLC, Southern LNG Company, LLC, and Elba Express Company
ELP	Elba Liquefaction Project
EPA	U.S. Environmental Protection Agency
EPAct	Energy Policy Act
EPC	Engineering, Procurement, and Construction
ERP	Emergency Response Plan
ESA	Endangered Species Act of 1973
FAA	Federal Aviation Administration
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEED	front-end-engineering-design
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FGT	Florida Gas Transmission
FHWA	Federal Highway Administration
FLEX	FLNG Expansion, L.P., FLNG Liquefaction, LLC, FLNG Liquefaction 2, LLC, and FLNG Liquefaction 3, LLC
FLUCCS	Florida Land Use, Cover, and Forms Classification System
FNAI	Florida Natural Areas Inventory
Fourchon	Fourchon LNG LLC
FRA	Federal Rail Administration
Freeport LNG	Freeport LNG Development, LP
Freeport-McMoRan	Freeport-McMoRan Energy, LLC
FSA	Facility Security Assessment
FSP	Facility Security Plan
ft	feet
FTA	Free Trade Agreement
FWC	Florida Fish and Wildlife Conservation Commission

FWS	U.S. Fish and Wildlife Service
g	gravity
GHG	greenhouse gases
GMD	geomagnetic disturbances
Golden Pass	Golden Pass Products LLC
GPS	global positioning system
Gulf LNG	Gulf LNG Liquefaction Company, LLC
GWP	global warming potential
H_2S	hydrogen sulfide
HAP	hazardous air pollutants
HAZID	Hazard Identification Analysis
HAZOP	hazard and operability
hp	horsepower
HUC	Hydrologic Unit Code
IBC	International Building Code
IMO	International Maritime Organization
IPSMR	Improved Single Mixed Refrigerant
ISA	International Society for Automation
JAXPORT	Jacksonville Port Authority
JEA	Jacksonville Electric Authority
KMLP	Kinder Morgan Louisiana Pipeline
KOP	key observation points
kV	kilovolt
kW/m^2	kilowatts per square meter
Lake Charles LNG	Lake Charles LNG Company, LLC
lb	pound
L_d	daytime noise level
L_{dn}	Day-Night Sound Level
L_{eq}	equivalent sound level
L_n	nighttime noise level
LNG	liquefied natural gas
LNG Vessels	LNG carriers and LNG barges
LNGC	LNG carrier
LOD	Letter of Determination
LOI	Letter of Intent
LOR	Letter of Recommendation
LPG	liquid petroleum gas
m^3	cubic meters
Magnolia	Magnolia LNG, LLC
MBTA	Migratory Bird Treaty Act
MCL	Maximum Contaminant Level
MEOW	maximum envelope of water
MMBtu	million British thermal units
MMBtu/hr	million British thermal units per hour
MMLS	Movable Modular Liquefaction Systems
MMPA	Marine Mammal Protection Act of 1972
MMscf/d	million standard cubic feet per day
MOU	memorandum of understanding
MPEH Project	Main Pass Energy Hub LNG Export Project

mph	miles per hour
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MTPA	million tonnes per annum
MTSA	Maritime Transportation Security Act
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NARW	North Atlantic right whale
NAVD88	North American Vertical Datum of 1988
NBSIR	National Bureau of Standards Information Report
NEHRP	National Earthquake Hazards Reduction Program
NEPA	National Environmental Policy Act of 1969
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NGA	Natural Gas Act
NHPA	National Historic Preservation Act
NHTSA	National Highway Traffic Safety Administration
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NOI	Notice of Intent to Prepare an Environmental Impact Statement for the Planned Jacksonville Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting
NO_X	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	noise-sensitive area
NSPS	New Source Performance Standards
NSR	New Source Review
NTU	Nephelometric Turbidity Unit
NUREG	Nuclear Regulatory Commission Regulation
NVIC	Navigation and Vessel Inspection Circular
NWI	National Wetlands Inventory
OFW	Outstanding Florida Water
OSMR®	Optimized Single Mixed Refrigerant
P&ID	piping and instrument diagram
PFD	process flow diagram
PGA	peak ground acceleration
PHMSA	Pipeline and Hazardous Materials Safety Administration
Plan	Upland Erosion Control, Revegetation, and Maintenance Plan
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
Port Arthur	Port Arthur LNG, LLC and Port Arthur Pipeline, LLC
ppmv	parts per million by volume
ppt	parts per thousand
pre-FEED	preliminary front-end-engineering-design
Procedures	Wetland and Waterbody Construction and Mitigation Procedures

Project	Jacksonville Project
PSD	Prevention of Significant Deterioration
PVB	pressure vessel burst
RHA	Rivers and Harbors Act
Rio Bravo	Rio Grande LNG, LLC and Rio Bravo Pipeline Company, LLC
Route 105	Florida State Route 105
RV	recreational vehicle
Sabine Pass LNG	Sabine Pass LNG, LP
SAFMC	South Atlantic Fishery Management Council
SCPT	Seismic Cone Penetration Tests
SHPO	State Historic Preservation Office
SI ICE	spark ignition internal combustion engines
SJRWMD	St. Johns River Water Management District
SLOSH	Sea, Lake, and Overland Surge from Hurricanes
SMR	Single Mixed Refrigerant
SNG	Southern Natural Gas
SO2	sulfur dioxide
SPCC Plan	Spill Prevention, Control and Countermeasure Plan
SPT	Standard Penetration Tests
SR	State Road
SSE	safe shutdown earthquake
SSURGO	Soil Survey Geographic Database
Supplemental NOI	Supplemental Notice of Intent to Prepare an Environmental Impact Statement for the Planned Jacksonville Project and Request for Comments on Environmental Issues
SWEL	storm surge still water elevation
SWPPP	Stormwater Pollution Prevention Plan
Texas LNG	Texas LNG Brownsville LLC
TMDL	Total Maximum Daily Load
tpy	tons per year
Trunkline	Trunkline Gas Company
TWIC	Transportation Worker Identification Credential
USC	United States Code
USDA	U.S. Department of Agriculture
USGCRP	U.S. Global Change Research Program
USGS	United States Geological Survey
VE	velocity wave
Venture Global	Venture Global Calcasieu Pass, LLC and Venture Global Plaquemines LNG, LLC
VLCC	very large crude carrier
VOC	volatile organic compounds
VRM	Visual Resource Management
WBID	Water Body Identification
WEG	wind erodibility group
WSA	Waterway Suitability Assessment

EXECUTIVE SUMMARY

INTRODUCTION

On January 31, 2017, Eagle LNG Partners Jacksonville, LLC (Eagle LNG) filed an application with the Federal Energy Regulatory Commission (FERC or Commission) under section 3(a) of the Natural Gas Act and parts 153 and 380 of the Commission's regulations. The application was assigned Docket No. CP17-41-000 and a Notice of Application was issued on February 13, 2017 and noticed in the Federal Register on February 17, 2017. Eagle LNG requests authorization to site, construct, and operate a natural gas liquefaction and export facility at a proposed site on the north bank of the St. Johns River in Jacksonville, Florida. The project is referred to as the Jacksonville Project.

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

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

PROPOSED ACTION

Eagle LNG's stated purpose of the Jacksonville Project is to receive domestic natural gas, liquefy and store it, and deliver it to small- to mid-sized marine vessels and trucks to serve the domestic and export markets for liquefied natural gas (LNG). The project would access natural gas from a new 120-foot-long non-jurisdictional pipeline connected to the existing Peoples Gas intrastate pipeline. Any exports would be consistent with authorizations from the DOE. The DOE granted an authorization to Eagle LNG to export to countries having a free trade agreement with the United States on July 21, 2016 (Fossil Energy Docket No. 16-15-LNG and Order No. 3867). Eagle LNG filed an application on January 27, 2016, for export to non-free trade agreement nations, which is pending the DOE's review.

Subject to the receipt of FERC authorization and all other applicable permits, authorizations, and approvals, Eagle LNG anticipates starting construction as soon as possible, with a current estimated start for in-service in early summer 2021.

The proposed LNG terminal site is on the north bank of the St. Johns River in Jacksonville, Duval County, Florida, and would occupy about 70.7 acres onshore and 11.1 acres of submerged lands. The facility would include three LNG trains, each with the capacity to produce 550,000 gallons per day of LNG. At full build-out, the facility would produce 1,650,000 gallons per day of LNG. Construction of the LNG facility and the subsequent commissioning of Train 1 would occur over about 2 years. The commissioning of Train 2 would occur the following year and Train 3 about 6 months later.

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

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

PUBLIC INVOLVEMENT

On December 3, 2014, FERC began its pre-filing review of the Jacksonville Project and established pre-filing Docket No. PF15-7-000 to place information related to the project into the public record. The pre-filing review process provides opportunities for interested stakeholders to become involved early in project planning, facilitates interagency cooperation, and assists in the identification and resolution of issues prior to a formal application being filed with FERC.

On February 24, 2015, the Commission issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Jacksonville Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting* (NOI). The NOI was published in the Federal Register on March 2, 2015, and mailed to 197 interested parties on the environmental mailing list (including federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; affected property owners; other interested parties; and local libraries and newspapers). Publication of the NOI established a 30-day public comment period for the submission of comments related to the environmental aspects of the project and announced a public scoping meeting that was held in Jacksonville, Florida on March 12, 2015. On March 25, 2015, the Commission issued a supplemental NOI to extend the public comment period to April 24, 2015 due to a mailing error with the original notice. In March 2015, we met with representatives of interested agencies, including the Coast Guard, COE, and Florida Department of Environmental Protection, and conducted a site visit at the proposed LNG terminal site.

During the scoping period, we received comments from a total of six commenters on a variety of environmental issues including visual impacts, water quality, air quality, threatened and endangered species, noise, and safety.

On November 16, 2018, we issued a *Notice of Availability of the Draft Environmental Impact Statement for the Proposed Jacksonville Project*. This notice, which was published in the Federal Register, listed the date and location of the public comment session, and established a closing date of January 7, 2019, for receiving comments on the draft EIS. Copies of the notice were mailed to nearly 190 stakeholders. The EPA noticed receipt of the draft EIS in the Federal Register on November 23, 2018. On February 7, 2019, the Commission reopened the formal period for receiving comments on the draft EIS due to the funding lapse at certain federal agencies between December 22, 2018 and January 25, 2019, which established a new draft EIS comment period closing date of February 25, 2019.

We held one public comment session in Jacksonville, Florida, on December 12, 2018, which provided stakeholders an opportunity to present oral comments on the analysis of environmental impacts described in the draft EIS. Four people commented during the public comment session. We also received five written comment letters from federal and state agencies, Native American tribes, and Eagle LNG in response to the draft EIS.

Substantive environmental issues identified through this public review process are addressed in this EIS. The transcripts of the public scoping and comment sessions, and all written comments are part of FERC's public record for the project and are available for viewing on the FERC internet website (http://www.ferc.gov).[3]

[3] To access public documents on the FERC website, use 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., PF15-7, CP17-41). Be sure to select an appropriate date range.

ENVIRONMENTAL IMPACTS AND MITIGATION

We evaluated the potential impacts of construction and operation of the project on geology; soils; water resources; wetlands; vegetation; wildlife and aquatic resources; threatened, endangered, and special status species; land use, recreation, and visual resources; socioeconomics; cultural resources; air quality and noise; reliability and safety; and cumulative impacts. In section 3 of the EIS, we summarized our evaluation of alternatives to the project, including the no-action alternative, system alternatives, and site alternatives. Where necessary, we recommend additional mitigation measures to minimize or avoid these impacts. Sections 5.1 and 5.2 of the EIS contain our conclusions and a compilation of our recommended mitigation measures, respectively.

Construction of the Jacksonville Project would affect about 92.2 acres of land within a 193.4-acre parcel. During operation, about 81.8 acres of land would be required for the LNG terminal, including about 11.1 acres of submerged lands. The remaining 10.4 acres would return to preconstruction conditions and uses.

Based on our analysis, project scoping, agency consultations, and public comments, the major project construction and operational issues are impacts on water resources and wetlands; wildlife and aquatic resources; special status species; land use, recreation, and visual resources; socioeconomics; cultural resources; air quality and noise; reliability and safety; and cumulative impacts.

Water Resources and Wetlands

The Jacksonville Project lies within the Floridan aquifer system, which underlies all of Florida and parts of Alabama, Georgia, and South Carolina. Eagle LNG would construct two on-site water wells to supply water during construction and operation of the LNG terminal and anticipates using 135,000 gallons per day during the construction period. Hydrostatic testing would require a one-time withdrawal and use of 8.4 million gallons, but the proposed volume represents less than one-tenth of a percent of the total water withdrawn daily from the Floridan aquifer in Duval County. Therefore, we have determined that the project would not have a significant effect on groundwater drawdown or saltwater intrusion in the Floridan aquifer system.

The proposed project is on the north bank of the St. Johns River within the Lower St. Johns River Basin, about 14.5 river miles from the river mouth. The river reverses flow twice daily in response to tidal action from the Atlantic Ocean. Drummond Creek discharges to the St. Johns River on the south side of the project site. These two waterbodies have designated uses for fish consumption, recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife.

Eagle LNG would dredge the marine facilities berthing area using hydraulic cutterhead suction and/or mechanical dredging techniques, and would remove about 179,000 cubic yards of dredged material. Dredging would result in increased suspended solid and turbidity levels in the St. Johns River. Eagle LNG would store dredged material in an on-site dredged material management area (DMMA) designed to hold the entire volume of dredged material. The DMMA would also store dredged material from subsequent maintenance dredging during the life of the project. Eagle LNG would conduct dredging using standard construction methods to minimize turbidity (e.g., decrease bucket speed, take smaller bucket bites, use self-contained or sealed bin walls on barges loaded with dredged material, use slow and deliberate sweeps of cutterhead suction dredge, install turbidity curtains) and would monitor turbidity levels during dredging operations.

Eagle LNG proposes to cease dredging if turbidity levels exceed 29 nephelometric turbidity units (NTU) above ambient river water quality and would only continue when turbidity levels reach less than 29 NTU. Additionally, Eagle LNG would discharge water from the DMMA to Drummond Creek and would monitor turbidity levels during these discharges. If turbidity exceeds 29 NTU above background, Eagle LNG would cease discharges from the DMMA until water quality levels reach less than 29 NTU. Eagle LNG would install turbidity barriers around the discharge point, if needed, to maintain water quality. With implementation of these measures, we conclude that impacts on water quality due to dredging and discharges from the DMMA would be temporary and minor.

Inadvertent spills or leaks of hazardous materials during construction and operation of the LNG terminal would pose a potential risk of contamination to groundwater and surface water near the project. Eagle LNG would follow its project-specific *Construction Spill Control and Waste Management Plan* during construction and commits to develop a *Spill Prevention, Control, and Countermeasures Plan* for use during operation to minimize potential impacts associated with an inadvertent spill or leak of hazardous material. Key aspects of these plans include monitoring storage and refueling activities, provisions for secondary containment around bulk storage of hazardous materials, and the immediate response and cleanup should a spill or leak occur. Additionally, vessels calling on the LNG terminal would be required to have a shipboard oil pollution emergency plan in accordance with International Maritime Organization regulations. Given the impact minimization and mitigation measures, we conclude that the probability of spills or leaks would be small and any resulting impacts on aquatic resources would be temporary and minor.

Construction of the project would affect a total of about 2.2 acres of wetlands, of which about 1.9 acres (1.2 acres of forested wetlands and 0.7 acre of estuarine salt marsh) would be permanently lost. Eagle LNG would allow the remaining 0.3 acre of wetland to revegetate after construction. About 0.3 acre of wetlands would be disturbed by the installation of the DMMA drain pipe during periodic (every 1 to 2 years) maintenance dredging for the life of the project. The DMMA drainpipe would be removed after each dredging event.

Eagle LNG would implement the mitigation measures in its project-specific *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) to minimize impacts on wetlands and ensure all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species. Given the limited volume of wetland fill associated with the project and Eagle LNG's commitment to restoring the wetland temporarily affected by construction, we conclude that construction and operation of the LNG terminal would have permanent but not significant impacts on wetlands. In addition, Eagle LNG has committed to purchasing credits from off-site mitigation banks in the approved watershed to offset the 1.9 acres of permanent wetland/salt marsh impacts in accordance with COE requirements, which would result in no net loss of wetlands.

Wildlife and Aquatic Species

A total of about 92.2 acres of wildlife habitat would be affected by construction of the LNG facility, of which about 70.7 acres of vegetated land onshore would be permanently converted to industrial use and 11.1 acres of submerged land would be converted to industrial use for the marine facilities or retained in open water for the berthing area. The remaining habitat on the 193.4-acre parcel would remain intact and provide similar habitat for wildlife present in the area. Wildlife would be directly displaced from the facility footprint, and some wildlife may be indirectly displaced within a larger area due to the increase in noise and lighting during construction and operation of the LNG facility. The direct loss of habitat and the indirect effects associated with displacement from construction and operation of the LNG terminal would result in permanent, but not significant impacts on wildlife.

The LNG terminal is within the migratory bird Atlantic Flyway, which terminates in the Caribbean, and is the most densely populated flyway. Project construction would result in direct impacts on migratory birds. However, this would be limited to a one-time event during construction. Further, the vegetation communities within the LNG terminal site include about 37.0 acres of recently cleared and replanted coniferous plantation, which reduces the habitat value for many species. Additionally, the remaining forested areas outside the terminal footprint are a mix of young coniferous plantation, mature live oak hammock, and forested wetlands that would continue to provide better suitable habitat for some migratory birds than the LNG terminal site. In response to U.S. Fish and Wildlife Service (FWS) comments on Eagle LNG's *Migratory Bird Plan*, we recommend that Eagle LNG file mitigation measures developed in consultation with the FWS to minimize impacts on colonial rookeries prior to conducting site clearing between March and August. For these reasons and with implementation of the measures included in Eagle LNG's *Migratory Bird Plan* and our recommendation, we have determined that the project would not substantially affect migratory birds or colonial waterbirds.

One bald eagle nest was identified outside the construction limits west of the project site. The LNG terminal site is outside the 660-foot FWS buffer for bald eagle nests. Eagle LNG committed to conduct monitoring of the nest if construction activities would occur within the bald eagle nesting season (October 1 to May 15). If active bald eagle nesting is observed in the known nest, Eagle LNG would monitor that nest during pile driving activities within 0.5 mile of the nest site. If any disruption is observed, Eagle LNG would cease pile driving and consult with the FWS for guidance on mitigation or alternative methods that could be implemented prior to continuing with pile driving activities. If no disturbance is apparent, Eagle LNG would complete pile driving activities and submit a final report to the FWS. Eagle LNG would file a copy of any correspondence and/or the final report with the Commission. With implementation of Eagle LNG's proposed mitigation, we conclude that impacts on bald eagles would be short term and not significant.

Habitat for aquatic resources present within the project footprint includes the St. Johns River, Drummond Creek, and the associated saltmarsh on the north shore of the river. Designated essential fish habitat for multiple species is present in the St. Johns River estuary, unconsolidated bottom (soft sediments), tidal creeks, and estuarine emergent wetlands associated with the project area. Dredging of the berthing area would temporarily increase noise, turbidity, and suspended solid levels within the water column, reducing light penetration and primary production, adversely affecting fish eggs and juvenile fish survival, benthic community diversity and health, foraging success, and suitability of spawning habitat. Deposition of water column sediments on nearby substrates could bury aquatic macroinvertebrates. Construction of the berthing area would affect 11.1 acres of submerged offshore land, and would permanently convert 0.7 acre of saltmarsh to industrial facilities.

Most fish species are highly mobile and would leave the area during dredging activities. However, dredging would result in direct mortality of benthic organisms (e.g., aquatic macroinvertebrates, mollusks, and crustaceans), which are important food sources for many species of fish, within the dredge footprint that currently provides open water habitat. Following construction, we anticipate aquatic resources would return to the berthing area, which would be similar to the existing habitat, but deeper. Eagle LNG would implement dredging mitigation measures appropriate for the dredging technique used and would monitor turbidity levels during dredging. Eagle LNG would also follow its project-specific *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan), Procedures, and stormwater pollution prevention plan. Therefore, based on the available information, we have determined that impacts on aquatic resources and essential fish habitat due to temporary increases in noise, turbidity, and suspended solid levels from dredging would be localized, temporary, and not significant. Additionally, as stated above, Eagle LNG would provide compensatory mitigation for the permanent loss of saltmarsh in accordance with COE requirements.

Eagle LNG would conduct maintenance dredging of the berthing area every 1 to 2 years, which would result in mortality and habitat modification as well as temporary increases in noise, turbidity, and suspended solid levels. The impacts would be similar to the initial dredging event but would occur for a shorter duration. Eagle LNG would implement its proposed construction turbidity monitoring and mitigation measures during each periodic maintenance dredging event. Therefore, we conclude that the maintenance dredging would have localized, temporary, and minor impacts on aquatic resources.

Construction of the LNG terminal would require installation of 239 piles using pile driving techniques that would increase underwater noise levels. Potential impacts on aquatic resources associated with pile driving would include injury or trauma to fish, sea turtles, and other animals with gas-filled cavities, such as swim bladders and hearing structures. Eagle LNG has not committed to specific mitigation measures it would implement during pile driving activities to reduce underwater noise impacts to below injury thresholds. Therefore, we recommend that Eagle LNG file an *Underwater Noise Mitigation Plan* that identifies the specific mitigation measures it would implement to achieve its proposed reductions of underwater noise associated with pre-stressed concrete pile driving and steel impact pile driving. The plan should include an underwater noise monitoring plan to ensure that the target noise levels are achieved, and additional mitigation that Eagle LNG would implement in the event that target noise levels are not achieved. Based on incorporation of these mitigation measures and with our recommendation, we conclude that impacts on aquatic resources would not be significant impact.

Cooling water intakes associated with LNG carriers would result in impingement and entrainment of early life stages of fish (ichthyoplankton) and other small organisms. Eagle LNG conducted an ichthyoplankton study in the project's cooling water intake area during the peak winter and summer spawning periods. Based on the overall low adult loss equivalent values, we conclude that cooling water intake effects on fisheries would not be significant.

Eagle LNG estimates that cooling water discharged from LNG carriers would be about 3 degrees Celsius warmer than the ambient water temperature. Fish and invertebrates could be temporarily affected by the increase in temperature. Given the volume of cooling water discharged relative to the total volume of water within the St. Johns River and the mobility of resident species, which could relocate to surrounding waters if necessary, we have determined that impacts on aquatic resources would be intermittent and minor.

Lighting associated with in-water activities during construction and operation of the LNG terminal would affect small organisms attracted to the light and could result in increased predation by larger species. During construction, lighting would be limited to activities that require 24-hour operation. No effects from lighting would result from dredging and pile driving because these activities would be limited to daytime hours. Over-water lighting used during LNG terminal operations would be shielded and limited to the extent necessary to carry out marine operations or facility maintenance. Sea turtles and manatees are unlikely to be attracted to the facility berthing area due to the lack of foraging habitat. In addition to impacts associated with artificial lighting, shading impacts would occur where the trestle traverses wetlands (about 0.1 acre). The shading impacts would be small compared to the large area of remaining wetlands. Based on the likelihood that aquatic resources would acclimate over time to increased lighting and the small area of shading impacts, we have determined that impacts on aquatic resources from increased lighting and shading would be localized and minor.

Underwater noise generated by LNG carriers would increase near the transiting vessels. Impacts on aquatic resources due to increased noise levels would vary by species. Due to the existing industrial and shipping activities within the LNG vessel transit routes and the mobility of resident species, we have determined that project impacts on aquatic resources associated with engine noise would be intermittent and minor.

Special Status Species

A total of 33 species that are federally listed as threatened or endangered, or those that are candidates for listing under the Endangered Species Act may be affected by the project. Critical habitat has been designated for three species in the project area or along the vessel transit route: the North Atlantic right whale, loggerhead sea turtle, and Florida manatee. We determined the project would have *no effect* on 13 federally listed species because either suitable habitat is not present or the project is not within the species' range. We have also determined that the project would have *no effect* on the critical habitat for the North Atlantic right whale, the loggerhead sea turtle, or the Florida manatee.

Eagle LNG has proposed mitigation measures to reduce the risk of harm to listed species, including relocating gopher tortoises, following the *Standard Manatee Conditions for In-Water Work,* and requiring vessels to comply with the National Oceanic and Atmospheric Administration's *Vessel Strike Avoidance Measures and Reporting for Mariners* publication and with the voluntary North Atlantic right whale mitigation measures by including these requirements in its shipper contracts. Based on our analysis and Eagle LNG's mitigation measures, we determined that the project is *not likely to adversely affect* 17 federally listed species and *is not likely to jeopardize the continued existence* of the 3 candidate species. Because consultation with the FWS and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service is ongoing, we recommend completion of any necessary Endangered Species Act consultation with these agencies prior to construction.

An additional nine species that are state listed as threatened or endangered may be affected by the project. The primary threat to these species is loss of habitat (about 0.7 acre of saltmarsh) and disturbance due to light and noise associated with operation of the facility. We conclude that this disturbance would result in permanent but minor impacts on four state-listed species, and that there would be *no effect* on the remaining five species.

Land Use, Recreation, and Visual Resources

There are two special use areas less than 1.5 miles from the project site, the Jacksonville Zoo and Reddie Point Preserve. There would be no direct impacts on either of the facilities, but users of these areas may experience increases in traffic and noise during construction and operation of the LNG terminal.

Recreational boating and fishing activities occur within the St. Johns River, especially on weekends. Recreational users in the project vicinity may observe a slight increase in barge traffic during construction and LNG carrier traffic during operation. Construction traffic would be minimal on Saturdays and Sundays when most recreational users would be on the river. Eagle LNG anticipates a nominal 100 vessel calls on the facility each year during operation. Because the increase in vessel traffic would be minimal, we determined there would be no significant effect on recreational users during construction and operation of the project.

The project would not affect any nationally or stated-designated visual resources or visually sensitive areas, but the project would generally be visible to motorists on State Route 105 from the north and to Reddie Point and residences from the south and southeast. However, a vegetated island in the middle of the river and forested areas that would remain on the project site would partially screen the LNG terminal. Permanent changes to the visual character of the area would result from operation of the LNG terminal, which would modify the viewshed. The most prominent visual features would be the LNG storage tank, which would be about 158 feet wide and 130 feet high, and the flare stack, which would be about 50 feet high when no flame is present. The maximum flame height is about 24 feet from the top of the flare stack. However, these features would only be partially visible and generally less prominent in the viewshed than other industrial facilities. Outdoor lighting would be required for operations and safety, and for elevated structures. Eagle LNG would use directional lighting to minimize the horizontal emission of light. During operation, there would be a nominal increase in vessel traffic (100 vessels per year) within the viewshed of residences on the St. Johns River and recreationists at Reddie Point Preserve. The incremental change in large vessel activity would be minimally perceptible; therefore, we conclude that the project's vessel traffic would not have a significant impact on visual resources.

Socioeconomics

Construction of the project would require an average monthly construction workforce of 307 workers (peak of 465 workers) over the 20-month period required for construction of the LNG terminal (not including commissioning of the trains). Vehicular traffic associated with construction of the facility would result in increased traffic congestion on State Route 105, but would have little effect on nearby interstate highways. Increased traffic on State Route 105 would affect visitors to the Jacksonville Zoo and other regional facilities. Operation of the LNG terminal would result in an average of 12 roundtrips per day associated with worker commutes. Additionally, Eagle LNG anticipates 5 to 10 roundtrips per week of LNG trucks, a maximum of 2 off-site heavy hydrocarbon truck deliveries per week, and 62 truck deliveries for receipt of mixed refrigerant components per year. To reduce congestion associated with construction and operation of the facility, Eagle LNG would schedule construction shift changes during non-peak times and would construct acceleration and deceleration lanes for access to the LNG terminal. Therefore, we have determined that construction and operation of the LNG terminal would have negligible impacts on roadway transportation.

During operation, Eagle LNG anticipates a maximum of 100 LNG vessel calls per year, including small and mid-size vessels with an LNG cargo capacity between 6,500 and 45,000 cubic meters as well as bunker vessels with capacities of about 3,400 cubic meters. Vessels calling on the LNG terminal during construction and operation would use established shipping channels. Use of the waterway by LNG carriers, barges, and support vessels during construction and operation of the facility would be consistent with the planned purpose and use of active shipping channels. Therefore, we conclude that the nominal increase in vessel traffic would not significantly affect vessel transportation on the St. Johns River.

Cultural Resources

Eagle LNG conducted cultural resources assessment surveys for the project. The cultural resources identified during surveys included three archaeological sites (two multi-component and one historic), one archaeological occurrence, one architectural structure, and one resource group (homestead). Eagle LNG recommended these resources as not eligible for listing in the National Register of Historic Places. The State Historic Preservation Office (SHPO) concurred. We also concur.

Eagle LNG also conducted underwater cultural resources surveys and identified four potentially significant submerged targets. One feature would be avoided based on the current project design and was not examined. Two of the features examined were determined to be non-cultural and the remaining feature was determined to be a modern anchor. The SHPO concurred and requested that Eagle LNG establish buffers around specific targets. Eagle LNG would comply with the buffer recommendations. We concur with the SHPO recommendations.

Compliance with Section 106 of the National Historic Preservation Act is complete for the project.

Air Quality and Noise

Construction of the project would result in temporary impacts on air quality associated with emissions generated from construction equipment and fugitive dust. Based on the estimated construction emissions, there may be localized minor to moderate elevated levels of fugitive dust and tailpipe emissions near the construction area. However, Eagle LNG would implement mitigation measures and best management practices to limit construction emissions and control fugitive dust thus ensuring that construction emissions would not have a significant effect on air quality in the area.

To evaluate air quality impacts associated with facility operation, Eagle LNG estimated pollutant concentrations in the vicinity of the project for comparison with the National Ambient Air Quality Standards. The analysis for all pollutants at the LNG terminal showed that the air quality impacts associated with the operation of the facility would be minor, limited to the project vicinity, and would not result in significant air quality impacts on the region.

The most prevalent noise-generating equipment and activity during construction of the LNG terminal is anticipated to be pile driving, although internal combustion engines associated with general construction equipment and dredging would also produce noise that would be perceptible in the vicinity of the site. Most construction activity, including pile driving, would be restricted to daytime working hours with pile driving occurring over a 10-month period. Sound levels attributable to construction activities at two noise sensitive areas are predicted to be above a day-night sound level of 55 decibels on the A-weighted scale with increases in background noise levels of over 10 decibels. Eagle LNG would restrict these elevated noise levels to daytime hours. To minimize pile driving noise impacts, we recommend that Eagle LNG monitor pile driving sound levels and implement noise mitigation measures. With implementation of Eagle LNG's proposed limits on working hours and our recommendation, we conclude that noise impacts on residents and the surrounding communities would be moderate during construction of the LNG terminal.

Operation of the LNG terminal would produce noise on a continual basis. The results of a noise impact analysis indicate that the noise attributable to the project would be lower than the FERC sound level requirement of a day-night sound level of 55 decibels on the A-weighted scale at the nearest NSA. Based on Eagle LNG's modeling, we conclude that noise impacts on residents and the surrounding communities would be minor during operation of the LNG terminal. To verify the accuracy of the noise modeling, we recommend that Eagle LNG conduct post-construction noise surveys after each LNG train is placed into service and once the entire LNG terminal is placed into service.

Safety and Reliability

As part of the National Environmental Policy Act review, Commission staff assessed the potential impact on the human environment in terms of safety and whether the proposed facilities would operate safely, reliably, and securely.

As a cooperating agency, the DOT advises the Commission on whether Eagle LNG's proposed design would meet Title 49 of the Code of Federal Regulations (CFR) Part 193, Subpart B, siting requirements. On March 13, 2019, the DOT issued a Letter of Determination (LOD) to FERC on the project's compliance with 49 CFR Part 193 Subpart B regulatory requirements.[4] The LOD provides PHMSA's analysis and conclusions regarding 49 CFR 193 Subpart B regulatory requirements for the Commission's consideration in its decision on the project application. If the project is authorized, constructed, and operated, the facility would be subject to the DOT's inspection and enforcement program and final determination of whether a facility is in compliance with the requirements of 49 CFR 193 would be made by the DOT staff.

As a cooperating agency, the Coast Guard also assisted the FERC staff by reviewing the proposed LNG terminal and the associated LNG marine carrier traffic. The Coast Guard reviewed a Waterway Suitability Assessment (WSA) submitted by Eagle LNG that focused on the navigation safety and maritime security aspects of LNG carrier transits along the affected waterway. On February 7, 2018, the Coast Guard issued a Letter of Recommendation to FERC staff indicating the St. Johns River would be considered suitable for accommodating the type and frequency of LNG marine traffic associated with this project, based on the Waterway Suitability Assessment and in accordance with the guidance in the Coast Guard's Navigation and Vessel Inspection Circular 01-11. If the project is authorized and constructed, the LNG

[4] March 13, 2019 letter "Re: Eagle LNG Project, Docket No. CP17-41-000, 49 CFR, Part 193, Subpart B, Siting – Letter of Determination" from Massoud Tahamtani to Rich McGuire. Filed in Docket Number CP17-41-000 on March 18, 2019. FERC eLibrary accession number 20190318-3004.

terminal would be subject to the Coast Guard's inspection and enforcement program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

FERC staff conducted a preliminary engineering and technical review of the Eagle LNG design, including potential external impacts based on the site location. Based on FERC staff review, we recommend a number of mitigation measures to ensure continuous oversight prior to initial site preparation, prior to construction of final design, prior to commissioning, prior to introduction of hazardous fluids, prior to commencement of service, and throughout the life of the facility in order to enhance the reliability and safety of the facility to mitigate the risk of impact on the public. With the incorporation of these mitigation measures and oversight, we conclude that the Eagle LNG terminal design would include acceptable layers of protection or safeguards that would reduce the risk of a potentially hazardous scenario from developing into an event that could impact the offsite public.

Cumulative Impacts

Recently completed, presently occurring, and reasonably foreseeable future actions in the temporal and geographic scope of the Jacksonville Project were identified for inclusion in our cumulative impact analysis. The majority of the cumulative impacts associated with these projects and with the Jacksonville Project would be minor and temporary during construction. However, some long-term and permanent cumulative impacts would occur on forested habitat, particularly mature live oak hammock, and project development impacts on the state-listed Worthington's marsh wren, little blue heron, tricolored heron, and least tern.

Of the projects identified within the same watershed as the Jacksonville Project, two projects, the Jacksonville Electric Authority and the Peoples Gas projects, are non-FERC-jurisdictional projects associated with the Jacksonville Project that would occur concurrently with construction of the project. The Port of Jacksonville Channel Deepening Project is within the same subwatershed. If dredging were to occur concurrently with the Jacksonville Project, impacts associated with turbidity and sedimentation could occur over a longer period and larger area. However, both the Jacksonville Project and the Port of Jacksonville Channel Deepening Project would be required to monitor for in-stream turbidity and implement best management practices to minimize turbidity contributable to each respective project during dredging activities, which would ensure that the projects would not significantly contribute to additional turbidity impacts on the St. Johns River.

If the construction associated with the Port of Jacksonville Channel Deepening Project and Florida Department of Transportation State Route 104 Project occurred simultaneous to the Jacksonville Project, some additional construction noise impacts would be experienced at nearby NSAs. However, the Jacksonville Project, which is anticipated to have a moderate impact on surrounding NSAs, would be the dominant noise source during construction. Cumulative noise impacts associated with construction of the Jacksonville Project, in conjunction with these other projects, would be moderate and primarily associated with daytime construction activities.

No significant cumulative impacts on federally listed species are anticipated because all federally regulated projects, including the Port of Jacksonville Channel Deepening Project and the Jacksonville Project, are required to coordinate with the FWS and the National Oceanic and Atmospheric Administration to minimize impacts on federally listed species.

There would be minimal cumulative effects on traffic, visual resources, or cultural resources from construction of any of these projects. Any overlap of the Jacksonville Electric Authority and Peoples Gas projects would only have temporary and minor effects on air quality and noise. There is potential for the Port of Jacksonville Channel Deepening Project to overlap temporally with the Jacksonville Project and, due to the close proximity of portions of the channel deepening project, construction emissions from the two projects could overlap. However, based on the mitigation measures proposed by Eagle LNG, which include fugitive dust control measures and proper maintenance and operation of construction equipment, construction emissions from the Jacksonville Project would not extend significantly beyond the project site, thus we do not anticipate any significant cumulative effects.

ALTERNATIVES CONSIDERED

As alternatives to the proposed action, we evaluated the no-action alternative, system alternatives, and terminal site alternatives. Under the No Action alternative, the environmental impacts associated with constructing and operating the project would not occur; however, equal or greater impacts could occur at other location(s) in the region as a result of another LNG export project seeking to meet the demand identified by the applicants. Therefore, we have dismissed the no-action alternative as a reasonable alternative to meet the objectives of the Jacksonville Project. Furthermore, because the purpose of the Jacksonville Project is to construct and operate a terminal to serve the domestic and export markets for LNG, the development or use of other energy sources would not be a reasonable alternative to the proposed action.

We evaluated 9 existing LNG terminal sites with approved, proposed, and/or planned expansions and 15 new LNG projects with approved, proposed, and/or planned LNG terminals located on greenfield sites. Although it might be feasible to construct the proposed facilities by building additional infrastructure at one of the other locations, the expansion would likely result in similar environmental impacts because the impacts would be merely transferred from the proposed site to the alternative location. Moreover, none of the system alternatives would meet Eagle LNG's project purpose. Therefore, none of these system alternatives were considered further. We evaluated seven alternative sites for the LNG terminal. Each site was excluded from further consideration due to size constraints, lease restrictions, and/or presence of additional sensitive resources.

CONCLUSIONS

We determined that construction and operation of the project would result in some limited adverse environmental impacts, but impacts would not be significant with the implementation of Eagle LNG's proposed and our recommended mitigation measures. This determination is based on a review of the information provided by Eagle LNG and further developed from data requests; field investigations; scoping; literature research; alternatives analysis; and contacts with federal, state, and local agencies as well as Indian tribes and individual members of the public.

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

- The LNG terminal site would be in an area currently zoned for industrial use, and is along an existing, maintained ship channel in the St. Johns River.
- Eagle LNG would minimize impacts on natural and cultural resources during construction and operation of the project by implementing the Plan and Procedures, and other project-specific plans (e.g., *Fugitive Dust Control Plan*, *Unanticipated Discovery of Contaminated Soils Plan*, *Paleontological Unanticipated Discovery Plan*, *Underwater Noise Mitigation Plan*, *Migratory Bird Plan*).
- The DOT siting requirements for the project, the Letter of Recommendation issued by the Coast Guard for the LNG marine traffic associated with the project, FERC staff's preliminary engineering review and recommendations for the project, and the regulatory requirements for the project would avoid a significant increase in public safety risks.

- We would complete all appropriate consultation with the FWS and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service regarding federally listed threatened and endangered species before construction would be allowed to begin.
- Eagle LNG would comply with all applicable air and noise requirements during construction and operation of the project.
- An environmental inspection program would be implemented to ensure compliance with the mitigation measures that become conditions of the FERC authorization.

In addition, we developed project-specific mitigation measures that Eagle LNG should implement to further reduce the environmental impacts of the project, including recommendations specific to engineering, vulnerability, and detailed design of the LNG terminal, and ongoing recommendations relating to inspections, reporting, notification, and non-scheduled events that would apply throughout the life of the LNG terminal facility. Some of our conclusions are based on implementation of these measures. Therefore, we are recommending that these mitigation measures be attached as conditions to any authorization issued by the Commission for the project.

1.0 INTRODUCTION

On January 31, 2017, Eagle LNG Partners Jacksonville, LLC (Eagle LNG) filed an application with the Federal Energy Regulatory Commission (Commission or FERC) for authorization pursuant to section 3(a) of the Natural Gas Act (NGA) and parts 153 and 380 of the Commission's regulations. The application was assigned FERC Docket No. CP17-41-000, and a Notice of Application was issued on February 13, 2017 and noticed in the Federal Register on February 17, 2017. Eagle LNG seeks approval under the NGA to construct and operate the facilities necessary to liquefy natural gas at a proposed site on the St. Johns River in Jacksonville, Florida. The actions and facilities proposed by Eagle LNG are referred to in this environmental impact statement (EIS) as the Jacksonville Project.

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

The Jacksonville Project would involve the construction of a liquefied natural gas (LNG) terminal on about 81.1 acres[2] of a 193.4-acre parcel of land on the north bank of the St. Johns River in Jacksonville, Florida. The Jacksonville Project would produce a nominal capacity of about 1.0 million (metric) tonnes per annum (MTPA) of LNG during the life of the project. The LNG terminal would receive natural gas from about 120 feet of non-jurisdictional natural gas pipeline constructed by Peoples Gas (a subsidiary of TECO Energy, Inc. [TECO]), connected via its existing local gas distribution transmission pipeline, which is immediately adjacent to the proposed terminal site.

Eagle LNG would use three separate processing units to convert natural gas to LNG (liquefaction trains), each with a nominal capacity of about 0.33 MTPA, which would then be stored on site in a full containment LNG storage tank with a capacity of 45,000 cubic meters (m^3). The LNG would be loaded onto LNG carriers and LNG barges (collectively referred to as LNG vessels) for export overseas, domestic marine distribution, and possible LNG bunkering;[3] and onto LNG trucks for road distribution to LNG refueling stations in Florida and the surrounding states. During operation of the project, Eagle LNG anticipates 40 to 100 LNG marine vessels and about 260 to 520 LNG trucks would be loaded at the LNG terminal each year. Figure 1-1 provides the general location of the Jacksonville Project. Section 2.1 provides more detailed information regarding specific facility components.

The vertical line in the margin identifies text that is new or modified in the final EIS and differs materially from corresponding text in the draft EIS. Changes were made to address comments from the cooperating agencies and other stakeholders on the draft EIS; incorporate modifications to the project proposed by Eagle LNG after publication of the draft EIS; and incorporate information filed by Eagle LNG in response to our recommendations in the draft EIS.

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

2 The LNG terminal would occupy 81.8 acres of land (70.7 acres onshore and 11.1 acres of submerged land); however, 92.2 acres (81.1 acres onshore and 11.1 acres of submerged offshore land) would be required for construction of the facility.

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

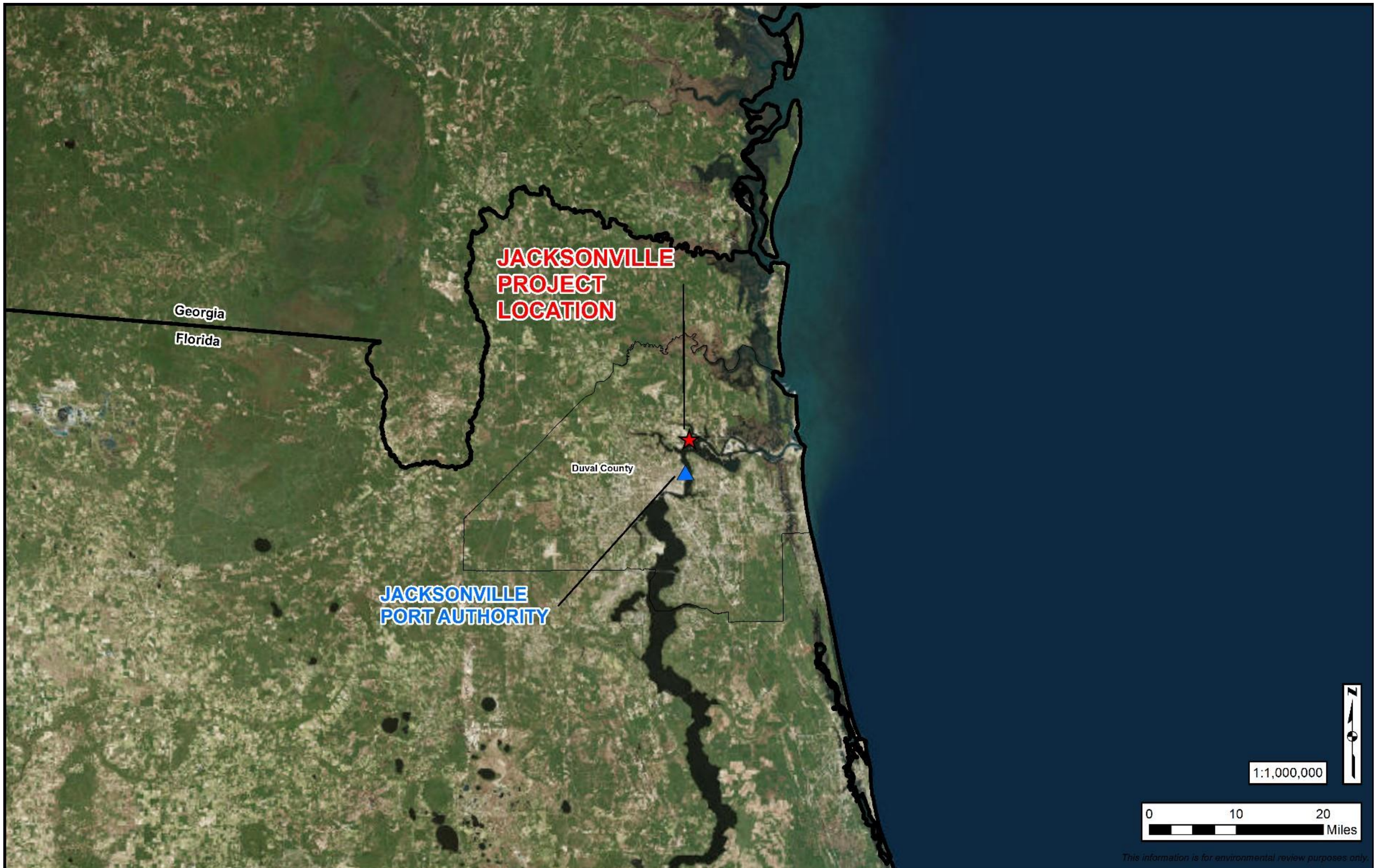

Figure 1-1
Project Location Map
Jacksonville Project
Duval County, Florida

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1.1 PROJECT PURPOSE AND NEED

According to Eagle LNG, the purpose of the Jacksonville Project is to receive domestic natural gas, liquefy and store it, and deliver it to marine vessels and trucks to serve the domestic and export markets for LNG. All exports would be consistent with authorizations by the U.S. Department of Energy (DOE). Eagle LNG identifies the following benefits of the project:

- provides an efficient and cost-effective outlet for the abundant supplies of U.S. domestic natural gas available in the marketplace;
- supports export of LNG via small- to mid-sized LNG vessels to markets that cannot be served by large LNG carriers;
- supports domestic waterway transportation of LNG in bunker vessels or self-propelled LNG carriers for use as vessel fuel in the marine bunkering trade; and
- supports highway distribution of LNG in trucks to serve the business of providing LNG as fuel for long-haul trucking and other domestic uses of LNG.

Eagle LNG advises that Peoples Gas would construct an interconnect and lateral to the LNG terminal from its transmission system to provide pipeline quality gas supply to the LNG terminal (see description of non-jurisdictional facilities in section 1.4).

1.2 PURPOSE AND SCOPE OF THIS STATEMENT

The principal purposes in preparing an EIS are to:

- identify and assess potential impacts on the human environment that would result from implementation of the proposed action;
- describe and evaluate reasonable alternatives to the proposed action that would avoid or minimize adverse effects on the human environment;
- identify and recommend specific mitigation measures to avoid or minimize environmental effects; and
- encourage and facilitate involvement by the public and interested agencies in the environmental review process.

This EIS focuses on the facilities that are under FERC's jurisdiction (i.e., the facilities proposed by Eagle LNG within the boundaries of the LNG terminal site). The topics addressed in this EIS include geology; soils; water use and quality; wetlands; vegetation; wildlife, aquatic resources, and essential fish habitat (EFH); threatened, endangered, and special status species; land use, recreation, and visual resources; socioeconomics and transportation; cultural resources; air quality and noise; reliability and safety; cumulative impacts; and alternatives. This EIS describes the affected environment as it currently exists, discusses the potential environmental consequences of construction and operation of the project, and compares the project's potential impact to that of various alternatives. Further, the EIS presents our conclusions and recommended mitigation measures.

The Energy Policy Act of 2005, as amended (EPAct 2005) states that FERC shall act as the lead agency for coordinating all applicable authorizations related to jurisdictional natural gas facilities and for the purposes of complying with NEPA. FERC, as the "lead federal agency," is responsible for preparation of this EIS. This effort was undertaken with the participation and assistance of the U.S. Army Corps of Engineers (COE), U.S. Coast Guard (Coast Guard), DOE, and U.S. Department of Transportation (DOT) as "cooperating agencies" under NEPA.

Cooperating agencies have jurisdiction by law or special expertise regarding environmental impacts involved with a proposal. The roles of FERC, the COE, the Coast Guard, the DOE, and the DOT are described below. The EIS provides a basis for coordinated federal decision making in a single document, avoiding duplication among federal agencies in the NEPA environmental review processes. In addition to the lead and cooperating agencies, other federal, state, and local agencies may use this EIS in approving or issuing permits for all or part of the project. Federal, state, and local permits, approvals, and consultations for the project are discussed in section 1.5.

1.2.1 Federal Energy Regulatory Commission

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

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

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

1.2.2 U.S. Army Corps of Engineers

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

The primary decisions to be addressed by the COE include:

- issuance of section 404 permits for wetland impacts associated with construction and operation of the project; and
- issuance of a section 10 permit for construction activities within navigable waters of the United States associated with the Jacksonville Project.

This EIS contains information needed by the COE to reach decisions on these issues. Through the coordination of this document and the circulation of a COE public notice, the COE will obtain the views of the public and natural resource agencies prior to reaching its decisions on the project. A copy of the COE's public notice of its receipt of Eagle LNG's application is provided in appendix A.

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

1.2.3 U.S. Coast Guard

The Coast Guard is the federal agency responsible for assessing the suitability of the Project Waterway (defined as the waterways that begin at the outer boundary of the navigable waters of the United States) for LNG marine traffic. The Coast Guard exercises regulatory authority over LNG facilities that affect the safety and security of port areas and navigable waterways under Executive Order 10173; the MSA (50 USC 191); the Ports and Waterways Safety Act (46 USC 700); and the Maritime Transportation Security Act of 2002 (46 USC 701). The Coast Guard is responsible for matters related to navigation safety, vessel engineering and safety standards, and all matters pertaining to the safety of facilities or equipment in or adjacent to navigable waters up to the last valve immediately before the receiving LNG tanks.

The Coast Guard also has authority for LNG facility security plan reviews, approval and compliance verification as provided in 33 CFR 105, and siting as it pertains to the management of vessel traffic in and around LNG facilities to a point 12 nautical miles seaward from the coastline (to the territorial seas). As appropriate, the Coast Guard (acting under the authority in 33 USC 1221 et seq.) also would inform FERC of design- and construction-related issues identified as part of safety and security assessments. If the Jacksonville Project is approved, constructed, and operated, the Coast Guard would continue to exercise regulatory oversight of the safety and security of the LNG terminal facilities, in compliance with 33 CFR 127.

As required by its regulations, the Coast Guard is responsible for issuing a Letter of Recommendation (LOR) and a LOR Analysis as to the suitability of the waterway for LNG marine traffic following a Waterway Suitability Assessment (WSA). The process of preparing the LOR begins when an applicant submits a Letter of Intent (LOI) to the local Captain of the Port (COTP). In a letter dated November 25, 2014, Eagle LNG submitted its LOI, additional information, and a follow-on WSA was submitted on November 10, 2016. In a letter dated February 7, 2018, the Coast Guard issued the LOR for the project, which stated that the St. Johns River is considered suitable for LNG marine traffic in accordance with the guidance in Coast Guard Navigation and Vessel Inspection Circular (NVIC) 01-2011.

1.2.4 U.S. Department of Energy

The DOE must meet its obligation under section 3 of the NGA to authorize the proposed import or export of natural gas, including LNG, unless it finds that the import or export is not consistent with the public interest. By law, under section 3(c) of the NGA, applications to export natural gas to countries with which the United States has free trade agreements that require national treatment for trade in natural gas are deemed to be consistent with the public interest and authorization must be granted without modification or delay.

On January 27, 2016, Eagle LNG filed an application with the DOE (Fossil Energy Docket No. 16-15-LNG) seeking authorization to export LNG both to any nation with which the United States currently has, or in the future will have, a Free Trade Agreement (FTA) requiring national treatment for trade in natural gas (FTA countries), and to any country with which the United States does not have an FTA requiring national treatment for trade in natural gas and LNG (non-FTA countries), except where prohibited by U.S. law or policy. The application requested authorizations to export the equivalent of 0.14 billion cubic feet per day (Bcf/d) of domestically produced LNG or a total capacity of 49.8 billion cubic feet per year, equivalent to 1.0 MTPA, for a 20-year period, commencing the earlier of the date of first export or 5 years from the date of issuance of the requested authorization. Three supplements to the application were submitted to the DOE in the ensuing months.

On July 21, 2016, Eagle LNG received approval from the DOE to export LNG from the LNG terminal to FTA countries (Fossil Energy Docket No. 16-15-LNG and Order No. 3867). The purpose and need for the DOE action for the current proposal is to respond to Eagle LNG's application for authority to export LNG from the LNG terminal to non-FTA countries (Fossil Energy Docket No. 16-15-LNG). In the case of LNG export applications to non-FTA countries, section 3(a) of the NGA requires the DOE to conduct a public interest review and to grant the authorization unless the DOE finds that the proposed exports would not be consistent with the public interest. Additionally, NEPA requires the DOE to consider the environmental impacts of its decisions on non-FTA export applications. In this regard, the DOE is a cooperating agency in preparing this EIS. The DOE has stated it will not make a decision on applications to export LNG to non-FTA countries until the DOE has met all of its statutory responsibilities. In accordance with 40 CFR 1506.3, after an independent review of the final EIS, the DOE may adopt it prior to issuing a Record of Decision relating to Eagle LNG's application for authority to export LNG to non-FTA countries.

1.2.5 U.S. Department of Transportation

The DOT's Pipeline and Hazardous Materials Safety Administration has prescribed the minimum federal safety standards for LNG facilities in compliance with 49 USC 60101 et seq. These 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, (2001 edition) *Standard for the Production, Storage, and Handling of Liquefied Natural Gas*, is incorporated into Part 193 by reference, with regulatory preemption in the event of conflict. In February 2004, the Coast Guard, the 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 marine carrier operations, and maximizing the exchange of information related to the safety and security aspects of the LNG facilities and related marine operations. Under the Interagency Agreement, FERC is the lead agency responsible for the preparation of the analysis required under NEPA for impacts associated with terminal construction and operation. The DOT and Coast Guard participate as cooperating agencies but remain responsible for enforcing their respective regulations covering LNG facility siting, design, construction, and operation. In addition, the August 31, 2018 Memorandum of Understanding (MOU) between FERC and the DOT provides guidance and policy on each agency's respective statutory responsibility to ensure that each agency works in a coordinated and comprehensive manner.

As a cooperating agency, the DOT assists the FERC staff in evaluating whether Eagle LNG's proposed design would meet the DOT's 49 CFR 193 Subpart B siting requirements. On February 23, 2018, the DOT provided a letter to FERC stating that it had no objection to Eagle LNG's design spill methodologies being used for the selection of single accidental leakage sources. In accordance with the August 31, 2018 MOU, the DOT will issue a Letter of Determination (LOD) to the Commission after the DOT completes its analysis of whether the proposed project facilities would meet the DOT's siting standards.

1.3 PUBLIC REVIEW AND COMMENT

On November 26, 2014, Eagle LNG filed a request with FERC to implement the Commission's pre-filing review process for the project. The main goals of the pre-filing process are to encourage the early involvement of interested stakeholders, facilitate interagency cooperation, and identify and resolve issues before a formal application is filed. On December 3, 2014, FERC granted Eagle LNG's request and established pre-filing Docket No. PF15-7-000 to place information related to the project into the public record.

During the pre-filing process, Eagle LNG held two open houses in Jacksonville, Florida on January 14 and 15, 2015. The purpose of the open houses was to provide affected landowners, elected and agency officials, and the general public with information about the Jacksonville Project and to give them an opportunity to ask questions and express their concerns. We participated in the open houses to provide information regarding the Commission's environmental review process to interested stakeholders.

Between January 13 and 15, 2015, we met with representatives of the COE, Coast Guard, and Florida Department of Environmental Protection (FDEP) to discuss coordination of agency review, permit requirements and status, and each agency's interest in participating in our environmental review as a cooperating agency.

On February 24, 2015, the Commission issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Jacksonville Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting* (NOI). The NOI was published in the Federal Register on March 2, 2015, and mailed to about 197 interested parties, including federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; affected property owners; other interested parties; and local libraries and newspapers (environmental mailing list) (see appendix B). The NOI briefly described the project and the EIS process, provided a preliminary list of issues we had identified, invited written comments from the public on the environmental issues that should be addressed in the EIS, listed the date and location of a scoping meeting to be held in the project area, and established March 26, 2015 as the closing date for receipt of comments.

On March 12, 2015, we held a public scoping meeting in Jacksonville, Florida to provide an opportunity for agencies, stakeholders, and the general public to learn more about the Jacksonville Project and to participate in our analysis by commenting on issues to be addressed in the EIS. Two individuals commented at the scoping meeting, both in support of the project. The comments were transcribed by a court reporter and the transcript was placed into the public record for the Jacksonville Project.[4]

Due to a mailing error with the February 24, 2015 NOI, FERC issued a *Supplemental Notice of Intent to Prepare an Environmental Impact Statement for the Planned Jacksonville Project and Request for Comments on Environmental Issues* (Supplemental NOI) on March 25, 2015. FERC also mailed the Supplemental NOI to the parties on the environmental mailing list. Publication of the Supplemental NOI extended the public comment period, and established April 24, 2015 as the new closing date for receipt of comments. All written scoping comments are part of the public record for the project and are available for viewing through eLibrary on the FERC internet website (http://ferc.gov). In addition, during the pre-filing process, we conducted conference calls on an approximately bi-weekly basis with representatives from Eagle LNG to discuss the Jacksonville Project's progress and issues. Summaries of the calls were placed in the public record (i.e., eLibrary).

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4 The transcript is available on FERC's website at http://www.ferc.gov. 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., PF15-7). Be sure to select an appropriate date range.

Table 1.3-1 lists the environmental issues identified during scoping. Table 1.3-1 also identifies the relevant section of the EIS in which each issue is addressed. In addition to the comments received at the public scoping meetings, nine written comments were filed with FERC and placed in the public record for the Jacksonville Project as of November 15, 2018. Two motions to intervene were filed with FERC for the project. The most frequently received comments relate to visual impacts, water quality, air quality, threatened and endangered species, noise, and safety. Additional issues we independently identified are also addressed in the EIS and are identified in table 1.3-1.

On November 16, 2018, we issued a *Notice of Availability of the Draft Environmental Impact Statement for the Proposed Jacksonville Project*. This notice, which was published in the Federal Register, listed the date and location of the public comment session and established a closing date of January 7, 2019, for receiving comments on the draft EIS. Copies of the notice were mailed to nearly 190 stakeholders. The U.S. Environmental Protection Agency (EPA) noticed receipt of the draft EIS in the Federal Register on November 23, 2018. On February 7, 2019, the Commission reopened the formal period for receiving comments on the draft EIS due to the funding lapse at certain federal agencies between December 22, 2018 and January 25, 2019, which established a new closing date of February 25, 2019.

We held one public comment session in Jacksonville, Florida on December 12, 2018, to receive comments on the draft EIS. The comment session provided stakeholders with an opportunity to present oral comments on the analysis of environmental impacts described in the draft EIS. Four people commented during the public comment session. The comment session was documented by a court reporter, and the transcript was placed into the public record for the project.[5] We also received five written comment letters from federal and state agencies, Native American tribes, and companies/organizations in response to the draft EIS. The written comment letters are available for viewing through eLibrary on the FERC internet website (www.ferc.gov).

All substantive comments on the draft EIS that pertain to environmental issues are addressed in this final EIS. The issues raised in the comments are discussed in the applicable EIS sections, and the FERC staff's responses to comments are provided in appendix K.

As of August 2018, the Commission moved to electronic issuance of environmental documents for FERC's natural gas and hydropower programs to save valuable resources, align FERC with the digital age, and continue to ensure that information is accessible to stakeholders.[6] The final EIS has been filed with the EPA for issuance of a formal Notice of Availability in the Federal Register.

In accordance with the CEQ's regulations implementing NEPA, no agency decision on the proposed actions may be made until 30 days after the EPA publishes the Notice of Availability in the Federal Register. However, the CEQ regulations provide an exception to this rule when an agency decision is subject to a formal internal appeal process that allows other agencies or the public to make their views known. This is the case at FERC, where any Commission decision on the proposed action would be subject to a 30-day rehearing period. Therefore, the FERC decision may be made and recorded concurrently with the publication of the final EIS.

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5 The comment session transcript is available at: http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20181212-4004.

6 The FERC press release associated with the change to electronic issuance of environmental documents is available online at: https://www.ferc.gov/media/news-releases/2018/2018-3/08-31-18.asp.

TABLE 1.3-1

Key Environmental Concerns Identified for the Jacksonville Project

Issue/Specific Comment	EIS Section Addressing Comment
General	
Handling of solid and hazardous waste during construction	4.2.3 and 4.3.1.5
Soils	
Erosion and sediment control	4.2.3
Water Quality and Aquatic Resources	
Impacts on groundwater quality	4.3.1.4
Impacts associated with hydrostatic testing	4.3.1.4
Water quality impacts during dredging, construction, and operation	4.3.2.3
Wetlands	
Impacts on wetlands	4.4.2
Vegetation	
Impacts on flora in the affected area	4.5.2
Wildlife	
Risk of invasive species from ballast water	4.6.2.2
Impacts on essential fish habitat	4.6.3.3
Impacts on fish, marine mammals and sea turtles resulting from construction activities and proposed mitigation measures to reduce impacts	4.6 and 4.7
Special Status Species	
Agency coordination and requirements	4.7
Impacts on threatened or endangered species and their habitat	4.7.1
Impacts on designated critical habitats	4.7.1
Impacts on state listed and special status species and their habitat	4.7.3
Land Use and Recreation	
Potential impacts on the Jacksonville Zoo	4.8.4.1
Visual impacts on skyline	4.8.6
Socioeconomics	
Impacts on environmental justice populations	4.9.8
Cultural Resources	
Plan to address unanticipated discoveries	4.10.2
Required tribal consultations	4.10.3
Air Quality	
Impacts on air quality during construction and operation	4.11.1
Climate change and project-related greenhouse gas emissions	4.11.1 and 4.13.2.13
Reliability and Safety	
Emergency response plans	4.12.5
Impacts associated with sea level rise, flooding, and storm surge	4.12.5
Cumulative Impacts	
Cumulative air quality impacts	4.13.2.11

1.4 NON-JURISDICTIONAL FACILITIES

FERC is required to consider, as part of its decision to authorize jurisdictional facilities, all factors bearing on the public convenience and necessity. Occasionally, proposed projects have associated facilities that do not come under the jurisdiction of the Commission. These "non-jurisdictional" facilities may be integral to the need for the proposed facilities (e.g., a power plant at the end of a FERC-jurisdictional pipeline), or they may be merely associated as minor, non-integral components of the jurisdictional facilities that would be constructed and operated as a result of certification of the proposed facilities.

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

- LNG trucking, domestic marine distribution, and LNG bunkering activities that would take place after the LNG truck or LNG vessel has departed from the LNG terminal;
- construction of about 120 feet of a natural gas interconnect pipeline to extend natural gas transmission service from the Peoples Gas existing local distribution natural gas transmission line to the LNG terminal; and
- construction of an electric transmission line and switching station to extend power from Jacksonville Electric Authority's (JEA) existing system to the LNG terminal.

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

1.4.1 LNG Trucking, Domestic Marine Distribution, and LNG Bunkering

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

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

Because the LNG trucking and LNG bunkering operations fall outside of the Commission's jurisdiction once the truck or barge exits the terminal boundary, we cannot require Eagle LNG to implement measures to mitigate environmental impacts during these activities. Therefore, the environmental mitigation measures presented in this EIS, relative to LNG trucking and LNG bunkering, are only those proposed by Eagle LNG.

1.4.1.1 LNG Trucking

During operation of the Jacksonville Project, Eagle LNG would load a portion of the LNG produced at the terminal onto trucks for road distribution to refueling stations in Florida and the surrounding states. While no agreements have been executed for the transportation of LNG in trucks, Eagle LNG anticipates it would load 260 to 520 12,000-gallon capacity LNG trucks per year at the terminal. LNG trucks calling on the terminal would deliver LNG to a number of private LNG refueling stations that exist in Florida and the surrounding states, to one of the six public LNG refueling stations currently in operation in Florida and Georgia, or to additional LNG refueling stations currently under development. The locations of the current public use refueling stations include the following:

- Clean Energy – Atlanta Fulton Industrial Park, Georgia;
- Clean Energy – Atlanta East, Georgia;
- Clean Energy – Albany, Georgia;
- Clean Energy – Express Fuels, Jacksonville, Florida;
- Clean Energy – Valdosta, Georgia; and
- Clean Energy – Midway Pilot Ocala, Florida.

To quantify potential risk to the public in the event of an unexpected shipping incident between the LNG terminal and the Interstate Highway System, Eagle LNG conducted a hazardous materials route analysis. The results of the analysis indicate that the lowest-risk route would be between the LNG terminal site and Interstate 295 via State Road 105 (also known as Heckscher Drive and Zoo Parkway), at which point these trucks would navigate the U.S. interstate system to their desired locations. Eagle LNG indicated that motor carriers with hazardous materials (e.g., LNG) would follow this route during transit from the LNG terminal to Interstate 295 (see figure 1.4.1-1).

LNG trucking associated with the Jacksonville Project would be operated in compliance with 49 CFR 178.338 – Specification MC-338. It is required that truck operators be trained to satisfy the minimum requirements of 49 CFR 172, 177, and 193, as well as the requirements of the Florida Department of Transportation (FDOT), City of Jacksonville, and Duval County.

1.4.1.2 Domestic Marine Distribution and LNG Bunkering

Eagle LNG anticipates that LNG would be loaded onto 40 to 100 LNG vessels per year for domestic marine distribution and possible LNG bunkering. As a result of the anticipated construction of new ships with LNG fuel systems, LNG barges loaded at the LNG terminal would make bulk deliveries to the ship fueling facilities and offshore support port areas in the region (ships and offshore supply vessels would not be directly fueled/bunkered at the LNG terminal site). As described above (section 1.2.3), the Coast Guard is the federal agency responsible for assessing the suitability of the Project Waterway for LNG marine traffic. Due to increased interest in the use of LNG as a maritime fuel, the Coast Guard, Office of Design and Engineering Standards issued Policy Letter No. 02-15 *Design Standards for U.S. Barges Intending to Carry Liquefied Natural Gas in Bulk* (Coast Guard, 2015a). This policy letter provides options for how barges transporting LNG in bulk can be designed in compliance with the International Gas Carrier (IGC) Code and 46 CFR 154 – Safety Standards for Self-Propelled Vessels Carrying Bulk Liquefied Gases (Coast Guard, 2015a).

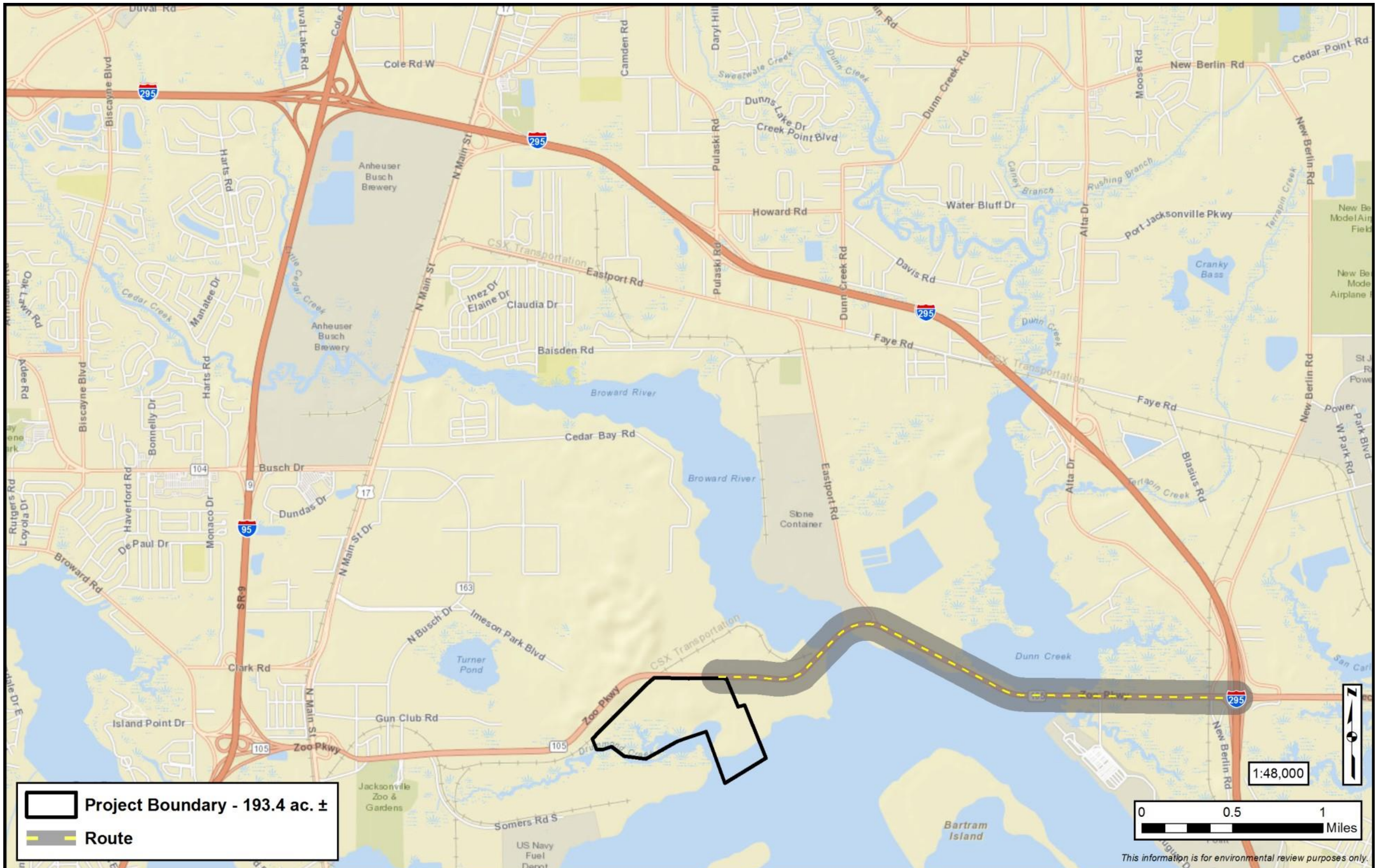

Figure 1.4.1-1
Hazardous Material Shipping Route
Jacksonville Project
Duval County, Florida

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1.4.2 Tie-in to Peoples Gas Natural Gas Transmission Line

Peoples Gas would provide natural gas supply for the project from an existing 24-inch-diameter gas transmission pipeline adjacent to the project site boundary in the State Road 105 (also known as Heckscher Drive and Zoo Parkway) right-of-way (see figure 1.4.2-1). Peoples Gas would construct a tap and 16-inch-diameter interconnect pipeline linking the project facilities to the existing gas pipeline. About 20 feet of pipeline would lie in the road right-of-way and about 100 feet within the project facility boundary. Peoples Gas would also construct an inlet filter and custody transfer metering skid(s) within the project site. The anticipated workspace within the Zoo Parkway right-of-way would be about 50 by 20 feet (about 25 feet on each side of the pipeline interconnect). All work outside the project boundary would be within an existing road right-of-way and, therefore, would not disturb any sensitive resources. Peoples Gas would obtain any necessary permits required to construct the transmission line, including a permit from the City of Jacksonville. In addition, Peoples Gas would apply for a limited-jurisdiction blanket certificate under 18 CFR 284.224 for transporting interstate natural gas to the export point (i.e., the LNG terminal site).

1.4.3 Tie-in to Jacksonville Electric Authority Electric Transmission Line

To provide electrical power to the Jacksonville Project, JEA would build two redundant 200-foot-long, 138.0 kilovolt (kV) electric transmission lines from its existing 138.0 kV electric transmission line to a 0.4-acre switch gear within the LNG terminal site (see "JEA Interconnect" on figure 1.4.2-1). The transmission line would begin at JEA's existing transmission line north of State Road 105 (also known as Heckscher Drive and Zoo Parkway), cross Zoo Parkway, and connect to the LNG terminal site. JEA would conduct the necessary consultations and obtain applicable permits and approvals for the reductant service drops and switching station. JEA would also submit a local construction permit to the City of Jacksonville and Duval County after the final design is completed and conduct necessary coordination with the FDOT regarding the transmission line crossings of Zoo Parkway.

This tie-in would occur along Zoo Parkway immediately adjacent to the Jacksonville Project site; however, the exact tie-in location is yet to be determined. Any ground disturbance and workspace required for the tie-in would occur within the existing highway right-of-way and thus any environmental impacts would be negligible. Eagle LNG does not anticipate impacts on water resources, special status species, sensitive vegetation, wildlife, or cultural resources from the construction or operation of JEA's electric transmission lines, and we agree.

1.5 PERMITS, APPROVALS, AND REGULATORY REVIEWS

As the lead federal agency for the Jacksonville Project, FERC is required to comply with a number of regulatory statutes including, but not limited to, NEPA, section 7 of the ESA, the MSA, section 106 of the NHPA, and section 307 of the CZMA. Eagle LNG must comply with regulatory requirements of the RHA, CWA, and the Clean Air Act (CAA). Each of these statutes has been taken into account in the preparation of this EIS.

Table 1.5-1 lists the major federal, state, and local permits, approvals, and consultations identified for the construction and operation of the project, and identifies when Eagle LNG commenced or anticipates commencing formal permit and consultation procedures. Eagle LNG would be responsible for obtaining all permits and approvals required to construct and operate the project, regardless of whether they appear in this table. FERC encourages cooperation between applicants and state and local authorities, but this does not mean that state and local laws may prohibit or unreasonably delay the construction or operation of facilities approved by FERC. Any state or local permits issued with respect to jurisdictional facilities must be consistent with the conditions of any authorization issued by FERC.

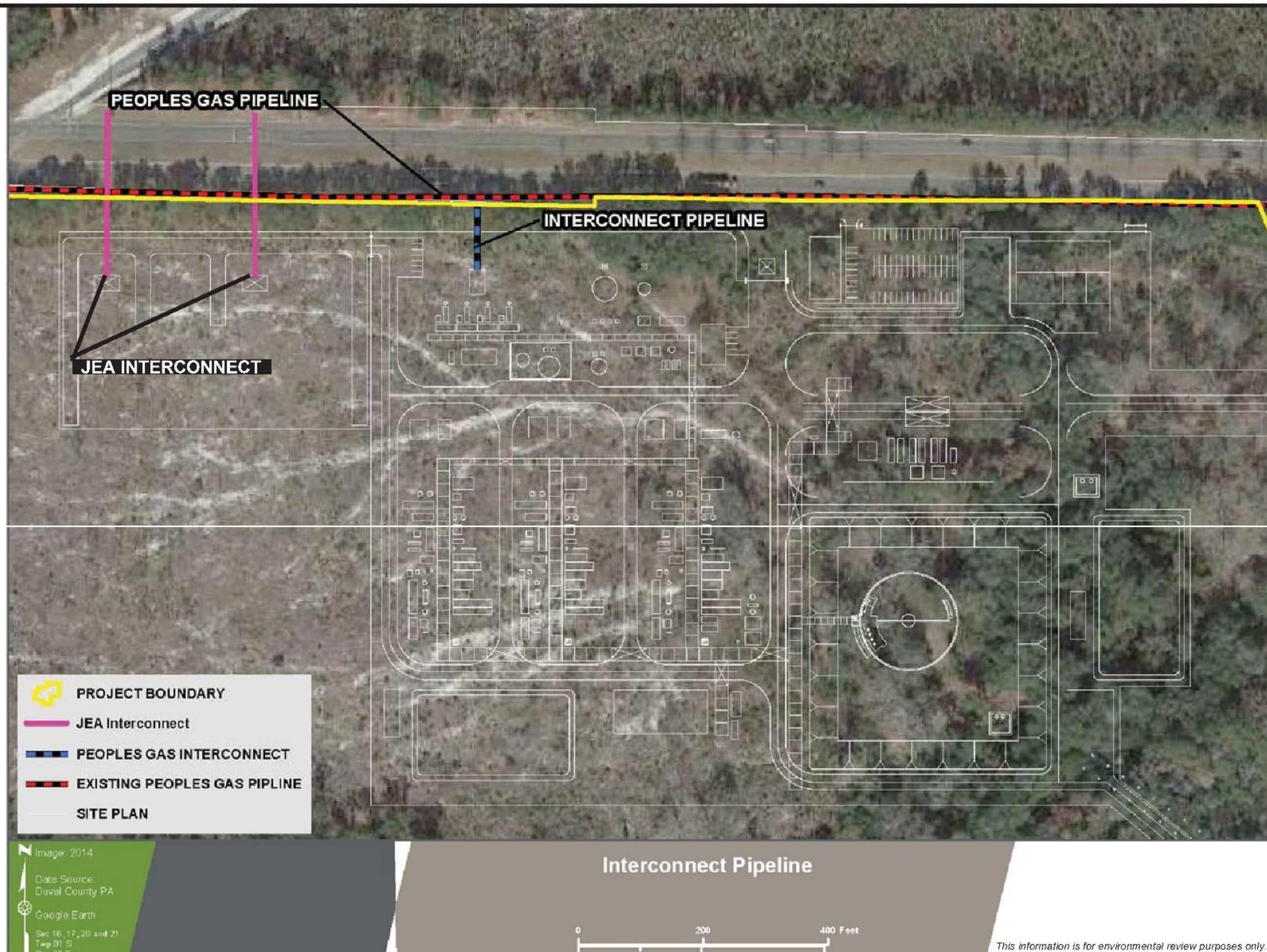

Figure 1.4.2-1
Tie-ins to Existing Peoples Gas Natural Gas Distribution Pipeline and Jacksonville Electric Authority Electric Transmission Line
Jacksonville Project
Duval County, Florida

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TABLE 1.5-1

Major Permits, Approvals, and Consultations for the Jacksonville Project [a]

Agency	Permit/Approval/Consultation	Agency Action	Status
Federal			
FERC	Authorization to Site, Construct and Operate an LNG Terminal – Section 3 of the Natural Gas Act and 18 CFR Part 380	Authorization	Application filed on January 31, 2017; status pending
DOE	Authorization to Export LNG under Section 3 of the NGA	Authorization	Application filed on January 27, 2016; FTA export approved July 21, 2016; non-FTA export pending
COE, Jacksonville District	Permit under section 404 of the CWA	Permit	Application submitted on January 31, 2017; permit pending
	Permit under section 10 of the RHA	Permit	Application submitted on January 31, 2017; permit pending
FWS, Jacksonville Office	Section 7 of the ESA	Consultation	Consultation initiated January 23, 2015 and ongoing
	Migratory Bird Treaty Act and Section 3 of Executive Order 13186	Consultation	Consultation initiated January 23, 2015 and ongoing
	Bald and Golden Eagle Protection Act	Consultation	Consultation initiated January 23, 2015 and ongoing
NOAA Fisheries	Section 7 of the ESA	Consultation	Consultation initiated on April 30, 2015 and ongoing
	MSA	Consultation	Consultation initiated on April 30, 2015 and ongoing
	Section 101(a)(5)(d) of the Marine Mammal Protection Act	Consultation	Consultation initiated on April 30, 2015 and ongoing
	Compliance with the CAA	Consultation	Consultation initiated on April 23, 2015 and ongoing
U.S. Coast Guard	Waterfront Facilities Handling Liquefied Natural Gas and Liquefied Hazardous Gas (33 CFR 127), which includes LOI submission (33 CFR 127.007), WSA consultation, and LOR from the Coast Guard (18 CFR 157.21)	Letter of Recommendation	Consultation complete: LOR issued February 7, 2018
Federal Emergency Management Administration	Floodplain Consultation per Joint COE/State Environmental Resource Permit Application	Consultation	Joint COE/State Environmental Resource Permit Application filed with the COE in January 2017; consultation ongoing
Native American Tribes	Consultation on activities potentially affecting tribal resources (Section 106, NHPA consultation).	Consultation	Consultation initiated January 29, 2015 and ongoing
Florida			
FDEP, Office of Submerged Lands and Environmental Resources	FDEP Environmental Resource Permit 62-1.201(5) permit (process includes dredge and fill [wetland/ Environmental Resource Permit], submerged lands easement, Section 401 Water Quality Certification, and State Lands Easement) National Pollutant Discharge Elimination System permit for construction stormwater discharges Review Stormwater Pollution Prevention and Spill Response Plans Determination of state-owned sovereign submerged lands Limited Use Public Water Supply	Permits and consultation	Joint COE/State Environmental Resource Permit Application filed with the COE in January 2017 (FDEP filing pending) National Pollutant Discharge Elimination System permit anticipated to be submitted in August 2019

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations for the Jacksonville Project [a]

Agency	Permit/Approval/Consultation	Agency Action	Status
FDEP, Coastal Management Program	Determine the project's consistency with Coastal Zone Management Program plans	Consultation	Joint COE/State Environmental Resource Permit Application filed with COE in January 2017 (FDEP filing pending)
FDEP, Air Resource Management Program	Air Construction Permit	Permit	Application submitted on March 13, 2018; responses to FDEP's request for additional information submitted in October 2018 and January 2019; permit pending
Florida Department of State, Division of Historic Resources (State Historic Preservation Office) [a]	Consultation on activities potentially affecting cultural resources (Section 106, NHPA consultation).	Clearance	Concurrence with Phase I cultural resources survey report and submerged cultural resources remote sensing survey report received April 14, 2015 and June 16, 2015, respectively; consultation complete
Florida Fish and Wildlife Conservation Commission (FWC)	State-listed species consultation. Gopher tortoise relocation/ handling permit	Consultation and permit	Informal consultation initiated January 28, 2015; FWC response received March 20, 2015; consultation response letter received February 6, 2019
FDOT	State road, highway, or interstate crossing or connection permits Drainage connection permits LNG Safety and Security Review (Pipeline and Hazardous Materials Safety Administration)	Permit and consultations Review of traffic study	Application submitted in January 2019; permits pending
Local			
St. Johns River Water Management District (or Duvall County)	Well Construction Permit Water Use Permit	Permit	Permits anticipated to be filed 4 to 6 months prior to construction
City of Jacksonville	Consultation on activities potentially affecting cultural resources (Section 106, NHPA consultation).	Consultation	Informal consultation initiated January 29, 2015; survey reports submitted on March 13 and May 15, 2015 at city's request; City of Jacksonville not required to comment/respond
Jacksonville Historical Society	Consultation on activities potentially affecting cultural resources (Section 106, NHPA consultation).	Consultation	Informal consultation initiated January 29, 2015; Jacksonville Historical Society not required to comment/respond
City of Jacksonville	10-set approval City of Jacksonville Land Development Code coordination Variance of Use Permit Local permits/approvals (driveway, right-of-way, fire, hazardous materials, aboveground storage tank, building, individual trade permits) Floodplain Development	Permits and consultations	Permit application anticipated to be filed in May 2019

[a] Consultations with Native American tribes are discussed in section 4.10.3.

Endangered Species Act

Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by any federal agency should not "…jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined…to be critical…" (16 USC 1536(a)(2)(1988)). To comply with section 7, FERC is required to determine whether any federally listed or proposed threatened or endangered species or their designated critical habitat occur in the vicinity of the project and conduct consultations with the U.S. Fish and Wildlife Service (FWS) and/or the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NOAA Fisheries), if necessary. If FERC determines that these species or habitats may be affected by the project, FERC is required to prepare a Biological Assessment (BA) to identify the nature and extent of adverse impact, and to recommend measures to avoid or reduce potential impacts on the habitat and/or species. As part of the consultation process, we have prepared a BA for the project and are requesting concurrence with our determinations of effect on the species and critical habitat within the project area (see appendix C and section 4.7).

Magnuson-Stevens Fishery Conservation and Management Act

The MSA, as amended by the *Sustainable Fisheries Act of 1996* (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal fisheries management plan. The MSA requires federal agencies to consult with NOAA Fisheries on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH (MSA section 305(b)(2)). Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidating EFH consultations with interagency coordination procedures required by other statutes, such as NEPA, the *Fish and Wildlife Coordination Act of 1934*, or the ESA (50 CFR 600.920(e)), to reduce duplication and improve efficiency. As part of the consultation process, an EFH Assessment has been prepared for the project (see appendix D and section 4.6.3).

Rivers and Harbors Act

The RHA pertains to activities in navigable waters as well as harbor and river improvements. Section 10 of the RHA prohibits the unauthorized obstruction or alteration of any navigable water of the United States. Construction of any structure or the accomplishment of any other work affecting course, location, condition, or physical capacity of waters of the United States must be authorized by the COE (see section 4.3.2.2 for more information).

Clean Water Act

The CWA, as amended, regulates the discharges of pollutants into waters of the United States and regulates quality standards for surface waters. Both the EPA and the COE have regulatory authority under the CWA. The EPA has implemented pollution control programs, including setting wastewater standards for industry and creating water quality standards for all contaminants in surface waters. Under the CWA, it is unlawful to discharge any pollutant from a point source into waters of the United States without a permit. In accordance with section 402 of the CWA, the EPA operates the National Pollutant Discharge Elimination System (NPDES) permit program, which regulates discharges by industrial, municipal, and other facilities that directly enter surface waters. Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States, and is under the jurisdiction of the COE.

Section 401 of the CWA requires that an applicant for a federal permit who conducts any activity that may result in a discharge to waters of the United States must provide the federal regulatory agency with a section 401 certification. Section 401 of the CWA certifications are made by the state in which the discharge originates and declares that the discharge would comply with applicable provisions of the act, including state water quality standards. In Florida, the FDEP and Water Management Districts have jurisdiction over section 401 water quality certification (see section 4.4 for more information).

Clean Air Act

The CAA, as amended, regulates air emissions from stationary and mobile sources, and defines the EPA's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer. Among other things, the law authorizes the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare, sets limits on certain air pollutants, and limits emissions of air pollutants coming from sources, such as industrial facilities. Air quality is further addressed in section 4.11.1.

National Historic Preservation Act

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

Coastal Zone Management Act

The CZMA calls for the "effective management, beneficial use, protection, and development" of the nation's coastal zone and promotes active state involvement in achieving those goals. As a means to reach those goals, the CZMA requires participating states to develop management programs that demonstrate how they would meet their obligations and responsibilities in managing their coastal areas. In Florida, the FDEP administers the state's Coastal Zone Management Program and is the lead state agency that performs federal consistency reviews (see section 4.8.5 for more information).

2.0 PROPOSED ACTION

2.1 PROPOSED FACILITIES

The Jacksonville Project would involve the construction and operation of an LNG terminal along the St. John's River in Jacksonville, Florida. Figure 1-1 in section 1.0 provides the general location of the project. Components of the LNG terminal would include Eagle LNG's facilities to treat and liquefy natural gas; store LNG; and load LNG onto LNG vessels and trucks for domestic distribution and export. A summary of the LNG terminal facility components is provided below:

- three LNG trains, each with a nominal capacity of 0.33 MTPA of LNG for export, resulting in a total nominal capacity of 1.0 MTPA;
- one LNG storage tank with a net capacity of 45,000 m^3;
- marine facilities with a concrete access trestle and loading platform, and two liquid loading arms capable of docking and mooring a range of LNG vessels with an LNG cargo capacity of up to 45,000 m^3;
- LNG truck loading facilities with a dual bay capable of loading 260 to 520 LNG trucks per year;
- a boil-off gas compression system;
- on-site refrigerant storage;
- ground flare and cold vent systems; and
- utilities and support facilities (e.g., administration, control, and workshop buildings; roads and parking areas; power and communications; water, air, septic, and stormwater systems).

These facilities are described in more detail in the following sections.

2.1.1 LNG Terminal Facilities

Eagle LNG proposes to construct the LNG terminal on the north bank of the St. Johns River in Jacksonville, Florida (see figure 2.1.1-1). The site, which is zoned for industrial use, is about 14.5 river miles west of the mouth of the St. Johns River and the Atlantic Ocean.

The LNG terminal would receive natural gas via a new interconnect pipeline and meter station constructed and owned by Peoples Gas. The interconnect pipeline would tie into Peoples Gas' existing local distribution transmission pipeline system, which is immediately adjacent to the northern side of the LNG terminal. Eagle LNG would then treat, liquefy, and store the natural gas on site in a full-containment LNG storage tank. The LNG would be loaded onto LNG vessels for export overseas, domestic marine distribution, and possible LNG bunkering; and onto LNG trucks for road distribution to LNG refueling stations in Florida and the surrounding states. Additional information regarding the LNG terminal components is provided in the sections below.

Figure 2.1.1-1 provides an overview of the LNG terminal and surrounding area. Figure 2.1.1-2 illustrates the LNG terminal site plan.

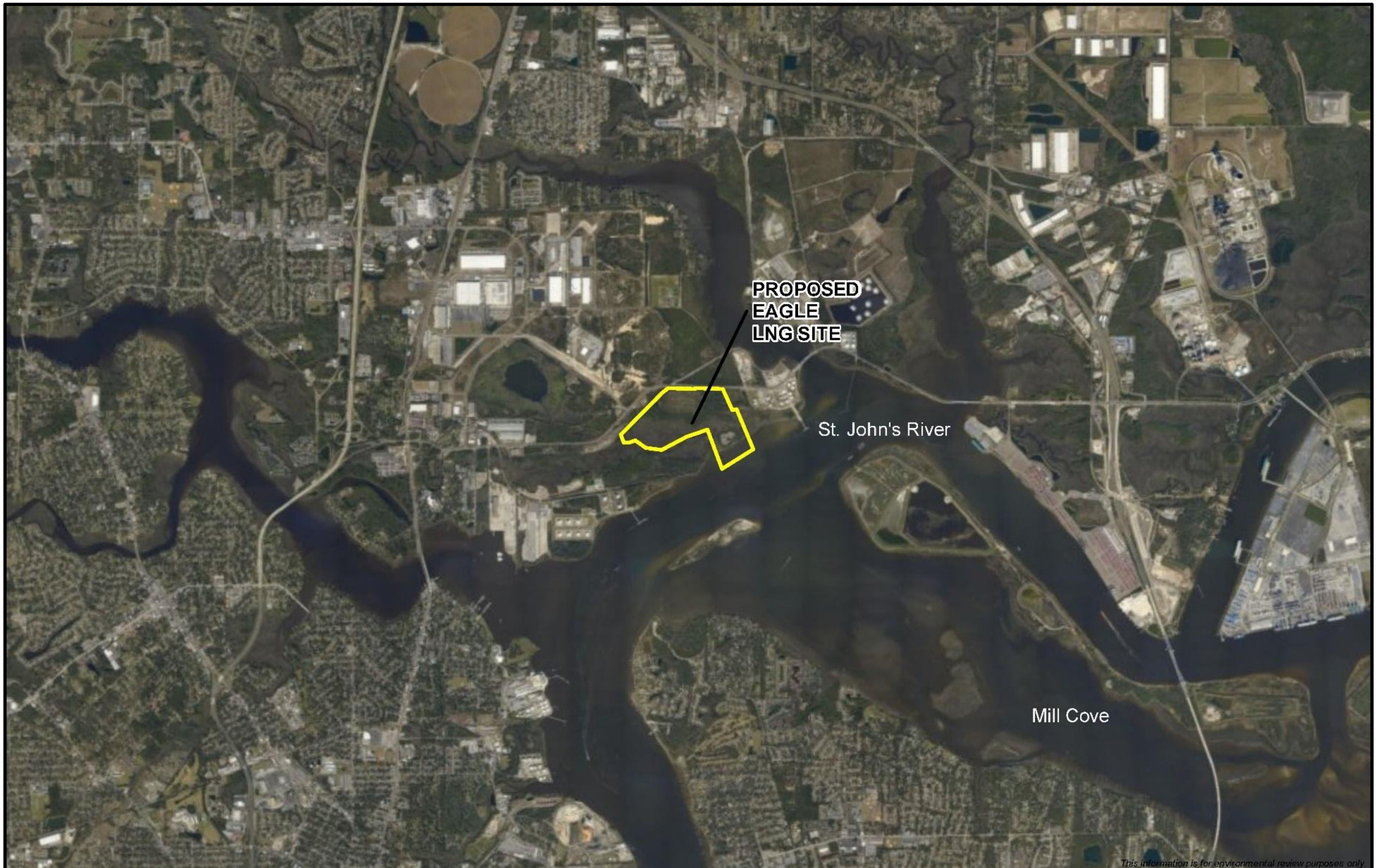

Figure 2.1.1-1
Overview Map of LNG Terminal and Surrounding Area
Jacksonville Project
Duval County, Florida

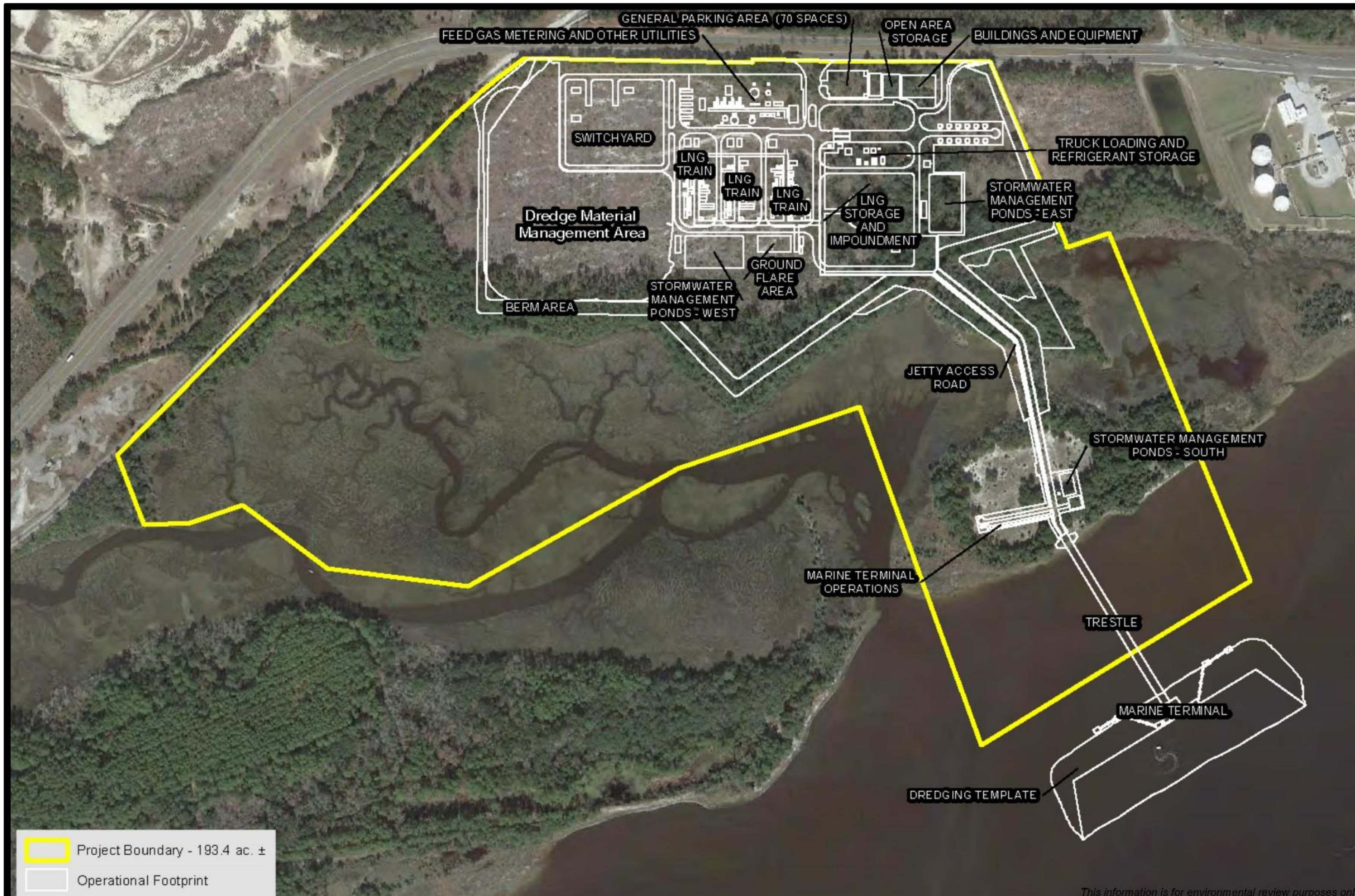

Figure 2.1.1-2
LNG Terminal Site Plan
Jacksonville Project
Duval County, Florida

Imagery: Google Earth, 2016

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DRAWN BY: TG

2.1.1.1 Inlet Gas Compression System

The Peoples Gas distribution system would provide the feed gas through its custody transfer metering skid(s) to Eagle LNG's Inlet Gas Compression System within the boundaries of the LNG terminal site. Eagle LNG would compress the feed gas from the relatively low pressure of the Peoples Gas transmission line (minimum operating pressure of 280 pounds per square inch gauge [psig]) to the optimal feed gas pressure for liquefaction. The Inlet Gas Compression System would consist of four inlet gas compressors (one compressor for each of the three LNG trains and an additional fourth as a spare), each one sized to handle the maximum capacity of one LNG train. Each inlet gas compressor contains a suction drum to remove any entrained liquid and a discharge air cooler to remove the heat of compression from the gas. Compression would be achieved with an electric motor-driven centrifugal compressor. All four units would take suction and discharge into common headers to serve any of the three LNG trains.

2.1.1.2 LNG Trains

At full build-out, the Jacksonville Project would include three LNG trains, each having the capacity to produce 550,000 U.S. gallons per day of LNG from a range of about 47.3 to 48.0 million standard cubic feet per day (MMscf/d) of feed gas.[1] Table 2.1.1-1 illustrates the anticipated daily and annual LNG output volumes for export and domestic distribution of LNG for each of the three proposed LNG trains.

TABLE 2.1.1-1

Anticipated Daily and Annual LNG Terminal Output Volumes for Export and Domestic Distribution of LNG for Trains 1, 2, and 3 [a]

Train	Capacity (U.S. gallons per day)	Daily Production Volume (U.S. gallons)		Annual Production Volume (U.S. gallons) [b]	
		Export	Domestic	Export	Domestic
Train 1	550,000	495,000	55,000	171,641,250	19,071,250
Train 2	550,000	495,000	55,000	171,641,250	19,071,250
Train 3	550,000	495,000	55,000	171,641,250	19,071,250

[a] Assumes a maximum volume of 60 truck loadings per week.
[b] Assumes downtime associated with anticipated scheduled maintenance.

Table 2.1.1-2 illustrates the total anticipated annual LNG output volumes for the Jacksonville Project during the first 3 years of service based on the anticipated staggered in-service dates for the three trains.

TABLE 2.1.1-2

Total Anticipated Daily and Annual LNG Output Volumes for the Jacksonville Project [a]

Year	Annual Capacity (U.S. gallons)	Daily Production Volume (U.S. gallons)		Annual Production Volume (U.S. gallons) [b]	
		Export	Domestic	Export	Domestic
Year 1	200,750,000	495,000	55,000	171,641,250	19,071,250
Year 2	401,500,000	990,000	110,000	343,282,500	38,142,500
Year 3	602,250,000	1,485,000	165,000	514,923,750	57,213,750

[a] Assumes a maximum volume of 60 truck loadings per week. Annual figures for total production volume based on year-end total capacity.
[b] Assumes downtime associated with anticipated scheduled maintenance.
Note: Factors that may affect the LNG Terminal's total output, including the commissioning of Trains 2 and 3, include changes in demand for LNG exports to markets served by the LNG terminal; changes in the rate of market adoption for domestic LNG; and changes in the available supply of feed gas.

[1] The feed gas would be pipeline quality natural gas.

Each LNG train would include an Acid Gas Removal Unit (AGRU), Dehydration and Mercaptans Removal Unit, Mercury Removal Unit, and a Gas Liquefaction Unit capable of separating heavy hydrocarbons from the inlet gas stream during the initial cool down steps of the liquefaction process.

Acid Gas Removal Unit

The compressed feed gas from the Inlet Gas Compression System would enter the pre-treatment process at the AGRU, which would remove carbon dioxide (CO_2) and hydrogen sulfide (H_2S) to prevent the gas from freezing inside the liquefaction system. Heat for the amine acid gas removal system would be supplied by circulating hot oil from a hot oil heater. The flash gas resulting from this process would be used as supplemental fuel gas to the hot oil heater while the acid gas would be oxidized in a thermal oxidizer. Amine and hot oil first charge and make-up would be imported to the LNG facility via trucks. Spent amine would be removed via truck (estimated one truckload per year) to a licensed/registered off-site waste disposal/handling facility in accordance with applicable regulations.

Dehydration and Mercaptan Removal System

After leaving the AGRU, the treated gas would enter the dehydration system. At this stage, the treated gas would contain substantial amounts of water vapor. The molecular sieve dehydrator/treater would reduce the water vapor in the treated gas to prevent freezing. To deodorize the treated gas, mercaptans would be removed to meet the total sulfur specification. Spent adsorbent materials from the molecular sieve dehydrator/treater and mercaptans removal beds would periodically be removed and transported via truck (estimated eight truckloads per year) to a state licensed/registered off-site waste disposal/handling facility in accordance with applicable regulations.

Mercury Removal System

The presence of mercury in the feed gas can cause a phenomenon known as liquid metal embrittlement, which can cause a catastrophic failure of the aluminum process equipment in a liquefaction system. Even though it is not anticipated that mercury would be present in the feed gas, the facility would include a mercury removal unit as a safeguard to protect downstream equipment. Any mercury potentially entrained in the feed gas would be reduced when the dry treated gas passes over the mercury removal bed. Spent catalyst from the mercury removal bed would periodically be removed and transported via truck (estimated at one or less truckloads per year) to a state licensed/registered off-site waste disposal/handling facility in accordance with applicable regulations.

Liquefaction and Heavy Carbon Removal Unit

The treated gas from the mercury removal beds would enter a liquefaction cold box where the gas would cool to an intermediate temperature to condense heavy hydrocarbons, which would be removed and reheated before being discharged to a warm heavy hydrocarbon separation system. After removal of the heavy hydrocarbons, Eagle LNG would liquefy and subcool the remaining gas before flowing to the LNG storage system. Refrigeration for this process would be provided by Chart's proprietary Improved Single Mixed Refrigerant (IPSMR) process (see figure 2.1.1-3). The refrigerant would consist of a mixture of nitrogen, methane, ethylene, propane, and n-butane, which boils over a wide temperature range to provide an efficient refrigeration to liquefaction temperature with a single refrigeration cycle. This mixture can be adjusted to accommodate seasonal changes in ambient temperature to achieve the highest efficiency. To account for any refrigerant leakage within the mixed refrigerant loop, Eagle LNG would supply make-up refrigerant on an as-needed basis. Make-up ethylene, propane, and n-butane would be delivered to the LNG facility via truck (in refrigerated conditions) and stored in on-site mounded refrigerant storage vessels until needed. Eagle LNG would source make-up methane directly from the treated natural gas entering the liquefaction system. Nitrogen would be supplied from the nitrogen generation packages, which would store and vaporize liquid nitrogen previously delivered to the site via truck. Heavy hydrocarbon removal from the facility is described in section 2.1.1.5.

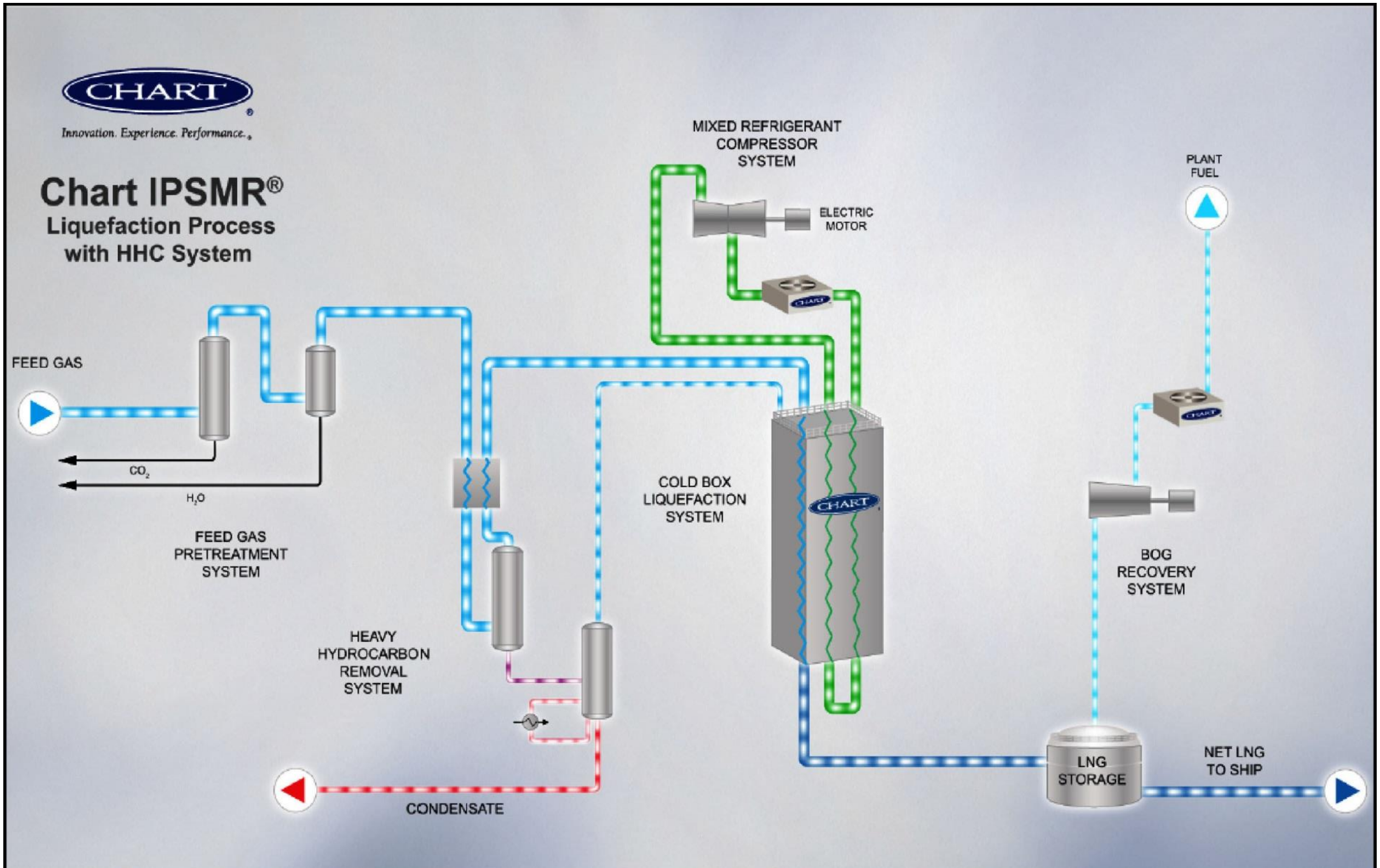

Figure 2.1.1-3

Schematic of Chart's Proprietary Improved Single Mixed Refrigerant Liquefaction Process

Jacksonville Project

Duval County, Florida

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DRAWN BY: TG

2.1.1.3 LNG Storage Tank

One full-containment, double-walled LNG storage tank, with a net volume capacity of about 45,000 m^3 (or about 12,000,000 U.S. gallons), would store the LNG produced by the three LNG trains. The LNG storage tank would be designed to meet the requirements of the NFPA Standard 59A, the DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) regulations at 49 CFR 193, and other applicable standards. The double-walled tank would consist of an inner tank for storing the refrigerated liquid under normal operating conditions and a secondary, outer container capable of containing the LNG and vapor that would result from a potential product leakage from the inner tank.

The LNG storage tank would have the following design features:

- The 9-percent nickel steel inner tank (primary containment) would have an open top, and would be designed to hold the gross volume of LNG.
- The concrete outer tank (secondary containment) would be 158 feet in diameter, 147 feet in height, and would consist of a reinforced concrete base, a pre-stressed concrete sidewall, and a reinforced concrete dome roof. The outer tank would be capable of containing 110 percent of the capacity of the inner tank. A carbon steel plate liner would be installed on the inner surfaces to contain product vapor and prevent water vapor from entering the tank from the atmosphere.
- The top of the inner tank would be covered with a suspended insulation deck supported from the outer tank roof.[2] The suspended deck would include vents to allow passage of product vapor across the suspended deck between the inner and outer tanks. The tank insulation system would be designed to minimize boil-off gas (BOG) generated by heat leak to no more than 0.07 percent of the maximum tank liquid contents per day.
- The tank foundation would consist of a reinforced concrete mat supported on grade (see section 2.5.1).
- In-tank pump columns would be supported from the outer tank roof with suitable bracing to the sidewall of the inner tank. The columns would have provisions for safe and effective pump withdrawal when the tank is in service.
- The design would include top and bottom fill nozzles to prevent stratification.
- Pressure relief valves and vacuum relief valves would be included in accordance with NFPA 59A.
- Stairways to the tank roof and roof-mounted platforms would provide access to storage tank accessories, a permanent ladder and platforms would provide access to the inner tank bottom from the roof access platform, and an emergency ladder would provide a secondary means of egress from the tank roof to grade.

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[2] The inner tank would have no permanent penetrations in the bottom or sidewall of the inner tank; all connections to the inner tank would be through the suspended deck and the outer tank roof.

- Tank instrumentation would include cool down sensors, leak detection, liquid level gauges, high level switches, and pressure instruments.

- Tank design would include a tertiary containment facility comprising a berm and wall enclosure surrounding the LNG storage tank that would be capable of containing over 100 percent of the capacity of the inner tank.

2.1.1.4 Marine Facilities

The marine facilities would be on the southeastern edge of the LNG terminal site off the north bank of the St. Johns River between the Marathon Petroleum marine terminal and a U.S. Navy Fuel Terminal. The marine facilities structures would consist of a land access trestle terminated by an LNG marine loading platform about 900 feet offshore to approach the federal channel and gain access to deep water.

The marine facilities would include cryogenic transfer piping, including a portion of vacuum-jacketed piping, and the following components:

- a concrete access trestle structure about 885 feet long by 36 feet wide with associated shoreline protection;

- a concrete loading platform;

- a docking terminal supported by driven or drilled piles, set back 255 feet from the federal channel (Cut 50) in the St. Johns River. The approximately 72-foot by 72-foot LNG marine loading platform would be approximately +13 feet North American Vertical Datum of 1988 (NAVD 88);

- two liquid loading arms incorporating cryogenic piping, one vapor return arm, associated piping and spill containment facilities, fire and safety equipment, and a jetty vapor blower;

- four berthing dolphins and four mooring dolphins, each measuring about 22 feet by 30 feet;

- a gangway for ship access; and

- a 10.1-acre dredging template to accommodate LNG carriers.

A general layout of the marine facilities is depicted on figure 2.1.1-2.

The facilities have been designed to safely dock and moor a range of LNG vessels, including ships with an LNG cargo capacity between 6,500 and 45,000 m^3 as well as LNG bunker vessels with capacities of about 3,400 m^3. LNG would be loaded into small- to mid-sized LNG vessels for export and into bunkering vessels for domestic bunkering activities in the Port of Jacksonville and other nearby domestic ports (e.g., Jacksonville, Miami, and Port Everglades, Florida; Charleston, South Carolina; Savannah, Georgia). These vessels would be designed and operated by third parties in accordance with applicable standards set forth in 46 CFR 35, 46 CFR 38.15, 46 CFR 154, and 33 CFR 155 and 156. The bunkering vessels would moor next to the LNG vessels while the vessels are in port. While marine bunker fueling operations outside of Eagle LNG's terminal would be conducted by parties other than Eagle LNG, LNG fuel would be transferred from bunker vessels to receiving vessels in accordance with applicable standards set forth in 46 CFR 35, 46 CFR 38.15, 46 CFR 154, and 33 CFR 155 and 156.

2.1.1.5 LNG Truck Loading Facility

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

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

The capacity of each LNG truck would be about 12,000 U.S. gallons (45 m^3) with a loading flow rate of about 300 U.S. gallons per minute (60 cubic meters per hour). As a result, LNG loading at a truck loading bay would take about 40 minutes for a single truck, or about 80 minutes for two trucks loaded simultaneously. After LNG loading operations are complete, the LNG trucks would follow the plant road to turn around and exit the LNG terminal site. Additional information on LNG truck transit is described in section 1.4.1.

Current projections indicate that, once more LNG fueling stations become operational in Florida and the neighboring states, an average of 10 trucks would be loaded per week (520 trucks per year) at the LNG terminal when operating at full capacity. Therefore, the anticipated average volume of LNG to be delivered by truck would be about 6,240,000 U.S. gallons per year during full operation of the LNG terminal.

The truck loading facility would also include facilities for heavy hydrocarbon truck loading. Heavy hydrocarbons extracted from the feed gas during the initial cool down steps of the liquefaction process would be stored in a mounded pressurized vessel and loaded onto trucks for off-site domestic distribution. The heavy hydrocarbon loading equipment (i.e., loading pump and flexible hoses) would be within the LNG truck loading loop. The facilities would be designed with a maximum loading flow rate of 300 U.S. gallons per minute and a turnaround time of about 40 minutes for a truck with a capacity of 12,000 U.S. gallons. Eagle LNG anticipates two off-site heavy hydrocarbon deliveries per week.

2.1.1.6 Boil-Off Gas Compression System

The BOG compression system would accommodate all anticipated BOG loads for the LNG facility. The BOG would be compressed and used in the fuel gas system or combined with feed gas entering the inlet gas compressors. The facility would have a cold vent near the jetty for handling ship vapors from arriving LNG vessels, which would also act as a stand-by flare to handle the LNG storage tank BOG in the event of a BOG compression system failure (see section 2.1.1.8 for more information regarding the flare and cold vent systems).

2.1.1.7 On-Site Refrigerant Storage

The LNG facility includes a system for receipt, storage, and vaporization of make-up ethylene, propane, and n-butane for the mixed refrigerant system. All refrigerants would be delivered to the LNG facility via truck and unloaded via flexible hoses and dry break couplings. The refrigerant storage capacity would accommodate the inventory of the refrigerants circuits of two LNG trains. Eagle LNG would store the ethylene in mounded pressurized vessels insulated by a vacuum jacket. Additionally, Eagle LNG would use boil-off ethylene generated from ambient heat leak as refrigerant make-up. Propane and n-butane would be stored as pressurized liquid at ambient temperature in mounded vessels.

2.1.1.8 Ground Flare and Cold Vent Systems

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

The LNG terminal would have a common ground flare approximately 35 feet in height for the three LNG trains for safe disposal of hydrocarbon vapor and liquid streams that result from start-up, shutdown, upsets, and emergencies. The ground flare would include segregated multi-point wet and dry flare systems, each sized to handle the largest single relief from an operating train plus any operational flaring associated with the start-up of a second train. Each flare system would include dedicated knock-out drums to collect any liquids upstream of the burners.

The LNG terminal would have a single cold vent about 50 feet in height that would handle ship vapors from LNG carriers in a warm, CO_2-inerted condition[3] and BOG from the LNG storage tank upon a failure of the BOG compression system. The cold vent is designed to accommodate a BOG flow rate corresponding to a complete outage of the BOG compression system during ship loading.

2.1.1.9 Utilities and Support Facilities

Water Supply

Potable water for the LNG terminal would be obtained from a new on-site potable water supply well during both construction and operation of the LNG terminal. During construction, Eagle LNG would require about 96,000 gallons per day during mass grading activities and an additional 108,000 gallons per day for dust control after mass grading is complete. Eagle LNG estimates that about 9,800 gallons per day would be required during LNG terminal operation.

During construction of the LNG terminal, Eagle LNG would obtain fire protection water on demand from an on-site well, stormwater collection, on-site storage, or barge-in/truck-in. In the event of a fire, the maximum anticipated demand from the fire protection well would not exceed 1,100 gallons per minute for 8 hours. During operation of the LNG terminal, fire protection water for the LNG terminal would come from an on-site 500,000-gallon fire water storage tank and the fire protection well. Eagle LNG estimates that 500,000 gallons would be sufficient to handle the maximum fire event demand for 2 hours. This demand is below the yields from surrounding wells in the area.

During construction of the LNG terminal, wastewater would be collected from construction facilities and transferred to holding tanks; licensed vendors would remove the contents using vacuum trucks

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3 Inerting is the process of introducing an inert or non-combustible gas, such as carbon dioxide, into a hydrocarbon-filled system to prevent fires or explosions of hydrocarbon vapors (liquefiedgascarrier.com, 2018).

for proper off-site disposal. Additionally, during construction portable toilet vendors would service the site with wastewater, and periodically remove it via vacuum trucks for proper off-site disposal.

Stormwater System

Eagle LNG would route stormwater to three management ponds prior to off-site discharge. The west and east ponds would be used during both construction and operations. After construction is completed, Eagle LNG would fill the south pond and construct a new permanent south pond near the jetty for use during operations. Oil-contaminated stormwater would be treated to remove contaminants prior to being routed to the stormwater management ponds; however, clean stormwater would be routed directly to the ponds. Under normal operating conditions (i.e., no spill), Eagle LNG would route stormwater collected in the LNG spill containment system to the LNG spill containment sumps for discharge to the stormwater management ponds. Low temperature cut-off switches on the sump pumps would inhibit pump operation in the event of an LNG spill to prevent contaminated water from entering the stormwater management system.

Septic System

A septic system would consist of 12 seepage pits with permeable walls that allow the percolation of liquids into the surrounding soil to dispose of sanitary waste. The top of the pits would be made of concrete and the bottom lined with gravel. Routine cleaning or service of the septic system would not be required provided that adequate biological conditions are maintained.

Facility and Instrument Air

The LNG terminal instrument air system would supply dry compressed air for operation of instruments and purging and would have three 100 percent electric-driven air compressor packages, each sized for the operating demand of a single LNG train. A diesel-driven air compressor package would provide air for emergency shutdown and would act as a backup in the event of a failure of one of the electric-driven compressors. Each air compressor package would include an oil-free air compressor, intercoolers, after cooler, and instrument air dryers. A common dry air receiver for the three LNG trains would provide 15 minutes hold-up for normal air demand for operation of control valves during emergency shutdown.

LNG terminal utility air would be used to provide motive power for pneumatic tools and equipment that may be used during maintenance activities at the site. The LNG terminal air take-off for utility stations would be downstream of the air dryers. Thus, facility air would have the same distribution pressure and quality as the instrument air. The quantity and location of utility stations would be determined during detailed engineering.

Demineralized Water and Amine Storage and Make-up

Demineralized water would be trucked to the LNG terminal and stored in the demineralized water tank. Two pumps (one operating and one back-up) designed to handle 100 percent capacity for the three LNG trains would deliver demineralized water from the demineralized water tank to a common distribution system to provide make-up water to the AGRUs. Eagle LNG would determine the demineralized water storage capacity at the site based on the total volume of all three LNG trains.

Amine would be trucked to the site and stored in the 34,650-gallon amine storage tank, within an impoundment basin, which would accommodate the storage capacity of the initial fill volume of all three LNG trains. Two pumps (one operating and one back-up) designed to handle 100 percent capacity for the three LNG trains would deliver amine to a common distribution system to provide make-up amine to the AGRUs.

Nitrogen

Liquid nitrogen would be trucked to the LNG terminal and vaporized and stored on site for use in inert purging of lines/equipment and to provide make-up nitrogen for the IPSMR process. The three LNG trains would have a common nitrogen distribution system with connections for three portable liquid nitrogen generation packages (vaporizer and storage).

Fuel Gas

A common system would provide fuel gas for operation of various facility components, including fired heaters within the LNG trains, a common thermal oxidizer, the dry and wet flare pilots, the cold vent pilots, and flares. The fuel gas would be sourced from:

- heavy hydrocarbon vapors;
- flash gas from the amine flash drums (supplemental fuel to the hot oil heaters);
- BOG from the LNG storage and loading system; and
- start-up fuel gas.

Hot Oil

Hot oil would be trucked to the LNG terminal for use as the heating medium for amine regeneration in the AGRU. Eagle LNG would equip each LNG train with an independent hot oil-fired heater and hot oil surge drum to provide process heating to the amine reboiler. Each hot oil heater would contain a gas-fired heater, heater combustion air blower, surge tank, and hot oil circulation pumps.

Administration, Control, and Workshop Buildings

The LNG terminal site would include an administration building, a main control room building, a security building/guard house, and a warehouse/maintenance shop/chemical storage building. More information regarding safety and security systems is provided in section 2.7.

Roads and Parking Areas

No new access roads or improvements to existing off-site roadways are proposed for construction or operation of the LNG terminal. However, because there are no existing roads within the LNG terminal site, internal roads would be constructed within the site boundary, including a new heavy-haul road to transport marine deliveries and materials staged within the LNG terminal site laydown areas (see additional discussion in section 2.1.1.9). Eagle LNG would construct a perimeter road and site access roads to provide access within the LNG terminal. LNG terminal roads and parking areas would be paved with asphalt.

Entrance into the facility from State Road 105 (also known as Heckscher Drive or Zoo Parkway) would be limited to the main entrance at the security building/guard house. An emergency exit onto State Road 105 would provide a means of emergency departure. Eagle LNG would coordinate with the FDOT to determine the specific roadway requirements and permits necessary to provide safe entrance/exit from the LNG terminal.

Power and Communications

Eagle LNG would obtain electric power for the LNG Terminal from a local utility provider (JEA) and supplement it by on-site power from natural gas-driven reciprocating engine generator sets (see also section 1.4.3). Redundant 138.0 kV feeders would enter the LNG terminal site above ground via electric poles and terminate at the open electrical switchyard.

The LNG terminal would include five reciprocating engine electric power generators, four operating and one spare. Each generator would be rated to develop 2 megawatts (MW) of continuous power at 4,160 V. During ship loading activities, all five generators would operate and the gas would generate power in excess of 8 MW, which would be utilized for other plant loads. Fuel gas for the generator sets would be sourced from the BOG compression system. A master generator set controller would synchronize the operation of the electric power generators and main electric power supply.

An emergency diesel generator connected to the main substation would supply emergency power. This generator would provide 4,160 V of backup power for safe emergency shutdown in the event of an LNG terminal power outage. The emergency diesel generator would be equipped with a 24-hour diesel day tank.

The communication system at the site would consist of:

- a telephone exchange;
- a radio system;
- a computer network;
- a plant telecommunication network;
- a telemetry system for data transfer to/from the LNG terminal;
- an electronic mail system for communication; and
- a closed-circuit television system.

2.1.2 LNG Transport Vessels

2.1.2.1 LNG Carriers

LNG could be shipped to a variety of locations, including domestic facilities in Puerto Rico, Florida, and potentially New York, as well as FTA-countries. In addition, Eagle LNG has submitted an application to the DOE seeking authorization to export to non-FTA countries, which is currently under review (see discussion in section 1.2.4). Although LNG carriers and their operation are directly related to the use of the proposed LNG terminal, they are not subject to the authorization under section 3(a) of the NGA sought by Eagle LNG's application with the Commission. As previously discussed, the Coast Guard is the federal agency responsible for determining the suitability of the waterway for LNG marine traffic associated with the Jacksonville Project. As required by its regulations, the Coast Guard completed its review of the WSA and, on February 7, 2018, issued an LOR determining that the St. Johns River is suitable for accommodating the LNG marine traffic associated with the Jacksonville Project.[4]

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

[4] A copy of the Coast Guard's February 7, 2018 LOR is available on the FERC website at: http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20180301-3020.

required to comply with all federal and international standards regarding LNG shipping. A detailed discussion of design and safety features of LNG carriers is presented in section 4.12.5.

LNG carriers would access the LNG terminal site from the Atlantic Ocean via the St. Johns Bar Cut along the main channel of the St. Johns River. The total inbound transit distance from the mouth of the St. Johns River to the LNG terminal berth is about 14.5 river miles. The same route would be reversed for outbound LNG carrier transits. However, actual vessel movement patterns would be determined by the conditions that exist at the time of transit and could be influenced by factors such as weather conditions, individual vessel characteristics, waterway conditions, and Coast Guard safety/security zones. The Coast Guard LOR outlines conditions for LNG marine traffic in the waterway, including additional resources or assets that would be required prior to allowing LNG carriers to transit up the St. Johns River to the LNG terminal. If traffic is restricted to one-way, the Coast Guard Captain of the Port would coordinate scheduling efforts with the Jacksonville Marine Transportation Exchange and the St. Johns Bar Pilots to ensure that all maritime interests are aware of any restrictions or special vessel traffic considerations.

The COE is responsible for maintenance dredging of the federal channel within the St. Johns River. Eagle LNG would be responsible for maintenance dredging of its berthing area at the marine terminal load-out facility. Based on estimated sedimentation rates within the St. Johns River and actual operating berth clearance requirements, Eagle LNG estimates that maintenance dredging would be required every 1 to 2 years and about 49,000 cubic yards of dredge material would be removed (Taylor Engineering, 2017a).

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

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

A ballast control system, which permits simultaneous ballasting during cargo transfer operations, is also incorporated into each LNG carrier. This allows the LNG carrier to maintain a constant draft during all phases of its operation to enhance performance. Under normal operating conditions, ballast water would be discharged from the ship during LNG loading at the LNG terminal. A typical LNG carrier of the type that would call on Eagle LNG's facility would discharge about 3 million gallons of ballast water into the St. Johns River during loading operations (see the ballast water discharge discussion in section 4.3.2.3).

2.1.2.2 LNG Barges

Although LNG barges and their operation are directly related to the use of the proposed LNG terminal, they are not subject to the authorization under section 3(a) of the NGA sought by Eagle LNG's application with the Commission. As previously discussed, the Coast Guard is the federal agency responsible for determining the suitability of the waterway for LNG marine traffic. The Coast Guard has completed its review of the WSA and issued the LOR on February 7, 2018, which stated that the St. Johns River is considered suitable for proposed LNG marine traffic.

Barges designed to carry LNG as cargo do not currently exist in the United States; however, the Coast Guard, Office of Hazardous Materials Division is currently developing policy regarding the design of LNG barges. The foundation for design of LNG barge requirements is included in CG-ENG Policy Letter No. 02-15, *Design Standards for US Barges intending to Carry Liquefied Natural Gas in Bulk* dated

April 10, 2015 (Coast Guard, 2015d). This Policy Letter includes design details for barges carrying LNG in bulk within the regulatory framework. LNG barges, both domestic and foreign, would be required to comply with the Coast Guard regulations for LNG carriers as described above.

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

Fire protection and safety systems for LNG barges would be designed to comply with the Coast Guard International Gas Carrier Code regulations, which would require firefighting systems, cargo control/monitoring equipment, and gas detection systems on LNG barges. LNG barges calling at the LNG terminal would be required to comply with the Coast Guard international design, safety, and operational requirements applicable to the specific vessel type. In addition, Eagle LNG has committed to developing procedures for vetting LNG vessels that would call at the LNG Terminal, including requiring the LNG vessel's agents to certify that all requirements for LNG transfer have been or would be met prior to the start of operations.

2.1.3 LNG Trucks

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

Typical LNG trucks loading at the LNG terminal would have a capacity of approximately 12,000 gallons (45 m^3). The trailer containing the LNG would be 60 feet long, 9 feet wide, and 12 feet high. The trailer would contain a pressure relief system to protect against overpressure, emergency shutoff switches, and the maximum allowable operating pressure would be approximately 79 psig. Design temperatures for the inner LNG container would be –320 °F to 100 °F.

LNG trucks would be required to comply with DOT regulations (49 CFR 178.338). Truck operators would be trained to satisfy the minimum requirements of 49 CFR 193, as well as the requirements of the DOT, FDOT, City of Jacksonville, and Duval County.

2.2 LAND AND WATER REQUIREMENTS

Property under the control of Eagle LNG would include 193.4 acres of land, including 174.1 acres onshore and approximately 19.3 acres of submerged lands within the St. Johns River.[5] Construction of the LNG terminal would require a total of 92.2 acres of land, including 81.1 acres onshore and 11.1 acres of submerged offshore lands. Following construction, 81.8 acres of land would be permanently maintained

[5] Eagle LNG has executed a purchase agreement with the landowner of the LNG terminal site, which would be fully executed after receipt of FERC authorization and other necessary federal, state, and local agency approvals/authorizations.

for operation and maintenance of the proposed facilities, including 70.7 acres onshore and 11.1 acres of submerged lands for dredging and the marine facilities.

Table 2.2-1 summarizes the land requirements for the Jacksonville Project. Section 4.8 provides a more detailed description and breakdown of land requirements and use.

TABLE 2.2-1

Land Requirements for the Jacksonville Project [a]

Facility	Land Required for Construction (acres) [b]	Land Required for Operation (acres)
LNG Terminal Facilities		
LNG terminal terrestrial facilities	81.1	70.7
Dredging and marine facilities	11.1	11.1
TOTAL LAND REQUIREMENTS	**92.2**	**81.8**

[a] Only a portion of the 193.4-acre site to be owned by Eagle LNG would be required during construction and operation of the LNG terminal.
[b] Includes both construction and operational impacts.

2.3 CONSTRUCTION SCHEDULE AND WORKFORCE

Eagle LNG would start construction of the LNG facility as soon as possible after receipt of all required certifications, authorizations, and necessary permits. Construction of the LNG terminal and commissioning of Train 1 is estimated take about 2 years (20 months to construct the LNG terminal followed by commissioning of Train 1). Eagle LNG would place Train 2 into service the following year and Train 3 about 6 months afterwards. Construction activities would occur predominantly during the day, between about 7:00 a.m. and 6:00 p.m., Monday through Saturday. However, certain activities would occur up to 24 hours per day, 6 days per week (see section 4.11.2.3 for more information).

In total, a maximum of 465 workers per month would be employed during construction of the LNG terminal. Eagle LNG estimates that 95 percent of the construction workforce would be hired locally, including 60 percent from Duval County and 35 percent from adjacent counties in Florida (see section 4.9.1).

2.4 ENVIRONMENTAL COMPLIANCE

FERC may impose conditions on any authorization it issues for the proposed Jacksonville Project. These conditions include additional requirements and mitigation measures recommended in this EIS to minimize the environmental impact that would result from construction and operation of the LNG terminal (see sections 4 and 5). We would recommend that these additional requirements and mitigation measures (bold type in the text of the EIS) be included as specific conditions to any authorization issued for the proposed Jacksonville Project. We would also recommend to the Commission that Eagle LNG be required to implement the mitigation measures proposed as part of the project unless specifically modified by other authorization conditions. Eagle LNG would be required to incorporate all environmental conditions and requirements of the FERC authorization, and associated construction permits into the construction documents for the project.

Eagle LNG plans to employ one environmental inspector (EI) to monitor construction activities at the LNG terminal, including cleanup and restoration, and to verify environmental compliance. The EI's responsibilities would include verifying that environmental obligations, conditions, and other requirements of permits and authorizations are met. The responsibilities of the EI are described in more detail in Eagle

LNG's project-specific *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) (see appendix E). Eagle LNG's project-specific Plan and Procedures are based on the 2013 FERC Plan and Procedures,[6] which are a set of construction and mitigation measures developed to minimize the potential environmental impacts of the construction of pipeline projects in general. Eagle LNG has requested to modify section V.B.1.b of the FERC Procedures to conduct in-stream work within a timeframe compatible with its construction schedule, rather than within the limited window of June 1 through November 30, if approved during consultations with federal and state regulatory agencies (see section 4.6.2.2). Eagle LNG would attempt to minimize in-stream impacts by adhering to best management practices (BMP) during all in-stream work. Eagle LNG would otherwise comply with the requirements of the Plan and the remainder of the Procedures.

Eagle LNG would implement the environmental compliance and monitoring requirements of its project-specific Plan and Procedures and the requirements of federal, state, and local permits, clearances, and authorizations during construction of the LNG terminal.

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

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

Eagle LNG would conduct environmental training for its EI to familiarize him/her with project-specific issues and requirements. Eagle LNG would also incorporate environmental requirements and specifications into contractor bid documents; provide the contractors with copies of environmental permits, certificates, and clearances; and conduct environmental training for contractor personnel prior to and during construction, as needed, to make them aware of the environmental requirements at each facility. The EI would also verify construction workspaces prior to use, confirm that all sensitive resources are properly marked, and ensure proper installation and maintenance of all erosion control devices. The EI would have peer status with all other inspectors and would have the authority to enforce FERC and permit environmental conditions, issue stop-activity orders, and impose corrective actions to maintain environmental compliance.

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

In addition to Eagle LNG's environmental compliance activities, FERC staff would conduct periodic field inspections during all phases of construction. Following the inspections, we would enter inspection reports into the Commission's public record. Other federal and state agencies may also conduct inspections as well. Representatives of these agencies could require the implementation of additional and/or corrective environmental measures. These representatives could also issue work stoppages, impose fines, and/or recommend additional actions in response to environmental compliance failures. After construction is completed, FERC staff would continue to monitor affected areas during operation to verify successful restoration. Additionally, FERC staff would conduct biennial engineering safety inspections of the LNG terminal throughout the life of the facility.

2.5 CONSTRUCTION PROCEDURES

Sections 2.5.1 through 2.5.7 describe the general procedures proposed by Eagle LNG for construction activities at the LNG terminal. Section 4 provides more detailed information regarding the proposed construction and restoration procedures as well as additional measures that we are recommending to avoid or reduce environmental impacts.

Under the provisions of the *Natural Gas Pipeline Safety Act of 1968*, as amended, the proposed LNG terminal must be designed, constructed, operated, and maintained in accordance with the DOT's Liquefied Natural Gas Facilities: Federal Safety Standards (49 CFR 193) and the NFPA's Standards for the Production, Storage, and Handling of LNG (2001 ed.) (NFPA 59A). These standards specify siting, design, construction, equipment, and fire protection requirements for new LNG facilities. The LNG ship loading facilities and any appurtenances between the LNG ships and the last valve immediately before the LNG storage tanks would comply with applicable sections of the Coast Guard regulations in Waterfront Facilities Handling Liquefied Natural Gas (33 CFR 127 and Executive Order 10173).

Eagle LNG would be required to implement all conditions in the authorization issued by the Commission for the proposed Jacksonville Project as well as the requirements of its project-specific Plan and Procedures (see section 2.4).

To prevent contamination of soils within nearby wetlands, waterbodies, and other sensitive resources during construction, Eagle LNG would implement its project-specific *Construction Spill Control and Waste Management Plan* (CSCWM Plan)[7] during construction, and its *Spill Prevention, Control, and Countermeasures Plan* (SPCC Plan)[8] during operation of the LNG terminal. These plans outline potential sources of releases at the sites, measures to prevent a release to the environment, and initial responses in the event of a spill. Eagle LNG would also implement conditions resulting from other permit requirements and its project-specific plans developed to avoid or minimize environmental impacts during construction, which are discussed throughout this EIS.

2.5.1 Site Preparation and Foundations

Site Preparation

Site preparation would begin immediately following mobilization activities. Site preparation activities would commence with the installation of security fencing and erosion and sediment control

[7] The CSCWM Plan was included Eagle LNG's application, Resource Report 2, appendix 2.B, which is available online at the FERC's website at: http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20170131-5314.

[8] Eagle LNG has committed to filing its SPCC Plan with the Secretary of the Commission prior to the start of construction of the Jacksonville Project.

measures and would conclude with final soil stabilization activities, including revegetation and paving. Site preparation activities would generally progress in the following order:

- mark boundaries of wetlands and other environmentally sensitive areas to be avoided during construction and install erosion and sediment control measures consistent with the Plan and Procedures;
- clear and grub vegetation and remove root systems and debris;
- strip any organic laden soils, weak soils, and topsoil to reach a subgrade capable of supporting construction activities. A "working platform" or geo-grid layers may be required for construction equipment, including cranes, prior to raising the site;
- evaluate subgrade using proof-rolling with a heavy (20-ton) rubber-tired vehicle or vibratory roller (where feasible). In areas where proof-rolling is not feasible, a qualified representative would perform probing or density checks to verify soil competence;
- remove and replace unsuitable subgrade soils;
- excavate the east and west stormwater management ponds. Use the soil excavated from the east and west stormwater management ponds to construct the jetty access road to the Dredged Material Management Area (DMMA) and simultaneously construct the DMMA using a balance of cut and fill within the DMMA footprint;
- raise portions of the site using suitable dredged material to accommodate the temporary fill storage area, construction laydown area, and construction offices and parking;
- complete construction roads and drainage infrastructure including the south stormwater management pond;
- install any electrical, communications, and water systems needed for subsequent construction;
- provide temporary stabilization of surface soils, where needed, using geotextiles and/or aggregate materials (e.g., gravel and crushed stone) to level and finish construction areas and to minimize dust and the potential for erosion and sedimentation;
- install foundations;
- complete final site grading, including backfilling; and
- install final surfaces, including revegetation and paving of permanent roads and process areas.

Final site elevations would be optimized to maximize the use of dredged material as on-site fill and to ensure that all operating areas are above +13 feet NAVD88 to minimize storm flooding risk. More information regarding site elevations is provided in section 4.12.5.

Foundations

Eagle LNG would use a range of foundation types depending on localized soil, subsurface, and site conditions as well as structural/equipment load requirements. Generally, shallow foundations (e.g., spread and strip footings and mat foundations made of reinforced concrete) would be used, likely placed at a minimum depth of 4 feet below grade on natural, competent soils. Unsuitable materials encountered at the foundation depth would be removed and replaced with compacted granular (sandy) fill, lean concrete, or flowable fill (i.e., soil-cement slurry).

Eagle LNG currently plans to support the LNG storage tank using a reinforced concrete slab foundation, with a thickened edge, placed on an approximately 2-foot-thick gravel pad. The reinforced concrete slab foundation would support and distribute the load of the tank shell and provide a level and solid surface to facilitate its construction, while the thickened edge would transfer the higher tank wall loads and help prevent local failure at the tank edges. Eagle LNG would improve the subgrade soil using Vibro Replacement (i.e., stone columns) or dynamic compaction and remove or replace any loose or weak soils at the bottom of the gravel pad with compacted structural sand fill or flowable fill. Improving the existing soils using soil improvement techniques would increase bearing capacity, reduce settlement, and reduce/prevent soil liquefaction (if liquefaction potential exists), which would allow the placement of the LNG tank on shallow foundations.

2.5.2 Material and Equipment Delivery

Construction materials and equipment would be delivered directly to the project site via ground transportation using local highway routes. Eagle LNG anticipates an average of 20 truck deliveries per day during construction of the project. However, for short durations (3 to 5 days) during construction, up to 100 truck deliveries per day could occur. When practical, large equipment units would be fabricated off-site at existing fabrication facilities. All of the LNG train components, interconnecting pipe sections and racks, and major utility equipment would be prefabricated, with delivery being coordinated to accommodate the project's schedule and available laydown areas.

All equipment would be designed, fabricated, and rigorously tested by highly qualified specialist suppliers at their respective facilities, overseen by Eagle LNG inspectors, and shipped to the project site only after the necessary inspections have taken place and the equipment has been approved by Eagle LNG for release. In addition, Eagle LNG would inspect all equipment upon arrival at the project site.

An existing, off-site concrete batch plant would provide all the concrete required for the Jacksonville Project. Eagle LNG anticipates that concrete would be supplied by one or more of the five ready mix concrete suppliers within a 4.0-mile driving distance of the Jacksonville Project site (i.e., Griswold Ready Mix Concrete, Eastport Ready Mix, Prestige Materials, Quikrete, and/or Titan Concrete and Titan Block). Supplier selection and exact travel routes to the site would not be known until after Eagle LNG has commenced construction. For precast concrete, Eagle LNG anticipates that a supplier would be selected due to its proximity to the project site. Eagle LNG estimates that about 10,000 cubic yards of concrete would be needed for full build-out of the LNG terminal (about 8,500 cubic yards of concrete for the first phase).

2.5.3 Marine Facilities

The Eagle LNG marine facilities would consist of a land access trestle terminated by an LNG marine loading platform. Figure 2.5.3-1 depicts the marine facilities layout. The access trestle and LNG marine loading platform would include pipe racks and supporting equipment. The LNG marine loading platform would be about 900 feet offshore to approach the federal channel and facilitate access to the deepest available water. Eagle LNG would design the marine facilities structures with a 255-foot setback from the federal channel so the largest proposed vessel in berth would not encroach on the 150-foot safe setback distance as defined by the COE for Cut 50 of the federal channel.

The LNG marine loading platform would include four berthing dolphins and four mooring dolphins to accommodate the full range of ship designs and to provide the necessary spectrum of mooring arrangements.

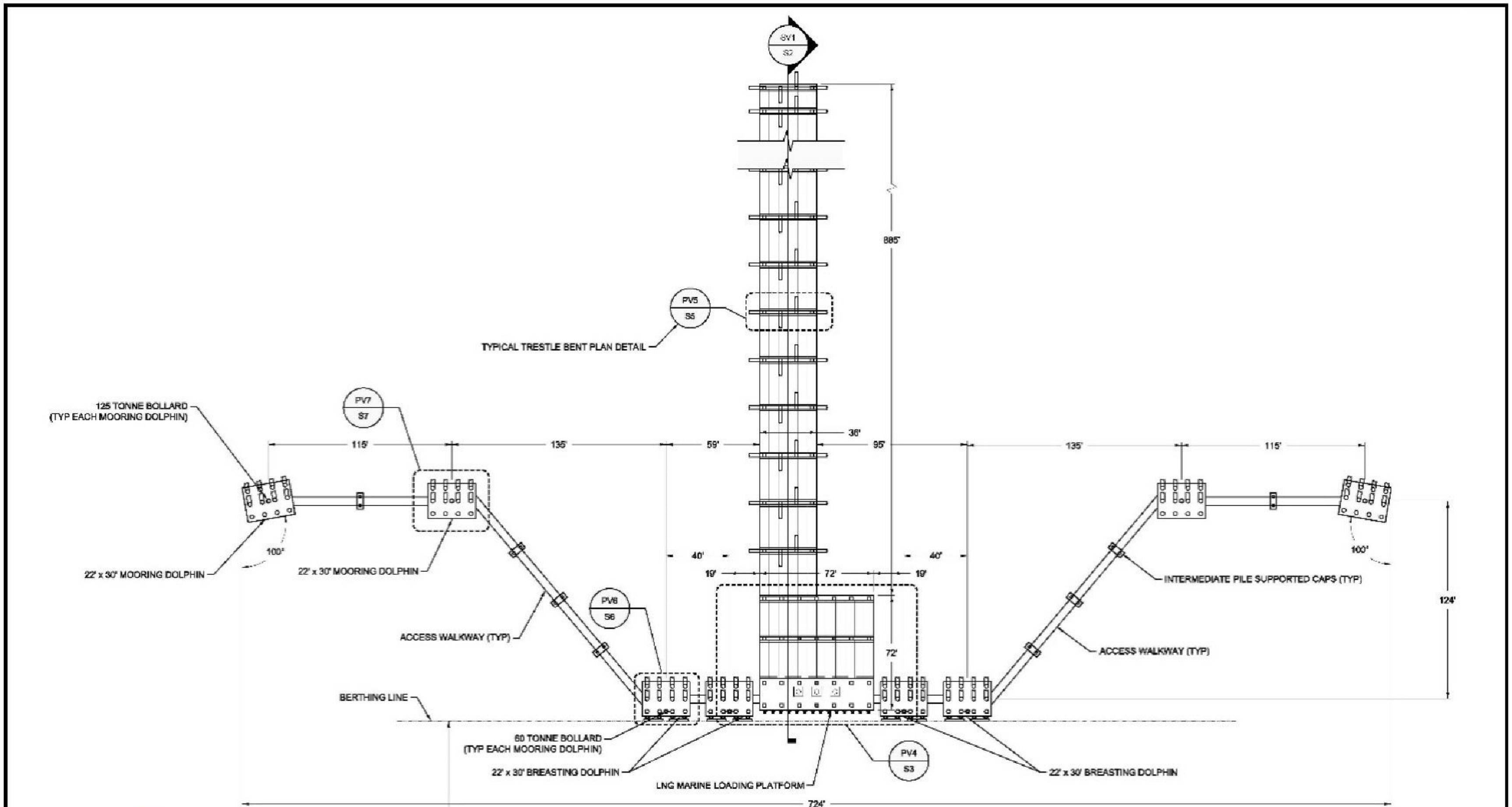

Figure 2.5.3-1
Marine Facilities
Jacksonville Project
Duval County, Florida

Table 2.5.3-1 provides the estimated pile requirements for the marine facilities, totaling 239 piles; however, the final pile size, material, and number of pilings would be determined during the final structural engineering for the project.

TABLE 2.5.3-1

Estimated Pile Requirements for the Marine Facilities

Structure Type	Material	Estimated Pile Count	Piling Diameter (inches)	Estimated Pile Length (feet)	Estimated Length Below River (feet)	Estimated Number of Strikes per Pile	Estimated Number of Piles per Day	Estimated Total Number of Strikes per Day
Trestle	Pre-stressed concrete	85	24	50–70	30–50	600	3	1,800
LNG loading platform	Pre-stressed concrete	28	24	50–70	20–30	600	3	1,800
Breasting dolphin	Steel pipe	54	30	80–100	40–60	800	2	1,600
Mooring dolphin	Steel pipe	48	30	80–100	60–80	800	2	1,600
Walkways	Pre-stressed concrete	24	18	40–45	20–30	500	3	1,500

Installation of concrete piles would likely include predrilling or jetting to initially position and set each pile, followed by pile driving to reach the specified minimum depth and attain appropriate pile bearing capacity. To attain the significant pile tension loads imposed by ship berthing and mooring, the steel pipe piles would require significant embedment into the limestone and/or underlying marl formation. Pile installation would involve the following generalized procedures:

- vibrate or drive the pipe pile until competent limestone is reached;
- advance a rotary drill bit 2 to 3 inches smaller in diameter than the outside of the pile, or similar equipment, through the limestone and dense marl;
- drive the pipe pile with an impact hammer to the depth required to achieve the allowable bearing and tension capacity;
- install a steel reinforced cage; and
- place concrete within the pipe pile by use of tremie technique.[9]

Construction of the marine facilities structure is anticipated to take place from in-water barges using cranes to facilitate pile driving. The project specifications would allow the contractor to use its discretion regarding construction means and methods. However, the trestle deck would likely feature a structural deck element constructed of pre-stressed/pre-cast concrete, which would allow construction of the trestle from the shore to the LNG marine loading platform using the constructed deck for staging. This construction sequence would allow the contractor to drive materials and construction equipment on the completed portion of the access trestle to facilitate construction of subsequent sections of the access trestle and/or terminal dolphins.

[9] The tremie technique involves the placement of concrete under water using a specialized concrete mix and a vertical pipe that extends from above the water surface to the riverbed or seafloor (University of Washington, 2007).

Construction of the marine facilities berthing area would initially require removal of 179,000 cubic yards of dredged material (silts, sands, and possibly weathered limestone). Eagle LNG estimates that dredging would occur over a 12-week period. Dredging activities would occur predominantly during the day, between about 7:00 a.m. and 6:00 p.m., Monday through Friday. No time-of-year restrictions are anticipated. The dredged material would be removed via hydraulic cutterhead[10] or mechanical dredging equipment and either hydraulically pumped directly into the DMMA basin (hydraulic cutterhead) or slurry pumped from a hopper barge to the permanent DMMA (mechanical dredging). Eagle LNG would construct the permanent DMMA in the upland area west of the LNG terminal's process area to accommodate the entire initial dredge volume, any required maintenance dredging for the life of the LNG facility, and to serve as a single-cell dredged material processing facility. This DMMA would include:

- an earthen containment dike enclosure;
- interior box weirs and piping system for controlled return water discharge;
- a perimeter road for transport and inspection;
- a perimeter ditch and retention basin for stormwater and seepage water management;
- an exterior working pad for equipment access and stockpiling/loading dewatered dredged material; and
- an earthen ramp to allow ingress and egress from the interior basin.

Figure 2.5.3-2 shows the location of the DMMA within the LNG terminal. Figure 2.5.3-3 shows an overview of the dredge area within the St. Johns River.

Eagle LNG plans to separate dredged materials with appropriate engineering properties for use during on-site upland construction. The dredged material would be checked for construction suitability (including quality and presence of any contaminants/pollutants). Soil treatment would be performed as required by the geotechnical engineer (remediation of contaminants, if any, and/or mixing with other soils to attain acceptable soil quality). Before it could be used as fill, the dredge material may require mixing with onshore material excavated during the construction phase. Suitable soil would be removed from the temporary DMMA and placed on the upland portion of the site. Soil compaction or improvement would be performed as required by a geotechnical engineer and equipment-specific criteria. Eagle LNG would comply with any local restrictions that may apply to the disposal/storage of dredged materials within a Federal Emergency Management Agency floodplain. Eagle LNG's *Jacksonville Project Marine Terminal Dredged Material Management Plan* is provided in appendix F. We have reviewed Eagle LNG's plan, and the revised information filed by Eagle LNG on August 16, 2018, and find the plan and updated information acceptable.

To control the potential spread of invasive species from vessel activities and construction, Eagle LNG has prepared a *Noxious and Invasive Weed Control Plan*. Ballast water management is described in section 4.3.2.3.

[10] A "hydraulic cutterhead" is rotating steel head (consisting of hardened cutting blades and a backing ring) that is mounted onto the suction entrance of a hydraulic pipeline and is used to dislodge and remove bottom material (U.S. Army Corps of Engineers, 2003).

Figure 2.5.3-2
Dredged Material Management Area
Jacksonville Project
Duval County, Florida

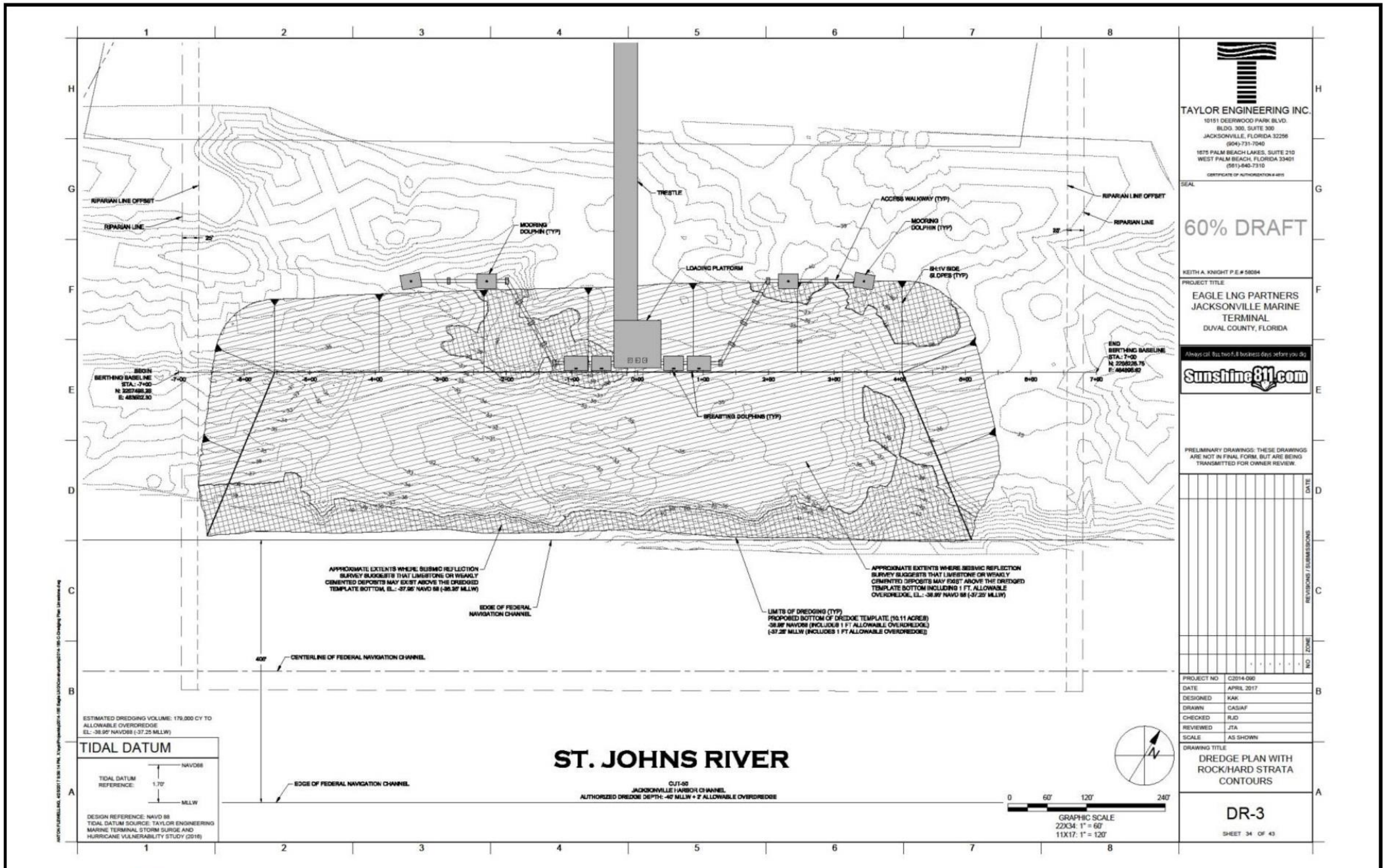

Figure 2.5.3-3
Overview of Dredge Area Within the St. Johns River
Jacksonville Project
Duval County, Florida

2.5.4 LNG Trains

The LNG trains would be designed, constructed, operated, and maintained in accordance with the DOT Federal Safety Standards for Liquefied Natural Gas Facilities at 49 CFR 193 and would meet the LNG Standards under NFPA 59A (2001 ed.). The LNG trains would be constructed using a modular approach. Each individual LNG train would be broken down into process modules, which would be fabricated off site in a fabrication workshop and transported to the site via truck in a specific sequence to allow efficient assembly of the LNG trains. Eagle LNG would use cranes to transfer the modules from the truck and into final position on the piled supports. Equipment, pipes, valves, and electrical and instrument components would be pre-fabricated, mounted to skids, insulated, painted, and tested in the fabrication workshop to ensure quality and reduce on-site installation work. The fabrication workshop currently performs fabrication for multiple projects and would not be constructed or operated solely for the execution of the Jacksonville Project.

2.5.5 LNG Storage and Processing Facilities

After site preparation, the LNG storage tank would be erected on site using conventional construction techniques. Figure 2.5.5-1 depicts the design of a typical LNG storage tank.

The LNG storage tank foundation arrangement includes a reinforced concrete mat supported on grade (see section 2.5.1). Following the installation of the foundation, construction of the tank base, erection of the inner 9-percent nickel steel shell and outer A516-70 steel liner, and pouring of the outer concrete wall would occur. In parallel, the steel dome roof (including installation of roof nozzles, penetrations, and studs) would be constructed on temporary supports and later air-raised into position and secured to the top of the outer concrete container wall. After which, the outer tank concrete roof would be poured. Internal accessories (e.g., pump columns, bottom and top fill, instrument wells, and purge and cool-down piping) would be installed, followed by installation of platforms, walkways, pipework, and pipe supports.

To ensure that the tank is capable of operating at the design pressure, Eagle LNG would complete pneumatic and hydrostatic testing of the outer and inner tanks (respectively) in accordance with the American Petroleum Institute Standard 620. Hydrostatic testing typically involves the installation of a small boat in the tank's interior prior to the start of the hydrostatic test. The small boat floats up with the rising water level and, when the tank is about to be emptied, an operator gets into the boat and power washes the sides of the tank as the water level recedes. Following the discharge of hydrostatic and power wash water, Eagle LNG would install process piping from the tank top down to grade (see section 4.3.2.3 for more information regarding hydrostatic test water and discharge). The required instrumentation would then be installed inside the tank and insulation would be injected into the annular space. After cleaning and visual inspection, Eagle LNG would install the LNG pumps and purge and cool the storage tanks with nitrogen to a positive gauge pressure.

2.5.6 LNG Truck Loading Facilities

After site preparation and foundation work is completed, Eagle LNG would initiate construction of the dual-bay LNG truck loading facilities. Each bay would include cryogenic piping, instrumentation, control panels, and other components that would be skid-mounted at the manufacturer's shop and transported to the site as assembled equipment packages. After installation, Eagle LNG would connect the truck loading skids to the facility piping, electrical, controls, and utility systems. Weigh scales for each loading bay would be delivered to the site as stand-alone components and installed on each truck loading lane. Eagle LNG would verify and test the LNG truck loading systems and controls for proper functioning before placing them into service in accordance with American Society of Mechanical Engineers (ASME) standards.

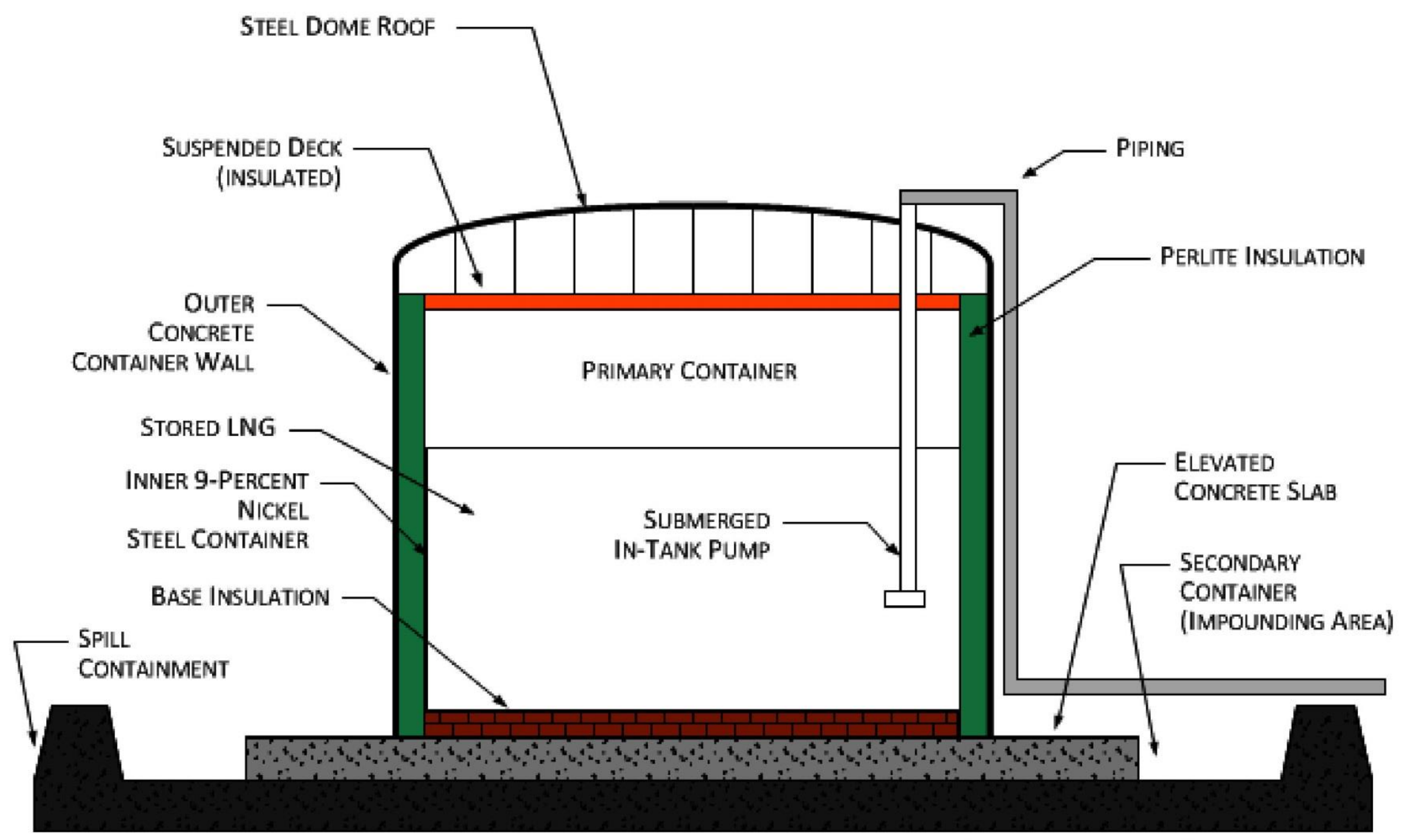

Figure 2.5.5-1
Typical LNG Storage Tank Design
Jacksonville Project
Duval County, Florida

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2.5.7 Site Restoration

Following construction, Eagle LNG would restore the LNG terminal site in accordance with its project-specific Plan and Procedures. All disturbed areas not covered by permanent facilities would be finish-graded, and construction debris would be disposed of properly at an approved, permitted facility. Eagle LNG would cover most areas in and around the LNG terminal, piping, equipment, and maintenance access roads with gravel to minimize the amount of maintenance required. The remaining disturbed areas would be fertilized, seeded, mulched, and monitored according to the requirements of Eagle LNG's Plan and/or in accordance with applicable permits or agency recommendations. Eagle LNG would implement its *Noxious and Invasive Weed Control Plan* to mitigate the introduction of noxious and invasive species within the LNG terminal site. Temporary/interim erosion control measures would be removed once adequate vegetation cover is achieved. After the site is permanently stabilized, Eagle LNG would convert two of the sediment basins used during construction to permanent stormwater control facilities. Eagle LNG would fill the third sediment basin used during construction and construct a new permanent one near the jetty for use during operations.

2.6 OPERATION AND MAINTENANCE PROCEDURES

2.6.1 LNG Terminal Facilities

Eagle LNG would operate and maintain its facilities in compliance with 49 CFR 193, 33 CFR 127, NFPA 59A, and other applicable federal and state regulations. Eagle LNG has prepared a *Draft Emergency Response Plan*[11] (ERP) in accordance with FERC's *Draft Guidance for LNG Terminal Operator's Emergency Response Plan* and the requirements of 49 CFR 193.2509. The ERP establishes procedures for the safe operation of the LNG facility and responding to emergency situations that could affect the public. Before commencing operation of the LNG terminal, Eagle LNG would prepare and submit to FERC for approval an *Operations Execution Plan* and a number of other manuals, procedures, and plans that address safety, reliability, and security during construction, commissioning, startup, and maintenance of the LNG facility in accordance with 49 CFR 193 and NFPA 59A. Eagle LNG would include specific procedures for the safe operation of the ship loading facilities in accordance with 33 CFR 127.305. Operating procedures are required to address normal operations as well as safe startup, shutdown, and emergency conditions.

Eagle LNG would employ a minimum of 8 to 12 personnel during operation of the LNG terminal, each of whom would be trained to properly and safely perform their assigned duties and responsibilities. This training would include the handling of potential hazards associated with LNG, cryogenic operations, and the proper operation of all equipment. The operators would meet all the training requirements of the Coast Guard, DOT, Florida State Fire Marshall, and other regulatory entities.

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

Information regarding safety and security is provided in section 4.12.

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[11] The *Draft Emergency Response Plan* was submitted with Eagle LNG's application as appendix 13.P of Resource Report 13 and is available on FERC's website in RR13_Public Part 2 of 3 at: https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20170131-5314.

3.0 ALTERNATIVES

As required by NEPA and FERC policy, we evaluated alternatives to the Jacksonville Project to determine whether an alternative would be environmentally preferable and/or technically and economically feasible to the proposed action while still meeting the project objectives. The range of alternatives analyzed include the no-action alternative, system alternatives, and terminal site alternatives. These alternatives were evaluated using a specific set of criteria. The evaluation criteria applied to each alternative include a determination whether the alternative:

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

Through environmental comparison and application of our professional judgment, each alternative is considered to a point where it becomes clear if the alternative could or could not meet the three evaluation criteria. To ensure a consistent environmental comparison and to normalize the comparison factors, we generally use desktop sources of information (e.g., publicly available data, geographic information system data, aerial imagery). Where appropriate, we also use site-specific information (e.g., field surveys or detailed designs). Our environmental analysis and this evaluation consider quantitative data (e.g., acreage) and use common comparative factors such as site availability, existing land use, and land requirements.

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

The alternatives were reviewed against the evaluation criteria in the sequence presented above. The first consideration for including an alternative in our analysis is whether or not it could satisfy the stated purpose of the project. Eagle LNG's stated objective for the project is to serve the domestic and export markets for LNG, including:

- export of LNG via LNG carriers to foreign markets, consistent with its DOE authorizations;

- domestic waterway transportation of LNG in bunker vessels for use as vessel fuel in the marine bunkering trade in Florida and nearby states; and

- distribution of LNG in trucks for use as a fuel for long-haul trucking and other domestic uses of LNG.

An alternative that cannot achieve the purpose for the project cannot be considered as an acceptable replacement for the project.

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

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

Our analysis of alternatives is based on project-specific information provided by the applicant, affected landowners, and other concerned parties; comments received during project scoping; publically available information; our consultations with federal and state agencies; and our own research regarding the siting, construction, and operation of natural gas transmission facilities and their impacts on the environment (i.e., our alternatives analysis is comment and resource driven). Unless otherwise noted, we used the same desktop sources of information to standardize comparisons between the project and each alternative. As a result, some of the information presented in this section relative to the project may differ from information presented in section 4.0, which is based on project-specific data derived from field surveys and engineered drawings.

3.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the Jacksonville Project would not be constructed and Eagle LNG's objective of providing the proposed liquefaction and transportation capacity for domestic and export markets of LNG would not be realized. In addition, the potential adverse and beneficial environmental impacts discussed in section 4.0 of this EIS would not occur.

The development and production of gas supplies from conventional and unconventional gas formations has increased in recent years throughout many areas of the United States. With or without the no-action alternative, other LNG export projects could be developed in the Atlantic and Gulf Coast regions or elsewhere in the United States, resulting in both adverse and beneficial environmental impacts. Mid-scale LNG terminal developments and expansion of pipeline systems of similar scope and magnitude to the project would likely result in environmental impacts of comparable significance, especially those projects in a similar regional setting.

The no-action alternative could require that potential end users make different arrangements to obtain LNG from other sources, use other fossil fuel energy sources (e.g., coal or fuel oil), or possibly use traditional long-term energy sources (e.g., nuclear power) and/or renewable energy sources (e.g., solar power) to compensate for the lack of natural gas that would otherwise be supplied by the Jacksonville Project. Although the no-action alternative could also be aligned with a drive to promote international energy conservation, this sphere of discussion lies beyond our analytical scope and would not meet the project purpose. Traditional energy alternatives to natural gas include coal, oil, hydroelectric, and nuclear power. Renewable energy resources such as solar, ocean energy, biomass, wind, landfill gas, and municipal solid waste represent more recent, advanced energy alternatives. Conceivably, each of these energy alternatives could support the generation of electric power, which, along with residential heating, commercial, and industrial uses, is a major consumer of natural gas. However, because the purpose of the Jacksonville Project is to construct and operate a terminal to serve the domestic and export markets for LNG, the development or use of other energy sources would not be a reasonable alternative to the proposed action. Therefore, we have dismissed the no-action alternative as a reasonable alternative to meet the objectives of the Jacksonville Project.

3.2 SYSTEM ALTERNATIVES

We reviewed system alternatives to evaluate the ability of other existing, modified, planned, or proposed facilities to meet the stated objectives of the Jacksonville Project and to determine if a technically and economically feasible system alternative exists that would have a significant environmental advantage over the project.[1] Figure 3.2-1 illustrates the general location of system alternatives for the project. The status identified for each system alternative (e.g., planned, proposed, or approved) is current as of the time this EIS is being written, and is subject to change over time. By definition, implementation of a system alternative would make construction of all or some of the proposed facilities unnecessary; conversely, infrastructure additions or other modifications to the system alternative may be required to increase capacity or provide receipt and delivery capability consistent with that of the proposed facilities. Such modifications may result in environmental impacts that are less than, comparable to, or greater than those associated with construction and operation of the proposed facilities.

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

Eagle LNG is proposing to export LNG to FTA and non-FTA countries. The volume of gas for FTA countries has already been approved by the DOE and the determination of non-FTA would be subject to DOE approval. For Eagle LNG's volumes of LNG to transfer to other facilities that have DOE approval for export, those facilities would need to construct additional LNG production capacity.

In addition to LNG export, Eagle LNG is proposing to load LNG onto LNG barges for marine distribution in the Atlantic and Caribbean Basin as well as onto LNG trucks for road distribution to refueling stations in Florida, Georgia, and the surrounding states. Therefore, obtaining LNG from other facilities would require those facilities to be in the Caribbean or Eastern or Gulf regions of the United States.

The alternatives examined included both existing LNG terminals with planned, proposed, or authorized expansions, as well as new LNG terminals planned, proposed, or authorized on greenfield sites. These potential system alternatives are identified in table 3.2-1. Our analysis was predicated on the assumption that each project has an equal chance of being constructed and would therefore be available as a potential alternative. However, market forces will ultimately decide which and how many of these facilities are built.

As identified in table 3.2-1, there are nine existing LNG terminal sites along the Gulf and East Coasts of the United States with approved, proposed, and/or planned expansion(s) to export LNG to FTA countries. We also identified 15 new LNG projects with approved, proposed, and/or planned LNG terminals located on greenfield sites. All but two of the LNG projects are authorized or have applied to the DOE to export to FTA countries.[2] The NGA, as amended, has deemed FTA exports to be in the public interest; therefore, we will not speculate or conclude that excess capacity is available to accommodate this project's purpose and need. Consequently, the export capacity at any other existing or proposed LNG facility would likely require an expansion to accommodate the necessary additional liquefaction and export facilities similar to the proposed facilities. Although it might be feasible to construct Eagle LNG's proposed facilities at most of the terminal and/or port locations by building additional infrastructure, the expansion would likely result in similar environmental impacts because the impacts would be merely transferred from the proposed site to the alternative location. Moreover, none of the system alternatives would meet Eagle LNG's project purpose. As a result, none of these system alternatives were considered further.

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

2 The DOE, at the applicant's request, vacated Main Pass Energy Hub, LLC's FTA authorization; and Pointe LNG has not filed an export application with the DOE.

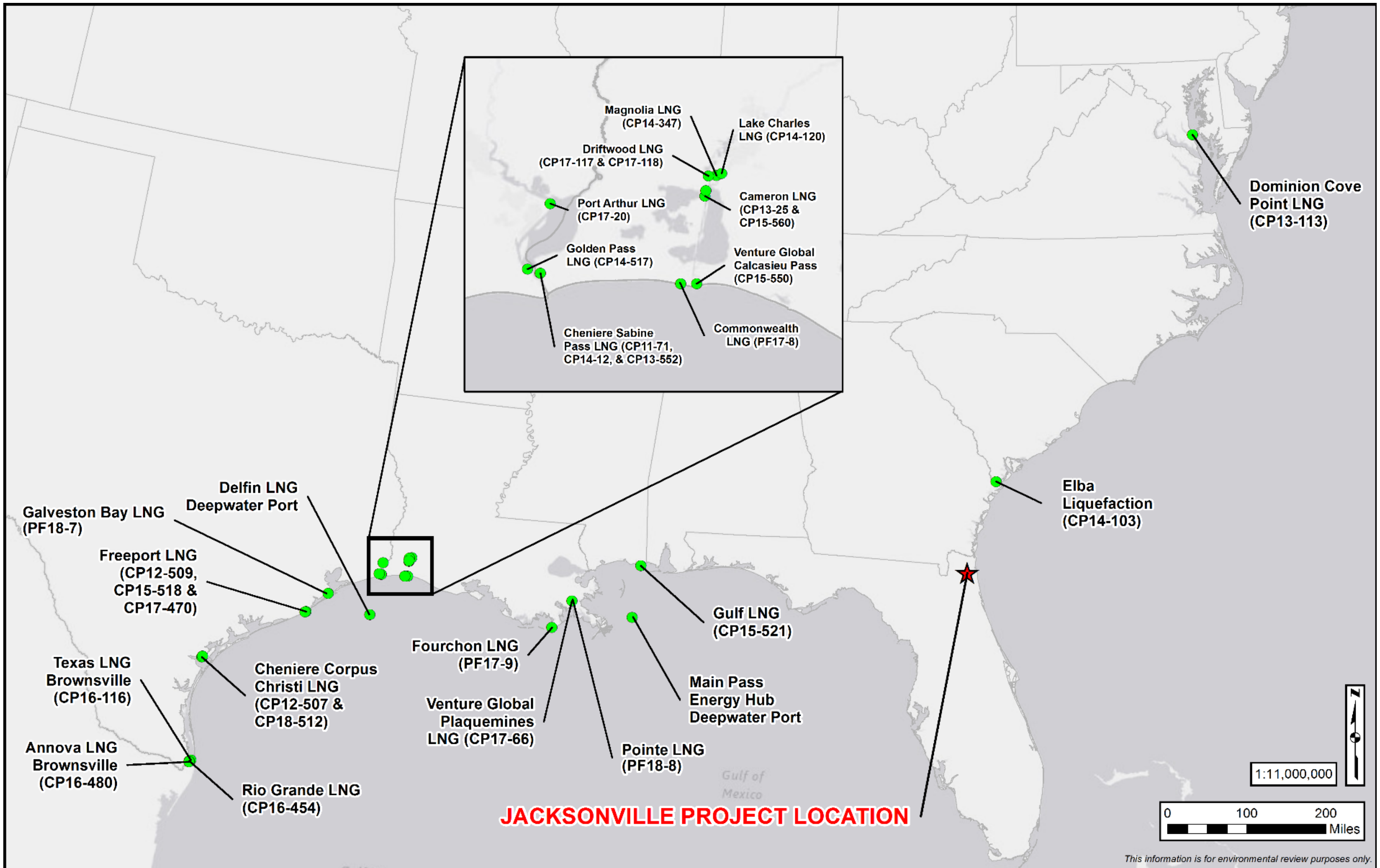

Figure 3.2-1
General Location of System Alternatives
Jacksonville Project
Duval County, Florida

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TABLE 3.2-1

Liquefied Natural Gas Export Terminals with Planned, Proposed, or Approved Liquefaction Projects

Project	MTPA	DOT/FERC Status	Target In-Service Date
EXISTING LNG TERMINAL EXPANSIONS			
Approved Projects			
Sabine Pass LNG – Trains 1– 4	20	Operational, first cargo shipped February 2016	2016
Sabine Pass LNG – Trains 5, 6	9.0	Train 5 operational	2019
Cameron LNG	14.9	Under construction	2019
Cameron LNG Expansion Trains 4, 5	9.9	Authorized May 2016	2019
Freeport LNG	15.3	Under construction	2019–2020
Dominion Cove Point LNG Terminal	6.0	Operational	2018
Lake Charles/Trunkline LNG	15	Authorized December 2015	2019–2020
Elba Liquefaction LNG Terminal	2.5	Under construction	2019
Golden Pass LNG	15.6	Initial site preparation approved September 2017, facility construction pending	2022
Proposed Projects			
Gulf LNG Liquefaction Company	10	Application filed June 2015	2023–2024
Freeport LNG Expansion Train 4	5.1	Application filed June 2017	2022
Planned Projects			
Main Pass Energy Hub Deepwater Port [a]	24	Deepwater port license application not filed	2024
NEW LNG TERMINALS			
Approved Projects			
Corpus Christi LNG	15	Construction completed and currently operational	2019
Magnolia LNG	8	Approval received April 2016	2021
Delfin LNG Deepwater Port	9.2	Approval received March 2017	2021–2022
Venture Global Calcasieu Pass Project	10	Approval received February 2019	2022
Proposed Projects			
Port Arthur LNG	10	Application filed November 2016	2023
Texas LNG	4	Application filed March 2016	2023–2024
Annova LNG	6.95	Application filed July 2016	2024
Rio Grande LNG	27	Application filed May 2016	2023
Venture Global Plaquemines LNG	20	Application filed March 2017	2022
Driftwood LNG	26	Application filed March 2017	2023–2026
Corpus Christi LNG Stage 3	11.45	Application filed June 2018	2021
Planned Projects			
Pointe LNG [b]	6	Pre-filing initiated September 2018	2025
Galveston Bay LNG	5.5	Pre-filing initiated September 2018	2027
Commonwealth LNG	9	Pre-filing initiated August 2017	2022
Fourchon LNG Project	5	Pre-filing initiated August 2017	2021/2023

[a] The DOE, at the applicant's request, vacated Main Pass Energy Hub, LLC's FTA authorization; there are no existing or pending applications/authorizations at the DOE for the applicant.

[b] Pointe LNG has not filed an export application with the DOE.

3.3 TERMINAL SITE ALTERNATIVES

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

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

- Property Size – Based on the proposed design, a waterfront site with at least 40 acres of upland would be needed to build and operate the LNG Terminal and accommodate the proposed facility configuration.

- Existing Land Use – We considered sites located in an industrial/commercial setting preferable to sites located in close proximity to residential development.

- Site Availability – One significant challenge of siting an LNG facility is finding suitable property that is available (for purchase or lease greater than 20 years) with current zoning for industrial development. Availability is critical because section 3 of the NGA does not provide the project proponent the authority of eminent domain in acquiring the property for the LNG terminal. In some cases, a site may possess the available land required for an LNG terminal, but the owner is unwilling to sell or lease the property.

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

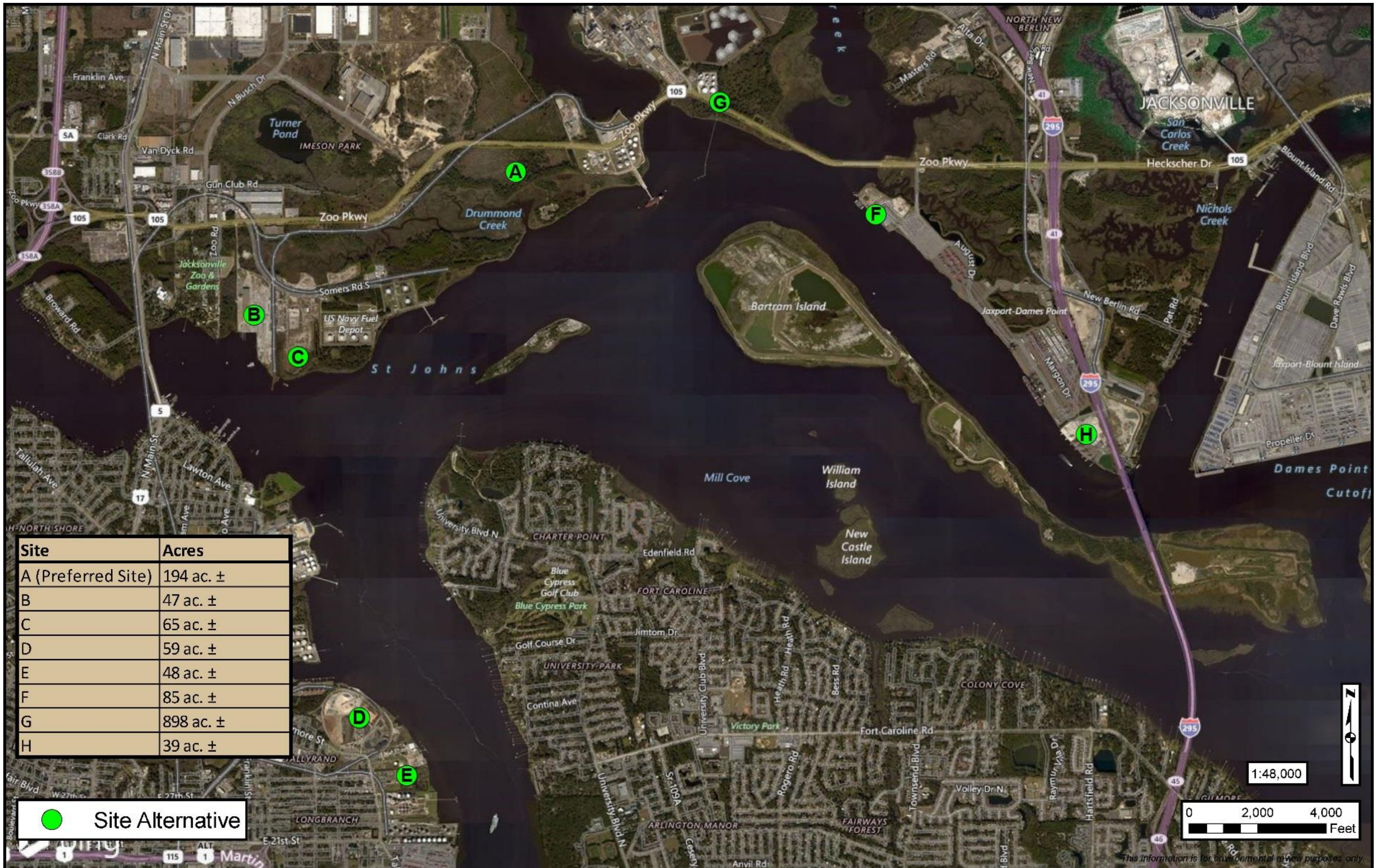
- Population Centers/Residences – Sites that are not in close proximity to population centers or occupied residences were considered preferable.

- Distance to an Interstate Highway – Sites proximate to existing interstate highway(s) (within 10 miles of existing interstate highway) were considered preferable to support LNG trucking.

Using the screening criteria described above, we evaluated seven alternative sites for the LNG terminal (i.e., Sites B, C, D, E, F, G, and H). The general locations of the seven site alternatives along with the proposed site are shown on figure 3.3-1. A comparison of each alternative site to the proposed site is presented in table 3.3-1 and discussed below.

Proposed Site

The proposed Jacksonville Project is on the St. Johns River in Jacksonville, Florida, on a 193.4-acre site currently under purchase agreement negotiations by Eagle LNG. The site consists of 174.1 acres onshore and 19.3 acres of submerged lands within the St. Johns River. The site is currently undeveloped lands zoned for industrial use bordered on the south by the St. Johns River, to the north by Zoo Parkway and other undeveloped lands, and to the east and west by commercial and industrial development and bulk fuel terminals (see sections 4.8.1 and 4.13).



Site	Acres
A (Preferred Site)	194 ac. ±
B	47 ac. ±
C	65 ac. ±
D	59 ac. ±
E	48 ac. ±
F	85 ac. ±
G	898 ac. ±
H	39 ac. ±

Figure 3.3-1
General Location Map of Alternative Sites for LNG Terminal
Jacksonville Project
Duval County, Florida

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TABLE 3.3-1								
Comparison of Alternative Sites for the LNG Terminal								
Selection Criteria	Site A (Proposed Site)	Site B	Site C	Site D	Site E	Site F	Site G	Site H
Property size (acres)	193.4	47	65	59	48	85	898	39
Existing land use	Unde-veloped	Industrial	Industrial	Industrial	Industrial	Commer-cial	Unde-veloped	Industrial
Site availability	Available	Not Available [a]	Not Available [a]	Not Available [a]	Not Available [a]	Not Available [a]	Available	Not Available [a]
Distance to federal channel (mi)	0.2	0.5	0.4	0.2	0.2	0.1	0.3	0.2
Dredging requirements (cubic yards)	179,000	2,548,000	2,580,000	0	245,000	0	0	0
Distance to nearest natural gas pipeline system (miles)	0.0	0.1	0.4	0.0	0.0	<0.1	0.0	0.5
Distance to nearest electric transmission line (miles)	0.2	0.1	0.3	<0.1	<0.1	0.2	<0.1	<0.1
Approximate acreage of wetlands	3.5	10.2	11.5	6.1	6.1	28.8	194.1	0.2
Number of residences within 1.5 miles of site	165	315	290	450	390	65	320	45
Distance to nearest occupied residence (miles)	0.8	0.2	0.4	<0.1	<0.1	0.1	<0.1	0.3
Distance to nearest Interstate highway (miles)	2.9	1.6	2.1	3.1	3.0	1.3	2.1	2.0

[a] These sites were available for lease or purchase during the pre-filing process, but have since become unavailable.

The proposed site meets the screening requirements of waterfront access, is greater than 40 acres in size, and is currently available for purchase. As described in section 2.1.1, Peoples Gas' existing 24-inch-diameter distribution transmission pipeline is along the northern boundary of the LNG terminal site; about 120 feet of 16-inch-diameter interconnect pipeline would facilitate the transportation of natural gas required by the proposed Jacksonville Project. JEA's existing electric transmission facilities are also immediately adjacent to the northern boundary of the LNG terminal site.

Site B

Site B is on a 47-acre parcel of land adjacent to the mouth of the Trout River. The site is graveled and includes a paved parking lot and warehouse building. The previously developed site is zoned for industrial activity and is bordered to the east by commercial and industrial development, to the west and north by undeveloped land and to the south by open water.

Eagle LNG indicated that due to the irregular shape of the property, there is insufficient space available to site the LNG storage tank without significantly increasing costs. The waterfront is not conducive to a dock due to its shallow depth and distance from the federal channel (0.5 mile). Eagle LNG estimates that it would need to dredge about 2,548,000 cubic yards of material to accommodate vessel traffic. Site B is about 0.2 mile from the nearest residence and has about 315 residences within 1.5 miles. In contrast, the nearest residence to the proposed site is 0.8 mile (165 residences within 1.5 miles). In addition, Site B has more National Wetlands Inventory (NWI)-mapped wetlands (10.2 acres) than the proposed site (3.5 acres). For these reasons, we do not consider Site B environmentally preferable to the proposed site, and we do not recommend it. In addition, Eagle LNG indicated that Site B is no longer available for purchase or long-term lease.

Site C

Site C is a 65-acre parcel at the mouth of the Trout River adjacent to the federal channel in the St. Johns River east of Site B. The site includes several concrete pads, an existing building, and is dominated by emergent vegetation. The partially developed site is zoned for industrial activity and is bordered to the east and west by commercial and industrial development, to the north by undeveloped land and roadway, and to the south by undeveloped shoreline on open water. Eagle LNG indicated that due to the irregular shape of the property, there is insufficient space available to site the LNG storage tank without significantly increasing costs.

The waterfront is not conducive to a dock due to its undeveloped shoreline, shallow depth, and distance from the federal channel (0.4 mile). Eagle LNG estimates that it would need to dredge about 2,580,000 cubic yards of material to accommodate vessel traffic. Site C is about 0.4 mile from the nearest residence and has about 290 residences within 1.5 miles. In contrast, the nearest residence to the proposed site is 0.8 mile (165 residences within 1.5 miles). In addition, Site B has more NWI-mapped wetlands (11.5 acres) than the proposed site (3.5 acres). For these reasons, we do not consider Site C to provide a significant environmental advantage to the proposed site, and we do not recommend it. Further, Eagle LNG indicated that Site C is no longer available for purchase or long-term lease.

Site D

Site D is on a 59-acre parcel of land adjacent to the St. Johns River and is currently being used as a bulk material terminal. The site includes several stormwater retention ponds and graveled areas for material storage. The partially developed site is zoned for industrial activity and is bordered to the south by residential development, to the west by forestland and industrial development, to the north by the St. John's River, and east by the JEA Kennedy Generating Station and the St. John's River.

The prior development at Site D included bulk storage on site, which could increase the potential for encountering contaminated material during construction. A residential development is adjacent and southwest of the property (less than 0.1 mile from Site D) and there are about 450 residences within 1.5 miles. In contrast, the nearest residence to the proposed site is 0.8 mile (165 residences within 1.5 miles). In addition, Site D has more NWI-mapped wetlands (6.1 acres) than the proposed site (3.5 acres). An advantage of Site D is that it would not require dredging to accommodate vessel traffic. However, given the potential for contamination, nearby residences, and increases in wetland impacts, we do not consider Site D to provide a significant environmental advantage to the proposed site, and we do not recommend it. In addition, Eagle LNG indicated that Site D is no longer available for purchase or long-term lease.

Site E

Site E is on a 48-acre parcel of land adjacent to the St. Johns River. The site is currently being used by JEA for its Kennedy electric generating station and includes paved roads, electric transmission infrastructure, and office buildings. The partially develop site is zoned for industrial activity and is bordered to the north by industrial development; to the west by a roadway, light commercial property, and a nearby residential neighborhood; to the south by developed land; and to east by open water.

Eagle LNG indicated that, due to the limited uplands, there is insufficient space to site the LNG storage tank without significantly increasing costs. Site E is on the federal channel in the St. Johns River and would require dredging about 245,000 cubic yards of material to accommodate vessel traffic. A residential development is adjacent and west of the property and there are about 390 residences within 1.5 miles. In contrast, the nearest residence to the proposed site is 0.8 mile (165 residences within 1.5 miles). In addition, Site E has more NWI-mapped wetlands (6.1 acres) than the proposed site (3.5 acres). For these reasons, we do not consider Site E to provide a significant environmental advantage to the proposed site, and we do not recommend it. Further, Eagle LNG indicated that Site E is no longer available for purchase or long-term lease.

Site F

Site F is on an 85-acre parcel of land adjacent to the St. Johns River. The site is owned by the Jacksonville Port Authority and is currently used as a cruise terminal. The site includes a paved parking lot, cruise ship terminal building, and ornamental landscaping. The existing site is bordered to the north by wetlands, to the east by industrial property, and to the west and south by open water.

An advantage of Site F is that it is on the federal channel in the St. Johns River and would not require any dredging. Site F would be within 1.5 miles of 100 fewer residences; however, it does have a residence within 0.1 mile of the site. In contrast, the nearest residence to the proposed site is 0.8 mile. Site F has more NWI-mapped wetlands (28.8 acres) than the proposed site (3.5 acres). For these reasons, we do not consider Site F to provide a significant environmental advantage to the proposed site, and we do not recommend it. In addition, Eagle LNG indicated that Site F is no longer available for purchase or long-term lease.

Site G

Site G consists of an 898-acre parcel of land that was available for purchase by Eagle LNG and is crossed by Highway 105. The site contains forestland, wetlands, and open land. The undeveloped site is zoned for industrial activity and is bordered to the north by railroad tracks and residential development, to the west by Eastport Road and industrial property, and to the south and east by open water. In order to access the waterfront, a cryogenic pipeline would need to cross Highway 105 to reach the dock.

An advantage of Site G is that it is on the federal channel in the St. Johns River and would not require dredging. A residential development is adjacent and north of the site (less than 0.1 mile from Site G) and there are about 320 residences within 1.5 miles. In contrast, the nearest residence to the proposed site is 0.8 mile (165 residences within 1.5 miles). In addition, the land has extensive wetlands (with very little uplands to support the LNG storage tank), and the soil is not suitable for siting an LNG terminal without substantial wetland disturbance. Site G has significantly more NWI-mapped wetlands (194.1 acres) than the proposed site (3.5 acres). For these reasons, we do not consider Site G to provide a significant environmental advantage to the proposed site, and we do not recommend it.

Site H

Site H consists of a 39-acre, irregularly shaped parcel of land adjacent to the federal channel in the St. Johns River. The site contains paved and gravel roads, retentions ponds, and areas covered in gravel. The previously developed site is zoned for industrial activity and is bordered to the north by commercial and industrial development, to the west and the south by the St. Johns River, and to the east by Interstate 295. With only a 39-acre parcel, there is insufficient land to support the LNG storage tank without much more expensive containment alternatives, and may not be technologically and economically feasible.

Site H is about 0.3 mile from the nearest residences. In contrast, the nearest residence to the proposed site is 0.8 mile. An advantage of Site H is that it has less NWI-mapped wetlands (0.2 acre) than the proposed site (3.5 acre) and would not require dredging. Even though there would be a reduced impact on NWI-mapped wetlands for Site H, we do not consider it to provide a significant environmental advantage to the proposed site due to the other factors evaluated. Additionally, Eagle LNG indicated that Site H is no longer available for purchase or long-term lease.

Conclusion

Our alternatives impacts analysis is resource and comment driven. We did not receive any comments during scoping suggesting that we evaluate any terminal site alternatives and, based on our review of the project, we did not identify any additional terminal site alternatives that would offer significant environmental advantages over the proposed site. Further, we conclude that the proposed site represents an acceptable site for the proposed LNG terminal. The proposed site is currently zoned for industrial use, sufficiently sized to allow optimal facility layout design, and minimizes the distances for connections to both electric power and natural gas pipelines. It is also geographically separated from area residences, the closest of which is more than 0.8 mile from the proposed site. From a visual impact perspective, the new LNG terminal would be consistent with the existing industrial development bulk fuel terminals along the St. Johns River. In summary, we have determined that Eagle LNG's proposed project, as modified by our recommended mitigation measures, is the preferred alternative that can meet the project's objectives.

4.0 ENVIRONMENTAL IMPACT ANALYSIS

This section describes the affected environment as it currently exists and the environmental consequences of the project. The section is organized by the following major resource topics: geology; soils; water resources; 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 environmental consequences of constructing and operating the project would vary in duration and significance. Four levels of impact duration were considered: temporary, short-term, long-term, and permanent. Temporary impacts generally occur during construction with the resource returning to preconstruction condition almost immediately afterward. Short-term impacts could continue for up to 3 years following construction. Impacts were considered long-term if the resource would require more than 3 years to recover. 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. We considered an impact to be significant if it would result in a substantial adverse change in the physical environment.

Eagle LNG, as part of its proposal, developed certain mitigation measures to reduce the impact of the project. In some cases, we determined that additional mitigation measures could further reduce project impacts. Our additional mitigation measures appear as bulleted, boldfaced paragraphs in the text of this section and are also listed in section 5.2. We will recommend to the Commission that these measures be included as specific conditions in any authorization the Commission may issue to Eagle LNG for the project.

The conclusions in the EIS are based on our analysis of the environmental impact and the following assumptions:

- Eagle LNG would comply with all applicable laws and regulations;
- the proposed facilities would be constructed as described in section 2.0; and
- Eagle LNG would implement our recommended mitigation measures in section 5.2, the mitigation measures included in its application and supplemental submittals to FERC and the cooperating agencies, and other applicable permits and approvals requirements.

4.1 GEOLOGIC CONDITIONS, RESOURCES, AND HAZARDS

4.1.1 Geologic Setting

The project would be within the Sea Island section of the Coastal Plain physiographic province. The Coastal Plain is the flattest of the provinces and stretches over 2,200 miles in length from Cape Cod to the Mexican border and southward another 1,000 miles to the Yucatan Peninsula. The Coastal Plain is comprised of an elevated sea bottom with low topographic relief and extensive marshlands dipping gently seaward from inland highlands. The Sea Island section spans the northeast portion of Florida, Georgia, South Carolina, and North Carolina. This section is characterized by a terraced coastal plain with a submerged margin that is bordered by numerous barrier islands; this section extends westward to the fall line where the Coastal Plain meets the Piedmont physiographic province (National Park Service, 2017).

The project is underlain by undifferentiated sediments of Pleistocene/Holocene age. These sediments primarily consist of unconsolidated clay or mud; unconsolidated beach sand and incidental amounts of unconsolidated peat; coarse-detrital gravel; and freshwater carbonates (Scott et al., 2001). Elevations near the LNG terminal site typically range from sea level to 30 feet above mean sea level.

Eagle LNG performed geotechnical studies to evaluate subsurface soil and groundwater conditions within the site including:

- 47 onshore geotechnical borings ranging in depth from 10 to 150 feet below ground surface (bgs);
- 8 geotechnical offshore borings ranging in depth from 75 to 120 feet bgs;
- 2 temporary piezometers to a depth of 40 and 60 feet bgs; and
- field and laboratory geotechnical tests on the recovered soil samples.

The borings at the LNG terminal site encountered layers of silty sand, clayey sand, and sand to depths of approximately 40 to 60 feet bgs. Below these surficial layers is a layer of clayey sand with intermittent layers of limestone and sandstone, underlain by bedrock (sandstone, limestone, and shale). Onshore bores encountered bedrock in 25 of the 47 samples at depths ranging from 28 to 63 feet bgs. The two piezometer tests showed depth-to-water readings ranging from 7.4 to 24 feet bgs (Fugro, 2016). Offshore geotechnical borings encountered layers of very loose dark gray to light gray clayey fine sand, loose to very firm and slightly silty to silty fine sands with seams of silt and clay to depths of approximately 34 to 40 feet bgs. Between approximately 54 and 70 feet bgs, borings encountered weakly cemented to cemented, highly weathered porous limestone. Below this limestone formation is the Hawthorn Formation, also known as marl. This formation is a highly preconsolidated soil deposit comprised of firm to very dense gray calcareous slightly silty to silty fine to medium sands and slightly clayey to clayey fine sands with varying amounts of phosphate particles (Amec Foster Wheeler, 2016).

4.1.2 Mineral Resources

In Florida, the top five nonfuel minerals in 2010 and 2011 were phosphate rock, crushed stone, Portland cement, sand and gravel, and zirconium (U.S. Geological Survey [USGS], 2015). Based on a review of the USGS topographical maps, recent aerial imagery, and available USGS and FDEP databases, no active mining or extraction of nonfuel mineral resources are within 1 mile of the proposed facilities (USGS, 2017c; FDEP, 2018b, 2018c).

Oil and gas production in Florida is most prevalent in the panhandle and southwestern Florida in Lee, Henry, and Collier Counties. According to the FDEP, there are no current or historic oil and gas wells within 0.25 mile of the project (FDEP, 2014b).

4.1.3 Geologic Hazards

Geologic hazards are natural, physical conditions that can result in damage to land and structures or injury to people. Such hazards typically include seismicity (e.g., earthquakes, surface faults, and soil liquefaction), landslides, flash flooding, and ground subsidence. Conditions necessary for the development of other geologic hazards, including avalanches and volcanism, are not present in the project area. In general, there is a low probability for geologic hazards to significantly affect construction or operation of project facilities. Natural geologic hazards associated with the LNG terminal are discussed in detail in section 4.12.5.2.

4.1.4 Paleontology

Sedimentary rocks underlie the project area, and therefore the region contains many fossils. The Antiquities Act of 1906 and the Paleontological Resources Preservation Act of 2009 protects objects of antiquity and fossils, respectively, on federal lands. No such protection for paleontological resources exists in laws or regulations for non-federal lands. Review of the Fossilworks Paleobiology Database revealed four vertebrate fossil entries in Duval County, including species of fish, marine algae, shark, and walrus (Fossilworks, 2017). However, no paleontological resources were discovered during geotechnical borings at the proposed project site, and based on the stratigraphy of the borings and thickness of surficial undifferentiated sandy soils, it is unlikely that paleontological resources would be encountered during project activities. In the event of a paleontological resources discovery during construction, Eagle LNG developed a *Paleontological Unanticipated Discovery Plan*,[1] which identifies procedures for recognizing and handling vertebrate fossils, including contacting the Florida Museum of Natural History and the Florida Geological Survey. Therefore, we find that paleontological resources would be adequately protected.

4.1.5 Design and Construction of the LNG Terminal

Site preparation, foundation, and facility structure design are described in detail in sections 2.5 and 4.12.5.2.

Geotechnical investigations of the LNG terminal site determined that the onshore project area is classified as Site Class D (stiff soil) based on a site average shear wave velocity that ranged between 540 and 1,180 feet per second. The offshore site area is classified as Site Class F due to the presence of liquefiable soils in accordance with the International Building Code and standard American Society of Civil Engineers (ASCE) 7-05 (Fugro, 2017b). Sites with softer and looser soils in Site Class D have slower shear-wave velocities compared to Site Class B (rock) or Site Class C (very dense soil and soft rock) and would experience some amplifications of surface earthquake ground motions (Kelly, 2006).

As discussed in section 4.1.3.1, Eagle LNG performed a site-specific Seismic Hazard Assessment for the site (Fugro, 2017a). The study concluded that earthquake ground motions at the site that have a 2 percent probability of being exceeded in 50 years (2,475-year return period) have a 1.0-second spectral acceleration value and PGA value of 6 percent g (Fugro, 2017a). Compared to other locations in the United States, the predicted spectral acceleration and PGA value are relatively low and generally correlate with weak to moderate perceived ground shaking and very light to no potential damage to structures (Wald et al., 1999).

4.1.5.1 Submittal of Final Design Documents

The design of the facility is currently at the preliminary front-end-engineering-design (pre-FEED) level of completion. Eagle LNG has proposed a preliminary design and has committed to conducting additional detailed design work for the proposed LNG terminal if the Commission authorizes the project. Information regarding the development of the final design, as detailed below, would need to be reviewed by FERC staff to ensure that the final design addresses the requirements identified in the pre-FEED.

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[1] The P*aleontological Unanticipated Discovery Plan* was included Eagle LNG's application, Resource Report 4, appendix 4.D, which is available at: http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20170131-5314.

Therefore, FERC staff recommends in section 4.12.6 that Eagle LNG file the requested information, stamped and sealed by the professional engineer-of-record licensed in Florida.

4.1.6 General Impacts and Mitigation

Construction and operation of the LNG terminal would affect 92.2 acres of the 193-acre site. Eagle LNG would clear, grade, and fill about 70.7 acres to the extent necessary to install the facilities on a level platform with sufficient space to execute the work safely. Of these 70.7 acres, Eagle LNG would retain 24.7 acres as open space, fence line, and berm. Final grade surfacing and landscape for the remainder of the project site would consist of gravel, asphalt, and concrete.

The LNG terminal would also require the dredging of about 179,000 cubic yards of material from a 10.1-acre area within the St. Johns River to construct the marine facility. Sediment removal would occur using a hydraulic cutterhead or mechanical dredging equipment. Eagle LNG created a Marine Terminal Dredging and Dredged Material Management Area Plan (Taylor Engineering, Inc., 2017a), which outlines procedures for dredging and on-site dredged material management as well as periodic removal of dredged material to an off-site disposal area (see section 4.3.2.3 for more information). We have reviewed this plan and determined that it would adequately manage the dredging activities and waste generated.

During construction and operation of the LNG terminal, Eagle LNG would implement measures outlined in its project-specific Plan and Procedures to minimize shoreline erosion, including but not limited to installing and maintaining temporary erosion controls, as needed, and restoring vegetation following completion of the project. To minimize impacts of shoreline erosion further, Eagle LNG would install rubble revetment along the shoreline from mean high water mark to +10 feet-NAVD88 as outlined in the Taylor Engineering, Inc.'s Erosion Evaluation and Protection study (Taylor Engineering, Inc., 2016a). State regulations require that the revetment not extend below the mean high water mark, which is +1.01 feet-NAVD88 at the project site. Revetment stone size specifications and design would meet the Florida Department of Transportation Bank and Shore stone specifications and other state and federal requirements (Taylor Engineering, Inc., 2016a).

Construction and operation of the project would not materially alter the geologic conditions of the project area, and the project would not affect the extraction of mineral resources during construction or operation. Blasting is not anticipated during construction of the project. Based on Eagle LNG's proposal, including implementation of the project-specific Plan and Procedures, we conclude that impacts on geologic resources would be adequately minimized and would not be significant.

4.2 SOILS

4.2.1 Existing Soil Resources

Existing soil characteristics in the project area were assessed using the Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database (Soil Survey Staff, 2017), and geotechnical investigations conducted at the site. The mapped soils in the project area are Arents, Boulogne fine sand, Penney find sand, Pottsburg fine sand, and Tisonia mucky peat. These soils have slopes ranging from 0 to 5 percent. The Arents soil series consists of somewhat poorly drained soils with a loamy sand surface texture found in flatwoods. The Boulogne soil series consists of poorly drained soils with sand to fine sand surface texture also found in flatwoods. The Penney soil series consists of excessively drained soils with sand to fine sand surface texture found on rises within the Lower Coastal Plain. The Pottsburg soil series consists of somewhat poorly drained soils with fine sand surface texture found in flatwoods. The

Tisonia soil series consists of very poorly drained soils with a clay surface texture found in tidal marshes (Soil Survey Staff, 2017).

Project area soils were evaluated to identify prime farmland, unique farmland, and farmland of statewide or local importance, as well as major soil characteristics that could affect construction or increase the potential for adverse construction-related soil impacts. Such soil limitations include hydric soils, erosion potential, compaction potential, shallow bedrock (bedrock within 60 inches of the ground surface), rocky soils, and soils with revegetation concerns. No soils classified as farmland, unique farmland, or farmland of statewide or local importance, no soils underlain by shallow bedrock, and no rocky or highly water erodible soils are present in the project area. The soil characteristics associated with the construction and operation of the project are provided in tables 4.2.1-1 (construction impacts) and 4.2.1-2 (operational impacts). The sections below discuss individual soil characteristics and the mitigation measures Eagle LNG would employ.

4.2.1.1 Erosion

Soil erosion is the wearing away of physical soil properties by wind and water, and could result in a loss of soil structure, organic matter, and nutrients, all of which, when present, contribute to healthy plant growth and ecosystem stability. While project area soils are not considered highly water erodible, clearing, grading, and equipment movement can accelerate the erosion process (via both wind and water) and, without adequate protection, result in discharge of sediment to waterbodies and wetlands. Factors such as soil texture, structure, slope, vegetation cover, rainfall intensity, and wind intensity can influence the degree of erosion.

Slope angles affect wind erosion processes less than water processes. Wind-induced erosion often occurs on dry soil where vegetation cover is sparse and strong winds are prevalent. Susceptibility to wind erosion was based on the wind erodibility group (WEG) designation, where available, which is a grouping of soils that have similar surface-soil properties affecting their resistance to soil blowing, including texture, organic matter content, and aggregate stability. WEGs may range from 1 to 8, with 1 being the highest potential for wind erosion, and 8 the lowest (Soil Survey Staff, 2017). Soils with a WEG of 1 or 2 are considered highly erodible by wind.

Based on the WEG designations discussed above, about 88 percent (81.2 acres) of the project area soils are considered highly wind erodible. Of these, 87 percent (70.6 acres) would be permanently occupied by the LNG terminal aboveground facilities or DMMA, or would be permanently covered with concrete or gravel.

4.2.1.2 Hydric Soils

Hydric soils are those “soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part” (U.S. Department of Agriculture [USDA] NRCS, 2016). A soil that is drained or protected (for instance, by dikes or levees) meets the definition of a hydric soil if the upper part formed under anaerobic conditions in an unaltered state. Generally, hydric soils are those soils that are poorly or very poorly drained. Hydric soils may indicate the presence of wetlands. Eagle LNG delineated wetland areas containing hydric soils within the entire project area as described in section 4.4.1. Section 4.4.2 provides detailed information about the location of wetlands affected by the project.

Less than one percent (0.7 acre) of the project area soils are considered hydric; all hydric soils would be permanently affected by the operation of the project.

TABLE 4.2.1-1

Summary of Soil Characteristics Associated with Construction of the Jacksonville Project (acres) [a]

Facility	Total	Hydric	Highly Erodible Wind [b]	Compaction Prone [c]	Revegetation Concerns [d]
Terrestrial facilities					
Switchyard area	3.9	0.0	3.9	3.9	3.9
Ground flare area	0.3	0.0	0.3	0.3	0.0
Feed gas metering and utilities	3.4	0.0	3.4	3.4	3.4
Liquefaction trains	5.2	0.0	5.2	5.2	3.8
Stormwater ponds	3.7	<0.1	3.7	3.7	0.2
LNG storage and impoundment	4.0	0.0	4.0	4.0	0.0
Truck loading and refrigerant storage	2.4	0.0	2.4	2.4	0.4
Buildings and equipment	0.9	0.0	0.9	0.9	0.2
Roads and parking	8.6	0.0	8.6	8.6	5.9
Jetty access and operations	2.3	0.0	2.3	2.3	0.0
Dredge material management area	15.9	0.0	15.9	15.9	15.5
Construction laydown areas /facility open area, fence line, berm	30.0	0.4	29.5	30.0	1.3
Subtotal [e]	80.6	0.4	80.1	80.6	34.6
Marine facilities					
Dredging template	10.1	0.0	0.0	0.0	0.0
Marine terminal and trestle	1.6	0.0	1.1	1.1	0.0
Subtotal [e]	11.7	0.0	1.1	1.1	0.0
Total [e]	**92.2**	**0.4**	**81.2**	**81.7**	**34.6**

[a] None of the project soils are prime farmland, highly erodible by water, rocky, or contain shallow bedrock.

[b] Includes soils in wind erodibility groups 1 and 2, which includes soils with poor aggregation that are particularly susceptible to wind erosion.

[c] Compaction prone soils include those ranked as moderate and high.

[d] Includes coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained and soils with an average slope greater than 8 percent.

[e] Due to rounding, the subtotals and totals shown in this table may not equal the sums of the addends; not all soils are classified with limitations and certain soils are classified as having multiple limitations.

Source: Soil Survey Staff, 2017

TABLE 4.2.1-2

Summary of Soil Characteristics Associated with Operation of the Jacksonville Project (acres) [a]

Facility	Total	Hydric	Highly Erodible Wind [b]	Compaction Prone [c]	Revegetation Concerns [d]
Terrestrial facilities					
Switchyard area	3.7	0.0	3.7	3.7	3.7
Ground flare area	0.3	0.0	0.3	0.3	0.0
Feed gas metering and utilities	2.9	0.0	2.9	2.9	2.9
Liquefaction trains	5.2	0.0	5.2	5.2	3.8
Stormwater ponds	2.3	0.0	2.3	2.3	0.2
LNG storage and impoundment	4.0	0.0	4.0	4.0	0.0
Truck loading and refrigerant storage	1.1	0.0	1.1	1.1	0.0
Buildings and equipment	0.9	0.0	0.9	0.9	0.2
Roads and parking	6.9	0.0	6.9	6.9	3.9
Jetty access and operations	2.3	0.0	2.3	2.3	0.0
Dredge material management area	15.6	0.0	15.6	15.6	15.5
Construction laydown areas /facility open area, fence line, berm	24.7	0.4	24.3	24.7	3.8
Subtotal [e]	69.9	0.4	69.5	69.9	34.0
Marine facilities					
Dredging template	10.1	0.0	0.0	0.0	0.0
Marine terminal and trestle	1.6	0.0	1.1	1.1	0.0
Subtotal [e]	11.7	0.0	1.1	1.1	0.0
Total [e]	**81.5** [f]	**0.4**	**70.6**	**71.0**	**34.0**

[a] None of the project soils are prime farmland, highly erodible by water, rocky, or contain shallow bedrock.

[b] Includes soils in wind erodibility groups 1 and 2, which includes soils with poor aggregation that are particularly susceptible to wind erosion.

[c] Compaction prone soils include those ranked as moderate and high.

[d] Includes coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained and soils with an average slope greater than 8 percent.

[e] Due to rounding, the subtotals and totals shown in this table may not equal the sums of the addends.

[f] Soil impacts total 81.5 acres instead of 81.8 acres because the DMMA discharge pipe would not involve any ground/soil disturbance.

Source: Soil Survey Staff, 2017

4.2.1.3 Compaction Potential

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

The degree of compaction potential was evaluated based on the drainage class of the soils. Very poorly and poorly drained soils were considered to have a high potential for compaction. Somewhat poorly to moderately well drained soils were considered to have a moderate potential for soil compaction. Well drained to excessively drained soils were considered to have a low potential for soil compaction. Soils with a high potential for compaction and structural damage in the project area are typically very poorly drained soils in wetlands with an organic soil component.

About 89 percent (81.7 acres) of the project area soils are considered compaction prone, all of which have a "moderate" compaction prone classification. Of these, 87 percent (71.0 acres) would be permanently affected by the operation of the project, and the remaining 10.7 acres would be restored and allowed to revegetate. Section 4.4.2 includes a discussion of special construction procedures within wetlands.

4.2.1.4 Revegetation Potential

NRCS official series descriptions and county soil surveys were evaluated to determine the ability of soils to support successful revegetation. The drainage class, slope class, and erosion potential of each soil type was evaluated to determine revegetation potential. Other considerations included whether the mapped soils were natural, human transported, or disturbed.

Revegetation may be difficult in drought vulnerable soils that have coarse-textured surface layers and that are moderately to excessively well drained. Drier soils have less water to aid in the germination and eventual establishment of new vegetation. Coarser textured soils also have a lower water holding capacity following precipitation, which could result in moisture deficiencies in the root zone, creating unfavorable conditions for many plants. Drought vulnerable soils within the project area were identified by querying the SSURGO database for component soil series that have a surface texture of sandy loam or coarser, and are moderately well to excessively drained. In addition, steep slopes may make the reestablishment of vegetation difficult; however, project area slopes do not exceed 8 percent. Therefore, this factor was not used in identifying soils with limited revegetation potential.

About 38 percent (34.6 acres) of the project area soils are considered to have revegetation concerns. Construction of the project would permanently affect 98 percent (34.0 acres) of these soils, and the remaining 0.6 acre would be allowed to revegetate (see section 4.2.3 for more information).

4.2.2 Soil Contamination

State and federal databases and geographic information system data including brownfields, superfund, groundwater contamination, petroleum cleanup/remediation, drycleaner cleanup sites, Resource Conservation and Recovery Act (RCRA) Corrective Action sites, large quantity hazardous waste generators, small quantity hazardous waste generators, state cleanup program, registered storage tanks, NPDES, and solid waste sites were reviewed to determine if any potential and/or actual sources of contamination are within the proposed project area (FDEP, 2018d; EPA, 2017b). Multiple sites were found within 1 mile of the project. However, based on the nature of the contamination and groundwater flow direction, these sites are unlikely to affect or be affected by construction and operation of the project because the project is proposed hydraulically upgradient of the contamination sources. See section 4.3.1.4 for more information.

Eagle LNG conducted sediment sampling and analysis at 12 locations within the proposed dredging area for the project and tested for polycyclic aromatic hydrocarbons, organochlorine pesticides, polychlorinated biphenyls, tributyltins, and metals (including arsenic, aluminum, copper, lead, cadmium, mercury, nickel, and zinc). Test results showed that the concentrations of the above-referenced analytes were below the Soil Cleanup Target Levels (SCTL) for commercial and industrial use provided by FDEP (2013) for all samples. Given the proposed use of Jacksonville Port Authority (JAXPORT) local dredged material management areas for the periodic disposal of dredged material from the on-site DMMA and the fact that no sediment samples exceeded the commercial and industrial SCTLs, no impacts associated with contaminated sediments are anticipated.

4.2.3 Impacts and Mitigation

Typical soil impacts that may occur during construction include mixing of topsoil and subsoil layers, compaction, rutting, erosion, and alteration of drainage characteristics. Construction activities such as clearing, grading, excavation, backfilling, heavy equipment traffic, and restoration have the potential to adversely affect natural soil characteristics such as water infiltration, storage, and routing, and soil nutrient levels, thus reducing soil productivity. Clearing removes protective vegetation cover and exposes soil to the effects of wind and water, which potentially increases the potential for soil erosion and the transport of sediment to sensitive resource areas.

To minimize the impacts of construction on soils, Eagle LNG would implement its project-specific Plan and Procedures. The Plan and Procedures include measures to control erosion and sedimentation during construction, to limit soil compaction, and to ensure proper revegetation of disturbed areas following construction. Relevant mitigation measures specified in Eagle LNG's project-specific Plan and Procedures include the following:

- Temporary erosion control measures (e.g., sediment barriers, check dams, sandbags, waddles) would be installed during construction.
- Temporary perimeter controls (e.g., silt fences, straw bales) would be installed during construction. All straw bales would be certified weed free.
- Dust suppression, via water application, would be used as necessary to control and minimize wind erosion. Additional dust prevention measures would be developed and permitted through the City of Jacksonville, which may include wind fences.
- Where soils are unstable and saturated, stable temporary work surfaces (e.g., timber mats) may be constructed to minimize compaction and rutting.
- An EI would monitor field conditions daily to ensure that the erosion and sedimentation control measures are functional and adequate until the construction workspace is fully stabilized.

The majority of the soils disturbed within the LNG terminal site would be permanently affected (81.8 acres) by paved or gravel plant roads, occupied by aboveground facilities, or remain in open water, which would minimize erosion potential. Eagle LNG would comply with seed, fertilizer, and soil additive recommendations by the NRCS and the City of Jacksonville for the remaining 10.4 acres within the LNG terminal site, including the 0.6 acre of soil with revegetation concerns, which would help ensure successful revegetation of all soils on the project site. Eagle LNG is in the process of applying for the City of

Jacksonville 10-set approval permits which would require seeding for permanent and temporary stabilization. Eagle LNG has committed to complying with city requirements during project construction including:

- installing double silt fence barriers in areas adjacent to the St. Johns River and associated wetlands;

- limiting temporary slopes to 1.5 horizontal to 1 vertical slopes and permanent slopes to 4 horizontal to 1 vertical;

- applying temporary soil stabilization measures within the first 7 days to cleared areas that would remain dormant for 30 days or more. These measures may include seeding of rapidly growing vegetation and/or application of biodegradable liquid copolymer erosion control products; and

- applying long-term soil stabilization measures to cleared areas that would remain dormant for 12 months or longer. These measures may include planting permanent vegetation or placement of riprap, gravel, mulch, or other ground cover.

Soils underlying aboveground facility foundations would be permanently affected by compaction, and alteration of soil drainage characteristics may occur. Eagle LNG would restore the remaining 10.7 acres of compaction prone soils not permanently affected by the project in accordance with the project-specific Plan and Procedures. Therefore, we have determined that the effects of compaction would be highly localized and minor.

Construction contractors would remove debris (e.g., rock, timber), and would restore temporary work areas to their preconstruction conditions. Eagle LNG would conduct post-construction monitoring of mitigation measures to ensure their successful implementation. Disturbed areas would be monitored following construction for at least the first and second growing seasons in upland areas and at least 3 years in wetlands until revegetation is successful, as detailed in the project-specific Plan and Procedures.

Soil contamination may result from hazardous material or fuel spills during construction and/or from construction occurring in pre-existing undocumented or unidentified contaminated areas. To prevent contamination of soils within nearby uplands, wetlands, waterbodies, and other sensitive resources, Eagle LNG developed a CSCWM Plan. During construction, Eagle LNG and its contractor would implement the CSCWM Plan to minimize accidental spills of materials that may contaminate soils, and to ensure that inadvertent spills of fuels, lubricants, or solvents are contained, cleaned up, and disposed of as quickly as possible in an appropriate manner. We have reviewed the CSCWM Plan and find it acceptable. During project operation, Eagle LNG would implement its SPCC Plan, which it has committed to filing with the Secretary of the Commission (Secretary) prior to the start of construction.

Eagle LNG would also require its construction contractor to develop an *Unanticipated Discovery of Contaminated Soils Plan*. This plan would include guidelines for identifying contaminated soils, isolating the contaminated area, notifying the appropriate agencies, and monitoring conditions. Because this plan has yet to be submitted to FERC for review, **we recommend that:**

- **<u>Prior to construction</u>, Eagle LNG should file with the Secretary of the Commission (Secretary), for review and written approval by the Director of the Office of Energy Projects (OEP), a copy of its Unanticipated Discovery of Contaminated Soils Plan.**

Impacts on soils due to construction and operation of the project would be permanent. However, with implementation of the impact minimization and mitigation measures described above, we conclude that impacts would not be significant.

4.3 WATER RESOURCES

4.3.1 Groundwater

The Jacksonville Project is within the Floridan aquifer system, which underlies all of Florida as well as portions of Alabama, Georgia, and South Carolina, and encompasses about 100,000 square miles (USGS, 1990). This aquifer system is primarily comprised of limestone and dolomite dating to the Tertiary period and generally thickens seaward from a thin edge near its northern extent (USGS, 2018a). The Floridan aquifer system, composed of the upper Floridan aquifer, middle confining and composite units, and lower Floridan aquifer, is generally between 1,800 and 2,400 feet thick and occurs at a depth of 250 or more feet near the project area (USGS, 2018; City of Jacksonville, 2018). In 2010, the Floridan aquifer system provided over 3 billion gallons of groundwater per day to all users, and it supplies drinking water to large municipalities in the area, including Jacksonville, Florida (FDEP, 2015a; USGS, 2018b). In the project area, the Floridan aquifer system is under artesian flow conditions with a potentiometric surface of about 30 feet above land surface (Florida Geological Survey, 2016).[2] Eagle LNG reports that Floridan aquifer wells in this area are capable of producing about 1,500 gallons of water per minute.

A surficial aquifer system overlies the Floridan aquifer in northeast Florida. The lithology of this aquifer system varies, but generally consists of beds of unconsolidated sand, shelly sand, and shell. Groundwater in the surficial aquifer generally moves from higher to lower elevation along short flowpaths before discharging as baseflow into surface waters (FDEP, 2004a). The surficial aquifer is typically less than 50 feet thick. The surficial aquifer provides water for domestic, commercial, and small municipal water supplies (FDEP, 2015a). Of the 47 soil borings conducted at the site, 17 encountered water. Depth to water ranged from a minimum of 4.5 feet to a maximum of 32.5 feet with an average depth to water of 17.4 feet.

In the project area, a thick clay layer separates the surficial aquifer from the Floridan aquifer, which is about 500 feet below ground surface (Phelps, 1994). In Duval County, about 122 million gallons per day are pumped from the Floridan aquifer for the public water supply (Borisova and Rogers, 2014; City of Jacksonville, 2018). The USGS reported that there has been a gradual intrusion of saltwater into the Floridan aquifer system in Nassau, Duval, and St. Johns Counties, though the mechanism of intrusion is unclear.

4.3.1.1 Springs

Based on a review of publically available electronic databases from the FDEP, no springs are within a 0.5-mile radius of the project (Harrington, 2016).

4.3.1.2 Public and Private Groundwater Wells

Based on review of publically available electronic databases from the FDEP, no public or private groundwater wells are within 150 feet of the project (FDEP, 2000, 2003, 2015d).

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[2] A potentiometric surface is a hypothetical surface to which groundwater would rise in tightly cased wells that tap a confined aquifer (Lohman, 1975).

4.3.1.3 Water Supply Wells

The FDEP implements the Source Water Assessment and Protection Program in compliance with the *Safe Drinking Water Act of 1974*, as amended. The Source Water Assessment and Protection Program divides public water supply wells into three categories:

1. non-community water systems that require a 500-foot assessment radius around the well;

2. community water systems serving populations less than 1,000 persons that require a 1,000-foot assessment radius around the well; and

3. community water systems serving populations greater than or equal to 1,000 persons that require a 1,000-foot assessment radius around the well and a 5-year groundwater travel time (FDEP, 2004a).

Based on a review of publically available electronic mapping, no water system assessment areas overlap the project area (FDEP, 2009, 2014a). Additionally, based on a review of publically available electronic databases from the FDEP, no wellhead protection areas are within the project boundaries (FDEP, 2009).

4.3.1.4 Groundwater Quality

The FDEP runs the Aquifer Protection Program to establish quality standards of groundwater produced in Florida. Under the Federal Safe Drinking Water Act, implemented at the state level by the FDEP, the EPA has established the primary Maximum Contaminant Level (MCL) for pollutants that may pose a health risk in public drinking water. A primary MCL is the highest level of a contaminant that the EPA allows in public drinking water. The secondary MCLs set by the EPA are non-enforceable guidelines for the taste, odor, or appearance of water (EPA, 2017a).

The most current FDEP groundwater quality assessment in the project vicinity is in the *Final Integrated Water Quality Assessment for Florida: 2018 Sections 303(d), 305(b), and 314 Report and Listing Update,* published in June 2018. The report found that 19 percent of groundwater samples did not meet MCL standards for coliform and 13 percent did not meet MCL standards for sodium during the 2015 through 2016 monitoring period in the Lower St. Johns River Basin. Additionally, during the same monitoring period for the Lower St. Johns – Floridan Aquifer System, one public water system exceeded the MCL for volatile organic compounds, two public water systems exceeded the MCL for synthetic organic chemicals, and one public water system exceeded the MCL for saline water. Finally, in assessing the surface water/groundwater interaction, the report indicated that unconfined aquifers that have the potential to interact with streams within the Lower St. Johns River basin had a dissolved oxygen level lower than the median average, and iron and phosphorus levels higher than the median average of Florida streams (FDEP, 2018a).

We reviewed state and federal databases and geographic information system data including brownfields, superfund, groundwater contamination, petroleum cleanup/remediation, drycleaner cleanup sites, HAZWASTE site, large quantity hazardous waste generators, small quantity hazardous waste generators, state cleanup program, registered storage tanks, NPDES, and solid waste sites to determine if any potential sources of groundwater contamination are within the proposed project area (FDEP, 2018d; EPA, 2017b). We identified seven sites of known groundwater contamination within a 1-mile radius of the project, including four active petroleum cleanup sites and three pending petroleum cleanup sites. Contaminants identified include benzene, ethylbenzene, xylenes, naphthalene, 1-methyl naphthalene, 2-methyl naphthalene, toluene, total petroleum hydrocarbons, and methyl tertiary butyl ether. The closest site is about 0.3 mile east of the project adjacent to the river. Eagle LNG evaluated the surficial aquifer water table flow directions from these sites and determined the project is hydraulically upgradient from the source of contamination. Construction of the project would not likely change the groundwater flow paths from the contaminated sites. Additionally, four of these contaminated sites are currently subject to remedial action/monitoring programs that would restrict the likelihood of contaminant migration. Therefore, we conclude that it is unlikely that contaminated groundwater would be encountered during construction or operation of the project and no significant impacts would occur.

4.3.1.5 Groundwater Impacts and Mitigation

Construction

The majority of construction associated with the project would involve shallow, temporary, and localized excavation, with the exception of the installation of two water supply wells around the upland facilities, dredging within the St. Johns River, and the installation of piles to support the marine facility and marine jetty. Shallow surficial aquifers could sustain minor, indirect impacts from changes in overland water flow and recharge areas caused by clearing and grading of work areas. In addition, near-surface soil compaction caused by heavy construction vehicles could reduce the soil’s ability to absorb water. Excavation and backfill could affect local water table elevations during construction. In areas where groundwater is near the surface, excavation may intersect the water table, in which case dewatering could also temporarily impact local water tables. However, we conclude these minor impacts would be temporary and would not significantly affect groundwater resources or change groundwater flow patterns.

The LNG terminal would use two new groundwater wells during operation of the facility for service/potable water and for firewater protection (see section 4.3.1.5). The target drill depth for each well would be 600 feet below land surface to obtain water from the Floridan aquifer. Concrete and steel piles required for LNG ship loading and berthing areas would be driven to a depth of about 95 feet below NAVD88. These piles would likely enter the surficial aquifer, but would not intersect the Floridan aquifer. This would limit impacts on the confining layer between the aquifers. We conclude that these direct and indirect impacts would have a temporary and minor impact on groundwater resources. To further minimize or avoid potential impacts on groundwater, Eagle LNG would implement the measures in its project-specific Plan and Procedures.

Following construction of the LNG terminal, the portion of the ground surface that is not paved, is not part of the stormwater system, or is not occupied by the aboveground facilities would be revegetated or graveled to eliminate exposed soils and to ensure restoration of overland flow and recharge patterns. The operational footprint for the project would be about 81.8 acres, of which, about 13.5 acres would be converted to impervious cover after construction. The remaining 68.3 acres would be vegetated land, gravel, or open water. Because a relatively small area of the project would be impervious surface, we conclude that impacts on groundwater recharge to the shallow aquifers would be minimal.

Contamination

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

To minimize potential contamination, Eagle LNG would implement its project-specific Plan and Procedures and CSCWM Plan during facility construction, and its SPCC Plan during operation. These plans would identify preventive measures to reduce the likelihood of a spill (e.g., secondary containment for petroleum products, daily vehicle inspection for leaks, and restrictions on the transport of potentially hazardous materials to the construction work areas) and specify measures to contain and clean up a spill should one occur. In addition, these plans would address the storage and transfer of hazardous materials and petroleum products. The proper implementation of these plans would minimize the potential for groundwater impacts associated with an inadvertent spill of hazardous materials during construction and operation of the project.

During construction of the marine terminal, Eagle LNG's contractor would drive piles to a maximum depth of about 95 feet below NAVD88 to support the marine terminal structures and access jetty. The use of pile foundations can increase the potential for contamination of isolated aquifer layers through seepage from one layer to another. Additionally, deep pile foundations can act as a transport mechanism for surficial contamination into deep, previously uncontaminated water-bearing zones. While the piles would likely penetrate the surficial aquifer, the piles would not penetrate the Floridan aquifer. Based on the bore logs completed by Eagle LNG, the majority of the piles would be driven into limestone occurring within about 10 feet of the mudline after dredging is complete. Potential contamination flow paths resulting from pile installation would be minimized by establishing pilot holes in the limestone that are 2 to 3 inches smaller than the gross diameter of the pile. The pilot holes would ensure a tight fit when installing the piles and would reduce the potential for flow paths reaching surficial groundwater layers.

Groundwater Withdrawals

Eagle LNG proposes to install two on-site water wells, which would be the primary source of construction water. Eagle LNG would obtain a consumptive use permit from the St. Johns River Water Management District for construction of the on-site wells. One well would provide fire water and would not require any water quality sampling. The second well would be a service water well to supply potable water for safety showers and buildings. The service water well would qualify as a Limited Use Public Water System under 64E-8, FAC. Eagle LNG would acquire a Department of Health Operating Permit, which requires water quality analysis for coliform bacteria, nitrates, and lead pursuant to 64E-8.002(9), FAC.

On average, a total of 135,000 gallons per day would be required for construction activities, which include dust control, soil compaction, concrete curing, vehicle washing, and a small amount for construction worker potable water needs. About 8.4 million gallons of water would be required for one-time hydrostatic testing of the LNG storage tank, firewater tank, potable/service water tank, and underground systems. Following the completion of hydrostatic testing, the water would be treated through turbulence to neutralize the pH and sent through a filter system to remove any particulates before being discharged to the on-site stormwater system, and in accordance with Eagle LNG's NPDES permit. During facility operation, Eagle LNG would withdraw approximately 9,800 gallons of groundwater per day for drinking water, sanitation, emergency showers, and other freshwater needs.

Eagle LNG would obtain water for emergency fire protection through a combination of on-site wells, stormwater collection, on-site storage, and barge-in/truck-in. Eagle LNG estimates that it would require a maximum of 1,100 gallons per minute for an 8-hour period for fire protection; however, Eagle LNG would confirm the quantity required during detailed design.

Groundwater use associated with construction and operation of the LNG terminal would increase the overall withdrawal from the Floridan aquifer, which is the main public water supply in Duval County. Approximately 122 million gallons of water are withdrawn from the Floridan aquifer daily in Duval County (Borisova and Rogers, 2014; Marella and Berndt, 2005). The proposed daily withdrawal for the LNG terminal during construction (135,000 gallons per day) is equivalent to less than 0.1 percent of the current daily water withdrawal from the Floridan aquifer in Duval County. Collection of hydrostatic test water (about 8.4 million gallons) would occur over a minimum of 4 days and is equivalent to less than 0.1 percent of the total water withdrawn daily from the Floridan aquifer in Duval County. Collected water would be stored in on-site storage tanks until needed. The proposed maximum daily water withdrawal for facility operation (9,800 gallons) is substantially less than 0.1 percent of the current daily water withdrawal.

Saltwater intrusion has been slowly increasing in Duval County, and studies suggest that as artesian pressure declines, the potential for saltwater intrusion increases. However, given that the maximum project-related water withdrawal from the Floridan aquifer would be less than 0.1 percent of the total water withdrawn daily in Duval County, the project is not likely to cause a significant decrease in artesian pressure or a corresponding increase in saltwater intrusion. Based upon the proposed usage rates and characteristics of the Floridan aquifer, we conclude that the groundwater usage and potential impacts on groundwater during construction and operation of the LNG terminal would have minimal, and not significant, impacts on groundwater resources in the project area.

4.3.2 Surface Water

4.3.2.1 Surface Water Classification and Quality

States develop quality standards to enhance or maintain water quality, protect the public health or welfare, and provide for the designated uses of the waters of the state. In Florida, the FDEP is the agency responsible for establishing surface water standards to meet the requirements of the CWA. Chapter 62-302, FAC establishes water quality designations for surface waters in the state with Class I waters receiving the most protection and Class V waters receiving the least. The classification of waterbodies affected by the project are provided in table 4.3.2-1.

TABLE 4.3.2-1

Waterbodies Potentially Affected by the Jacksonville Project

Facility/Waterbody	Description	Type	Water Quality Classification [a]	Affected Area (acres)	Impact Profile
St. Johns River	River	Perennial	III, Section 10[b], EFH [c]	11.1[d]	Vessel traffic, dredging, marine facilities and berthing area
Drummond Creek	Stream	Perennial	III, Section 10[b], EFH [c]	NA [e]	Indirect impacts
Atlantic Ocean	Ocean	Open water	EFH [c]	NA [f]	Vessel traffic

[a] Florida State Water Quality Classifications (FDEP, 2015a). Designated uses include:
I = Potable Water Supplies
II = Shellfish Propagation or Harvesting
III = Fish Consumption, Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife
III-Limited = Fish Consumption, Recreation, Propagation and Maintenance of a Limited Population of Fish and Wildlife
IV = Agriculture Water Supplies
V = Navigation, Utility and Industrial Uses

[b] Designated as a section 10 waterbody under the River and Harbors Act of 1899.

[c] Designated as EFH under the MSA.

[d] Area affected by dredging (10.1 acres) and marine facilities (1.0 acre).

[e] Drummond Creek may be indirectly affected as a result of impacts on adjacent wetlands.

[f] The portion of the Atlantic Ocean at the mouth of the St. Johns River may be affected due to vessel traffic to and from the Jacksonville LNG terminal.

Note: NA = Not applicable

In addition to the surface water classifications, another potential waterbody designation under Chapter 62-302.700, FAC is as an Outstanding Florida Water (OFW). The intention of an OFW designation is to provide special protection to a water due to its natural attributes and to protect existing good water quality (FDEP, 2016a).

4.3.2.2 Existing Surface Water Resources

The north-flowing St. Johns River is 310 miles long and drops less than 30 feet (about 1 inch per mile) over its length. The river is divided into three watersheds: the upper, middle, and lower basins (St. Johns River Water Management District [SJRWMD], 2013). The proposed project is within the Lower St. Johns River Basin (Hydrologic Unit Code [HUC] no. 03080103), which has a drainage area of about 2,646 square miles. The Lower St. Johns River basin receives abundant rainfall and contains many lakes, streams, and wetlands (FDEP, 2015c).

The proposed project is in an area designated as a Florida Water Resource Caution Area by the SJRWMD. Florida Water Resource Caution Areas are those areas that have critical water supply concerns or are projected to have critical water supply problems within the next 20 years (FDEP, 2011).

The largest contributor of pollution in the Lower St. Johns River Basin is from pumping partially treated wastewater directly into the river, and from agricultural runoff into canals, ditches, and streams that flow to the river (SJRWMD, 2016). The St. Johns River is slow moving, and reverses its flow twice daily in response to tidal action from the Atlantic Ocean. During periods of low water, the river can reverse flow as far as 161 miles upstream and high and sustained northeasterly winds can cause reverse flow for many days. Consequently, it is difficult for the river to flush out pollutants from the basin (SJRWMD, 2013).

Figure 4.3.2-1 shows the waterways near the Jacksonville Project. Table 4.3.2-1 provides a list of the waterbodies that would be affected by construction and operation of the project. Two perennial waterbodies would be affected: the St. Johns River and Drummond Creek. The St. Johns River would be directly affected by construction and operation of the marine facilities. Drummond Creek would be directly affected by discharge water from the DMMA and indirectly affected by impacts on abutting wetlands during construction of the LNG terminal. In addition, the portion of the Atlantic Ocean at the mouth of the St. John's River would be affected by LNG vessel traffic to/from the LNG terminal.

The project is within a segment of the St. Johns River identified by the FDEP as Water Body Identification (WBID) number 2213C (St. Johns River above Dames Point). The designated uses established by the FDEP for segment 2213C are fish consumption, recreation, and propagation and maintenance of a healthy, well-balanced population of fish and wildlife (FDEP, 2016b). The FDEP assessed the designated uses of the Lower St. Johns River in three cycles per the requirements of section 305(b) of the CWA. They completed the Cycle 1 assessment in 2003, and the Cycle 2 assessment in 2008. At the conclusion of the Cycle 2 assessment, WBID 2213C was listed as an impaired stream due to the U.S. Department of Health 2005–2008 fish consumption advisory data for 76 king mackerel fish species that had an average mercury concentration of 0.50 parts per million. A Total Maximum Daily Load (TMDL) for mercury was established at the conclusion of the Cycle 2 assessment. The Cycle 3 assessment represents the current assessment period, and FDEP completed it in 2014. At the conclusion of the Cycle 3 assessment, WBID 2213C was categorized as impaired for fish consumption based on mercury levels, but was delisted as requiring a TMDL, because a TMDL was provided for mercury by the FDEP in 2013 (FDEP, 2016b).

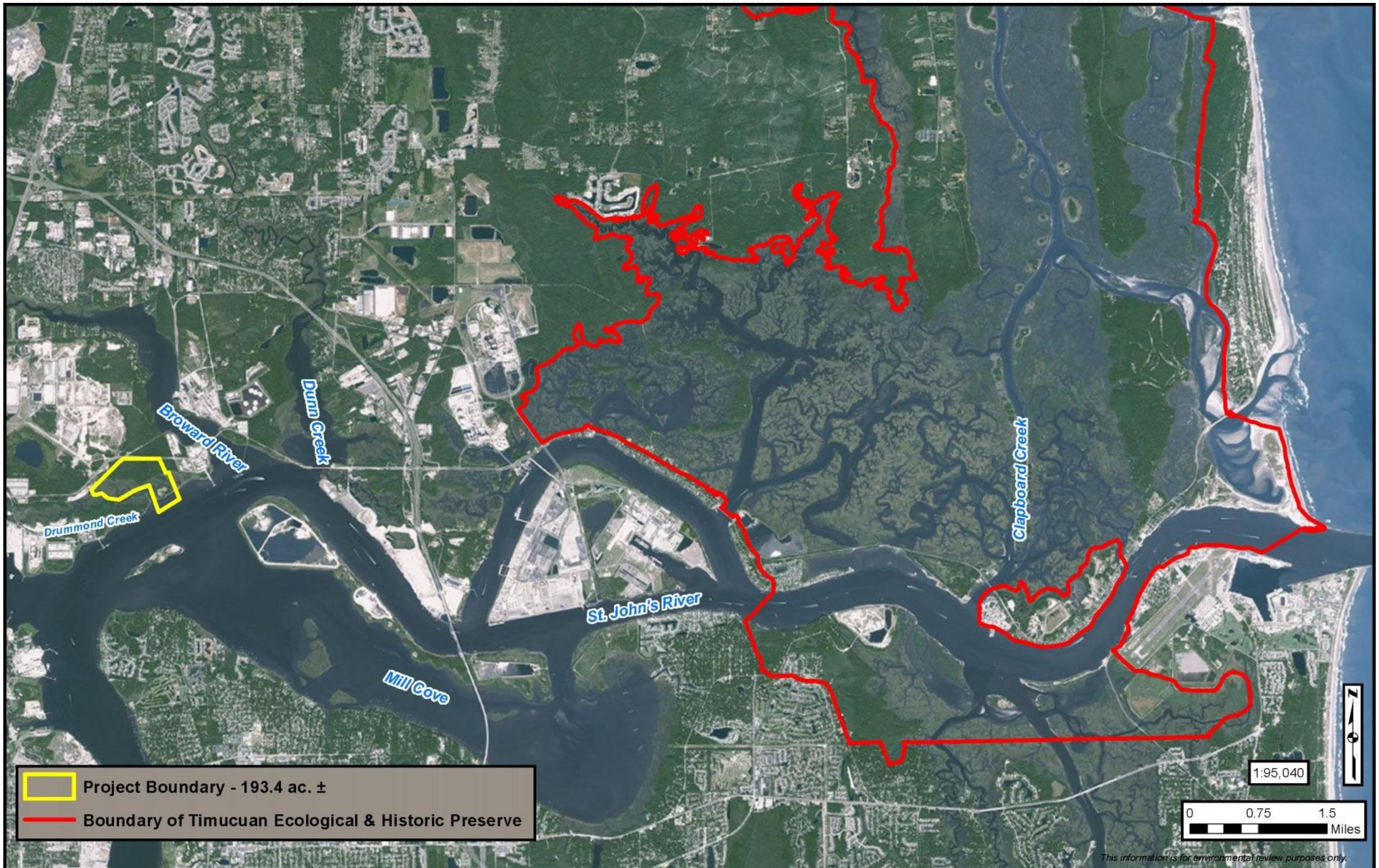

Figure 4.3.2-1
Waterways in the Vicinity of the Jacksonville Project
Jacksonville Project
Duval County, Florida

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EFH designations are present in portions of the St. Johns River, Drummond Creek, and the Atlantic Ocean (NOAA, 2017). Portions of the St. Johns River and the Atlantic Ocean also contain suitable habitat for federally listed species (NOAA Fisheries, 2017a). Detailed descriptions of the potential impacts of the project on EFH and federally listed species are in sections 4.6.3 and 4.7.1, respectively. The St. Johns River and Drummond Creek are designated as Navigable Waterways under section 10 of the RHA (COE, 2014). Most of the St. Johns River, including the project area, is designated as an American Heritage River (American Heritage Rivers Initiative, 1998).

A downstream segment of the St. Johns River that is part of the Timucuan Ecological and Historic Preserve (see figure 4.3.2-1) is designated as an OFW. LNG vessels would transit this segment of the St. Johns River while en route to and from the LNG terminal.

In March 2015, Eagle LNG conducted a contaminated soils sampling study within the proposed marine facilities site. As described in more detail in section 4.2.2, the cores were analyzed for contaminants of concern (e.g., heavy metals, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, and pesticides). The results showed that the samples fell below the Soil Cleanup Target Levels for commercial and industrial use (Taylor Engineering, 2015).

4.3.2.3 Surface Water Impacts and Mitigation

Potential impacts on the surface waters listed in table 4.3.2-1 during construction and operation of the LNG terminal would be associated with dredging, construction of the LNG loading and ship berthing facilities, vessel traffic, site modification and stormwater runoff, hydrostatic testing, and/or spills or leaks of hazardous materials. The following sections describe these potential impacts as well as measures proposed by Eagle LNG to minimize impacts on surface waters.

Dredging and Dredge Material Placement

To create the berthing area and accommodate a fully loaded LNG carrier, dredging would occur in a 10.1-acre open water area to an elevation of 37.3 feet below mean lower low water. As described in additional detail in section 2.5.3, an area about 900 feet offshore would be dredged to construct the berthing area. Dredging would remove about 179,000 cubic yards of sediment/soil from the berthing area, and is anticipated to take place over a 12-week period. Dredging would occur only during daylight hours.

Potential impacts on water quality in the St. Johns River from dredging would include temporary increases in suspended solid and turbidity levels as well as potential resuspension of contaminated sediments and downstream sedimentation. Increased suspended solid and turbidity levels could cause a reduction in light penetration through the water column, which could lower the rate of photosynthesis, introduce organic material and/or nutrients that could lead to an increase in biological oxygen demand and reduce dissolved oxygen, and alter water circulation and flow patterns. Increased suspended solids could also smother benthic organisms and eggs as solids settle out of the water column.

Eagle LNG would use either mechanical dredging or hydraulic cutterhead suction dredging techniques. Mechanical dredging work would consist of mechanically dredging material, loading it into barges, and slurry pumping the material from the hopper barge to the permanent DMMA on the west side of the project site. Hydraulic cutterhead suction dredging utilizes a rotating cutter mounted at the end of an intake suction pipe. The dredge pumps a slurry of earth cuttings and water to an upland DMMA. This dredging method minimizes water quality impacts and turbidity from re-suspension of the sediment in the water column.

Eagle LNG conducted geotechnical borings of the dredge area and encountered weathered limestone in three shallow borings and all deep borings. They encountered weakly cemented (weathered) to well-cemented fossiliferous sandy limestone with layer thicknesses ranging from 2 to 3.5 feet in the shallow borings and 10 to 30 feet in the deep borings (Taylor Engineering, 2017a). The limestone is considered relatively weak and Eagle LNG anticipates that a properly equipped cutter-suction dredge or force arm mechanical dredge could remove the limestone without the need for blasting. Eagle LNG also conducted soil sampling in the dredge area, which indicated that the area contains soils that are suitable for commercial or industrial use (see section 4.3.2.2).

A single-cell DMMA adjacent to the west side of proposed facility would hold the dredged material. Eagle LNG would surround the DMMA with an earthen containment dike enclosure; interior box weirs and piping system for controlling the return water discharge; a perimeter road for dredged material transport and inspection; a perimeter ditch for stormwater and seepage water management; and an exterior working pad for equipment access and dredged material stockpiling and offloading. The DMMA would be a permanent feature that would accommodate both the initial dredging and subsequent maintenance dredging over the life of the project.

If hydraulic dredging were used, dredged material would be hydraulically pumped directly into the DMMA basin. For mechanical dredging, materials would be slurry pumped from a holding barge to the DMMA. The DMMA would have sufficient capacity to store the full volume of dredged material before offloading. Eagle LNG would periodically remove an equivalent volume of materials from the DMMA prior to each maintenance dredging event. This material would be disposed of at the JAXPORT local dredge material management area or used to benefit local area construction projects or other equivalent location(s) identified by Eagle LNG during the life of the facility. As mentioned above, sediment sampling did not identify any contaminated sediments.

Eagle LNG would monitor turbidity levels every 4 hours during the duration of dredging activities. Eagle LNG would collect background samples about 300 meters up-current from the dredge site and outside the limits of any visible plume. Samples would be collected at 1 foot above the bottom, mid depth, and at 1 foot below the surface. If turbidity levels exceed 29 nephelometric turbidity units (NTU)[3] above the ambient river water quality condition at the compliance sampling location, Eagle LNG would cease dredging operations until turbidity levels reach less than 29 NTUs above background level in accordance with state surface water quality criteria (62-302.530, FAC). Monitoring frequency would increase to every 2 hours until turbidity levels reach acceptable limits. During dredging operations, to ensure that Eagle LNG meets the turbidity levels, it may implement the following mitigation measures:

- decreasing the speed of bucket movement through the water column (mechanical dredging);
- taking smaller bucket “bites” (mechanical dredging) so fewer sediments are released while the bucket moves through the water column;
- assuring that barges loaded with dredged material (mechanical dredging) are self-contained or sealed with bin walls to prevent runoff from the dredged spoils;
- using slow and deliberate sweeps of the cutter head suction dredge to minimize stirring up of loose sediment;

[3] Nephelometric turbidity unit is a unit measuring the lack of clarity of water. Water containing 1 milligram of finely divided silica per liter has a turbidity of 1 NTU.

- temporarily halting dredging activities during times of extreme tidal change to reduce the possibility of rapid transport of suspended sediments;

- using turbidity curtains around the dredge to restrict the turbidity zone; and/or

- placing dredged material in the DMMA, which is designed with adjustable weir boards to control return water discharge after suspended sediments have settled into the DMMA.

Although dredging would result in a temporary increase in suspended sediment and turbidity levels, these impacts are expected to be temporary and limited to the vicinity of dredging activity within the St. Johns River. With implementation of turbidity monitoring and Eagle LNG's other mitigation measures to reduce turbidity during dredging activities, we conclude that impacts on water quality due to dredging would be temporary and not significant.

A temporary weir discharge pipe would run from the DMMA to Drummond Creek to direct discharges from the DMMA. The DMMA design would provide sufficient ponding depth and residence time to allow suspended sediment to settle into the DMMA, thus allowing for clarified discharge water. To further minimize turbidity impacts, Eagle LNG would conduct turbidity monitoring 500-feet downstream of the discharge point every 6 hours. If any measurement exceeds 29 NTUs above background levels, the contractor would cease dredging or adjust DMMA operation to improve discharge conditions. Additionally, deployment of turbidity curtains at the DMMA outfall location would minimize potential turbidity issues at the return water discharge point. Therefore, we conclude that impacts on water quality due to discharges from the DMMA would be temporary and not significant.

During operation, periodic maintenance dredging of the berthing area would be required to maintain adequate water depths for LNG vessel maneuvering. Eagle LNG anticipates it would need to conduct maintenance dredging within the berthing area for about 1 month every 1 to 2 years based on estimated sedimentation rates within the St. Johns River and actual operating berth clearance requirements (Taylor Engineering, 2017a). Eagle LNG would remove an estimated 49,000 cubic yards of sediment during maintenance dredging and would store the dredged material at the on-site DMMA. Eagle LNG would remove an equivalent volume of material from the DMMA prior to each maintenance dredging event and dispose of it at the JAXPORT local dredge material management area or use the material to benefit local area construction projects.

Although maintenance dredging would result in impacts similar to the initial dredging event, only smaller. We expect these impacts to be temporary and limited to the vicinity of dredging activity within the St. Johns River. Therefore, we conclude that impacts on water quality due to maintenance dredging would be temporary and not significant.

Marine Facilities Construction

In-water construction associated with the marine load-out-facility would include installation of pilings for the access trestle, T-head platform structure, and the mooring/berthing dolphins. Construction of the LNG loading and ship berthing facilities would also require over-water and land-based equipment installation (e.g., LNG loading platform, trestle, breasting and mooring dolphin, walkways) (see figure 2.5.3-1 in section 2.5.3). Construction contractors would use in-water marine construction equipment (e.g., cranes, pile driving equipment) to install the pilings and over-water structures.

Construction of the marine facilities would result in localized, temporary increases in turbidity and suspended sediment levels. However, these impacts would be temporary (i.e., confined primarily to the period of in-water activity and shortly thereafter) and limited to the area within and immediately adjacent to the access trestle and T-head platform. Therefore, we conclude that no permanent or long-term water quality impacts would occur.

Vessel Traffic

During construction, Eagle LNG anticipates less than five barge trips to the site for deliveries of equipment and materials, but that contractors would use barges for dredging and construction of the marine terminal. During operation, Eagle LNG anticipates a maximum of 100 LNG vessel calls per year (one LNG carrier every 9 to 10 days and one small vessel every 3 to 4 days). All LNG vessels coming from the Atlantic Ocean would use the established St. Johns River federal channel. As such, use of the waterways by LNG carriers, barges, and support vessels during construction and operation of the marine facilities would be consistent with the planned purpose and use of active shipping channels. Therefore, we conclude that the associated impacts on water quality within the shipping channel would be minor.

Ballast Water Discharge

LNG carriers serving the LNG terminal would likely arrive with empty cargo tanks to load at the terminal with LNG for export. Vessels with empty cargo tanks ride higher in the water and can experience challenges associated with navigation due to the extra sail area (ship surface area above the water line). Challenges include increased susceptibility to wind influences and decreased efficiency as a result of reduced performance of the propeller, rudder, and propulsion system. To reduce or eliminate the challenges of navigating the ship without cargo aboard, water is often taken in ballast tanks to provide additional draft and improve navigation. To maintain a constant draft, ballast water is typically discharged below the water surface as the LNG cargo is loaded. The amount of ballast water discharged during LNG cargo loading could be up to about 3 million gallons per vessel.

Eagle LNG anticipates that all LNG vessels received at the LNG terminal would use a Coast Guard-approved ballast water management system. The Coast Guard established dates for vessel ballast water management system compliance under 33 CFR 151, which requires that vessels use one of the following ballast water management methods:

- a ballast water management system approved under 46 CFR 162;
- use water only from a U.S. public water supply;
- perform complete ballast water exchange in an area 200 nautical miles from any shore;
- do not discharge ballast water in the United States; or
- discharge to a facility onshore or to another vessel for purposes of treatment.

Alternate ballast water management systems are available if they meet the requirements described in 33 CFR 151.2026. Vessels must submit their ballast water exchange records to the National Ballast Information Clearinghouse.

Ballast water discharges at the LNG terminal could affect water quality by changing the salinity, temperature, pH, and dissolved oxygen level of water within the St. Johns River. The physiochemical composition of ballast water in comparison to the water present within the St. Johns River would vary depending on tidal and hydrologic conditions at the time of discharge. Ballast water discharges also have the potential to introduce non-native and invasive species into the St. Johns River. See section 4.6.2.2 for additional detail regarding potential impacts and mitigation measures associated with the introduction of invasive species due to ballast water discharge.

The primary potential impact on water quality due to ballast water discharge would be a temporary increase in salinity level. Based on data obtained from the FDEP between 2011 and 2015, salinity within the St. Johns River varies between about 6 and 32 parts per thousand [ppt] throughout the year, and tends to increase with water depth (FDEP, 2016c). Ballast water, which would generally consist of open ocean water, would have a salinity between 32 and 37 ppt (Burkholder et al., 2007). Because of the natural variability in salinity levels in the river, the discharge of ballast water may not have a measurable impact on salinity under normal tidal cycles. However, during periods of heavy rainfall when salinity levels decrease in the St. Johns River, ballast water would have a higher salinity than the surrounding water. Assuming 3 million gallons of ballast water would be discharged per vessel, the amount of ballast water discharged into the St. Johns River during each LNG carrier visit to the LNG terminal would make up about 2 percent of the approximately 142 million gallons of receiving water within the vicinity of the project site. Based on modeling conducted by Taylor Engineering (2018)[4], in which the model assumed 3 million gallons of ballast water per vessel, a high discharge rate of 1.5 million gallons per hour (to show the maximum effect), and a receiving water volume of 142 million gallons, results showed that within 2 hours salinity would be within 2 ppt of background at about 2,000 feet from the discharge location under all tidal conditions, and within 4 hours, differences in salinity would be negligible within about 6,000 feet. However, slower discharge rates would reduce the effects of the discharge on the receiving waters by allowing the discharge to more gradually mix. Additionally, tidal influence and ships moving into and out of the federal channel and berthing area would displace water, circulating it into, around, and out of the berthing area. Therefore, we conclude that increased salinity would represent a temporary and minor impact on water quality within the St. Johns River.

Ballast water is stored in the ship's hull below the waterline; as a result, discharged water temperatures would not be expected to deviate markedly from ambient water temperatures. The pH of the ballast water (reflective of seawater in open ocean conditions) is maintained in a fairly narrow range (8.1 to 8.4). Although pH within the St. Johns River can be lower than seawater (generally ranging from 7.5 to 7.8), it varies over space and time (FDEP, 2016c). Therefore, we conclude that impacts on water temperature and pH would be temporary and minor.

Ballast water discharges may also affect dissolved oxygen levels. Dissolved oxygen levels in water are dependent upon many factors including temperature, rainfall, tidal magnitude, depth, currents, and phytoplankton activity. Ballast water would contain low dissolved oxygen levels and could decrease existing dissolved oxygen levels in the immediate vicinity of the discharge point. Based on modeling conducted by Taylor Engineering (2018), dissolved oxygen levels would be within 2 parts per million within 3,000 feet of the discharge location at 2 hours, and within 1 part per million within 6,000 feet at 4 hours under all tidal conditions. However, because of the relatively minimal volume of discharged ballast water compared to the water volume of the St. Johns River within the vicinity of the project area, we conclude that effects on dissolved oxygen levels from ballast water discharge would be temporary and minor.

Cooling Water Discharge

LNG carriers docked at the marine facilities would likely run auxiliary engines to maintain power; these engines would require cooling water. The volume of water required for cooling varies depending on a vessel's mode of operation (i.e., transit, maneuvering, in-port). Table 4.3.2-2 provides an estimate of the cooling water demands for LNG carriers calling on the LNG terminal. Because transit mode is specific to open ocean transit, the estimated cooling water demands are based on vessel maneuvering and in-port modes only.

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4 *Eagle LNG Liquefied Natural Gas Marine Terminal Ballast Discharge Fate*, Final Report Duval County, Florida. Available online at: http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20180124-5122.

TABLE 4.3.2-2 **Estimates of LNG Carrier Cooling Water Use and Intake Rates at the LNG Terminal [a]**							
Vessel Type	Time to Maneuver (hours)	Time to Load (hours)	Maneuvering Rate (gallons per hour)	Maneuvering Volume (gallons per day)	In-port Rate (gallons per hour)	In-port Volume (gallons)	Total Volume (gallons)
Duel fuel/diesel electric LNG carrier	3	21	1,680,000	5,040,000	120,000	2,520,000	7,560,000

a Estimates are based on a dual-fuel electric LNG carrier of up to 180,000 m^3 capacity that would require cooling of two main seawater pumps and three auxiliary pumps when operating in maneuvering mode, and cooling of two auxiliary pumps when operating in in-port mode.

Impacts on surface waters because of cooling water intake and discharge would be primarily limited to an increase in water temperature near the LNG vessel. Cooling water return temperatures vary widely depending on the type of LNG carrier and mode of operation. It is estimated that cooling water discharged at the LNG terminal would be about 3.0 degrees Celsius (°C) warmer than ambient water temperature. Due to the limited temperature difference, the relatively small volume of water discharge compared to the total volume of water within the project area of the St. Johns River, and the location of the LNG terminal within an active port that is already subject to withdrawals and discharges of vessel engine cooling water, we anticipate that the increased water temperature levels would diminish shortly after discharge and, therefore, would have only temporary and minor impacts on water quality. Section 4.6.2.2 describes the effects of cooling water intakes and discharges on aquatic resources.

Site Modification and Stormwater Runoff

The project would not result in any temporary or permanent fill of open waterbodies.[5] Construction of the LNG terminal would increase the amount of impervious surface leading to an increase in surface water runoff and possible sedimentation into the St. Johns River and Drummond Creek. To minimize impacts on water quality due to increased stormwater runoff, Eagle LNG would conduct land disturbing activities in compliance with the FDEP Environmental Resource Permit, Eagle LNG's project-specific *Stormwater Pollution Prevention Plan* (SWPPP), and Eagle LNG's Plan and Procedures. Section 4.2.3 describes measures to control erosion.

During operation of the LNG terminal, three stormwater ponds would collect stormwater runoff to allow any sediments to settle out of the stormwater prior to discharge into the St. Johns River. Eagle LNG would install oil and water separators to treat runoff from the maintenance areas prior to discharging into the stormwater management ponds. With the implementation of these measures, we have determined that stormwater discharges resulting from construction and operation of the LNG terminal would result in temporary and minor impacts on surface waters.

Hydrostatic Test Water

Before being placed into service, plant piping and the LNG storage tanks would be hydrostatically tested. On-site groundwater wells would supply the majority of hydrostatic test water. For each component requiring hydrostatic testing, table 4.3.2-3 identifies the volume of water required, proposed water source, and discharge location.

5 One of the stormwater ponds Eagle LNG would construct for use during construction of the LNG terminal would be filled in and replaced with a new stormwater pond at a different location for use during operation. For the purposes of this analysis, the man-made stormwater pond that Eagle LNG would remove prior to operation is not considered a waterbody.

TABLE 4.3.2-3

Hydrostatic Test Water Requirements for the LNG Terminal

Component Tested	Water Source	Discharge Location	Volume Required (gallons)
LNG Storage Tank	On-site wells	Stormwater retention ponds	7,700,000
Service Fire Water Tank	On-site wells	Stormwater retention ponds	560,000
Potable/Service Water Tank	On-site wells	Stormwater retention ponds	57,000
Underground Systems	On-site wells	Stormwater retention ponds	100,000

The peak withdrawal rate for hydrostatic test water would not exceed 1,500 gallons per minute collectively from two wells, and the peak discharge rate would not exceed 1,400 gallons per minute. To minimize potential impacts on water quality, Eagle LNG would neutralize pH through turbulence and filter out any particulates prior to discharge. Eagle LNG would discharge hydrostatic test water in a limited number of discrete events and would implement its project-specific Procedures; therefore, we conclude that impacts on surface waters due to hydrostatic testing would be negligible. In addition, Eagle LNG would discharge hydrostatic test water in accordance with the NPDES discharge permit.

Spills

During construction and operation of the LNG terminal, hazardous materials resulting from spills or leaks flushed into waterbodies with stormwater runoff or entering the St. Johns River and/or Drummond Creek could have an adverse impact on water quality. To prevent spills and leaks, Eagle LNG would implement its CSCWM Plan during construction and its SPCC Plan during operation of the LNG terminal, which outline potential sources of releases at the site, measures to prevent a release, and initial responses in the event of a spill. In accordance with 33 CFR 151.26, vessels calling on the LNG terminal would maintain a Shipboard Oil Pollution Emergency Plan (SOPEP) that meets the International Maritime Organization regulations, which would minimize impacts on water quality from a ship-related spill (see section 4.12.5.2). Given the impact minimization and mitigation measures described above, we conclude that impacts on surface waters due to spills or leaks during construction and operation of the LNG terminal would be temporary and minor.

4.4 WETLANDS

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation (Environmental Laboratory, 1987). Wetlands can be a source of substantial biodiversity and serve a variety of functions that include providing wildlife habitat, recreational opportunities, flood control, and naturally improving water quality.

Wetlands are protected under section 404 of the CWA; in the project area, the COE, Jacksonville District implements section 404 of the CWA. Section 404 establishes standards to evaluate and reduce total and net impacts on wetlands under the jurisdiction of the COE. These standards require avoidance of wetlands where possible and minimization of disturbance where impacts are unavoidable, to the extent practicable. Eagle LNG must demonstrate that they have taken appropriate steps to minimize wetland impacts, in compliance with the COE's section 404(b)1 guidelines that restrict discharges of dredged or fill material where a less environmentally damaging alternative exists.

Wetland impacts authorized under section 404 of the CWA also require state water quality certification under section 401 of the CWA. Water quality certification has been delegated to the state agencies (in Florida, the FDEP and Water Management Districts have jurisdiction over section 401 of the CWA), with review by the EPA.

4.4.1 Existing Wetland Resources

Eagle LNG conducted wetland delineations in accordance with the COE's Wetlands Delineation Manual and Atlantic and Gulf Coastal Plain regional supplement, which require the identification of wetlands based on the presence of three parameters: hydrophytic vegetation, hydric soils, and wetland hydrology (Environmental Laboratory, 1987; COE, 2010).

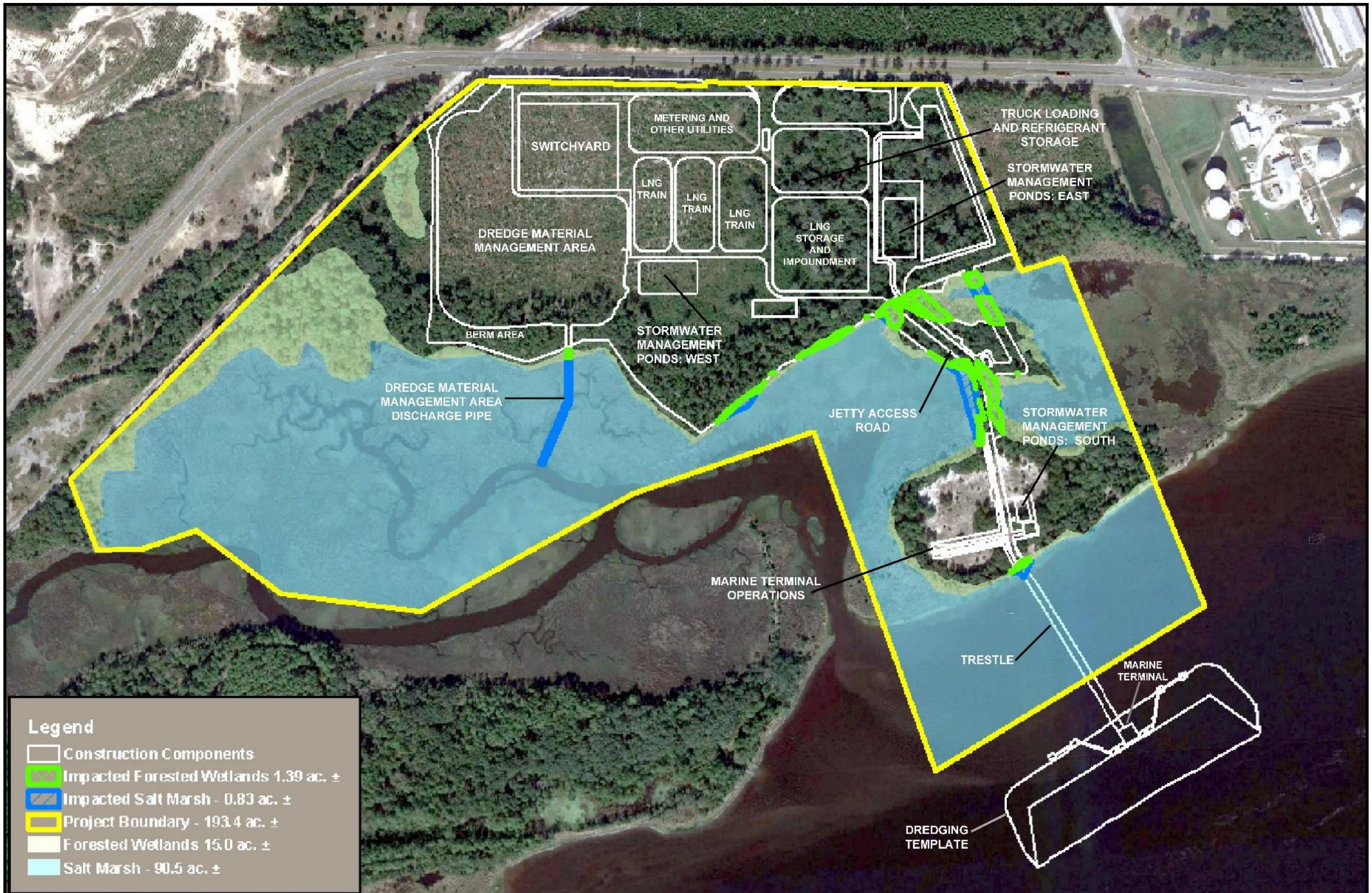
Wetland classifications identified during surveys within the proposed Jacksonville Project area were palustrine forested wetlands and estuarine intertidal emergent wetlands. Palustrine wetlands are defined as non-tidal wetlands dominated by trees, shrubs, persistent emergent vegetation, emergent mosses, or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 parts per trillion. Estuarine wetlands are defined as tidal wetlands that are usually semi-enclosed by land, but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from land (Cowardin et al., 1979).

The palustrine forested wetlands are scattered around the perimeter of the proposed LNG terminal facility, and the estuarine wetlands are adjacent to the St. Johns River and Drummond Creek. Dominant vegetation within the palustrine forested wetlands includes slash pine, swamp bay, red maple, dahoon holly, sweetbay, red cedar, and cabbage palm; with a shrub understory dominated by elderberry and evergreen bayberry. The herbaceous layer was dominated by cinnamon fern, Virginia chain fern, and royal fern.

About 12.2 acres of a mixed forested wetland is present at the upland/wetland interface along the southern edge of the site. Slash pine, sweetbay, red cedar, cabbage palm, dahoon holly, and swamp bay dominated the mixed forested wetland communities. A 2.9-acre slash pine swamp forest dominated by greenish-white sedge (and recently planted slash pine is present on the western side of the site. About 65.0 acres of salt marsh is present adjacent to the St. Johns River and Drummond Creek. The estuarine salt marsh communities associated with Drummond Creek and the St. Johns River were generally dominated by smooth cordgrass, needlerush, and marsh-hay cordgrass.

4.4.2 Wetland Impacts and Mitigation

Construction of the LNG terminal would result in impacts on approximately 2.2 acres of wetlands, of which approximately 1.9 acres would be permanently lost, including approximately 1.2 acres of palustrine forested wetlands and approximately 0.7 acre of estuarine salt marsh (see table 4.4.2-1). The remaining forested wetland (approximately 0.2 acre) and salt marsh (approximately 0.1 acre) would be allowed to revegetate after construction**.** During construction, wetlands within the LNG terminal site would be permanently filled and converted to upland industrial land use, including construction of the facility berm, the vapor wall, and the marine terminal. Temporary construction impacts would result from construction activities associated with the construction laydown areas, facility open area, fence line and berm, and the placement of a weir discharge pipe from the DMMA through portions of the forested wetland and saltmarsh before discharging into Drummond Creek. Eagle LNG would allow these wetlands to revegetate naturally. Figure 4.4.2-1 depicts the wetlands that would be affected during construction of the LNG terminal.



This information is for environmental review purposes only.

Figure 4.4.2-1
Wetland Impacts During Construction
Jacksonville Project
Duval County, Florida

Imagery: Google Earth, 2016

FILE: _Figure_4_4_2_1 | REVISED: 03/08/2018

DRAWN BY: TG

TABLE 4.4.2-1[a]

Wetlands Affected by Construction and Operation of the Jacksonville Project

Project Component	Wetland Type	Construction Impacts (acres)	Operational Impacts (acres)
Dredged material management area	Palustrine forested	<0.1	<0.1
	Estuarine saltwater marsh	0.2	0.2
Construction laydown areas/facility open area, fence line & berm	Palustrine forested	0.4	0.2
	Estuarine saltwater marsh	0.2	0.1
Jetty access and operations	Palustrine forested	1.0	1.0
	Estuarine saltwater marsh	0.4	0.4
Marine terminal and trestle	Palustrine forested	<0.1	<0.1
	Estuarine saltwater marsh	0.1	0.1
Total Impacts		**2.2**	**1.9**

[a] The totals shown in this table may not equal the sum of the addends due to rounding.

During project design, Eagle LNG reduced wetland impacts by locating project facilities in upland areas along the northern portion of the property boundary, away from wetlands and waterbodies. Where wetlands could not be avoided, Eagle LNG would reduce impacts on palustrine forested and saltwater marshes by routing the jetty access road between wetlands and by reducing the width of the toe-of-berm from 25 feet to 10 feet in wetland and wetland buffer areas. Eagle LNG would also reduce construction-related impacts on wetlands by implementing its project-specific Procedures, which include:

- cutting vegetation at ground level, leaving the existing root system in place;
- limiting the pulling of tree stumps to areas of permanent fill;
- using low-ground-weight construction equipment or operating normal equipment on timber riprap, prefabricated equipment mats, or terra mats;
- removing all project-related material used to support equipment on the construction right-of-way upon completion of construction;
- installing sediment barriers upslope of the wetland boundary to prevent sediment flow into wetlands; and
- ensuring that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species.

With Eagle LNG's proposed facility placement to reduce impacts on wetlands and implementation of Eagle LNG's Procedures, including the mitigation measures described above, we conclude that construction and operation of the LNG terminal would have permanent, but not significant impacts on wetlands.

4.4.3 Compensatory Mitigation

In addition to the mitigation measures described above, the COE has a goal of "no net loss" of wetlands in the United States. This means that unavoidable wetland impacts must be offset by the creation, restoration, enhancement, or preservation of at least an equal amount of wetlands, which is referred to as compensatory mitigation. Some wetlands temporarily affected by construction of the LNG terminal (0.3 acre) would be allowed to revert to their pre-existing conditions following construction. As described in section 4.4.2, operation of the project would result in the permanent loss of approximately 1.9 acres of wetlands. Eagle LNG committed to purchasing credits from off-site mitigation bank(s) in the approved watershed to offset wetland impacts once it receives approval of the functional wetland assessment provided with its COE application. This would further reduce any wetland impacts as a result of construction and operation of the project.

4.5 VEGETATION

The Jacksonville Project would be situated in the Southern Coastal Plain ecoregion, which covers the majority of central and northern Florida and its coastline. The plains are mostly flat and historically covered by longleaf pine flatwoods and savannas. Land cover in the region currently comprises mostly slash pine and loblolly pine, along with agricultural and urban development in the more populated areas (EPA, 2017b; Wilken et al., 2011).

4.5.1 Existing Vegetation Resources

The project would occupy a portion of a 193.4-acre tract of relatively undeveloped land next to the St. Johns River, within the city limits of Jacksonville. The project site generally transitions from open water and wetland vegetation near Drummond Creek and the St. Johns River to predominantly upland vegetation communities at the northern boundary of the site. As shown in table 4.5.1-1, eight communities listed in the Florida Land Use, Cover, and Forms Classification System (FLUCCS) were identified within the Jacksonville Project property boundary (FDOT, 1999).

TABLE 4.5.1-1

Summary of Land Use/Cover Communities Within the Property Boundary of the Jacksonville Project

FLUCCS Code	FLUCCS Community	Habitat Description
427	Live Oak Hammock	Upland-wetland interfaces
441	Coniferous Plantation	Recently clear-cut and replanted with pine
510	Streams and Waterways	Open-water systems
627	Slash Pine Swamp Forest	Dominated by slash pine
630	Wetland Forested Mixed	A closed canopy of hydrophytic tree species, dense understory and sparse groundcover
641	Freshwater Marsh	Natural freshwater community dominated by herbaceous hydrophytes
642	Salt Marsh	Natural saline community dominated by herbaceous vegetation
720	Sand Other Than Beaches	Sparsely vegetated area dominated by large areas of bare sand deposits

Construction of the LNG terminal would affect about 92.2 acres of land within the 193.4-acre site along the north bank of the St. Johns River. All further discussion of vegetation communities in this section is referring to the 92.2 acres of land affected by the project. Upland forest communities dominate the LNG terminal site, which occur on 85 percent of the site, while the remaining communities within the terminal site are composed primarily of open water and wetlands (14 percent). Historically, the LNG terminal footprint was likely a live oak hammock community (FLUCCS Code 427) dominated by live oak. However, 54 percent of the upland area that would be disturbed by construction was converted to coniferous plantation (FLUCCS Code 441). Most of the coniferous plantation (37 acres) was recently clear-cut and replanted with pine species. In addition to the planted pine, other species present in the community include laurel oak, live oak, black cherry, southern magnolia, mimosa, American beautyberry, saw palmetto, winged sumac, and American pokeweed. Groundcover species present include broomsedge bluestem, bushy bluestem, briars, wiregrass, grape, and trumpet vine.

The live oak hammock community occurs in about 45 percent of the terminal site where the upland interfaces with the wetland boundary. The tree canopy is primarily dominated by live oak but occasionally co-dominated by slash pine. Additional tree species present include red cedar, cabbage palm, sand live oak, laurel oak, southern magnolia, sweetgum, camphor, and Chinese tallow. Common understory and shrub species include overstory recruits, saw palmetto, hairy indigo, St. John’s wort, American olive, gallberry, rusty lyonia, and silverling.

The sand (other than beaches) community (FLUCCS 720) is present in about 1 percent of the terminal site. The community forms an “island” dominated by sand substrate within the southeastern corner of the project boundary. The area is sparsely vegetated and dominated by large areas of bare, sand deposits. Plants species present in this community include Hercules club, yaupon holly, prickly pear cactus, briar, saw palmetto, dogfennel, black cherry, pinweed, reindeer moss, bahiagrass, rustweed, and American plum.

The streams and waterways community (FLUCCS 510) is present in about 12 percent of the terminal site and represents the open water systems associated with the St. Johns River and Drummond Creek. Because this is not a vegetation community, streams and waterways are not further described in this section.

The wetland communities found within the terminal footprint include salt marshes and mixed forested wetlands. Salt marshes (FLUCCS 642) make up 1 percent of the terminal site and occur within intertidal areas on the border of saltwater bodies with low-energy tidal-fluctuating inundation. Wetlands are further discussed in

Several age classes of trees occur in the upland and wetland habitats. Some trees identified in these communities may be considered exceptional specimen trees by the City of Jacksonville because they have a diameter at breast height of 24 inches or greater. Any specimen trees proposed for removal would require a permit from the City of Jacksonville pursuant to Jacksonville Code of Ordinances, Zoning Section Chapter 656, Part 12, Subpart B.

4.5.2 Vegetation Impacts and Mitigation

As summarized in table 4.5.2-1, Eagle LNG would clear a total of 81.1 acres of vegetation during construction of the LNG terminal. Following construction, the majority of the vegetation affected at the LNG terminal (70.7 acres) would be converted to developed land for industrial use associated with operation of the facility, resulting in the permanent loss of 67.9 acres of upland forest (27.9 acres of live oak hammock and 40.0 acres of coniferous plantation), 0.9 acre of open land (sand other than beaches), 1.2 acres of mixed wetland forest, and 0.7 acre of salt marsh. Eagle LNG would seed any of the remaining open areas within the LNG terminal site not occupied by facilities according to its project-specific Plan, which would result in the conversion of live oak hammock and coniferous plantation to an upland herbaceous community. After construction of the LNG terminal is complete, about 10.0 acres of upland forest (about 7.6 acres of live oak hammock and 2.5 acres of coniferous plantation), 0.2 acre of mixed forested wetland, and 0.1 acre each of open land and salt marsh outside the LNG terminal site would be allowed to return to their preconstruction vegetation communities. About 0.3 acre of wetlands (less than 0.1 acre mixed forested wetland and 0.2 acre of salt marsh) would be temporarily disturbed by the DMMA drain pipe installed during periodic (every 1 to 2 years) maintenance dredging for the life of the project and are considered permanent impacts. The DMMA drainpipe would be removed after each dredging event.

TABLE 4.5.2-1

Vegetation Communities Affected by Construction and Operation of the LNG Terminal (in acres) [a]

Facilities	Live Oak Hammock		Coniferous Plantation		Sand Other Than Beaches		Mixed Forested Wetland		Salt Marsh		**Total [b]**	
	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	**Const.**	**Oper.**
Buildings and equipment	0.3	0.3	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	**0.9**	**0.9**
Construction laydown areas, facility open area, fence line, and facility berms	18.4	13.4	11.0	11.0	0.0	0.0	0.4	0.2	0.2	0.1	**30.0**	**24.7**
Dredge material management area	5.2	5.2	10.4	10.4	0.0	0.0	<0.1	0.0	0.2	0.2	**15.9**	**15.9**
Dredging template	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.0**
Feed gas metering and other utilities	0.0	0.0	3.4	2.9	0.0	0.0	0.0	0.0	0.0	0.0	**3.4**	**2.9**
Ground flare area	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	**0.3**	**0.3**
Jetty access and operations	0.2	0.2	0.0	0.0	0.8	0.8	1.0	1.0	0.4	0.4	**2.3**	**2.3**
Liquefaction trains	0.4	0.4	4.9	4.9	0.0	0.0	0.0	0.0	0.0	0.0	**5.2**	**5.2**
LNG storage and impoundment	3.4	3.4	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	**4.0**	**4.0**
Marine facilities and trestle	0.5	0.5	0.0	0.0	0.0	0.0	<0.1	<0.1	0.1	0.1	**0.6**	**0.6**
Roads and parking	2.7	2.4	5.9	4.6	0.0	0.0	0.0	0.0	0.0	0.0	**8.6**	**6.9**
Stormwater ponds	2.3	1.2	1.2	1.0	0.9	0.7	0.0	0.0	0.0	0.0	**3.7**	**2.3**
Switchyard area	0.0	0.0	3.9	3.7	0.0	0.0	0.0	0.0	0.0	0.0	**3.9**	**3.7**
Truck loading and refrigerant storage	2.1	1.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**2.4**	**1.1**
TOTAL	**35.5**	**27.9**	**42.4**	**40.0**	**0.9**	**0.9**	**1.4**	**1.2**	**0.8**	**0.7**	**81.1**	**70.7**

[a] Construction area includes the total acres of workspace required for construction of the project, including the area retained for operation.

[b] Totals may not match the sum of addends due to rounding. Total vegetation impacts are 11.1 acres less than total land impacts due to the removal of streams and waterways from the vegetation impacts analysis.

During construction, Eagle LNG would segregate topsoil for use in revegetating areas after construction is complete. Temporary workspace would be allowed to revert to preconstruction conditions. Eagle LNG would implement the measures in its project-specific Plan and Procedures to minimize impacts on vegetation communities within and adjacent to the LNG terminal, including the use of temporary and permanent erosion control measures, revegetation procedures, and post-construction monitoring. Eagle LNG would mow/clear vegetation in open areas within the fenced facility boundary as necessary to maintain the areas in low grasses for safety and security purposes. Eagle LNG would not conduct routine vegetation mowing or clearing more frequently than every 3 years in areas outside the fenced facility boundary out to the toe of the facility berm or between April 15 and August 1 of any year unless specifically approved in writing by the responsible land management agency or the FWS. Additionally, Eagle LNG would comply with permit and mitigation requirements established by the City of Jacksonville for removal of any exceptional specimen trees during construction, and would and would comply with seed, fertilizer, soil additive, and other mitigation recommendations by the NRCS and the City of Jacksonville. Due to the presence of similar undeveloped habitats within a 1.0-mile radius of the project, the relatively small size of the LNG terminal, and the implementation of the project-specific Plan and Procedures, we have determined that impacts on vegetation from construction and operation of the LNG terminal would be permanent but not significant.

4.5.3 Exotic or Invasive Plant Communities and Noxious Weeds

Exotic plant communities, invasive species, and noxious weeds can out-compete and displace native plant species, thereby negatively altering the appearance, composition, and habitat value of affected areas. In accordance with the Plant Protection Act of 2000 (7 USC 7701), 106 plants have been federally designated as noxious weeds that could occur in Florida (USDA NRCS, 2018a). Additionally, the Florida Exotic Pest Plant Council identified 80 non-native species in 2017 considered to alter native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. Field surveys identified the silk tree, camphor tree, and Chinese tallow tree within the project area.

The silk tree is a leguminous tree that spreads both vegetatively and by seed. Hand pulling can control seedlings, and large trees can be girdled (USDA, 2004). Camphor trees grow rapidly and displace native species. Mechanical control such as continuous mowing can be an effective control. Burning may also be effective; however, resprouting usually occurs for larger trees (University of Florida Institute of Food and Agricultural Sciences, 2008a). Chinese tallow trees also grow and spread rapidly. When cut, treating the stump with herbicide can prevent multiple stump sprouts (University of Florida Institute of Food and Agricultural Sciences, 2008b). Herbicides can also be used to control all three species.

Eagle LNG would implement the project-specific Plan and Procedures, which require post-construction monitoring for the first and second growing seasons in uplands and for 3 years in wetlands, to evaluate the success of revegetation. As part of this monitoring, Eagle LNG would be required to examine the project area for the presence of invasive species and restore the area to no more than the same density of invasive species as the surrounding area. In addition to its project-specific Plan and Procedures, Eagle LNG developed a *Noxious and Invasive Weed Control Plan* (see appendix G) to prevent, mitigate, and control the spread of noxious and invasive weeds, which includes:

- pre-construction training for staff regarding noxious weed management;
- identifying and flagging noxious weed locations prior to construction;
- returning soils from noxious weed infestation areas to their original location;
- physical, mechanical, and/or chemical control of known weed populations; and
- monitoring and treating noxious weed populations on the project site.

We have reviewed the plan and find it acceptable.

4.5.4 Vegetation Communities of Special Concern

Vegetation communities of special concern may include ecologically important natural communities, threatened or endangered plant species, or other rare and imperiled plants in need of special protection or minimal disturbance. Coordination with the Florida Fish and Wildlife Conservation Commission (FWC) and the FWS and data obtained from the FWS Information, Planning, and Conservation System (2017a) and Florida Natural Areas Inventory (FNAI) databases identified no vegetation communities of special concern within the project site (FNAI, 2017). Therefore, we conclude that construction or operation of the LNG terminal would not affect vegetation communities of special concern. One state-listed plant (sweet shrub [*Calycanthus floridus var. floridus*] was identified within the project site; however, section 4.7 provides additional information regarding state-listed species.

4.6 WILDLIFE AND AQUATIC RESOURCES

4.6.1 Wildlife Resources

Wildlife species occurring in the project area are characteristic of the habitats provided by the plant communities that occur in these areas. Detailed information on vegetation types present within the project area is included in section 4.5.1. Habitat types were identified based on aerial photography and field surveys. Sections 4.6.2 and 4.7, respectively, describe aquatic resources and protected wildlife species.

4.6.1.1 Existing Wildlife Habitats

The wildlife habitat types present within the project area include upland forest habitats, open/agricultural land, wetlands, and open water. Typical wildlife occurring within these habitat types is described below.

About 77.9 acres of upland forest occurs within the LNG terminal site, which includes live oak hammock and coniferous plantation. These habitats provide necessary food, cover, and young-rearing habitat for a wide variety of wildlife species. Nuts from trees such as oaks and hickories provide food for many species. Berries from understory shrubs and woody vines also may provide important wildlife foods. Secondary canopy shrubs and saplings, brush piles, and fallen logs provide cover for various small- to medium-sized mammals. Forested areas provide important habitat for warblers and other migrating and nesting songbirds. Species typically associated with temperate hardwood forest and habitat in the area include white-tailed deer, wild turkey, barred owl, raccoon, opossum, and gray squirrel (University of Florida, 2006). Species associated with coniferous plantations in the project area include white-tailed deer, wild turkey, gray squirrel, and gopher tortoise which were observed on the site.

A small area (about 2.0 acres) of open land occurs within the LNG terminal site and is composed of a sparsely vegetated sand "island" on the south side of the project adjacent to the river. The area is likely a former spoil pile and generally provides poor to moderate quality wildlife habitat.

About 2.2 acres of wetlands occur within the LNG terminal site, including freshwater forested wetland and saltwater marsh. Wetlands support a diverse ecosystem that provides nutrients, cover, shelter, and water for a variety of terrestrial and aquatic wildlife species, including waterfowl, wading birds, raptors, mammals, reptiles, and amphibians. Typical wildlife associated with forested wetlands include white-tailed deer, marsh rabbit, raccoon, and cotton mouse (Mitch and Gosselink, 2000; USDA NRCS, 2001). Common salt marsh species include marsh wren, great egrets, great blue heron, marsh rabbit, and diamondback terrapins (Stokes and Stokes, 1996).

Construction would affect about 11.1 acres of the St. Johns River. Typical wildlife associated with open water habitat includes wading birds, waterfowl, manatees, and other wildlife species dependent on an aquatic environment (see section 4.6.2 for additional information).

4.6.1.2 Impacts and Mitigation

A total of about 92.2 acres of wildlife habitat would be affected by construction of the LNG facility. The greatest impact would be on upland forest (about 77.9 acres), followed by open water (11.1 acres), wetlands (2.2 acres), and open land (0.9 acres). Following construction, about 70.7 acres of vegetated land would be permanently converted to industrial use (including 0.3 acre of wetlands that would be temporarily affected every 1 to 2 years during maintenance dredging over the life of the project) and 11.1 acres would be retained as open water, although water depth would be increased in the dredged area. Further detail regarding temporary and permanent land use impacts is included in tables 4.5.1-1 and 4.8.1-1.

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

The greatest impacts on terrestrial wildlife would result from the permanent loss of about 68.7 acres of forested and open land within the terminal site (67.9 acres and 0.9 acre, respectively), which would result in a permanent reduction in these habitat types in the general vicinity of the LNG terminal. Due to the relatively recent clear cutting and replanting of the pine plantation, vegetation species diversity is low in about 37.0 acres, which lessens its value as habitat for some wildlife. Gopher tortoises and tortoise commensals currently utilizing this habitat for burrows and foraging would be permanently displaced.[6] To mitigate for that loss, Eagle LNG would apply for permits to relocate tortoises and tortoise commensals (e.g., gopher frog, pine snake, Florida mouse) to suitable on-site habitat or to an off-site FWC-approved recipient site.

Construction and operation of the LNG terminal would also result in the permanent loss of about 1.9 acres of wetlands, including 1.2 acres of forested wetlands along the south side of the main facility area and 0.7 acre of salt marsh between the main facility and berthing area. Operation of the facility would also result in periodic temporary impacts on <0.1 acre forested wetland and 0.2 acre saltmarsh for placement of the DMMA discharge pipe during periodic maintenance dredging events. Although these are relatively small areas, wetland habitats support a diverse ecosystem and provide nutrients, cover, shelter, nesting, and water for a variety of terrestrial and aquatic wildlife species. To minimize impacts on wetlands, Eagle LNG would implement its project-specific Procedures during construction and during each maintenance dredging event. This would minimize impacts by ensuring that wetlands outside of the construction work area would not be affected. In addition, Eagle LNG would mitigate for the loss of this habitat and the impacts on wildlife that are dependent on wetland habitats by purchasing suitable mitigation bank credits (see section 4.4.3 for additional information relating to agency approvals).

Operation of the LNG terminal would result in increased noise, lighting, and human activity that could disturb wildlife in the area. Due to current industrial activities in the adjacent properties, wildlife species in the area are likely acclimated to the noise associated with these activities. However, the project area is currently shielded from lighting of adjacent parcels by the surrounding forest. Eagle LNG would adhere to light shielding and illumination characteristics provided in 33 CFR 127.109, *Waterfront Facilities Handling Liquefied Natural Gas and Liquefied Hazardous Gas*. Eagle LNG would also illuminate only

[6] Tortoise commensals are those species that benefit from the gopher tortoise burrows by using them for food, refuge, and other benefits. As many as 350 species are considered tortoise commensals and include the gopher frog, Florida mouse, Florida pine snake, eastern indigo snake, eastern diamondback rattlesnake, and numerous invertebrates including moths, beetles, crickets, and flies (FWC, 2012a-j).

active working areas and areas necessary to safely perform 24-hour operations. See sections 4.6.1.3 and 4.6.2.2 for more information regarding the effects of lighting on migratory birds and aquatic resources.

To minimize project-related impacts on wildlife, Eagle LNG would implement its project-specific Plan and Procedures as well as its CSCWM Plan, and would develop and implement its SPCC Plan during operation. Included in these plans are BMPs, which typically include a combination of installation of silt fencing, routine inspection, and good housekeeping techniques.

Based on the remaining habitat within the 193.4-acre tract that includes the LNG terminal site and surrounding land that would be owned by Eagle LNG, space would likely not become a limiting factor for many of the wildlife species in the project area. Based on the presence of adequate similar wildlife habitat in the vicinity, the relocation of gopher tortoises and associated commensal species, and implementation of Eagle LNG's proposed mitigation measures, we have determined that construction and operation of the proposed LNG terminal would have permanent, but not significant impacts on wildlife.

4.6.1.3 Unique and Sensitive Wildlife

Unique or sensitive wildlife resources, such as migratory birds, colonial waterbird nesting or foraging areas, and bald eagles, may be present near the proposed project and are described below. Species protected under the ESA, the *Bald and Golden Eagle Protection Act of 1940*, as amended, and state endangered and threatened species regulations are described in section 4.7.

Migratory Birds and Colonial Waterbirds

Migratory bird species nest in the United States and Canada during the summer months and then migrate south to the tropical regions of Mexico, Central and South America, and the Caribbean for the non-breeding season. Some species migrate from breeding areas in the north to the Florida coast for the non-breeding season. The Migratory Bird Treaty Act (MBTA) provides protection to migratory birds, and prohibits the take or killing of individual migratory birds, their eggs and chicks, and active nests. The MBTA provides that it is unlawful to pursue, hunt, take, capture, kill, possess, sell, purchase, barter, import, export, or transport any migratory bird, or any part, nest, or egg of any such bird. Executive Order 13186 (January 2001) directs federal agencies to consider the effects of agency actions on migratory birds and determine where unintentional take is likely to have a measurable negative effect on migratory bird populations, and to avoid or minimize adverse impacts on migratory birds through enhanced collaboration with the FWS. Executive Order 13186 states that emphasis should be placed on species of concern, priority habitats, and key risk factors, and that particular focus should be given to addressing population-level impacts.

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

To accurately identify bird species with the greatest conservation priority and stimulate action by federal/state agencies and private parties, the FWS Migratory Bird Office issued a report describing the Birds of Conservation Concern (BCC) (FWS, 2008a). The report identifies priority bird species at the national, regional, and Bird Conservation Region (BCR) levels. BCRs are small-scale ecologically distinct regions with similar bird communities, habitats, and resource management issues. Each BCR has its own list of BCC. The Jacksonville Project site is within BCR 27 – Southeastern Coastal Plain and is in close proximity (about 17 miles) to BCR 31 – Peninsular Florida (FWS, 2008a). Table 4.6.1-1 identifies the BCC that have been documented, or are cited as potentially occurring, near the project.

TABLE 4.6.1-1

Birds of Conservation Concern with Potential to Occur in the Vicinity of the Jacksonville Project

Common Name	Bird Conservation Region 27	Bird Conservation Region 31	Season/Status
American kestrel (paulus ssp.)	✓	✓	All seasons – common
American oystercatcher	✓	✓	All seasons – common
Bachman's sparrow	✓	✓	All seasons – uncommon
Bald eagle [a, b]	✓	✓	All seasons – uncommon
Black rail	✓	✓	All seasons – uncommon
Black skimmer	✓	✓	All seasons – common
Black-throated green warbler	✓		Migration – common
Blue-winged warbler	✓		Migration – uncommon
Brown-headed nuthatch	✓	✓	All seasons – common
Chuck-will's-widow	✓	✓	Breeding – common
Common ground-dove	✓	✓	All seasons – common
Gull-billed tern	✓		Breeding – uncommon
Least tern [c]	✓	✓	Breeding – common
Lesser yellowlegs (nb)		✓	Winter – common
Loggerhead shrike	✓	✓	All seasons – common
Long-billed curlew (nb)	✓	✓	Winter – uncommon
Marbled godwit (nb)	✓	✓	Winter – uncommon
Nelson's sharp-tailed sparrow (nb)	✓	✓	Winter – common
Painted bunting	✓	✓	Breeding – common
Peregrine falcon (breeding)	✓	✓	Winter – uncommon
Prothonotary warbler	✓	✓	Breeding – common
Red knot	✓	✓	Winter-common
Reddish egret		✓	Breeding – uncommon
Red-headed woodpecker	✓	✓	All seasons – common
Roseate spoonbill (nb)	✓	✓	Breeding – uncommon
Rusty blackbird (nb)	✓		Winter – uncommon
Saltmarsh sharp-tailed sparrow (nb)	✓	✓	Winter – common
Sandwich tern	✓		Breeding – common
Seaside sparrow (c)	✓	✓	All seasons – common
Semipalmated sandpiper (eastern) (nb)	✓	✓	Migration – common
Short-billed dowitcher (nb)	✓	✓	Winter – common
Swallow-tailed kite	✓	✓	Migration – uncommon
Wilson's plover	✓	✓	Breeding – common
Wood thrush	✓		Breeding – uncommon
Yellow warbler (gundlachi spp.)		✓	Migration – common

[a] A bald eagle nest is present on the parcel but is outside the construction footprint.
[b] ESA delisted.
[c] Non-listed subspecies or population of threatened or endangered species.
Note: (nb) = non-breeding in this BCR

Colonial waterbirds, a subset of migratory birds, include a large variety of bird species that share two common characteristics: 1) they tend to gather in large assemblies, called colonies or rookeries, during the nesting season, and 2) they obtain all or most of their food from the water (FWS, 2002). Colonial waterbirds demonstrate nest fidelity, meaning that they return to the same rookery year after year. Rookeries are typically established in marshes or near the shores of ponds or streams. Although some colonial waterbirds (e.g., least terns) will nest in developed areas, many waterbirds (e.g., great blue heron and great egrets) are wary of human activity. No colonial waterbird rookeries were identified within 100 meters of the LNG terminal site.

Migratory birds follow broad routes called flyways between breeding grounds in Canada and the United States and wintering grounds in Central and South America, and the Caribbean. Additionally, several species migrate from breeding areas in the north to winter along the Atlantic coast, where they remain throughout the non-breeding season. The LNG terminal is within the Atlantic Flyway, which terminates in the Caribbean. The Atlantic Coast is the most densely populated flyway and much of the region is threatened by development. Least terns and wood storks are among the priority species in the Atlantic flyway (Audubon, 2017; FWS, 2017a).

Bald Eagle

The bald eagle was federally delisted in 2007, but is still afforded protection by both the FWC (under 68A-16.002, FAC) and by the FWS through the MBTA/Bald and Golden Eagle Protection Act. Effective May 2017, the FWC revised its rule to only require federal permits for activities with the potential to take or disturb eagles or their nests (2017i). In November 2017, Florida replaced its management plan with *A Species Action Plan for the Bald Eagle Haliaeetus leucocephalus* (FWC, 2017k). On December16, 2016, the FWS announced a final rule revising the regulations for permits for incidental take of eagles and take of eagle nests (Federal Register, 91494-91554). The bald eagle is a large raptor distinguished by its white head and white tail feathers. Its habitat includes estuaries, large lakes, reservoirs, rivers, and some seacoasts. In winter, the birds congregate near open water in tall trees for spotting prey and night roosts for sheltering. This species typically nests in tall trees (mostly live pines) that provide clear views of the surrounding area. Nesting season in Florida is October 1 to May 15. Major threats include habitat loss because of development and commercial timber harvest, pollutants, and decreasing food supply. One bald eagle nest was identified outside the construction limits about 0.6 mile west of the project site.

Impacts and Mitigation

The vegetation communities within the LNG terminal site provide potential habitat for migratory bird species, including songbirds, waterbirds, and raptors. However, recently cleared and replanted pine plantation makes up about 37.0 acres of the vegetated land, which reduces bird nesting habitat value for many species. Impacts on migratory birds and their habitat due to construction and operation of the LNG terminal would typically be similar to impacts on general wildlife resources (see section 4.6.1.2). Project construction would result in direct impacts on migratory birds. However, this would be limited to a one-time event during construction. Habitat removal and/or modification during construction would have indirect effects on migratory birds. These activities could affect egg and young survival, could cause displacement impacts during bird migration, and could affect nesting, foraging, and mating behaviors. Construction would also reduce the amount of habitat available for foraging and predator protection and would permanently displace birds into adjacent habitats, which could increase the competition for food and other resources. In addition, potential impacts specific to migratory birds include injury or disorientation due to flaring and other artificial illumination.

Construction and operation of the LNG terminal would result in the permanent loss of 27.9 acres of mature oak forest, 37.0 acres of recently cleared and replanted upland pine plantation, 3 acres of mature pine plantation, and about 1.9 acres of wetland habitat (including 1.2 acres of forested wetlands and 0.7 acre of estuarine salt marsh), which could directly affect the available nesting and foraging habitat for migratory birds, including colonial waterbirds. Migratory birds not already nesting would be able to avoid construction activities and move to other forested areas. Small areas of upland and wetland forests present on the 193.4-acre parcel, but outside the project footprint (between the river and the main terminal site), would not be affected and would still provide potential habitat for some migratory birds. Additional forested areas are present west of the project site across SR 105 and along the river southwest of the project site. These forested areas would continue to provide refuge for migratory birds and would buffer some impacts associated with light and noise. Significant areas of saltmarsh would also remain following construction of the project, which provides suitable habitat for some migratory birds. Due to the poor habitat quality of the 37 acres of recently cleared and replanted pine plantation and the availability of other forest communities both on the parcel and outside the project footprint, and on nearby properties, we have determined that the project would not significantly affect migratory birds. Eagle LNG anticipates that site clearing would occur outside the colonial waterbird nesting season (March through August), but it would implement measures to minimize impacts, where feasible, if clearing is required during the nesting period. In response to comments from the FWS on Eagle LNG's *Migratory Bird Plan* and because Eagle LNG has not provided the specific mitigation measures it would implement if initial site clearing occurred during the colonial waterbird nesting season, **we recommend that**:

- **<u>Prior to conducting site clearing activities between March and August</u>, Eagle LNG should file with the Secretary, for review and written approval by the Director of OEP, mitigation measures to minimize impacts on colonial rookeries developed in consultation with the FWS and include in the filing documentation of FWS comments on these measures.**

Many migratory birds use natural light from the sun, moon, and stars for navigation. Artificial lighting can hide natural light sources, having unknown effects on birds at the population level. Fatalities to avian species due to artificial light are well documented. Avian fatalities are associated with attraction to light sources, especially in low light, fog, and when there is a low cloud ceiling (Orr et al., 2013).

Eagle LNG anticipates that flaring would occur during startup of the LNG terminal and every 3 to 5 years during operation and maintenance activities. The facility would also use a common ground flare to manage unplanned upsets and emergencies. Though the exact number and duration of flaring events is unknown, it is expected to be relatively infrequent. Eagle LNG intends to operate the flare only when warranted for safety reasons. Therefore, we have determined that the temporary flaring during construction and the occasional flaring during operation would not substantially affect migratory birds.

The LNG terminal would require adequate lighting for operations and safety. During construction, Eagle LNG would direct light to active working areas or areas deemed necessary for 24-hour operations. To minimize the effects of artificial lighting on migratory birds, outdoor lighting would illuminate only active working areas and areas necessary to perform 24-hour operations safely. During operation of the LNG terminal, facility lighting would comply with 33 CFR 127.109. Forested areas remaining on the 193.4-acre parcel during operation would be outside the fence line and berm, west of the DMMA area, well away from active operations. Therefore, we have determined that operational lighting would not substantially affect migratory birds.

As mentioned above, a bald eagle nest was identified outside the construction limits west of the project site. For activities that would be visible from the nest, the FWS bald eagle management guidelines recommend a 660-foot buffer between activities and any bald eagle nest and that any established landscape buffers be maintained. The FWS guidelines also recommend avoiding extremely loud noises (i.e., pile driving) within 0.5 mile of active nests. Construction activities associated with the LNG terminal would not occur within 660 feet of the bald eagle nest; however, pile driving activities may occur within 0.5 mile of the nest site. Prior to starting any construction activities during the bald eagle October 1 to May 15 nesting season, Eagle LNG has committed to conducting initial monitoring to determine if the nest is active. If active, Eagle LNG would monitor the nest during pile driving activities conducted within 0.5 mile of the nest site in accordance with the FWS Bald Eagle Monitoring Guidelines. If any disruption is observed, Eagle LNG would stop pile driving activities and consult with the FWS for guidance on mitigation methods that could be implemented prior to continuing the activity. If no disturbance is apparent, Eagle LNG would complete pile driving activities and, within 30 days, submit a final report to the FWS documenting that pile driving activities were completed without incident. Eagle LNG would also file a copy of any correspondence and/or the final report with the Secretary.

Construction and operation of the facility would result in a reduction of available forest habitat for migratory birds. Additionally, impacts associated with light and noise could affect migratory birds, colonial waterbirds, and bald eagles utilizing the project site. However, due to the mitigation measures proposed by Eagle LNG and the availability of suitable forested habitats both on site and on nearby properties that would buffer both noise and light, and with implementation of Eagle LNG's *Migratory Bird Plan* and our recommendation regarding colonial waterbirds, we have determined that construction and operation of the project would not substantially affect migratory birds or colonial waterbirds. Although bald eagles could be affected if pile driving activities occur during the October 1 to May 15 nesting season, with implementation of Eagle LNG's proposed mitigation, we conclude that impacts on bald eagles would be short term and not significant.

4.6.2 Aquatic Resources

4.6.2.1 Existing Aquatic Resources

The project is in the lower basin of the St. Johns River, where the river becomes an estuary discharging into the Atlantic Ocean. The area includes a mix of dredged channels, an estuary with extensive saltmarshes, adjacent wetlands, and hardwood hammocks. The COE performs regular maintenance dredging of the federal channel. The area experiences freshwater influence from Broward River to the east and Trout River to the west. The St. Johns River and its tributaries near the project site are intertidal, estuarine environments that support a warmwater estuarine fishery.

Habitat for aquatic resources present within the project footprint includes the St. Johns River, Drummond Creek, and the associated saltmarsh on the north shore of the river. The river and salt marsh provide nutrients, cover, shelter, and year-round warmwater habitat for aquatic resources. The saltmarsh, tidal creek, and soft sediments are designated as EFH for red drum, bluefish, spiny lobster, coastal migratory pelagics, the snapper-grouper complex, summer flounder, and shrimp (see section 4.6.3) (South Atlantic Fishery Management Council [SAFMC], 2016). Nearshore water depths in the river range from 5 to 10 feet, but the federal channel is currently maintained at 40 feet due to regular maintenance dredging. Substrates are composed primarily of mud, shell hash, and sand bottom. Unconsolidated sediments provide foraging habitat for benthic (bottom dwelling) organisms and fish, and are designated EFH for red drum, spiny lobster, shrimp, and coastal migratory pelagic species (see section 4.6.3) (SAFMC, 2016).

Table 4.6.2-1 lists representative fish species that may be found in the vicinity of the LNG terminal site and indicates which of these species are economically important for commercial or recreational fisheries.

4.6.2.2 Impacts and Mitigation

Potential impacts on aquatic resources during construction and operation of the LNG terminal include those associated with dredging, pile driving, hydrostatic testing, vessel traffic, stormwater runoff, lighting, and inadvertent spills.

TABLE 4.6.2-1

Representative Fish Species Potentially Occurring in the Vicinity of the LNG Terminal

Common Name	Scientific Name	Classification
Shellfish		
Blue crab [a]	*Callinectes sapidus*	Estuarine
Spiny lobster [a]	*Panulirus argus*	Estuarine
Stone crab [a]	*Menippe mercenaria*	Estuarine
White shrimp [a]	*Litopenaeus setiferus*	Estuarine
Finfish		
American shad [a]	*Alosa sapidissima*	Estuarine
Atlantic croaker [a]	*Micropogonias undulates*	Estuarine
Atlantic tarpon [a]	*Megalops atlanticus*	Estuarine
Black drum [a]	*Pogonias cromis*	Estuarine
Black sea bass [a]	*Centropristis striata*	Estuarine
Bonefish [a]	*Albula vulpes*	Estuarine
Common snook [a]	*Centropomus undecimalis*	Estuarine
Crevalle jack [a]	*Caranx hippos*	Estuarine
Gafftopsail catfish [a]	*Bagre marinus*	Estuarine
Gag [a]	*Mycteroperca microlepis*	Estuarine
Gray snapper [a]	*Lutjanus griseus*	Estuarine
Hake	*Urophycis* spp.	Estuarine
Hardhead catfish	*Arius felis*	Estuarine
Killifish	*Fundulus* spp.	Estuarine
Kingfish [a]	*Menticirrhus* spp.	Estuarine
Ladyfish	*Elops saurus*	Estuarine
Lane snapper [a]	*Lutjanus synagris*	Estuarine
Lookdown [a]	*Selene vomer*	Estuarine
Mosquitofish	*Gambusia affinis*	Estuarine
Mullet [a]	*Mugil* spp.	Estuarine
Mutton snapper [a]	*Lutjanus analis*	Estuarine
Permit [a]	*Trachinotus falcatus*	Estuarine
Puffer	*Sphoeroides* spp.	Estuarine
Sheepshead [a]	*Archosargus probatocephalus*	Estuarine
Silver seatrout [a]	*Cynoscion nothus*	Estuarine
Silverside	*Menidia* spp.	Estuarine
Southern flounder [a]	*Paralichthys lethostigma*	Estuarine
Spadefish	*Chaetodipterus faber*	Estuarine
Spanish mackerel [a]	*Scomberomorus maculatus*	Estuarine
Spot	*Leiostomus xanthurus*	Estuarine
Spotted seatrout [a]	*Cynoscion nebulosus*	Estuarine
Striped bass [a]	*Morone saxatilis*	Estuarine
Sturgeon	*Ascipenser spp.*	Estuarine
Weakfish [a]	*Cynoscion regalis*	Estuarine

[a] This species is considered economically important (i.e., commercially or recreationally sought after).
Source: SJRWMD, 2012

Dredging

Construction of the berthing area at the LNG terminal site would require the dredging of 10.1 acres in the St. Johns River. Eagle LNG is requesting to modify our Procedures to conduct in-stream work within a timeframe compatible with its construction schedule, rather than within the limited window of June 1 through November 30. We note that our Procedures do not allow construction outside this timeframe unless expressly permitted or further restricted by the appropriate federal or state agency, in writing, on a site-specific basis. In response to our recommendation in the draft EIS, Eagle LNG confirmed it would either adhere to the June 1 through November 30 waterbody construction time window or file documentation of approval from the FWS and FWC to construct outside the waterbody construction time window.

As described in section 2.5.3, dredging would remove about 179,000 cubic yards of sediments over about a 12-week period using either mechanical dredging techniques or a hydraulic cutterhead suction dredge. Dredging would occur only during daylight hours.

Eagle LNG would transfer dredge material to the on-site DMMA via slurry pumping from a hopper barge if mechanical dredging were used or via direct pumping if hydraulic cutterhead suction dredge were used. Potential impacts on aquatic resources resulting from dredging activities include direct take and habitat modifications as well as temporary increases in noise, turbidity, and suspended solid levels, which are described below.

Most fish species are highly mobile and would leave the area during dredging activities. However, dredging would result in direct mortality of benthic organisms (e.g., aquatic macroinvertebrates, mollusks, and crustaceans, which are important food sources for many species of fish) within the 10.1-acre portion of the dredge footprint that currently provides open water habitat. Slower, less mobile benthic invertebrates would also be directly affected, while larger, more mobile species (e.g., blue crab) would experience temporary displacement or mortality. Following construction, we anticipate aquatic resources would return to the berthing area, which would be similar to the existing habitat within the St. Johns River, but would have an increased water depth.

Dredging activities would also temporarily increase noise, turbidity, and suspended solid levels within the water column, which could reduce light penetration and the corresponding primary production of aquatic plants, algae, and phytoplankton. Increased turbidity and suspended solid levels could also adversely affect fish eggs and juvenile fish survival, benthic community diversity and health, foraging success, and suitability of spawning habitat. Deposition of water column sediments on nearby substrates could bury aquatic macroinvertebrates. The significance of in-water changes to turbidity levels would depend on tidal and freshwater inflow conditions present during the dredging activities. The project site lies within the Jacksonville Port section of the St. Johns River and experiences heavy marine shipping traffic. The federal channel undergoes periodic maintenance dredging to maintain a suitable depth for marine traffic. Impacts on aquatic resources due to increased turbidity and suspended solid levels would vary by species; however, the aquatic resources present within the project area are likely accustomed to regular fluctuations in turbidity levels from vessel activity and regular maintenance dredging within the federal channel.

The St. Johns River is designated as a Class III water under Florida's surface water quality standards (62-302, FAC). Class III waters are intended to protect, in part, the propagation and maintenance of a healthy, well-balanced population of fish and wildlife, and the numerical value applied to turbidity in the Code is less than or equal to 29 NTU above natural background conditions. To minimize impacts on aquatic resources due to increased turbidity and suspended solid levels, Eagle LNG would implement measures appropriate for the dredging technique used (see section 4.3.2.3) and, in accordance with an FDEP

Environmental Resource Permit, would monitor turbidity levels every 4 hours during dredging activities. If any samples exceed 29 NTU of the ambient (background) river water quality conditions, dredging operations would cease until turbidity levels reach acceptable limits. Eagle LNG would also follow its project-specific Plan and Procedures. Therefore, based on the available information, we have determined that impacts on aquatic resources due to temporary increases in noise, turbidity, and suspended solid levels from dredging would be localized, temporary, and not significant.

Eagle LNG would conduct maintenance dredging of the berthing area every 1 to 2 years and would remove about 49,000 cubic yards of sediment per cycle. Dredged material would be placed in the on-site DMMA. Potential impacts on aquatic resources from maintenance dredging include direct take and habitat modification as well as temporary increases in noise, turbidity, and suspended solid levels similar to those described above for dredging during construction of the LNG terminal. However, impacts would be shorter in duration due to the reduced volume of material being removed from the berthing area. In response to our recommendation in the draft EIS, Eagle LNG confirmed it would implement its proposed construction turbidity monitoring and mitigation measures during each periodic maintenance dredging event. For these reasons, we conclude that maintenance dredging would have localized, temporary, and minor impacts on aquatic resources.

Pile Driving

Construction of the LNG terminal would require the installation of 239 piles to support the components of the marine facilities including 102 steel piles and 137 pre-stressed concrete piles. In-water pile driving would be required to install the trestle, LNG loading platform, breasting dolphin, mooring dolphin, and walkways. Pile installation would likely include vibration or driving of piles followed by rotary drilling into limestone or marl, and final driving with an impact hammer. Pile driving would occur over a 10-month period (see section 2.5.3).

Pile driving activities would result in a temporary increase in in-water noise levels. The primary impacts on aquatic resources from pile driving activities would be avoidance of the area, stress, or injury due to the underwater sound pressure levels. Studies have shown that the sound waves from pile driving may result in injury or trauma to fish, sea turtles, and other mammals with gas-filled cavities, such as swim bladders, lungs, sinuses, and hearing structures (Buehler, et al., 2015; Hastings and Popper, 2005).

The intensity of the sound pressure levels produced during pile driving depends on a variety of factors such as the type and size of the pile, the substrate into which the pile is being driven, the depth of water, and the type of pile-driving equipment being used. In describing the impacts of sound on aquatic resources, it is important to note the difference in sound intensity in air versus water. Sound in water and sound in air are both waves that move similarly and can be characterized the same way; however, the differences in density and sound speed (the speed at which the sound wave travels through the medium, in this case air or water) result in a different reference pressure in air than in water.

While Eagle LNG has not yet finalized pile driving plans, it did provide an estimate of pile driving activities based on projected facility needs. Eagle LNG would conduct pile driving activities during daytime hours. Project activities would require the use of both pre-stressed concrete and steel piles, both of which generate different underwater noise levels.

Underwater Noise

The construction of the proposed facility, particularly pile driving and dredging activities, would result in the generation and propagation of underwater noise energy. Eagle LNG provided an estimate of pile driving activities provided based on project facility needs. Eagle LNG would conduct pile driving activities during daytime hours. Project activities would require the use of both pre-stressed concrete and steel piles, which generate different underwater noise levels that have been estimated separately. A summary of the proposed pile driving activities is provided in table 2.5.3-1 in section 2.5.3. The sound levels for the two types of pile driving are shown in table 4.6.2-2. Typical undeveloped ambient noise levels in the ocean are 100 dB (referenced to 1 micropascal [re: 1 µPa])[7], although the noise environment in the project area would be elevated due to existing industry and ship traffic.

TABLE 4.6.2-2

Sound Levels for Pile Driving Activities Associated with the Jacksonville Project

Pile Driving Activity	Measured Distance (m)	Peak Pressure (dB re: 1 µPa)	RMS SPL (dB re: 1 µPa)	SEL (dB re: 1 µPa^{2}s)
Assessment of Impacts on Marine Mammals				
24-inch pre-stressed concrete [a]	10	185	173	163
30-inch steel [b]	10	210	190	177
Assessment of Impacts on Sea Turtles				
24-inch pre-stressed concrete [c]	10	188	176	166
30-inch steel [c]	10	210	190	177

[a] Caltrans, 2015.
[b] WSDOT, 2015.
[c] GARFO, 2018.
Notes: RMS = root mean square; SPL = sound power level; SEL = sound exposure level

Eagle LNG estimated potential impacts on fish, marine mammals, and sea turtles associated with pile driving activities, dredging activities, and marine vessel traffic. The thresholds for fish injury and disturbance, based on the Fisheries Hydroacoustic Working Group's interim criteria (2008), are shown in table 4.6.2-3. The acoustic thresholds at which five types of marine mammals would experience temporary or permanent changes to hearing sensitivity from exposure to underwater anthropogenic sources are shown in table 4.6.2-4. The thresholds to sea turtle injury and disturbance are shown in table 4.6.2-5.

TABLE 4.6.2-3

Thresholds for Fish Injury and Disturbance

Onset of Physical Injury			Behavior	
Peak (dB re: 1 µPa)	Cumulative SEL (dB re: 1 µPa^{2}s)		Noise (RMS) (dB re: 1 µPa)	Effective Quiet Noise Level (dB re: 1 µPa^{2}s)
Fish All Sizes	Fish ≥ 2 g	Fish < 2 g		
206	187	183	150	150

Notes: RMS = root mean square; SPL = sound power level; SEL = sound exposure level

[7] Underwater noise is referenced to 1 micro (one millionth) pascal, whereas in air it is referenced to 20 microPascals of pressure.

TABLE 4.6.2-4				
Acoustic Thresholds for Permanent Injury and Disturbance to Marine Mammals				
	Threshold to Permanent Injury (Received Level)			Threshold to Disturbance
	Impulsive Noise		Non-Impulsive Noise	
Hearing	$L_{peak,flat}$	$L_{E,LF,24h}$	$L_{E,LF,24h}$	Noise (RMS)
Low-Frequency (LF) Cetaceans [a]	219 dB	183 dB	199 dB	
Mid-Frequency (MF) Cetaceans [b]	230 dB	185 dB	198 dB	
High-Frequency (HF) Cetaceans [a]	202 dB	155 dB	173 dB	160 dB
Phocid Pinnipeds (PW) [a]	218 dB	185 dB	201 dB	
Otariid Pinnipeds (OW) [a]	232 dB	203 dB	219 dB	

a Not likely to be present in the impact area associated with pile driving and dredging activities.
b May be present in the impact area associated with pile driving and dredging activities.

TABLE 4.6.2-5	
Threshold for Sea Turtle Injury and Disturbance	
Injury (dB re 1 µPa RMS)	Behavioral Disturbance Noise (dB re 1 µPa RMS)
180	166

Notes: RMS = root mean square

Tables 4.6.2-6, 4.6.2-7, and 4.6.2-8 provide the distances to acoustic thresholds of injury and behavioral disturbance for fish, marine mammals, and sea turtles respectively. The tables differentiate between 24-inch pre-stressed concrete and 30-inch steel piles, in both the unmitigated case and a mitigated scenario. Eagle LNG plans to implement 12 dB (re: 1 µPa) of mitigation for pre-stressed concrete piles and 25 dB of mitigation for steel piles. Eagle LNG also plans to use vibratory pile driving where feasible. More information on the proposed mitigation measures is provided in the next section.

TABLE 4.6.2-6				
Summary of Noise Impacts on Fish From Pile Driving Associated with Construction of the LNG Terminal				
	Onset of Physical Injury (feet)			Behavior Disturbance (feet)
	Peak Noise (dB re: 1 µPa)	Cumulative SEL (dB re: 1 $\mu Pa^2 s$)		Noise (RMS) (dB re: 1 µPa)
Type of Piles/ Level of Mitigation	Fish All Sizes	Fish ≥ 2 g	Fish < 2 g	
24-inch pre-stressed concrete				
No mitigation	0	138	138	203
12 dB mitigation	0	59	59	125
30-inch steel				
No mitigation	59	210	210	295
25 dB mitigation	0	45	45	131

Notes: RMS = root mean square; SEL = sound exposure level

TABLE 4.6.2-7

Summary of Noise Impacts on Marine Mammals From Pile Driving Associated with Construction of the LNG Terminal

Type of Piles/ Level of Mitigation	Onset of Physical Injury (feet) Peak Noise (dB re: 1 μPa)	Onset of Physical Injury (feet) Cumulative SEL (dB re: 1 $\mu Pa^2 s$)	Behavior Disturbance (feet) Peak Noise (dB re: 1 μPa)	Behavior Disturbance (feet) Cumulative SEL (dB re: 1 $\mu Pa^2 s$)
Impact Pile Driving				
24-inch pre-stressed concrete				
No mitigation	0	8	0	241
12 dB mitigation	0	1	0	38
30-inch steel				
No mitigation	0	63	0	3,281
25 dB mitigation	0	1	0	71
Vibratory Pile Driving				
No mitigation	0	187	0	464

Notes: RMS = root mean square; SEL = sound exposure level

TABLE 4.6.2-8

Summary of Noise Impacts on Sea Turtles From Pile Driving Associated with Construction of the LNG Terminal

Type of Piles/ Level of Mitigation	Onset of Physical Injury (feet) (dB re: 1 μPa RMS)	Behavior Disturbance (feet) (dB re: 1 μPa RMS)
24-inch pre-stressed concrete		
No mitigation	0	98
12 dB mitigation	0	0
30-inch steel		
No mitigation	98	190
25 dB mitigation	0	0

Notes: RMS = root mean square

Eagle LNG compared continuous, non-impulsive sounds associated with dredging against the acoustic thresholds for marine mammals. Based on a worst-case assessment of a stationary dredging sound source occurring continuously for 24 hours and impacting a stationary manatee over that period, the distance predicted to avoid permanent hearing changes in manatees is 15 meters from the stationary dredging source.

Based on the berthing activity occurring continuously for one hour using the sound level equivalent to the logarithmic summation of the sound levels of the four vessels, Eagle LNG estimated that the permanent injury threshold for pinnipeds (considered to be similar to manatees) is expected to occur within 60 meters from the source. For the transiting of the vessels within the 1-mile radius of the marine terminal, estimated to be for a half hour period, the permanent injury threshold is exceeded within 11 meters of the transiting source. Due to the conservative assumptions involved in these calculations, the actual distances to permanent injury are likely to be less. Furthermore, it is expected that the manatees would display avoidance behavior in response to the moving vessels.

Proposed Mitigation Measures and Conclusion

Eagle LNG stated that by implementing noise mitigation measures that reduce underwater noise associated with pre-stressed concrete pile driving by 12 dB (re: 1 μPa) and reducing underwater noise associated with steel impact pile driving by 25 dB (re: 1 μPa), underwater noise levels associated with pile driving activities would be below injury thresholds for fish, marine mammals, and sea turtles at a distance of 20 meters (about 66 feet) and would be below behavioral disturbance thresholds at a distance of 40 meters (about 131 feet). Eagle LNG identified several mitigation measures it may use to reduce underwater noise impacts, including:

- using vibratory pile driving, where feasible, for steel piles;
- pre-drilling and jetting, where possible;
- using confined or unconfined bubble curtains;
- installing temporary noise attenuation pile and/or double-walled noise attenuation piles; and
- having a designated marine life observer notify a construction supervisor in the event of marine mammals entering the exclusion area.

Because Eagle LNG has not committed to specific mitigation measures it would implement during pile driving activities to reduce underwater noise impacts to below injury thresholds, **we recommend that:**

- **<u>Prior to construction</u>, Eagle LNG should file with the Secretary, for review and written approval by the Director of OEP, an *Underwater Noise Mitigation Plan* that identifies the specific mitigation measures Eagle LNG would implement to achieve its proposed reduction of 12 dB (re: 1 μPa) associated with pre-stressed concrete impact pile driving and its proposed reduction of 25 dB (re: 1 μPa) associated with steel impact pile driving. The *Underwater Noise Mitigation Plan* should also include an underwater noise monitoring plan to ensure that sound levels associated with pre-stressed concrete and steel impact pile driving achieve target noise levels, as well as additional mitigation that Eagle LNG would implement in the event that target noise levels are not achieved.**

The impacts associated with pile driving would be localized and temporary and, with implementation of Eagle LNG's proposed mitigation measures and our recommendation to develop and file an *Underwater Noise Mitigation Plan*, we conclude that impacts on aquatic resources would not be significant.

Vessel Traffic

During construction and operation of the LNG terminal, barges, support vessels, and LNG vessels (LNG carriers and LNG barges) would call on the LNG terminal, increasing ship traffic within the St. Johns River and Atlantic Ocean. Potential impacts on aquatic resources resulting from increased vessel traffic include resuspension of sediments, ballast water discharges, cooling water discharges, and increased noise levels. The following sections describe these potential impacts as well as measures proposed by Eagle

LNG to minimize impacts on aquatic resources. Potential impacts on aquatic marine mammals and sea turtles resulting from vessel strikes are described in sections 4.7.1 and 4.7.2.

Ballast Water Discharges

Section 4.3.2.3 describes the effects of ballast water discharges on four ambient water quality parameters (temperature, pH, dissolved oxygen, and salinity). Ballast water is stored below the ship's hull; as a result, the temperature of discharged water is not expected to deviate substantially from ambient water temperature. The pH of ballast water would be similar to or slightly higher than ambient water within the river. However, this difference would not be outside the tolerance range of resident species, and impacts would be temporary and negligible.

As described in section 4.3.2.3, salinity in the river varies between about 6 and 32 ppt (FDEP, 2016c) while ballast water, which would consist of open ocean water, would be between 33 and 37 ppt (NOAA National Weather Service, 2017). During and immediately following ballast water discharges, benthic aquatic species may be affected by higher salinity levels because the higher salinity ballast water would sink to the lower portion of the river due to its higher specific gravity relative to ambient water. However, tidal influence and ships moving into and out of the federal channel and berthing area would displace water, circulating it into, around, and out of the berthing area. Therefore, any increased salinity levels resulting from ballast water discharges would be temporary. Resident species within the St. Johns River are euryhaline, which enables them to live in waters with a wide range of salinity including that of seawater. Therefore, we have determined that increases in salinity from ballast water discharges would be temporary and not likely to adversely affect aquatic resources.

Dissolved oxygen levels below 4 milligrams per liter are generally considered unhealthy for aquatic life, and levels below 2 milligrams per liter are considered hypoxic and inadequate to support most aquatic life. As described in section 4.3.2.3, ballast water would contain low dissolved oxygen levels and could decrease existing dissolved oxygen levels within the immediate vicinity of the discharge point. Depending on the oxygen levels present in both the ballast and ambient water at the time of discharge, aquatic resources present near the discharge point could be exposed to dissolved oxygen levels considered unhealthy for aquatic life. The adaptability of resident species within the St. Johns River to natural spatiotemporal variation in oxygen levels, and the ability to move over a short distance to more suitable conditions, would minimize the adverse impacts associated with ballast water discharges. Given that the amount of ballast water discharged into the St. Johns River during each LNG vessel visit to the LNG terminal would make up only a small portion of the volume of water within the project vicinity of the St. Johns River, we have determined that impacts on aquatic resources would be temporary and not significant.

Due to the volumes of ballast water often collected by vessels, a possibility exists that living marine organisms may enter ballast tanks. The larger macroorganisms (e.g., zebra mussels, comb jellyfish) that could be collected may die during transit; however, some species survive and many of the smaller planktonic organisms could also survive. An environmental concern associated with ballast discharge includes the risk of introducing exotic species in marine and estuarine ecosystems (National Research Council, 1996; Takahashi, et al., 2008). Loaded with water from the surrounding ports and coastal waters throughout the world, vessels can carry a diverse assemblage of marine organisms in ballast water that may be foreign and exotic to the ship's port of destination. Invasive species threaten to outcompete and exclude native species and the overall health of an ecosystem, causing algal blooms and hypoxic conditions and affecting all trophic levels resulting in a decline in biodiversity.

U.S. regulations require that all vessels equipped with ballast water tanks that enter or operate in U.S. waters maintain a vessel-specific ballast water management plan and assign responsibility to the master or appropriate official to understand and execute the ballast water management strategy for that vessel (33 CFR 151.2026). Under these requirements, vessels must implement one of five strategies to prevent the spread of exotic aquatic nuisance species in U.S. waters. The International Maritime Organization has adopted this regulation and requires each vessel to install and operate a ballast water management system (option 1 as currently defined). Compliance dates associated with this International Maritime Organization requirement were phased, but became effective for all vessels beginning in 2016.[8] Therefore, ballast water that is likely to be introduced into the St. Johns River would be composed mainly of open ocean water collected during ballast water exchange.

A wide variety of ballast water treatment systems are currently available that may be utilized by LNG carriers frequenting the LNG terminal during operation which include systems that use chemicals or UV light. Treatment systems that utilize chemical additives such as chlorine and/or sulphate/bisulphate-based products could have adverse impacts on aquatic resources if discharged in high concentrations. However, all ballast water treatment systems (including those using chemical additives) are required to ensure that discharged ballast water would either meet or exceed the Coast Guard's regulatory limits for environmental compliance. All visiting vessels would be required by the Coast Guard to comply with the regulatory limits. With the implementation of the mandatory practices required by the Coast Guard, we conclude that the impacts on aquatic resources from ballast water discharges would be temporary and minor.

Cooling Water Intake and Discharge

All ships use water to cool their boilers. Cooling water withdrawal would occur along the vessel transit routes and from the St. Johns River within the berthing area. LNG barges would use about 535 gallons of water for engine cooling while at the LNG terminal. Depending upon engine type, LNG carriers would use a relatively small volume of water for engine cooling while they are at the LNG terminal compared to the large volume of water in the St. Johns River. Intake of water can also result in the entrainment of aquatic resources. Early life stages that utilize the river for nursery habitat would be most susceptible to entrainment. To calculate that loss, Eagle LNG conducted ichthyoplankton studies at the proposed terminal site using a NOAA Fisheries approved sampling protocol. Sampling occurred during peak abundance seasons (winter and summer) in the St. Johns River. Winter sampling occurred in February 2018 and summer sampling occurred in August 2018. Adult equivalent loss calculations were conducted for species where sufficient life history information is available (i.e., commercially and recreationally important species, food sources, and bait fish).

Winter ichthyoplankton sampling results indicated that cooling water intake would affect bay anchovy, weakfish, ladyfish, and Atlantic croaker. Based on winter sampling results, the annual loss equivalent would be highest for bay anchovy egg entrainment (annual adult loss equal to 58) followed by larval entrainment of Atlantic croaker (annual adult loss equal to 23). The loss equivalent calculated for larval ladyfish and weakfish was 0.4 and 0.1, respectively.[9]

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[8] This regulation (33 CFR 151.2026) currently applies to all new vessels as well as existing vessels with ballast water capacity between 1,500 and 5,000 m^3 that have been dry-docked since January 1, 2014. Compliance by existing vessels with ballast water capacity less than 1,500 m^3 or greater than 5,000 m^3 will be required as of the vessel's first scheduled drydocking after January 1, 2016.

[9] Annual loss equivalent modeling is used to convert age and life stage specific estimates of entrainment and impingement loss to an easily understood currency, such as number of individuals (Dey, 2002).

Summer ichthyoplankton sampling results indicated that cooling water intake would affect bay anchovy, spotted seatrout, and weakfish. Summer sampling results indicated that the annual loss equivalent would again be highest for bay anchovy (annual loss equivalent equal to 98 due to egg entrainment, 1.26 due to larval entrainment, and 13,421 due to adult entrainment). The loss equivalent calculated for larval entrainment of weakfish and spotted seatrout was 0.3 and 0.2, respectively.

Bay anchovy was the most common species found in both the winter and summer sampling events. This species is a serial spawner that produces a large volume of pelagic eggs that are found throughout the water column. Each female can produce more than 50,000 eggs per season and adult bay anchovies can produce more than 100 trillion eggs each year (Chesapeake Bay Program, 2019). They form large schools and are an important food source for other species including weakfish and piscivorous birds. Bay anchovy mortality rates are high due to both predation and starvation (FWS, 1989; Leak and Houde, 1987; Zastrow et al., 1991; DeLancey, 2005; Sheridan, 1978). Though the annual loss equivalent for bay anchovy appears high, the loss is small considering the volume of eggs produced each year. Therefore, we conclude that cooling water intake effects on ichthyoplankton would not be significant.

Eagle LNG anticipates that water used for engine cooling would be discharged at a temperature about 3 degrees °F warmer than ambient water temperature. Fish and invertebrates within the immediate vicinity of the LNG carrier could be temporarily affected by this increase in temperature; however, many of the species present are mobile and would relocate to more suitable conditions during discharges. Given the volume of cooling water discharged relative to the total volume of water within the St. Johns River, and the mobility of resident species, which could relocate to cooler surrounding waters if necessary, we have determined that impacts on aquatic resources would be intermittent and minor.

<u>Increased Noise Levels</u>

Engine-noise produced by LNG vessels would result in temporary increases in underwater noise levels near the transiting ships. Noise generated by LNG vessels is generally omni-directional, emitting from the sides of the vessel (Whale and Dolphin Conservation Society, 2004), but are greatest on the sides of the ship and weakest on the front and rear of the ship. Impacts on aquatic resources due to increased noise levels would vary by species; however, the aquatic resources present within the LNG carrier routes are likely accustomed to regular fluctuations in noise levels from ongoing industrial and commercial shipping activities. Additionally, as described above, many of the species present within the LNG carrier routes are mobile and would move out of areas of noise that would startle or stress aquatic resources present. Due to the existing industrial and shipping activities within the LNG vessel transit routes and the mobility of resident species, we have determined impacts on aquatic resources associated with engine noise produced by LNG carriers during operation of the LNG terminal would be intermittent and minor.

Stormwater Runoff

Construction activities at the LNG terminal would remove vegetation cover at the site and expose the underlying soils to the effects of wind and rain, which increases the potential for soil erosion and sedimentation of aquatic habitat. Similarly, during operation of the LNG terminal, 70.7 acres of currently vegetated land would be converted to impervious or semi-pervious surfaces associated with aboveground facilities, which would increase stormwater runoff into adjacent vegetated and open water habitats. Potential impacts from stormwater runoff on aquatic resources include increased turbidity and suspended solid levels, which are described above (see section 4.6.2.2, *Dredging*).

To minimize impacts on aquatic resources due to stormwater runoff, Eagle LNG would conduct land-disturbing activities in compliance with its project-specific SWPPP, and project-specific Plan and Procedures. Therefore, we conclude that impacts on aquatic resources as a result of stormwater runoff would be localized and not significant.

Lighting

Eagle LNG would install and use temporary lighting during construction of the LNG terminal to facilitate construction activities deemed necessary for 24-hour operations. Lighting associated with in-water activities would have the greatest potential to affect aquatic resources. During operation of the LNG terminal, facility lighting selected would minimize the horizontal emission of light away from unintended areas, and over-water lighting would be shielded and limited to the extent necessary to carry out marine operations or facility maintenance.

Illumination of surface waters in the vicinity could cause artificially inducted aggregations of small organisms that rely on sun or moonlight to determine movement patterns, resulting in increased predation by larger species. It is unlikely that manatees or sea turtles would be attracted to the area due to the lack of foraging habitat. Generally, impacts on aquatic species would be minor because these species may change their feeding habits over time. In addition to impacts associated with artificial lighting, shading impacts would occur where the trestle traverses wetlands (about 0.1 acre). The shading impacts would be small compared to the large area of remaining wetlands. Based on the likelihood that aquatic resources would acclimate over time to increased lighting at the LNG terminal and the small area of shading impacts, we have determined that impacts on aquatic resources from increased lighting and shading from the marine trestle during construction and operation of the LNG terminal would be localized and minor.

Inadvertent Spills

During construction and operation, hazardous materials resulting from spills or leaks entering the St. Johns River or Drummond Creek could have adverse impacts on aquatic resources. The impacts are caused either by the physical nature of the material (e.g., physical contamination and smothering) or by its chemical components (e.g., toxic effects and bioaccumulation). These impacts would depend on the depth and volume of the spill, as well as the properties of the material spilled. To prevent spills and leaks, Eagle LNG would implement its project-specific CSCWM Plan[10] during construction and its SPCC Plan during operation of the LNG terminal, which outline potential sources of releases at the site, measures to prevent a release, and initial responses in the event of a spill. Additionally, all ships calling on the LNG terminal would maintain a SOPEP, which would minimize any impacts on water quality from a ship related spill. Given the impact minimization and mitigation measures described above, we conclude that the probability of a spill of hazardous materials is small and any resulting impacts on aquatic resources would be temporary and minor.

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[10] The CSCWM Plan was included Eagle LNG's application, Resource Report 2, appendix 2.B, which is available at: http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20170131-5314.

4.6.3 Essential Fish Habitat

4.6.3.1 Regulatory Background

Along with other goals, the intent of the MSA (Public Law 94-265 as amended through October 11, 1996) was to promote the protection of EFH during the review of projects to be conducted under federal permits, licenses, or other authorizations that affect or have the potential to affect such habitat. The MSA defines EFH as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Federal agencies that authorize, fund, or undertake activities that may adversely affect EFH must consult with NOAA Fisheries. Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as NEPA, the Fish and Wildlife Coordination Act, and the ESA to reduce duplication and improve efficiency (50 CFR 600.920(e)). Generally, the EFH consultation process includes the following steps:

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

2. EFH Assessment – The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH Assessment should include:

    - a description of the proposed action;

    - an analysis of the effects (including cumulative effects) of the proposed action on EFH, managed fish species, and major prey species;

    - the federal agency's views regarding the effects of the action on EFH; and

    - proposed mitigation, if applicable.

3. EFH Conservation Recommendations – After reviewing the EFH Assessment, NOAA Fisheries should provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.

4. Agency Response – Within 30 days of receiving the recommendations, the action agency must respond to NOAA Fisheries. The action agency may notify NOAA Fisheries that a full response to the conservation recommendations would be provided by a specified completion date agreeable to all parties. The response must include a description of measures proposed by the agency to avoid, mitigate, or offset the impact of the activity on EFH.

An EFH Assessment for the Jacksonville Project was developed for interagency coordination as required by NEPA. We requested to initiate consultation with the issuance of the draft EIS. A copy of the EFH Assessment is included as appendix D.

4.6.3.2 Essential Fish Habitat Within the Project Area

Between 1982 and 1993, the South Atlantic and Mid-Atlantic Fisheries Management Councils prepared fishery management plans for six marine groups within the project area: snapper/grouper complex, spiny lobster (*Panulirus argus*), shrimp, coastal migratory pelagics, bluefish (*Pomatomus saltatrix*), and summer flounder (*Paralichthys dentatus*) (Gulf of Mexico and SAFMC, 1982 & 1983; SAFMC 1983, 1993; Mid-Atlantic Fishery Management Council, 1988, 1990). All of the fishery management plans have been amended several times since they were first prepared (SAFMC, 2017). Table 4.6.3-1 identifies life stage occurrences for several species within these groups along with the EFH category present within the project site.

Designated EFH is in the area and includes the St. Johns River estuary, unconsolidated bottom (soft sediments), tidal creeks, and estuarine emergent wetlands. Estuarine emergent wetland EFH serves as important nursery and feeding habitat for many fish and invertebrates (e.g., worms and mollusks living on and in the sediments). Estuarine water column habitat serves as EFH for several species and their prey at various life stages by providing suitable habitat for spawning, breeding, and foraging. (SAFMC, 2018; 2016). Per Eagle LNG, the soft sediments in and near the proposed marine facilities are composed of shell hash, mud, or sand bottom with no known seagrass; saltmarsh habitat and rock areas are present adjacent to the project site. The community composition of both the mud substrates and estuarine water column in and near the proposed marine facilities remain in an early successional stage due to regular maintenance dredging, propeller wash from passing vessels, and natural sedimentation.

TABLE 4.6.3-1

Life Stage Occurrence for Species with Essential Fish Habitat Designated in the Vicinity of the LNG Terminal

Species	Adults	Eggs	Juveniles	Larvae	Spawners	EFH Category Within Project Area
Shrimp Brown shrimp Pink shrimp White shrimp			✓	✓		Soft substrate; estuarine emergent wetlands
Snapper/grouper complex [a] Mutton snapper Spadefish	✓		✓			Estuarine emergent vegetated wetlands; tidal creeks; unconsolidated bottom (soft sediments)
Red drum	✓	✓	✓	✓	✓	Estuarine emergent vegetated wetlands; unconsolidated bottom (soft sediments)
Coastal migratory pelagics [b] Spanish mackerel	✓	✓	✓			High salinity estuaries, all coastal inlets
Spiny lobster	✓		✓			Shallow subtidal bottom; unconsolidated bottom (soft sediments)
Bluefish	✓		✓			Major estuaries (including the St. Johns River)
Summer flounder	✓		✓	✓		All inshore estuaries where summer flounder were identified as being present

[a] Snapper/grouper complex includes 73 total species.
[b] Coastal migratory pelagics includes 5 total species.
Sources: SAFMC, 1998; NOAA Fisheries, 2017b-c; NOAA National Centers for Coastal Ocean Science, 2017

4.6.3.3 Impacts and Mitigation

As described in section 4.6.2.2, construction of the LNG terminal (in particular, construction of the LNG loading and berthing facilities) would result in temporary increases in noise, artificial lighting, shading, turbidity, and suspended solids within the estuarine water column. Impacts on managed species during construction and operation of the LNG terminal would be similar to those described above for aquatic resources (see section 4.6.2.2). Potential impacts on estuarine wetland, soft sediments, and estuarine water column habitat are described below.

Estuarine Emergent Wetland

During project design, Eagle LNG minimized project impacts on the estuarine wetlands to the extent feasible. However, construction of the berthing area would permanently convert 0.7 acre of saltmarsh to industrial facilities for the facility berm, jetty access, and marine load-out terminal and trestle.

Eagle LNG would implement its project-specific Plan and Procedures and SWPPP to ensure that impacts related ground and sediment disturbance would be minimized and would not contribute to ongoing sedimentation in the area. Therefore, we have determined that the Jacksonville Project would not have a significant adverse impact on estuarine wetland habitat.

Soft Sediments

Construction of the 10.1-acre berthing area would require deepening the existing open water area to a depth of about 37.3 feet below mean lower low water to accommodate the full range of LNG vessels. Dredging activities would result in the removal of the existing sediments from a 10.1-acre area (which would remove the existing benthic community). In addition, sediments resuspended in the water column during dredging and other construction activities would be redeposited on nearby substrates, potentially smothering immobile fish eggs and larvae as well as benthic invertebrates. Dredging activities could also cause mortality of larval or post-larval shrimp and fish species in the immediate vicinity of the dredge. Although Eagle LNG has not developed a precise dredging schedule at the time of this writing, it anticipates that dredging would occur over a 12-week period, and impacts on soft sediments would be greatest if dredging occurs during a period of peak larval abundance in early spring or summer.

Maintenance dredging within the 10.1-acre berthing area would occur every 1 to 2 years, and would have impacts on mud substrates similar to those described above for dredging during construction; however, impacts would be shorter in duration due to the reduced amount of material removal from the berthing area.

As described above, soft sediments within the St. Johns River remain in an early successional stage due to periodic maintenance dredging of the federal channel. Given that impacts on soft sediments would generally be limited to the period during and immediately following construction and maintenance dredging, we have determined that the Jacksonville Project would not have a significant adverse impact on soft sediment habitat.

Water Column and Tidal Creeks

Construction of the LNG terminal would increase noise, artificial lighting, turbidity, and suspended solid levels within the estuarine water column near the terminal. Impacts on the estuarine water column would be greatest during dredging and pile driving activities, but would occur throughout construction of the LNG terminal. During operation of the LNG terminal, increased noise and artificial lighting, stormwater runoff, and vessel traffic could affect estuarine water column habitat near the LNG terminal. Impacts would primarily be limited to the 10.1-acre berthing area; however, some impacts (e.g., noise and suspended solids) may extend beyond the berthing area, although the impact would decrease with distance. Potential impacts on fisheries present within the water column due to project-related changes in water quality and increased noise and artificial lighting could include decreased foraging success, suitability of spawning habitat, and survival of juvenile fish (see section 4.6.2.2).

Vessel traffic associated with construction and operation of the LNG terminal could affect estuarine and marine water column habitat within the St. Johns River and Atlantic Ocean. Impacts on water quality may occur due to resuspension of suspended solids, discharge of ballast water, and intake and discharge of cooling water. However, the federal channel was specifically created to provide deepwater access for maritime commerce and support high levels of deep draft traffic; therefore, impacts on water quality due to the incremental increase in vessel traffic within these waterways during construction and operation of the Jacksonville Project would not have a significant adverse impact on water column habitat.

4.7 THREATENED, ENDANGERED, AND OTHER SPECIAL STATUS SPECIES

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species that are protected under the ESA, as amended; species that are currently candidates for federal listing under the ESA; state-listed threatened or endangered species; and species otherwise granted special status at the state or federal level (e.g., protected under the *Marine Mammal Protection Act of 1972* [MMPA]).

Federal agencies are required under section 7 of the ESA, as amended, to ensure that any actions authorized, funded, or carried out by the agency would not jeopardize the continued existence of a federally listed threatened or endangered species, or result in the destruction or adverse modification of the designated critical habitat of a federally listed species. As the lead federal agency, the FERC is required to coordinate with the FWS and/or NOAA Fisheries to determine whether federally listed threatened or endangered species or designated critical habitat are found in the vicinity of the project, and to determine 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 prepare a BA and submit its BA to the FWS and/or NOAA Fisheries. If the action would adversely affect a listed species and/or its critical habitat, the federal agency must also submit a request for formal consultation. In response, the FWS and/or NOAA Fisheries would issue a Biological Opinion as to whether the federal action would likely jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat.

We developed a BA for the Jacksonville Project used for interagency coordination required under NEPA (see appendix C). We requested initiation of consultation with NOAA Fisheries and the FWS with issuance of the draft EIS. Furthermore, we request concurrence with our findings of effect for the federally listed species. Table 4.7-1 summarizes the potential for the project to affect these species and our determinations of effect. Further discussion of federally and state-listed species and our assessment of potential impacts are provided in sections 4.7.1 and 4.7.2.

TABLE 4.7-1

Threatened and Endangered Species Potentially Occurring Within the Jacksonville Project Area

Common Name *(Scientific Name)*	Federal Status	State Status	Habitat Requirements	Determination of Effect [d]
West Indian manatee (*Trichechus manatus)*	Threatened [b]	Federally Threatened [c]	Inhabits large, slow-moving rivers, river mouths, and shallow coastal areas such as coves and bays (FWS, 2017b). Manatees are documented in the St. Johns River near the project site (Jacksonville University, 2015).	*Is not likely to adversely affect.* Species could utilize offshore areas along the transit route; ships would have dedicated watchstanders and follow standard manatee construction conditions.
Blue whale (*Balaenoptera musculus)*	Endangered [b]	–	Inhabits the open ocean and are sometimes found in coastal waters (NOAA Fisheries, 2016a).	*Is not likely to adversely affect.* Species could utilize offshore areas along the transit route; ships would have dedicated watchstanders.
Fin whale (*Balaenoptera physalus physalus)*	Endangered [b]	Federally Endangered [c]	Inhabits the open ocean.	*Is not likely to adversely affect.* Species could utilize offshore areas along the transit route; ships would have dedicated watchstanders.
North Atlantic right whale (*Eubalaena glacialis)*	Endangered [b]	Federally Endangered [c]	This species is one of the most endangered whales in the world. Critical habitat (calving grounds) is present in waters off the east coast of Florida, including the St. Johns inlet (NOAA Fisheries, 2016b).	*Is not likely to adversely affect.* Species utilizes Florida's east coast and St. Johns River inlet along the transit route; ships would have dedicated watchstanders and would utilize the Mandatory Ship Reporting System.
Sei whale (*Balaenoptera borealis)*	Endangered [b]	Federally Endangered [c]	Inhabits the open ocean (NOAA Fisheries, 2012a).	*Is not likely to adversely affect.* Species could utilize offshore areas along the transit route; ships would have dedicated watchstanders.
Sperm whale (*Physeter macrocephalus)*	Endangered [b]	Federally Endangered [c]	Inhabits the open ocean (NOAA Fisheries, 2017d).	*Is not likely to adversely affect.* Species could utilize offshore areas along the transit route; ships would have dedicated watchstanders.
Birds				
Eastern black rail (*Laterallus jamaicensis jamaicensis*)	Candidate [a]	–	Inhabits densely vegetated salt or freshwater marshes dominated by tuft-forming cordgrass (FWS, 2018a; FWC, 2003).	*Not likely to jeopardize the continued existence of the species.* Project would affect 0.7 acre of salt marsh but adjacent suitable habitat would remain.
Rufa red knot (*Calidris canutus rufa)*	Threatened [a]	Federally Threatened	Inhabits coastal marine and estuarine habitats (FWS, 2005).	*No effect.* Suitable habitat is not present.
Piping plover *(Charadrius melodus)*	Threatened/ Critical Habitat [a]	Federally Threatened	Overwinters in Florida with critical habitat designated for emergent shoals and shoreline in some areas at the mouth of the St. Johns River (FWS, 2007).	*No effect.* Suitable habitat is not present.

TABLE 4.7-1 (cont'd)

Threatened and Endangered Species Potentially Occurring Within the Jacksonville Project Area

Common Name *(Scientific Name)*	Federal Status	State Status	Habitat Requirements	Determination of Effect [d]
Red-cockaded woodpecker (*Picoides borealis)*	Endangered [a]	Federally Endangered	Red-cockaded woodpeckers are cavity nesters that rely on mature pine forests where they excavate cavities in living pine trees that are generally over 80 years old. Red-cockaded woodpeckers prefer longleaf pine, but also inhabit slash and loblolly pines in Florida (FWS, 2016b).	*No effect.* Suitable habitat is not present.
Wood stork (*Mycteria americana)*	Threatened [a]	Federally Threatened	Inhabits mixed hardwood swamps, sloughs, mangroves, and cypress domes. Reproductive success is tied to distance from rookery (FWS, 2013b).	*Is not likely to adversely affect.* Within core foraging area of two wood stork colonies. Project would impact about 1.9 acres of wetlands. Eagle LNG would purchase mitigation bank credits to offset impacts.
Worthington's marsh wren (*Cistothorus palustris griseus)*	–	State Threatened [a]	Inhabits tidal marshes dominated by cordgrass and was observed in the saltmarsh during field surveys (FWC, 2012d).	*Permanent minor impacts are anticipated.* Project would impact 0.7 acres of salt marsh but adjacent suitable habitat would remain.
Little blue heron (*Egretta caerulae)*	–	State Threatened [a]	Utilizes shallow fresh, brackish, and saltwater habitats, and prefers freshwater lakes, marshes, swamps, and streams (FWC, 2012e).	*Permanent minor impacts are anticipated.* Project would impact 0.7 acres of salt marsh but adjacent suitable habitat would remain.
Tricolored heron (*Egretta tricolor)*	–	State Threatened [a]	Inhabits both fresh and saltwater marshes, estuaries, and river deltas (FWC, 2012f).	*Permanent minor impacts are anticipated.* Project would impact 0.7 acres of salt marsh but adjacent suitable habitat would remain.
American oystercatcher (*Haematopus palliatus)*	–	State Threatened [a]	Inhabits coastal beaches, sandbars, and mud flats (FWC, 2012g).	*No adverse impacts anticipated.* Species could be present along the transit route, but use of highly traveled shipping lanes would not affect species habitat.
Black skimmer (*Rynchops niger)*	–	State Threatened [a]	Inhabits sand beaches, sandbars, and islands developed by dredged material (FWC, 2012h).	*No adverse impacts anticipated.* Species could be present along the transit route, but use of highly traveled shipping lanes would not affect species habitat.
Least tern (*Sternula antillarum)*	–	State Threatened [a]	Inhabits coastal areas including estuaries and bays, nesting sites are well-drained sand or gravel with little vegetation (FWC, 2012i). Least tern observed in the project area during surveys.	*Permanent minor impacts are anticipated.* No nesting colonies recorded within 100 meters of the project but suitable habitat would be affected.
Fish				
Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus)*	Endangered	Federally Endangered	Benthic species that utilizes both saltwater and freshwater habitats during different parts of the year and is known to utilize the St. Johns River as nursery habitat (FWS 2012b).	*Is not likely to adversely affect.* Species could utilize project site and vessel transit route but would exhibit avoidance behavior due to noise.

TABLE 4.7-1 (cont'd)

Threatened and Endangered Species Potentially Occurring Within the Jacksonville Project Area

Common Name *(Scientific Name)*	Federal Status	State Status	Habitat Requirements	Determination of Effect [d]
Nassau grouper (*Apinephelus striatus)*	Threatened	–	Adults are most commonly found in clear water with high relief coral reefs or rocky substrates while smaller individuals are found nearshore (Cornish and Eklund, 2003; Florida Fish and Wildlife Conservation Commission [FWC], 2017a). Their range includes south Florida, Bermuda, and the Caribbean Sea (Hill, 2016).	*No effect.* Project area not within species range; suitable habitat not present.
Shortnose sturgeon (*Acipenser brevirostrum)*	Endangered	Federally Endangered [c]	Inhabits rivers and estuaries in areas with rocky or gravel substrate or limestone outcroppings. They tolerate marine habitats, which are utilized while traveling between rivers (NOAA Fisheries, 2015b; FWC, 2017b).	*Is not likely to adversely affect.* Species could utilize project site and vessel transit route but would exhibit avoidance behavior due to noise.
Smalltooth sawfish (*Pristis pectinata)*	Endangered	Federally Endangered	Inhabits coastal waters and estuaries, utilizing areas with muddy or sandy bottoms in waters less than 32 feet deep and show a preference for warm water between 71 °F and 82 °F. They travel inland in river systems and prefer salinity ranges of 18 to 24 parts per thousand (NOAA Fisheries, 2015c)	*Is not likely to adversely affect.* Species occurrence is not expected at river mile 14.5, but they could be encountered along the vessel transit route and Eagle LNG would comply with NOAA Fisheries *Sea Turtle and Smalltooth Sawfish Construction Conditions*.
Reptiles				
Green sea turtle *(Chelonia mydas)*	Threatened	Federally Threatened [c]	Occurs in coastal and offshore waters off the Florida coast and nests on Florida's beaches. The species may be present along the LNG transit routes (NOAA Fisheries, 2016c).	*Is not likely to adversely affect.* Nesting beaches would not be affected. Turtles could be encountered along the vessel transit route. Eagle LNG would comply with NOAA Fisheries *Sea Turtle and Smalltooth Sawfish Construction Conditions* and would have dedicated watchstanders during vessel transit.
Hawksbill sea turtle *(Eretmochelys imbricata)*	Endangered	Federally Threatened [c]	Occurs in rocky areas, coral reefs, shallow coastal areas, lagoons, and narrow creeks (NOAA Fisheries 2014a). The species is the rarest of Florida's sea turtles, but could be present along the LNG transit routes.	*Is not likely to adversely affect.* Nesting beaches would not be affected. Turtles could be encountered along the vessel transit route. Eagle LNG would comply with NOAA Fisheries *Sea Turtle and Smalltooth Sawfish Construction Conditions* and would have dedicated watchstanders during vessel transit.
Kemp's ridley sea turtle *(Lepidochelys kempii)*	Endangered	Federally Threatened [c]	Inhabits nearshore and inshore waters and is a shallow benthic feeder (NOAA Fisheries 2015c). Limited nesting occurs in central and south Florida but the species may be present in estuarine and	*Is not likely to adversely affect.* Nesting beaches would not be affected. Turtles could be encountered along the vessel transit route. Eagle LNG would comply with NOAA Fisheries *Sea*

TABLE 4.7-1 (cont'd)

Threatened and Endangered Species Potentially Occurring Within the Jacksonville Project Area

Common Name *(Scientific Name)*	Federal Status	State Status	Habitat Requirements	Determination of Effect [d]
			offshore waters along the LNG transit routes (FWS, 2015c).	*Turtle and Smalltooth Sawfish Construction Conditions* and would have dedicated watchstanders during vessel transit.
Leatherback sea turtle *(Dermochelys coriacea)*	Endangered	Federally Endangered [c]	Inhabits open ocean and commonly nests on Florida beaches, especially in south Florida (NOAA Fisheries, 2016d; FWS, 2015d). Three nests were documented in Duval County in 2015 (FWC, 2017d). This species may be present along the LNG transit routes.	*Is not likely to adversely affect.* Nesting beaches would not be affected. Turtles could be encountered along the vessel transit route. Eagle LNG would comply with NOAA Fisheries *Sea Turtle and Smalltooth Sawfish Construction Conditions* and would have dedicated watchstanders during vessel transit.
Loggerhead sea turtle *(Caretta caretta)*	Threatened	Federally Threatened [c]	Inhabits oceans in temperate and tropical regions and can be found in inshore areas such as bays, ship channels, large river mouths, and salt marshes (NOAA Fisheries 2017f). This species is commonly nests in north Florida and could utilize both inshore and offshore waters along the LNG transit routes (FWS, 2015e; FWC, 2017e).	*Is not likely to adversely affect.* Nesting beaches would not be affected. Turtles could be encountered along the vessel transit route. Eagle LNG would comply with NOAA Fisheries *Sea Turtle and Smalltooth Sawfish Construction Conditions* and would have dedicated watchstanders during vessel transit.
Eastern indigo snake (*Drymarchon corais couperi)*	Threatened	Federally Threatened	Species prefers xeric longleaf pine sandhills with gopher tortoises and require very large tracts of land (FWC, 2017f; FWS, 2010b). Fragmented habitat on site makes it unlikely that indigo snakes utilize the site.	*Is not likely to adversely affect.* No observed snakes in Duval County for more than 10 years. Project would comply with the FWS *Standard Protection Measures for the Indigo Snake*.
Gopher tortoise (*Gopherus polyphemus)*	Candidate	State Threatened	Inhabits well-drained sandy areas with sparse tree canopy (FWS, 2011; FWS, 2016c; FWC, 2017g). Gopher tortoise burrows were observed on site.	*Not likely to jeopardize the continued existence of the species.* Eagle LNG would conduct 100 percent surveys prior to construction, would comply with FWC *Gopher Tortoise Permitting Guidelines*, and would apply for relocation permits.
Florida pine snake (*Pituophis melanoleucus mugitus)*	–	State Threatened	Inhabits upland areas with well-drained sandy soils (FWC, 2012j).	*No adverse impacts anticipated.* Fragmented habitat and recent clear cutting of pine on the site makes it unlikely that pine snakes utilize the site.
American alligator (*Alligator mississippiensis)*	Threatened (Similarity of Appearance)	Federally Threatened (Similarity of Appearance)	Inhabits lakes, ponds, and freshwater and brackish water wetlands (FWS, 2008b). Species listed due to its similarity of appearance to the American crocodile, which does not occur in north Florida.	*Is not likely to adversely affect.* The species is only listed due to similarity of appearance with the American crocodile which is only present in south Florida.

TABLE 4.7-1 (cont'd) **Threatened and Endangered Species Potentially Occurring Within the Jacksonville Project Area**				
Common Name *(Scientific Name)*	Federal Status	State Status	Habitat Requirements	Determination of Effect [d]
Amphibians				
Frosted flatwoods salamander (*Ambystoma cingulatum)*	Threatened	Federally Threatened	Upland habitat composed of fire-maintained, open-canopied longleaf pine-wiregrass flatwoods and savannas. Breeding occurs in small, isolated, ephemeral wetlands dominated by pond cypress, blackgum, and slash pine that lack predatory fish (FWS, 2018b). Florida's easternmost county within the current range of this species is Baker County; the range does not include Duval County.	*No effect.* Suitable habitat is not present and Project located outside current range
Striped newt (*Notophthalmus perstriatus)*	Candidate	–	Inhabits sandhill and scrub habitats and requires ephemeral, isolated ponds with no predatory fish (FWS 2017c). Suitable or preferred habitat not present on site.	*Not likely to jeopardize the continued existence of the species.* Species last observed in project area in 1963 (Enge, 2011). Available habitat is marginal.
Invertebrates				
Boulder star coral (*Orbicella franksi)*	Threatened	Federally Threatened	Boulder star coral is one of the reef-building star corals in the order Scleractinia. Star corals are part of the *Orbicella* species complex and were historically dominant components of coral reefs in the Caribbean. Reef-building corals require a hard substrate, mean temperatures typically between 77 °F to 86 °F, and adequate light and water flow (NOAA Fisheries, 2012a, 2015a).	*No effect.* Project area is not within species range
Elkhorn coral (*Acropora palmata)*	Threatened	Federally Threatened	This species is a branching coral typically found in shallow water areas with a lot of wave action. Elkhorn coral is one of the Acroporids that was a dominant reef-building species in Florida and the Caribbean. Their distribution includes the Bahamas, south Florida, and the Caribbean (NOAA Fisheries, 2004b).	*No effect.* Project area not within species range
Lobed star coral (*Orbicella annularis)*	Threatened	Federally Threatened	One of the reef-building star corals in the order Scleractinia. Star corals are part of the *Orbicella* species complex and were historically dominant components of coral reefs in the Caribbean. Reef-building corals require a hard substrate, mean temperatures typically between 77 °F to 86 °F, and adequate light and water flow (NOAA Fisheries, 2012a, 2015a).	*No effect.* Project area is not within species range

TABLE 4.7-1 (cont'd)

Threatened and Endangered Species Potentially Occurring Within the Jacksonville Project Area

Common Name *(Scientific Name)*	Federal Status	State Status	Habitat Requirements	Determination of Effect [d]
Mountainous star coral (*Orbicella faveolata)*	Threatened	Federally Threatened	Mountainous star coral is one of the reef-building star corals in the order Scleractinia. Star corals are part of the *Orbicella* species complex and were historically dominant components of coral reefs in the Caribbean. Reef-building corals require a hard substrate, mean temperatures typically between 77 °F to 86 °F, and adequate light and water flow (NOAA Fisheries, 2012a, 2015a).	*No effect.* Project area not within species range
Pillar coral (*Dendrogyra cylindrus)*	Threatened	Federally Threatened	Pillar coral is one of the reef-building corals in the order Scleractinia. They are typically found as scattered, isolated colonies in warm marine waters off the southeast coast of Florida and throughout the Caribbean. These corals require a hard substrate, temperatures typically between 77 to 86 degrees Fahrenheit (°F), and adequate light and water flow (NOAA Fisheries, 2012a, 2015a; FWC, 2012a).	*No effect.* Project area is not within species range
Rough cactus coral (*Mycetophyllia ferox)*	Threatened	Federally Threatened	Rough cactus coral is one of the reef-building corals in the order Scleractinia. They are generally found in shallow reef environments and are one of the least common species. These corals require a hard substrate, temperatures typically between 77 °F to 86 °F, and adequate light and water flow (NOAA Fisheries, 2012a, 2015a).	*No effect.* Suitable habitat is not present
Staghorn coral (*Acropora cervicornis)*	Threatened	Federally Threatened	This species is a branching coral typically found in shallow water areas with a lot of wave action. Staghorn coral is one of the Acroporids that was a dominant reef-building species in Florida and the Caribbean. Their distribution includes the Bahamas, south Florida, and the Caribbean (NOAA Fisheries, 2004b).	*No effect.* Project area is not within species range
Black Creek crayfish (*Procambarus pictus)*	-	State Threatened	Inhabit cool, tannic-stained streams and is restricted to higher water quality headwaters (FWC, 2012k; Moler and Crandall, 2010).	*No effect.* Species is not found in the project segment of the St. Johns River
Plants				
Johnson's seagrass (*Halophila johnsonii)*	Threatened	Federally Threatened	This seagrass prefers the intertidal zone and deeper water of coast lagoons with course sand and muddy substrates. The	*No effect.* Project area is not within species range

TABLE 4.7-1 (cont'd)

Threatened and Endangered Species Potentially Occurring Within the Jacksonville Project Area

Common Name *(Scientific Name)*	Federal Status	State Status	Habitat Requirements	Determination of Effect [d]
			species inhabits areas with turbid water and high tidal currents (NOAA Fisheries, 2015b). The northern extent of the species range is Sebastian Inlet in southeast Florida.	
Sweet shrub (*Calycanthus floridus)*	-	State Endangered	Distribution in Florida includes Escambia, Franklin, Gadsden, Jackson, Leon, Liberty, Okaloosa, Santa Rosa, Suwannee, and Walton Counties. (USDA NRCS, 2018b).	*No effect.* An occurrence of sweet shrub was observed at the project site; however, its location suggests that it was planted on a homestead by the previous landowner and is not a native occurrence of this species.
Critical Habitat				
North Atlantic right whale critical calving habitat	Critical Habitat	–	The calving habitat physical and biological features must occur simultaneously over an area of 231 square nautical miles between November and April and include calm sea surface conditions, a sea surface temperature ranging from a minimum of 44.6 °F to 62.6 °F, and water depth from about 20 to 92 feet (NOAA Fisheries, 2016e).	*No effect.* Vessel traffic would not affect the components of North Atlantic right whale critical habitat.
Loggerhead sea turtle critical habitat a) Nearshore reproductive habitat b) Foraging habitat c) Winter habitat d) Breeding habitat e) Constricted migratory habitat f) Sargassum habitat	Critical Habitat	–	a) The physical and biological features of nearshore reproductive habitat include nearshore waters up to 1.0 mile offshore of the highest density nesting beaches, waters that are generally free of obstructions and artificial lighting to allow transit through the surf zone toward open water, and waters with minimal manmade structures that could concentrate predators, disrupt wave patterns, and/or create excessive longshore currents; b) the physical and biological foraging habitat features include sufficient prey availability and quality such as benthic invertebrates, and water temperatures generally above 50 °F; c) winter habitat features include water temperatures above 50 °F from November through April, continental shelf waters close to the western boundary of the Gulf Stream, and waters between about 65 to 328 feet deep; d) breeding habitat features include high densities of reproductive adults, proximity to the primary Florida migratory	*No effect.* Vessel traffic would not affect the components of loggerhead sea turtle critical habitat.

TABLE 4.7-1 (cont'd)

Threatened and Endangered Species Potentially Occurring Within the Jacksonville Project Area

Common Name *(Scientific Name)*	Federal Status	State Status	Habitat Requirements	Determination of Effect [d]
			corridor, and proximity to Florida nesting beaches; e) constricted migratory habitat features consist of continental shelf areas that constrict the migratory pathway and where passage conditions allow for the migration of sea turtles to nesting, breeding, and/or foraging areas; and f) *Sargassum* habitat are composed of locations where water temperature supports the optimal *Sargassum* growth and loggerhead inhabitance, where Sargassum concentrations support abundant prey and cover, available prey, and sufficient water depth and currents to ensure transport out of the surf zone (NOAA Fisheries, 2014b).	
Florida manatee critical habitat	Critical Habitat	–	The FWS designated critical habitat for the Florida manatee on September 24, 1976. The St. Johns River is among the areas identified in Florida as critical habitat. The FWS intends to eventually identify the physical and biological features essential to manatees, including the necessity of available warm-water refugia. However, until changes are made, the currently designated critical habitat will continue to be subject to regulatory protections (FWS, 2010a).	*No effect.* Vessel traffic would not alter Florida manatee critical habitat.

[a] Species protected under the MBTA (see section 4.6.1.3)

[b] Species protected under the Marine Mammal Protection Act (see section 4.7.2.9)

[c] FWC does not have constitutional authority of this species (FWC, 2017j)

[d] Full assessment of each federally listed species and critical habitat determined to be potentially affected are provided in the BA (see appendix C). Full assessment of each state listed species determined to be potentially affected are provided in section 4.7.2. Impacts are identified based on the potential for the species to occur within or in proximity to the LNG terminal site or along the LNG vessel transit route.

4.7.1 Federally Listed Threatened and Endangered Species

Based on a review of publicly available information, agency correspondence, and field surveys, 30 federally listed threatened and endangered species and 3 species that are candidates for listing under the ESA may occur within the proposed project area. Additionally, three areas of designated critical habitat are within the project area or on the vessel transit route. Of these, we have concluded that the project would have *no effect* on 13 of the 33 federally listed threatened, endangered or candidate species or any critical habitat and they are not discussed further. The project would be *not likely to adversely affect* the remaining 17 federally listed species and would be *not likely to jeopardize the continued existence* of the 3 candidate species.

A variety of measures have been proposed by Eagle LNG to minimize impacts on federally listed species, including implementation of its project-specific Plan and Procedures, SPCC Plan, and complying with speed zones to minimize impacts on marine mammals and sea turtles. However, because consultation with NOAA Fisheries and the FWS is ongoing, **we recommend that:**

- **Eagle LNG should <u>not begin construction</u> activities <u>until</u>:**
  - **a. FERC staff completes ESA section 7 consultation with NOAA Fisheries and the FWS; and**
  - **b. Eagle LNG has received written notification from the Director of OEP that construction may begin.**

If new species are listed or identified at the project site, FERC staff would reinitiate consultation with NOAA Fisheries and/or the FWS.

4.7.2 State-Listed and Special Status Species

Based on information obtained from the FWC, 38 state-listed threatened or endangered species have the potential to occur within the project area. Twenty-eight of the state-listed species (red knot; piping plover; red-cockaded woodpecker; wood stork; West Indian manatee; fin, North Atlantic right, sei, and sperm whales; Atlantic and shortnose sturgeon; smalltooth sawfish; green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles; eastern indigo snake, American alligator; frosted flatwoods salamander; boulder star, elkhorn, lobed star, mountainous star, pillar, rough cactus, and staghorn corals; and Johnson's seagrass) are also federally listed as threatened or endangered, and one (gopher tortoise) is a candidate for federal listing; as indicated in table 4.7-1 and are discussed in section 4.7.1. One state-listed species, the Black Creek crayfish, inhabits small, tannic-stained streams and is restricted to higher water quality headwaters, and does not occur in the project segment of the St. Johns River, and is not discussed further (FWC, 2012k, Moler and Crandall, 2010). The state-listed plant, sweet shrub, was identified on the project site during field surveys, but is not believed to be a native occurrence. Sweet shrub distribution does not include Duval County (USDA NRCS, 2018b). The location of the plant on the project site suggests it was planted on the homestead by the previous landowner. Therefore, the sweet shrub is not discussed further. The remaining 7 species are discussed in the sections below.

4.7.2.1 Worthington's Marsh Wren

Worthington's marsh wren is state listed as threatened. It is a small wren with a prominent white stripe above the eye; a plain, unstreaked crown; and black triangle on the back, which is streaked with white. Its diet primarily consists of spiders, insects, and invertebrates. Worthington's marsh wrens are found from the St. Mary's/Cumberland Island Sound to the northern edge of the St. Johns River in Florida. They inhabit tidal marshes dominated by cordgrass (*Spartina alterniflora*) and nest in tall grasses along tidal creeks from March and April. Habitat destruction is the main threat to the marsh wren population. Dredge and fill in salt marshes can degrade or destroy habitat and cause a decrease in available prey. Wrens are intolerant to the invasion of woody vegetation into marsh habitat. Sea level rise is another significant factor impacting Worthington's marsh wren habitat (FWC, 2012d; FNAI, 2004a).

The project site has preferred habitat for the wren. During specific surveys conducted for the Worthington's marsh wren, several adults were heard and a pair of adults was visually identified within the interior tidal marsh portion of the site, outside of the proposed construction area. Construction and operation of the facility would result in 0.7 acre of impacts on salt marsh habitat used by marsh wrens. Additionally, noise and light at the LNG terminal could disturb wrens during construction and operation of the facility. However, the acreage of suitable marsh wren habitat that would be affected by the project is small and there is available habitat adjacent to the project site that would not be affected by noise and light.

Therefore, we conclude that the project would have some permanent but minor impacts on Worthington's marsh wrens.

4.7.2.2 Little Blue Heron

The little blue heron is state listed as threatened. These herons are small wading birds that feed alone in shallow fresh, brackish, and saltwater habitats, but prefer freshwater lakes, marshes, swamps, and streams. They feed on fish, insects, shrimp, and amphibians. Little blue herons are colonial nesters, often in colonies with other wading bird species. Colonies are usually in flooded swamps or on islands. Primary threats to these herons are the alteration of wetland hydroperiods. Their preferred foraging habitat also increases their exposure to pesticides, and contamination from heavy metals (FWC, 2012g; FNAI, 2004b). No nesting colonies have been recorded within 100 meters of the project but little blue herons were documented in the project area during other species surveys. Construction of the project would result in the loss of 0.7 acre of suitable wetland foraging habitat. Noise and light associated with construction and operation of the LNG terminal could prevent little blue herons from utilizing other suitable foraging habitat that would remain on the site. However, the acreage of suitable little blue heron habitat that would be affected by the project is small and there is available habitat adjacent to the project site that would not be affected by noise and light. Therefore, we conclude that the project would have some permanent but minor impacts on little blue herons.

4.7.2.3 Tricolored Heron

The tricolored heron is state listed as threatened. Their habitat consists of both fresh and saltwater marshes, estuaries, mangrove swamps, lagoons, and river deltas. Tricolored herons are colonial nesters that prefer nesting on mangrove islands or in willow thickets over standing water. Breeding season is between February and August. Tricolored herons forage for fish in permanently and seasonally flooded wetlands, mangrove swamps, tidal creeks, ditches, and pond and lake edges. Threats to the tricolored heron include the continued development of wetlands as well as exposure to pollutants and pesticides (FWC, 2012h; FNAI, 2004c). A tricolored heron was documented foraging in the marsh during other species surveys. Construction of the project would result in the loss of 0.7 acres of suitable wetland foraging habitat. Noise and light associated with construction and operation of the LNG terminal could prevent tricolored herons from utilizing other suitable foraging habitat that would remain on the site. However, the acreage of suitable tricolored heron habitat that would be affected by the project is small and there is available habitat adjacent to the project site that would not be affected by noise and light. Therefore, we have determined the project would have some permanent but minor impacts on tricolored herons.

4.7.2.4 American Oystercatcher

The American oystercatcher is a shorebird species state listed as threatened. It is restricted to coastal areas and is more common on the Gulf coast of Florida. Breeding on the Atlantic coast occurs north of Palm Beach County with largest concentrations in the Indian River Lagoon system. It is easily identified by its long, bright reddish-orange bill, yellow eyes, and distinct red eye ring. Oystercatchers feed primarily on mollusks, but also eat jellyfish, worms, and insects. American oystercatchers require large areas of beach, sandbar, mud flat, and shellfish beds for foraging. They use sparsely vegetated, sandy areas or islands developed from dredged up material for nesting, but also will use beach wrack and marsh grass. They have been known to nest on gravel rooftops. American oystercatcher nesting begins in March and can extend through August. The main threats to American oystercatchers are coastal development and shoreline armoring. Where breeding occurs, nests are vulnerable to disturbance by beachgoers, boaters, pets, predators, and severe weather events (FWC, 2012d; FNAI, 2004d). Suitable habitat may be present along the LNG transit route at the mouth of the St. Johns River, and coastal waters of the western Atlantic Ocean may provide foraging and nesting habitat. Due to the high level of ship traffic, it is unlikely that oystercatchers would use beaches at the mouth of the river. Based on Eagle LNG's proposed use of existing, highly traveled shipping lanes, we conclude that adverse impacts on American oystercatchers due to LNG transit during operation of the LNG terminal are not anticipated.

4.7.2.5 Black Skimmer

The black skimmer is a seabird state listed as threatened whose key physical feature is its large red and black bill. Its diet primarily consists of fish. Black skimmers are colonial nesters that nest in Florida between May and early September on sand beaches, sandbars, and islands developed by dredged material. The main threat to the species is habitat loss due to coastal development. Other threats include recreational activity, beach driving, shoreline hardening, mechanical raking, oil spills, and increased presence of domestic animals, all of which may prevent or disrupt nesting or result in the death or abandonment of eggs and young (FWC, 2012e; FNAI 2004c). Suitable habitat may be present along the LNG transit route at the mouth of the St. Johns River and coastal areas of the western Atlantic Ocean may provide foraging and nesting habitat. Due to the high level of ship traffic, it is unlikely that black skimmers would use beaches at the mouth of the river. Based on Eagle LNG's proposed use of existing, highly traveled shipping lanes, we have determined that adverse impacts on black skimmers due to LNG transit during operation of the LNG terminal are not anticipated.

4.7.2.6 Least Tern

The least tern is state listed as threatened. Least terns have yellow beaks, gray backs, white bellies, and black caps, and are the smallest terns in North America. The least tern's diet primarily consists of fish, but also includes small invertebrates. The least tern inhabits coastal areas of Florida including estuaries and bays. Nests are constructed on well-drained sand or gravel and usually have little vegetation, but they are increasingly using artificial nesting sites, including gravel rooftops, dredge spoil islands or other dredged material deposits, construction sites, causeways, and mining lands. The main threat to the least tern population is habitat loss attributed to coastal development, including building on the coasts, human traffic on the beaches, and recreational activities. Rising sea levels and more frequent strong storms may damage and destroy least tern nests, as well as habitat. Other threats to the least tern include shoreline hardening, mechanical raking, oil spills, response to oil spill events, and increased presence of domestic animals (FWC, 2012f; FNAI, 2004e).

No nesting colonies have been recorded within 100 meters of the project, but a least tern was documented in the area during other species surveys. An area of suitable habitat would be affected. Terns would not likely inhabit the remaining habitat during operation of the facility due to disturbance from light, noise, and other activities. However, terns could utilize a sparsely vegetated island in the middle of the St. Johns River across from the project site. Therefore, we have determined that some suitable habitat would be lost due to construction of the project and would result in permanent, but minor impacts on least terns.

4.7.2.7 Florida Pine Snake

The Florida pine snake is state listed as threatened. Florida pine snakes are non-venomous snakes that occur throughout most of peninsular Florida. They prefer dry, upland areas with well-drained sandy soils with a moderate to open canopy, but also occur in scrubby flatwoods, oak scrub, dry oak forests, and old fields and agricultural borders. The pine snake diet includes small mammals, lizards, and other snakes and their eggs. These snakes frequently utilize pocket gopher burrows as underground refugia. The major threats to the pine snake include habitat loss, fragmentation, silviculture, mining, and road construction (Miller, et al., 2015; FWC, 2012j). No pine snakes were observed during field surveys, and the fragmented nature of the site along with the recent clear-cutting of pine make it unlikely that pine snakes utilize the site. Therefore, we have determined that the project impacts on the Florida pine snake are not likely.

4.7.3 Marine Mammals

Marine mammals are federally protected under the MMPA. The MMPA established, with limited exceptions, a moratorium on the "taking" of marine mammals in waters or on lands under United States jurisdiction. The act further regulates, with certain exceptions, the "take" of marine mammals on the high seas by persons, vessels, or other conveyances subject to the jurisdiction of the United States. A total of 36 mammals protected under the MMPA may occur along the LNG transit routes (NOAA Fisheries, 2018a; NOAA Fisheries 2018b). Five of these species are also listed under the ESA (the West Indian manatee and four whales) and are included in table 4.7-1 and discussed in sections 4.7.1.1 and 4.7.1.2. The remaining 30 marine mammal species and their potential area of occurrence along the LNG transit routes are described in table 4.7.3-1 and discussed below.

TABLE 4.7.3-1

Non-Endangered Species Act Listed Marine Mammals Potentially Occurring Along the LNG Transit Routes

Common Name	Scientific Name	Area Where Mammal May Occur
Seals and sea lions		
Gray seal	*Halichoerus grypus*	Western North Atlantic
Harbor seal	*Phoca vitulina*	Western North Atlantic
Harp seal	*Pagophilus groenlandicus*	Western North Atlantic
Hooded seal	*Cystophora cristata*	Western North Atlantic
Dolphins		
Atlantic spotted dolphin	*Stenella frontalis*	Western North Atlantic
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Western North Atlantic
Common bottlenose dolphin	*Tursiops truncatus*	Jacksonville Estuarine System and Western North Atlantic
Clymene dolphin	*Stenella clymene*	Western North Atlantic
Common dolphin	*Delphinus capensis*	Western North Atlantic
Frasier's dolphin	*Lagenodelphis hosei*	Western North Atlantic
Killer whale	*Orcinus orca*	Western North Atlantic
Melon-headed whale	*Peponocephala electra*	Western North Atlantic
Pantropical spotted dolphin	*Stenella attenuata*	Western North Atlantic
Pygmy killer whale	*Feresa attenuata*	Western North Atlantic
Risso's dolphin	*Grampus griseus*	Western North Atlantic
Rough-toothed dolphin	*Steno bredanensis*	Western North Atlantic
Short-finned pilot whale	*Globicephala macrorhynchus*	Western North Atlantic
Spinner dolphin	*Stenella longirostris*	Western North Atlantic
Striped dolphin	*Stenella coeruleoalba*	Western North Atlantic
White-beaked dolphin	*Lagenorhynchus albirostris*	Western North Atlantic
Whales		
Blainville's beaked whale	*Mesoplodon densirostris*	Western North Atlantic
Cuvier's beaked whale	*Ziphius cavirostris*	Western North Atlantic
Dwarf sperm whale	*Kogia sima*	Western North Atlantic
False killer whale	*Pseudorca crassidens*	Western North Atlantic
Gervais' beaked whale	*Mesoplodon europaeus*	Western North Atlantic
Long-finned pilot whale	*Globicephala melas*	Western North Atlantic
Northern bottlenose whale	*Hyperoodon ampullatus*	Western North Atlantic
Pygmy sperm whale	*Kogia breviceps*	Western North Atlantic
Sowerby's beaked whale	*Mesoplodon bidens*	Western North Atlantic
True's beaked whale	*Mesoplodon mirus*	Western North Atlantic

Source: NOAA Fisheries, 2018b

Impacts on marine mammals occurring along the LNG transit routes would be similar to those discussed in the BA (see appendix C) regarding the West Indian manatee and federally listed whales, respectively. The primary threat to marine mammals resulting from LNG vessel transits would be an increased risk of vessel strikes during operation. During construction, Eagle LNG would incorporate the standard protection measures and agency recommendations provided by the FWS, NOAA Fisheries, and the FWC, such as abiding by manatee speed zones, operating at idle speed/no wake at all times, and using manatee observers during all in-water work. During operation, Eagle LNG would write into its shipper contracts that all vessels calling on the facility would comply with NOAA Fisheries (2008) *Vessel Strike Avoidance Measures and Reporting for Mariners*. Eagle LNG's terminal regulations would also incorporate a Ship Strike Avoidance Measures Document, which would generally require, to the extent international standards or NOAA Fisheries guidance directs, that LNG carrier vessels employ and have on duty wildlife watchstanders who have been trained to spot whales, turtles, manatees, and other species surfacing in the vicinity of the vessel while it is underway. Eagle LNG would make the provisions relating specifically to the use of dedicated wildlife watchstanders applicable through Eagle LNG's sale/tolling agreements to customers and their carriers during periods in which an LNG vessel is in transit in U.S. domestic waters. These mitigation measures would protect other marine mammals. Therefore, we conclude that the LNG terminal would have no significant adverse impacts on marine mammals.

4.8 LAND USE, RECREATION, AND VISUAL RESOURCES

4.8.1 Land Use

4.8.1.1 Environmental Setting

The project facilities would affect three general land use types, including forested/woodland, open land, and open water. Table 4.8.1-1 summarizes the acreage of each land use type that would be affected by construction and operation of the project. The definitions of each land use type and the associated subcategories in FLUCCS are as follows:

- Open land – non-forested uplands, maintained (vegetated) utility rights-of-way, and emergent (herbaceous) and scrub-shrub wetlands. Includes saltwater marsh and sand other than beaches;

- Forest/woodland – areas characterized by tree cover, generally greater than 6 meters tall, with tree canopy accounting for between 25 and 100 percent of land cover. Includes live oak, coniferous plantation, and mixed forested wetland; and

- Open water – all areas of open water, typically with less than 25 percent cover of vegetation and land. Includes streams and waterways.

The project facilities would occupy about 92.2 acres of land within a 193.4-acre site along the north bank of the St. Johns River. The site, which is zoned for industrial use, is situated in a primarily undeveloped piece of land (City of Jacksonville, 2018). The 92.2-acre construction footprint includes about 37.0 acres of a recently cleared coniferous tree plantation. No buildings or aboveground structures are present within the proposed LNG terminal site. Nearby industrial properties include the Marathon Petroleum bulk fuel terminal, Hess Corporation bulk fuel terminal, and a U.S. Navy terminal. The nearest residences are about 0.8 mile north of the proposed site; this community is situated along the west side of Broward River.

TABLE 4.8.1-1

Land Use Types Affected by Construction and Operation of the LNG Terminal (in acres) [a]

	Open Land		Forest/ Woodland		Open Water		Total	
Facility	Cons.	Oper.	Cons.	Oper.	Cons.	Oper.	Cons. [b]	Oper.
Terrestrial Facilities								
Switchyard area	0.0	0.0	3.9	3.7	0.0	0.0	3.9	3.7
Construction laydown areas/Facility Open Area, Fence Line and Berm	0.2	0.1	29.8	24.6	0.0	0.0	30.0	24.7
Ground flare area	0.0	0.0	0.3	0.3	0.0	0.0	0.3	0.3
Feed gas metering and utilities	0.0	0.0	3.4	2.9	0.0	0.0	3.4	2.9
Liquefaction trains	0.0	0.0	5.2	5.2	0.0	0.0	5.2	5.2
Stormwater ponds	0.1	0.1	3.6	2.2	0.0	0.0	3.7	2.3
LNG storage and impoundment	0.0	0.0	4.0	4.0	0.0	0.0	4.0	4.0
Truck loading and refrigerant storage	0.0	0.0	2.4	1.1	0.0	0.0	2.4	1.1
Buildings and equipment	0.0	0.0	0.9	0.9	0.0	0.0	0.9	0.9
Roads and parking	0.0	0.0	8.6	6.9	0.0	0.0	8.6	6.9
Jetty access and operations	1.2	1.1	1.1	1.1	0.0	0.0	2.3	2.3
Dredge material management area	0.2	0.2	15.7	15.6	0.0	0.0	15.9	15.9
Subtotal	**1.7**	**1.5**	**78.8**	**68.6**	**0.0**	**0.0**	**80.5**	**70.1**
Marine Facilities								
Dredging template	0.0	0.0	0.0	0.0	10.1	10.1	10.1	10.1
Marine facilities and trestle	0.1	0.1	0.5	0.5	1.0	1.0	1.6	1.6
Subtotal	**0.1**	**0.1**	**0.5**	**0.5**	**11.1**	**11.1**	**11.7**	**11.7**
TOTAL	**1.8**	**1.6**	**79.3**	**69.1**	**11.1**	**11.1**	**92.2**	**81.8**

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

b Total construction impacts include both temporary and permanent work areas.

The LNG terminal would be on the north bank of the St. Johns River on land currently owned by a private landowner. Land use adjacent to the St. Johns River, north of the project site, is also primarily undeveloped and zoned for industrial use. Current land use in these surrounding parcels is a mixture of emergent and woody wetlands, evergreen forest, and, north of Florida State Route 105 (Route 105), a mixture of developed and scrub-shrub land. Land uses near the project are depicted in figure 4.8.1-1 and described in additional detail below:

- North of the project site – Route 105 bounds the site to the north. North of this highway consists of primarily low lying vegetation with the exception of some trees bordering Route 105 and the Seaboard Coast Line Railroad.

- East of the project site – A strip of forested land and woody wetlands bounds the site to the east. Just east of this is the Marathon Petroleum bulk fuel terminal. C&K Truck and Gate Fuel Services are east of the project area and north of Route 105.

- Northwest of the project site – The Seaboard Coast Line Railroad bounds the site to the northwest. Continuing northwest is Route 105 and a combination of scrub shrub and forest/woody vegetation along with barren land associated with sand/gravel pits and industrial land associated with Imeson Industrial Park.

- Southwest of the project site – Drummond Creek bounds the site to the southwest. Continuing southwest land uses consist of evergreen forest and industrial land associated with the U.S. Navy terminal.

- South of the project site – woody wetlands, evergreen forest, and the St. Johns River bound the site to the south. Across the St. Johns River is Reddie Point Preserve (about 1.3 miles southwest of the LNG terminal) and a residential neighborhood (about 1.0 mile south).

4.8.1.2 Impacts and Mitigation

Construction of the project would affect a total of 92.2 acres. Of this, operation of project facilities would permanently affect 81.8 acres (including 11.1 acres of open water) and 10.4 acres would be allowed to revert to the existing land use type after the completion of construction activities. As shown in table 4.8.1-1, impacts on land use would primarily affect forest/woodland areas. Impacts on open land, forest/woodland, and open water land uses are described below.

Open Land

Construction of the project would affect a total of 1.8 acres of open land, of which 1.6 acres would be permanently retained within the LNG terminal facility footprint. All 1.6 acres of open land would be converted to industrial/commercial land for the operation of the project.

Forest/Woodland

Construction of the project would affect a total of 79.3 acres of forest/woodland. However, as noted above, about 37.0 acres of upland forested land/coniferous plantation within the LNG terminal site was recently cleared and replanted with pine species. Permanent impacts include those forested areas that would be permanently removed during construction (69.1 acres). Temporary impacts include forested areas within temporary workspaces and staging areas that would be allowed to revert to existing forest land after construction (10.2 acres).

Figure 4.8.1-1
Land Uses in the Vicinity of the Project
Jacksonville Project
Duval County, Florida

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Open Water

Construction of the project would affect a total of 11.1 acres of open water. Construction of the berthing area would require dredging of a 10.1-acre area within the St. Johns River and installation of a LNG marine loading platform, a concrete jetty, and concrete breasting and mooring dolphins, which would occupy about 1.0 acre (see section 2.5.3). Operation of the project would result in the conversion of all 11.1 acres of open water to industrial/commercial use associated with these offshore facilities, although the area would continue to function as open water habitat in the marine facilities and berthing area. Impacts on use of open water within the St. Johns River associated with the construction and operation of the project include reduced access for recreational users when an LNG vessel is at the LNG terminal, as well as increased marine vessel traffic. Additional information on impacts on recreational use and marine vessel traffic can be found in sections 4.8.4 and 4.9.6.1, respectively.

Eagle LNG designed the DMMA to accommodate the full volume of dredged material anticipated for removal from the proposed dredge area. Eagle LNG would remove dredged material prior to subsequent maintenance dredging events and transport it to a Jacksonville Port Authority DMMA or provide it to a local area construction project for use in upland construction sites.

4.8.2 Landowner and Easement Requirements

Eagle LNG has executed a purchase agreement with the current title landowner of the 193.4-acre site (see section 2.3). Eagle LNG currently has an exclusive option to purchase the land associated with the project. Upon closing of the land transaction, Eagle LNG would be the sole owner of the property.

4.8.3 Residential Areas and Planned Developments

There are no residential areas or subdivisions currently proposed within a 0.25-mile radius of the project. Additionally, according to the Jacksonville City Planner, there are no planned commercial or residential developments within a 1.0-mile radius surrounding the project boundary (City of Jacksonville, 2015). Certain non-jurisdictional facilities are planned to provide utilities to the LNG terminal. Each of these non-jurisdictional projects, as well as other planned residential and commercial/industrial development projects in the broader project area are described in the cumulative impact analysis provided in section 4.13.

The nearest existing residential area is about 0.8 mile north of the LNG terminal site. Additional existing residential areas are situated 1.0 mile to the south, 1.2 miles to the west, 1.8 miles to the southwest, and 1.9 miles northeast. Potential visual impacts on existing residential areas are described in section 4.8.6.

4.8.4 Public Lands, Recreation, and Special Interest Areas

USGS topographic maps; aerial photographs; correspondence with federal, state, and local agencies; field reconnaissance; and internet searches were used to identify parks, recreation areas, scenic areas, and other designated or special interest areas in the vicinity of the project facilities. No public lands, recreation areas, or special interest areas would be directly affected by the project. Additionally, no designated natural, recreational, or scenic areas, or registered national landmarks would be affected and no National Wild and Scenic Rivers, National Trails, or National Wilderness Preserves are within 0.25 mile of the project. The National Park Service's Timucuan Ecological and Historic Preserve and the Fort Caroline National Memorial are about 10 miles east of the proposed project.

Local recreational fishing and boating activities along the St. Johns River may be affected by increased industrial traffic, but the river is routinely used for both recreational and industrial purposes. Ship traffic would access the LNG terminal via the St. Johns River. During construction, barges would deliver equipment and materials to the LNG terminal; however, Eagle LNG anticipates truck deliveries for the majority of equipment and materials to the site. Eagle LNG estimates that fewer than five barge deliveries would be required during construction. Recreational users of the St. Johns River in the project vicinity may observe this slight increase in barge traffic during the construction period, including some Saturdays; however, Eagle LNG does not anticipate working on federal holidays.

Recreational users on the St. Johns River may also encounter LNG carrier traffic through the channel during operation of the LNG terminal, which would increase transit time for recreational vessels. As described in section 4.9.6, Eagle LNG currently estimates an increase of one or two vessels a week (or about 40 to 100 vessels per year), which equates to about a 6 percent increase in existing large vessel traffic levels. As a result, we conclude that St. Johns River users would not be significantly affected by marine traffic during construction or operation of the project.

The Jacksonville Zoo and Reddie Point Preserve are in the vicinity of the St. Johns River and offer a variety of recreational activities that are discussed in sections 4.8.4.1 and 4.8.4.2, respectively.

4.8.4.1 Jacksonville Zoo

The Jacksonville Zoo, located at 370 Zoo Parkway, is about 1.1 miles west of the project site and more than 1.5 miles from the LNG terminal operational area boundary. The zoo is open daily from 9 a.m. to 5 p.m. and offers a variety of wildlife and environmental educational tours through the zoo's animal exhibits, botanical gardens, and the Trout River (Jacksonville Zoo, 2017).

There would be an increase in traffic along Zoo Parkway during construction, which may increase travel time for visitors accessing the zoo. During project operation, an estimated maximum of 20 trucks would be loaded at the LNG terminal each day during peak capacity. A maximum of 520 LNG truck trips are anticipated per year. See section 4.9.6 for more information regarding project-related traffic impacts and proposed mitigation measures.

We received a comment on the draft EIS regarding potential project-related impacts on zoo animals. Due to the distance between the zoo and the LNG terminal site (1.1 miles), the existing industrial nature of the area, and the existing visual screening (i.e., forested land) present between the sites, we conclude that construction of the project would not have any direct impacts on the zoo animals. Any perceptible increase in noise associated with construction of the project would be temporary, minor, and primarily limited to daytime hours (see section 4.11.2.3). Acoustic modeling indicates that operation of the LNG terminal would result in no predicted increase to ambient noise levels at noise-sensitive area (NSA) 6, which is adjacent to the Jacksonville Zoo. Further, operation of the facility would result in no anticipated regionally significant impacts on air quality (see section 4.11.1.5). Therefore, we conclude that any potential impacts on zoo animals associated with construction and operation of the project would be temporary and minor.

4.8.4.2 Reddie Point Preserve

The Reddie Point Preserve is across the St. Johns River about 1.3 miles southwest of the project site. It consists of a 102-acre site purchased by the City of Jacksonville in 2002 with Phase II construction completed in 2010. The preserve is a day-use facility providing public fishing docks, picnic facilities, observation areas, multi-use fields, and trails. There is currently on-site parking available for 20 vehicles (City of Jacksonville, 2017).

Given Reddie Point Preserve's location in relation to the proposed project area, it is unlikely that visitors would experience traffic-related impacts while accessing the preserve. However, visitors accessing the preserve from the St. Johns River may experience delays in vessel transit during project operation. Recreational users along the coastal portions of the preserve would be able to see both construction and operation of the project. These impacts are discussed in further detail in section 4.8.6. Reddie Point Preserve is near NSA 3, which is about 1.2 miles from the project area. Recreational users may also experience an increase in noise related to both the construction and operation of the project. Construction and operational noise impacts are discussed in sections 4.11.2.3 and 4.11.2.4, respectively.

4.8.5 Coastal Zone Management

In 1972, Congress passed the CZMA to "preserve, protect, develop, and where possible, to restore or enhance, the resources of the nation's coastal zone for this and succeeding generations" and to "encourage and assist the states to exercise effectively their responsibilities to the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone" (16 USC 1452, sections 303(1) and (2)). In Florida, the FDEP administers the state's Coastal Zone Management Program and is the lead state agency that performs federal consistency reviews.

The Florida Coastal Management Program covers the entire state; therefore, a federal consistency review is required for the project. The federal consistency review would be conducted concurrently with the FDEP Environmental Resource Permit process for the proposed facility. Eagle LNG has not yet received the consistency determination from the state; therefore, **we recommend that:**

- **<u>Prior to construction</u>, Eagle LNG should file with the Secretary a copy of the determination of consistency with the laws and rules of the Florida Coastal Zone Management Program issued by the FDEP.**

4.8.6 Visual Resources

Visual resources refers to the composite of basic terrain features, geologic features, hydrologic features, vegetation patterns, and anthropogenic features that define the visual appearance and affect the visual appeal of an area for residents or visitors. In general, impacts on visual resources may occur during construction when large equipment, excavation activities, spoil piles, and construction materials are visible to local residents and visitors, and during operation to the extent that facilities or portions of facilities and their lighting are visible to residents and visitors. The degree of visual impact resulting from activities such as the proposed project varies, but is typically a product of the contrast between the general character of the existing landscape and the visually prominent features of the proposed facilities.

One landowner expressed concern about the visual impacts the project would have on riverfront residents due to the size, height, and lighting requirements of the facility, and the effects of flaring on the night sky. The primary existing structures in the viewshed of the project include the existing Marathon Petroleum bulk fuel terminal, Hess Corporation bulk fuel terminal, and a U.S. Navy fuel terminal. The viewshed also includes forested wetlands, forested land, and open water of the St. Johns River. The proposed site is slightly lower in elevation than some of the land to the north, and nearly level with other surrounding lands. The project would generally be visible from the south and southeast. The residences about 1.0 mile north of the project would be outside of the viewshed (the area within which the project would be potentially visible), given the change in topography and screening provided by existing vegetation. The shoreline portions of Reddie Point Reserve, as well as residences to the south and southeast of the project (on the south side of the St. Johns River), would be within the viewshed; however, these visual receptors would be at least partially screened by a vegetated island in the middle of the river as well as forested areas that would remain on the east and west side of the property outside the facility footprint. The Jacksonville Zoo, located southwest of the project site, would be largely screened from view by tree canopy cover within the zoo and forested land between the zoo and industrial sites to the east.

The project would not affect any nationally or state-designated visual resources or visually sensitive areas such as natural landmarks, scenic roads, trails, or scenic rivers (National Park Service, 2007 2009, 2010; National Wilderness Institute, 2012). In addition to Reddie Point Reserve and the residences described above, project construction activities would be visible to recreationists using the St. Johns River as well as motorists driving along Route 105, including those traveling to and from the Jacksonville Zoo. The presence of large construction equipment and truck traffic would change the visual quality of these areas; however, due to the distance to the site, existing industrial nature of the area, and short duration of impact (until the vehicle passes the construction site), we conclude that visual impacts would not be significant.

Project operation would permanently change the visual character of the area due to the presence of aboveground structures that would modify the viewshed. The most prominent visual features at the LNG terminal would be the project's single LNG storage tank, which would be about 158 feet wide and 130 feet high, and the flare stack, which would be about 50 feet high when no flame is present. During normal operations, the flame height would be about 2 feet from the top of the flare stack. The maximum flame height during an emergency flaring event is about 24 feet from the top of the flare stack. Eagle LNG anticipates that controlled flaring would occur during planned startup and shutdown events, which are expected to occur every 3 to 5 years. In addition, structures present at the project site would include three LNG trains, a marine facilities and dock, and a truck load-out facility. These facilities would also require lighting for operations and safety, as well as Federal Aviation Administration (FAA)-compliant lighting on elevated structures, including the LNG tank and flare stack. Directional lighting at the facility would minimize the horizontal emission of light away from unintended areas, and over-water lighting would be shielded and limited to the extent necessary to carry out marine operations or facility maintenance. See sections 4.6.2.2 and 4.12.5.2 for further discussion associated with lighting.

Eagle LNG conducted visual simulations for four scenarios at key observation points (KOP) in the vicinity of the project. Eagle LNG selected these KOPs based on proximity to and the potential presence of views of the project, as well as concerns from residents. Table 4.8.6-1 describes the KOPs, as well as the results of the visual simulations, based on our review. These visual simulations are provided in Eagle LNG's Viewshed Analysis and Visual Resource Management Assessment (see appendix H).

TABLE 4.8.6-1

Key Observation Points Used for Visual Resource Assessment of Jacksonville Project Facilities

KOP	Purpose of KOP	Summary of Findings and Impacts
Western Shore of Reddie Point Reserve	Popular recreation destination	The top half of the LNG tank, a small portion of the flare stack, and the entire flare flame would be visible under clear conditions. These facilities would generally be less prominent in the viewshed than either the U.S. Navy fuel facility (closer to the viewer) or the stack at the Cedar Bay Generating Plant (farther from the viewer than the project).
End of Pier at Reddie Point Preserve	Popular recreation destination	The top two-thirds of the LNG tank, about half the flare stack, and the entire flare flame would be visible under clear conditions. These facilities would generally be less prominent in the viewshed than either the U.S. Navy fuel facility (closer to the viewer) or the stack at the Cedar Bay Generating Plant (farther from the viewer than the project).
Oak Bay Drive North	Residential area	The top two-thirds of the LNG tank, about half of the flare stack, and the entire flare flame would be visible under clear conditions. These facilities would generally be less prominent in the viewshed than the stack at the Cedar Bay Generating Plant (farther from the viewer).
Boat Club Drive	Residential area	The top half of the LNG tank, a small portion of the flare stack, and the entire flare flame would be visible under clear conditions. These facilities would generally be less prominent in the viewshed than either the Marathon fuel terminal or the stack at the Cedar Bay Generating Plant (both farther from the viewer).

To assess the operational impact of the project on existing visual resources, Eagle LNG applied the U.S. Bureau of Land Management's Visual Resource Management (VRM) methodology. For each affected visual setting, the VRM system identifies visual "classes," based on existing scenic quality, distance from typical viewers, and the sensitivity of the resource to change or visual disruption. While VRM is typically used to evaluate and manage scenic resources under U.S. Bureau of Land Management jurisdiction (primarily in the western United States), Eagle LNG applied this methodology to the Jacksonville Project based on our comments during the pre-filing process.

Eagle LNG applied the VRM methodology to four areas of public land in the region: Reddie Point Preserve, the Timucuan Ecological and Historical Preserve (more than 10.0 miles away), the dredge spoil island immediately south of the project site, and a series of natural islands in the St. Johns River, about 3.0 miles from the site. Of these resources, only the Timucuan Ecological and Historical Preserve met the VRM criteria for "most valuable" (Class I) existing visual resources; the remaining locations were classified as "least valuable" (Class IV). The Timucuan Ecological and Historical Preserve would not be within the project viewshed.

Based on this analysis, combined with the visual simulations described above, we conclude that the project would not adversely affect any visually sensitive areas, and that viewsheds from other areas would not be significantly affected.

Residences along the shores of St. Johns River and recreationists at Reddie Point Preserve would be within the viewshed of marine traffic associated with the project. As described in section 4.9.6, the project would result in 40 to 100 additional marine vessel calls per year, which equates to about a 6 percent increase in existing large vessel traffic levels. LNG carriers associated with the project would be similar to vessels already visible on the St. Johns River. This incremental change in large vessel activity would be minimally perceptible to observers, and would represent a minimal change in visual conditions. As a result, the project's vessel traffic would not have a significant impact on visual resources.

4.9 SOCIOECONOMICS

Construction and operation of the LNG terminal could affect socioeconomic conditions, either adversely or positively, in the general project vicinity. These potential impacts include alteration of population levels or local demographics, increased demand for housing and public services, increased employment opportunities, increased traffic on area roadways and waterways, and an increase in government revenue associated with payroll, sales, and property taxes.

The greatest socioeconomic impacts would occur in Duval County (the City of Jacksonville), where the LNG terminal is proposed. Clay, St. Johns, and Nassau Counties are also included in the socioeconomic analysis because they are close to the LNG terminal and would likely see an increase in non-local workers commuting into the area due to the relatively short commute distances. For the purpose of the socioeconomic analysis, these four counties and city are defined as the "project area."

4.9.1 Population

Table 4.9.1-1 provides a summary of selected population and demographic information for the project area.

TABLE 4.9.1-1

Existing Socioeconomic Conditions in the Project Area for the Jacksonville Project

State/County or City	Population [a, b]	Population Density (persons per square mile) [a, b]	Per Capita Income [c]	Civilian Labor Force [d, e]	Unemployment Rate (percent) [d, e, f]	Top Industries [g]
Florida	20,612,439	313	$26,829	10,108,400	4.8%	E, R, H
Clay	208,311	323	$26,464	100,545	4.5%	E, H, T
Duval	926,255	1,009	$26,543	468,907	5.0%	E, H, P
Nassau	80,622	111	$28,670	37,328	4.6%	E, H, R
St. Johns	235,087	286	$37,581	116,071	3.7%	E, P, R
Jacksonville	868,031	981	$25,554	751,600	4.5%	E, H, P

a U.S. Census Bureau and U.S. Department of Commerce: Vintage 2016 Population Estimates; Population Estimates.
b U.S. Census Bureau, 2015a.
c U.S. Census Bureau: QuickFacts. 2011-2015.
d Bureau of Labor Statistics: Economy at a Glance: Florida, March 2017.
e Bureau of Labor Statistics: Labor Force Data by County, 2016 Annual Averages.
f Bureau of Labor Statistics: Economy at a Glance: Jacksonville, February 2017.
g U.S. Census Bureau, 2015b.

Industries:
A = Arts, entertainment, recreation, and accommodation and food services
E = Educational services, and healthcare and social assistance
H = Health care and social assistance
M = Manufacturing
P = Professional, scientific, management, administrative, and waste management services
R = Retail trade and wholesale trade
T = Transportation and warehousing and utilities

Duval County has the largest population of the four counties within the affected area with a population of about 926,255 residents in 2016 and a population density of 1,009 persons per square mile (U.S. Census Bureau and U.S. Department of Commerce: Vintage 2016 Population Estimates; Population Estimates). In comparison, the 2016 population of the State of Florida was approximately 20,612,439 residents.

Construction of the LNG facility and commissioning of Train 1 is expected to take about 2 years (20 months to construct the LNG facility followed by additional time for commissioning of Train 1). Eagle LNG would place Train 2 into service the following year and Train 3 about 6 months afterwards. Eagle LNG estimates a monthly workforce average of 307 workers, and a peak of about 465 workers during a 7-month period. The estimated workforce required to construct the LNG terminal by month is presented on figure 4.9.1-1.[11] Eagle LNG estimates that most workers would be hired from the project area, with 60 percent of workers coming from Duval County, 35 percent from the other three counties in the project area, and 5 percent from outside of the project area. It is possible that a larger percentage of the overall construction workforce would come from outside the four county area. Table 4.9.1-2 presents the existing construction workforce potentially available in the project area. The overall construction workforce needed to construct the project would represent less than 2 percent of the overall construction workforce currently located in the project area.

11 The 20 months represented in figure 4.9.1-1 represent the workforce required for construction of the LNG terminal facilities. Commissioning of Train 1 and construction and commissioning of Trains 2 and 3 would occur after this period.

FIGURE 4.9.1-1
Estimated On-Site Construction Workforce Associated with the LNG Terminal

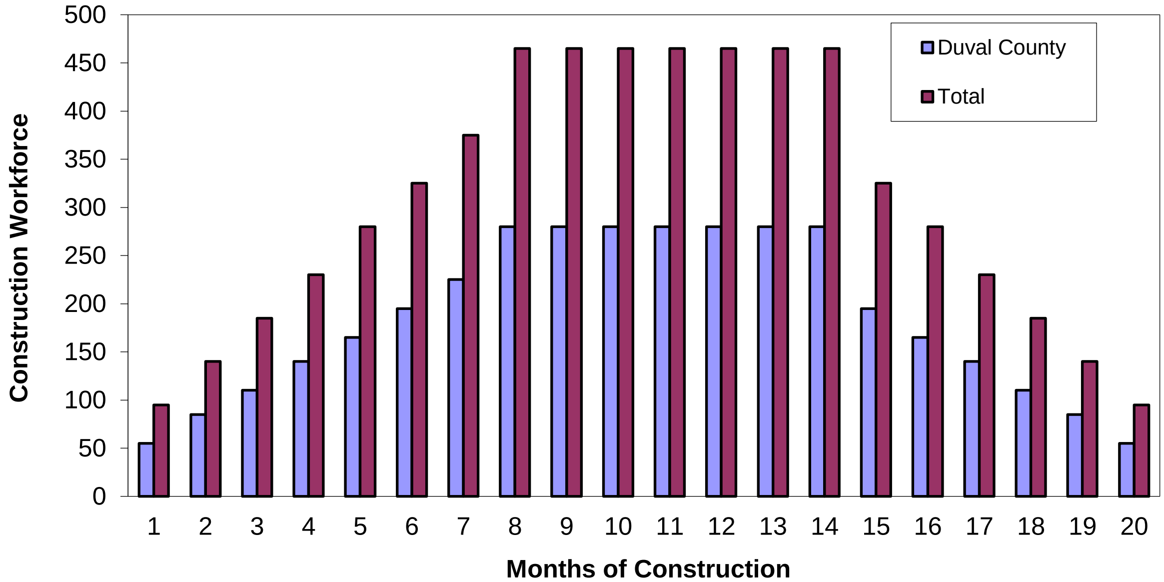

TABLE 4.9.1-2 **Existing Construction Workforce Potentially Available for Jacksonville Project**	
County	Construction Workforce
Clay	2,504
Duval	22,491
Nassau	686
St. Johns	3,477
Total	**29,158**

Notes: Includes only currently employed construction workers.
Source: U.S. Census Bureau: American Fact Finder, 2015 County Business Patterns.

Should the non-resident workers be accompanied by family members, and based on an average household size of 2.6 persons in Florida, up to 65 non-local persons could relocate to the project area. If all non-resident workers came from outside the four county area and were accompanied by their families, up to 1,209 persons could relocate to the project area. The short-term increase in population would be small as compared to the total population of the region.

During operation, Eagle LNG anticipates employing a minimum of 8 to12 workers at the LNG terminal, of which half are expected to be non-local hires. Even assuming that all 12 workers relocate to the project area, this smaller number of operational workers would not have a measurable effect on the local population in the vicinity of the LNG terminal site.

4.9.2 Economy and Employment

Table 4.9.1-1 provides employment and income statistics for the affected area. The main employment sectors include:

- educational, health, and social services;
- arts, entertainment, recreation, and accommodation and food services;
- retail and wholesale trade;
- manufacturing; and
- professional, scientific, management, administrative, and waste management services [Bureau of Labor Statistics (accessed May 2016)].

The civilian labor force is defined as the sum of employed persons and those actively searching for work (U.S. Census Bureau, 2013).[12] The civilian labor force in Duval County is 599,339 persons and per capita income is $27,235. Duval County has an unemployment rate of 3.9 percent, and 14.5 percent of Duval County households fall below the poverty line (U.S. Census Bureau, 2017a; Federal Reserve Bank of St. Louis, 2018).

Eagle LNG estimates that construction of the LNG terminal would stimulate the economy through $300 million over a 20-month period. Roughly $30 to $40 million of this would be direct expenditures within the study area. Construction of the Jacksonville Project would affect the regional economy in several ways. These include construction material purchases from regional vendors and increased income from construction workers and others involved in project construction. Most construction material purchases such as electronics, piping, and tanks would come from non-local sources; however, some materials such as cement and lumber would likely come from vendors in the area. An estimated $12 to $20 million would be spent on locally sourced construction materials. Additionally, 78 percent of the construction payroll is estimated to be spent locally by both local and non-local workers for the purchase of housing, food, gasoline, and other goods, services and entertainment in the project area.

Typically, construction activities increase economic activity within an area in several ways:

- <u>a direct effect</u> – hiring of local construction workers and purchases of goods and services from local businesses;
- <u>an indirect effect</u> – the additional demand for goods and services, such as replacing inventory from the firms that sell goods and services directly to the project or to workers and their families; and
- <u>an induced effect</u> – the spending of disposable income by the construction workers at local businesses, which in turn order new inventory from their suppliers.

The increase in economic activity resulting from direct, indirect, and induced effects would result in a temporary positive economic effect in the vicinity of the LNG terminal.

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12 Naval Air Station Jacksonville is a military airport about 8 miles south of the central business district of Jacksonville, Florida. Military personnel are not included in the civilian work force.

Anticipated operational expenditures would include $10.2 in annual regional taxable expenditures on goods and services, about $900,000 per year in salaries, and additional indirect and induced expenditures as these dollars are spent and re-spent through the economy. About half of the operational expenditures, or $5.1 million annually, would be direct expenditures within the local area. We conclude that the expenditures and permanent workforce associated with operation of the LNG terminal would result in minor positive permanent impact on the local economy.

4.9.3 Local Taxes and Government Revenue

Eagle LNG anticipates spending between $12 and $20 million on construction materials in the affected area, which would generate increased local, state, and federal sales tax revenues. The expenditures on goods and services by the construction workers and their families would also generate increased tax revenues. In addition, local, state, and federal governments would tax the anticipated $20 million per year in total construction workforce payroll. This increase in tax revenue would be a minor, temporary, and positive affect on tax revenue within the affected area.

During operation, Eagle LNG would contribute property taxes to Duval County. Eagle LNG estimates that annual property taxes would be $4.2 million. There would also be long-term increases in sales tax revenue from expenditures on materials, goods, and services by Eagle LNG and the operational workforce.

Additional annual federal taxes are estimated between $1 million and $10 million, and state and local taxes would also be between $1 million and $10 million.

4.9.4 Housing

The number of housing units (permanent and temporary) varies across the affected area, largely based on county population and the presence or absence of a major city. Table 4.9.4-1 provides data on the local rental and other temporary housing options in the project area. Based on the 2012-2016 American Community Survey, Duval County has the greatest number of total housing units (407,420), and also the greatest number of residents (937,934) within the affected area. In contrast, Nassau County has both the lowest population (82,721) and number of housing units (38,926) within the affected area. In addition, the estimated total number of rental housing units available in Duval County is 13,773 (U.S. Census Bureau, 2017a-b).

TABLE 4.9.4-1

Temporary and Short-term Housing Availability Within the Affected Area

State/County	Total Housing Units [a]	Vacant Housing Units [a]	Vacant Rental Housing Units [a]	Gross Rent Median [a]	Hotels and Motels [b]	Number of RV Parks and Campgrounds [b]
Florida	9,152,815	1,759,553	371,626	$1,032	3,197	251
Clay	77,490	6,963	1,161	$1,028	11	0
Duval	396,150	54,244	13,773	$962	137	4
Nassau	36,152	6,938	829	$1,050	14	1
St. Johns	97,065	15,757	1,545	$1,150	68	5

Sources:
[a] U.S. Census Bureau, 2016a
[b] U.S Census Bureau, 2016b

There are about 216 hotels/motels within the affected area that could be used by the short-term workforce. Duval County alone has 137 hotels and motels with an estimated 11,997 rooms for rent. The area also offers temporary housing options such as campgrounds and recreational vehicle (RV) parks, the closest of which (The Flamingo Lake RV Resort) is about 9.5 miles to the project area.

As stated previously, local residents would comprise about 95 percent of the workers hired for construction of the LNG terminal. Within the affected area, Duval County has the highest number of vacant housing units that would be available to the workforce, including vacant units for rent (13,733) as well as rooms at 137 hotels and motels. Even if all of the construction workers were needed to relocate to the project area, the currently available housing in Duval County would be sufficient to accommodate them (as well as their families, should they relocate to the area) during the peak construction period.

The construction schedule could coincide with other demands for housing and temporary accommodations from tourism. Non-local workers hired temporarily who seek hotel accommodations could potentially compete with seasonal visitors to the Jacksonville area. Given the number of hotel rooms in Duval County, no disruptions are anticipated.

Operation of the LNG terminal would result in a minimum of about 12 workers, with half expected to be non-local workers. Because of the adequate number of housing units that are available in the affected area, we anticipate that even if all 12 of the operations workers to relocate to the project area, this would have a minimal impact on the local housing market.

4.9.5 Public Services

Table 4.9.5-1 provides an overview of public services available to the project area. Within the affected area, there are a total of 289 public schools, 39 police departments and sheriff's offices, 100 fire departments, and 10 hospitals.

TABLE 4.9.5-1

Public Services Available Within the Affected Area

State/County	No. of Public Schools [a,b,c,d]	No. of Police Departments and/or Sheriff's Facilities [e]	No. of Fire Departments [f]	No. of Hospitals and Medical Facilities [g]	Hospital Beds [g]
Florida					
Clay	43	11	4	1	280
Duval	183	15	64	7	2,450
Nassau	16	5	12	1	32
St. Johns	47	8	20	1	300

Sources:
[a] Clay County School District, 2017.
[b] Duval County Public Schools, 2017.
[c] Nassau County School District, 2017.
[d] St. Johns County Schools, 2018.
[e] USA Cops, 2017.
[f] Fire Department Information, 2017.
[g] U.S. Census Bureau, 2007.

To understand potential impacts on schools, assumptions are made based on anticipated workforce. Eagle LNG estimates a peak number of 465 construction workers and anticipates that 5 percent (25 workers) would be non-local hires. Even if all 465 workers relocated to the project area, we conclude measureable impacts on schools are not expected.

Construction of the project would have little or no short-term impact on the availability of local community facilities and services such as police, fire, and medical because the workforces would be small relative to the current population. The local communities have adequate infrastructure and community services to meet the needs of the workers that would be required for construction and operation of the facility. Therefore, we conclude that impacts on public services during construction and operation of the LNG terminal would be temporary and minor. In addition, Eagle LNG has developed a preliminary ERP in accordance with the requirements of the FERC Draft Guidance for Terminal Operator's Emergency Response Plan. The ERP was established to develop procedures for responding to specific emergencies that may occur at the facility as well as procedures for emergency situations that could affect the public along LNG carrier transit routes (see section 4.12.3 for additional details).

Eagle LNG anticipates about 12 permanent workers would be employed at the LNG terminal, and half are anticipated to be non-local hires. Eagle LNG anticipates that 6 of these would be local hires. However, even if all 12 families relocated to the project area, this would represent a negligible increase in the local population. Therefore, we conclude that local public services would not be affected by population increases associated with the project. Local public emergency services would be moderately affected by the facility; however, with the development of the ERP, we conclude that potential impacts on public emergency services due to LNG terminal operation would not be significant.

4.9.6 Transportation

Several potential impacts on vehicular and marine traffic may result from the construction and operation of the LNG terminal. Potential impacts on vehicular traffic would generally be related to the construction of the project and would be the result of the influx of workers commuting to and from the various construction sites as well as the transport of construction materials. Marine traffic impacts would generally result from increases in vessel movements in the St. Johns River during construction and operation of the LNG terminal.

Land Transportation

Access for transporting equipment, materials, and personnel to the project site would largely be available through the use of existing roads. The entrance to the LNG terminal would be on State Road (SR) 105 (Heckscher Drive, also known as Zoo Parkway), which runs east-west and links the project site to the two north-south Interstates (I-95 and I-295), both of which are six-lane limited-access freeways. SR 105 is a four lane bi-directional arterial road with a landscaped median and turn lanes. The segment of SR 105 between I-95 and I-295 provides access points to the Jacksonville Zoo and Gardens, the Jacksonville Cruise Terminal, and other industrial facilities such as a Marathon Petroleum bulk fuel terminal, a Hess Corporation bulk fuel terminal, and a U.S. Navy fuel terminal.

The most recently recorded traffic volumes on SR 105 range between 11,800 and 13,300 vehicles per day. Interstate traffic in the vicinity of the project ranges from 60,000 to 109,000 on I-295, and from 107,500 to 124,000 on I-95 (North Florida Transportation Planning Organization, 2017). Traffic volumes on these roads have generally increased in recent years.

During construction of the project, traffic levels on area roadways would increase due to the presence of worker vehicles, construction vehicles, and trucks delivering concrete to the site. Eagle LNG estimates that construction worker commutes would result in an average of 307 roundtrips to the site per day. During the peak of construction, about 465 roundtrips to the site would occur per day. In addition, Eagle LNG estimates an average of 10 to 15 roundtrips per day for the delivery of equipment and supplies. This would be equivalent to about a 7 to 8 percent increase in existing (2015) traffic on SR 105, less than a 2 percent increase in traffic on I-295, and less than a 1 percent increase in traffic on I-95.

To reduce potential traffic congestion associated with construction and operation of the facility, Eagle LNG would construct acceleration and deceleration lanes (consistent with the FDOT requirements) for access to the LNG terminal. As necessary, Eagle LNG would establish parking areas for workers at the facility, and typically would schedule construction working hours and commuting time during off-peak hours.

Eagle LNG's construction contractors would comply with all local weight limits and restrictions on area roadways and remove any debris from equipment onto roadway surfaces. Eagle LNG would work with state and local officials to obtain all necessary permits for temporary construction-related impacts on roadways. Eagle LNG would also employ appropriate traffic control measures, such as flagmen and signs, as necessary, to ensure the safety of local traffic, particularly during heavy equipment movements into and out of the project site.

Movement of construction personnel, construction equipment, and materials to construction areas would increase congestion for non-project road users; however Eagle LNG's proposal to schedule shift changes during non-peak times would minimize such increases. Overall, project-related traffic increases would not be out of character with typical fluctuations in existing traffic, as well as periodic traffic increases associated with trips to the cruise ship terminal, the Zoo, and other regional facilities. Therefore, we conclude that construction impacts would be temporary and not significant.

Operation of the LNG terminal would result in an average of 12 roundtrips per day associated with worker commutes. Additionally, Eagle LNG anticipates 5 to 10 roundtrips per week of LNG trucks and a maximum of 2 off-site heavy hydrocarbon truck deliveries per week and 62 truck deliveries for receipt of mixed refrigerant components per year. This would represent a minimal increase to existing roadway traffic. Therefore, we have determined that operation of the LNG terminal would have negligible impacts on roadway transportation.

Marine Transportation

During construction, Eagle LNG anticipates that one or two larger pieces of equipment could be transported to the Jacksonville region via barge on the St. Johns River, with subsequent final delivery to the site via truck. Eagle LNG anticipates fewer than five construction-phase barge deliveries on the St. Johns River during construction.

Eagle LNG's contractors would utilize barges for dredging and construction of the marine terminal. The number of barges and amount of barge activity has not been estimated, but is expected to be relatively low compared to existing vessel traffic on the St. Johns River. The number of barges would be limited by how many can effectively work within the dredge area and have room to safely maneuver between the dredge area and the on-site DMMA.

JAXPORT, which manages three cargo terminals and a cruise terminal on the St. Johns River, reports they received 1,782 vessel calls in Fiscal Year 2016 (JAXPORT, 2017). During operation of the project at full capacity, between 40 and 100 LNG vessels would call on the LNG terminal per year. The number of vessel calls would depend on the type of vessels used (i.e., larger vessels would result in fewer calls, and vice-versa). If smaller ships are used, project-related vessel activity would comprise about 6 percent of existing large vessel traffic in the region. The LNG carrier vessels likely to be used by the project are similar in size to those already present on the St. Johns River.

LNG carriers would access the project site by proceeding inbound from the Atlantic Ocean via the St. Johns Bar Cut along the main channel of the St. Johns River, to the Drummond Creek Range where the project berth would be located. Vessels would moor at the LNG terminal on the north side of the St. Johns River. The total inbound transit distance is about 14.5 river miles from the mouth of the St. Johns River.

We have evaluated the proposed transit route and increase in vessel traffic and conclude that the nominal increase in vessel traffic (40 to 100 LNG vessels) would not significantly affect vessel transportation on the St. Johns River.

4.9.7 Property Values

Potential impacts on the value of a tract of land depends on many factors, including size, the values of adjacent properties, presence of other industrial facilities or pipelines, the current value of the land, and the extent of development and other aspects of current land use. A potential purchaser would make an offer to purchase based on his or her own values, which might take the LNG terminal presence into account.

The proposed location of the LNG terminal is within an active port and is zoned for industrial use. The nearest residences are about 0.8 mile north of the proposed site, and we do not anticipate any impact on the value of adjacent properties. One study on this issue showed the construction of industrial facilities (e.g., fossil fuel generation plants) in the vicinity of residential areas may have a minor effect on property values in those residential areas (Davis, 2010). However, given the number of other industrial facilities in the area and other economic growth in the Jacksonville area, as much as 5 percent growth year-over-year (U.S. Bureau of Economic Analysis, 2015), the project would be unlikely to have a significant impact on property values.

4.9.8 Environmental Justice

For projects with major aboveground facilities, FERC regulations (18 CFR 380.12(g)(1)) direct applicants to consider the impacts on human health or the environment of the local populations, including impacts that would be disproportionately high and adverse for minority and low-income populations. Additionally, during Project scoping, we received comments raising concerns about the impacts of the Jacksonville Project on minority and low-income populations.

The EPA's Environmental Justice Policies (which are directed, in part, by Executive Order 12898: *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations*) focus on enhancing opportunities for residents to participate in decision making. The EPA (2011) states that Environmental Justice involves meaningful involvement so that: "(1) potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that would affect their environment and/or health; (2) the public's contributions can influence the regulatory agency's decision; (3) the concerns of all participants involved would be considered in the decision-making process; and (4) the decision-makers seek out and facilitate the involvement of those potentially affected." CEQ also has called on federal agencies to actively scrutinize a number of important issues with respect to environmental justice (CEQ, 1997).

As part of our NEPA review, we have evaluated potential environmental justice impacts related to the Jacksonville Project, taking into account the following:

- the racial and economic composition of affected communities;
- health-related issues that may amplify project effects on minority or low-income individuals; and
- public participation strategies, including community or tribal participation in the NEPA process.

The EPA provides guidance on determining whether there is a minority or low-income community to be addressed in a NEPA analysis. According to this guidance, minority population issues must be addressed when they comprise over 50 percent of an affected area or when the minority population percentage of the affected area is substantially greater than the minority percentage in the larger area of the general population. According to 15 USC 689(3), the U.S. Department of Housing and Urban Development defines a low-income community as a census block or tract having a poverty rate of greater than 20 percent of the population living below the federal poverty line, among other possible indicators.

In accordance with these guidelines, we prepared an environmental justice analysis for the project. To develop a more accurate understanding of the racial and ethnic characteristics of the communities in the immediate vicinity of the LNG terminal, census block group-level data was used. Our environmental justice analysis focused on the census block groups intersected by a 2-mile radius around the project site. The 2-mile radius captures census blocks and communities most likely to see impacts associated with project construction and operation. Table 4.9.8-1 identifies racial composition and economic status of the eleven block groups, Duval County, and the State of Florida. Table 4.9.8-2 provides further detail regarding ethnic and minority composition in the project vicinity. Table 4.9.8-3 provides an overview of the general economic status of these areas.

TABLE 4.9.8-1

Demographics in the Vicinity of the LNG terminal (in percent)

Area	White, not Hispanic or Latino	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Other	Two or more Races
Florida	55.6	16.1	0.3	2.8	0.1	2.9	2.6
Duval County	54.7	29.4	0.2	4.4	0.1	1.2	3.5
Block Group 1: Census Tract 1	51.0	43.2	0.0	0.0	0.0	0.0	0.0
Block Group 2: Census Tract 1	46.0	44.5	0.0	1.4	0.0	0.0	0.0
Block Group 1: Census Tract 101.03	71.7	16.1	0.0	2.1	0.0	0.7	3.9
Block Group 2: Census Tract 102.01	57.4	29.0	0.2	3.1	0.0	2.0	2.8
Block Group 1: Census Tract 102.02	68.2	13.9	0.0	2.1	0.0	1.3	8.6
Block Group 2: Census Tract 102.02	87.9	2.5	0.0	1.7	0.0	0.3	0.3
Block Group 3: Census Tract 146.01	82.8	5.3	0.0	0.0	0.0	0.0	2.6
Block Group 2: Census Tract 147.01	50.8	33.0	0.0	5.1	0.0	2.2	4.2
Block Group 3: Census Tract 147.01	32.7	57.9	0.6	0.0	0.0	0.0	0.0
Block 1: Census Tract 147.02	42.9	47.0	0.0	4.5	0.0	1.0	1.9
Block Group 2: Census Tract 147.02	61.9	8.1	0.0	11.5	0.0	1.1	13.5

Source:
U.S. Census Bureau American Community Survey 2016 5-year estimates, 2018.

TABLE 4.9.8-2		
Ethnic and Minority Composition in the Vicinity of the LNG Terminal (in percent)		
Area	White with Hispanic or Latino Ethnicity	Total Minority Population
Florida	20.3	45.1
Duval County	6.5	45.3
Block Group 1: Census Tract 1	5.7	49.0
Block Group 2: Census Tract 1	8.1	54.0
Block Group 1: Census Tract 101.03	5.5	28.3
Block Group 2: Census Tract 102.01	5.7	42.6
Block Group 1: Census Tract 102.02	5.9	31.8
Block Group 2: Census Tract 102.02	7.2	12.1
Block Group 3: Census Tract 146.01	9.2	17.2
Block Group 2: Census Tract 147.01	4.7	49.2
Block Group 3: Census Tract 147.01	8.9	67.3
Block Group 1: Census Tract 147.02	2.8	57.1
Block Group 2: Census Tract 147.02	3.9	38.1

Source: U.S. Census Bureau American Community Survey 2016 5-year estimates, 2018.

TABLE 4.9.8-3		
Economic Statistics in the Vicinity of the LNG Terminal		
Area	Median Household Income [a]	Population Below Poverty (percent)[b]
Florida	$48,900	16.1
Duval County	$49,196	16.6
Block 1: Census Tract 1	$22,926	18.4
Block 1: Census Tract 2	$44,091	14.4
Block 1: Census Tract 101.03	$87,907	4.7
Block 2: Census Tract 102.01	$58,617	5.6
Block 1: Census Tract 102.02	$57,292	2.7
Block 2: Census Tract 102.02	$55,054	7.0
Block 3: Census Tract 146.01	$91,047	5.0
Block 2: Census Tract 147.01	$44,013	10.7
Block 3: Census Tract 147.01	$38,487	12.4
Block 1: Census Tract 147.02	$37,813	33.7
Block 2: Census Tract 147.02	$67,083	3.2

Sources: U.S. Census, American Community Survey 2016 5-year estimates, 2018

Five of the 11 block group communities have a higher proportion of minority population and 2 of the 11 have a higher proportion of the population in poverty than the State of Florida. Census tract 102.02, block group 1 (where the proposed project is located), and census tract 146.01, block group 3 do not meet any criteria for consideration as an Environmental Justice community and are not further evaluated. Although several block groups fall within the 2-mile radius of the project site that would potentially be considered Environmental Justice communities, the impacts of the project on these block groups would be the same as the impact on the other block groups that do not meet criteria to be considered Environmental Justice communities. The block groups with a higher proportion of minority residents or population below the poverty line would not be impacted differently and therefore would not be disproportionately affected. The block group where the project is proposed would likely bear most of the impacts, and it does not have any disadvantaged populations. Further, Eagle LNG selected this site based on its access to deep-draft shipping channels, its industrial/commercial setting, and distance to occupied residences, not land value or avoiding impacts on a particular community. Therefore, we conclude that the project would not disproportionately affect minority populations or low-income groups.

4.10 CULTURAL RESOURCES

Section 106 of the NHPA, as amended, requires the FERC to take into account the effects of its undertakings on properties listed, or eligible for listing, in the National Register of Historic Places (NRHP), and to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. Eagle LNG, as a non-federal party, assisted the FERC in meeting our obligations under section 106 by preparing the necessary information, analyses, and recommendations, as authorized by 36 CFR 800.2(a)(3).

Construction and operation of the project could have the potential to affect historic properties (that is, cultural resources listed or eligible for listing on the NRHP). Historic properties include prehistoric or historic archaeological sites, districts, buildings, structures, and objects, as well as locations with traditional value to Native Americans or other groups. Historic properties generally must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and must meet one or more of the criteria for evaluation specified in 36 CFR 60.4.

The Jacksonville Project consists of an approximately 194-acre parcel, including about 174.1 acres onshore and about 19.3 acres of submerged land within the St. Johns River. The area of potential effects (APE) included both direct effects and indirect effects. The APE for direct effects encompassed the entire Jacksonville Project parcel, including both the approximately 174.1-acre land parcel and the approximately 19.3-acre submerged lease area. The APE for indirect effects encompassed 2.0 miles from the proposed project and 1.0 mile from the route to sea.

4.10.1 Cultural Resources Assessments

Eagle LNG completed a records review, a cultural resources assessment survey, and an underwater cultural resources survey of the proposed LNG facility. The terrestrial cultural resources assessment survey covered both archaeological and architectural resources. Cultural resources survey reports for the terrestrial and underwater portions of the project were provided to the FERC and the Florida State Historic Preservation Office (SHPO) (Jones and Jones, 2015; Krivor, 2015a and 2015b).

The cultural resources assessment survey examined the approximately 174-acre terrestrial portion of the terminal site to identify prehistoric or historic archaeological sites, structures, bridges, cemeteries or other resources that may be present. The survey consisted of pedestrian surface inspection and systematic and judgmental subsurface shovel testing. A total of 130 shovel tests were excavated; areas that were under water, excessively wet, or created with fill less than 50 years ago were excluded from shovel testing but were visually inspected. Three archaeological sites (two multi-component and one historic), one archaeological occurrence, one architectural structure, and one resource group (homestead) were identified during the survey; all of these resources were recommended by Eagle LNG as not eligible for the NRHP, and Eagle LNG recommended the project would not affect historic properties. In an April 14, 2015 letter, the SHPO concurred with the recommendations in the report. We concur.

The underwater cultural resources survey consisted of a marine magnetometer survey, a side-scan sonar survey, and use of a sub-bottom profiler. The marine magnetometer survey documented 50 magnetic anomalies, 2 of which were considered potentially significant and recommended for either avoidance or diver identification and evaluation. The side-scan sonar documented 34 sonar returns, 1 of which was associated with one of the potentially significant magnetic anomalies. Analysis of the sub-bottom profiler data identified two additional features recommended for avoidance or diver identification and limited subsurface testing. Eagle LNG conducted archaeological diver identification and evaluation of three of the four potentially significant submerged targets. One feature would be avoided based on the current project design and was not examined. Two of the features examined were determined to be non-cultural and the remaining feature was determined to be a modern anchor.

In a June 16, 2015 letter, the SHPO commented on the underwater cultural resources survey. The SHPO concurred with the underwater cultural resources survey results, recommended that Eagle LNG establish avoidance buffers around the anomalies and targets not diver-tested (50-foot buffer zones around the magnetic anomalies and one side-scan target and 150-foot buffer zones around the two sub-bottom profiler features), and concurred that no additional archaeological investigations would be necessary for one magnetic/side-scan sonar target and two sub-bottom profiler features. Eagle LNG indicated it would avoid the submerged features in accordance with the buffer recommendations. We concur with the SHPO.

4.10.2 Unanticipated Discoveries Plan

Eagle LNG prepared an Unanticipated Discoveries Plan that would be implemented in the event that cultural resources or human remains are encountered during construction of the project. Eagle LNG provided its plan to the SHPO on July 11, 2016. To date the SHPO has not provided comments regarding the plan. We have reviewed the plan and find it acceptable.

4.10.3 Native American Consultation

Eagle LNG contacted 16 Native American tribes with traditional ties to the area that would be affected by the project. On January 29, 2015, Eagle LNG sent letters to the Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town, Chickasaw Nation, Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Eastern Band of Cherokee Indians, Eastern Shawnee Tribe of Oklahoma, Jena Band of Choctaw Indians, Miccosukee Tribe of Indians of Florida, Mississippi Band of Choctaw Indians, Muscogee (Creek) Nation of Oklahoma, Poarch Band of Creek Indians, Seminole Nation of Oklahoma, Seminole Tribe of Florida, Thlopthlocco Tribal Town, and United Keetoowah Band of Cherokee Indians. The letters introduced the proposed project and requested the tribes communicate any concerns about potential impacts the proposed project may have on archaeological sites, burials, or traditional cultural properties.

In a February 11, 2015 email, the United Keetoowah Band of Cherokee Indians deferred to other federally recognized tribes with a historic interest in the area.

In a February 13, 2015 letter, the Alabama-Coushatta Tribe of Texas declined the opportunity to participate in consultation on the project, and indicated that Duval County was beyond its area of interest.

In a February 18, 2015 letter, the Seminole Tribe of Florida requested continued communication regarding the project and a copy of the cultural resources survey reports. Eagle LNG provided a copy of the cultural resources assessment survey report to the tribe on March 13, 2015. In response, the tribe indicated it had no objection to the project, and requested to be notified if cultural resources or human remains were discovered during construction activities. On March 27, 2015, the tribe requested copies of the underwater cultural resources survey reports. Eagle LNG provided copies of the underwater cultural resources surveys to the tribe on May 15, 2015. In a June 19, 2015 letter, the tribe commented on the reports and indicated that it had no objection to the project, but requested to be informed of inadvertent discoveries. In an April 6, 2017 letter, the Seminole Tribe of Florida requested a Phase I cultural resource survey be conducted for the project. As noted above, the tribe has been provided, and commented on, the project reports.

In a February 25, 2015 email, the Jena Band of Choctaw Indians requested a copy of the cultural resources survey reports. Eagle LNG provided a copy of the cultural resources assessment survey report to the tribe on March 13, 2015. In an April 28, 2015 email, the tribe concurred with Eagle LNG's recommendations that no historic properties would be affected by the project. The tribe also requested that it be notified of any inadvertent discoveries. Eagle LNG provided a copy of the underwater cultural resources survey to the tribe on May 15, 2015. The tribe has not provided comments on the underwater cultural resources survey report.

In a March 3, 2015 email, the Choctaw Nation of Oklahoma requested locational information to determine if the project was in the tribe's area of historic interest. On March 5, 2015, Eagle LNG provided global positioning system (GPS) coordinates to the tribe. In an April 24, 2015 response, the tribe indicated that Duval County was outside its area of historic interest, and deferred to the other tribes contacted.

In a March 3, 2015 email, the Muscogee (Creek) Nation of Oklahoma requested a copy of the cultural resources survey reports. Eagle LNG provided a copy of the cultural resources assessment survey report to the tribe on March 13, 2015. Eagle LNG provided a copy of the underwater cultural resources survey to the tribe on May 15, 2015. The tribe has not provided comments on the cultural resources survey reports.

On March 4, 2015, Eagle LNG sent follow-up letters to the Alabama-Quassarte Tribal Town, Chickasaw Nation, Coushatta Tribe of Louisiana, Eastern Band of Cherokee Indians, Eastern Shawnee Tribe of Oklahoma, Miccosukee Tribe of Indians of Florida, Mississippi Band of Choctaw Indians, Poarch Band of Creek Indians, Seminole Nation of Oklahoma, and Thlopthlocco Tribal Town.

In a March 13, 2015 email, the Chickasaw Nation indicated the project was not in its area of interest.

In March 5 and April 7, 2015 letters, the Coushatta Tribe of Louisiana concurred with a finding of "no historic properties affected," and requested to be notified if cultural resources or human remains were discovered during construction.

In a March 9, 2017 voice message, the Miccosukee Tribe of Indians of Florida stated the tribe had no interest in the project.

No additional responses from tribes have been received to date.

In accordance with the above requests, the Unanticipated Discoveries Plan includes notification of the Coushatta Tribe of Louisiana, Jena Band of Choctaw Indians, Muscogee (Creek) Nation of Oklahoma, Seminole Nation of Oklahoma, and Seminole Tribe of Florida.

We sent our NOI, Supplemental NOI, and follow-up letters to the same 16 tribes. The NOI requested comments on the proposed project and encouraged attendance at the FERC's public scoping meeting. The letters requested comments on the project, and the tribes' assistance in identifying properties of traditional, religious, or cultural importance that may be affected by the project.

In a May 18, 2015 letter, the Choctaw Nation of Oklahoma indicated that Duval County was outside its area of historic interest and deferred to the other tribes contacted.

On March 9, 2017, the Seminole Nation of Oklahoma requested a list of flora in the project area, that a Phase I cultural resource survey be conducted for the project, and to be notified of inadvertent discoveries of human remains and related items. On April 25 and 27, 2017, Eagle LNG provided a copy of the cultural resources assessment survey report and a list of flora identified in the project area to the tribe.

In a November 22, 2016 letter, the Seminole Tribe of Florida requested consultation with the FERC.

No additional responses to our NOIs or letters have been received.

4.10.4 Other Parties

Eagle LNG sent letters to the City of Jacksonville Planning and Development Department and Jacksonville Historical Society on January 29, 2015. In a February 20, 2015 letter, the City of Jacksonville noted that an archaeological survey should be conducted due to the location of the Jacksonville Project in a high site probability per the Duval County Archaeological Plan. Eagle LNG provided a copy of the cultural resources assessment survey report to the City of Jacksonville on March 13, 2015. Eagle LNG provided a copy of the underwater cultural resources survey to the City of Jacksonville on May 15, 2015. No further comments have been received from the City of Jacksonville. No comments have been received from the Jacksonville Historical Society.

4.10.5 Compliance with the National Historic Preservation Act

Compliance with section 106 of the NHPA is complete for the project.

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

Construction and operation of the LNG terminal could potentially have effects on local and regional air quality. The section summarizes federal and state air quality regulations that are applicable to the proposed facilities. The section also characterizes the existing air quality and describes potential impacts the facilities may have on air quality regionally and locally.

The term *air quality* refers to relative concentrations of pollutants in the ambient air. The subsections below describe well-established air quality concepts that are applied to characterize air quality and to determine the significance of increases in air pollution. This includes metrics for specific air pollutants known as criteria pollutants, as well as ambient air quality standards (AAQS), regional designations to manage air quality known as Air Quality Control Regions (AQCR), and efforts to monitor ambient air concentrations.

Pollutants of concern are primarily ground-level ozone (ozone), carbon monoxide (CO), nitrogen oxides (NO_X), sulfur dioxide (SO_2), respirable and fine particulate matter (inhalable particulate matter with an aerodynamic diameter less than or equal to 10 microns [PM_{10}] and less than or equal to 2.5 microns [$PM_{2.5}$]). VOCs are a subset of organic compounds that are emitted during fossil fuel combustion and can cause a variety of health effects, from irritation to serious health impacts as well as the reactant to form ozone. Hazardous air pollutants (HAP) are also emitted during fossil fuel combustion and contain compounds that are known or suspected of causing cancer and other serious health effects.

Additionally, fugitive dust would be produced during project construction and operation from earth moving, road dust, etc. The majority of fugitive dust would be particulate matter in excess of 10 microns, but a portion would be PM_{10} and $PM_{2.5}$.

Greenhouse Gases (GHG) produced by fossil-fuel combustion are CO_2, methane (CH_4), and nitrous oxide (N_2O). GHGs are not considered a pollutant due to toxicity as they are non-hazardous to health at normal ambient concentrations. GHGs absorb infrared radiation in the atmosphere, and an increase in emissions of these gasses cause warming of the climate system. Emissions of GHGs are typically expressed in terms of CO_2 equivalents (CO_2e), where the potential of each gas to increase heating in the atmosphere is expressed as a multiple of the heating potential of CO_2 over a specific timeframe, or its global warming potential (GWP). Because each of the gases remains in the atmosphere for a different amount of time and each has a varying ability to absorb solar radiation, the calculated GWP for each gas in relation to CO_2 can vary greatly and is at times adjusted based on updated scientific estimates or changing atmospheric concentrations of GHGs. For comparison purposes, we use the 100-year GWP based on the current list presented in 40 CFR 98 table A-1, in which CO_2 has a GWP of 1, CH_4 has a GWP of 25, and N_2O has a GWP of 298. During construction and operation of the project, these GHGs would be emitted from construction equipment, ships, and operational equipment.

4.11.1.1 Regional Climate

The proposed LNG terminal is in an area with a humid subtropical climate, with long, warm, and relatively humid summers, and mild winters with periodic cool to cold periods caused by northern air fronts.

June, July, and August are the hottest months in the project area, while December, January, and February are typically the coolest months. Winters are typically mild, with periodic cool to cold air from the north. The greatest rainfall, which occurs mostly in the form of local thunderstorms, occurs during the summer months. The annual average precipitation is about 52.4 inches. Precipitation is distributed fairly evenly throughout the year; September tends to be the wettest month with an annual average of 8.2 inches. Normal annual average relative humidity is 75 percent, ranging from about 90 percent in the early morning hours to 55 percent in the afternoon (NOAA, 2016).

The predominant wind direction is from the north-northeast in the fall, from the north-northwest in the winter, and from the west-southwest in the spring and summer. On average, wind speed is 6.7 mph, with a monthly average maximum wind speed of 8.0 mph occurring in March.

4.11.1.2 Existing Air Quality

Ambient Air Quality Standards and Monitoring

The EPA has established NAAQS to protect public health (primary standards) and public welfare (secondary standards). Standards have been set for six principal pollutants, called “criteria pollutants” (EPA, 2014c). The NAAQS were set at levels the EPA determined are necessary to protect human health and welfare for healthy adults, as well as sensitive populations such as the children, and the elderly.

The criteria pollutants are ozone, CO, NO_X, SO_2, $PM_{10,}$ $PM_{2.5}$, and airborne lead. Ozone is not directly emitted into the atmosphere from an emissions source. Ozone develops as a result of a chemical reaction between NO_X and volatile organic compounds (VOC) in the presence of sunlight. Therefore, NO_X and VOCs are often referred to as ozone precursors. The NAAQS are codified in 40 CFR 50 and are available for review at the EPA's website.[13] Florida has adopted the NAAQS and does not have state-level AAQS.

Florida's ambient air monitoring network is operated by 19 different state, local, and private environmental programs. The FDEP Division of Air Resource Management gathers data from the air monitoring network. Data from these air monitoring sites are available through the FDEP's Florida Air Quality System website. The majority of emissions generated during construction and operation of the project facilities would occur in Duval County.

Ambient air quality monitoring data from the 3-year period of 2013 to 2015 are summarized in table 4.11.1-1 for those monitors that were nearest or most representative of the proposed facilities in Duval County. The concentrations listed in table 4.11.1-1 are maximum or near maximum values for the identified monitors. As such, they are not necessarily representative of current actual air quality in the immediate vicinity of the proposed facilities. For each monitor, table 4.11.1-1 lists the applicable concentrations such as annual mean concentration in each year and/or a near maximum short-term concentration, which are comparable to the applicable NAAQS.

TABLE 4.11.1-1

Ambient Air Quality Concentrations for Areas Near the Eagle LNG Terminal

Pollutant	Averaging Period	Rank	Location	3 Year Average	Applicable NAAQS (µg/m^3)	Monitor Location
Eagle LNG Terminal – Duval County						
CO	1-hour	2nd high	Jacksonville	1,533	40,000	A
	8-hour	2nd high	Jacksonville	1,000	10,000	A
NO_2	1-hour	98th percentile	Jacksonville	36	188	B
	Annual	Mean	Jacksonville	7.6	100	B
Ozone	8-hour	4th high	Jacksonville	57	140	C
$PM_{2.5}$	24-hour	98th percentile	Jacksonville	17	35	B
	Annual	Mean	Jacksonville	7.7	12	B
PM_{10}	24-hour	2nd high	Jacksonville	73	150	B
SO_2	1-hour	99th percentile	Jacksonville	16	198	B
	24-hour	2nd high	Jacksonville	6.0	365	B
	Annual	Mean	Jacksonville	0.3	80	B
Lead	3-month	Not to be exceeded	N/A	N/A	0.15	N/A

Monitor Key:
A Minerva Street, Jacksonville, Florida (monitor no. 12-031-0080). Approximately 7.25 miles southwest of the project site.
B Kooker Park, Jacksonville, Florida (monitor no. 12-031-0032). Approximately 3.5 miles southwest of the project site.
C Sheffield Elementary, Jacksonville, Florida (monitor no. 12-031-0077). Approximately 5 miles northeast of the project site.
Notes: µg/m^3 = micrograms per cubic meter; N/A – not available
Source: EPA, 2017

An AQCR is defined under 42 USC 7407(c) as "...any interstate area or major intrastate area which [the Administrator of the EPA] deems necessary or appropriate for the attainment and maintenance of

13 The NAAQS are available online on the EPA's website at https://www.epa.gov/criteria-air-pollutants/naaqs-table.

ambient air quality standards." Each AQCR, or portion(s) of an AQCR, is classified as either attainment, non-attainment, or maintenance with respect to the NAAQS.

Areas where ambient air concentrations of the criteria pollutants are below the levels listed in the NAAQS are considered in attainment; if ambient air concentrations of criteria pollutants are above the NAAQS levels, then the area is considered to be in non-attainment. Areas that have been designated nonattainment but have since demonstrated compliance with the NAAQS are designated maintenance for that pollutant. Maintenance areas are treated similarly to attainment areas for the permitting of stationary sources; however, specific provisions may be incorporated through the state's approved maintenance plan to ensure that the air quality would remain in compliance with the NAAQS for that pollutant. Maintenance areas retain the classification for 20 years before being re-classified as attainment areas. Areas where air quality data are not available are considered unclassifiable and are treated as attainment areas. The project would be in areas classified as in attainment for all criteria pollutant standards. Duval County is classified as a maintenance area for ozone.

The project LNG vessels are anticipated to pass through the ozone maintenance area while transiting the St. John's River en route to the Atlantic Ocean. Although the EPA maintains jurisdiction over portions of the outer continental shelf within the Atlantic Ocean (40 CFR 55), attainment status does not apply in offshore areas. Therefore, LNG vessels transiting the Atlantic Ocean would not pass through non-attainment or maintenance areas.

4.11.1.3 Regulatory Requirements for Air Quality

State air quality rules govern the issuance of air permits for construction and operation of a stationary emission source. The FDEP is the lead air permitting authority for the project. The FDEP's air quality regulations are codified in subsections of Florida Administrative Code 62. The regulations incorporate the federal program requirements listed in 40 CFR 50-99 and establish permit review procedures for all facilities that can emit pollutants to the ambient air. New facilities are required to obtain an air quality permit prior to initiating construction. For larger facilities subject to major NSR, review and approval at the federal level may be required.

Federal Air Quality Requirements

<u>New Source Performance Standards</u>

Section 111 of the CAA authorized the EPA to develop technology-based standards that apply to specific categories of stationary sources. These standards, referred to as New Source Performance Standards (NSPS), are found in 40 CFR 60. The NSPS apply to new, modified, and reconstructed affected facilities in specific source categories. We have determined that the following NSPS would be applicable to the project facilities.

Subpart A – General Provisions

The general provisions listed in Subpart A include broader definitions of applicability and various methods for maintaining compliance with requirements listed in subsequent subparts of 40 CFR 60. Subpart A also specifies the state agencies to which the EPA has delegated authority to implement and enforce standards of performance. The FDEP has delegated authority for all 40 CFR 60 standards promulgated by the EPA, except for *Subpart AAA – Standards of Performance for New Residential Wood Heaters*, which is not applicable to the project. Equipment at the LNG terminal subject to any of the NSPS subparts listed below would all be subject to Subpart A.

Subpart Dc – Standards of Performance for Small Industrial, Commercial, and Institutional Steam Generating Units

Subpart Dc applies to new steam-generating units that have a heat input capacity of 10 million British thermal units per hour (MMBtu/hr) or more, but less than 100 MMBtu/hr. Eagle LNG proposes to install three natural gas-fired hot oil heaters each rated at 16 MMBtu/hr, which would be subject to NSPS Subpart Dc. Eagle LNG also proposes to install three small regeneration gas heaters each rated at 6 MMBtu/hr which would not be subject to Subpart Dc.

Subpart Dc specifies recordkeeping and reporting requirements for the boilers proposed at the LNG terminal.

Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

Subpart IIII applies to owners and operators of stationary compression ignition internal combustion engines (CI ICE) that commence construction after July 11, 2005 where the stationary CI ICE are: 1) manufactured after April 1, 2006 and are not fire pump engines, or 2) are manufactured as a certified NFPA fire pump engine after July 1, 2006.

Subpart IIII specifies emission standards, fuel requirements, compliance requirements, and testing requirements for CI ICE, some of which vary by model year, engine power, and displacement, and also specifies notification, reporting, and recordkeeping requirements for owners and operators of CI ICE subject to this subpart. CI ICEs at the LNG terminal for use with the emergency generator for the air compressor package and the firewater pump would be subject to NSPS Subpart IIII.

Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

Subpart JJJJ applies to owners and operators of stationary spark ignition internal combustion engines (SI ICE) that: 1) commence construction after June 12, 2006 and are manufactured after July 1, 2007 (for engines with a design rating greater than or equal to 500 hp), or 2) SI ICE that undergo modification or reconstruction after June 12, 2006.

Subpart JJJJ specifies emission standards, testing requirements, monitoring, recordkeeping, and reporting requirements for owners and operators of SI ICE subject to this subpart. SI ICEs at the LNG terminal for use as non-emergency stationary power generation would be subject to NSPS Subpart JJJJ.

National Emissions Standards for Hazardous Air Pollutants

Section 112 of the CAA authorized the EPA to develop technology-based standards that apply to specific categories of stationary sources that emit HAPs. These standards are referred to as National Emission Standards for Hazardous Air Pollutants (NESHAP) and are found in 40 CFR 61 and 63. Eight hazardous substances are regulated per 40 CFR 61, including asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. NESHAP can apply to major and/or area (minor) sources of HAPs. The EPA develops national priorities for NESHAPs that focus on significant environmental risks and noncompliance patterns.

The 1990 CAA Amendments established a list of 189 HAPs, resulting in the promulgation of Part 63, also known as the Maximum Achievable Control Technology standards. Part 63 regulates HAPs from major sources of HAPs and specific source categories emitting HAPs. Some NESHAPs may apply to area (minor) sources of HAPs. Major source thresholds for NESHAPs are 10 tpy of any single HAP or 25 tpy of total HAPs.

During operation of the project, the annual emissions of each individual HAP would be less than 10 tpy, and the total annual emissions of all HAPs would be less than 25 tpy. Therefore, the facility would be an area (minor) source of HAPs. The following NESHAP subparts would apply to the LNG facility.

Subpart A – NESHAP General Provisions

The general provisions listed in Subpart A include broader definitions of applicability and various methods for maintaining compliance with requirements listed in subsequent subparts of 40 CFR 63. This subpart also addresses the delegation of NESHAP authority to the states. Though not all NESHAPs have been delegated to the state in Florida, the specific NESHAPs that are applicable to the LNG terminal have been delegated to the FDEP.

Subpart ZZZZ – NESHAP for Stationary Reciprocating Internal Combustion Engines

Subpart ZZZZ regulates HAP emissions from reciprocating internal combustion engines. Based on the potential to emit for HAPs, the project would be an area source. The reciprocating internal combustion engines proposed for the LNG terminal includes the engines used for the emergency generator and the fire water pump. In accordance with 40 CFR 63.6590(c), compliance with Subpart ZZZZ would be achieved through compliance with NSPS Subpart IIII and JJJJ for compression ignition engines, as applicable.

Mandatory Greenhouse Gas Reporting

Subpart W of 40 CFR 98 requires petroleum and natural gas facilities that emit 25,000 metric tons or more of CO_2e per year to report annual emissions of specified GHGs from various processes within the facility. LNG storage and LNG import and export equipment are considered part of the source category regulated by Subpart W. The project would be required to report GHG emissions because annual emissions of GHGs would be above 25,000 metric tpy.

General Conformity

A General Conformity applicability analysis is required for any part of the project occurring in nonattainment or maintenance areas for criteria pollutants. Section 176(c) of the CAA requires federal agencies to ensure that federally approved or funded projects conform to the applicable approved State Implementation Plan. Such activities must not:

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

As noted in section 4.11.1.2, Duval County is an ozone maintenance area. Table 4.11.1-2 presents the project emissions subject to review under the General Conformity rule. Project operation emissions covered under a federally enforceable operational permit program are exempt from the General Conformity rule; therefore, the project operation emissions subject to review under General Conformity include emissions associated with vehicular traffic and LNG carrier/tug boat emissions.

TABLE 4.11.1-2

General Conformity Applicability Analysis

Pollutant	Applicability Threshold (tpy)	Project Emissions (tpy)				
		Year 1	Year 2	Year 3 [a]	Year 5 [b]	Annual Operating Emissions
Duval County – Ozone Maintenance Area						
VOC [c]	100	2.0	3.6	1.9	2.1	2.4
NO_X [c]	100	33.8	47.2	37.3	50.3	63.3

a Represents worst-case construction emissions for simultaneous construction of Trains 2 and 3, and operation of Train 1.
b Represents construction of Train 3, and simultaneous operation of Trains 1, 2.
c VOC and NO_X are ozone precursor pollutants.

As presented in table 4.11.1-2, the project emissions would be less than General Conformity applicability thresholds; therefore, the project would not require a General Conformity determination.

New Source Review – Prevention of Significant Deterioration

Congress established the NSR preconstruction permitting program as part of the 1977 CAA Amendments. Federal preconstruction review under NSR is conducted under separate procedures for sources in attainment areas and sources in nonattainment areas. Nonattainment New Source Review applies to sources in nonattainment areas. Because the project facilities would not be in nonattainment areas, this process does not apply and is not discussed further.

PSD permitting applies to new major sources or major modifications at existing sources in attainment areas or in areas that are unclassifiable. PSD is intended to keep new air emission sources from causing the existing air quality to deteriorate beyond acceptable levels. Under PSD, any new major source or major modification of an existing source of air pollutants is required to obtain an air quality permit before beginning construction. The definition of a PSD major source of air pollutants as applicable to the project is any stationary source which emits, or has the potential to emit, 250 tpy of a regulated criteria pollutant (40 CFR 51.166(b)(1)(i)(b)). Based on the operation emission estimates provided in section 4.11.1.5, the project would not trigger PSD review.

Title V Operating Permit

The Part 70 Operating Permit program, as described in 40 CFR 70, requires major stationary sources of air emissions to obtain a federally enforceable operating permit. Part 70 operating permits are more commonly referred to as "Title V" permits. The EPA has delegated the authority to issue Title V permits to the FDEP, which has incorporated the program in FAC 62-213.

Based on the operation emission estimates provided in section 4.11.1.5, the project would require a Title V operating permit. Eagle LNG would apply for a Title V operating permit following construction. The Title V operating permit would identify emission limits, monitoring, recordkeeping, and reporting requirements, and would require renewal once every five years.

Federal Class I Areas

The CAA Amendments of 1977 designated certain areas of the United States as Mandatory Federal Class I areas, based on their air quality being considered a special feature of the area (e.g., national parks, wilderness areas). Class I areas are protected against several types of pollution, including elevated levels of criteria pollutant concentrations, visibility degradation, and acid deposition. If the new major source or major modification is within 62 miles (100 kilometers [km]) of a Class I area, the facility is required to notify the appropriate federal official and assess potential impacts of that project on the nearby Class I area. For major sources that are within 6.2 miles (10 km) from a Class I area, ambient air pollutant impacts must be assessed for any project emission increase. Under the protection of the CAA, there are currently 156 protected areas nationwide designated as “Class I” areas. When evaluating the potential impacts of sources of new air emissions on designated Class I areas, special analyses are required by federal law.

Two factors determine potential impacts on Federal Class I areas: (1) magnitude of emissions; and (2) distance to the Class I area. The Okefenokee Wilderness, which is about 60 km from the facility, would be nearest Federal Class I area to the LNG terminal.

Eagle LNG completed a screening analysis based on proposed emissions (Q in tons per year) and the distance from the emission source to the Class I area (d in km). If the ratio (Q/d) is less than 10, no additional analysis of impacts on the Class I area from project emissions is needed (NPS, 2010). The Q/d ratio is 3.25 based on annualized daily maximum emissions from the project and the distance of 60 km to the Okefenokee Wilderness. Based on this screening analysis, no additional Class I impact assessment was needed. We have reviewed this analysis and agree no additional Class I impact assessment is needed for the project.

Florida Air Quality Requirements

The project facilities would be subject to state standards, codified in FAC 62-4.030, 62-4.050, 62-4.055, 62-4.070, 62-4.160, 62-210.300, and 62-212.400. The following state standards would apply to the project facilities:

- Rule 62-296.320(1), FAC – General VOC Emissions Standard
- Rule 62-296.320(4)(b)1, FAC – General Visible Emissions Standard
- Rule 62-297.310, FAC – General Compliance Test Requirements

In addition, the facility would be required to obtain an air construction permit prior to commencing construction. Eagle LNG submitted an air permit application to the FDEP for a minor source air construction permit on March 11, 2018. As previously noted, Eagle LNG would apply for a Title V operating permit from the FDEP following construction. It is expected that the FDEP construction and operation permits would include permit conditions in the respective permits to ensure compliance with these regulations.

Local Air Quality Requirements

The Jacksonville Environmental Protection Board has also developed rules necessary for the administration and enforcement of the City of Jacksonville’s environmental ordinances.

- Rule 2.1301 – General Standard for Volatile Organic Compounds
- Rule 2.1302 – Emissions from Ships and Locomotives
- Rule 2.1303 – Air Pollution Nuisances

Eagle LNG would comply with the applicable portions of these rules.

4.11.1.4 Construction Air Emissions and Impacts and Mitigation

During construction, a reduction in ambient air quality would result from emissions and fugitive dust generated by construction equipment. Fugitive dust emission levels would vary in relation to moisture content, composition, and volume of soils disturbed. Fugitive dust and other emissions from construction activities generally do not result in a significant increase in regional pollutant levels, although local pollutant levels could intermittently increase during the lengthy construction period.

Air pollutant emissions during construction of the project facilities would result from the operation of construction vehicles, marine traffic, vehicles driven by construction workers commuting to and from work sites, and the generation of fugitive dust during construction activities.

The quantity of particulate emissions that would result from fugitive dust generated by construction-related activities would depend on several factors, including:

- the size of area disturbed;
- the nature and intensity of construction activity;
- surface properties (such as the silt and moisture content of the soil);
- the wind speed; and
- the speed, weight, and volume of vehicular traffic.

LNG Terminal

Eagle LNG estimated that it would take about 2 years to complete construction and place into service Train 1. Construction of Trains 2 and 3 would continue for 1 additional year, at which time Train 2 would be placed into service. Construction of Train 3 would continue for 6 additional months, at which time all three trains would be operational (totaling about 3.5 years of construction). Therefore, there would be a 1.5-year period during which the facility would be partially operational and under construction.

Eagle LNG developed an inventory of non-road equipment, vessels, on-road vehicles, off-road vehicles, and expected activity levels (either hours of operation or miles travelled) based on expected duration of construction at the site. The level of activity for each piece of construction equipment was combined with the relevant emission factors to determine estimates of annual construction emissions. Annual construction emissions were estimated for the following types of activities:

- construction equipment engines;
- on-road vehicle travel;
- off-road vehicle travel;
- fugitive dust from earth moving activities;
- pile driving fugitive dust emissions; and
- dredging activities.

Annual emissions estimates for activities associated with construction of the LNG terminal are summarized in table 4.11.1-3. The fugitive emission estimate consists of contributions from general site construction work, earth-moving fugitive dust emissions, and vehicle traffic emissions.

Marine vessels would be used during dredging activities. Emissions from dredging activities, including dredging barges and cranes, tug boats, bull dozers, and front-end loaders, are included in the construction equipment/vehicle emission estimates included in table 4.11.1-3.

TABLE 4.11.1-3 **Annual LNG Terminal Construction Emissions**								
	Emissions (tpy)							
Activity	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$	VOC	HAP	CO_2
Year 1								
Construction equipment/vehicle emissions	33.8	11.6	0.4	1.4	1.4	2.0	<0.1	711
Fugitive dust	--	--	--	32.4	3.9	--	--	--
Total for Year 1	**33.8**	**11.6**	**0.4**	**33.7**	**5.3**	**2.0**	**0.1**	**711**
Year 2								
Construction equipment/vehicle emissions	47.2	18.2	0.4	2.1	2.1	3.6	0.4	4,356
Fugitive dust	--	--	--	22.2	2.9	--	--	--
Total for Year 2	**47.2**	**18.2**	**0.4**	**24.3**	**5.0**	**3.6**	**0.4**	**4,356**
Year 3								
Construction equipment/vehicle emissions [a, c]	16.2	6.0	0.2	11.6	2.0	1.1	<0.1	4,356
Total for Year 3	**16.2**	**6.0**	**0.2**	**11.6**	**2.0**	**1.1**	**<0.1**	**4,356**
Year 4								
Construction equipment/vehicle emissions [a, b, c]	16.2	6.0	0.2	11.6	2.0	1.1	<0.1	4,356
Total for Year 4	**16.2**	**6.0**	**0.2**	**11.6**	**2.0**	**1.1**	**<0.1**	**4,356**
Year 5								
Construction equipment/vehicle emissions [a, c]	8.1	3.0	<0.1	5.8	1.0	0.6	<0.1	4,356
Total for Year 5	**8.1**	**3.0**	**<0.1**	**5.8**	**1.0**	**0.6**	**<0.1**	**4,356**

a Fugitive dust emissions are included in the total PM_{10} and $PM_{2.5}$ estimates.
b Construction year 4 emissions were assumed to be equal to construction year 3 emissions.
c Eagle LNG did not provide CO_2 emission estimates for construction years 3, 4, and 5. Worst-case emissions from construction year 2 were assumed.

Fugitive dust emission levels would vary in relation to moisture content, composition, activity level, wind speed, vehicle traffic, vehicle types, roadway characteristics, and volume of soils during construction. Fugitive dust would be produced primarily during the site preparation activities, when the site would be cleared of debris, leveled, and graded.

As previously noted, Eagle LNG would continue construction of the additional two trains following the commencement of operation of Train 1; therefore, there would be a 1.5-year period during which the facility would be partially operational and under construction.

Mitigation Measures

Eagle LNG proposes to mitigate combustion-related construction emissions by keeping construction equipment maintained and operated on an as-needed basis. Generation of fugitive dust associated with construction of the LNG terminal would be mitigated, as necessary, by applying water and/or other commercially available dust control agents on unpaved areas subject to frequent vehicle traffic. In addition, Eagle LNG has identified additional BMPs which may be implemented, as deemed appropriate by the EI, to control fugitive dust.

General construction and fugitive dust emissions would occur during the construction period and would subside once construction activities for any given project component are complete. Additionally, LNG terminal construction emissions would be primarily limited to the construction area.

Conclusions

Construction emissions would only occur during the years of construction and would not be permanent. The construction activities proposed in association with the LNG terminal are comparable to other types of infrastructure projects or industrial facilities. Eagle LNG has proposed mitigation measures, including fugitive dust control measures, that would ensure that the construction emissions would not have a long-term effect on air quality in the area. However, based on the estimated construction emissions and proposed mitigation measures, there may be localized minor to moderate elevated levels of fugitive dust and tailpipe emissions (criteria pollutants, VOCs, and HAPs) near the construction areas during the construction period associated with the LNG terminal.

4.11.1.5 Operation Air Emissions Impacts and Mitigation

Operating Air Emissions

The project would include the following operational emission sources:

- three natural gas and plant fuel gas-fired boilers (each rated at 16 MMBtu/hr) and three regeneration gas heaters;
- five natural-gas fired power generators;
- one diesel-fired emergency generator;
- one diesel-fired emergency fire water pump;
- one LNG storage tank;
- emergency flares;
- thermal oxidizer; and
- fugitive emissions from pipe flanges, valves, valve stems, and truck loading activities.

Annual emissions by source for the project and a summary of total annual emissions are provided in table 4.11.1-4. Emission estimates include control technologies proposed for the LNG terminal.

TABLE 4.11.1-4

Emissions by Source and Total Annual Emissions Associated with Operation of the LNG Terminal

Emission Source	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$	VOC	HAPs	CO_2e
Hot oil heaters (3)	20.6	17.3	0.1	1.6	1.6	1.1	0.4	24,600
Regeneration gas heaters (3)	7.7	6.5	<0.1	0.6	0.6	0.4	0.2	9,225
Emergency generator	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	9
Emergency firewater pump	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	6
Power generators	68.2	136.4	<0.1	4.1	4.1	47.8	0.4	9,213
Thermal oxidizer	14.1	6.0	0.1	1.1	1.1	0.8	0.3	17,937
Emergency flares	4.0	1.7	<0.1	0.3	0.3	0.2	<0.1	2
Fugitive emissions	--	--	--	--	--	6.1	--	13,389
Truck unloading emissions	--	--	--	--	--	15.5	--	34,995
LNG Terminal Stationary Sources Subtotal	**115.0**	**168.0**	**0.4**	**7.8**	**7.8**	**72.0**	**1.3**	**109,376**
LNG vessels	24.1	2.2	0.7	0.8	0.8	1.0	--	1,103 [a]
Tug boats/escort vessels	39.2	3.4	1.1	1.3	1.2	1.4	--	1,786 [a]
LNG Terminal Mobile Sources Subtotal	**63.3**	**5.6**	**1.8**	**2.1**	**2.0**	**2.4**	**<0.1**	**2,889 [a]**
TOTAL	**178.3**	**173.6**	**2.2**	**9.9**	**9.8**	**74.4**	**1.3**	**112,265**

Note: All units of measurement are expressed in tpy.
[a] Mobile source GHG emissions were provided as CO_2; however, these sources do not appreciably emit other GHGs.

The facility would be a minor source with respect to a PSD major source; however, it would be a Title V major source for CO and NO_X, exceeding the major source threshold of 100 tpy. The facility would be considered a minor source of HAP emissions. Eagle LNG completed a NAAQS analysis to estimate air quality impacts associated with facility operation. The result of this analysis is discussed below.

As previously noted, Eagle LNG would continue construction of the additional two trains following the commencement of operation of Train 1; therefore, there would be a 1.5-year period during which the facility would be partially operational and under construction. We included a recommendation to obtain the construction emissions during years 3 and 4 during the comment period of the draft EIS to assess the total emissions associated with overlapping facility construction and operation.

LNG Terminal Ambient Impacts

Eagle LNG conducted a NAAQS Analysis using EPA's AERMOD modeling tool. The model was used to estimate air quality impacts associated with facility operation. Once facility impacts were estimated, regional background concentrations of each air pollutant was added to determine if the facility would have the potential to cause or contribute to an exceedance of the NAAQS. In additional to stationary emission sources, the model also included emissions from LNG vessels and tug boats in the moored berthing area. In accordance with EPA modeling guidance, fugitive emissions and emergency generator emissions were not included.[14]

Eagle LNG performed a NAAQS analysis for NO_2, CO, PM_{10}, and $PM_{2.5}$, and SO_2. Based upon EPA modeling guidance, NO_x emissions were converted to NO_2 for comparison to NAAQS (EPA, 2011). The results of these analyses are summarized in table 4.11.1-5. The background concentrations for each pollutant and averaging period have been included and added to the results for comparison to the applicable NAAQS.

TABLE 4.11.1-5

Facility Air Quality Modeling Analysis

Pollutant	Averaging Period	Concentrations: LNG Terminal Maximum (µg/m^3)	Concentrations: Background Concentration (µg/m^3)	Concentrations: Total Concentration (Facility + Background) (µg/m^3)	Concentrations: NAAQS (µg/m^3)	NAAQS Exceedance? (Yes/No)
CO	1-Hour	244.6	1,533	1,777.6	40,000	No
	8-Hour	168.0	1,000	1,168	10,000	No
NO_2	1-Hour	56.2	36	92.2	188	No
	Annual	2.5	7.6	10.1	100	No
$PM_{2.5}$	24-Hour	2.7	17	19.7	35	No
	Annual	0.2	7.7	7.9	12	No
PM_{10}	24-Hour	3.3	73	76.3	150	No
SO_2	1-Hour	2.2	16	18.2	196	No
	24-Hour	0.9	6.0	6.9	365	No
	Annual	0.1	0.3	0.4	80	No

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14 An air quality modeling report and supplemental data files can be accessed at FERC's eLibrary (https://elibrary.ferc.gov/idmws/search/fercadvsearch.asp) using the following accession numbers: 20170131-5314 and 20170502-5144.

As shown in table 4.11.1-5, the air quality impacts associated with the operation of the LNG terminal, when combined with background air quality concentrations, would be below the NAAQS. Therefore, we conclude that the air quality impacts associated with the operation of the facility would be limited to the project vicinity, and would not result in significant impacts on local or regional air quality.

Mitigation Measures

Eagle LNG proposes to mitigate air emissions associated with facility operation by using equipment, emission controls, and operating practices that meet or exceed the applicable regulatory requirements, which are further described in section 4.11.1.3. Eagle LNG would use a flare to minimize methane and VOC emissions associated with upset or emergency conditions.

Conclusions

Residents near the construction areas may have elevated emission levels during the period of construction. However, through implementation of construction work practices, analysis of the estimated emissions from construction and operation, an analysis of the modeled air quality impacts from operation of the LNG terminal, we conclude that there would be no regionally significant impacts on air quality.

4.11.2 Noise

Sound is a sequence of waves of pressure that propagates through compressible media such as air or water. When sound becomes excessive, annoying, or unwanted, it is referred to as noise. Construction and operation of the project would affect overall noise levels in the vicinity of project components. The ambient sound level of a region is defined by the total noise generated within the specific environment and usually comprises natural and manmade sounds. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of a day and throughout the week. This variation is caused in part by changing weather conditions and the effect of seasonal vegetation cover.

Two measurements used by some federal agencies to relate the time-varying quality of environmental noise to its known effects on people are the equivalent sound level (L_{eq}) and the day-night sound level (L_{dn}). The preferred single value figure to describe sound levels that vary over time is L_{eq}, which is defined as the sound pressure level of a noise fluctuating over a period of time, expressed as the amount of average energy. L_{dn} is defined as the 24-hour average of the equivalent average of the sound levels during the daytime (L_d – from 7:00 a.m. to 10:00 p.m.) and the equivalent average of the sound levels during the nighttime (L_n – 10:00 p.m. to 7:00 a.m.). Specifically, in the calculation of the L_{dn}, late night and early morning (10:00 p.m. to 7:00 a.m.) noise exposures are increased by 10 dB to account for people's greater sensitivity to sound during nighttime hours.

Decibels are the units of measurement used to quantify the intensity of noise. To account for the human ear's sensitivity to low level noises the decibel values are corrected to weighted values known as decibels on the A-weighted scale (dBA). The A-weighted scale is used because human hearing is less sensitive to low and high frequencies than mid-range frequencies. A 3-dB change of sound level is considered to be barely perceivable by the human ear, a 5- or 6-dB change of sound level is considered noticeable, and a 10-dB increase is perceived as if the sound intensity has doubled.

Additional noise measurements are used to characterize noise associated with specific Project activities including the maximum A-weighted sound level over a particular time interval (L_{max}) (EPA, 1974) and peak sound level (L_{peak}), which is the highest pressure above or below ambient that is associated with a sound wave. The L_{max} and L_{peak} are measurements used to characterize maximum sound pressure generated by an activity and are often associated with intermittent activities such as pile driving. The cumulative 24-hour low frequency sound exposure level ($L_{E, LF 24 hr}$) is used for continuous noise generating activities, such as vibratory pile driving. Decibels re 1 microPascal (μPa) are used to report underwater sound levels, which accounts for the difference between sound under water and sound in air (Caltrans, 2015).

4.11.2.1 Noise Regulations

Federal Regulations

In 1974, the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA, 1974). This publication evaluated the effects of environmental noise with respect to health and safety. The document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has determined that in order to protect the public from activity interference and annoyance outdoors in residential areas, noise levels should not exceed an L_{dn} of 55 dBA. We have adopted this criterion (18 CFR 157.206(b)(5)) for new compression and associated pipeline facilities, and it is used here to evaluate the potential noise effects from construction and operation of the LNG terminal. An L_{dn} of 55 dBA is equivalent to a continuous noise level of 48.6 dBA for facilities that operate at a constant level of noise.

State and Local Regulations

The State of Florida has no regulations that would limit noise generated from the construction and operation of the LNG terminal.

The city of Jacksonville has adopted a noise ordinance (Code of Ordinances, Chapter 368 – Noise Control). The Jacksonville Environmental Protection Board Rule 4: Noise Pollution Control provides rules for the City of Jacksonville to implement, administer, and enforce. Part II of Rule 4, Section 4.201 establishes classifications for land according to use. Although the land use type of the project area is not specifically listed in Rule 4, it would generally be considered Class D (industrial).

A Class D property, which includes industrial facilities, can propagate sounds less than 65 dBA to Class A properties, which includes undeveloped land, during daytime hours and less than 60 dBA during night time hours.

Impulsive sounds are limited to maximum levels of 55 dBA at Class A lands from any other land use measured using the fast dynamic characteristic of the sound level meter as stated in Section 4.206. Other construction noise is limited at Class A land to a maximum level of 65 dBA. Exhaust equipment and silencers at least as good as those provided by the manufacturer are required on construction and other equipment. Sounds from safety valves, rupture disks, and commercial water-borne traffic are exempt from Rule 4. Sounds from air-conditioning, air handling or refrigeration equipment is limited to 60 dBA at Class A property.

While FERC's noise criterion is applicable at NSAs and not based on land use classifications, it is more stringent than the city of Jacksonville noise limits as applied to this project, and we have focused our analysis with compliance with FERC's noise criterion.

4.11.2.2 Existing Sound Levels and Noise-Sensitive Areas

The project is proposed in a heavy industrial area with no existing residents within 5,000 feet of the site. Eagle LNG's consultant (Siebein Associates, Inc.) conducted a noise survey between April 1 and 15, 2015 to characterize the existing noise environment at the NSAs nearest to the LNG terminal site (see figure 4.11.2-1) (Trinity Consultants, 2017). The results of the ambient noise survey as well as the distance and direction of each identified NSA from the LNG terminal are provided in table 4.11.2-1.

TABLE 4.11.2-1

Eagle LNG Facilities – Existing Noise Levels at Nearby Noise-Sensitive Areas

NSA	Distance from Terminal (feet)	Direction from Terminal	Average L_{dn} (dBA)
2	11,750	East	58
3	8,500	South	47
4	9,770	West	57
5	4,430	North	47
6	7,800	West	57

Note: NSA 1, as referenced in Eagle LNG's noise survey, is an undeveloped residentially zoned parcel of land with no known development planned. Therefore, it is not considered as an NSA in this analysis.

4.11.2.3 Construction Noise Impacts and Mitigation

Project construction activities would generate increases in sound levels over a total of about 2 years, at which time Train 1 would be placed into service. Construction of Trains 2 and 3 would continue for 1 additional year, at which time Train 2 would be placed into service. Construction of Train 3 would continue for 6 additional months, at which time all three trains would be operational (totaling about 3 and a half years of construction). Therefore, there would be a 1.5-year period during which the facility would be partially operational and under construction. Project construction activities would involve the following steps, each of which would involve various equipment and activities that could generate noise:

- upland site preparation, which includes removal of vegetation, excavation, grading and filling;
- dredging;
- pile driving;
- upland structural foundations, which includes concrete pouring;
- on-site tank fabrication;
- on-site installation of liquefaction trains; and
- other civil, mechanical, and electrical installation.

Figure 4.11.2-1
Eagle LNG - Nearby Noise Sensitive Areas
Jacksonville Project
Duval County, Florida

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Construction activities would occur predominantly during the day, between about 7:00 a.m. and 6:00 p.m., Monday through Saturday. However, certain activities would occur up to 24 hours per day, 6 days per week. In particular, the following activities may occur up to 24 hours per day, 6 days per week:

- foundation pour at the upland site could occur to avoid high daytime temperatures;
- welding;
- mechanical, electrical, and instrumentation work based on project schedule needs; and
- other miscellaneous low noise activities (e.g., concrete pours, welding, and mechanical/ electrical/instrumentation work) to meet deadlines.

The most prevalent sound-generating equipment and activity during construction of the LNG terminal is anticipated to be pile driving, although internal combustion engines associated with general construction equipment and dredging would also produce sound levels that would be perceptible in the vicinity of the site. Eagle LNG has indicated that pile driving, dredging, or other marine construction would be restricted to daytime working hours. Pile driving is estimated to occur for 100 workdays over the course of a 10-month period. The various types of construction activities proposed at the LNG terminal and associated noise levels are described below.

Facility Construction Activities

Noise levels resulting from construction would vary over time and would depend upon the number and type of equipment operating, the level of operation, and the distance between sources and receptors. Eagle LNG provided two scenarios during which maximum noise impact from construction activities would be expected: construction scenario 1: simultaneous operation of upland site preparation, on-site fabrication of the LNG tank, and dredging, where all activities occur during daytime hours; and scenario 2: simultaneous operation of on-site fabrication of LNG tank, on-site installation of liquefaction trains, and pile driving at LNG loading area, where pile driving would occur during daytime hours and upland construction would occur 24 hours per day. Table 4.11.2-2 provides the estimated composite noise levels for these two construction scenarios at various distances from the project site.

The nearest NSA to the LNG site (NSA 5) is about 4,430 feet to the north. During construction scenario 1 (simultaneous upland site preparation, on-site fabrication of the LNG tank, and 12-hour dredging), the composite noise level at the nearest NSA is estimated to be 50.3 dBA; during construction scenario 2 (simultaneous 24-hour on-site fabrication of LNG tank, daytime on-site installation of liquefaction trains, and daytime pile driving at LNG loading area), the composite noise level at the nearest NSA is estimated to be 57.8 dBA. The current daytime noise level at the nearest NSA is 47 dBA. Sound levels attributable to construction activities at two of the five NSAs are predicted to be above FERC's L_{dn} criterion of 55 dBA, with increases in background noise levels of over 10 dB; however, these elevated noise levels would occur during daytime hours, because pile driving would not occur during nighttime hours.

With the exception of underwater noise from pile driving activities (discussed in section 4.6.2), the construction noise estimates provided by Eagle LNG indicate the maximum day-night average noise levels generated by construction activities would be below the existing daytime background noise at some nearby NSAs, but would be audible at other nearby NSAs.

TABLE 4.11.2-2

Eagle LNG – Construction Noise Estimates

NSA	Distance/Direction	Existing Noise Level (dBA L_{dn})	Scenario 1 Construction Noise Level (dBA L_{dn})	Scenario 1 Construction Noise Level + Background (dBA L_{dn}) [a]	Scenario 1 Predicted Increase in Ambient Noise Level (dB)
NSA 2	11,750 / East	58	42.8	58.1	0.1
NSA 3	8,500 / South	47	50.0	51.8	4.8
NSA 4	9,770 / West	57	42.4	57.1	0.1
NSA 5	4,430 / North	47	50.3	52.0	5.0
NSA 6	7,800 / West	57	39.3	57.1	0.1
NSA	Distance/Direction	Existing Noise Level (dBA L_{dn})	Scenario 2 Construction Noise Level (dBA L_{dn})	Scenario 2 Construction Noise Level + Background (dBA L_{dn}) [a]	Scenario 2 Predicted Increase in Ambient Noise Level (dB)
NSA 2	11,750 / East	58	52.4	59.1	1.1
NSA 3	8,500 / South	47	60.1	60.3	13.3
NSA 4	9,770 / West	57	50.6	57.9	0.9
NSA 5	4,430 / North	47	57.8	58.1	11.1
NSA 6	7,800 / West	57	47.5	57.5	0.5

[a] Sound pressure levels are measured on a logarithmic scale; therefore, the predicted increase in ambient noise level at the NSAs during construction of the LNG terminal would not be the sum of the two noise levels.

Pile driving noise is impulsive in nature (like a car backfiring, gunshot, etc.) and the noise impacts are not readily captured by longer time averaged metrics such as L_{eq}, or L_{dn}. L_{max} or L_{peak} are metrics that capture the short duration impulse noise most effectively. The L_{max} is the maximum sound level expected during a pile driving event using the fast time constant and is used to characterize short-term, impulsive events rather than the long-term average sound levels in an area. The L_{max} is a substantially different metric than the equivalent sound levels shown for the ambient level. The L_{max} captures the highest sound pressure level during a given period while the equivalent sound level, L_{eq}, gives the sound level with the same energy as the time varying sounds over a given period, essentially an energy average. The ambient sound level measurements were one-hour in duration and are reported as one-hour L_{eq}s. During that hour, there were likely many L_{max} events with sound levels that were much higher than the L_{eq}. Impulsive L_{max} events generally do not have a significant effect on a long-term L_{eq} or L_{dn} due to their short duration.

Due to the expected duration of pile driving activities during construction, there would be moderate impacts on the daytime sound levels at nearby NSAs. Pile driving events would likely be audible, especially when activities are taking place at the closest pile driving locations to the NSAs. However, pile driving is not planned for nighttime hours, so the potential for sleep disturbance is reduced. The impact sound level events from pile driving activities are expected to cause at most a moderate impact at nearby NSAs because pile driving activities would be limited to daytime hours. Impulsive pile driving noise has the potential to cause elevated noise levels and annoyance for residents and other users of NSAs at even far distances during the 10 months of estimated daytime pile driving. Because the NSAs are across bodies of water and/or very flat land with limited vegetation, there exists potential for significant annoyances due to pile driving over the 10 months.

To ensure that actual noise impacts from pile driving activities are not significantly greater than predicted, **we recommend that:**

- **Eagle LNG should monitor sound levels during pile driving activities, and file <u>weekly</u> noise data with the Secretary that identify the noise impact on the nearest NSAs. If any measured noise impacts due to pile driving (L_{max}) at the nearest NSAs are greater than 10 dBA over the L_{eq} ambient levels, Eagle LNG should:**

  a. cease pile driving activities and implement noise mitigation measures; and

  b. file with the Secretary evidence of noise mitigation installation and request written notification from the Director of OEP that pile driving may resume.

With the proposed mitigation and recommendation above, and in section 4.6.2 regarding reducing noise from pile driving, we conclude that noise impacts on residents and the surrounding communities would be moderate during construction of the LNG terminal.

4.11.2.4 Operation Noise Impacts and Mitigation

Operation of the LNG terminal would produce noise on a continual basis. Eagle LNG performed modeling to calculate noise levels that would be generated by operation of the LNG terminal. Sound level data for the proposed equipment were obtained either from vendors or from measurements at other LNG facilities. The modeling also assumed that purchased equipment would be outfitted with noise enclosures or other standard noise mitigation measures, but no additional noise mitigation measures were included in the noise model. Table 4.11.2-3 provides the estimated equipment quantities and sound power levels used in the modeling. Table 4.11.2-4 presents the results of the modeling, along with a comparison with the existing ambient noise level, the expected noise level during operation of the LNG terminal compared to the ambient noise level, and the resulting increase in ambient noise level due to operation of the LNG terminal. Based on these estimates, the noise generated by the operation of the LNG terminal may be perceptible at some nearby NSAs, but would not perceptibly increase the existing sound levels at the NSAs.

The results of the noise impact analysis indicate that the noise attributable to the project would be lower than the FERC sound level requirement of 55 dBA L_{dn} at the nearest NSA. We recognize, however, that actual results may be different from those obtained from modeling. Therefore, **we recommend that:**

- **Eagle LNG should file a full power load noise survey with the Secretary for the LNG terminal <u>no later than 60 days</u> after each liquefaction train is placed into service. If the noise attributable to operation of the equipment at the LNG terminal exceeds an L_{dn} of 55 dBA at the nearest NSA, <u>within 60 days</u> Eagle LNG should modify operation of the liquefaction facilities or install additional noise controls until a noise level below an L_{dn} of 55 dBA at the NSA is achieved. Eagle LNG should confirm compliance with the above requirement by filing a second noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

TABLE 4.11.2-3	
LNG Terminal Operation – Equipment Quantities and Sound Power Levels	
Equipment	Sound Power Level Per Item (dBA)
HV Substation	93.0
Electrical Substation	94.6
Inlet Feed Gas Metering Skid	104.3
Inlet Gas Compressor	92.0
Inlet Gas Compressor Discharge Cooler	97.6
Inlet Gas Compressor Lube Oil Cooler	96.2
Air Compressor Package	92.0
Amine Pump A	92.0
Amine Pump B	92.0
Amine Booster Pump A	87.0
Amine Booster Pump B	87.0
Lean Amine Cooler	95.9
Amine Reflux Condenser	95.9
Treated Gas Cooler	97.1
Regen Gas Discharge Cooler	97.6
Regen Gas Cooler	93.5
Regen Gas Compressor	92.0
MR Compressor	92.0
MR Compressor Lube Oil Cooler	99.6
MR Compressor Intercooler	99.4
MR Compressor Desuperheater	99.1
MR Compressor Condenser	101.8
BOG Compressor	96.1
BOG Compressor Aftercooler	97.6
Jetty Blower	92.0
Heavy HC Truck Loading Pump	92.0
Generator Set	106.5

TABLE 4.11.2-4					
LNG Terminal Operation – Composite Noise Levels at Nearby Noise-Sensitive Areas					
NSA	Distance and Direction from LNG Terminal (feet)	Existing Ambient L_{dn} (dBA)	Predicted LNG Terminal Contribution L_{dn} (dBA)	Ambient + LNG Terminal L_{dn} (dBA) [a]	Predicted Increase in Ambient Noise Level (dB)
2	11,750/East	58	35.4	58.0	0.0
3	8,500/South	47	40.6	47.9	0.9
4	9,770/West	57	35.8	57.0	0.0
5	4,430/North	47	43.0	48.5	1.5
6	7,800/West	57	34.6	57.0	0.0

[a] Sound pressure levels are measured on a logarithmic scale; therefore, the predicted increase in ambient noise level at the NSAs during operation of the LNG terminal would not be the sum of the two noise levels.

In addition, **we recommend that:**

- **Eagle LNG should file a noise survey with the Secretary <u>no later than 60 days</u> after placing the entire LNG terminal into service. If a full load condition noise survey is not possible, Eagle LNG should provide an interim survey at the maximum possible horsepower load <u>within 60 days</u> of placing the LNG terminal into service and provide the full load survey <u>within 6 months</u>. If the noise attributable to operation of the equipment at the LNG terminal exceeds an L_{dn} of 55 dBA at the nearest NSA under interim or full horsepower load conditions, Eagle LNG should file a report on what changes are needed and should install the additional noise controls to meet the level <u>within 1 year</u> of the in-service date. Eagle LNG should confirm compliance with the above requirement by filing an additional noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

The LNG facility would also be equipped with an emergency flare system. The purpose of a flare system is to safely and reliably protect plant systems from overpressure during start-up, shutdown, plant upsets, and emergency conditions. The flaring creates noise with a low-pitched 'roaring' character. While Eagle LNG was not able to predict the number of flare events per year or duration of the flaring activities, Eagle LNG provided estimated impacts assuming a 2-hour flaring event. Eagle LNG has estimated the peak sound pressure level for a high-pressure flare as measured at 50 feet from the flare to be 115 dBA. The estimated sound pressure level at the nearest NSA during a flaring event would be 58.9 dBA. This would be a moderate sound level impact, which Eagle LNG anticipates would occur only during upset, emergency situations.

Vessel traffic associated with operation of the LNG terminal would generate underwater sounds during facility operation. Cargo vessels, which are in the same category as LNG vessels, are known to emit high levels of low frequency sound (6.8 to 7.7 hertz at 181 to 190 decibels (re: 1 microPascal)) capable of traveling long distances (Richardson, et al., 1995). Noise generated by LNG vessels is generally omni-directional, emitting from all sides of the vessel (Whale and Dolphin Conservation Society, 2004). However, noise levels are greatest on the sides of the ship and weakest on the front and rear of the ship. Above-water noise associated with the LNG vessels would be similar to other large vessel traffic along the waterway and would result in temporary and minor noise impacts along the vessel transit route.

Based on the operational noise estimates provided by Eagle LNG, the maximum noise levels generated by facility operation would be below FERC's noise criteria of 55 dBA L_{dn} at the nearby NSAs. The noise generated by the operation of the LNG terminal would not perceptibly increase the existing sound levels at the NSAs. Therefore, we conclude that noise impacts on residents and the surrounding communities would be minor during operation of the LNG terminal.

4.12 RELIABILITY AND SAFETY

4.12.1 LNG Facility Reliability, Safety, and Security Regulatory Oversight

LNG facilities handle flammable and sometimes toxic materials that can pose a risk to the public if not properly managed. These risks are managed by the companies owning the facilities, through selecting the site location and plant layout as well as through suitable design, engineering, construction, and operation of the LNG facilities. Multiple federal agencies share regulatory authority over the LNG facilities and the operator's approach to risk management. The safety, security, and reliability of Eagle LNG's Project would be regulated by the DOT, the Coast Guard, and the FERC.

In February 2004, the DOT, the Coast Guard, and the FERC entered into an Interagency Agreement to ensure greater coordination among the three agencies in addressing the full range of safety and security issues at LNG terminals and LNG marine vessel operations, and maximizing the exchange of information related to the safety and security aspects of the LNG facilities and related marine operations. Under the Interagency Agreement, the FERC is the lead federal agency responsible for the preparation of the analysis required under NEPA for impacts associated with terminal construction and operation. The DOT and the Coast Guard participate as cooperating agencies but remain responsible for enforcing their regulations covering LNG facility siting, design, construction, operation, maintenance, and security. All three agencies have some oversight and responsibility for the inspection and compliance during the LNG facility's operation.

The DOT establishes and has the authority to enforce the federal safety standards for the location, design, installation, construction, inspection, testing, operation, and maintenance of onshore LNG facilities under the Federal Pipeline Safety Laws (49 USC 60101, *et seq.*). The DOT's LNG safety regulations are codified in 49 CFR 193, which prescribe safety standards for LNG facilities used in the transportation of gas by pipeline that are subject to federal pipeline safety laws (49 USC 60101 *et seq.*), and 49 CFR 192. On August 31, 2018, DOT and FERC signed a MOU regarding methods to improve coordination throughout the LNG permit application process for FERC jurisdictional LNG facilities. In the MOU, DOT agreed to issue a Letter of Determination (LOD) stating whether a proposed LNG facility would be capable of complying with location criteria and design standards contained in Subpart B of Part 193. The Commission committed to rely upon the LOD in conducting its review of whether the facilities would be consistent with the public interest. The issuance of the LOD does not abrogate DOT's continuing authority and responsibility over a proposed project's compliance with Part 193 during construction and future operation of the facility. The DOT's conclusion on the siting and hazard analysis required by Part 193 is based on preliminary design information which may be revised as the engineering design progresses to final design. DOT regulations also contain requirements for the design, construction, equipment, operation, maintenance, qualifications and training of personnel, fire protection, and security for LNG facilities, as defined by 49 CFR 193, which would be completed during later stages of the Jacksonville Project. If the project is authorized, constructed, and operated, the LNG facilities, as defined in 49 CFR 193, would be subject to the DOT's inspection and enforcement programs to ensure compliance with the requirements of 49 CFR 193.

The Coast Guard has authority over the safety of an LNG terminal's marine transfer area and LNG marine vessel traffic, as well as over security plans for the waterfront facilities handling LNG terminal and LNG marine vessel traffic. The Coast Guard regulations for waterfront facilities handling LNG are codified in 33 CFR 105 and 33 CFR 127. As a cooperating agency, the Coast Guard assists the FERC staff in evaluating whether an applicant's proposed waterway would be suitable for LNG marine vessel traffic and whether the waterfront facilities handling LNG would be operated in accordance with 33 CFR 105 and 33 CFR 127. If the facilities are constructed and become operational, the facilities would be subject to the Coast Guard inspection program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

The FERC authorizes the siting and construction of LNG terminals under the NGA and delegated authority from the DOE. The FERC requires standard information to be submitted to perform safety and reliability engineering reviews. FERC's filing regulations are codified in 18 CFR 380.12 (m) and (o), and requires each applicant to identify how its proposed design would comply with the DOT's siting requirements of 49 CFR 193, Subpart B. The level of detail necessary for this submittal requires the applicant to perform substantial front-end engineering of the complete project. The design information is required to be site-specific and developed to the extent that further detailed design would not result in significant changes to the siting considerations, basis of design, operating conditions, major equipment selections, equipment design conditions, or safety system designs. As part of the review required for a

FERC order, we use this information from the applicant to assess whether the proposed facilities would have a public safety impact and to suggest additional mitigation measures for the Commission to consider for incorporation as conditions in the order. If the facilities are approved and the suggested mitigation measures are incorporated into the order as conditions, FERC staff would review material filed to satisfy the conditions of the order and conduct periodic inspections throughout construction and operation.

In addition, the Energy Policy Act of 2005 requires FERC to coordinate and consult with the DOD on the siting, construction, expansion, and operation of LNG terminals that would affect the military. On November 21, 2007, the FERC and the DOD (http://www.ferc.gov/legal/mou/mou-dod.pdf) entered into a MOU formalizing this process. In accordance with the MOU, the FERC sent a letter to the DOD on April 1, 2015 requesting their comments on whether the planned project could potentially have an impact on the test, training, or operational activities of any active military installation. On June 4, 2018 the FERC received a response letter from the DOD Siting Clearinghouse stating that Eagle LNG's Facility would have a minimal impact on military training and operations conducted in the area.

4.12.2 DOT Siting Requirements and 49 CFR 193 Subpart B Determination

Siting LNG facilities, as defined by 49 CFR 193, with regard to ensuring that the proposed site selection and location would not pose an unacceptable level or risk to public safety is required by DOT's regulations in 49 CFR 193, Subpart B. The Commission's regulations under 18 CFR 380.12 (o) (14) require Eagle LNG to identify how the proposed design complies with the siting requirements in DOT's regulations under 49 CFR 193, Subpart B. The scope of DOT's siting authority under 49 CFR 193 applies to LNG facilities used in the transportation of gas by pipeline subject to the federal pipeline safety laws and 49 CFR 192.[15]

The regulations in 49 CFR 193, Subpart B, require the establishment of an exclusion zone surrounding an LNG facility in which an operator or government agency must exercise legal control over the activities where specified levels of thermal radiation and flammable vapors may occur in the event of a release for as long as the facility is in operation. Approved mathematical models must be used to calculate the dimensions of these exclusion zones. The siting requirements specified in NFPA 59A (2001), an industry consensus standard for LNG facilities, are incorporated into 49 CFR 193, Subpart B by reference, with regulatory preemption in the event of conflict. The following sections of 49 CFR 193, Subpart B specifically address siting requirements:

- Section 193.2051, Scope, states that each LNG facility designed, replaced, relocated or significantly altered after March 31, 2000, must be provided with siting requirements in accordance with Subpart B and NFPA 59A (2001). In the event of a conflict with NFPA 59A (2001), the regulatory requirements in Part 193 prevail.

- Section 193.2057, Thermal radiation protection, requires that each LNG container and LNG transfer system have thermal exclusion zones in accordance with section 2.2.3.2 of NFPA 59A (2001).

- Section 193.2059, Flammable vapor-gas dispersion protection, requires that each LNG container and LNG transfer system have a dispersion exclusion zone in accordance with sections 2.2.3.3 and 2.2.3.4 of NFPA 59A (2001).

15 49 CFR 193.2001 (b) (3), Scope of part, excludes any matter other than siting provisions pertaining to marine cargo transfer systems between the LNG marine vessel and the last manifold (or in the absence of a manifold, the last valve) located immediately before a storage tank.

- Section 193.2067, Wind forces, requires that shop fabricated containers of LNG or other hazardous fluids less than 70,000 gallons must be designed to withstand wind forces based on the applicable wind load data in ASCE 7 (2005). All other LNG facilities must be designed for a sustained wind velocity of not less than 150 mph unless the DOT Administrator finds a lower wind speed is justified or the most critical combination of wind velocity and duration for a 10,000-year mean return interval.

As stated in 49 CFR 193.2051, LNG facilities must meet the siting requirements of NFPA 59A (2001), Chapter 2, and include but may not be limited to:

- NFPA 59A (2001) section 2.1.1(c) requires consideration of protection against forces of nature.

- NFPA 59A (2001) section 2.1.1(d) requires that other factors applicable to the specific site that have a bearing on the safety of plant personnel and surrounding public be considered, including an evaluation of potential incidents and safety measures incorporated in the design or operation of the facility.

- NFPA 59A (2001) section 2.2.3.2 requires provisions to minimize the damaging effects of fire from reaching beyond a property line, and requires provisions to prevent a radiant heat flux level of 1,600 British thermal units per square foot per hour (Btu/ft^2-hr) from reaching beyond a property line that can be built upon. The distance to this flux level is to be calculated with LNGFIRE3 or with models that have been validated by experimental test data appropriate for the hazard to be evaluated and that have been approved by DOT.

- NFPA 59A (2001) section 2.2.3.4 requires provisions to minimize the possibility of any flammable mixture of vapors from a design spill from reaching a property line that can be built upon and that would result in a distinct hazard. Determination of the distance that the flammable vapors extend is to be determined with DEGADIS or approved alternative models that take into account physical factors influencing LNG vapor dispersion.[16]

Taken together, 49 CFR 193, Subpart B, and NFPA 59A (2001) require that flammable LNG vapors from designs spills do not extend beyond areas in which the operator or a government agency legally controls all activities. Furthermore, consideration of other hazards which may affect the public or plant personnel must be evaluated as prescribed in NFPA 59A (2001), section 2.1.1(d).

Title 49 CFR 193, Subpart B, and NFPA 59A (2001) also specify three radiant heat flux levels which must be considered for LNG storage tank spills for as long as the facility is in operation:

- 1,600 Btu/ft^2-hr - This level can extend beyond the plant property line that can be built upon but cannot include areas that are used for outdoor assembly by groups of 50 or more persons;[17]

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[16] DOT has approved two additional models for the determination of vapor dispersion exclusion zones in accordance with 49 CFR 193.2059: FLACS 9.1 Release 2 (Oct. 7, 2011) and PHAST-UDM Version 6.6 and 6.7 (Oct. 7, 2011).

[17] The 1,600 Btu/ft^2-hr flux level is associated with producing pain in less than 15 seconds, first degree burns in 20 seconds, second degree burns in approximately 30-40 seconds, 1% mortality in approximately 120 seconds, and 100% mortality in approximately 400 seconds, assuming no shielding from the heat, and is typically the maximum allowable intensity for emergency operations with appropriate clothing based on average 10 minute exposure.

- 3,000 Btu/ft^2-hr - This level can extend beyond the plant property line that can be built upon but cannot include areas that contain assembly, educational, health care, detention or residential buildings or structures;[18] and
- 10,000 Btu/ft^2-hr - This level cannot extend beyond the plant property line that can be built upon.[19]

The requirements for design spills from process or transfer areas are more stringent. For LNG spills, the 1,600 Btu/ft^2-hr flux level cannot extend beyond the plant property line onto a property that can be built upon.

In addition, section 2.1.1 of NFPA 59A (2001) requires that factors applicable to the specific site with a bearing on the safety of plant personnel and the surrounding public must be considered, including an evaluation of potential incidents and safety measures incorporated into the design or operation of the facility. DOT has indicated that potential incidents, such as vapor cloud explosions and toxic releases should be considered to comply with Part 193 Subpart B.[20]

On February 23, 2018, the DOT provided a letter to FERC staff regarding its preliminary review of information filed by Eagle LNG that stated it had no objection to the design spill selection methodologies being used for the selection of single accidental leakage sources to meet the requirements of 49 CFR 193, Subpart B.[21]

The DOT subsequently issued an LOD on March 13, 2019 to FERC regarding the project's compliance with the 49 CFR 193, Subpart B regulatory requirements in accordance with the August 31, 2018 MOU.[22] The LOD provides PHMSA's analysis and conclusions regarding 49 CFR 193, Subpart B regulatory compliance, including the vapor dispersion that extends beyond the project's boundary. Pursuant to the 2018 MOU, the LOD is a consideration in the Commission's decision to authorize, with or without modification or conditions, or deny an application.

4.12.3 Coast Guard Safety Regulatory Requirements and Letter of Recommendation

4.12.3.1 LNG Marine Vessel Historical Record

Since 1959, marine vessels have transported LNG without a major release of cargo or a major accident involving an LNG marine vessel. There are more than 370 LNG marine vessels in operation routinely transporting LNG between more than 100 import/export terminals currently in operation worldwide. Since U.S. LNG terminals first began operating under FERC jurisdiction in the 1970s, there

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[18] The 3,000 Btu/ft^2-hr flux level is associated with producing pain in less than 5 seconds, first degree burns in 5 seconds, second degree burns in approximately 10-15 seconds, 1% mortality in approximately 50 seconds, and 100% mortality in approximately 180 seconds, assuming no shielding from the heat, and is typically the critical heat flux for piloted ignition of common building materials (e.g., wood, PVC, fiberglass, etc.) with prolonged exposures.

[19] The 10,000 Btu/ft^2-hr flux level is associated with producing pain in less than 1 seconds, first degree burns in 1 seconds, second degree burns in approximately 3 seconds, 1% mortality in approximately 10 seconds, and 100% mortality in approximately 35 seconds, assuming no shielding from the heat, and is typically the critical heat flux for unpiloted ignition of common building materials (e.g., wood, PVC, fiberglass) and degradation of unprotected process equipment after approximate 10 minute exposure and to reinforced concrete after prolonged exposure.

[20] The US DOT PHMSA's "LNG Plant Requirements: Frequently Asked Questions" item H1, https://www.phmsa.dot.gov/pipeline/liquified-natural-gas/lng-plant-requirements-frequently-asked-questions, accessed Aug. 2018.

[21] February 23, 2018 letter "Re: Eagle LNG Partners Jacksonville Project, FERC Docket CP17-41" from Kenneth Lee to Rich McGuire. Filed in Docket Number CP17-41-000 on March 28, 2018. Accession Number 20180328-3020.

[22] March 13, 2019 letter "Re: Eagle LNG Project, Docket No. CP17-41-000, 49 CFR, Part 193, Subpart B, Siting – Letter of Determination" from Massoud Tahamtani to Rich McGuire. Filed in Docket Number CP17-41-000 on March 18, 2019. FERC eLibrary accession number 20190318-3004.

have been thousands of individual LNG marine vessel arrivals at terminals in the U.S. For more than 40 years, LNG shipping operations have been safely conducted in U.S. ports and waterways.

A review of the history of LNG maritime transportation indicates that there has not been a serious accident at sea or in a port which resulted in a spill due to rupturing of the cargo tanks. However, insurance records, industry sources, and public websites identify a number of incidents involving LNG marine vessels, including minor collisions with other marine vessels of all sizes, groundings, minor LNG releases during cargo unloading operations, and mechanical/equipment failures typical of large vessels. Some of the more significant occurrences, representing the range of incidents experienced by the worldwide LNG marine vessel fleet, are described below:

- **El Paso Paul Kayser** grounded on a rock in June 1979 in the Straits of Gibraltar during a loaded voyage from Algeria to the United States. Extensive bottom damage to the ballast tanks resulted; however, no cargo was released because no damage was done to the cargo tanks. The entire cargo of LNG was subsequently transferred to another LNG marine vessel and delivered to its U.S. destination.

- **Tellier** was blown by severe winds from its docking berth at Skikda, Algeria in February 1989 causing damage to the loading arms and the LNG marine vessel and shore piping. The cargo loading had been secured just before the wind struck, but the loading arms had not been drained. Consequently, the LNG remaining in the loading arms spilled onto the deck, causing fracture of some plating.

- **Mostefa Ben Boulaid** had an electrical fire in the engine control room during unloading at Everett, Massachusetts on February 5, 1996. The LNG marine vessel crew extinguished the fire and the ship completed unloading.

- **Khannur** had a cargo tank overfill into the LNG marine vessel's vapor handling system on September 10, 2001, during unloading at Everett, Massachusetts. Approximately 100 gallons of LNG were vented and sprayed onto the protective decking over the cargo tank dome, resulting in several cracks. After inspection by the Coast Guard, the Khannur was allowed to discharge its LNG cargo.

- **Mostefa Ben Boulaid** had LNG spill onto its deck during loading operations in Algeria in 2002. The spill, which is believed to have been caused by overflow rather than a mechanical failure, caused significant brittle fracturing of the steelwork. The LNG marine vessel was required to discharge its cargo, after which it proceeded to dock for repair.

- **Norman Lady** was struck by the USS Oklahoma City nuclear submarine while the submarine was rising to periscope depth near the Strait of Gibraltar in November 2002. The 87,000 m^3 LNG marine vessel, which had just unloaded its cargo at Barcelona, Spain, sustained only minor damage to the outer layer of its double hull but no damage to its cargo tanks.

- **Tenaga Lima** grounded on rocks while proceeding to open sea east of Mopko, South Korea due to strong current in November 2004. The shell plating was torn open and fractured over an approximate area of 20 by 80 feet, and internal breaches allowed water to enter the insulation space between the primary and secondary membranes. The LNG marine vessel was refloated, repaired, and returned to service.

- **Golar Freeze** moved away from its docking berth during unloading on March 14, 2006, in Savannah, Georgia. The powered emergency release couplings on the unloading arms activated as designed, and transfer operations were shut down.

- **Catalunya Spirit** lost propulsion and became adrift 35 miles east of Chatham, Massachusetts on February 11, 2008. Four tugs towed the LNG marine vessel to a safe anchorage for repairs. The Catalunya Spirit was repaired and taken to port to discharge its cargo.

- **Al Gharrafa** collided with a container ship, Hanjin Italy, in the Malacca Strait off Singapore on December 19, 2013. The bow of the Al Gharrafa and the middle of the starboard side of the Hanjin were damaged. Both ships were safely anchored after the incident. No loss of LNG was reported.

- **Al Oraiq** collided with a freight carrier, Flinterstar, near Zeebrugge, Belgium on October 6, 2015. The freight carrier sank, but the Al Oraiq was reported to have sustained only minor damage to its bow and no damage to the LNG cargo tanks. According to reports, the Al Oraiq took on a little water but was towed to the Zeebrugge LNG terminal where its cargo was unloaded using normal procedures. No loss of LNG was reported.

- **Al Khattiya** suffered damage after a collision with an oil tanker off the Port of Fujairah on February 23, 2017. Al Khattiya had discharged its cargo and was anchored at the time of the incident. A small amount of LNG was retained within the LNG marine vessel to keep the cargo tanks cool. The collision damaged the hull and two ballast tanks on the Al Khattiya, but did not cause any injury or water pollution. No loss of LNG was reported.

- **Aseem** collided with a very large crude carrier (VLCC) Shinyo Ocean off the Port of Fujairah on March 26, 2019. The VLCC suffered severe portside hull height breach and Aseem had damage to its bow. Both marine vessels were unloaded at the time of the collision and subsequently no LNG or oil was released. Aseem was moved to port for anchorage and Shinyo Ocean was relocated to another point of anchorage.

4.12.3.2 LNG Marine Vessel Safety Regulatory Oversight

The Coast Guard exercises regulatory authority over LNG marine vessels under 46 CFR 154, which contains the United States safety standards for self-propelled LNG marine vessels transporting bulk liquefied gases. The LNG marine vessels visiting the proposed facility would also be constructed and operated in accordance with the International Maritime Organization (IMO) *Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* and the *International Convention for the Safety of Life at Sea*. All LNG marine vessels entering U.S. waters are required to possess a valid IMO Certificate of Fitness and either a Coast Guard Certificate of Inspection (for U.S. flag vessels) or a Coast Guard Certificate of Compliance (for foreign flag vessels). These documents certify that the LNG marine vessel is designed and operating in accordance with both international standards and the U.S. regulations for bulk LNG marine vessels under 46 CFR 154.

The LNG marine vessels that would deliver or receive LNG to or from the proposed project would also need to comply with various U.S. and international security requirements. The IMO adopted the *International Ship and Port Facility Security Code* in 2002. This code requires both ships and ports to conduct vulnerability assessments and to develop security plans. The purpose of the code is to prevent and suppress terrorism against ships; improve security aboard ships and ashore; and reduce the risk to passengers, crew, and port personnel on board ships and in port areas. All LNG marine vessels, as well as other cargo vessels (e.g., 500 gross tons and larger), and ports servicing those regulated vessels, must adhere to the IMO standards. Some of the IMO requirements for ships are as follows:

- ships must develop security plans and have a Vessel Security Officer;
- ships must have a ship security alert system to transmit ship-to-shore security alerts identifying the ship, its location, and an indication of whether the security of the ship is under threat or has been compromised;
- ships must have a comprehensive security plan for international port facilities, focusing on areas having direct contact with ships; and
- ships must have equipment onboard to help maintain or enhance the physical security of the ship.

In 2002, the Maritime Transportation Security Act (MTSA) was enacted by the U.S. Congress and aligned domestic regulations with the maritime security standards of the *International Ship and Port Facility Security Code and the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* and the *International Convention for the Safety of Life at Sea*. The Coast Guard's regulations in 33 CFR 104 require marine vessels to conduct a vessel security assessment and develop a vessel security plan that addresses each vulnerability identified in the vessel security assessments. All LNG marine vessels servicing the facility would have to comply with the MTSA requirements and associated regulations while in U.S. waters.

The Coast Guard also exercises regulatory authority over LNG facilities that affect the safety and security of port areas and navigable waterways under Executive Order 10173; the Magnuson Act (50 USC section 191); the Ports and Waterways Safety Act of 1972, as amended (33 USC section 1221, *et seq*.); and the MTSA of 2002 (46 USC section 701). The Coast Guard is responsible for matters related to navigation safety, LNG marine vessel engineering and safety standards, and all matters pertaining to the safety of facilities or equipment located in or adjacent to navigable waters up to the last valve immediately before the receiving tanks. The Coast Guard also has authority for LNG facility security plan review, approval, and compliance verification as provided in 33 CFR 105.

The Coast Guard regulations in 33 CFR 127 apply to the marine transfer area of waterfront facilities between the LNG marine vessel and the last manifold or valve immediately before the receiving tanks. Title 33 CFR 127 applies to the marine transfer area for LNG of each new waterfront facility handling LNG and to new construction in the marine transfer areas for LNG of each existing waterfront facility handling LNG. The scope of the regulations includes the design, construction, equipment, operations, inspections, maintenance, testing, personnel training, firefighting, and security of the marine transfer area of LNG waterfront facilities. The safety systems, including communications, emergency shutdown, gas detection, and fire protection, must comply with the regulations in 33 CFR 127. Under 33 CFR 127.019, Eagle LNG would be required to submit two copies of its Operations and Emergency Manuals to the Coast Guard Captain of the Port (COTP) for examination.

Both the Coast Guard regulations under 33 CFR 127 and FERC regulations under 18 CFR 157.21, require an applicant who intends to build an LNG terminal facility to submit a Letter of Intent (LOI) to the Coast Guard no later than the date that the owner/operator initiates pre-filing with FERC, but, in all cases, at least 1 year prior to the start of construction. In addition, the applicant must submit a WSA to the COTP with the LOI.

The Preliminary WSA provides an initial explanation of the port community and the proposed facility and transit routes. It provides an overview of the expected impacts LNG operations may have on the port and the waterway. Generally, the Preliminary WSA does not contain detailed studies or conclusions. This document is used by the COTP to begin his or her evaluation of the suitability of the waterway for LNG marine traffic. The Preliminary WSA must provide an initial explanation of the following:

- port characterization;
- characterization of the LNG facility and the LNG marine vessel route;
- risk assessment for maritime safety and security;
- risk management strategies; and
- resource needs for maritime safety, security, and response.

A Follow-On WSA must be provided no later than the date the owner/operator files an application with FERC, but in all cases at least 180 days prior to transferring LNG. The Follow-on WSA must provide a detailed and accurate characterization of the waterfront facilities handling LNG, the LNG marine vessel route, and the port area. The Follow-on WSA provides a complete analysis of the topics outlined in the Preliminary WSA. It should identify credible security threats and navigational safety hazards for the LNG marine vessel traffic, along with appropriate risk management measures and the resources (i.e., federal, state, local, and private sector) needed to carry out those measures. Until a facility begins operation, applicants must also annually review their WSAs and submit a report to the COTP as to whether changes are required. This document is reviewed and validated by the Coast Guard and forms the basis for the agency's LOR to the FERC.

In order to provide the Coast Guard COTPs/Federal Maritime Security Coordinators, members of the LNG industry, and port stakeholders with guidance on assessing the suitability of a waterway for LNG marine traffic, the Coast Guard has published a Navigation and Vessel Inspection Circular (NVIC) – *Guidance on Assessing the Suitability of a Waterway for Liquefied Natural Gas (LNG) Marine Traffic* (NVIC 01-11).

NVIC 01-11 directs the use of the three concentric Zones of Concern, based on LNG marine vessels with a cargo carrying capacity up to 265,000 m^3, used to assess the maritime safety and security risks of LNG marine traffic. The Zones of Concern are:

- Zone 1 – impacts on structures and organisms are expected to be significant within 500 meters (1,640 feet). The outer perimeter of Zone 1 is approximately the distance to thermal hazards of 37.5 kW/m^2 (12,000 Btu/ft^2-hr) from a pool fire.

- Zone 2 – impacts would be significant but reduced, and damage from radiant heat levels are expected to transition from severe to minimal between 500 and 1,600 meters (1,640 and 5,250 feet). The outer perimeter of Zone 2 is approximately the distance to thermal hazards of 5 kW/m^2 (1,600 Btu/ft^2-hr) from a pool fire.

- Zone 3 – impacts on people and property from a pool fire or an un-ignited LNG spill are expected to be minimal between 1,600 meters (5,250 feet) and a conservative maximum distance of 3,500 meters (11,500 feet or 2.2 miles). The outer perimeter of Zone 3 should be considered the vapor cloud dispersion distance to the lower flammability limit from a worst case un-ignited release. Impacts to people and property could be significant if the vapor cloud reaches an ignition source and burns back to the source.

Once the applicant submits a complete Follow-On WSA, the Coast Guard reviews the document to determine if it presents a realistic and credible analysis of the public safety and security implications from LNG marine traffic both in the waterway and when in port.

As required by its regulations (33 CFR 127.009), the Coast Guard is responsible for issuing a LOR to the FERC regarding the suitability of the waterway for LNG marine traffic with respect to the following items:

- physical location and description of the facility;
- the LNG marine vessel's characteristics and the frequency of LNG shipments to or from the facility;
- waterway channels and commercial, industrial, environmentally sensitive, and residential areas in and adjacent to the waterway used by LNG marine vessels en route to the facility, within 25 kilometers (15.5 miles) of the facility;
- density and character of marine traffic in the waterway;
- locks, bridges, or other manmade obstructions in the waterway;
- depth of water;
- tidal range;
- protection from high seas;
- natural hazards, including reefs, rocks, and sandbars;
- underwater pipes and cables; and
- distance of berthed LNG marine vessels from the channel and the width of the channel.

The Coast Guard may also prepare an LOR Analysis, which serves as a record of review of the LOR and contains detailed information along with the rationale used in assessing the suitability of the waterway for LNG marine traffic.

4.12.3.3 Eagle LNG's Waterway Suitability Assessment

On November 25, 2014, Eagle LNG submitted a LOI and a Preliminary WSA to the COTP, Sector Jacksonville, to notify the Coast Guard that it proposed to construct an LNG export terminal. In order to assess the safety and security aspects of this Project, Sector Jacksonville consulted with the Coast Guard, Port of Jacksonville Authority, Jacksonville Harbor Safety Committee, St. John's River Bar Pilots, Florida Docking Masters Association, Jacksonville Marine Transportation Exchange, Jacksonville Fire and Rescue Department, and other port stakeholders. Eagle LNG submitted a Follow-On WSA to the Coast Guard on November 10, 2016.

4.12.3.4 LNG Marine Vessel Routes and Hazard Analysis

An LNG marine vessel's transit to and from the terminal would enter from the Atlantic Ocean via the St. Johns Bar Cut along the main channel of the St. Johns River, to the Drummond Creek Range where the Jacksonville Project marine berth would be located. The total inbound transit distance to the Eagle LNG marine berth is approximately 13.5 miles from the mouth of the St. Johns River. The route would be reversed for outbound LNG marine vessel transits. Pilotage is compulsory for foreign marine vessels and U.S. marine vessels under registry in foreign trade when in U.S. waters. All deep draft marine vessels currently entering the shared waterway would employ a U.S. pilot. The National Vessel Movement Center in the U.S. would require a 96-hour advance notice of arrival for deep draft marine vessels calling on U.S. ports. During transit, LNG marine vessels would be required to maintain voice contact with controllers and check in on designated frequencies at established way points.

NVIC 01-11 references the "Zones of Concern" for assisting in a risk assessment of the waterway. As stated above in section 4.13.4.1, NVIC 01-11 directs the use of the three concentric Zones of Concern, based on LNG marine vessels with a cargo carrying capacity up to 265,000 m^3, used to assess the maritime safety and security risks of LNG marine traffic. However, the LNG marine vessels associated with the Jacksonville Project would have total capacities of no more than 45,000 m^3. Based on the smaller LNG marine vessel size, Eagle LNG estimated the zones of concern to be less than the distances used for the larger LNG marine vessels. Eagle LNG applied the following approximate zones of concern distances for the smaller LNG marine vessels: Zone 1 would extend 250 meters (820 feet), Zone 2 would extend between 250 meters and 750 meters (820 feet and 2,460 feet), and Zone 3 would extend beyond 750 meters (2,460 feet). FERC staff evaluated the suitability of the smaller zones of concern by conducting an analysis using Sandia and ABS consequence modeling tools for 45,000 m^3 LNG marine vessels assuming similar breach sizes for accidental and intentional breaches. The results showed an increase in coverage area over what Eagle LNG proposed for their zones, but less than the NVIC01-11 that are applicable to larger LNG marine vessels, as shown below in table 4.12.3-1. FERC staff and the Coast Guard collaborated in reviewing the FERC generated consequence distances and the Coast Guard determined that the increased coverage area did not significantly change the risk results outlined in Eagle LNG's WSA.

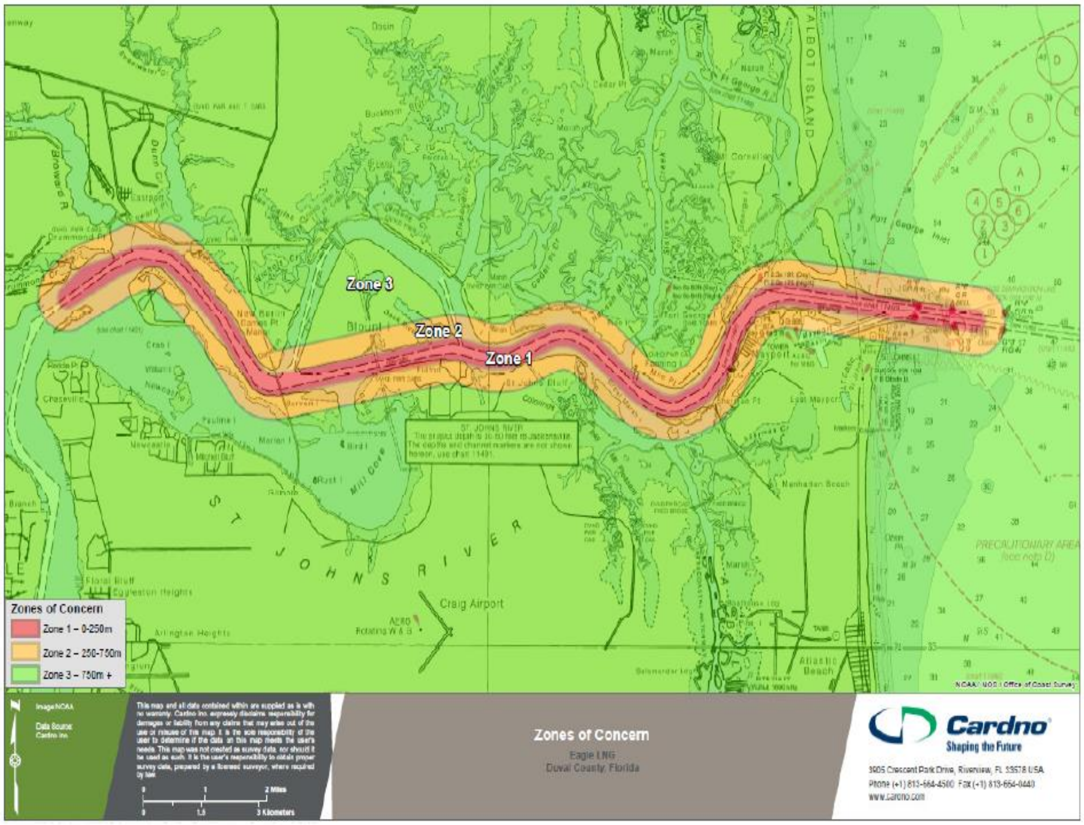
TABLE 4.12.3-1

Results of FERC Staff Analysis of 45,000 m^3 LNG Marine Vessels

Zone	Sandia Report Based on Larger LNG Marine Vessels	Eagle LNG Proposed Based on Smaller LNG Marine Vessels	FERC Staff Suggested Distance Based on Smaller LNG Marine Vessels
Zone 1	Accidental: 250 m Intentional: 500 m	250 m	Accidental: 230 m Intentional: 435 m
Zone 2	Accidental: 750 m Intentional: 1600 m	750 m	Accidental: 700 m Intentional: 1380 m
Zone 3	Accidental: 1700 m Intentional: 3500 m	1700 m	Accidental: 1630 m Intentional: 3360 m

As LNG marine vessels proceed along the intended transit route, Eagle LNG's estimated zones of concern would extend over resources such as residential and industrial areas, military installations, and also non-residential areas accessible to the public such as parks. Hazard Zone 1 would include the Huguenot Memorial Park, Helen Cooper Floyd Memorial Park, and a power line crossing the St. Johns River at Blount Island and the Interstate 295 Dames Point Bridge. Hazard Zones 1 and 2 would encompass portions of the Mayport Naval Station, Mayport and Atlantic Beach including the Mayport Coast Guard Station and the St. George Island Mayport Ferry, portions of the communities on Batten Island and Fanning Island, commercial marine activities, small industrial facilities, portions of the Timucuan Ecological and Historic Preserve, and portions of Blount Island, Alligator Island, and Dames Point. Hazard Zone 2 would extend over a portion of Little Talbot Island State Park, Yellow Bluff Fort State Historic Site, and Marathon Oil Terminal. Hazard Zone 3 would include the Jacksonville Port Cruise Ship Terminal and Naval Fuel Depot.

The described areas impacted by the three different hazard zones proposed by Eagle LNG are illustrated in figure 4.12.3-1.



	Sandia Hazard Zone 1 (0-250m)
	Sandia Hazard Zone 2 (250-750m)
	Sandia Hazard Zone 3 (750-1700m)

Figure 4.12.3-1 Hazard Zones Along the LNG Marine Vessel Route

4.12.3.5 Coast Guard Letter of Recommendation and Analysis

In a letter dated February 7, 2018, the Coast Guard issued an LOR and LOR Analysis to FERC stating that the St. Johns River would be considered suitable for accommodating the type and frequency of LNG marine traffic associated with this Project. The LOR was based on full implementation of the strategies and risk management measures identified by the Coast Guard to Eagle LNG in its WSA.

Although Eagle LNG has suggested mitigation measures for responsibly managing the maritime safety and security risks associated with LNG marine traffic, the necessary vessel traffic and/or facility control measures may change depending on changes in conditions along the waterway. The Coast Guard regulations in 33 CFR 127 require that applicants annually review WSAs until a facility begins operation and submit a report to the Coast Guard identifying any changes in conditions, such as changes to the port environment, the LNG facility, or the LNG marine vessel route, that would affect the suitability of the waterway for LNG marine traffic.

The Coast Guard's LOR is a recommendation, regarding the current status of the waterway, to the FERC, the lead agency responsible for siting the on-shore LNG facility. Neither the Coast Guard nor the FERC has authority to require waterway resources of anyone other than the applicant under any statutory authority or under the ERP or the Cost-Sharing Plan. As stated in the LOR, the Coast Guard would assess each transit on a case by case basis to identify what, if any, safety and security measures are necessary to safeguard the public health and welfare, critical infrastructure and key resources, the port, the marine environment, and the LNG marine vessel.

Under the Ports and Waterways Safety Act, the Magnuson Act, the MTSA, and the Security and Accountability For Every Port Act, the COTP has the authority to prohibit LNG transfer or LNG marine vessel movements within his or her area of responsibility if he or she determines that such action is necessary to protect the waterway, port, or marine environment. If this project is approved and if appropriate resources are not in place prior to LNG marine vessel movement along the waterway, then the COTP would consider at that time what, if any, vessel traffic and/or facility control measures would be appropriate to adequately address navigational safety and maritime security considerations.

4.12.4 LNG Facility Security Regulatory Requirements

The security requirements for the proposed Jacksonville Project are governed by 33 CFR 105, 33 CFR 127, and 49 CFR 193 Subpart J – Security. Title 33 CFR 105, as authorized by the MTSA, requires all terminal owners and operators to submit a Facility Security Assessment (FSA) and a Facility Security Plan (FSP) to the Coast Guard for review and approval before commencement of operations of the proposed project facilities. Eagle LNG would also be required to control and restrict access, patrol and monitor the plant, detect unauthorized access, and respond to security threats or breaches under 33 CFR 105. Some of the responsibilities of the applicant include, but are not limited to:

- designating a Facility Security Officer with a general knowledge of current security threats and patterns, security assessment methodology, vessel and facility operations, conditions, security measures, emergency preparedness, response, and contingency plans, who would be responsible for implementing the FSA and FSP and performing an annual audit for the life of the Jacksonville Project;

- conducting a FSA to identify site vulnerabilities, possible security threats and consequences of an attack, and facility protective measures; developing a FSP based on the FSA, with procedures for: responding to transportation security incidents; notification and coordination with federal, state, and local authorities; prevention of unauthorized access; measures to prevent or deter entrance with dangerous substances or devices; training; and evacuation;

- defining the security organizational structure with facility personnel with knowledge or training in current security threats and patterns; recognition and detection of dangerous substances and devices, recognition of characteristics and behavioral patterns of persons who are likely to threaten security; techniques to circumvent security measures; emergency procedures and contingency plans; operation, testing, calibration, and maintenance of security equipment; and inspection, control, monitoring, and screening techniques;

- implementing scalable security measures to provide increasing levels of security at increasing maritime security levels for facility access control, restricted areas, cargo handling, vessel stores and bunkers, and monitoring; ensuring that the Transportation Worker Identification Credential (TWIC) program is properly implemented;

- ensuring coordination of shore leave for vessel personnel or crew change out as well as access through the facility for visitors to the LNG marine vessel;

- conducting drills and exercises to test the proficiency of security and facility personnel on a quarterly and annual basis; and

- reporting all breaches of security and transportation security incidents to the National Response Center.

Title 33 CFR 127 has requirements for access controls, lighting, security systems, security personnel, protective enclosures, communications, and emergency power. In addition, an LNG facility regulated under 33 CFR 105 and 33 CFR 127 would be subject to the TWIC Reader Requirements Rule issued by the Coast Guard on August 23, 2016. This rule requires owners and operators of certain vessels and facilities regulated by the Coast Guard to conduct electronic inspections of TWICs (e.g., readers with biometric fingerprint authentication) as an access control measure. The final rule would also include recordkeeping requirements and security plan amendments that would incorporate these TWIC requirements. The implementation of the rule was first proposed to be in effect August 23, 2018. In a subsequent notice issued on June 22, 2018, the Coast Guard indicated delaying the effective date for certain facilities by three years, until August 23, 2021. On August 2, 2018, the President of the United States signed into law the Transportation Worker Identification Credential Accountability Act of 2018 (H.R. 5729). This law prohibits the Coast Guard from implementing the rule requiring electronic inspections of TWICs until after the Department of Homeland Security (DHS) has submitted a report to the Congress. Although the implementation of this rule has been postponed, the company may need to consider the rule when developing access control and security plan provisions for the facility.

Title 49 CFR 193 Subpart J also specifies security requirements for the onshore component of LNG facilities, as defined by 49 CFR 193, including requirements for conducting security inspections and patrols, liaison with local law enforcement officials, design and construction of protective enclosures, lighting, monitoring, alternative power sources, and warning signs. If the Jacksonville Project is authorized, constructed, and operated, compliance with the security requirements of 33 CFR 105, 33 CFR 127, and 49 CFR 193 Subpart J would be subject to the respective Coast Guard and DOT inspection and enforcement programs.

Eagle LNG provided preliminary information on these security features and indicated additional details would be completed in the final design. We recommend in section 4.12.6 that Eagle LNG provide final design details on these security features for review and approval, including: lighting coverage drawings that illustrate photometric analyses demonstrating the lux levels at the interior of the terminal are in accordance with its referenced American Petroleum Institute (API) Standard 540 and federal regulations, including lighting along the perimeter fence line, along paths/roads of access and egress, and at hooks and capstans that may be used at the marine berth; camera coverage drawings that illustrate coverage areas of each camera such that the entire perimeter of the facility is covered with redundancy and the interior of plant is covered, including, a camera be provided at the top of the LNG storage tank, coverage within pretreatment areas, within liquefaction areas, within truck transfer areas, within marine transfer areas, and buildings; drawings that demonstrate a fence would deter or mitigate entry along the perimeter of the entire facility and is set back from hazardous piping and equipment by at least 10 feet; vehicle barrier and controlled access point drawings that demonstrate crash rated barriers are provided to prevent uncontrolled access, inadvertent entry, and impacts to components containing hazardous fluids from vehicles. Furthermore, in accordance with the February 2004 Interagency Agreement among FERC, DOT, and Coast Guard, FERC staff would collaborate with Coast Guard and DOT on the Jacksonville Project's security features.

4.12.5 FERC Engineering and Technical Review of the Preliminary Engineering Designs

LNG Facility Historical Record

The operating history of the U.S. LNG industry has been free of safety-related incidents resulting in adverse effects on the public or the environment with the exception of the October 20, 1944, failure at an LNG plant in Cleveland, Ohio. The 1944 incident in Cleveland led to a fire that killed 128 people and injured 200 to 400 more people.[23] The failure of the LNG storage tank was due to the use of materials not suited for cryogenic temperatures. LNG migrated through streets and into underground sewers due to inadequate spill impoundments at the site. Current regulatory requirements ensure that proper materials suited for cryogenic temperatures are used in the design and that spill impoundments are designed and constructed properly to contain a spill at the site. To ensure that this potential hazard would be addressed for proposed LNG facilities, we evaluate the preliminary and final specifications for suitable materials of construction and for the design of spill containment systems that would properly contain a spill at the site.

Another operational accident occurred in 1979 at the Cove Point LNG plant in Lusby, Maryland. A pump electrical seal located on a submerged electrical motor LNG pump leaked causing flammable gas vapors to enter an electrical conduit and settle in a confined space. When a worker switched off a circuit breaker, the flammable gas ignited, causing severe damage to the building and a worker fatality. With the participation of the FERC, lessons learned from the 1979 Cove Point accident led to changes in the national fire codes to better ensure that the situation would not occur again. To ensure that this potential hazard would be addressed for proposed facilities that have electrical seal interfaces, we evaluated the preliminary designs and recommend in section 4.12.6 that Eagle LNG provide, for review and approval, the final design details of the electrical seal design at the interface between flammable fluids and the electrical conduit or wiring system, details of the electrical seal leak detection system, and the details of a downstream physical break (i.e., air gap) in the electrical conduit to prevent the migration of flammable vapors.

On January 19, 2004, a blast occurred at Sonatrach's Skikda, Algeria, LNG liquefaction plant that killed 27 and injured 56 workers. No members of the public were injured. Findings of the accident investigation suggested that a cold hydrocarbon leak occurred at Liquefaction Train 40 and was introduced into a high-pressure steam boiler by the combustion air fan. An explosion developed inside the boiler firebox, which subsequently triggered a larger explosion of the hydrocarbon vapors in the immediate vicinity. The resulting fire damaged the adjacent liquefaction process and liquid petroleum gas separation equipment of Train 40, and spread to Trains 20 and 30. Although Trains 10, 20, and 30 had been modernized in 1998 and 1999, Train 40 had been operating with its original equipment since start-up in 1981. To ensure that this potential hazard would be addressed for proposed facilities, we evaluated the preliminary design for mitigation of flammable vapor dispersion and ignition in buildings and combustion equipment to ensure they would be adequately covered by hazard detection equipment that could isolate and deactivate any combustion equipment whose continued operation could add to or sustain an emergency. We also recommend in section 4.12.6 that Eagle LNG provide, for review and approval, the final design details of hazard detection equipment, including location and elevation of all detection equipment, instrument tag numbers, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment.

On March 31, 2014, a detonation occurred within a gas heater at Northwest Pipeline Corporation's LNG peak-shaving plant in Plymouth, Washington[24]. This internal detonation subsequently caused the

[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.

[24] For a description of the incident and the findings of the investigation, see Root Cause Failure Analysis, Plymouth LNG Plant Incident Investigation under CP14-515.

failure of pressurized equipment, resulting in high velocity projectiles. The plant was immediately shut down, and emergency procedures were activated, which included notifying local authorities and evacuating all plant personnel. No members of the public were injured, but one worker was sent to the hospital for injuries. As a result of the incident, the liquefaction trains and a compressor station located on site were rendered inoperable. Projectiles from the incident also damaged the control building that was located near pre-treatment facilities and penetrated the outer shell of one of the LNG storage tanks. All damaged facilities were ultimately taken out of service for repair. The accident investigation showed that an inadequate purge after maintenance activities resulted in a fuel-air mixture remaining in the system. The fuel-air mixture auto-ignited during startup after it passed through the gas heater at full operating pressure and temperature. To ensure that this potential hazard would be addressed for proposed facilities, we recommend in section 4.12.6 that Eagle LNG provide a plan for purging, for review and approval, which addresses the requirements of the American Gas Association *Purging Principles and Practice* and to provide justification if not using an inert or non-flammable gas for purging. In evaluating such plans, we would assess whether the purging could be done safely based on review of other plans and lessons learned from this and other past incidents. If a plan proposes the use of flammable mediums for cleaning, dry-out or other activities, we would evaluate the plans against other recommended and generally accepted good engineering practices, such as NFPA 56, *Standard for Fire and Explosion Prevention during Cleaning and Purging of Flammable Gas Piping Systems*.

We also recommend in section 4.12.6 that Eagle LNG provide, for review and approval, operating and maintenance plans, including safety procedures, prior to commissioning. In evaluating such plans, we would assess whether the plans cover all standard operations, including purging activities associated with startup and shutdown. Also, in order to prevent other sources of projectiles from affecting occupied buildings and storage tanks, we recommend in section 4.12.6 that Eagle LNG incorporate mitigation into their final design with supportive information, for review and approval, that demonstrates it would mitigate the risk of a pressure vessel burst or boiling liquid expanding vapor explosion (BLEVE) from occurring.

FERC Preliminary Engineering Review

FERC requires an applicant to provide safety, reliability, and engineering design information as part of its application, including hazard identification studies and front-end-engineering-design (FEED) information for its proposed Project. FERC staff evaluates this information with a focus on potential hazards from within and nearby the site, including external events, which may have the potential to cause damage or failure to the project facilities, and the engineering design and safety and reliability concepts of the various protection layers to mitigate the risks of potential hazards.

The primary concerns are those events that could lead to a hazardous release of sufficient magnitude to create an off-site hazard or interruption of service. In general, FERC staff considers an acceptable design to include various layers of protection or safeguards to reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public. These layers of protection are generally independent of one another so that any one layer would perform its function regardless of the initiating event or failure of any other protection layer. Such design features and safeguards typically include:

- a facility design that prevents hazardous events, including the use of inherently safer designs; suitable materials of construction; adequate design margins from operating limits for process piping, process vessels, and storage tanks; adequate design for wind, flood, seismic, and other outside hazards;

- control systems, including monitoring systems and process alarms, remotely-operated control and isolation valves, and operating procedures to ensure that the facility stays within the established operating and design limits;

- safety instrumented prevention systems, such as safety control valves and emergency shutdown systems, to prevent a release if operating and design limits are exceeded;

- physical protection systems, such as appropriate electrical area classification, proper equipment and building spacing, pressure relief valves, spill containment, and cryogenic, overpressure, and fire structural protection, to prevent escalation to a more severe event;

- site security measures for controlling access to the plant, including security inspections and patrols, response procedures to any breach of security, and liaison with local law enforcement officials; and

- on-site and off-site emergency response, including hazard detection and control equipment, firewater systems, and coordination with local first responders, to mitigate the consequences of a release and prevent it from escalating to an event that could impact the public.

The inclusion of such protection systems or safeguards in a plant design can minimize the potential for an initiating event to develop into an incident that could impact the safety of the off-site public. The review of the engineering design for these layers of protection are initiated in the application process and carried through to the next phase of the proposed project in final design if authorization is granted by the Commission.

The reliability of these layers of protection is informed by occurrence and likelihood of root causes and the potential severity of consequences based on past incidents and validated hazard modeling. As a result of the continuing engineering review, we recommend mitigation measures and continuous oversight to the Commission for consideration to include as conditions in the Order. If the facility is authorized and recommendations are adopted as conditions to the Order, FERC staff would continue its engineering review through final design, construction, commissioning, and operation.

Process Design Review

In order to liquefy natural gas, most liquefaction technologies require that the feed gas stream to be pre-treated to remove components that could freeze out and clog the liquefaction equipment or would otherwise be incompatible with the liquefaction process or equipment, including hydrogen sulfide (H_2S), CO_2, water, mercaptans, mercury, and heavy hydrocarbons. For example, mercury is typically limited to concentrations less than 0.01 micrograms per normal cubic meter because it can induce embrittlement and corrosion resulting in a catastrophic failure of equipment.

The inlet gas would be conditioned to remove solids and water droplets and compressed to a higher pressure prior to entering feed gas pretreatment processes. After the inlet gas is compressed, it would enter an Acid Gas Removal Unit (AGRU) to remove the CO_2 and H_2S from the feed gas by contact with an amine-based solvent solution, methyl diethanolamine, in an absorber column. After CO_2 and H_2S accumulate in the amine solution, an amine regenerator column would release the CO_2 and H_2S from the amine solution. The regenerated amine solution would be recycled back to the absorber column and the removed CO_2 and H_2S would be spent to the thermal oxidizer, where CO_2, H_2S, and trace amounts of hydrocarbons would be incinerated.

The feed gas exiting the absorber column then enters a mole sieve dehydration system to remove water and mercaptans using regenerative molecular sieve beds. Heated gas would regenerate the molecular sieve beds by removing absorbed water and mercaptans. The molecular sieve absorbent bed material would be replaced every five years and the material would be transported by a licensed carrier to a waste handling facility. The heated regeneration gas would then be cooled and sent to a Mercaptan Removal Unit where catalyst beds would extract the mercaptans. The regeneration gas would be recycled back to the feed gas stream entering the AGRU. The mercaptan absorbent bed material would be replaced every six months and the material would be transported by a licensed carrier to a licensed waste handling facility.

After dehydration, a Mercury Removal Bed containing non-regenerable, sulfur-impregnated carbon would remove trace amounts of mercury in the feed gas. The mercury removal absorbent bed material would be replaced every five years and the material would be transported by a licensed carrier to a licensed waste handling facility. The treated dry gas would then flow to the liquefaction unit.

Heavy hydrocarbon removal would be integrated into the liquefaction process. The first pass through the refrigeration process would be used to remove heavy hydrocarbons at intermediate temperatures. The feed gas would flow into a heavy hydrocarbon knockout drum to remove the liquids. The vapor from the knockout drum would reenter the refrigeration process and would be sub-cooled into LNG. The liquid from the knockout drum would flow into a stabilizer to further separate the heavy hydrocarbons. The lighter hydrocarbon gas would be routed to the BOG system. The heavy hydrocarbon liquid would be sent to an on-site storage vessel. Heavy hydrocarbon liquids would be removed by truck approximately twice per week. The LNG exiting the refrigeration process would flow to an LNG expander to reduce pressure, then into an LNG flash vessel before being pumped to the LNG storage tank.

In order to achieve the cryogenic temperatures needed to liquefy the natural gas stream in the above process, the gas would be cooled by a thermal exchange process driven by a closed loop refrigeration system using mixed refrigerants comprised of nitrogen, methane, propane, ethylene, and n-butane. Methane would be provided from the BOG system and the other refrigerants required for the liquefaction process would be delivered by truck and stored on site for initial filling and use, as needed, for make-up. Truck loading/unloading facilities would be provided to unload make-up refrigerants and to load LNG and heavy hydrocarbons trucks for off-site delivery. Eagle LNG anticipates that twelve refrigerant tanker trucks would be needed per year.

During export operations, LNG stored in the LNG storage tank would be sent out through multiple in-tank pumps and through the roof of the LNG tank for an inherently safer design compared to penetrating the side of the tank. The design of the LNG storage tank, in-tank pumps, and associated piping would be provided by various contractors. Therefore, in order to ensure coordination between the various contractors during final design, we recommended in section 4.12.6 of the draft EIS that Eagle LNG specify the responsibilities of the LNG storage tank contractor, and the contractor for the piping associated with the LNG storage tank and for the piping associated with the LNG in-tank pumps. This is also done to ensure coordination on various interdependencies, such as differential settlement between the tank and the associated piping and loads shared between the LNG storage tank and associated piping support structure. Eagle LNG commented that this recommendation be removed as the division in scope between the contractors and equipment suppliers does not have an impact on the technical assessment of the project. However, FERC staff disagrees with this comment and maintains this recommendation to ensure coordination between the various contractors and equipment suppliers. The LNG from the LNG storage tank would then be sent through a marine transfer line and multiple liquid marine transfer arms connected to LNG ships. Specifically, Eagle LNG's design includes two liquid marine transfer arms and one vapor marine transfer arm, however, FERC staff noted that the design does not include a spare hybrid marine transfer arm which would be capable of handling either liquid or vapor. Therefore, we recommended in section 4.12.6 of the draft EIS that Eagle LNG evaluate the need for a hybrid (i.e., liquid/vapor) LNG loading/unloading arm. Eagle LNG commented that the recommendation be removed because the use of a hybrid marine transfer arm is not required by applicable regulations or industry codes. FERC staff notes that although the use of a hybrid arm is not required by regulations or codes, it is a good engineering practice and is a design feature incorporated at every single other FERC jurisdictional LNG terminal. Therefore, FERC staff has modified this recommendation for Eagle LNG to provide plans and procedures that address how the facility would handle ship loading operations in the event a marine transfer arm (i.e,, liquid/vapor) experiences a liquid or vapor release or is out of service. In order to keep the marine transfer line cold between LNG export cargoes, an LNG recirculation line would keep the marine transfer line cold and avoid cool down prior to every LNG ship loading operation. The LNG transferred to the ships would displace vapors from the ships, which would be sent back through a vapor marine transfer arm, a vapor return blower, and into the BOG system. Once loaded, the LNG ship would be disconnected and leave for export. Low pressure BOG generated from stored LNG (LNG is continuously boiling) as well as vapors returned during LNG ship filling operations would be compressed and would be split to either the fuel gas system or sent back to the inlet feed gas where it would be reliquefied. The closed BOG system to prevent the release of BOG to the atmosphere is in accordance with NFPA 59A and is an inherently safer design compared to allowing the BOG to vent to the atmosphere.

In addition, the Jacksonville Project would include many utilities and associated auxiliary equipment. The major auxiliary systems required for the operation of the liquefaction facility include fuel gas, hot oil, flares, instrument and utility air supply, water supply, demineralized water, nitrogen, and backup power. Hot oil would provide heat to the steam exchanger, regeneration gas heater, and the stabilizer reboiler. A ground flare (consisting of wet and dry flares) would be designed to handle and control the vent gases from the process areas. In addition, a cold vent stack would be provided to handle vent gases from warm LNG ships and to handle BOG in the event of a failure in the BOG compression system. Diesel would be stored in dedicated tanks for their respective equipment, which includes a backup firewater pump and an emergency generator. Trucks would fill liquid nitrogen storage tanks and vaporizers would supply gaseous nitrogen for various uses in the plant including pre-commissioning, start-up, and refrigerant make-up.

The failure of this equipment could pose potential harm if not properly safeguarded through the use of appropriate controls and operation. Eagle LNG would install process control valves and instrumentation to safely operate and monitor the facilities. Alarms would have visual and audible notification in the control room to warn operators that process conditions may be approaching design limits. Operators would have the capability to take action from the control room to mitigate an upset. Eagle LNG would develop facility operation procedures after completion of the final design; this timing is fully consistent with accepted industry practice. Eagle LNG would design their control systems and human machine interfaces (HMI) to the International Society for Automation (ISA) Standards 5.3, 5.5, 60.1, 60.3, 60.4, and 60.6, and other standards and recommended practices. FERC staff recommends in section 4.12.6 that Eagle LNG provide final specifications for these systems. We also recommend in section 4.12.6 that Eagle LNG develop and implement an alarm management program, for review and approval to ensure the effectiveness of the alarms. FERC staff would evaluate the alarm management program against recommended and generally accepted good engineering practices, such as ISA Standard 18.2.

Operators would have the capability to take action from the control room to mitigate an upset. Eagle LNG would develop facility operation procedures after completion of the final design; this timing is fully consistent with accepted industry practice. We recommend in section 4.12.6 that Eagle LNG provide more information on the operating and maintenance procedures, including but not limited to, safety procedures, hot work procedures and permits, abnormal operating conditions procedures, and personnel training prior to commissioning. We would evaluate these procedures to ensure that an operator can operate and maintain all systems safely, based on benchmarking against other operating and maintenance plans and comparing against recommended and generally accepted good engineering practices, such as American Institute of Chemical Engineers (AIChE) Center for Chemical Process Safety (CCPS), *Guidelines for Writing Effective Operating and Maintenance Procedures*, AIChE CCPS, *Guidelines for Management of Change for Process Safety*, AIChE CCPS, *Guidelines for Effective Pre-Startup Safety Reviews*, AGA, *Purging Principles and Practices,* and NFPA 51B, *Standard for Fire Prevention During Welding, Cutting,* *and Other Hot Work*. In addition, we recommend in section 4.12.6 that Eagle LNG tag and label instrumentation and valves, piping, and equipment and provide car-seals/locks to address human factor considerations and improve facility safety and prevent incidents.

In the event of a process deviation, emergency shutdown valves and instrumentation would be installed to monitor, alarm, shut down, and isolate equipment and piping during process upsets or emergency conditions. The project would have an emergency shutdown system to initiate closure of valves and shutdown of the process during emergency situations. In addition, the plant would have plant-wide emergency shutdown and individual process unit shutdown capabilities. Safety-instrumented systems would comply with ISA Standard 84.00.01 and other recommended and generally accepted good engineering practices. We recommend in section 4.12.6 that Eagle LNG file information, for review and approval, on the final design, installation, and commissioning of instrumentation and emergency shutdown equipment to ensure appropriate cause-and-effect alarm or shutdown logic and enhanced representation of the emergency shutdown system in the plant control room and throughout the plant.

In developing the FEED, Eagle LNG conducted a Hazard Identification Analysis (HAZID) to identify potential hazards associated with the proposed facility location, site layout and process design. This HAZID was a facilitated review which focused on the site layout and process flow diagrams (PFD). A more detailed and thorough hazard and operability (HAZOP) review analysis would be performed by Eagle LNG 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 hazard or operability issue, and identify whether there are adequate engineering and administrative controls to prevent or mitigate the risk from such events. Where insufficient engineering or administrative controls were identified, recommendations to prevent or minimize these hazards would be generated from the results of the HAZOP review. We recommend in section 4.12.6 that Eagle LNG file the HAZOP study on the completed final design for review and approval. We would evaluate the HAZOP to ensure all systems are covered and process deviations are covered with appropriate and consistent severity, likelihood, and risk values with commensurate layers of protection in accordance with recommended and generally accepted good engineering practices, such as AIChE, *Guidelines for Hazard Evaluation Procedures*. We also recommend in section 4.12.6 that Eagle LNG file the resolutions of the recommendations generated by the HAZOP review for review and approval by FERC staff. Once the design has been subjected to a HAZOP review, the design development team would track, manage, and keep records of changes in the facility design, construction, operations, documentation, and personnel. Eagle LNG would evaluate these changes to ensure that the safety, health, and environmental risks arising from these changes are addressed and controlled based on its management of change procedures. If FERC staff recommendations are adopted into the Commission Order, resolutions of the recommendations generated by the HAZOP review would be monitored by FERC staff. We also recommend in section 4.12.6 that Eagle LNG file all changes to their FEED for review and approval by FERC staff. However, major modifications could require an amendment or new proceeding.

If the project is authorized, constructed, and operated, Eagle LNG would install equipment in accordance with its design. We recommend in section 4.12.6 that that project facilities be subject to construction inspections and that Eagle LNG provide, for review and approval, commissioning plans, procedures and commissioning demonstration tests that would verify the performance of equipment. In addition, we recommend in section 4.12.6 that Eagle LNG provide semi-annual reports that include abnormal operating conditions and facility modifications. Furthermore, we recommend in section 4.12.6 that the project facilities be subject to regular inspections throughout the life of the facilities to verify that equipment is being properly maintained and to verify basis of design conditions, such as feed gas and sendout conditions, do not exceed the original basis of design.

Mechanical Design Review

Eagle LNG provided codes and standards for the design, fabrication, construction and installation of piping and equipment and specifications for the facility. The design specifies materials of construction and ratings suited to the pressure and temperature conditions of the process design. Piping would be designed, fabricated, assembled, erected, inspected, examined, and tested in accordance with the American Society of Mechanical Engineers (ASME) Standards B31.3, B36.10, and B36.19. Valves and fittings would be designed to standards and recommended practices such as API Standards 594, 598, 600, 602, 607, and 609; ASME Standards B16.5, B16.9, B16.10, B16.20, B16.21, B16.25, B16.34, and B16.47; and ISA Standard 75.08.01. Portions of the facility regulated under 33 CFR 127 for the marine transfer system, including piping, hoses, and loading arms should also be tested in accordance with 33 CFR 127.407. We have included a recommendation in section 4.12.6 that Eagle LNG demonstrate, 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. Eagle LNG commented that the recommendation be revised to provide an option to specify that for the piping and piping nipples of hazardous fluids, 2 inches or less are to be no less than schedule 160 for carbon steel and schedule 80 for stainless steel. FERC staff disagrees with this comment on revising the recommendation. The recommendation does not necessarily dictate a pipe stress analysis as the only means for demonstrating piping are designed to withstand external loads. Other methods are allowable depending on the expected external loads. Therefore, FERC staff maintains this recommendation in section 4.12.6.

Pressure vessels must be designed, fabricated, inspected, examined, and tested in accordance with ASME Boiler and Pressure Vessel Code (BPVC) Section VIII per 49 CFR Part 193 Subparts C, D, and E and NFPA 59A (2001). Heat exchangers would be designed to ASME BPVC Section VIII standards; API Standards 660 and 661; and the Tubular Exchanger Manufacturers Association standards. Rotating equipment would be designed to standards and recommended practices, such as API Standards 610, 613, 614, 617, 618, 619, 670, 672, 675, 676, and 682; and ASME Standards B73.1 and B73.2. Fired heaters would be specified and designed to standards and recommended practices, such as API Standards 556 and 560.

The LNG storage tank must be designed, fabricated, tested, and inspected in accordance with 49 CFR 193 Subpart D, NFPA 59A (2001 and 2006), and API Standard 620. In addition, Eagle LNG would design, fabricate, test, and inspect the LNG storage tank in accordance with API Standard 625 and American Concrete Institute (ACI) Standard 376. Other low-pressure storage tanks such as the amine and condensate storage tanks would be designed, inspected, and maintained in accordance with the API Standards 650 and 653. The LNG storage tank would also include boil-off gas compression to prevent the release of boil-off to the atmosphere in accordance with NFPA 59A (2001) for inherently safer design. However, FERC staff noted the LNG storage tank design would be equipped with vacuum relief valves that would utilize ambient air in lieu of process vacuum breaker gas which is most commonly used in LNG storage tank vacuum relief valve system designs. Therefore, we recommended in section 4.12.6 of the draft EIS that Eagle LNG include a vacuum breaker gas or pad gas system in addition to the LNG storage tank vacuum relief system to mitigate the risk of failures caused by vacuum conditions. Additionally, we recommended in section 4.12.6 of the draft EIS that Eagle LNG also provide an analysis that verifies the entrainment of ambient air on the LNG storage tank vacuum relief valves would not result in a flammable atmosphere in the tank. Eagle LNG commented that the recommendation be modified to providing the analysis on the use of ambient air as an alternative to including a vacuum break gas or pad gas system. We disagree on Eagle LNG's proposed modification to the recommendation. Installing a vacuum breaker gas or a pad gas system is a good engineering practice that is common among FERC jurisdictional LNG facilities to ensure that there are multiple layers of protection to prevent the formation of a vacuum condition that could lead to failure of the LNG storage tank. Reliance on a single layer of protection would potentially put the public at a significant risk given the potential consequences if the vacuum relief system did not function as intended. Therefore, we have modified the recommendation in section 4.12.6 for Eagle LNG to include a vacuum breaker gas or pad gas system in addition to the LNG storage tank vacuum relief system in order to mitigate the risk of failures caused by vacuum conditions.

Pressure and vacuum safety relief valves, a vent stack, and flares would be installed to protect the storage containers, pressure vessels, process equipment, and piping from an unexpected or uncontrolled pressure excursion. The safety relief valves would be designed to handle process upsets and thermal expansion within piping, per NFPA 59A (2001 edition), ASME Standard 31.3, and ASME BPVC Section VIII; and would be designed in accordance with API Standards 520, 521, 526, 527, 537, and 2000 and other recommended and generally accepted good engineering practices. In addition, the operator should verify the set pressure of the pressure relief valves meet the requirements in 33 CFR 127.407. However, it was unclear whether L-405 would operate as a vent stack or flare stack because it was listed under the vent stack section in the application and the description suggests it would operate as a vent stack, however, other sections in the application make reference to Cold Vent pilots, the data sheet included in the application suggests it would operate as a flare, and responses to data requests indicate it would operate as a flare stack. Therefore, we recommended prior to the end of the comment period of the draft EIS that Eagle LNG clarify whether L-405 would operate as a vent stack or a flare stack. Eagle LNG clarified in a response filed on January 4, 2019 that L-405 would operate as a flare stack with a continuous pilot. However, L-405 would have fuel gas supplied by BOG, heavy hydrocarbon vapor, and feed gas that is downstream of the feed gas emergency shutdown. Therefore, we recommend in section 4.12.6 that Eagle LNG provide: final design details for the L-405 flare stack such as purge, pilots, etc., whether the flare would meet API 537 or equivalent, and a quantitative analysis which demonstrates that the redundancy built into the flare pilot design is sufficient to ensure that an operational pilot would be available or alternatively provide a vapor dispersion analysis of the unlit flare that demonstrates flammable vapors would not reach any ignition sources, equipment, buildings, or grade. We also recommend in section 4.12.6 Eagle LNG provide final design information on pressure and vacuum relief devices, vent stack, and flares, for review and approval, to ensure that the final sizing, design, and installation of these components are adequate and in accordance with the standards reference and other recommended and generally accepted good engineering practices.

Although many of the codes and standards were listed as ones the project would meet, Eagle LNG did not make reference to these standards on many of the specifications and data sheets for process equipment (e.g., ASME B16.21, API 613, 618, 619, 660, 661, 670, 672, 675, 676, 682) and some additional specifications that are recommended and generally accepted good engineering practices were not included (e.g., ASME B16.48) and some included in the codes and standards list did not seem applicable (e.g., API 616, ASME B31.5). Therefore, we recommend in section 4.12.6 that Eagle LNG provide the final specifications for all equipment and a cross referenced list of all codes and standards for review and approval. If the project is authorized, constructed, and operated, Eagle LNG would install equipment in accordance with its specifications and design and FERC staff would verify equipment nameplates to ensure equipment is being installed based on approved design and conduct construction inspections including reviewing quality assurance and quality control plans to ensure construction work is being performed according to proposed project specifications, procedures, codes and standards. We also recommend in section 4.12.6 Eagle LNG provide semi-annual reports that include equipment malfunctions and abnormal maintenance activities. In addition, we recommend in section 4.12.6 that the project facilities be subject to inspections throughout the life of the facility to verify that the plant equipment is being properly maintained.

Hazard Mitigation Design Review

If operational control of the facilities were lost and operational controls and emergency shutdown systems failed to maintain the Jacksonville Project within the design limits of the piping, containers, and safety relief valves, a release could potentially occur. FERC regulations under 18 CFR 380.12 (o) (1) through (4) require applicants to provide information on spill containment, spacing and plant layout, hazard detection, hazard control, and firewater systems. In addition, 18 CFR 380.12 (o) (7) require applicants to provide engineering studies on the design approach and 18 CFR 380.12 (o) (14) requires applicants to demonstrate how they comply with 49 CFR 193 and NFPA 59A. As required by 49 CFR 193 Subpart I, and by incorporation section 9.1.2 of NFPA 59A (2001), fire protection must be provided for all DOT regulated LNG plant facilities based on an evaluation of sound fire protection engineering principles, analysis of local conditions, hazards within the facility, and exposure to or from other property. NFPA 59A (2001) also requires the evaluation on the type, quantity, and location of hazard detection and hazard control, passive fire protection, emergency shutdown and depressurizing systems, and emergency response equipment, training, and qualifications. If authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 Subpart I and would be subject to DOT's inspection and enforcement programs. However, NFPA 59A (2001) also indicates the wide range in size, design, and location of LNG facilities precludes the inclusion of detailed fire protection provisions that apply to all facilities comprehensively and includes subjective performance-based language on where emergency shutdown systems and hazard control are required and does not provide any additional guidance on placement or selection of hazard detection equipment and provides minimal requirements on firewater. Also, the project marine facilities would be subject to 33 CFR 127, which incorporates sections of NFPA 59A (1994), which have similar performance-based guidance. Therefore, FERC staff evaluated the proposed spill containment and spacing, hazard detection, emergency shutdown and depressurization systems, hazard control, firewater coverage, structural protection, and on-site and off-site emergency response to ensure they would provide adequate protection of the LNG facilities as described more fully below.

Eagle LNG performed a preliminary fire protection evaluation to ensure that adequate mitigation would be in place, including spill containment and spacing, hazard detection, emergency shutdown and depressurization systems, hazard control, firewater coverage, structural protection, and on-site and off-site emergency response. We recommend in section 4.12.6 that Eagle LNG provide a final fire protection evaluation for review and approval, and to provide more information on the final design, installation, and commissioning of spill containment, hazard detection, hazard control, firewater systems, structural fire protection, and on-site and off-site emergency response procedures for review and approval.

Spill Containment

In the event of a release, sloped areas at the base of storage and process facilities would direct a spill away from equipment and into the impoundment system. This arrangement would minimize the dispersion of flammable vapors into confined, occupied, or public areas and minimize the potential for heat from a fire to impact adjacent equipment, occupied buildings, or public areas if ignition were to occur.

Title 49 CFR 193.2181, under Subpart C, specifies that each impounding system serving an LNG storage tank must have a minimum volumetric liquid capacity of 110 percent of the LNG tank's maximum design liquid capacity for an impoundment serving a single tank, unless surge is accounted for in the impoundment design. If authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 Subpart C and would be subject to DOT's inspection and enforcement programs. For full containment LNG tanks, we also consider it prudent to provide a barrier to prevent liquid from flowing to an unintended area (i.e., outside the plant property). The purpose of the barrier is to prevent liquid from flowing off the plant property and does not define containment or an impounding area for thermal radiation or flammable vapor exclusion zone calculations or other code requirements already met by sumps and impoundments throughout the site. Eagle LNG proposes one full-containment LNG storage tank for which the outer tank wall would serve as the impoundment system. FERC staff verified that the LNG storage tank's outer concrete wall would have a liquid capacity of at least 110 percent of the inner LNG tank's maximum liquid capacity. In addition, Eagle LNG would also install a berm around the LNG storage tank area to prevent liquid in the storage tank area from flowing off-site in the event of an outer tank impoundment failed.

Eagle LNG proposes to install a Pretreatment and Liquefaction Area Sump located on the south side of each liquefaction train that would collect a spill from the process areas of Liquefaction Trains 1, 2, and 3. Eagle LNG also proposes to install a Jetty and Jetty Access Area Sump located on the southeast side of the jetty access road that would collect a potential spill from the LNG rundown and sendout header up to the LNG loading arms at the jetty platform. In addition, Eagle LNG would provide an LNG Truck Loading and Refrigerant Storage Area Sump located east of the refrigerant storage area which would be designed to contain a spill occurring from the LNG truck loading and refrigerant storage area. The refrigerant and heavy hydrocarbon storage vessels located in this area would be mounded, therefore, the capacity of the LNG Truck Loading and Refrigeration Storage Area Sump would be sized to contain the volumetric capacity of one LNG truck. Eagle LNG would also include local containment for both the Amine Storage Tank and Slop Tank which would have a volumetric capacity of 110 percent of both tanks. The FEED design did not include spill containment for liquid nitrogen releases, therefore, in order to minimize impacts from a liquid nitrogen release, we have included a recommendation in section 4.12.6 for Eagle LNG to provide spill containment for liquid nitrogen releases.

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. If authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 Subpart C and would be subject to DOT's inspection and enforcement programs. The impoundment system design for the marine facilities would be subject to the Coast Guard's 33 CFR 127, which does not specify a spill or duration for impoundment sizing. However, FERC staff evaluates whether all hazardous liquids are provided with spill containment based on the largest flow capacity from a single pipe for 10 minutes accounting for de-inventory or the liquid capacity of the largest vessel (or total of impounded vessels) served, whichever is greater and whether providing spill containment reduces consequences from a release.

Eagle LNG indicated that all piping, hoses, and equipment that could produce a hazardous liquid spill would be provided with spill collection and/or spill conveyance systems. As part of our preliminary engineering review, we evaluated that impoundment systems would be sized based on the largest flow capacity from a single pipe for 10 minutes or the capacity of the largest vessel served, whichever is greater. In some cases, it was unclear as to whether spill containment would be provided. Therefore, we recommend in section 4.12.6 that Eagle LNG provide additional information on the final design of the impoundment systems for review and approval, including that spill containment is provided for all hazardous liquids from the largest flow from a single line for 10 minutes or from the largest vessel or otherwise demonstrate spill containment would not significantly reduce the flammable vapor dispersion or radiant heat consequences of a spill.

Eagle LNG indicated that the stormwater pumps would be automatically operated by level control and interlocked using low temperature detectors to prevent pumps from operating if LNG is present. Eagle LNG would need to verify that the sump pumps meet the automatic shutdown controls and water removal requirements specified in 49 CFR 193 Subpart C. If authorized, constructed, and operated, final compliance with the requirements of 49 CFR 193 Subpart C would be subject to DOT's inspection and enforcement programs.

If the project is authorized, constructed, and operated, Eagle LNG would install spill impoundments in accordance with its design and FERC staff would verify during construction inspections that the spill containment system including dimensions, and slopes of curbing and trenches, and capacity matches final design information. In addition, we recommend in section 4.12.6 that project facilities be subject to regular inspections throughout the life of the facility to verify that impoundments are being properly maintained.

Spacing and Plant Layout

The spacing of vessels and equipment between each other, from ignition sources, and to the property line must meet the requirements of 49 CFR 193 Subparts C, D, and E, which incorporate NFPA 59A (2001). NFPA 59A (2001) includes spacing and plant layout requirements and further references NFPA 30, NFPA 58, and NFPA 59 for additional spacing and plant layout requirements. If the LNG facilities, as defined in 49 CFR 193, are authorized, constructed, and operated, Eagle LNG must comply with the requirements of 49 CFR 193 and would be subject to DOT's inspection and enforcement programs.

In addition, FERC staff evaluated the spacing to determine if there could be cascading damage and to inform what fire protection measures may be necessary to reduce the risk of cascading damage. If it was not practical for spacing to mitigate the potential for cascading damage, FERC staff evaluated whether other mitigation measures were in place and evaluated those systems in further detail as discussed in subsequent sections. FERC staff evaluated the spacing of buildings in line with AIChE CCPS, *Guidelines for Evaluating Process Plant Buildings for External Explosions and Fires*, and API 752 and 753, which provide guidance on identifying and evaluating explosion and fire impacts to buildings and occupants resulting from events external to the buildings. In addition, FERC staff evaluated other hazards associated with releases and whether any damage would likely occur at buildings or would result in cascading damage.

To minimize the risk of cryogenic spills causing structural supports and equipment from cooling below their minimum design metal temperature, Eagle LNG would have spill containment systems surrounding cryogenic equipment and would generally locate cryogenic equipment away from process areas that do not handle cryogenic materials. In addition, we recommend in section 4.12.6 that Eagle LNG file drawings and specifications for structural passive protection systems to protect equipment and supports that could be exposed to cryogenic releases. We also recommend in section 4.12.6 that Eagle LNG file calculations or test results that demonstrate their effectiveness in mitigating cryogenic exposures causing embrittlement.

To minimize risk for flammable or toxic vapor ingress into buildings and flammable vapors reaching areas that could result in cascading damage from explosions, Eagle LNG would generally locate buildings away from process areas and would locate fired equipment and ignition sources away from process areas. However, firewater pumps, firewater tank, control room, and other occupied buildings all appear within close proximity of hazardous fluid containing equipment, such as the pipe rack that would have pressurized feed gas that enters at the inlet feed gas metering skid and is compressed at the feed gas compressors. Therefore, in order to minimize the risk to equipment and the control room, we recommend in section 4.12.6 that Eagle LNG conduct an evaluation of potential relocation of the control room and firewater equipment such that it does not present an ignition source for a release of combustible vapors or otherwise demonstrate how it would be protected from such hazards. The relocation of the control building and firewater equipment should compare against minimum spacing requirements for buildings and firewater equipment relative to equipment containing hazardous fluids (e.g., 50 ft in NFPA 59A for buildings, 50 ft in NFPA 20 [2010 and later] for firewater pumps), and distances used in electrical area classification for ignition sources (e.g., 15 ft in NFPA 59A, and 15 ft for adequately ventilated process location with lighter than air gas or vapor in API 500). In addition, to minimize the risk for flammable or toxic vapor ingress into buildings, we recommend in section 4.12.6 that Eagle LNG conduct a technical review of facility, for review and approval, to identify all combustion/ventilation air intake equipment and the distances to any possible flammable gas or toxic release; and verify that these areas would be adequately covered by hazard detection devices that would isolate or shut down any combustion or heating ventilation and air conditioning equipment whose continued operation could add to or sustain an emergency.

Consideration should also be given to pressurizing the buildings and elevating air intakes and designing the buildings to withstand fires and explosions given their close proximity to the equipment, which may necessitate shelter in place in the event of a release. We also recommend in section 4.12.6 that project facilities be subject to periodic inspections during construction to verify flammable/toxic gas detection equipment is installed in heating, ventilation, and air condition intakes of buildings at appropriate locations. In addition, we recommend in section 4.12.6 that project facilities be subject to regular inspections throughout the life of the facilities to continue to verify that flammable/toxic gas detection equipment installed in building air intakes function as designed and are being maintained and calibrated. Explosions in process areas were also evaluated and demonstrated that overpressures would not reach the LNG storage tank, but may also reach the firewater pumps, firewater tank, control room, and other occupied buildings. Therefore, we recommend in section 4.12.6 that Eagle LNG also evaluate how these equipment would be relocated or protected from explosions.

To minimize the risk of pool fires from causing cascading damage, Eagle LNG would locate their impoundment such that the radiant heats would have a minimal impact on most areas of the plant. However, thermal radiation levels from an LNG tank roof top fire and other impoundments could potentially impact process equipment, process vessels, LNG and refrigerant trucks, and pipe racks located within the liquefaction train 1 area and the LNG truck loading and refrigerant storage area. To mitigate against a LNG tank roof top fire, impoundment fires, and jet fires within the plant, Eagle LNG proposes thermal radiation mitigation measures to prevent cascading events in the design, including thermal protection insulation, fire-retardant insulation materials, emergency depressurization, flame, combustible gas and low temperature detectors, fire proofing of structural steel columns supporting critical equipment, fixed automatic firewater spray system, low expansion foam system, and firewater monitors and hydrants. However, details of these systems would be done in final design. Therefore, we recommend in section 4.12.6 that Eagle LNG provide the final design of these thermal mitigation measures, for review and approval, to demonstrate cascading events would be mitigated.

To minimize the risk of jet fires from causing cascading damage that could exacerbate the initial hazard, Eagle LNG would generally locate flammable and combustible piping and equipment away from buildings and process areas that do not handle flammable and combustible materials. However, the firewater pumps, firewater tank, control room, and other occupied buildings all appear within close proximity of hazardous fluid containing equipment, such as the pipe rack that would have pressurized feed gas that enters at the inlet feed gas metering skid and is compressed at the feed gas compressors. Therefore, in order to minimize the risk to equipment and the control room, we recommend in section 4.12.6 that Eagle LNG conduct an evaluation of potential relocation of the control room and firewater equipment such that it is not impacted by a pool or jet fire or otherwise demonstrate how it would be protected from such hazards. The relocation of the control building should compare against radiant heat distances from pool and jet fires.

If the project is authorized, Eagle LNG would finalize the plot plan, and in section 4.12.6 that Eagle LNG provide any changes for review and approval to ensure capacities and setbacks are maintained. If the facilities are constructed, Eagle LNG would install equipment in accordance with the spacing indicated on the plot plans, and we recommend in section 4.12.6 that project facilities be subject to periodic inspections during construction to verify equipment is installed in appropriate locations and the spacing is met in the field. In addition, we recommend in section 4.12.6 that project facilities be subject to regular inspections throughout the life of the facilities to continue to verify that equipment setbacks from other equipment and ignition sources are being maintained during operations.

<u>Ignition Controls</u>

Eagle LNG's plant areas would be designated with a hazardous electrical classification and process seals commensurate with the risk of the hazardous fluids being handled in accordance with NFPA 59A, 70, 497, and API Recommended Practice (RP) 500. If authorized, constructed, and operated, LNG facilities, as defined by 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to DOT's inspection and enforcement programs, which require compliance, by incorporation by reference, with NFPA 59A (2001) and NFPA 70 (1999). The marine facilities must comply with similar electrical area classification requirements of NFPA 59A (1994) and NFPA 70 (1993), which are incorporated by reference into the Coast Guard regulations in 33 CFR 127. Depending on the risk level, these areas would either be classified as non-classified, Class 1 Division 1, or Class 1 Division 2. In addition, equipment in these areas would be designed such that in the event a flammable vapor is present, the equipment would have a minimal risk of igniting the vapor. FERC staff evaluated the Eagle LNG electrical area classification drawings to verify that Eagle LNG would meet these electrical area classification requirements in NFPA 59A, 70, 497, and API RP 500. However, it is unclear if the design would meet API 500. If the project is authorized, Eagle LNG would finalize the electrical area classification drawings and would describe changes made from the FEED design. We recommend in section 4.12.6 that Eagle LNG file the final design of the electrical area classification drawings for review and approval. If facilities are constructed, Eagle LNG would install appropriately classed electrical equipment, and we recommend in section 4.12.6 that project facilities be subject to periodic inspections during construction for FERC staff to spot check electrical equipment and verify equipment is installed per classification and are properly bonded or grounded in accordance with NFPA 70.

In addition, we recommend in section 4.12.6 that project facilities be subject to regular inspections throughout the life of the facility to ensure electrical equipment is maintained (e.g., bolts on explosion proof equipment properly installed and maintained, panels provided with purge, etc.), and electrical equipment are appropriately de-energized and locked out and tagged out when being serviced.

Submerged electrical motor pumps and instrumentation must be equipped with electrical process seals, and instrumentation in accordance with NFPA 59A (2001) and NFPA 70. We recommend in section 4.12.6 that Eagle LNG provide, for review and approval, final design drawings showing process seals installed at the interface between a flammable fluid system and an electrical conduit or wiring system that meet the requirements of NFPA 59A (2001) and NFPA 70. Furthermore, we recommend in section 4.12.6 that Eagle LNG file, for review and approval, details of an air gap or vent equipped with a leak detection device that should continuously monitor for the presence of a flammable fluid, alarm the hazardous condition, and shut down the appropriate systems. In addition, we recommend in section 4.12.6 that project facilities be subject to regular inspections throughout the life of the facility to ensure electrical process seals for submerged pumps continue to conform to NFPA 59A and NFPA 70 and that air gaps are being properly maintained.

Hazard Detection, Emergency Shutdown, and Depressurization Systems

Eagle LNG would also install hazard detection systems to detect cryogenic spills, flammable and toxic vapors, and fires. The hazard detection systems would alarm and notify personnel in the area and control room to initiate an emergency shutdown, depressurization, or initiate appropriate procedures, and would meet NFPA Standard 72, ISA Standard 12.13.01, *Performance Requirements for Combustible Gas Detectors*, ISA 12.13.02, *Recommended Practice for the Installation, Operation and Maintenance of Combustible Gas Detection Instruments*, ISA 60079-29-1, *Performance Requirements of Detectors for Flammable Gases*, and ISA 60079-29-2, *Selection, Installation, Use, and Maintenance of Detectors for Flammable Gases and Oxygen*, and other recommended and generally accepted good engineering practices. However, we note that Eagle LNG does not make reference to other ISA 12.13 standards and recommended practices in their codes and standards list or *specifications*, such as ISA Technical Requirement 12.13.04, *Performance Requirements for Open Path Combustible Gas Detectors*, ISA 92.00.01, *Performance Requirements for Toxic Gas Detectors*, ISA 92.00.02, *Installation, Operation, and Maintenance of Toxic Gas-Detection Instruments*, ISA 92.04.01, *Performance Requirements for*

Instruments Used to Detect Oxygen Deficient/Oxygen Enriched Atmospheres, and ISA 92.04.02, *Installation, Operation, and Maintenance of Instruments Used to Detect Oxygen Deficient/Oxygen Enriched Atmospheres*. In addition, Eagle LNG did not include a specification for hazard detection in the application. Therefore, we recommend in section 4.12.6 that Eagle LNG provide specifications, for review and approval, for the final design of fire safety specifications, including, hazard detection, hazard control, firewater systems to verify it would meet these and other recommended and generally accepted good engineering practices, or equivalents (e.g., ISA 12.15.01, ISA 12.15.02, etc.). We also recommend in section 4.12.6 that Eagle LNG file a list of final hazard detection equipment, including the selected manufacturer and model that would allow FERC staff to verify whether it would generally meet these and other recommended and generally accepted good engineering practices, or equivalents (e.g., ISA 12.15.01, ISA 12.15.02, etc.).

FERC staff evaluated the adequacy of the general hazard detection type, location, and layout to ensure adequate coverage to detect cryogenic spills, flammable and toxic vapors, and fires near potential release sources or in spill containment systems (i.e., pumps, compressors, sumps, trenches, flanges, and instrument and valve connections). Eagle LNG submitted spill containment drawings that show all LNG and refrigerant impoundments and trenches would include low temperature detection. FERC staff also reviewed the fire and gas cause and effect matrices to evaluate the detectors that would initiate an alarm, shutdown, depressurization, or other action based on the FEED. Our review identified a lesser number of flammable gas and flame detection devices than is typical which may not provide as rapid of detection of an incident. Therefore, we recommended in section 4.12.6 of the draft EIS that Eagle LNG provide a hazard detection study to evaluate the effectiveness of their flammable and gas detection system in accordance with ISA 84.00.07 or equivalent methodologies that would demonstrate 90 percent or more of releases (unignited and ignited) that could result in an off-site or cascading impact that could extend off site would be detected by two or more detectors and result in isolation and de-inventory within 10 minutes. The analysis should take into account the set points, voting logic, and different wind speeds and directions. Eagle LNG commented that the recommendation be removed as evaluating the effectiveness of the hazard detection system is not required by applicable regulations or industry codes and added that the proposed flammable gas detection system would meet the requirements of NFPA 59A (2001) and NFPA 72. FERC staff disagrees with this comment. NFPA 59A (2001) and NFPA 72 do not include requirements for effectiveness and spacing of hazard detectors. Therefore, in order to address the inadequate number of flammable gas and flame detection devices, FERC staff maintains this recommendation in section 4.12.6. In addition, FERC staff identified that an insufficient quantity of oxygen detectors in the liquid nitrogen storage area and hydrogen sulfide detectors were proposed. Due to the close proximity of the liquid nitrogen storage area to the main control room and the toxicity of hydrogen sulfide, we included a recommendation in section 4.12.6 of the draft EIS for Eagle LNG to provide additional oxygen and hydrogen sulfide detectors. Eagle LNG filed a comment requesting this recommendation be removed as the Hazard Analysis filed on November 18, 2018 discussed the results of the nitrogen dispersion and hydrogen sulfide release analysis and provided details of the proposed low oxygen and hydrogen sulfide detector locations. Eagle LNG also commented the hazard analysis indicated that there is no liquid rainout from the piping upstream of the nitrogen vaporizers and therefore spill containment is not necessary. Eagle LNG added that PHMSA has reviewed the design spill methodology for the project and issued a letter of no objection to FERC on February 23, 2018 indicating that the design spills considered for the hazard analysis are in compliance with 49 CFR 193. FERC staff does not solely evaluate the design of spill containment, hazard detection (e.g., low oxygen, hydrogen sulfide detectors), or other layers of protection based on design spills considered for the siting analysis as related to 49 CFR 193, rather we look at a range of hazard scenarios, including higher frequency smaller releases and lower frequency larger releases when evaluating these systems. Nonetheless, Attachment 1.3 of the March 14, 2019 filing, to fulfill the DOT LOD siting analysis requirements demonstrates that a release from the liquid nitrogen storage area would extend over the main control room. Furthermore, the hydrogen sulfide analysis provided in section 11.4 of the Hazard Analysis filed on November 19, 2018 included figures that show a release of hydrogen sulfide would reach the main control room, security building/guard house, and administration building as well as extend offsite. Therefore, in order to address these potential hazards to plant operators and personnel, FERC staff maintains these recommendations in section 4.12.6. We also recommend in section 4.12.6 that Eagle LNG provide additional information, for review and approval, on the final design of all hazard detection systems (e.g., manufacturer and model, elevations, etc.) and hazard detection layout drawings. In addition, FERC staff recommend in section 4.12.6 that Eagle LNG file the final design of the cause and effect matrices.

If the project is authorized, constructed, and operated, Eagle LNG would install hazard detectors according to its final specifications and drawings, and we recommend in section 4.12.6 that project facilities be subject to periodic inspections during construction to verify hazard detectors and emergency shutdown pushbuttons are appropriately installed per approved design and functional based on cause and effect matrixes prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.6 that project facilities be subject to regular inspections throughout the life of the facility to verify hazard detector coverage and functionality is being maintained and are not being bypassed without appropriate precautions.

Hazard Control

If ignition of flammable vapors occurred, hazard control devices would be installed to extinguish or control incipient fires and releases, and would meet NFPA 59A; NFPA 10, 12, 15, 17, and 2001; API 2218, and 2510A; as well as other recommended and generally accepted good engineering practices. FERC staff evaluated the adequacy of the number and availability of handheld, wheeled, and fixed fire extinguishing devices throughout the site based on the FEED. FERC staff also evaluated whether the spacing of the fire extinguishers would meet NFPA 10 and agent type and capacities meet NFPA 59A (2009 and later editions). The hazard control plans appeared to meet NFPA 10 travel distances to nearly all components containing flammable or combustible fluids (Class B) with 30 pounds (lb) handheld fire extinguishers (30-50 ft) and 300 lb wheeled extinguishers (100 ft) and NFPA 10 travel distance to nearly all other components that could pose an ordinary combustible hazard (Class A) or associated electrical (Class C) hazard for handheld extinguishers (75 ft) with exception of truck loading area near amine and slop tanks, feed gas metering area, instrument air area, and electrical switchyard area. Buildings also appear to be provided with handheld extinguishers that appear to satisfy NFPA 10 requirements, including placement at each entry/exit. The agent type (potassium bicarbonate) and agent storage capacities for wheeled (minimum 125 lb) also appear to meet NFPA 59A requirements, however it is unclear if handheld (minimum 20 lb) would meet as they do not appear to be specified. In addition, installation heights, visibility, flow rate capacities, and other requirements should be confirmed in final design and in the field where design details, such as manufacturer, obstructions, and elevations, would be better known. We recommend in section 4.12.6 that Eagle LNG file additional information on the final design of these systems, for review and approval, on the final design of these systems (e.g., manufacturer and model, elevations, flowrate, capacities, etc.) demonstrating they would meet NFPA 10 and where the final design could change as a result of these details or other changes in the final design of the Jacksonville Project. In addition, FERC staff evaluated whether clean agent systems would be installed in all electrical switchgear and instrumentation buildings in accordance with NFPA 2001. Eagle LNG indicated these buildings would include clean agent systems which would be automatically activated by relevant smoke and fire detection. We also recommend in section 4.12.6 that Eagle LNG file additional information on the final design of these systems, for review and approval, where details are yet to be determined (e.g., manufacturer and model, elevations, flowrate, capacities, etc.) and where the final design could change as a result of these details or other changes in the final design of the project.

If the project is authorized, constructed, and operated, Eagle LNG would install hazard control equipment, and we recommend in section 4.12.6 that project facilities be subject to periodic inspections during construction to verify hazard control equipment is installed in the field and functional prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.6 that project facilities be subject to regular inspections throughout the life of the facility to verify in the field that hazard control coverage and is being properly maintained and inspected.

Passive Cryogenic and Fire Protection

If cryogenic releases or fires could not be mitigated from impacting facility components to insignificant levels, passive protection (e.g., fireproofing structural steel, cryogenic protection, etc.) would be provided to prevent failure of structural supports of equipment and pipe racks. The structural fire protection would comply with NFPA 59A (2001) and other recommended and generally accepted good engineering practices. NFPA 59A (2001) section 6.4.1 requires pipe supports, including any insulation systems used to support pipe whose stability is essential to plant safety, to be resistant to or protected against fire exposure, escaping cold liquid, or both, if they are subject to such exposure. However, NFPA 59A (2001) does not provide the criteria for determining if they are subject to such exposure or the level of protection needed to protect the pipe supports against such exposures. In addition, NFPA 59A does not address pressure vessels or other equipment.

Therefore, FERC staff evaluated whether passive cryogenic and fire protection would be applied to pressure vessels and structural supports to facilities exposed to cryogenic liquids or to radiant heats of 4,000 Btu/ft^2-hr or greater from fires with durations that could result in failures[25] and that they are specified in accordance with recommended and generally accepted good engineering practices, such as: ISO 20088, API 2001, API 2010A, API 2218, ASCE/SFPE 29, American Society of Testing and Materials (ASTM) E 84, ASTME E 2226, IEEE 1202, ISO 22899, NACE 0198, NFPA 58, NFPA 255, NFPA 290, OTI 95 634, UL 1709, and/or UL 2080, with a cryogenic temperature and duration or fire protection rating commensurate to the exposure.

To minimize the risk of cryogenic spills causing structural supports and equipment from cooling below their minimum design metal temperature, Eagle LNG would have spill containment systems surrounding cryogenic equipment and would generally locate cryogenic equipment away from process areas that do not handle cryogenic materials.

To minimize the risk of a pool or jet fire from causing cascading damage, Eagle LNG would generally locate flammable and combustible containing piping, equipment, and impoundments away from buildings and other process areas that do not handle flammable and combustible materials. However, the firewater pumps, firewater tank, control room, and other occupied buildings all appear within close proximity of hazardous fluid containing equipment, such as the pipe rack that would have pressurized feed gas that enters at the inlet feed gas metering skid and is compressed at the feed gas compressors. In addition, jet fires, explosions, and other hazards could impact this equipment and buildings. Therefore, in order to minimize the risk to equipment and the control room, we recommend in section 4.12.6 that Eagle LNG conduct an evaluation of potential relocation of the control room and firewater equipment such that it does not present an ignition source for a release of combustible vapors and such that it is not impacted by a pool or jet fire or otherwise demonstrate how it would be protected from such hazards. Eagle LNG proposes to mound the refrigerant storage tanks, but other pressure vessels located within liquefaction trains would be exposed to radiant heats in excess of 4,000 Btu/ft^2-hr from an LNG pool fire from the LNG storage tank outer containment and pretreatment and liquefaction area sumps. Eagle LNG indicated that passive fire protection would not be provided for these vessels as the vessels would not have a sustained hydrocarbon liquid level. However, we do not consider this good engineering practice, therefore, we recommend in section 4.12.6 that Eagle LNG provide passive fire protection for pressure vessels and structural supports to facilities exposed to radiant heats of 4,000 Btu/ft^2-hr or greater from fires with durations that could result

25 Pool fires from impoundments are generally mitigated through use of emergency shutdowns, depressurization systems, structural fire protection, and firewater, while jet fires are primarily mitigated through the use of emergency shutdowns, depressurization systems, and firewater without structural fire protection.

in failures. In addition, we recommend in section 4.12.6 that Eagle LNG provide additional information on final design of these systems, for review and approval, where details are yet to be determined (e.g., calculation of structural fire protection materials, thicknesses, etc.) and where the final design could change as a result of these details or other changes in the final design of the project. FERC staff also recommends in section 4.12.6 that Eagle LNG demonstrate that passive protection is provided in areas where jet fires may result in failure of structural supports. Eagle LNG would need to file drawings of the passive structural fire protection for review and approval for structural supports and equipment that could result in a failure when exposed to a jet or pool fire.

We also note that it was unclear whether Eagle LNG would install fire walls in transformer areas, which would be required for certain transformers. Therefore, we recommend Eagle LNG provide fire walls for transformer in accordance with NFPA 850 or equivalent that would prevent cascading damage.

If the project is authorized, constructed, and operated, Eagle LNG would install structural cryogenic and fire protection according to its design, and we recommend in section 4.12.6 that project facilities be subject to periodic inspections during construction to verify structural cryogenic and fire protection is properly installed in the field as designed prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.6 that project facilities be subject to regular inspections throughout the life of the facility to continue to verify that passive protection is being properly maintained.

Firewater Systems

Eagle LNG would also provide firewater systems, including remotely operated firewater monitors, sprinkler systems, fixed water spray systems, and firewater hydrants and hoses for use during an emergency to cool the surface of storage vessels, piping, and equipment exposed to heat from a fire. These firewater systems would be designed, tested, and maintained to meet NFPA 59A (2001), 11, 13, 14, 15, 20, 22, 24, and 25 requirements. Eagle LNG would also install a high expansion foam system to suppress hydrocarbon spills and fires as well as to reduce vaporization rates from LNG pools and would meet NFPA 59A and NFPA 11. FERC staff evaluated the adequacy of the general firewater or foam system coverage and verify the appropriateness of the associated firewater demands of those systems and worst-case fire scenarios to size the firewater and foam pumps. The firewater demand indicated the warehouse building, which typically store spare parts and equipment as well as flammable and combustible materials (e.g., lube oil, solvents, etc.), would have a water sprinkler flow density that is reflective of extra hazard group 1. However, warehouses would typically be extra hazard group 2, which has higher water density requirements.[26] Therefore, we recommend Eagle LNG specify the design basis of the warehouse sprinkler system as extra hazard group 2 or justify an alternative design. Eagle LNG provided firewater coverage drawings for the firewater monitors and fire hydrants, however, where coverage circles intersect pipe racks, large vessels or process equipment, the firewater coverage could be blocked, and the coverage circles should be modified to account for obstructions during the final design. In addition, the firewater monitors do not reach the LNG storage tank. Eagle LNG indicated that firewater is not needed at the LNG storage tank because it is outside of the radiant heat zone of an impoundment fire. However, there are other sources of fire that could impact the LNG storage tank, such as jet fires. Therefore, we recommend Eagle LNG provide firewater coverage of the LNG storage tank. In addition, we recommend in section 4.12.6 that Eagle LNG

[26] NFPA 13 (2019 edition) defines five occupancies: light hazard, ordinary hazard group 1, ordinary hazard group 2, extra hazard group 1, and extra hazard group 2. Extra hazard group 1 is defined as occupancies or portions of other occupancies where the quantity and combustibility of contents are very high and dust, lint, or other materials are present, introducing the probability of rapidly developing fires with high rates of heat release, but with little or no combustible or flammable liquids. Extra hazard group 2 is defined as occupancies or portions of other occupancies with moderate to substantial amounts of flammable or combustible liquids or occupancies where shielding of combustibles is extensive.

complete and document the firewater monitor and hydrant coverage test to verify that actual coverage area from each monitor and hydrant as shown on facility plot plan(s).

FERC staff also assessed whether the reliability of the firewater pumps, firewater source, and on-site storage volume would be appropriate. Eagle LNG would provide a primary and backup firewater pump with different drivers per NFPA 20 and would include a firewater tank in accordance with NFPA 22. However, the data sheets did not make indication that the firewater tank would be designed to NFPA 22 and no specification has been provided. Therefore, we recommend the firewater tank specifications and final design information be provided. In addition, we recommend in section 4.12.6 that Eagle LNG file an updated fire protection evaluation on the final design, for review and approval, where details are yet to be determined (e.g., manufacturer and model, nozzle types, etc.) and where the final design could change as a result of these details or other changes in the final design of the project.

If the project is authorized, constructed, and operated, Eagle LNG would install the firewater and foam systems based on the final specifications and drawings, and we recommend in section 4.12.6 that project facilities be subject to periodic inspections during construction and that companies provide results of commissioning tests to verify the firewater and foam systems are installed and functional as designed prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.6 that project facilities be subject to regular inspections throughout the life of the facility to ensure firewater and foam systems are being properly maintained and tested.

Geotechnical and Structural Design Review

Eagle LNG provided geotechnical and structural design information for its facilities to demonstrate the site preparation and foundation designs would be appropriate for the underlying soil characteristics and to ensure the structural design of the project facilities would be in accordance with federal regulations, standards, and recommended and generally accepted good engineering practices. The application focuses on the resilience of the project facilities against natural hazards, including extreme geological, meteorological, and hydrological events, such as earthquakes, tsunamis, seiche, hurricanes, tornadoes, floods, rain, ice, snow, regional subsidence, sea level rise, landslides, wildfires, volcanic activity, and geomagnetism.

Geotechnical Evaluation

FERC regulations under 18 CFR 380.12 (h) (3) require geotechnical investigations to be provided. In addition, FERC regulations under 18 CFR 380.12 (o) (14) require an applicant to demonstrate compliance with regulations under 49 CFR 193 and NFPA 59A (2001). If authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to DOT’s inspection and enforcement programs. DOT regulations incorporate by reference NFPA 59A (2001). NFPA 59A (2001), section 2.1.4 requires soil and general investigations of the site to determine the design basis for the facility. However, no additional requirements are set forth in 49 CFR 193 or NFPA 59A on minimum requirements for evaluating existing soil site conditions or evaluating the adequacy of the foundations, therefore FERC staff evaluated the existing site conditions, geotechnical report, and proposed foundations to ensure they are adequate for the LNG facilities as described below.

Eagle LNG contracted Fugro to conduct geotechnical investigations to evaluate the existing soil site conditions and proposed foundation design for the proposed project. The existing site elevation ranges from +4 feet to +36 feet North American Vertical Datum of 1988 (NAVD88). The site would be cleared, grubbed, and prepared using standard earthmoving and compaction equipment. Site preparation would include cut and fill activities which would result in a final grade elevation being raised to elevations ranging from +13 to +27 feet (NAVD88) with the process trains, utility and auxiliary equipment at +27 feet, LNG storage tank at +15 feet, and the jetty access road sloping from +27 feet (north) to +13 feet (south). Berth dredging for the project is expected to provide 179,000 cubic yards of dredged material, which would be stored in an onsite DMMA large enough to accommodate the full volume of dredged material. No excess dredged material production is anticipated. Prior to each maintenance dredging event, material from the onsite DMMA would be disposed of at the JAXPORT local DMMA or used for other local area construction.

For the onshore facilities, Fugro conducted 47 soil borings to depths ranging from 10 feet to 150 feet below existing grade, 2 piezometric readings at 40 and 60 feet depths, and 2 downhole seismic tests. For the offshore marine facilities, AMEC Foster Wheeler conducted 15 borings and 7 more standard penetration tests to depths of 75 to 120 feet below the mudline completed in the berth area with an additional 8 standard penetration tests proposed. In addition, Fugro also conducted geophysical surveys to characterize the subsurface conditions. Geophyscial surveying included electrical resistivity tomography and seismic refraction. Fifteen different laboratory tests were conducted on 591 recovered onshore soil samples and three tests on 36 recovered offshore soil samples, including soil identification and classification tests, plasticity and density tests (water content, Atterberg liquid and plastic limits, sieve tests), strength and compressibility tests (consolidation tests, shear tests, triaxial tests), corrosion potential tests (pH, sulfate, chloride, electrical resistivity), and organic content tests in general accordance with pertinent ASTM standards. Rock coring and tests were also conducted in accordance with pertinent ASTM standards. FERC staff evaluated the geotechnical investigation to ensure the adequacy in the number, coverage, and type of the geotechnical borings and other tests, and found them to adequately cover all major facilities, including the marine facilities, LNG storage tank, liquefaction areas, pretreatment area, flare system, buildings, and the LNG storage tank tertiary berm. However, no Cone Penetration Tests (CPTs) or Seismic Cone Penetration Tests (SCPTs) were performed for onshore or offshore and no Standard Penetration Tests (SPTs) were performed for onshore. These tests are important to establish in-situ condition of the soil at various depths and are complimentary to borings. FERC staff recommended in section 4.12.6 of the draft EIS that Eagle LNG conduct and provide the results of CPTs, SCPTs, and/or SPTs prior to construction of final design. Eagle LNG commented that seismic reflection would be used to scan the subsurface conditions. Therefore, we have modified this recommendation in section 4.12.6 for Eagle LNG to file a geotechnical investigation and tests that verify the subsurface conditions as well as an analysis that confirms Eagle LNG's proposed ground improvement and includes any resulting foundation recommendations. FERC staff would continue its review of the results of the geotechnical investigation to ensure foundation designs are appropriate prior to construction of final design and throughout the life of the facilities.

Based on the onshore test borings conducted, silty sand soils are present from the surface to approximately 15 feet bgs, underlain by a clayey sand and silty sand to a depth of approximately 70 feet bgs. Clayey sands and silty sands are characterized by a lower permeability, which substantially impedes groundwater from traveling between the very fine gains downward into the strata. A limestone bed underlays the clayey sand and silty sands at a depth of approximately 70 feet bgs. The stratigraphic profiles suggest that the conditions for sinkholes to form are present, however, no karst has been identified through borings and subsequent laboratory testing. Corrosion tests indicate there is a high potential for corrosion of steel based on pH levels, mild potential based on electrical resistivity results, and moderate potential based on chloride ion concentrations. In addition, there is a mild potential for deterioration of concrete based on sulfate ion concentrations. Based on these results, the proposed project has considered the potential for corrosion in the design. Similar subsurface conditions existed offshore with 4 to 19 feet of mudline elevations underlain by clayey find sands and silty find sands to 33 feet with firm fine sands and slightly silty to silty find sands to 40 feet and limestone to depth of approximately 70 feet supported underneath to depths of 130 feet by the Hawthorn formation – a highly preconsolidated soil deposit.

Based on the subsurface conditions, shallow foundations would be suitable for some lightly to moderately loaded structures; however, as is common for heavier structures in areas with these types of soil conditions, the LNG storage tank, liquefaction trains, and associated structures would typically require deep foundations. However, Eagle LNG proposes that the LNG storage tank be supported by a shallow slab foundation combined with a gravel pad and soil improvement that includes stone columns. In order for this foundation system to function safely, Fugro indicates strict quality assurance and quality control measures be taken and field verification tests be conducted. Therefore, we recommend in section 4.12.6 that Eagle LNG provide additional tests to confirm the proposed ground improvement and foundation design are adequate, and provide its quality assurance and quality control procedures. We also recommend hydrostatic tests results be provided. Fugro recommended Eagle LNG to place foundations at a minimum depth of 4 feet below existing grade on natural and competent soil. If weak, loose, soft, or otherwise unsuitable materials are encountered at foundation depths, the foundation area should be over-excavated and backfilled with compacted granular fill or otherwise suitable material(s). Placed fill material would be compacted to 90 to 98 percent maximum dry unit weight, per ASTM D1557 depending on area and use. The proposed design would consider using pre-cast concrete piles and open-ended steel pipe piles for larger loaded equipment and critical equipment in the liquefaction and general process areas. Down-drag forces were not considered due to the granular material property of fill soils and in-situ soils as well as the interval of time between the site grading and load applications.

Subsidence is the sudden sinking or gradual downward settling of land with little or no horizontal motion, caused by movements on surface faults or by subsurface mining or pumping of oil, natural gas, or ground water. The results of Eagle LNG's geotechnical investigation at the proposed project site indicate that subsurface conditions are generally suitable for the proposed facilities if adequate site preparation, foundation design, and construction methods are implemented. Site preparation activities would be monitored to ensure adherence to the geotechnical design. Surface subsidence would be controlled by potential use of lime stabilization of the fill materials during placement and compaction. However, Eagle LNG addressed subsidence exclusively within the context of karst formations.

Eagle LNG contends that no active surface faults cross the project toward the site. According to the June 22, 2017 Supplemental Response to the April 28, 2017 Data Request, the closest known active tectonic fault is more than 125 miles from the proposed project site. Tectonic faults are distinct from highly localized small-scale faulting and geological discontinuities levels. FERC staff believe that Eagle LNG should also address the likelihood and severity of subsidence potentially caused by any local small-scale faulting. Because site-specific geotechnical mitigation has not incorporated into the proposed project (e.g., pile-supported foundations) in accordance with NFPA 59A (2001) and where applicable, NFPA 59A (2006), subsidence could be a significant hazard to the proposed facilities. Therefore, we recommend in section 4.12.6 that Eagle LNG file a site-specific analysis stamped and sealed by a professional engineer-of-record registered in the state of Florida to verify the underlying rock is competent to support the final design of foundations, including identifying the location, orientation, and inclination of any local faults or geological discontinuities in order to better characterize the risk of regional subsidence or surficial deformation.

The existing shoreline of the St. Johns River would be modified to construct and maintain an adequate berth to accommodate the full range of design ships. Dredging would make the river elevation -38.95 feet (NAVD88). To prevent slumping of the dredged slope, maintain the berthing line position, and provide structural integrity support to the landside facilities, the excavated shoreline would be reinforced with rip-rap armoring. The proposed rip-rap armoring would minimize the potential for erosion where the shoreline would be excavated. Eagle LNG would adopt recommendations provided by The Florida Department of Transportation concerning the selection of riprap materials (FDOT 2015, sec 530), with a median stone size guided by Hudson's Equation.

The results of Eagle LNG's geotechnical investigation at the project site indicate that subsurface conditions may be generally suitable for the proposed facilities, if proposed site preparation, foundation design, and construction methods and our recommendations are implemented, verified, and tested appropriately.

<u>Structural and Natural Hazard Evaluation</u>

FERC regulations under 18 CFR 380.12 (m) requires that applicants to address the potential hazard to the public from failure of facility components resulting from accidents or natural catastrophes, evaluate how these events would affect reliability, and describe the design features and procedures that would be used to reduce potential hazards. In addition, 18 CFR 380.12 (o) (14) require an applicant to demonstrate how they would comply with 49 CFR 193 and NFPA 59A. In addition, if authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to DOT's inspection and enforcement programs. DOT regulations under 49 CFR 193 have some specific requirements on designs to withstand certain loads from natural hazards and also incorporates by reference NFPA 59A (2001 and 2006) and ASCE 7-05 and ASCE 7-93 via NFPA 59A (2001). NFPA 59A (2001) Section 2.1.1(c) also requires that Eagle LNG consider the plant site location in the design of the project, with respect to the proposed facilities being protected, within the limits of practicality, against natural hazards, such as from the effects of flooding, storm surge, and seismic activities. This is covered in DOT PHMSA's LOD on 49 CFR 193 Subpart B. However, the LOD does not cover whether the facility is designed appropriately against these hazards, which is part of 49 CFR 193 Subpart C. Unlike other natural hazards, wind forces are covered in 49 CFR 193 Subpart B and are covered in the LOD. If authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, would be subject to DOT's inspection and enforcement programs. The marine facilities would be subject to 33 CFR 127, which requires if the waterfront facility handling LNG is in a region subject to earthquakes the piers and wharves must be designed to resist earthquake forces. In addition, Coast Guard regulations under 33 CFR 127 incorporates by reference certain portions of NFPA 59A (1994) and ASCE 7-88 via NFPA 59A (1994). However, Coast Guard regulations do not provide criteria for a region subject to earthquakes or the earthquake forces the piers and wharves are to withstand and NFPA 59A (1994) section referenced in 33 CFR 127 is for seismic design only and is applicable to stationary LNG containers, which would not be under 33 CFR 127. Therefore, we evaluated the basis of design for all facilities for all natural hazards under FERC jurisdiction, including those under DOT and Coast Guard jurisdiction.

In addition, the proposed facilities would be constructed to the requirements in the 2006 International Building Code, ASCE 7-05. These standards require various structural loads to be applied to the design of the facilities, including live (i.e., dynamic) loads, dead (i.e., static) loads, and environmental loads. FERC staff evaluated the potential of the engineering design to withstand impacts from natural hazards, such as earthquakes, tsunamis, seiche, hurricanes, tornadoes, floods, rain, ice, snow, regional subsidence, sea level rise, landslides, wildfires, volcanic activity, and geomagnetism. We recommend in section 4.12.6 that Eagle LNG file final design information (e.g., drawings, specifications, and calculations) and associated quality assurance and quality control procedures with the documents reviewed, approved, and stamped and sealed by a professional engineer-of-record registered in the state of Florida. If the project is authorized, constructed, and operated, Eagle LNG would install equipment in accordance with its final design. In addition, we recommend in section 4.12.6 that Eagle LNG file, for review and approval, settlement results during hydrostatic tests of the LNG storage container and periodically thereafter to verify settlement is as expected and does not exceed the applicable criteria in API 620, API 625, API 653, and ACI 376.

Earthquakes, Tsunamis, and Seiche

Earthquakes and tsunamis have the potential to cause damage from shaking ground motion and fault ruptures. Earthquakes and tsunamis often result from sudden slips along fractures in the earth's crust (i.e., faults) and the resultant ground motions caused by those movements, but can also be a result of volcanic activity or other causes of vibration in the earth's crust. The damage that could occur as a result of ground motions is affected by the type/direction and severity of the fault activity and the distance and type of soils the seismic waves must travel from the hypocenter (or point below the epicenter where seismic activity occurs). To assess the potential impact from earthquakes and tsunamis, Eagle LNG evaluated historic earthquakes along fault locations and their resultant ground motions.

The USGS maintains a database containing information on surface and subsurface faults and folds in the United States that are believed to be sources of earthquakes of greater than 6.0 magnitude occurring during the past 1.6 million years (Quaternary Period).[27] The location of the Jacksonville Project is within the Sea Island section of the Coastal Plain physiographic province. The Coastal Plain Province consists of mostly flat plains with marshes and swampy lowlands along the Gulf and Atlantic coasts. The province's 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 Province.

Eagle LNG conducted a site-specific seismic risk analysis for the proposed project involving field investigations and subsequent data evaluation. The presence or lack of seismically inactive faults does not determine the propensity for the project site to sustain seismic damage as a whole. Earthquakes can still occur locally or miles away, which can generate ground motions which can be felt large distances away from its hypocenter, depending on number of factors.

To address the potential ground motions at the proposed site, DOT regulations in 49 CFR 193.2101, under Subpart C, require that field-fabricated LNG tanks must comply with section 7.2.2 of NFPA 59A (2006) for seismic design. NFPA 59A (2006) requires LNG storage tanks to be designed to continue safely operating with earthquake ground motions at the ground surface at the site that have a 10 percent probability of being exceeded in 50 years (475-year mean return interval), termed the operating basis earthquake (OBE). In addition, DOT regulations in 49 CFR 193.2101, under Subpart C, require that LNG storage tanks be designed to have the ability to safely shutdown when subjected to earthquake ground motions which have a 2 percent probability of being exceeded in 50 years (2,475-year mean return interval) at the ground surface at the site (termed the safe shutdown earthquake [SSE]). DOT regulations in 49 CFR 193.2101, under Subpart C, also incorporate by reference NFPA 59A (2001) Chapter 6 which require piping systems conveying flammable liquids and flammable gases with service temperatures below -20 degrees Fahrenheit, be designed as required for seismic ground motions. If authorized, constructed, and operated, the proposed LNG facilities, as defined in 49 CFR 193, would be subject to the DOT's inspection and enforcement programs.

In addition, FERC staff recognizes Eagle LNG would also need to address hazardous fluid piping with service temperatures at -20 degrees Fahrenheit and higher and equipment other than piping and LNG storage containers. We also recognize the current FERC regulations under Title 18 CFR 380.12 (h) (5) continues to incorporate National Bureau of Standards Information Report (NBSIR) 84-2833. NBSIR 84-2833 provides guidance on classifying stationary storage containers and related safety equipment as Category I and classifying the remainder of the LNG project structures, systems, and components as either Category II or Category III, but does not provide specific guidance for the seismic design requirements for them. Absent any other regulatory requirements, this guidance recommends that other LNG project

27 USGS. Earthquake Hazards Program. Quaternary Fault and Fold Database of the United States. Available at: https://earthquake.usgs.gov/hazards/qfaults/. Accessed August 2018

structures classified as Seismic Category II or Category III be seismically designed to satisfy the Design Earthquake and seismic requirements of the ASCE 7-05 in order to demonstrate there is not a significant impact on public safety. ASCE 7-05 is recommended as it is a complete American National Standards Institute (ANSI) consensus design standard, its seismic requirements are based directly on the National Earthquake Hazards Reduction Program (NEHRP) Recommended Provisions, and it is referenced directly by the International Building Code (IBC). Having a link directly to the IBC and ASCE 7 is important to accommodate seals by the Engineer of Record because the IBC is directly linked to state professional licensing laws while the NEHRP Recommended Provisions are not.

The geotechnical investigation of the proposed site indicates the site is classified as Site Class D[28] in accordance with ASCE 7-05 and in accordance with IBC 2006. Sites with soil conditions of this type could experience significant amplifications of surface earthquake ground motions. Eagle LNG performed a site-specific seismic hazard study for the site. According to ASCE 7-05, shear velocities ranging from 600-1200 ft/second classifies a site as Site Class D. The study found that shear wave velocity profiles for the site ranged between approximately 540 ft/second and 1180 ft/second, placing the site within site classification of Site Class D, with offshore portions classified as Site Class F. However, due to the absence of a major fault in proximity to the site and lower ground motions, the seismic risk to the proposed site is considered low.

Fugro's report concluded that earthquake ground motions given Site Class D considering the site soil conditions with a 10 percent probability of being exceeded in 50 years (OBE) has a peak ground acceleration (PGA) of 0.0365 gravity (g) in the LNG storage tank area and PGA of 0.045 g in the LNG train area. The report also concluded that the site specific earthquake ground motions considering the site soil conditions with a 2 percent probability of being exceeded in 50 years (SSE) has a PGA of 0.108 g in the LNG tank area and PGA of 0.128 g in the LNG train area. The Fugro report also provides site specific Design Earthquake ground motion values S_{DS} and S_{D1} determined in accordance with ASCE 7-05 that that used for the Seismic Category II and III structures, components, and systems. FERC staff independently evaluated the OBE PGA, SSE PGA, 0.2-second design spectral acceleration, and 1.0-second design spectral accelerations for the site using the USGS Earthquake Hazards Program Seismic Design Maps[29] and Unified Hazard[30] tools for all occupancy categories (I through IV). We determined that the SSE PGA, OBE PGA, and 5 percent damped spectral design accelerations used by Eagle LNG are acceptable. These ground motions are relatively low compared to other locations in the United States. Based on the design ground motions for the site and the importance of the facilities, the facility seismic design is assigned Seismic Category I for LNG containers, systems required for isolation of LNG containers, and systems required for safe shutdown or fire protection. Seismic Category II structures include facilities and systems not included in Category I required for safe plant operation, which include the liquefaction trains, inlet facilities, pre-treatment area, fuel gas system, interconnecting piping systems, metering systems, LNG pumps, and other major systems. Seismic Category III includes all other facilities that are not included in Categories I and II, including administration buildings, dock service equipment, waste treatment plant, and incoming electrical power supply.

ASCE 7-05 also requires determination of the Seismic Design Category based on the Occupancy Category (or Risk Category in ASCE7-10 and 7-16) and severity of the earthquake design motion. The

28 There are six different site classes in ASCE 7-05, A through F, that are representative of different soil conditions that impact the ground motions and potential hazard ranging from Hard Rock (Site Class A), Rock (Site Class B), Very dense soil and soft rock (Site Class C), Stiff Soil (Site Class D), Soft Clay Soil (Site Class E), to soils vulnerable to potential failure or collapse, such as liquefiable soils, quick and highly sensitive clays, and collapsible weakly cemented soils (Site Class F).

29 USGS, Changes to U.S. Seismic Design Maps Web Tools, https://earthquake.usgs.gov/designmaps/us/application.php, accessed October 2018.

30 USGS, Unified Hazards Tool, https://earthquake.usgs.gov/hazards/interactive/, accessed October 2018.

Occupancy Category (or Risk Category) is based on the importance of the facility and the risk it poses to the public.[31] FERC staff has identified the project as a Seismic Design Category B or C based on the ground motions for the site and an Occupancy Category (or Risk Category) of III or IV. This seismic design categorization would appear to be consistent with the 2006 IBC and ASCE 7-05 (and ASCE 7-10).

Seismic events can also result in soil liquefaction in which saturated, non-cohesive soils temporarily lose their strength/cohesion and liquefy (i.e., behave like viscous liquid) as a result of increased pore pressure and reduced effective stress when subjected to dynamic forces such as intense and prolonged ground shaking. Areas susceptible to liquefaction may include saturated soils that are generally sandy or silty. Typically, these soils are located along rivers, streams, lakes, and shorelines or in areas with shallow groundwater. The site-specific seismic study conducted for the proposed project documented a sandy strata that could be liquefiable, however, the potential for a large enough seismic event near enough to cause soil liquefaction in the proposed project area is low. LNG facilities constructed on deep foundations would be less susceptible to the effects of soil liquefaction, however, piles would need to consider the effects of downdrag forces. In contrast, the LNG storage tank is proposed to be constructed on shallow foundations with ground improvement.

Seismic events in waterbodies can also cause tsunamis or seiches by sudden displacement of the sea floors in the ocean or standing water. Tsunamis and seiche may also be generated from volcanic eruptions or landslides. Wave action generated by these events can cause extensive damage to coastal regions. It is possible for a seismic activity off the coast of Florida or near the Bahamas to cause an underwater landslide from which a tsunami wave could originate. If a tsunami occurs, the proposed project would be vulnerable to tsunami impact due to its proximity to the coast. However, NOAA currently considers the east coast of Florida to be at low risk for this event. The last documented tsunami to hit Jacksonville, Florida occurred in 1886, originating from a 7.7-magnitude earthquake originating near Charleston, South Carolina. Historically, tsunami run-up elevations outside of the western coast are significantly less than the hurricane design storm surge elevations discussed below, so any tsunami hazard has been considered in design.

Hurricanes, Tornadoes, and other Meteorological Events

Hurricanes, tornadoes, and other meteorological events have the potential to cause damage or failure of facilities due to high winds and floods, including failures from flying or floating debris. To assess the potential impact from hurricanes, tornadoes, and other meteorological events, Eagle LNG evaluated such events historically. The severity of these events are often determined on the probability that they occur and are sometimes referred to as the average number years that the event is expected to re-occur, or in terms of its mean return/recurrence interval.

Because of its location, the proposed project site would likely be subject to hurricane force winds during the life of the project. Eagle LNG states that all project facilities would be designed to withstand a 183-mph 3-second gust and would have a 1.6 wind load factor applied when converting the wind speed to a wind load factor in accordance with ASCE 7-05. A 183 mph 3-second gust would convert to a sustained wind speed of 150 mph using the Durst Curve in ASCE 7-05 or using a 1.23 gust factor recommended for

[31] ASCE 7-05 defines Occupancy Categories I, II, III, and IV. Occupancy Category I represents facilities with a low hazard to human life in even of failure, such as agricultural facilities; Occupancy Category III represents facilities with a substantial hazard to human life in the event of failure or with a substantial economic impact or disruption of day to day civilian life in the event of failure, such as buildings where more than 300 people aggregate, daycare facilities with facilities greater than 150, schools with capacities greater than 250 for elementary and secondary and greater than 500 for colleges, health care facilities with 50 or more patients, jails and detention facilities, power generating stations, water treatment facilities, telecommunication centers, hazardous facilities that could impact public; Occupancy Category IV represents essential facilities, such as hospitals, fire, rescue, and police stations, emergency shelters, power generating stations and utilities needed in an emergency, aviation control towers, water storage and pump structures for fire suppression, national defense facilities, and hazardous facilities that could substantially impact public; and Occupancy Category II represents all other facilities. ASCE 7-10 changed the term to Risk Categories I, II, III, and IV with some modification.

offshore winds at a coast line in World Meteorological Organization, Guidelines for Converting between Various Wind Averaging Periods in Tropical Cyclone Conditions. These wind speeds are equivalent to approximately 95,000-year mean return interval or 0.05 percent probability of exceedance in a 50-year period for the site based on the ASCE 7-05 wind speed return period conversions. The 183 mph 3-second gust equates to a strong Category 4 Hurricane using the Saffir-Simpson scale (130-156 mph sustained winds, 166 195 mph 3-second gusts). Eagle LNG must meet 49 CFR 193.2067, under Subpart B, for wind load requirements. In accordance with the MOU, the DOT evaluated in its LOD whether an applicant's proposed project meets the DOT siting requirements under Subpart B. If the project is authorized, constructed, and operated, the LNG facilities, as defined in 49 CFR 193, would be subject to the DOT's inspection and enforcement programs. Final determination of whether the facilities are in compliance with the requirements of 49 CFR 193 would be made by the DOT staff.

However, as noted in section 6.5.4.3 of ASCE 7-05 (wind speed limitation), tornadoes were not considered in developing basic wind speed distributions. This leaves a potential gap in potential impacts from tornadoes. Therefore, FERC staff evaluated the potential for tornadoes. Appendix C of ASCE 7-05 makes reference to American Nuclear Society 2.3 (1983 edition), Standard for Estimating Tornado and Extreme Wind Characteristics at Nuclear Power Sites. This document has since been revised in 2011 and reaffirmed in 2016 and is consistent with NUREG/CR 4461, Tornado Climatology of the Contiguous U.S. Rev. 2 (NUREG2007). These documents provide maps of a 100,000-year mean return period for tornadoes using 2° latitude and longitude boxes in the region to estimate a tornado striking within 4,000-ft of an area. Figures 5-8 and 8-1 from NUREG/CR-4461 indicate a 100,000-year maximum tornado wind speeds would be approximately 127 mph 3-second gusts for the proposed project site location. Later editions of ASCE 7 (ASCE 7-10 and ASCE 7-16) make reference to International Code Council 500, Standard for Design and Construction of Storm Shelters, for 10,000-year tornadoes. However, the International Code Council 500 maps were conservatively developed based on tornadoes striking regions and indicate a 200 mph 3-second gust for a 10,000-year event, which is higher than the 127 mph 3-second gust in American Nuclear Society 2.3 and NUREG/CR 4461. As a result, FERC staff believe the use of a of 150 mph sustained wind speed, 183 mph 3-second gust, is adequate for the proposed LNG storage tank and conservative from a risk standpoint for the other LNG facilities.

ASCE 7 also recognizes the proposed site would be in a wind borne debris region. Wind borne debris has the potential to perforate equipment and the LNG storage tank if not properly designed to withstand such impacts. The potential impact is dependent on the equivalent projectile wind speed, characteristics of projectile, and methodology or model used to determine whether penetration or perforation would occur. However, no criteria are provided in 49 CFR 193 or ASCE 7 for these specific parameters. NFPA 59A (2016 and 2019) also requires that ACI 376 and Comité Euro-International du Béton (CEB) 187 be used to determine projectile perforation and scabbing depths. In order to address the potential impact, we recommend in section 4.12.6 that Eagle LNG provide a projectile analysis, for review and approval, to demonstrate that the outer concrete impoundment wall of the full-containment LNG tank could withstand wind borne projectiles prior to construction of the final design. The analysis should detail the projectile speeds and characteristics and method used to determine penetration or perforation depths. Eagle LNG commented that an analysis would be performed to determine the ability of the outer tank wall to resist an impact from a 100 lb. rigid body moving at a velocity of 100 mph and the impact loading would be evaluated and analyzed for the acceptance criteria stated in ACI 376. We recognize ACI 376 and CEB 187 are both referenced in newer editions of NFPA 59A. However, CEB 187 generally provides more conservative results than ACI 376. FERC staff would compare the analysis and specified projectiles and speeds using established methods, such as ACI 376, CEB 187, and DOE and Nuclear Regulatory Commission (NRC) guidance.

In addition, FERC staff evaluated historical tropical storm, hurricane, and tornado tracks in the vicinity of the project facilities using data from the DHS Homeland Infrastructure Foundation Level Data and NOAA Historical Hurricane Tracker.[32,33] The proposed Project location has historically experienced flooding caused by hurricanes and associated storm surges. Since 1900, a total of 12 hurricanes and 32 tropical storms have made land fall within 65 nautical miles of the project location, the most recent being Hurricane Matthew in 2016. Only two of the hurricanes were considered major (Category 3 or higher) – 1964 Hurricane Dora (Category 4 at peak, but Category 2 at landfall) and 2016 Hurricane Matthew (Category 5 at peak, but Category 3 when located offshore near Jacksonville). Eagle LNG's proposed wind speed basis of design would withstand these events.

Potential flood levels may also be informed from the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps, which identifies Special Flood Hazard Areas (base flood) that have a 1 percent probability of exceedance in 1 year to flood (or a 100-year mean return interval) and moderate flood hazard areas that have a 0.2 percent probability of exceedance in 1 year to flood (or a 500-year mean return interval). According to the FEMA National Flood Hazard Layer, portions of the proposed site would be located in the 100-year and 500-year floodplain. In addition, According to FEMA flood hazard maps (2016), the 100-year flood elevation at the site is 4.9 feet (NAVD88) and the 500-year flood elevation is 7.0 feet (NAVD88). We recognize that a 500-year flood event has been recommended as the basis of design for critical infrastructure in publications, including ASCE 24, *Flood Resistant Design and Construction*. Therefore, we believe it is good practice to design critical energy infrastructure to withstand 500-year event from a safety and reliability standpoint for both storm surge still water elevation (SWEL) and wave crests. Eagle LNG has proposed to design the project to withstand a 500-year flood event. Furthermore, Eagle LNG determined the maximum wave height using Sverdrup-Munk-Bretschneider models which incorporate surge water levels and corresponding wind speeds. The significant wave height for a 500-year occurrence was 5 feet with a maximum probable wave height of 9.3 feet.

We evaluated the maximum envelope of water (MEOW) storm surge inundation maps generated from the Sea, Lake, and Overland Surge from Hurricanes (SLOSH) model developed by NOAA National Hurricane Center. A 500-year event would equate to a Category 2 Hurricane and approximately 3-9 feet MEOW.[34] This is within the range indicated in the 500-year FEMA maps. In addition, while NOAA seems to provide higher resolution of topographic features, it limits its SLOSH maps to storm surge levels at high tide above 9 feet. As a result, we evaluated the storm surge against other sources using SLOSH maps that indicate a similar upper range of 6-9 feet MEOW for Category 2 Hurricanes, and also and also indicated 8-11 feet MEOW for Category 3 Hurricanes, 11-14 feet MEOW for Category 4 Hurricanes, and 14-17 feet MEOW for Category 5 Hurricanes.[35] This data suggests that the proposed site may withstand Category 3 or 4 Hurricane storm surge SWEL. In addition, significant wave heights would likely impact the channel side but would not reach the landward side where the LNG facilities are located where the finished grade elevations +13 to +15 ft with a tertiary berm + 27 ft and a 3 ft high concrete wall on top of the tertiary berm for the LNG tank for a top elevation of +30 ft.

Long-term sea level rise could contribute to flooding of the proposed site. Eagle LNG indicated that according to NOAA estimates with a 95 percent confidence interval that the sea level would rise near the mouth of the St. Johns River 2.50 mm/year which equates to between 4.9 and 5.5 inches over the 50-year project life. Typically, global warming and the melting of polar ice is attributed as the cause of sea level rise, but changes in coastal geology can be an exacerbating factor as well. Subsidence and accretion

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32 DHS. Homeland Infrastructure Foundation Level Data. Available at: https://hifld-geoplatform.opendata.arcgis.com/. Accessed August 2018.

33 NOAA. Historical Hurricane Tracker. Available at: https://coast.noaa.gov/hurricanes/. Accessed August 2018.

34 U.S. Department of Commerce. NOAA. National Hurricane Center. National Storm Surge Hazard Maps. Available at: https://www.nhc.noaa.gov/nationalsurge/#pop. Accessed August 2018.

35 Masters. J. Weather Underground. Storm Surge Inundation Maps for the U.S. Coast. Available at: https://www.wunderground.com/hurricane/surge_images.asp. Accessed August 2018.

near the mouth of the St. Johns River would also potentially increase the water level near the coast and only the riverside. We believe the use of intermediate values from NOAA for sea level rise and subsidence is more appropriate for design and higher projections are more appropriate for planning in accordance with NOAA (2017)[36] which recommends defining a central estimate or mid-range scenario as baseline for shorter-term planning, such as setting initial adaptation plans for the next two decades and defining upper bound scenarios as a guide for long-term adaptation strategies and a general planning envelope. NOAA (2017) indicates an intermediate projected sea level rise and subsidence of approximately 0.95 ft between 2020 and 2050.

The total potential flood depth is computed by adding the anticipated sea level rise to the 500-year flood elevation and wave height. Eagle LNG proposed 7.0 ft SWEL, 5.0 ft significant wave height, plus sea level rise of approximately ½ feet equals approximately 12.5 feet (NAVD88) of potential flood depth. We generally evaluate the design against a 500-year SWEL with a 500-year significant wave height, and sea level rise and subsidence. We estimated a 6-9 ft SWEL, 3.5-6.5 ft significant wave height, and approximately 1 ft sea level rise and subsidence for a potential inundation level of 10.5-16.5 ft. However, the waves would only likely impact near shore and not where the pretreatment, liquefaction, and LNG storage tank would be located based on FEMA's Flood Insurance Rate Map, which shows the facilities would be beyond the limit of moderate wave action and outside of the VE (velocity wave) zone that corresponds to the 100-year (1 percent annual chance) coastal floodplains that have additional hazards associated with storm waves. The pretreatment, liquefaction, and LNG storage tank are also outside the 500-year (0.2 percent annual chance) flood area. The only facility that lies within the VE zone is the marine facility, which would not be operated during a significant storm event.

Given the uncertainty in the 500-year SWEL data, 500-year wave data, SLOSH maps, sea level rise and subsidence projections, and settlement projections and uncertainties, FERC staff believes that the +13 to +15 site elevation would provide adequate protection of the Eagle LNG site where waves would not be expected and should be periodically monitored and maintained. Where waves could impact the site, Eagle LNG indicated there could be potential overtopping of the revetment stone in the event of a 500-year storm event, however, Eagle LNG did not provide a wave run-up calculation or state if the same would be the case for a 100-year storm. Regardless, due to the terminal being located outside of the VE zone, with the exception of the marine facility, the wave run-up would not impact the facility.

Shoreline erosion, and generally the recession of land, is a relevant concern for the gulf coast of Florida. Aerial photography comparing images of 1994 to 2015 indicate little, if any, erosion to the scarp surrounding the project. New rubble revetment and vegetation would help prevent erosion along the riverbank. Absent a significant weather event, the future impact of erosion is likely minimal.

<u>Landslides and other Natural Hazards</u>

Landslides are highly localized risks subject to specific rock and soil and conditions. Materials can form a landslide when subjected to a seismicity, flooding, or another event that applies a load exceeding static resistant forces. This is particularly true when material properties of the local strata include poor particle cohesion, high moisture content, and minimal compaction. Additionally, the relief of a potential land slide location is a significant factor for determining the probability of a land slide occurring, as the force applied from driving load increases as the angle of slope inclination from horizontal becomes steeper.

36 Global and Regional Sea Level Rise Scenarios for the United States. U.S. Department of Commerce. National Ocean and Atmospheric Administration. National Ocean Service Center for Operational Oceanographic Products and Services. January 2017.

Due to the low relief across the Eagle LNG site and absence of major seismic activity, there is little likelihood that landslides or slope movement at the site would be a realistic hazard.

Volcanic activity is primarily a concern along plate boundaries on the West Coast and Alaska and also Hawaii. Based on FERC staff review of maps from USGS[37] and DHS[38] of the nearly 1,500 volcanoes with eruptions since the Holocene period (in the past 10,000 years) there are no known active or historic volcanic activity for more than 1,000 miles away across the Gulf of Mexico in Los Atlixcos, Mexico.

Geomagnetic disturbances (GMDs) may occur due to solar flares or other natural events with varying frequencies that can cause geomagnetically induced currents, which can disrupt the operation of transformers and other electrical equipment. The USGS provides a map of GMD intensities with an estimated 100-year mean return interval.[39] The map indicates the Eagle LNG site could experience GMD intensities of -30 to 0 nano-Tesla with a 100-year mean return interval. However, the project would be designed such that if a loss of power were to occur the valves would move into a fail-safe position. In addition, Eagle LNG would only serve U.S. customers via trucking, which would likely only be temporarily interrupted by such events.

Karst formations develop in carbonaceous geology, such as limestone or dolomite, subject to dissolution from groundwater weathering. Weathering weakens the rock thereby reducing the load it can bear incrementally until brittle failure. Hazardous geological structures, such as sink holes, may form in this process. Near surface geology impacts the propensity for karst structures to form, as water must successfully permeate the soil and rock profiles overlapping carbonaceous geology. Eagle LNG stated its intention to develop preventative and responsive mitigation plans regarding sinkhole formation. Sink holes have the potential to form in karst geology and to expand rapidly undetected beneath a structure's foundation which would pose a risk to the reliability of the foundations. Eagle LNG indicated that proposed mitigation plans would be developed during the construction phase of the project. However, due to the uncertainty and rapid formation nature of sink holes, we believe that preventative aspects of the plan should be implemented prior to initial site preparation. Therefore, we recommend in section 4.12.6 that Eagle LNG file a plan for continuous monitoring of surface and subsurface conditions to detect early signs of sinkhole formation throughout the life of the LNG terminal, as well as a response plan in the event of a sinkhole formation.

External Impact Review

To assess the potential impact from external events, FERC staff conducted a series of reviews to evaluate transportation routes, land use, and activities within the facility and surrounding the Jacksonville Project site and the safeguards in place to mitigate the risk from events, where warranted. FERC staff coordinated the results of the reviews with other federal agencies to assess potential impacts from vehicles and rail; aircraft impacts to and from nearby airports and heliports; pipeline impacts from nearby pipelines; impacts to and from adjacent facilities that handle hazardous materials under the EPA's Risk Management Plan (RMP) regulations and power plants, including nuclear facilities under the Nuclear Regulatory Commission's regulations. Specific mitigation of impacts from use of external roadways, rail, helipads, airstrips, or pipelines are also considered as part of the engineering review done in conjunction with the NEPA review.

[37] United States Geological Survey. U.S. Volcanoes and Current Activity Alerts. Available at: https://volcanoes.usgs.gov/index.html. Accessed August 2018.

[38] Department of Homeland Security. Homeland Infrastructure. Foundation-Level data (HIFLD). Natural Hazards. Available at: hifld-geoplatform.opendata.arcgis.com. Accessed Aug 2018

[39] United States Geological Survey. Magnetic Anomaly Maps and Data for North America. Available at: https://mrdata.usgs.gov/magnetic/map-us.html#home. Accessed August 2018.

FERC staff uses a risk-based approach to assess the potential impact of the external events and the adequacy of the mitigation measures. The risk-based approach uses data based on the frequency of events that could lead to an impact and the potential severity of consequences posed to the Jacksonville Project site and the resulting consequences to the public beyond the initiating events. The frequency data is based on past incidents and the consequences are based on past incidents and/or hazard modeling of potential failures.

Road

FERC staff reviewed whether any truck operations would be associated with the project and whether any existing roads would be located near the site. FERC staff uses this information to evaluate whether the project and any associated truck operations could increase the risk along the roadways and subsequently to the public and whether any pre-existing unassociated vehicular traffic could adversely increase the risk to the project site and subsequently increase the risk to the public. In addition, if authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to the DOT's inspection and enforcement programs. DOT regulations under 49 CFR 193.2155(a)(5)(ii), under Subpart C, require that structural members of an impoundment system must be designed and constructed to prevent impairment of the system's performance reliability and structural integrity as a result of a collision by or explosion of a tank truck that could reasonably be expected to cause the most severe loading if the liquefaction facility adjoins the right-of-way of any highway. Similarly, NFPA 59A (2001), section 8.5.4, incorporated by reference in 49 CFR 193, requires transfer piping, pumps, and compressors to be located or protected by barriers so that they are safe from damage by rail or vehicle movements. However, the DOT regulations and NFPA 59A (2001) requirements do not indicate what collision(s) or explosion(s) could reasonably be expected to cause the most severe loading. FERC staff evaluated consequence and frequency data from these events to evaluate these potential impacts.

FERC staff evaluated the risk of the truck operations based on incident data from the DOT Federal Highway Administration (FHWA), DOT National Highway Traffic Safety Administration (NHTSA), DOT PHMSA, EPA, NOAA, and other sources[40,41,42,43], consequences from a release, frequency of trucks, proximity of nearby roads to the plant, and proposed mitigation that would prevent or reduce the impacts of a vehicular incident.

The DOT FHWA, DOT NHTSA, and DOT PHMSA incident data indicates hazardous material incidents are very infrequent (4e-3 incidents per lane-mile per year) and nearly 75-80 percent of hazardous material vehicular incidents occur during unloading and loading operations while the other 20-25 percent occur while in transit or in transit storage. In addition, approximately 99 percent of releases are 1,000 gallons or less and catastrophic events that would spill 10,000 gallons or more make up less than 0.1 percent of releases. In addition, less than 1 percent of all reportable hazardous material incidents with spillage result in injuries and less than 0.1 percent of all reportable hazardous material incidents with spillage result in fatalities.

The EPA and NOAA report that 80 percent of fires that lead to container ruptures results in projectiles and that 80 percent of projectiles from liquefied petroleum gas (LPG) incidents, which constitute the largest product involved in BLEVEs, travel less than 660 feet. The EPA and NOAA also report that

40 U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration, ALOHA®, User's Manual, The CAMEO® Software System, February 2007.

41 Birk, A.M., BLEVE Response and Prevention Technical Documentation, 1995.

42 American Institute of Chemical Engineers, Center for Chemical Process Safety, Guidelines for Vapor Cloud Explosion, Pressure Vessel Burst, BLEVE, and Flash Fire Hazards, Second Edition, 2010.

43 Lees, F.P, Lees Loss Prevention in the Process Industries, Hazard Identification, Assessment, and Control, Volume 2, Second Edition, 1996.

container ruptures would average less than four projectiles for cylindrical containers and 8.3 for spherical vessels. FERC staff evaluated other reports that affirmed the EPA and NOAA estimates based on data for approximately 150 experimental and accidental pressure vessel bursts (PVB) and BLEVEs with approximately 683 total projectiles (4.6 average fragments per incident) that showed approximately 80 percent of fragments traveled 490 to 820 feet and within 6.25 times the estimated or observed fireball radius. The data also showed projectiles have traveled up to 3,900 feet for large LPG vessels and 1,200 feet for LPG rail cars. In all the documented cases, the projectiles traveled less than 15 times the fireball diameter, but one of the reports indicated up to 30 times the fireball diameter is possible albeit very rare.

Unmitigated consequences under average ambient conditions from releases of 1,000 gallons through a 1-inch hole would result distances ranging from 25 to 200 feet for flammable vapor dispersion, and 75 to 175 feet for jet fires. Unmitigated consequences under worst case weather conditions from catastrophic failures of trucks proposed at the site generally can range from 200 to 2,000 feet for flammable vapor dispersion, 275 to 350 feet for radiant heat of $5kW/m^2$ from jet fires, 800 to 1,050 feet to a 1 psi overpressure from a BLEVE, 850 to 1,500 feet for a heat dose equivalent to a radiant heat of $5kW/m^2$ over 40 seconds from 250 to 325 feet radii fireballs burning for 5 to 15 seconds from a BLEVE, and projectiles from BLEVEs possibly extending farther. Based on a distribution function of the projectile distances, FERC staff estimate approximately 90 percent of all projectiles for a 10,000 gallon tanker truck would be within 0.5 mile and there is approximately a 1 percent probability they would extend beyond 1 mile and less than 0.1 percent probability they would extend 30 times the fireball diameter. These values are also close to the distances provided by DOT FHWA for designating hazardous material trucking routes (0.5 mi for flammable gases for potential impact distance) and DOT PHMSA for emergency response (0.5-1 mi for initial evacuation and 1 mi for potential BLEVEs for flammable gases).

During operation of the project, Eagle LNG estimates an average of 10 LNG trucks and 2 heavy hydrocarbon trucks would be loaded at the site weekly, and 12 refrigerant make-up trucks and 50 liquid nitrogen trucks would visit the site annually. State Road (SR) 105, also known as Heckscher Drive and Zoo Parkway, is located directly to the north of the facility property and would be used to access the Jacksonville Project site. SR 105 is a four lane bi-directional route with a 45 mph speed limit. Eagle LNG intends to construct a median cut for the main entrance, an emergency exit to SR 105, and acceleration and deceleration lanes compliant with Florida Department of Transportation design standards to mitigate the anticipated traffic increase throughout construction and operation of the proposed Project.

The Eagle LNG facilities containing hazardous fluids within proximity to SR 105 would include the generator and pretreatment area approximately 150 feet from the road, the refrigerant storage area approximately 400 feet from the road, the liquefaction facilities approximately 450 feet from the road, and the LNG storage tank approximately 590 feet from the road. All of these facilities would be set back far enough from the road to not to pose a potential concern from a vehicle veering off SR 105, and there were no other major highways or roads within close proximity to piping or equipment containing hazardous materials at the site that would raise concerns of direct impacts from a vehicle impacting the site. Each entrance would also have vehicular barriers to further mitigate accidental and intentional vehicle impacts. However, details of these have not been finalized. Therefore, FERC staff recommends in section 4.12.6 that Eagle LNG provide, for review and approval, final design details of vehicular barriers at each entrance to the site. In addition, most of these facilities, with exception of the generators and pretreatment equipment, would be set back farther than the hazard distances from the smaller 1,000 gal or less releases constituting approximately 99% of all hazardous material incidents, Most of these facilities with exception of generator and pretreatment area would also be farther than the worst case jet fires from the 10,000 gal or more releases constituting 1% of the hazardous material incidents described above. However, most of the facilities would be within range of the potential worst case unmitigated flammable vapor dispersion, fireball, and BLEVE impacts from the 10,000 gal or more releases constituting 1% of the hazardous material incidents.

In total, there is approximately 2.26 miles of road within 1 mile of the Jacksonville Project's 1,600,000 ft^2 footprint with approximately 160,000 ft^2 constituting the generator and pretreatment area, approximately 50,000 ft^2 of refrigerant storage area, 270,000 ft^2 of the liquefaction area, and approximately 20,000 ft^2 of the LNG storage tank. Unmitigated flammable vapors that reach onsite and ignite could impact workers, but it would not likely cause any cascading failures that would impact the public. In addition, vapor barriers for the site would likely mitigate flammable vapors that disperse from an incident from reaching onsite. An unmitigated jet fire from an incident could also potentially impact workers onsite and could have the potential of damaging the equipment. However, vapor barriers, passive structural fire protection, and firewater would be installed at the site that would prevent or mitigate these hazards. A fireball from a BLEVE could burn workers located onsite, but there would not likely be any cascading failures to onsite equipment that would impact the public. Projectiles from BLEVEs have the potential to impact workers located onsite and cause cascading damage that could impact the public if it were to reach and perforate the LNG storage tank. However, the LNG storage tank is approximately 590 feet away and less than 60% of projectiles would be able to extend far enough to reach the tank and the tank would constitute less than 1% of a potential impact area from projectiles that could reach that far. Moreover, the LNG storage tank would also be designed to withstand certain projectiles that would further protect it from cascading effects. In addition, Eagle LNG would coordinate with local emergency responders with regard to potential hazardous material vehicular incidents nearby its site.

Due to the low risk of a vehicular incident occurring that could directly impact the site, the low risk of hazardous material truck incidents, the low risk of a hazardous material truck incidents impacting the site that would cause cascading damage that could impact the public, and the proposed and recommended mitigation, we conclude the proposed Project would not pose a significant risk or significant increase in risk to the public from external impacts occurring on the road.

Rail

FERC staff generally reviews whether any rail operations would be associated with the project and whether any existing rail lines would be located near the site. FERC staff uses this information to evaluate whether the project and any associated rail operations could increase the risk along the rail line and subsequently to the public and whether any pre-existing unassociated rail operations could adversely increase the risk to the Eagle LNG site and subsequently increase the risk to the public. In addition, if authorized, constructed, and operated, LNG facilities, as defined in 49 CFR 193, once constructed, must comply with the requirements of 49 CFR 193 and would be subject to the DOT's inspection and enforcement programs. DOT regulations under 49 CFR 193.2155 (a) (5) (ii), under Subpart C, state that if the LNG facility adjoins the right-of-way of any railroad, the structural members of an impoundment system must be designed and constructed to prevent impairment of the system's performance reliability and structural integrity as a result of a collision by or explosion of a train or tank car that could reasonably be expected to cause the most severe loading. Section 8.5.4 of NFPA 59A (2001), incorporated by reference in 49 CFR 193, requires transfer piping, pumps, and compressors to be located or protected by barriers so that they are safe from damage by rail or vehicle movements. However, since the DOT regulations and NFPA 59A (2001) requirements do not indicate what collision(s) or explosion(s) could reasonably be expected to cause the most severe loading. Therefore, FERC staff evaluated consequence and frequency data from these events to evaluate these potential impacts. There would be no rail transportation associated with the Jacksonville Project.

FERC staff evaluated the risk of the rail operations based on incident data from the DOT Federal Rail Administration (FRA), DOT PHMSA, EPA, NOAA, and other reports, the consequences from a release, frequency of rail operations nearby Eagle LNG, proximity of nearby rail to the plant, and proposed mitigation that would prevent or reduce the impacts of a rail incident.

DOT FRA and DOT PHMSA incident data indicates hazardous material incidents are very infrequent (6e-3 incidents per rail-mile per year). In addition, approximately 95 percent of releases are 1,000 gallons or less and catastrophic events that would spill 30,000 gallons or more make up less than 1% of releases. In addition, less than 1% of hazardous material incidents result in injuries and less than 0.1% of hazardous material incidents result in fatalities.

As previously discussed, the EPA and NOAA report that 80 percent of fires that lead to container ruptures results in projectiles and that 80 percent of projectiles from LPG incidents, which constitute the largest product involved in BLEVEs, travel less than 660 feet. The EPA and NOAA also report that container ruptures average less than four projectiles for cylindrical containers and 8.3 for spherical vessels. FERC staff evaluated other reports that affirmed the EPA and NOAA estimates based on data for approximately 150 experimental and accidental PVBs and BLEVEs with approximately 683 total projectiles (4.6 average fragments per incident) that showed approximately 80 percent of fragments traveled 490 to 820 feet and within 6.25 times the estimated or observed fireball radius. The data also showed projectiles have traveled up to 3,900 feet for large LPG vessels and 1,200 feet for LPG rail cars. In all the documented cases, the projectiles traveled less than 15 times the fireball diameter, but one of the reports indicated up to 30 times the fireball diameter is possible albeit very rare.

Unmitigated consequences under average ambient conditions from releases of 1,000 gallons through a 1-inch hole would result in much more modest distances ranging from 25 to 200 feet for flammable vapor dispersion, and 75 to 175 feet for jet fires. Unmitigated consequences under worst case weather conditions from catastrophic failures of rail cars containing various flammable products generally can range from 300 to 3,000 feet for flammable vapor dispersion, 450 to 575 feet for radiant heat of 5 kW/m^2 from jet fires, 1,225 to 1,500 feet to a 1 psi overpressure from a BLEVE, 1,250 to 2,100 feet for a heat dose equivalent to a radiant heat of 5kW/m^2 over 40 seconds from 350 to 450 feet radii fireballs burning for 7 to 20 seconds from a BLEVE, and projectiles from BLEVEs possibly extending farther. Based on distribution function of the projectile distances, FERC staff estimate approximately 80 percent of all projectiles for a 30,000 gallon rail car would be within 0.5 mile and there is approximately a 5 percent probability they would extend beyond 1 mile and less than 0.1 percent probability they would extend 30 times the fireball diameter. These values are also close to the distances provided by DOT PHMSA for emergency response (0.5-1 mi for initial evacuation and 1 mi for potential BLEVEs for flammable gases).

The closest rail line is a CSX railroad located directly to the northwest corner of the Jacksonville Project site. The CSX railroad is a single line railroad that provides delivery of Navy fuel(s) from the Marathon Petroleum bulk fuel terminal once per day at a speed limit of 10 mph. AcuTech Group, Inc. performed a rail risk safety analysis and security risk assessment for Eagle LNG that evaluated the potential safety, security, and reliability impacts from the CSX railroad. The results and conclusion showed that given the safety and security measures, there would be a low risk of an event along the CSX railroad or highway rail crossing impacting the Jacksonville Project site.

The Eagle LNG facilities containing hazardous fluids within proximity to the CSX rail would include the generator and pretreatment area approximately 500-600 feet from the road, the liquefaction facilities approximately 700 feet from the road, the refrigerant storage area approximately 1,200 feet from the road, and the LNG storage tank approximately 1,300 feet from the road. All of these facilities would be set back far enough from the rail to not to pose a potential concern from a rail car derailing and impacting the site, and there were no other rail lines within close proximity to piping or equipment containing hazardous materials at the site that would raise concerns of direct impacts from a railcar derailing and impacting the site. In addition, most of these facilities, with exception of the generators and pretreatment equipment, would be set back farther than the hazard distances from the smaller 1,000 gal or less releases constituting approximately 95% of all hazardous material incidents, Most of these facilities with exception of generator and pretreatment area would also be farther than the worst case jet fires from the 30,000 gal or more releases constituting 1% of the hazardous material incidents described above. However, most of the facilities would be within range of the potential worst case unmitigated flammable vapor dispersion, fireball, and BLEVE impacts from the 30,000 gal or more releases constituting 1% of the hazardous material incidents.

In total, there is approximately 3.57 miles of rail within 1 mile of the Jacksonville Project's 1,600,000 ft^2 footprint with approximately 160,000 ft^2 constituting the generator and pretreatment area, approximately 50,000 ft^2 of refrigerant storage area, 270,000 ft^2 of the liquefaction area, and approximately 20,000 ft^2 of the LNG storage tank. Unmitigated flammable vapors that reach onsite and ignite could impact workers, but it would not likely cause any cascading failures that would impact the public. In addition, vapor barriers for the site would likely mitigate flammable vapors that disperse from an incident from reaching onsite. An unmitigated jet fire from an incident could also potentially impact workers onsite and could have the potential of damaging the equipment. However, vapor barriers, passive structural fire protection, and firewater would be installed at the site that would prevent or mitigate these hazards. A fireball from a BLEVE could burn workers located onsite, but there would not likely be any cascading failures to onsite equipment that would impact the public. Projectiles from BLEVEs have the potential to impact workers located onsite and cause cascading damage that could impact the public if it were to reach and perforate the LNG storage tank. However, the LNG storage tank is approximately 1,300 feet away and less than 45% of projectiles would be able to extend far enough to reach the tank and the tank would constitute less than 1% of a potential impact area from projectiles that could reach that far. Moreover, the LNG storage tank would also be designed to withstand certain projectiles that would further protect it from cascading effects. In addition, Eagle LNG would coordinate with local emergency responders with regard to potential hazardous material vehicular incidents nearby its site.

Due to the low risk of any rail incident occurring that could directly impact the site, the low risk of hazardous material rail incidents impacting the site that would cause cascading damage that could impact the public, and the proposed and recommended mitigation, we conclude the proposed Project would not pose a significant risk or significant increase in risk to the public from external impacts occurring on the rail.

Air

FERC staff reviewed whether any aircraft operations would be associated with the project and whether any existing aircraft operations would be located near the site. FERC staff uses this information to evaluate whether the project and any associated aircraft operations could increase the risk to the public and whether any pre-existing unassociated aircraft operations could adversely increase the risk to the project site and subsequently increase the risk to the public. In addition, if authorized, constructed, and operated, LNG facilities as defined in 49 CFR 193, must comply with the requirements of 49 CFR 193 and would be subject to the DOT's inspection and enforcement programs. DOT regulations under 49 CFR 193.2155 (b), under Subpart C, require an LNG storage tank must not be located within a horizontal distance of one mile from the ends, or 1/4 mile from the nearest point of a runway, whichever is longer and that the height of LNG structures in the vicinity of an airport must comply with DOT FAA requirements.

There would be no aircraft associated with the Jacksonville Project (e.g., helipads) that would warrant a review and that would increase the risk to the public from aircraft operations. The closest airport to the Jacksonville Project would be the Jacksonville International Airport located approximately 7 miles away. FERC staff also identified 8 smaller airports within a 20-mile radius from the Jacksonville Project site: Jacksonville Executive at Craig Municipal Airport located 7.9 miles away, Flying-A-Ranch Airport located 13.4 miles away, Herlong Recreational Airport located 14.7 miles away, Nassau Airport located 15.1 miles away, Deep Forest Airport located 15.3 miles away, Gary Gale Seaplane Base located 15.5 miles away, Fernandina Beach Municipal Airport located 16.6 miles away; and Cecil Airport located 20 miles away.

FAA regulations in 14 CFR 77 require Eagle LNG to provide notice to the FAA of its proposed construction. This notification should identify all equipment that are more than 200 feet above ground level or lesser heights if the facilities are within 20,000 feet of an airport (at 100:1 ratio or 50:1 ratio depending on length of runway) or within 5,000 feet of a helipad (at 100:1 ratio). In addition, mobile objects, including the LNG marine vessel that would be above the height of the highest mobile object that would normally traverse it would require notification to DOT FAA. The FAA aeronautical study would identify which structures and mobile objects exceed obstruction standards and would indicate if the identified structures would be a hazard to air navigation. Based on this study, FAA would issue a determination for each structure and mobile object that exceeds the obstruction standards.

The Jacksonville Project would not include permanent equipment taller than 200 feet. In addition, the proposed LNG marine vessels would not exceed the highest mobile object that would normally traverse the waterway. However, Eagle LNG would use a crane approximately 250 feet tall during construction. This crane would occupy the Jacksonville Project site only on a temporary basis and would not be a permanent structure. Given the height of the crane exceeding 200 feet, Eagle LNG would need to file notice to the FAA for any structures exceeding 200 feet to initiate an aeronautical study for determining whether they would constitute obstructions to air navigation. Therefore, we recommend in section 4.12.6 that Eagle LNG file the determination of no hazard (with or without conditions) from FAA prior to construction of final design to demonstrate there would not be an impact to the safety of aircraft.

In addition, FERC staff analyzed existing aircraft operation frequency data based on the airports identified above and their proximity to the LNG storage tank and process areas, the type and frequency of aircraft operations, take-off and landing directions, and the non-airport flight paths using the DOE Standard, DOE-STD-3014-2006, *Accident Analysis for Aircraft Crash into Hazardous Facilities*. Based upon that review, FERC staff concludes the proposed project would not pose a significant risk as a result of the proximity of the project to the airports.

With the implementation of our recommendations, FERC staff concludes the proposed project would not pose a significant risk or significant increase in risk to the public due to nearby aircraft operations as a result of the potential consequences, incident data, and distance and position of the closest aircraft operations relative to the populated areas north of the LNG terminal.

<u>Pipelines</u>

FERC staff reviewed whether any pipeline operations would be associated with the project and whether any existing pipelines would be located near the site. FERC staff uses this information to evaluate whether the project and any associated pipeline operations could increase the risk to the pipeline facilities and subsequently to the public and whether any pre-existing unassociated pipeline operations could adversely increase the risk to the Jacksonville Project site and subsequently increase the risk to the public.

Eagle LNG would receive natural gas from an existing Peoples Gas natural gas pipeline which runs parallel to the project site along State Road 105. FERC staff evaluated the potential risk from an incident from this pipeline and its potential impact. Based on the proposed route and evaluation of the potential likelihood of pipeline incidents and potential consequences from a pipeline incident, FERC staff concludes the proposed Project would not significantly increase the risk to the public beyond existing risk levels that would be present from the pipeline in a leak or pipeline rupture worst-case event within the vicinity of the project site.

In addition, based on the location of the existing Peoples Gas natural gas pipeline, any vehicular traffic that would enter and exit the project site would need to drive over the buried pipeline. Therefore, we have included a recommendation in section 4.12.6 for Eagle LNG to provide an analysis of traffic loads anticipated along the plant entrance/exit roads during construction and operation to determine whether provisions are needed to dissipate the loads on the Peoples Gas natural gas pipeline.

In addition, based on the location of the existing Peoples Gas natural gas pipeline, any traffic that would enter and exit the project site would need to drive over the buried pipeline. Therefore, we have included a recommendation in section 4.12.6 for Eagle LNG to provide an analysis of traffic loads anticipated along the plant entrance/exit roads during construction and operation to determine whether provisions are needed to dissipate the loads on the Peoples Gas natural gas pipeline.

Based an evaluation of the potential likelihood of pipeline incidents and potential consequences from a pipeline incident and with the implementation of our recommendation, FERC staff concludes the proposed project would not pose a significant increase in risk to the public as a result of the proximity of the project to the pipelines as a result of the potential consequences, incident data, and distance and position of the closest pipeline relative to the populated areas north of the LNG terminal.

<u>Hazardous Material Facilities and Nuclear Power Plants</u>

FERC staff evaluated whether any EPA RMP regulated facilities handling hazardous materials and power plants were located near the proposed site and if these facilities could adversely increase the risk to the Eagle LNG site, and whether the Eagle LNG site could increase the risk to the EPA RMP facilities and power plants and subsequently increase the risk to the public.

The closest facilities handling hazardous materials would be the Marathon Petroleum bulk fuel terminal located approximately 0.2 miles away, a U.S. Naval fuel terminal located approximately 0.94 miles away, Southern Belle Frozen Foods located approximately 2.4 miles away, NuStar Jacksonville petroleum terminal located approximately 2.46 miles away, Anheusr-Busch, Inc. located approximately 2.5 miles away, Renessenz, LLC located approximately 3.7 miles away, and JCI Jones Chemicals, Inc. located approximately 5 miles away from Eagle's proposed LNG storage tank. The closest power plant identified was JEA Northside Generating Station approximately 3.5 miles east of the facility and the closest nuclear power plant is located approximately 113 miles away.

Given the distances and locations of the facilities relative to the populated areas of the Jacksonville communities, we conclude the proposed project would not pose a significant increase in risk to the public or that the hazardous material facilities and power plants would pose a significant risk to the project and subsequently to the public.

On-site and Off-site Emergency Response Plans

As part of its application, Eagle LNG indicated that the Jacksonville Project would develop a comprehensive ERP with local, state, and federal agencies and emergency response officials to discuss the Facilities. Eagle LNG would continue these collaborative efforts during the development, design, and construction of the Jacksonville Project. The emergency procedures would provide for the protection of personnel and the public as well as the prevention of property damage that may occur as a result of incidents at the project facilities. Eagle LNG would also provide appropriate personnel protective equipment to enable operations personnel and first responder access to the area.

As required by 49 CFR 193.2509, under Subpart F, Eagle LNG would need to prepare emergency procedures manuals that provide for: a) responding to controllable emergencies and recognizing an uncontrollable emergency; b) taking action to minimize harm to the public including the possible need to evacuate the public; and c) coordination and cooperation with appropriate local officials. Specifically, 49 CFR 193.2509(b)(3) requires "Coordinating with appropriate local officials in preparation of an emergency evacuation plan…," which sets forth the steps required to protect the public in the event of an emergency, including catastrophic failure of an LNG storage tank. DOT regulations under 49 CFR 193.2905, under Subpart J, also require at least two access points in each protective enclosure to be located to minimize the escape distance in the event of emergency.

Title 33 CFR 127.307 also requires the development of emergency manual that incorporates additional material, including LNG release response and emergency shutdown procedures, a description of fire equipment, emergency lighting, and power systems, telephone contacts, shelters, and first aid procedures. In addition, 33 CFR 127.207 establishes requirements for warning alarm systems. Specifically, 33 CFR 127.207(a) requires that the LNG marine transfer area to be equipped with a rotating or flashing amber light with a minimum effective flash intensity, in the horizontal plane, of 5000 candelas with at least 50 percent of the required effective flash intensity in all directions from 1.0 degree above to 1.0 degree below the horizontal plane. Furthermore, 33 CFR 127.207(b) requires the marine transfer area for LNG to have a siren with a minimum 1⁄3- octave band sound pressure level at l meter of 125 decibels referenced to 0.0002 microbars. The siren must be located so that the sound signal produced is audible over 360 degrees in a horizontal plane. Lastly, 33 CFR 127.207 (c) requires that each light and siren must be located so that the warning alarm is not obstructed for a distance of 1.6 km (1 mile) in all directions. The warning alarms would be required to be tested in order to meet 33 CFR 127. Eagle LNG would be required to meet the warning alarms requirements specified in 33 CFR 127.207.

In accordance with the EPAct 2005, FERC must also approve an emergency response plan covering the terminal and ship transit prior to construction. Section 3A(e) of the NGA, added by section 311 of the EPAct 2005, stipulates that in any order authorizing an LNG terminal, the Commission must require the LNG terminal operator to develop an ERP in consultation with the Coast Guard and state and local agencies. The final ERP would need to be evaluated by appropriate emergency response personnel and officials. Section 3A (e) of the NGA (as amended by EPAct 2005) specifies that the ERP must include a Cost-Sharing Plan that contains a description of any direct cost reimbursements the applicant agrees to provide to any state and local agencies with responsibility for security and safety at the LNG terminal and in proximity to LNG marine vessels that serve the facility. The Cost-Sharing Plan must specify what the LNG terminal operator would provide to cover the cost of the state and local resources required to manage the security of the LNG terminal and LNG marine vessel, and the state and local resources required for safety and emergency management, including:

- direct reimbursement for any per-transit security and/or emergency management costs (for example, overtime for police or fire department personnel);
- capital costs associated with security/emergency management equipment and personnel base (for example, patrol boats, firefighting equipment); and
- annual costs for providing specialized training for local fire departments, mutual aid departments, and emergency response personnel; and for conducting exercises.

The cost-sharing plan must include the LNG terminal operator's letter of commitment with agency acknowledgement for each state and local agency designated to receive resources.

Eagle LNG described the ERP that would be developed to addresses emergency events and potential release scenarios in the Application. The ERP would include public notification, protection, and evacuation. As part of the FEED review, FERC staff evaluated the initial draft of the emergency response procedures to assure that it covers the hazards associated with the Jacksonville Project. In addition, we recommend in section 4.12.6 that Eagle LNG provide additional information, for review and approval, on development of updated emergency response plans prior to initial site preparation. We also recommend in section 4.12.6 that Eagle LNG file three-dimensional drawings, for review and approval, which demonstrate there is a sufficient number of access and egress locations. If the project is authorized, constructed, and operated, Eagle LNG would coordinate with local, state, and federal agencies on the development of an emergency response plan and cost sharing plan. We recommend in section 4.12.6 that Eagle LNG provide periodic updates on the development of these plans and ensure they are in place prior to introduction of hazardous fluids. In addition, we recommend in section 4.12.6 that project facilities be subject to regular inspections throughout the life of the facility and would continue to require Eagle LNG to provide updates to the ERP.

4.12.6 Recommendations from FERC Preliminary Engineering and Technical Review

Based on FERC staff's preliminary engineering and technical review of the reliability and safety of the Jacksonville Project, we recommend the following mitigation measures as conditions to any order authorizing the project. These recommendations would be implemented prior to initial site preparation, prior to construction of final design, prior to commissioning, prior to introduction of hazardous fluids, prior to commencement of service, and throughout the life of the facility to enhance the reliability and safety of the facility and to mitigate the risk of impact on the public.

- **<u>Prior to initial site preparation</u>, Eagle LNG should file with the Secretary a site-specific analysis stamped and sealed by a professional engineer-of-record, registered in the state of Florida, to verify the underlying rock is competent to support the final design of foundations, including identifying the location, orientation, and inclination of any local faults or geological discontinuities in order to better characterize the risk of regional subsidence or surficial deformation.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file with the Secretary documentation demonstrating it has received a determination of no hazard (with or without conditions) by DOT FAA for all temporary construction equipment that exceed the height requirements in 14 CFR 77.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in Florida:**

  a. geotechnical investigation and tests that verify subsurface conditions as well as an analysis that confirms Eagle LNG's proposed ground improvement and includes any resulting foundation recommendations;

  b. site preparation drawings and specifications;

  c. LNG storage tank foundation design drawings and calculations;

  d. LNG terminal structures and foundation design drawings and calculations (including prefabricated and field constructed structures);

  e. seismic specifications for procured equipment; and

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

In addition, Eagle LNG should file, <u>in its Implementation Plan</u>, the schedule for producing this information.

- **<u>Prior to commencement of service</u>, Eagle LNG should file with the Secretary a plan, stamped and sealed by a professional engineer-of-record, registered in the state of Florida, for continuous monitoring of surface and subsurface conditions to detect early signs of sinkhole formation throughout the life of the LNG terminal, as well as a response plan in the event of a sinkhole formation.**

Information pertaining to the following specific recommendations should be filed with the Secretary for review and written approval by the Director of OEP, or the Director's designee, within the timeframe indicated by each recommendation. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 833 (Docket No. RM16-15-000), including security information, should be submitted as critical energy infrastructure information pursuant to 18 CFR 388.113. See *Critical Electric Infrastructure Security and Amending Critical Energy Infrastructure Information*, Order No. 833, 81 Fed. Reg. 93,732 (December 21, 2016), FERC Stats. & Regs. 31,389 (2016). Information pertaining to items such as off-site emergency response, procedures for public notification and evacuation, and construction and operating reporting requirements would be subject to public disclosure. All information should be filed **<u>a minimum of 30 days</u>** before approval to proceed is requested.

- **<u>Prior to initial site preparation</u>, Eagle LNG should file an overall project schedule, which includes the proposed stages of the commissioning plan.**

- **<u>Prior to initial site preparation</u>, Eagle LNG should file quality assurance and quality control procedures for construction activities.**

- **<u>Prior to initial site preparation</u>, Eagle LNG should file procedures for controlling access during construction.**

- **<u>Prior to initial site preparation</u>, Eagle LNG should file an analysis of anticipated traffic loads along the plant entrance/exit roads during construction and operation to determine whether provisions are needed to dissipate the loads on the Peoples Gas natural gas pipeline. The analysis should be based on API RP 1102 or other approved methodology demonstrating the loads on buried pipelines and utilities at temporary and permanent crossings will be adequately distributed.**

- **<u>Prior to initial site preparation</u>, Eagle LNG should develop an ERP (including evacuation) and coordinate procedures with the Coast Guard; state, county, and local emergency planning groups; fire departments; state and local law enforcement; and appropriate federal agencies. This plan should include at a minimum:**

  a. **designated contacts with state and local emergency response agencies;**

  b. **scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;**

c. **procedures for notifying residents and recreational users within areas of potential hazard;**

d. **evacuation routes/methods for residents and public use areas that are within any transient hazard areas along the route of the LNG marine transit;**

e. **locations of permanent sirens and other warning devices; and**

f. **an "emergency coordinator" on each LNG marine vessel to activate sirens and other warning devices.**

Eagle LNG should notify the FERC staff of all planning meetings in advance and should report progress on the development of its ERP at <u>3-month intervals</u>.

- **<u>Prior to initial site preparation</u>, Eagle LNG should file a Cost-Sharing Plan identifying the mechanisms for funding all project-specific security/emergency management costs that would be imposed on state and local agencies. This comprehensive plan should include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. Eagle LNG should notify FERC staff of all planning meetings in advance and should report progress on the development of its Cost-Sharing Plan at <u>3-month intervals</u>.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file change logs that list and explain any changes made from the FEED provided in Eagle LNG's application and filings. A list of all changes with an explanation for the design alteration should be provided and all changes should be clearly indicated on all diagrams and drawings.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file information/revisions pertaining to Eagle LNG's response numbers 2, 18, 46, 50, 63, 68, 69, and 71 of its October 17, 2017 filing, response numbers 1–5, 7–18, 23, 25, 27, 28, 30, 32, 36–39, 41–45, and 48 to the March 5, 2019 engineering information request, and response number 1 to the March 20, 2019 engineering information request of its March 25, 2019 filing which indicated features to be included or considered in the final design.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file three-dimensional plant drawings to confirm plant layout for maintenance, access, egress, and congestion. In addition, the access/egress roads should demonstrate that road widths and turnarounds are adequate to handle fire apparatus and would meet good engineering practices such as NFPA 307 and the International Fire Code (Appendix D).**

- **<u>Prior to construction of final design</u>, Eagle LNG should file drawings of the storage tank piping support structure and support of horizontal piping at grade including pump columns, relief valves, pipe penetrations, instrumentation, and appurtenances.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file complete drawings of the proposed LNG tank design and installation.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file an up-to-date equipment list, process and mechanical data sheets, and specifications. The specifications should include:**

  a. building specifications (e.g., control buildings, electrical buildings, compressor buildings, storage buildings, pressurized buildings, ventilated buildings, blast resistant buildings);

  b. mechanical specifications (e.g., piping including vacuum jacketed piping, valve, insulation, rotating equipment, heat exchanger, storage tank and vessel, other specialized equipment);

  c. electrical and instrumentation specifications (e.g., power system, control system, safety instrument system [SIS], cable, other electrical and instrumentation); and

  d. security and fire safety specifications (e.g., security, passive protection, hazard detection, hazard control, firewater).

- **<u>Prior to construction of final design</u>, Eagle LNG should file a list of all codes and standards and the final specification document number where they are referenced.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file up-to-date PFDs and one complete set of piping and instrument diagrams (P&IDs) that incorporates the various vendors. The PFDs should include heat and material balances. The P&IDs should include the following information:**

  a. equipment tag number, name, size, duty, capacity, and design conditions;

  b. equipment insulation type and thickness;

  c. storage tank pipe penetration size and nozzle schedule;

  d. valve high-pressure side and internal and external vent locations;

  e. piping with line number, piping class specification, size, and insulation type and thickness;

  f. piping specification breaks and insulation limits;

  g. all control and manual valves numbered;

  h. relief valves with size and set points; and

  i. drawing revision number and date.

- **<u>Prior to construction of final design</u>, Eagle LNG should file P&IDs, specifications, and procedures that clearly show and specify the tie-in details required to safely connect subsequently constructed facilities with the operational facilities.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file a car seal philosophy and a list of all car-sealed and locked valves consistent with the P&IDs.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file information that demonstrates the Engineering, Procurement, and Construction (EPC) contractor has verified the HAZID recommendations have been addressed.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file a hazard and operability review prior to issuing the P&IDs for construction. A copy of the review, a list of the recommendations, and actions taken on the recommendations should be filed.**

- **<u>Prior to construction of final design</u>, Eagle LNG should specify that all drains from high-pressure hazardous fluid systems would be equipped with double isolation and bleed valves.**

- **<u>Prior to construction of final design</u>, Eagle LNG should specify positive isolation (e.g., double isolation and bleed, valve and blind) on high-pressure systems requiring class 600 flanges and higher.**

- **<u>Prior to construction of final design</u>, Eagle LNG should provide double isolation and bleed for drain lines ¾”-GH-111444, ¾”-LNG-111011, and ¾”-LNG-111014 at the source.**

- **<u>Prior to construction of final design</u>, Eagle LNG should include isolation valves on the discharge lines from the LNG tank pump columns.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file plans and procedures that address how the facility would handle ship loading operations in the event a marine transfer arm (i.e., liquid/vapor) experiences a liquid or vapor release or is out of service.**

- **<u>Prior to construction of final design</u>, Eagle LNG should include both absolute and barometric pressure transmitters in the LNG storage tank design.**

- **<u>Prior to construction of final design</u>, Eagle LNG should include a vacuum breaker gas or pad gas system in addition to LNG storage tank vacuum relief system to mitigate the risk of failures caused by vacuum conditions.**

- **<u>Prior to construction of final design</u>, Eagle LNG should provide an insulated flange connection at the battery limit connection between the feed gas pipeline and the facility shown on P&ID 15510-PI-100-001.**

- **<u>Prior to construction of final design</u>, Eagle LNG should include a check valve or other means in the feed gas piping, 10”-PG-1104, to the absorber to prevent backflow.**

- **<u>Prior to construction of final design</u>, Eagle LNG should specify construction material of line 2”-GH-111444-6AA that is suitable for cryogenic service.**

- **<u>Prior to construction of final design</u>, Eagle LNG should include temperature transmitters connected to the distributed control system (DCS) on the thermowells located on the inlet and outlet piping for the molecular sieve dehydrators.**

- **Prior to construction of final design, Eagle LNG should verify that the displacement of vapor through the LNG in-tank pump minimum flow valves during startup would exceed the minimum flow rate required for stable pump operation.**

- **Prior to construction of final design, Eagle LNG should clearly specify the responsibilities of the LNG tank contractor and the EPC contractor for the piping associated with the LNG storage tank and piping associated with the LNG pumps located within the tertiary containment.**

- **Prior to construction of final design, Eagle LNG should file the final design of the vacuum jacketed piping that demonstrates how the outer jacket design accounts for the mechanical forces from a release at maximum pressures and thermal stresses and shock from sudden cryogenic temperatures of an LNG release.**

- **Prior to construction of final design, Eagle LNG should file the final design of the vacuum jacketed inner pipe emergency shutdown and isolation valves, pressure relief valves and discharge, drains, vacuum ports, and instrumentation.**

- **Prior to construction of final design, Eagle LNG should file the final design of the leak detection and monitoring system of the vacuum jacketed inner pipe including alarm set points and shutdown capabilities.**

- **Prior to construction of final design, Eagle LNG should file the safe operating limits (upper and lower), alarm and shutdown set points for all instrumentation (e.g., temperature, pressures, flows, and compositions).**

- **Prior to construction of final design, Eagle LNG should file cause-and-effect matrices for the process instrumentation, fire and gas detection system, and emergency shutdown system. The cause-and-effect matrices should include alarms and shutdown functions, details of the voting and shutdown logic, and set points.**

- **Prior to construction of final design, Eagle LNG should file an evaluation of emergency shutdown valve closure times. The evaluation should account for the time to detect an upset or hazardous condition, notify plant personnel, and close the emergency shutdown valve(s).**

- **Prior to construction of final design, Eagle LNG should file an evaluation of dynamic pressure surge effects from valve opening and closure times and pump startup and shutdown operations.**

- **Prior to construction of final design, Eagle LNG should demonstrate that, for hazardous fluids, piping and piping nipples 2 inches or less in diameter are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and operator live loads in areas accessible by operators.**

- **Prior to construction of final design, Eagle LNG should file electrical area classification drawings.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file drawings and details of how process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system meet the requirements of NFPA 59A (2001).**

- **<u>Prior to construction of final design</u>, Eagle LNG should file details of an air gap or vent installed downstream of process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap should vent to a safe location and be equipped with a leak detection device that should continuously monitor for the presence of a flammable fluid, alarm the hazardous condition, and shut down the appropriate systems.**

- **<u>Prior to construction of final design</u>, Eagle LNG should specify that piping and equipment that may be cooled with liquid nitrogen would be designed for liquid nitrogen temperatures, with regard to allowable movement and stresses.**

- **<u>Prior to construction of final design</u>, Eagle LNG should include the capability of calculating the total LNG tank fill flow from each liquefaction train in the DCS, or directly measure the LNG tank fill flow, as well as include an associated high flow alarm.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file the structural analysis of the LNG storage tank and outer containment demonstrating they are designed to withstand all loads and combinations.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file an analysis of the structural integrity of the outer containment of the full containment LNG storage tank demonstrating it can withstand the radiant heat from a roof tank top fire.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file a projectile analysis that demonstrates whether the LNG storage tank would withstand projectiles from explosions and high winds, or demonstrate whether protective measures are in place to ensure the structural integrity of the LNG storage tank. If the analysis demonstrates the tank would be perforated, Eagle LNG should file an analysis indicating the containment dikes would sufficiently contain an LNG spill.**

- **<u>Prior to construction of final design</u>, Eagle LNG should specify the minimum distance required for valve maintenance, between the LNG loading header and the first valve in the discharge piping to the loading arm.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file the sizing basis and capacity for the final design of the flares and/or vent stacks as well as the pressure and vacuum relief valves for major process equipment, vessels, and storage tanks.**

- **<u>Prior to construction of final design</u>, Eagle LNG should provide the following information related to flare L-405: final design details (e.g., purge, pilots); whether the flare would meet API 537 or equivalent; and a quantitative analysis which demonstrates that the redundancy built into the flare pilot design is sufficient to ensure that an operational pilot would be available or alternatively provide a vapor dispersion analysis of the unlit flare demonstrating flammable vapors would not reach any ignition sources, equipment, buildings, or grade.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file detailed cooldown plans showing the piping and valve alignment, and instruments used to monitor the initial cooldown and filling of the LNG storage tank.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file detailed calculations for the flow rate of the jockey pumps accounting for flow rate losses due to leaks or other losses to ensure that system losses do not exceed the specified design flow rate of the jockey firewater pumps.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file a design that includes pressure relieving protection for flammable liquid piping segments (i.e., refrigerants, liquid hydrocarbons, condensate products) that can be isolated by valves.**

- **<u>Prior to construction of final design</u>, Eagle LNG should specify that all emergency shutdown valves are to be equipped with open and closed position switches connected to the DCS/SIS.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file a drawing showing the location of the emergency shutdown buttons. Emergency shutdown buttons should be easily accessible, conspicuously labeled, and located in an area which would be accessible during an emergency.**

- **<u>Prior to construction of final design,</u> Eagle LNG should file specifications and drawings of the vehicle barriers at each facility entrance for access control and internal road vehicle protections, such as guard rails, barriers, and bollards to protect transfer piping, pumps, and compressors, etc., to ensure that they are located away from roadway or protected from inadvertent damage from vehicles.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file security fence, camera, intrusion detection, and lighting drawings of the final design. The security fence drawings should surround the entire LNG plant with a setback that does not allow for the fence to be overcome. The security camera drawings should show the location, areas covered, and features of the camera (fixed, tilt/pan/zoom, motion detection alerts, low light, mounting height, etc.) to verify camera coverage of the entire perimeter and atop the LNG storage tank with redundancies for cameras interior to the facility to enable rapid monitoring of the LNG plant. The intrusion detection drawings should show or note the location of the intrusion detection to verify it covers the entire perimeter of the LNG plant. The lighting drawings should show the location, elevation, type of light fixture, and lux levels of the lighting system and cover the entire perimeter of the LNG plant and at mooring points.**

- **<u>Prior to construction of final design</u>, Eagle LNG should evaluate the terminal alarm system and external notification system design to ensure the location of the terminal alarms and other fire and evacuation alarm notification devices (e.g., audible/visual beacons and strobes) would provide adequate warning at the terminal and external off-site areas in the event of an emergency.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file an updated fire protection evaluation of the proposed facilities. A copy of the evaluation, a list of recommendations and supporting justifications, and actions taken on the recommendations should be filed. The evaluation should specify the warehouse**

sprinkler system using extra hazard group 2 design densities or justify an alternative design. The evaluation should also include a hazard detection study to evaluate the effectiveness of their flammable and gas detection system in accordance with ISA 84.00.07 or equivalent methodologies that would demonstrate 90 percent or more of releases (unignited and ignited) that could result in an off-site or cascading impact that could extend off site would be detected by two or more detectors and result in isolation and de-inventory within 10 minutes. The analysis should take into account the set points, voting logic, and different wind speeds and directions. The justification for firewater should provide calculations for all firewater demands including firewater coverage on the LNG storage tank, north of HV Substation A-701, and adjacent fire zones if they could result in cascading damage based on design densities, surface area, and throw distance and specifications for the corresponding hydrant and monitors needed to reach and cool equipment.

- **<u>Prior to construction of final design</u>, Eagle LNG should file spill containment system drawings with dimensions and slopes of curbing, trenches, impoundments, and capacity calculations considering any foundations and equipment within impoundments, as well as the sizing and design of the down-comer that would transfer spills from the tank top to the ground-level impoundment system. The spill containment drawings should show containment for all hazardous fluids, including all liquids handled above their flashpoint, from the largest flow from a single line for 10 minutes, including de-inventory, or the maximum liquid from the largest vessel (or total of impounded vessels) or otherwise demonstrate spill containment would not significantly reduce the flammable vapor dispersion or radiant heat consequences of a spill.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file an evaluation that demonstrates an LNG spill would not be directed to the LNG tank impoundment sump (S-814) or how LNG would be prevented from being discharged from S-814.**

- **<u>Prior to construction of the final design</u>, Eagle LNG should file a critical equipment and building siting assessment to ensure plant buildings that are occupied or critical to the safety of the LNG plant are adequately protected from potential hazards involving fires and vapor cloud explosions. The evaluation should assess the potential relocation of the firewater pumps, firewater tank, control building, and other buildings such that they do not present an ignition source to a release of flammable vapors and that they are not impacted by explosions, pool fires, and jet fires or provide analyses demonstrating they would be adequately protected from such events. The evaluation should compare against minimum spacing requirements for buildings relative to equipment containing hazardous fluids, distances used in electrical area classification for ignition sources as well as radiant heat distances from pool and jet fires.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file an analysis of the localized hazards to operators from a potential liquid nitrogen release and should also provide spill containment and low oxygen detectors to mitigate liquid nitrogen releases.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file an analysis of the localized hazards from a potential hydrogen sulfide release and should also provide toxic detectors to mitigate hydrogen sulfide releases from the acid gas piping system and**

potential release points (i.e., vents, relief valves, vent stacks, and thermal oxidizer stack).

- **<u>Prior to construction of final design</u>, Eagle LNG should file detailed calculations to confirm that the final fire water volumes would be accounted for when evaluating the capacity of the impoundment system during a spill and fire scenario.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file complete drawings and a list of the hazard detection equipment. The drawings should clearly show the location and elevation of all detection equipment. The list should include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of the hazard detectors when determining the lower flammable limit set points for methane, propane, ethylene, n-butane, and condensate.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of hazard detectors when determining the set points for toxic components such as condensate, heavy hydrocarbon liquids, and hydrogen sulfide.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file an evaluation of the voting logic and voting degradation for hazard detectors.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file a technical review of facility design that:**

  a. identifies all combustion/ventilation air intake equipment and the distances to any possible flammable gas or toxic release; and

  b. demonstrates that these areas are adequately covered by hazard detection devices and indicates how these devices would isolate or shutdown any combustion or heating ventilation and air conditioning equipment whose continued operation could add to or sustain an emergency.

- **<u>Prior to construction of final design</u>, Eagle LNG should file a design that includes hazard detection suitable to detect high temperatures and smoldering combustion products in electrical buildings and control room buildings.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file facility plan drawings and a list of the fixed and wheeled dry-chemical, hand-held fire extinguishers, and other hazard control equipment. Plan drawings should clearly show the location and elevation by tag number of all fixed dry-chemical systems in accordance with NFPA 17, and wheeled and hand-held extinguisher locations are along normal paths of access and egress and in compliance with NFPA 10 travel distances. The list should include the equipment tag number, type, capacity, equipment covered, discharge rate, and automatic and manual remote signals initiating discharge of the units.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file facility plan drawings showing the proposed location of the firewater and any foam systems. Plan drawings should clearly show the location of firewater and foam piping, post indicator valves, and the location and area covered by, each monitor, hydrant, hose, water curtain, deluge system, foam system, water-mist system, and sprinkler. In addition, firewater coverage should include the coverage of the entire marine transfer line, LNG storage tank, and HV Substation A-701 by hydrants or monitors and automatic or remotely operated monitors or fixed systems in areas inaccessible or difficult to access in the event of an emergency. The coverage circles should take into account obstructions to the firewater coverage and should reflect the firewater needed to reach and cool exposed surfaces potentially subjected to damaging radiant heats from a fire. The drawings should also include P&IDs of the firewater and foam systems.**

- **<u>Prior to construction of final design</u>, Eagle LNG should include or demonstrate the firewater storage volume for its facilities has minimum reserved capacity for its most demanding firewater scenario plus 1,000 gallons per minute for no less than 2 hours. The firewater storage should also demonstrate compliance with NFPA 22 or equivalent.**

- **<u>Prior to construction of final design</u>, Eagle LNG should specify that the firewater flow test meter is equipped with a transmitter and that a pressure transmitter is installed upstream of the flow transmitter. The flow transmitter and pressure transmitter should be connected to the DCS and recorded.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file drawings and specifications for the structural passive protection systems to protect equipment and supports from cryogenic releases.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file calculations or test results for the structural passive protection systems to protect equipment and supports from cryogenic releases.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file drawings and specifications for the structural passive protection systems to protect equipment and supports from pool and jet fires.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file a detailed quantitative analysis to demonstrate that adequate mitigation would be provided for each significant component within the 4,000 Btu/ft^2-hr zone from pool or jet fires that could cause failure of the component. Trucks at the truck loading/unloading areas should be included in the analysis. A combination of passive and active protection should be provided and demonstrate the effectiveness and reliability. Effectiveness of passive mitigation should be supported by calculations or test results for the thickness limiting temperature rise and active mitigation should be justified with calculations or test results demonstrating flow rates and durations of any cooling water would mitigate the heat absorbed by the vessel.**

- **<u>Prior to construction of final design</u>, Eagle LNG should file an evaluation and associated specifications and drawings of how cascading damage of transformers (e.g., fire walls or spacing) would be prevented in accordance with NFPA 850 or equivalent.**

- **Prior to commissioning, Eagle LNG should file a detailed schedule for commissioning through equipment startup. The schedule should include milestones for all procedures and tests to be completed prior to introduction of hazardous fluids and during commissioning and startup. Eagle LNG should file documentation certifying that each of these milestones has been completed before authorization to commence the next phase of commissioning and startup would be issued.**

- **Prior to commissioning, Eagle LNG should file detailed plans and procedures for: testing the integrity of on-site mechanical installation; functional tests; introduction of hazardous fluids; operational tests; and placing the equipment into service.**

- **Prior to commissioning, Eagle LNG should file a plan for clean-out, dry-out, purging, and tightness testing. This plan should address the requirements of the American Gas Association's Purging Principles and Practice, and should provide justification if not using an inert or non-flammable gas for clean-out, dry-out, purging, and tightness testing.**

- **Prior to commissioning, Eagle LNG should file the procedures for pressure/leak tests which address the requirements of ASME VIII and ASME B31.3. The procedures should include a line list of pneumatic and hydrostatic test pressures.**

- **Prior to commissioning, Eagle LNG should file the operation and maintenance procedures and manuals, as well as safety procedures, hot work procedures and permits, abnormal operating conditions reporting procedures, simultaneous operations procedures, and management of change procedures and forms.**

- **Prior to commissioning, Eagle LNG should tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves.**

- **Prior to commissioning, Eagle LNG should file a plan to maintain a detailed training log to demonstrate that operating staff has completed the required training.**

- **Prior to commissioning, Eagle LNG should file settlement results from the hydrostatic tests of the LNG storage container as well as a routine monitoring program to ensure settlements are as expected and do not exceed applicable criteria in API 620, 625, 653, and ACI 376. The program should specify what actions would be taken after seismic events.**

- **Prior to commissioning, Eagle LNG should equip the LNG storage tank and adjacent piping and supports with permanent settlement monitors to allow personnel to observe and record the relative settlement between the LNG storage tank and adjacent piping. The settlement record should be reported in the semi-annual operational reports.**

- **Prior to introduction of hazardous fluids, Eagle LNG should develop and implement an alarm management program to reduce alarm complacency and maximize the effectiveness of operator response to alarms.**

- **Prior to introduction of hazardous fluids, Eagle LNG should complete and document all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the DCS and SIS that demonstrate full functionality and operability of the system.**

- **Prior to introduction of hazardous fluids, Eagle LNG should complete and document a firewater pump acceptance test and firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant should be shown on facility plot plan(s).**

- **Prior to introduction of hazardous fluids, Eagle LNG should complete and document foam system and sprinkler system acceptance tests.**

- **Prior to introduction of hazardous fluids, Eagle LNG should complete and document clean agent acceptance tests.**

- **Prior to introduction of hazardous fluids, Eagle LNG should complete and document a pre-startup safety review to ensure that installed equipment meets the design and operating intent of the facility. The pre-startup safety review should include any changes since the last hazard review, operating procedures, and operator training. A copy of the review with a list of recommendations, and actions taken on each recommendation, should be filed.**

- **Eagle LNG should file a request for written authorization from the Director of OEP prior to unloading or loading the first LNG commissioning cargo. After production of first LNG, Eagle LNG should file weekly reports on the commissioning of the proposed systems that detail the progress toward demonstrating the facilities can safely and reliably operate at or near the design production rate. The reports should include a summary of activities, problems encountered, and remedial actions taken. The weekly reports should also include the latest commissioning schedule, including projected and actual LNG production by each liquefaction train, LNG storage inventories in each storage tank, and the number of anticipated and actual LNG commissioning cargoes, along with the associated volumes loaded or unloaded. Further, the weekly reports should include a status and list of all planned and completed safety and reliability tests, work authorizations, and punch list items. Problems of significant magnitude should be reported to the FERC within 24 hours.**

- **Prior to commencement of service, Eagle LNG should label piping with fluid service and direction of flow in the field, in addition to the pipe labeling requirements of NFPA 59A (2001).**

- **Prior to commencement of service, Eagle LNG should file plans for any preventative and predictive maintenance program that performs periodic or continuous equipment condition monitoring.**

- **Prior to commencement of service, Eagle LNG should develop procedures for off-site contractors' responsibilities, restrictions, and limitations and for supervision of these contractors by Eagle LNG staff.**

- **<u>Prior to commencement of service</u>, Eagle LNG should notify the FERC staff of any proposed revisions to the security plan and physical security of the plant.**

- **<u>Prior to commencement of service</u>, Eagle LNG should file a request for written authorization from the Director of OEP. Such authorization would only be granted following a determination by the Coast Guard, under its authorities under the Ports and Waterways Safety Act, the Magnuson Act, the MTSA of 2002, and the Security and Accountability For Every Port Act, that appropriate measures to ensure the safety and security of the facility and the waterway have been put into place by Eagle LNG or other appropriate parties.**

In addition, we recommend that the following measures should apply <u>throughout the life of the LNG terminal facilities</u>:

- **The facility should be subject to regular FERC staff technical reviews and site inspections on at least an <u>annual</u> basis or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, Eagle LNG should respond to a specific data request including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed P&IDs reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, should be submitted.**

- **<u>Semi-annual</u> operational reports should be filed with the Secretary to identify changes in facility design and operating conditions; abnormal operating experiences; activities (e.g., ship arrivals, quantity and composition of imported and exported LNG, liquefied and vaporized quantities, boil off/flash gas); and plant modifications, including future plans and progress thereof. Abnormalities should include, but not be limited to, unloading/loading/shipping problems, potential hazardous conditions from off-site vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tank, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, hazardous fluids releases, fires involving hazardous fluids and/or from other sources, negative pressure (vacuum) within a storage tank, and higher than predicted boil off rates. Adverse weather conditions and the effect on the facility also should be reported. Reports should be submitted <u>within 45 days after each period ending June 30 and December 31</u>. In addition to the above items, a section entitled "Significant Plant Modifications Proposed for the Next 12 Months (dates)" should be included in the semi-annual operational reports. Such information would provide the FERC staff with early notice of anticipated future construction/maintenance at the LNG facilities.**

- **In the event the temperature of any region of any secondary containment, including imbedded pipe supports, becomes less than the minimum specified operating temperature for the material, the Commission should be notified <u>within 24 hours</u> and procedures for corrective action should be specified.**

- **Significant non-scheduled events, including safety-related incidents (e.g., LNG, condensate, refrigerant, heavier hydrocarbons, or natural gas releases; fires; explosions; mechanical failures; unusual over pressurization; and major injuries) and security-related incidents (e.g., attempts to enter site, suspicious activities) should be reported to the FERC staff. In the event that an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification should be made immediately, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification should be made to the FERC staff within 24 hours. This notification practice should be incorporated into the liquefaction facility's emergency plan. Examples of reportable hazardous fluids-related incidents include:**

  a. fire;

  b. explosion;

  c. estimated property damage of $50,000 or more;

  d. death or personal injury necessitating in-patient hospitalization;

  e. release of hazardous fluids for 5 minutes or more;

  f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes hazardous fluids;

  g. any crack or other material defect that impairs the structural integrity or reliability of a facility that contains, controls, or processes hazardous fluids;

  h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes hazardous fluids to rise above its maximum allowable operating pressure (or working pressure for facilities) plus the build-up allowed for operation of pressure-limiting or control devices;

  i. a leak in a facility that contains or processes hazardous fluids that constitutes an emergency;

  j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;

  k. any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or a facility that contains or processes hazardous fluids;

  l. safety-related incidents from hazardous fluids transportation occurring at or en route to and from the facility; or

m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an LNG terminal's incident management plan.

In the event of an incident, the Director of OEP has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human life, health, property, or the environment, including authority to direct the liquefaction facility to cease operations. Following the initial company notification, the FERC staff would determine the need for a separate follow-up report or follow up in the upcoming semi-annual operational report. All company follow-up reports should include investigation results and recommendations to minimize a reoccurrence of the incident.

4.12.7 Conclusions on LNG Facility and Marine Vessel Reliability and Safety

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

As a cooperating agency, the DOT assists the FERC by determining whether Eagle LNG's proposed design would meet the DOT's 49 CFR 193 Subpart B siting requirements. On March 13, 2019, the DOT provided a Letter of Determination on the project's compliance with 49 CFR Part 193, Subpart B. This determination is provided to the Commission as further consideration to the Commission on its decision and final action on the project application. If the facility is authorized, constructed, and operated, the facility would be subject to the DOT's inspection and enforcement program and final determination of whether a facility is in compliance with the requirements of 49 CFR 193 would be made by the DOT staff.

As a cooperating agency, the Coast Guard also assisted the FERC staff by reviewing the proposed LNG terminal and the associated LNG marine vessel traffic. The Coast Guard reviewed a WSA submitted by Eagle LNG that focused on the navigation safety and maritime security aspects of LNG marine vessel transits along the affected waterway. On February 7, 2018, the Coast Guard issued a LOR to FERC staff indicating the St. Johns River would be considered suitable for accommodating the type and frequency of LNG marine traffic associated with this project based on the WSA and in accordance with the guidance in the Coast Guard's NVIC 01-11. If the project is authorized, constructed, and operated, the facilities would be subject to the Coast Guard's inspection and enforcement program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

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

4.13 CUMULATIVE IMPACTS

4.13.1 Projects and Activities Considered

The Jacksonville Project would be on the north shore of the St. Johns River in the city of Jacksonville in northern Florida. The site is about 14.5 miles west of the mouth of the St. Johns River and the Atlantic Ocean. The project includes an LNG terminal, an LNG marine loading terminal, and an LNG truck load station. Eagle LNG would start construction of the LNG facility as soon as possible after receipt of all required certifications, authorizations, and necessary permits. It is estimated that it would take about 2 years to complete construction and place into service Train 1. Construction of Trains 2 and 3 would continue for 1 additional year, at which time Train 2 would be placed into service. Construction of Train 3 would continue for 6 additional months, at which time all three trains would be operational (totaling about 3 and a half years of construction). Therefore, there would be a 1.5-year period during which the facility would be partially operational and under construction.

In accordance with NEPA, we considered the cumulative impacts of the Jacksonville Project and other projects or actions in the project area. As defined by the CEQ, a cumulative effect is the impact on the environment that results from the incremental impact of the proposed action when added to other past, present, or reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions (CEQ, 1997). Although the individual impact of each separate project may be minor, the additive or synergistic effects of multiple projects could be significant. This cumulative impacts analysis includes other actions meeting the following three criteria:

- the action impacts a resource that is also potentially affected by the Jacksonville Project;
- the action causes the impact(s) within all or part of the time span encompassed by the proposed or reasonably expected construction or operations schedule of the project; and
- the action causes the impact(s) within all or part of the same geographical area affected by the project.

As described in previous sections of this EIS, construction and operation of the Jacksonville Project would temporarily and permanently affect the environment, with most (but not all) impacts generally localized and minimal. The project would result in impacts on geological resources, soils, wetlands, water resources, vegetation, wildlife habitat, special status species, some land uses, recreational and visual resources, socioeconomics, air quality, noise, safety, and climate change. Throughout the individual resource discussions in this EIS, we have determined that the project would have only minimal, generally localized impacts on these resources.

Table 4.13.1-1 summarizes the resource-specific geographic boundaries that were considered in this analysis and the justification for each. Actions occurring outside these boundaries were generally not evaluated because their potential to contribute to a cumulative impact diminishes with increasing distance from the project.

TABLE 4.13.1-1

Cumulative Impact Resource-Specific Regions of Influence for the Jacksonville Project

Resource(s)	Cumulative Impact Region of Influence	Justification for Region of Influence
Geology	Area of disturbance of the Jacksonville Project and areas directly abutting the project site	Geologic resources and conditions occur within site-specific locations, and are generally not affected by activities occurring outside of the designated construction workspaces. Therefore, the geographic scope for cumulative impacts includes the project footprint and areas directly abutting the project site.
Soils	Area of disturbance of the Jacksonville Project and areas directly abutting the project site	Soil resources occur within site-specific locations and are generally not affected by activities occurring outside the designated construction workspaces. As such, the geographic scope for project-related impacts is defined as the area encompassed by the area of disturbance of the Jacksonville Project and the areas directly abutting the project site. Because direct effects are localized and limited primarily to the period of construction, cumulative impacts on soils would only occur if other projects are constructed at the same time and in the same geographic area as the project.
Water Resources and Wetlands	Hydrologic Unit Code 12	Subwatershed boundary defined by the USGS. Well-defined, published natural boundaries for water resources and are large enough to be deemed ecologically relevant to the impacts caused by the project and include the geographic area that sustains the resources of concern
Vegetation	Hydrologic Unit Code 12	Subwatershed drainage area as identified by the USGS. Well-defined, published natural boundaries for water resources and are large enough to be deemed ecologically relevant to the impacts caused by the project and include the geographic area that sustains the resources of concern.
Wildlife and Aquatic Resources including Fisheries	Hydrologic Unit Code 12	Subwatershed drainage area as identified by the USGS. Well-defined, published natural boundaries for water resources and are large enough to be deemed ecologically relevant to the impacts caused by the project and include the geographic area that sustains the resources of concern.
Land Use and Recreation	1-mile radius from LNG facility	Impacts on land uses generally occur within and adjacent to project areas as well as sites generally visible from the project area. As such, the geographic scope for project-related impacts on land use is defined as a 1-mile radius surrounding the project site.
Visual	Communities, Battlefields, and Historic Landmarks within 5-mile radius of the LNG facility	The geographic scope for project-related indirect effects encompasses historic structures buildings, or districts at which the tallest structure of the project would be visible (2-miles of the project site).
Environmental Justice	Census tracts within 2 miles of the LNG facility	Census tract boundaries are published and well defined. The project and other projects in the Census tracts within 2-mile of the project have the potential to affect environmental justice.
Socioeconomic	Four-county area of Clay, Duval, Nassau and St. Johns Counties	County boundaries are published and well defined. The project and other projects in the region have the potential to affect the socioeconomic condition on a county-level.
Cultural Resources	Direct APE (Jacksonville Project area of disturbance), Indirect APE (2-mile radius from LNG facility and 1-mile radius of route to sea).	Direct and indirect impacts are localized and limited to the period of construction, cumulative impacts on cultural resources only occur if other projects are constructed at the same time and in the same geographic boundaries as the project.
Air Quality	0.5-mile radius of the LNG facility for construction impacts and 50 km radius for operational air impacts [a]	Air emissions associated with construction are temporary, transitory, from smaller emission sources spread throughout the site and less likely to extend significantly beyond the project construction area; therefore, a 0.5-mile radius is appropriate for assessing cumulative impacts from construction emissions. Air emissions associated with project operation would be long term, stationary, and generally from larger emission sources more likely to extend farther beyond the project boundaries; therefore, a 50 km radius was deemed appropriate for assessing cumulative impacts from operation emissions. This distance was also determined to be appropriate based on the site-specific air quality impact analysis presented in section 4.11.1.5.

TABLE 4.13.1-1 (cont'd)

Cumulative Impact Resource-Specific Regions of Influence for the Jacksonville Project

Resource(s)	Cumulative Impact Region of Influence	Justification for Region of Influence
Noise	Overlapping NSAs for construction and operational noise	Noise impacts are localized and attenuate as the distance from the noise source increases. Cumulative impacts related to noise only occur if other projects impact the same NSA at the same time as the project.

[a] We note that GHGs do not have a localized geographic scope. GHG emissions from the project combine with GHG emission sources all over the planet to increase CO_2, methane, and other GHG concentrations in the atmosphere.

Table 4.13.1-2 identifies potential past, present, and reasonably foreseeable projects that are being constructed or may be constructed within the geographic scope of each resource area and may cumulatively or additively impact resources that would be affected by the construction and/or operation of the project. This includes (but is not limited to) actions under analysis by a regulatory agency, proposals being considered by state and local planners, plans that have begun implementation, or future actions that have been funded. For the purposes of this cumulative impacts analysis, we considered relevant, reasonably foreseeable actions to be future projects that are anticipated to be constructed between the present and completion of construction for the Jacksonville Project.

The temporal scope includes projects and actions where impacts on a resource within the geographic scope overlaps with the timeframe for construction, operation, and restoration of the proposed Jacksonville Project. Construction is expected to start in the second quarter of 2020, although this could change based on when regulatory approvals are received.

The other actions considered in our cumulative impact analysis may vary from the project in nature, magnitude, and duration. These actions are included based on the likelihood of their impacts occurring within the same geographic and temporal scope as the impacts of the project (i.e., the other actions have recent past, current, or ongoing impacts, or are "reasonably foreseeable"). The other actions that would be expected to affect similar resources during the same temporal scope as the project were considered further. The anticipated cumulative impacts of the project and these other actions are discussed below, as well as any pertinent mitigation actions.

4.13.2 Potential Cumulative Impacts by Resource

This section describes the potential cumulative impacts associated with the Jacksonville Project in conjunction with the other projects identified in table 4.13.1-2.

4.13.2.1 Geologic Resources

The project would require excavation and dredging for a number of different components, including the footings and foundations associated with the online portion of the LNG terminal, the marine berth, the DMMA, and the wastewater management ponds. Because the direct effects of the project would be highly localized, cumulative impacts would only be expected if other projects were constructed within the footprint of the project or the immediate project vicinity.

TABLE 4.13.1-2

Projects Considered in the Cumulative Impacts Analysis for the Jacksonville Project [a]

Project Type/ Project (or Owner)	Location	Distance from Site (miles)	Status	Description	Geographic Scope of Resources
Industrial Projects					
Port of Jacksonville Channel Deepening	Federal Channel	As close as 0.5 miles	In progress (Planned completion in 2023/2024)	Deepening of Federal Channel to 47 feet (from 40 feet) from St. Johns River entrance channel to River Mile 13.	All
Energy Projects					
Kinder Morgan Palmetto Pipeline	Louisiana, Mississippi, South Carolina, Georgia, and Florida	As close as 0.5 mile	Suspended	The Palmetto Project will provide shippers a new refined products pipeline service to move gasoline, diesel, and ethanol from Louisiana, Mississippi, and South Carolina to points in South Carolina, Georgia, and Florida. The project has a design capacity of 167,000 barrels per day.	All
Peoples Gas Cypress Creek Extension Project	Multiple Locations	Varies	On-going	General distribution system maintenance activities regularly undertaken by Peoples Gas that are unrelated to any system upgrades required to serve the Jacksonville Project.	All
JAX LNG (formerly WesPac Midstream LLC)	Dames Point	3.5	Under Construction (Operational in 2018)	LNG liquefaction, storage, dispensing facility for domestic use. Approximately 120,000 gallons per day of LNG capacity.	Land use, recreation, visual, socioeconomics, and operational air quality
Eagle LNG Maxville	West Jacksonville	27.8	Construction completed	Supply LNG fuel for Crowley Maritime and other domestic marine users.	Socioeconomics
Chesapeake Utilities Corporation/Florida Public Utilities	Fernandina Beach	19	Completed and in commercial service	The Eight Flags Energy facility is a combined heat and power plant that will generate steam to be sold to Rayonier Performance Fibers for use in the operation of its facility. Will also produce about 20 megawatts (MW) of base load power that will be sold to Florida Public Utilities Company for distribution to its retail electric customers.	Socioeconomics
Nassau County, Florida Natural Gas Expansion Project / Peninsula Pipeline Company (PPC), TECO Peoples Gas and Florida Public Utilities (FPU)	Nassau County, Florida	10	Planning	PPC and TECO Peoples Gas jointly own the primary transmission pipeline from the Duval/Nassau County line through Nassau County terminating at the Rock Tenn paper mill on Amelia Island. The project involves a 20 mile expansion of the system; however, detailed route information is not yet available.	Socioeconomics

TABLE 4.13.1-2 (cont'd)

Projects Considered in the Cumulative Impacts Analysis for the Jacksonville Project [a]

Project Type/ Project (or Owner)	Location	Distance from Site (miles)	Status	Description	Geographic Scope of Resources
Transportation Projects					
Baldwin Bypass	Baldwin	22.9	Under Construction	Construction of a new 4-mile, four-lane divided highway.	Socioeconomic
Residential, Recreational, and Commercial Development Projects, Including Entertainment and Hotels					
Walton International Group	North Jacksonville	8.5	Suspended	692-acre residential development. Single family homes, retail, and office space.	Socioeconomics
HE Otter, LLC	Jacksonville	12.6	Under Construction	Mixed use development. Apartments, retail, and office space.	Socioeconomics
Hunter's Hideaway	Jacksonville, FL	14.1	Planning	Large residential development, single family residences.	Socioeconomics
Alta Lakes Planned Unit Development (PUD)	Jacksonville, FL	3.3	Under Construction	Large residential development, single family residences.	Land use, socioeconomics
Copper Ridge PUD	Jacksonville, FL	19.2	Planning	Large residential development, single family residences.	Socioeconomics
Plantation Oaks/ Longleaf PUD	Jacksonville, FL	18	Under Construction	Residential development, single family residences.	Socioeconomics
Wells Creek PUD	Jacksonville, FL	20.2	Planning	Large residential development, single family residences.	Socioeconomics
Hampton West PUD	Jacksonville, FL	7.3	Under Construction	Residential development, single family residences.	Socioeconomics
Sunbeam Road PUD	Jacksonville, FL	14.5	Planning	Large residential development, single family residences.	Socioeconomics
Reed Island PUD	Jacksonville, FL	5.1	Planning	For use as a large recreational area for PUD and disposal of dredge material.	Land use, socioeconomics
Liberty Square South	Jacksonville, FL	16.5	Planning	Residential development, may include townhomes, condominiums and single family homes.	Socioeconomics
River City Rehabilitation Center	North Jacksonville	5.5	Planning	Owner is Health Care Managers, Inc. A 9.8-acre parcel that will have a 75,000-square-foot rehabilitation center with 111 beds.	Socioeconomics
VanTrust Real Estate	Nocatee	23.3	Planning	Four to six buildings, each four to six stories high with 100,000 to 150,000 square feet.	Socioeconomics
Three Rivers	Yulee	13.4	Planning	This mixed use development will include 3,000 homes as well as commercial and recreational facilities on 1,600 acres.	Socioeconomics
East Nassau Employment Center	Yulee	14.7	Under Construction	The employment center eventually can accommodate 7.1 million square feet of office, commercial, medical, and industrial uses as well as 4,038 residential units on 2,938 acres.	Socioeconomics

TABLE 4.13.1-2 (cont'd)					
Projects Considered in the Cumulative Impacts Analysis for the Jacksonville Project [a]					
Project Type/ Project (or Owner)	Location	Distance from Site (miles)	Status	Description	Geographic Scope of Resources
Twin Creeks	Nocatee	23.4	Under Construction (portions complete)	A mixed-use development that includes 1.35 million square feet of retail, restaurant and entertainment, 1.37 million square feet of office, 1.4 million square feet of industrial space, 630 units of multi-family residential and 2,560 single family lots.	Socioeconomics
SilverLeaf Plantation	St. Johns	27.1	Planning	Will add 10,700 homes by the end of its 15-year build-out	Socioeconomics
SteepleChase	West St. Augustine	34.5	Planning	965 homes.	Socioeconomics
Non-jurisdictional Associated Projects					
Jacksonville Electric Authority (JEA)	Adjacent to Project Site	0	Planning	Tie-in to power transmission line and switch station.	Vegetation, geology, soils, wildlife, aquatic resources, land use, socioeconomics, cultural, air quality, noise
Peoples Gas (transport of feed gas to project)	Adjacent to Project Site	0	Planning	Transportation of feed gas to the Jacksonville Project.	Vegetation, geology, soils, wildlife, aquatic resources, land use, socioeconomics, cultural, noise

Notes:

[a] This table includes major projects (major industrial or energy projects) within about 50 miles and minor projects (transportation, residential, recreational, and commercial development projects) within about 2 miles of the Jacksonville Project proposed location.

Sources: City of Jacksonville, 2016a and 2016b; FDOT, 2016; JEA 2016; Jacksonville Business Journal, 2015; Metro Jacksonville, 2016, DeLallo, 2016, WesPac Midstream, 2016, Florida Public Service Commission, 2016. Financial News & Daily Record, 2015 & 2016a-e; The Florida Times-Union, 2016a-i; Modern Cities, 2016; Jacksonville Business Journal, 2016a and b; Clay Today, 2016; St Johns County Government, 2016

The cumulative impact area for geologic resources is considered as the project footprint and areas directly abutting the project site. As identified in table 4.13.1-2, these projects are:

- Port of Jacksonville Channel Deepening;
- Kinder Morgan Palmetto Pipeline;
- Peoples Gas Cypress Creek Extension Project;
- JEA (tie-in to power transmission line and switch station); and
- Peoples Gas (transport of feed gas to the project).

The Jacksonville Project would permanently alter the geologic conditions at the site; however, in consideration of Eagle LNG's proposed mitigation and design criteria, the project would not significantly affect or be affected by geological conditions or hazards in the area and would not have a significant contribution towards cumulative impact from other past, present, and reasonably foreseeable future projects and actions. Ground-disturbing impacts associated with the projects listed above would be localized and limited to those projects' footprints. Development on the Kinder Morgan Palmetto Pipeline is currently suspended; therefore, construction, if it occurs, would be unlikely to overlap temporally with the Jacksonville Project construction.

The Port of Jacksonville Channel Deepening Project is currently under construction, and the project footprint may be within 1.5 miles of the proposed Jacksonville Project, but is unlikely to overlap temporally. The Peoples Gas Cypress Creek Expansion may overlap with the Jacksonville Project site; however, the project is still in development and final alignment has not been chosen. The JEA and Peoples Gas projects would primarily occur within the active construction site for the Jacksonville Project. However, due to the minor nature of these activities, we would not anticipate the cumulative impacts to significantly contribute to geologic resource impacts. For these reasons, we conclude that it is unlikely that the Jacksonville Project would contribute to a significant cumulative impact on geological resources in this area.

4.13.2.2 Soils

The Jacksonville Project would require excavation and dredging activities, as well as clearing, grubbing and grading of the site, which can cause erosion and sedimentation. For the Jacksonville Project to contribute to cumulative impacts on soils, other projects/actions would need to also result in soil exposure within an area that overlaps or directly abuts the active construction footprint (geographic scope) and occurs within the same timeframe (temporal scope) that soils would be exposed.

The cumulative impact area for soils is considered as the project footprint and adjacent parcels. As identified in table 4.13.1-2, these projects are:

- Port of Jacksonville Channel Deepening;
- Kinder Morgan Palmetto Pipeline;
- Peoples Gas Cypress Creek Extension Project;
- JEA (tie-in to power transmission line and switch station); and
- Peoples Gas (transport of feed gas to the project).

We evaluated projects that are or may occur within the project footprint and adjacent parcels for their potential cumulative impacts on soils. The Port of Jacksonville Channel Deepening Project is currently under construction, and the project footprint may be close to the proposed dredging of the Jacksonville Project, but is unlikely to overlap temporally. As previously noted, development on the Kinder Morgan Palmetto Pipeline is currently suspended. Therefore, construction, of these projects would be unlikely to overlap temporally with the Jacksonville Project construction and therefore would not contribute to cumulative impacts as we anticipate soils would be stable during construction of the Jacksonville Project.

The Peoples Gas Cypress Creek Extension Project may overlap with the Jacksonville Project site; however, the project is still in development and final alignment has not been chosen. Therefore, cumulative impacts from this project are unknown.

The JEA and Peoples Gas projects would primarily occur within the active construction site for the Jacksonville Project and, due to the minor nature of these activities, they would not be anticipated to significantly add to any cumulative impact on soil resources.

Eagle LNG would implement a range of temporary soil erosion and sedimentation control measures, in accordance with the project-specific Plan and Procedures as well as any state-specific NPDES permit requirements. In addition, Eagle LNG would deposit dredged material at an on-site location, which would minimize potential soil impacts associated with disposal of dredge material. Eagle LNG would also implement temporary and permanent construction BMPs to manage stormwater within project construction workspaces. The project would therefore generate limited temporary impacts on soils. As such, we conclude that temporary impacts on soils associated with construction of the project would not significantly add cumulative impacts on soil resources associated with other projects being undertaken in the same vicinity. While the project would result in some permanent impacts on soil resources, these impacts would be limited to the project footprint and would not contribute to cumulative impacts on soil resources.

4.13.2.3 Water Resources

For the Jacksonville Project to contribute to a cumulative impact on groundwater, surface water, wetlands, or aquatic resources, other unrelated projects/actions also must result in impacts on those water resources within the same geographic and temporal scopes. For the Jacksonville Project, the water resources geographic scope is the HUC-12 subwatershed where the project would be installed.

The following projects listed in table 4.13.1-2 are within the same HUC-12 sub-watershed as the Jacksonville Project and would involve ground disturbance or excavation; therefore, they could result in cumulative impacts on groundwater, surface water, wetlands, and/or other aquatic resources:

- Port of Jacksonville Channel Deepening;
- Kinder Morgan Palmetto Pipeline;
- Peoples Gas Cypress Creek Expansion;
- JEA (tie-in to power transmission line and switch station);
- Peoples Gas (transport of feed gas to the project); and
- FDOT SR 104.

Groundwater

Impacts on groundwater associated with the Jacksonville Project could occur from the clearing of vegetation, excavation of the project area and facility foundations, blasting, dewatering of the construction area, groundwater use during construction, soil mixing and compaction, new impervious surfaces, and hazardous material handling. These impacts would be minimized through the implementation of erosion controls, topsoil segregation, measures to avoid or reduce soil compaction, and revegetation of all disturbed areas contained in the project-specific Plans and Procedures, as well as through the implementation of measures outlined in Eagle LNG’s SPCC Plan. Additional long-term project impacts on groundwater supply could occur due to withdrawals for fire-fighting and daily potable use needs; however, the project would not use significant amounts of groundwater (see section 4.3.1.5).

Depending on the timing for construction of the projects listed above, there is a likely potential for the Jacksonville Project, when combined with these other projects, to contribute to a minor cumulative impact on groundwater due to excavations, possible blasting, the permanent removal of mature vegetation, and the addition of impervious surfaces within the same HUC-12 sub-watershed. However, impacts on groundwater from these projects, individually and cumulatively, would not be significant because construction activities (including water withdrawals for hydrostatic testing or other uses) are expected to be conducted in accordance with all applicable state, federal, and local permit requirements, including a groundwater consumptive use permit. As a result, the Jacksonville Project would only have a minor contribution to overall cumulative impacts combined with other past, present, and reasonably foreseeable future projects and actions on groundwater resources.

Waterbodies

Construction and operation of the Jacksonville Project would mainly result in only short-term impacts on surface water resources, with the exception of converting about 10.1 acres of shallow water to deeper water (see section 4.3). These impacts, such as increased turbidity due to sedimentation, dredging, and in-water construction (including pile driving), have the potential to affect water quality in the St. Johns River. Project discharges of hydrostatic test water, dewatering, cooling water, ballast water, and stormwater also have the potential to affect surface water quality.

The majority of the projects listed above also have the potential to affect surface water resources, the majority of which would be limited to the construction and restoration period. Impacts associated with these projects would be mitigated by permits and BMPs during construction. As such, the cumulative impacts on surface water would be minimal and temporary and would return to baseline levels over a period of days or weeks following construction. In the event that the Port of Jacksonville Channel Deepening Project overlaps with the Jacksonville Project construction and/or dredging schedule, the potential exists for cumulative impacts from the two projects. The Port of Jacksonville Channel Deepening Project would dredge approximately 18 million cubic yards based on the recommended plan, compared to approximately 179,000 cubic yards of dredge material generated by the Jacksonville Project. With the implementation of proposed mitigation measures, the Port of Jacksonville Channel Deepening Project is anticipated to have minimal impacts on key ecological indicators of the St. Johns River.

Both the Jacksonville Project and the Port of Jacksonville Channel Deepening Project would be required to monitor for in-stream turbidity and implement BMPs to minimize turbidity contributable to each respective project during dredging activities, which would ensure that the project would not significantly contribute to additional turbidity impacts on the waterbody.

Longer-term impacts could also occur until adjacent disturbed areas are stabilized through revegetation and from discharge of cooling water and ballast water, as well as ongoing maintenance dredging. Eagle LNG would minimize these effects by implementing specific waterbody construction and mitigation measures, including temporary and permanent erosion controls, implementing the project SPCC Plan, and by complying with applicable federal and state requirements. By implementing these mitigation measures, the project would not contribute to significant cumulative impacts on the waterbody.

4.13.2.4 Wetlands

The project would permanently affect approximately 1.9 acres of wetlands; however, Eagle LNG would offset wetland impacts through the purchase of credits from off-site wetland mitigation banks (see discussion in section 4.4.2). Cumulative impacts would only occur in the event multiple projects are constructed immediately before, concurrently, or immediately following the Jacksonville Project within the same HUC-12 sub watershed.

The six other projects listed above (see section 4.13.2.3) would be required to implement the terms and conditions of their respective CWA section 404 authorization and state permits to mitigate for unavoidable wetland impacts (potentially including compensatory mitigation). These other projects would take steps to avoid and minimize wetland impacts through implementing a wetland construction plan, mitigation measures, and BMPs, resulting in only minor impacts on wetlands. Therefore, any project impacts would be offset and would result in no net loss of wetland functions.

Because Eagle LNG would implement its project-specific Procedures and CSCWM Plan, restore wetlands within the temporary workspace to preconstruction conditions, and provide compensatory mitigation, and because the other projects would likely follow similar procedures for unavoidable impacts on wetlands, we conclude that cumulative impacts on wetlands would not be significant.

4.13.2.5 Vegetation

Construction activities associated with the Jacksonville Project would result in temporary and permanent impacts on vegetation. The geographic scope for analyzing a cumulative impact on vegetation is the HUC-12 subwatershed where the project would be installed. For the Jacksonville Project to contribute to a cumulative impact on vegetation, other projects/actions within the appropriate geographic scope would need to also result in impacts on vegetation. The temporal scope considered the project from the start of construction activities through 1 year after operation begins when herbaceous vegetation should be reestablished. Mature forests within temporary workspaces would take much longer to approach preconstruction conditions (25 years or more). The project would also result in the permanent removal of vegetation in the portions of the site that would be developed for the LNG terminal.

The following projects listed in table 4.13.1-2 are within the same HUC-12 sub-watershed as the Jacksonville Project:

- Port of Jacksonville Channel Deepening;
- Kinder Morgan Palmetto Pipeline;
- Peoples Gas Cypress Creek Expansion;
- JEA (tie-in to power transmission line and switch station);
- Peoples Gas (transport of feed gas to the project); and
- FDOT SR 104.

The major upland vegetation cover types affected by the Jacksonville Project include open lands and forest. Throughout construction and operation of the Jacksonville Project, Eagle LNG would abide by its project-specific Plan and Procedures to minimize impacts on vegetation resources.

The projects listed above, along with the Jacksonville Project, would result in both long-term and permanent impacts on vegetation. Areas developed for the LNG terminal would be converted to industrial use for the life of the project, and cleared forested areas in temporary workspaces would take perhaps 25 years or more to recover, depending on the forest type.

Because the long-term recovery time for mature forests to regrow within temporary workspaces, all of the 6 projects listed above would be constructed within the same temporal scope for cumulative impacts on vegetation as the Jacksonville Project. The two non-jurisdictional projects (JEA and Peoples Gas feed gas line) would occur within the area of disturbance of the LNG terminal and/or adjacent road rights-of-way and would not result in any additional permanent impacts on vegetation resources. The Port of Jacksonville Channel Deepening Project would have minimal impacts on vegetation because the majority of the work would be in-water, and dredge material would be disposed of at existing dredge material management areas. For the other projects, we expect project proponents would take precautions and implement mitigation measures in accordance with local, state, and federal permit terms and conditions to minimize permanent impacts on vegetation. Because of the nature of the other projects listed above, the majority of the vegetation impacts would be associated with the development of the Jacksonville Project. As discussed in section 4.5.2, we determined that project impacts on vegetation would be permanent but not significant. Therefore, the project impacts, when combined with impacts from the other projects listed above are unlikely to cause significant additional cumulative impacts on vegetation.

4.13.2.6 Wildlife and Aquatic Resources

Cumulative effects on wildlife and aquatic resources would occur where projects are constructed in the same general timeframe and proximity, which could represent permanent or long-term loss of habitat types important to wildlife. Impacts on wildlife and aquatic resources are related to vegetation, as a loss of vegetation results in the alteration of available habitat and ecosystem structure, which results in the temporary or permanent displacement of wildlife, increased population stress, predation, and mortality of some individuals (see discussion in section 4.6.1.2). Additionally, aquatic resources are affected due to shoreline development and development within the waterbody.

The cumulative assessment area for wildlife and aquatic resources is the HUC-12 sub-watershed. The following projects listed in table 4.13.1-2 are within the same HUC-12 sub-watershed as the Jacksonville Project:

- Port of Jacksonville Channel Deepening;
- Kinder Morgan Palmetto Pipeline;
- Peoples Gas Cypress Creek Expansion;
- JEA (tie-in to power transmission line and switch station);
- Peoples Gas (transport of feed gas to the project); and
- FDOT SR 104.

Eagle LNG would reduce the potential for impacts on wildlife and wildlife habitat from the Jacksonville Project by minimizing the amount of forested land that would be permanently removed to facilitate LNG terminal construction and operation, and facilitating successful revegetation. To further minimize project-related impacts on wildlife, Eagle LNG would implement its project-specific Plan and Procedures and CSCWM Plan during construction and its SPCC Plan during operation of the project. Eagle LNG would also implement BMPs, which typically include a combination of installation of silt fencing, routine inspection, and good housekeeping techniques.

The other projects described above would have limited vegetation and would not result in significant alterations to wildlife habitat; therefore, with Eagle LNG's implementation of its proposed plans and mitigation measures, we conclude that no significant cumulative impact on wildlife would occur.

Aquatic Resources

A number of project construction and operation activities could affect fishery resources and EFH including dredging, generation of noise from pile driving, ballast water and cooling water discharges, and potential deterioration in water quality due to spills from on-water vessels and equipment. In sections 4.6.2 and 4.6.3, we further describe the project's potential impacts on aquatic resources and EFH.

Dredging of the recessed berthing area would result in increased turbidity in the St. Johns River both during construction and during periodic maintenance dredging (likely every year or two). Any project activities with the potential to increase turbidity would be controlled by turbidity monitoring, and, if necessary, additional mitigation measures, such as the use of turbidity curtains. Of the projects listed above, the Jacksonville Project has the potential to contribute cumulatively to turbidity impacts in the St. Johns River, particularly when and if it coincides temporally with the Port of Jacksonville Channel Deepening Project. However, with the proposed mitigation measures, we conclude that the project's impacts, when combined with impacts associated with other projects described above, would not have a significant effect on turbidity levels in the St. Johns River.

Construction of the marine terminal would require pile driving activities. The noise associated with this activity is expected to temporarily affect fishery resources, but based on our analysis included in section 4.6.2, should not cause permanent injury. Cumulative impacts could occur if noise-producing activities coincide with the Port of Jacksonville's dredging activity. However, with the implementation of Eagle LNG's proposed mitigation measures, even if pile driving noise impacts were to occur concurrently with noise associated with the Port of Jacksonville Channel Deepening Project, it is unlikely that these impacts would result in cumulative effects on marine species.

Ballast water and cooling water discharges from LNG vessels also have the potential to affect fisheries and EFH. While ballast water procedures and treatments would be specific to each vessel design, all LNG vessels calling at the project's marine terminal would use a Coast Guard-approved ballast water management system, which is expected to treat water as it is pumped on board to prevent the spread of aquatic invasive species. Typical systems could include ultraviolet light or hypochlorite treatment. Given that discharges of cooling water would be subject to permit requirements, it is not expected that fisheries and EFH would be affected, even cumulatively.

Eagle LNG will implement its SPCC Plan to minimize potential impacts on fisheries and EFH associated with spills during operation. Other projects would also require use of a SOPEP during ship operations. Therefore, we conclude that there wouldn't be a significant cumulative effect from spills.

We conclude that with the implementation of Eagle LNG's and other projects' proposed mitigation measures, the project, combined with other projects listed above, would be unlikely to cumulatively impact aquatic resources.

4.13.2.7 Threatened, Endangered, and Other Special Status Species

The species discussed in section 4.7 could potentially be affected by construction and/or operation of other past, present, and reasonably foreseeable future projects occurring within the same area as the Jacksonville Project. Prior to construction, Eagle LNG and all projects that have a federal nexus (i.e., receive federal funding or are subject to federal permitting) are required under the ESA to consult with appropriate federal, state, and local agencies to evaluate the types of species that may be found in the area of the projects, identify potential impacts from construction and operation of the projects to any species identified, and implement measures to avoid, minimize, or mitigate impacts on special status species and their habitat. Projects that do not have a federal nexus are also required to comply with the ESA; however, review of these projects is covered under section 10 of the ESA. These projects may not harm or otherwise take a federally listed species unless the project proponent has an incidental take permit issued by the FWS. Regarding critical habitat, however, private landowners who take actions on their land that do not have a federal nexus are not required to obtain a permit.

Under the ESA, cumulative effects to federally listed species and critical habitat only take into account the effects of future state or private projects, not federal activities that are reasonably expected to occur within the project action area. Cumulative effects, under the ESA, are considered in the agency consultation and effect determinations, and in the development of appropriate mitigation. A project can only be authorized for construction if it complies with section 7 of the ESA, meaning that any impacts (direct, indirect, or cumulative) would not threaten the continued existence of any federally listed species.

In general, it is anticipated that the Jacksonville Project would have little overall effect on wildlife due to the lack of high quality preferred habitat in the area and the mitigation measures implemented by Eagle LNG. Based upon our analysis, we have determined that the project would have *no effect* on 13 federally listed species, *is not likely to adversely affect* the remaining 17 federally listed species, and *is not likely to jeopardize the continued existence* of the 3 candidate species. We have also determined that the

Jacksonville Project would have permanent minor impacts on the following state-listed species: Worthington's marsh wren, little blue heron, tricolored heron, and least tern. The impacts on these species would be caused by habitat loss due to conversion of portions of the project site to industrial use, as well as disturbance caused by construction and operation of the project (i.e., noise and light). While each species has differing habitat needs, and therefore, the region of influence for cumulative impacts would vary, we have not identified any projects listed in table 4.13.1-2 that may contribute to additional cumulative impacts on these species, or other federal or state-listed species potentially affected by the project, beyond the direct impacts associated with the project.

4.13.2.8 Land Use, Recreation, and Visual Resources

Impacts on land use, recreation, and visual resources would be confined to the construction workspaces and surrounding areas visible from the Jacksonville Project area. Therefore, the geographic scope for assessing potential cumulative impacts on land use and recreation was 1 mile from the project footprint, which includes the following projects identified in table 4.13.1-2:

- Port of Jacksonville Channel Deepening;
- Kinder Morgan Palmetto Pipeline;
- Peoples Gas Cypress Creek Expansion;
- JEA (tie-in to power transmission line and switch station); and
- Peoples Gas (transport of feed gas to the project).

The LNG terminal would be constructed in an area that is industrial in character and would therefore have minimal cumulative impacts on land use, recreation, and aesthetics. The Kinder Morgan Palmetto Pipeline, if built, would have potentially affected certain types of land uses within the 1-mile radius of the project. However, this project has been suspended indefinitely and therefore no cumulative impacts on land use in combination with the Jacksonville Project are expected. It is anticipated that the project in combination with the Port of Jacksonville's Channel Deepening Project could potentially affect boating and fishing activity in the St. Johns River because the increased construction, shipping, and dredging traffic would result in less space for use by recreational boaters and fishers. This impact should be minimal, however, due to the relative abundance of accessible shoreline and structures along the St. Johns River. The project and others in the vicinity would contribute to an incremental change in the existing viewshed; however, given the already industrialized character of the area, we conclude that this impact would be minimal.

4.13.2.9 Socioeconomics

Past, present, and reasonably foreseeable future projects and activities could cumulatively impact socioeconomic conditions in the geographic scope for the Jacksonville Project. The socioeconomic issues considered in the area of the project were employment and workforce, housing, economy and tax revenues, public services, and transportation. For evaluating cumulative impact on socioeconomics for the Jacksonville Project, the geographic scope was the four-county area of Clay, Duval, Nassau, and St. Johns Counties, because the metrics for assessing the resources that may be affected (population, housing, taxes, etc.) are generally collected at the regional level, and services such as healthcare, education, and public safety are usually provided on a regional basis. The projects in table 4.13.1-2 that are within the four-county area of Clay, Duval, Nassau and St. Johns Counties are as follows:

- Port of Jacksonville Channel Deepening;
- Kinder Morgan Palmetto Pipeline;

- Peoples Gas Cypress Creek Expansion;
- JEA (tie-in to power transmission line and switch station);
- Peoples Gas (transport of feed gas to the project);
- JAX LNG;
- FDOT SR 104;
- Eagle LNG Maxville;
- Chesapeake Utilities Corporation/Florida Public Utilities;
- Nassau County, Florida Natural Gas Expansion Project/Peninsula Pipeline Company (PPC), TECO Peoples Gas and Florida Public Utilities (FPU);
- Baldwin Bypass;
- Walton International Group;
- HE Otter, LLC;
- Hunter's Hideaway;
- Alta Lakes PUD;
- Cooper Ridge PUD;
- Plantation Oaks/Longleaf PUD;
- Wells Creek PUD;
- Hampton West PUD;
- Sunbeam Road PUD;
- Reed Island PUD;
- Liberty Square South Rehabilitation Center;
- VanTrust Real Estate;
- Three Rivers;
- East Nassau Employment Center;
- Twin Creeks;
- SilverLeaf Plantation; and
- SteepleChase.

Employment/Workforce

Eagle LNG anticipates that up to 95 percent of the overall construction workforce (estimated to average about 307 workers and peak at 465 workers) would be local hires; however, the potential exists that a larger percentage of the overall construction workforce could come from outside the four county local area. This would result in a temporary decrease in the local and regional unemployment rate and a temporary increase in income and sales taxes generated in the same geographic scope. Cumulative impacts on employment and workforce would largely depend on how much of the temporary construction workforce is sourced locally for the projects described above and the number of permanent positions that would be needed to operate the other facilities listed above.

Short-term construction laborers would be in high demand during the construction cycles of these projects, some of which may overlap. The impact on the local workforce would depend on the percentage of workers hired locally. When combined with the demand for temporary workers with the same general skill sets for the other projects in the same geographic scope, the short-term cumulative impacts would be beneficial to the four county area surrounding the Jacksonville Project. However, the overall construction workforce needed to construct the project would represent less than 2 percent of the overall construction workforce currently located in the project area, therefore, the cumulative impacts would be minor. These effects would only occur during the construction cycle of these projects; once construction winds down, the small demand for workers needed to operate these facilities would be easily met by local labor resources. The number of permanent employees that would be hired to operate the Jacksonville Project, estimated at 8 to 12, half of which would be non-local hires, would have a negligible contribution to a cumulative impact on employment in the geographic scope.

Economy and Tax Revenues

Eagle LNG would spend between $12 and $20 million on construction materials in the affected area, which would generate increased local, state, and federal sales tax revenues. During operation, Eagle LNG would contribute an estimated $4.2 million in annual property taxes to Duval County.

Property taxes generated from the Jacksonville Project would provide local governments with revenue to fund public facilities and services. In addition to property tax revenue, the temporary and permanent workforce associated with the project would spend money locally on consumer items and living expenses, which would generate sales tax revenue to the state and municipalities. The Jacksonville Project would contribute a minor positive tax revenue impact within its geographic scope. The workforce associated with the other projects listed above also would contribute sales and income taxes to the local economy, thereby leading to a compounding positive cumulative impact on the regional economy.

There would also be long-term cumulative impacts on the economy from property, sales, and income tax collections associated with the Jacksonville Project and the other projects listed above. The Jacksonville Project's contribution toward cumulative economic impact is anticipated to be positive through increased tax revenues generated within the project's geographic scope.

Housing

The largest impacts on housing from the Jacksonville Project would be from non-local workers relocating to the area during construction. Eagle LNG estimates that only 5 percent of construction workers (i.e., 15 to 25) would be non-local, which could be up to 65 non-local persons relocating to the project area including family members of construction workers; however, if a greater percentage of non-local construction workers were needed, up to 465 non-local persons could have to relocate to the project area, not including family members of construction workers. Given the large amount of temporary housing options available, we determined in section 4.9.4 that there is sufficient temporary housing to accommodate non-local workers at any percentage of the total construction workforce. As previously noted, Eagle LNG anticipates that 8 to 12 workers would be required for operation of the LNG terminal, half of which would be non-local. Therefore, the project would not generate a significant demand for temporary or permanent housing. Because the projects listed above would also likely rely on mainly local construction workers, we do not anticipate that cumulative impacts on housing would occur as a result of the Jacksonville Project when considered with other reasonably foreseeable past, present, and future projects.

Public Services

The cumulative impact on public services from the Jacksonville Project and the 28 other projects listed above would depend on the number of projects under construction at one time. The small incremental demands of several projects occurring at the same time would be unlikely to be difficult for police, fire, and emergency service personnel to address. With proper planning, emergency and other public services generally are able to handle additional service needs. The problem would be temporary, occurring only for the approximate 3.5-year duration of construction of the LNG terminal, and could be mitigated by the various project sponsors consulting with local emergency responders in the development of project-specific emergency response plans, providing their own personnel to augment the local capacity, or providing additional funds or training for local personnel. As explained in section 4.9.5, Eagle LNG has developed a preliminary ERP to address potential emergencies that could result from the construction and operation of the LNG terminal, which includes an individual emergency services coordination plan specific to the project area and to the local areas surrounding it. We assume that other non-FERC-regulated projects, would require similar plans to be implemented by its contractors. Therefore, we conclude that the project, along with other projects being developed in the area, would not result in significant cumulative impacts on public services.

Traffic and Transportation

Construction of the Jacksonville Project would result in temporary impacts on road traffic at locations where the work area is accessed and could contribute to cumulative traffic impacts if other projects take place at the same time and in the same areas. Short-term construction impacts would be mitigated by the fact that the construction workforce would access the work sites during non-peak traffic hours, as site construction activities typically extend from 7 a.m. to 7 p.m.; therefore, workers would arrive before 7 a.m. and likely leave after 7 p.m. Additionally, Eagle LNG would construct acceleration and deceleration lanes consistent with FDOT requirements to facilitate access to the LNG terminal.

The LNG terminal site would be accessed using SR 105, which is a four-lane bi-directional arterial road with average daily traffic volumes of between 11,800 and 13,300 vehicles per day. The project traffic increases associated with construction would represent a 7 to 8 percent increase in existing (2015) traffic on SR 105. Operational traffic associated with the operation of the LNG terminal would be minimal, including 12 roundtrips per day for employees and 5 to 10 roundtrips per week of LNG trucks. Because of the location of the project, it is unlikely that traffic associated with the construction and operation of the projects listed above would use SR 105, with the exception of the Kinder Morgan Palmetto Pipeline, which is currently suspended. Therefore, we conclude that, with the mitigation measures proposed by Eagle LNG, the Jacksonville Project, when considered with other projects in the region, would not have a significant cumulative impact on traffic.

The construction and operation of the Jacksonville Project would also increase marine traffic in the project area. The direct and indirect impacts of marine traffic associated with the project are described in section 4.9.6. With the exception of the Port of Jacksonville Channel Deepening Project, the other projects listed above would not result in additional marine traffic in the St. Johns River, which is the project's marine route to the Atlantic Ocean. Because the Port of Jacksonville Channel Deepening Project is a long-term project, it would likely overlap with both construction and operation of the Jacksonville Project. However, because the Jacksonville Project would comprise about 6 percent of existing large vessel traffic in the region, we do not anticipate significant cumulative impacts associated with marine vessel traffic. The Coast Guard completed its review of the follow-on Waterway Suitability Assessment for the Jacksonville Project and found that the St. Johns River is suitable for accommodating the type and frequency of LNG marine traffic associated with the project and issued its letter of recommendation on February 7, 2018.

4.13.2.10 Cultural Resources

Cultural resources surveys of the direct APE (defined as the approximately 193.4-acre parcel and the submerged lease area and dredging easement area of the project) have not identified any NRHP-eligible archaeological sites or historic resources. The indirect APE is defined as the areas within 2 miles of the project site and within a 1-mile radius of the route to sea. Other projects identified in table 4.13.1-2 that could potentially be within this area are:

- Port of Jacksonville Channel Deepening;
- Kinder Morgan Palmetto Pipeline;
- Peoples Gas Cypress Creek Expansion;
- JEA (tie-in to power transmission line and switch station); and
- Peoples Gas (transport of feed gas to the project).

A number of historic properties have been found within the indirect APE, of which 1 is listed on the NRHP, 6 are evaluated as eligible for the NRHP, 42 are ineligible for the NRHP, and 64 have not yet been evaluated. The facilities to be constructed at the project site would be minimally visible from the St. Johns River shoreline to the south and to the east; existing industrial facilities (fuel depots and terminals) are currently visible from these locations. The project site would not be visible from any aboveground historic properties. Because the project would have no impact on these resources, it would not contribute to cumulative impacts on historic properties within the indirect APE.

The route to sea follows an existing shipping channel and does not present a new use or appearance within the indirect APE. The channel passes through the boundaries of the NRHP-listed Fort Caroline National Memorial as drawn in 1975, although the verbal description of this historic property states that it is bounded on the north by the St. Johns River (Dilonardo, 1975). The vessels expected to call at the Jacksonville LNG marine terminal would be similar, or in most cases, smaller, in size and classification to those currently using the channel. At its peak, the annual volume of traffic to the Jacksonville Project LNG marine terminal would represent about 3 to 4 percent of the total marine vessel traffic expected within the Jacksonville Harbor. With the exception of the Port of Jacksonville Channel Deepening Project, none of the other projects listed above would generate marine vessel traffic. The COE determined that the Port of Jacksonville Channel Deepening Project would have no adverse effects on historic properties. As such, we conclude that the project would not likely contribute to cumulative impacts on historic resources within the proposed shipping channel.

4.13.2.11 Air Quality

Emissions such as criteria pollutants, VOCs, and HAPs would be emitted from projects in the area. These were listed for chronic and acute health impacts due to inhalation, as well as secondary environmental effects. For these pollutants, we consider a geographic scope for cumulative impacts of up to 50 kilometers.

We do not use 50 kilometers to consider cumulative GHG emissions. GHGs were identified by the EPA as pollutants in the context of climate change. GHG emissions do not directly cause local ambient air quality impacts. GHG emissions result in fundamentally global impacts that feed back to localized climate change impacts. Thus, the geographic scope for cumulative analysis of GHG emissions is global rather than local or regional. For example, a project 1 mile away emitting 1 ton of GHGs would contribute to climate change in a similar manner as a project 2,000 miles distant also emitting 1 ton of GHGs.

Construction Emissions

Construction of the Jacksonville Project (as well as most of the projects and activities listed in table 4.13.1-2) would involve the use of heavy equipment that would generate temporary emissions of air contaminants and fugitive dust. A large portion of criteria emissions generated during construction would be PM_{10} and $PM_{2.5}$ in the form of fugitive dust that would result from clearing, grading, excavation, and vehicle traffic on unpaved roadways. Typically, PM_{10} settles quickly near the construction sites. The cumulative air impacts would be additive emissions of pollutants due to the use of equipment powered by diesel or gasoline engines and further generation of fugitive dust from land clearing, ground excavation, and cut and fill operations. Emissions would be reduced by measures such as using properly maintained vehicles. During construction, the impacts would be localized to the vicinity of the active construction areas. For the Jacksonville Project to contribute to a cumulative impact from construction air emissions, other projects/actions listed in table 4.13.1-2 would need to also involve concurrent construction (temporal scope) in an area within 0.5 mile of the active construction footprint of the Jacksonville Project (geographic scope).

Projects identified within 0.5 mile of the active construction footprint of the project include:

- Port of Jacksonville Channel Deepening Project;
- Kinder Morgan Palmetto Pipeline;
- JEA (tie-in to power transmission line and switch station); and
- Peoples Gas (transport of feed gas to the project).

As previously noted, the Kinder Morgan Palmetto Pipeline has been suspended. If the project proceeds to construction, it is unlikely to overlap temporally with the Jacksonville Project. The JEA and Peoples Gas projects would primarily occur within the active construction site for the Jacksonville Project. Due to the minor nature of these activities, they are not anticipated to significantly add to the construction emissions and associated impacts estimated for the Jacksonville Project.

The potential exists for the Port of Jacksonville Channel Deepening Project to overlap temporally with the Jacksonville Project, and due to the close proximity of portions of the proposed channel deepening activities, the emissions associated with the Port of Jacksonville Channel Deepening Project could combine with the construction emissions generated by the Jacksonville Project. However, based on the mitigation measures proposed by the Jacksonville Project, which include fugitive dust control measures and proper maintenance and operation of construction equipment, we do not anticipate that construction emissions from the Jacksonville Project would extend significantly beyond the project site and do not anticipate cumulative impacts associated with construction emissions from the Jacksonville Project combined with other nearby construction activities.

Operation Emissions

Operation of the Jacksonville Project would result in permanent air quality impacts associated with the new emission-generating equipment at the LNG terminal site over the lifetime of the project. The Jacksonville Project would contribute cumulatively to air quality impacts when considering other stationary past, present, and reasonably foreseeable sources of air emissions within 30 miles (50 km), which is the geographic scope defined for operational air quality impacts. Past and present sources are already accounted for by including background values in the analysis presented in section 4.11.1. Reasonably foreseeable (i.e., future or pending) sources are discussed further below. For our analysis, operational emissions were taken from the EPA's Envirofacts database and FDEP air permitting records.

We were able to verify that the majority of the area within 30 miles of the LNG terminal is considered to be in attainment/unclassifiable for all of the NAAQS criteria pollutants. In Nassau County, about 19 miles northeast of the Jacksonville Project, there is a nonattainment area with an approximately 1.5 mile radius for the 2010 SO_2 NAAQS; however, due to the distance from the project area and relatively small amount of SO_2 emissions associated with the project, no cumulative impacts are anticipated to this SO_2 nonattainment area.

In terms of planned projects, given that impacts from construction projects would be localized and temporary, we excluded these from the cumulative impact assessment because they would not contribute to a sustained adverse cumulative impact, and no significant proposed construction projects were identified adjacent to the project area. There are two planned projects within a 30 mile radius of the facility that involve significant operational emission sources. According to the FDEP air permitting records, the JAX LNG and Jacksonville Lime facilities, are proposed to be within the vicinity of the Jacksonville Project. The JAX LNG facility would be about 4 miles east of the Jacksonville Project area, and, as previously noted, is currently under construction. The Jacksonville Lime facility is a proposed lime manufacturing plant that would be about 4 miles southwest of the Jacksonville Project area. These facilities have not begun operation, but are classified in their respective permits as Title V major sources of air pollution. The Kinder Morgan Palmetto Pipeline, an additional previously planned project with significant operational emissions, is currently suspended.

The Jacksonville Project may overlap with air emissions from the JAX LNG and Jacksonville Lime facilities, as well as other air emissions sources in the project area, including on-land and marine transportation emissions. As presented in section 4.11.1.5, air modeling completed for the facility showed that the operating emissions associated with the project would have minor impacts on air quality in the project vicinity and would be well below the NAAQS when combined with background ambient air quality concentrations. As such, the project would not significantly contribute to adverse cumulative air impacts from air emissions associated with facility operation.

4.13.2.12 Noise

Construction of the Jacksonville Project would involve construction equipment and generally result in highly localized and temporary noise impacts. For the Jacksonville Project to have a cumulative impact from construction noise, other projects/actions listed in table 4.13.1-2 would need to also involve concurrent construction (temporal scope) in an area that overlaps or directly abuts the active construction footprint of the Jacksonville Project (geographic scope).

As analyzed in section 4.11.2, operation of the Jacksonville Project would result in an increase of perceptible noise at NSAs near the proposed LNG terminal. Cumulative noise impacts could occur at an NSA where noise may be experienced from both the operation of a reasonably foreseeable project and the Jacksonville Project.

The geographic scope of the cumulative impact analysis is considered to be projects whose noise impacts would overlap with the NSAs analyzed for the Jacksonville Project, which includes:

- Port of Jacksonville Channel Deepening Project;
- Kinder Morgan Palmetto Pipeline;
- JEA (tie-in to power transmission line and switch station);
- Peoples Gas (transport of feed gas to the project); and
- FDOT SR 104.

Construction noise impacts attributable to the Jacksonville Project may affect nearby NSAs, especially during pile driving activities. We also included a recommendation to ensure that underwater noise mitigation levels committed to by Eagle LNG are successfully implemented.

As previously noted, the Kinder Morgan Palmetto Pipeline Project is currently suspended; therefore, construction is unlikely to overlap temporally with the Jacksonville Project. The JEA Project and Peoples Gas Project would both occur within the footprint of the Jacksonville Project. Due to the nature of these activities, they are not anticipated to significantly contribute to the existing project construction noise. Eagle LNG completed a cumulative noise impact analysis on nearby NSAs to account for noise impacts of other planned construction projects on nearby NSAs. The analysis reviewed two different scenarios: 12-hour upland construction and 24-hour dredging occurring simultaneously; and 24-hour upland construction and 12-hour dredging occurring simultaneously. The results of this analysis are presented in table 4.13.2-1, which includes the noise attributable to the project activities, as well as the noise attributable to project activities combined with noise attributable to the Port of Jacksonville Channel Deepening Project, the FDOT SR 104 Project, and background noise.

TABLE 4.13.2-1

Eagle LNG – Construction Noise Cumulative Impact Assessment

NSA	Existing Noise Level (dBA L_{dn})	Scenario 1 [a] Noise Level (dBA L_{dn})	Scenario 1 + Background [b, d] (dBA L_{dn})	Scenario 2 [c] Noise Level (dBA L_{dn})	Scenario 2 + Background [b, d] (dBA L_{dn})
NSA 2	58	60.3	62.3	60.5	62.5
NSA 3	47	58.3	58.6	60.4	60.6
NSA 4	57	47.2	57.4	50.6	57.9
NSA 5	47	54.5	55.2	58.2	58.5
NSA 6	57	44.1	57.2	47.5	57.5

a Assumes 24-hour dredging activities and 12-hour upland construction activities.
b Sound pressure levels are measured on a logarithmic scale; therefore, the predicted increase in ambient noise level at the NSAs during construction of the LNG terminal would not be the sum of the two noise levels.
c Assumes 12-hour pile driving activities and 24-hour upland construction activities.
d Includes construction noise from the Jacksonville Project, Jacksonville Channel Deepening Project, and FDOT SR 104 Project.

Based on the analysis presented in table 4.13.2-1, if the construction associated with the Port of Jacksonville Channel Deepening Project and FDOT SR 104 Project occurred simultaneous to the Jacksonville Project, some additional construction noise impacts would be experienced at nearby NSAs. The cumulative noise level increases during construction of the project at nearby NSAs could range from less than 1 dB to up to 14 dB. However, the Jacksonville Project would be the dominant noise source at most of the NSAs during construction. In section 4.11.2 we concluded that the noise associated with project construction would have a moderate impact on surrounding NSAs. Therefore, we conclude that, while some additional cumulative noise impacts at nearby NSAs may occur based on the construction of the Jacksonville Project and other nearby projects, these impacts would be moderate and primarily associated with daytime construction activities.

Operational noise impacts attributable to the Jacksonville Project are limited by FERC regulations to a maximum allowable contribution of 55 dBA L_{dn} at existing NSAs. To maintain compliance, we have recommended Eagle LNG file a noise survey within 60 days of placing each LNG Liquefaction Train, as well as the entire LNG terminal, in service. The recommendation further states that if the noise attributable to the operation of all of the equipment at the LNG terminal under interim or full horsepower load conditions exceeds 55 dBA L_{dn} at any nearby NSAs, Eagle LNG 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. Eagle LNG would then file a second noise survey within 60 days after it installs the additional noise controls.

Of the projects listed above, only the Kinder Morgan Palmetto Pipeline would have operational noise sources. As previously noted, this project is currently suspended; therefore, no cumulative impacts from operational noise sources are anticipated.

4.13.2.13 Climate Change

The climate change analysis presented in the draft EIS prepared for the project was based upon the 2014 U.S. Global Change Research Program (USGCRP) report. An updated report was released in November 2018, with portions available in 2017. We updated our analysis to reflect this revised information.

Climate change is the variation in climate (including temperature, precipitation, humidity, wind, and other meteorological variables) over time, whether due to natural variability, human activities, or a combination of both, and cannot be characterized by an individual event or anomalous weather pattern. For example, a severe drought or abnormally hot summer in a particular region is not a certain indication of climate change. However, a series of severe droughts or hot summers that statistically alter the trend in average precipitation or temperature over decades may indicate climate change. Recent research has begun to attribute certain extreme weather events to climate change (USGCRP, 2018).

The leading U.S. scientific body on climate change is the USGCRP, composed of representatives from thirteen federal departments and agencies.[44] The Global Change Research Act of 1990 requires the USGCRP to submit a report to the President and Congress no less than every 4 years that "1) integrates, evaluates, and interprets the findings of the Program; 2) analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and 3) analyzes current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years." These reports describe the state of the science relating to climate change and the effects of climate change on different regions of the United States and on various societal and environmental sectors, such as water resources, agriculture, energy use, and human health.

In 2017 and 2018, the USGCRP issued its *Climate Science Special Report: Fourth National Climate Assessment, Volumes I and II* (Fourth Assessment Report) (USGCRP, 2017 and 2018, respectively). The Fourth Assessment Report states that climate change has resulted in a wide range of impacts across every region of the country. Those impacts extend beyond atmospheric climate change alone and include changes to water resources, transportation, agriculture, ecosystems, and human health. The United States and the world are warming; global sea level is rising and acidifying; and certain weather events are becoming more frequent and more severe. These changes are driven by accumulation of GHGs in the atmosphere through combustion of fossil fuels (coal, petroleum, and natural gas), combined with agriculture, clearing of forests, and other natural sources. These impacts have accelerated throughout the end of the 20th and into the 21st century (USGCRP, 2018).

Climate change is a global phenomenon; however, for this analysis, we will focus on the existing and potential cumulative climate change impacts in the project area. The USGCRP's Fourth Assessment

[44] The USGCRP member agencies are: U.S. Department of Agriculture, U.S. Department of Commerce, U.S. Department of Defense, U.S. Department of Energy, U.S. Department of Health and Human Services, U.S. Department of the Interior, U.S. Department of State, U.S. Department of Transportation, U.S. Environmental Protection Agency, National Aeronautics and Space Administration, National Science Foundation, Smithsonian Institution, and U.S. Agency for International Development.

Report notes that the following observations of environmental impacts are attributed to climate change in the Southeast region (USGCRP, 2017, 2018):

- The region has experienced an increase in annual average temperature of 0.46 °F since the early 20th century, with the greatest warming during the winter months.
- The region has experienced more frequent and longer heat waves and a greater number of days with nighttime temperatures above 75 °F.
- Over the past 50 years, there has been an overall increase in extreme rainfall events in the region, except in some areas near the Appalachian Mountains and Florida where there has been a downward trend.
- The number of strong (Category 4 and 5) hurricanes has increased since the early 1980s.
- Average global sea level rise over the past century averaged approximately 8 to 9 inches; in some low lying areas of the Southeast region, the combination of vertical land motion and changing currents has resulted in as much as 1 to 3 feet of local relative sea level rise. This recent rise in local relative sea level has caused normal high tides to reach critical levels that result in flooding in many coastal areas in the region.

The USGCRP's Fourth Assessment Report notes the following projections of climate change impacts in the project region with a high or very high level of confidence[45] (USGCRP, 2018):

- The frequency and severity of extreme precipitation events are projected to increase, with up to double the number of heavy rainfall events by the end of the century.
- The Southeast region's coastal plain and inland low-lying areas are projected to experience daily high tide flooding by the end of the century due to sea level rise and extreme rainfall events.
- Rising temperatures and increases in the duration and intensity of droughts are expected to increase wildfire occurrence and also reduce the effectiveness of prescribed fire.
- The region is projected to experience an increase in economic vulnerabilities in the agricultural, timber, and manufacturing sector as well as exposure-linked health impacts due to changing seasonal climates and more frequent extreme heat episodes.
- Tropical storms are projected to be fewer in number globally, but stronger in force, exacerbating the loss of barrier islands and coastal habitats.

It should be noted that while the impacts described above taken individually may be manageable for certain communities, the impacts of compound extreme events (such as simultaneous heat and drought, wildfires associated with hot and dry conditions, or flooding associated with high precipitation on top of saturated soils) can be greater than the sum of the parts (USGCRP, 2018).

The GHG emissions associated with construction and operation of the project are described in section 4.11.1. The construction and operation of the project would increase the atmospheric concentration

[45] The report authors assessed current scientific understanding of climate change based on available scientific literature. Each "Key Finding" listed in the report is accompanied by a confidence statement indicating the consistency of evidence or the consistency of model projections. A high level of confidence results from "moderate evidence (several sources, some consistency, methods vary and/or documentation limited, etc.), medium consensus." A very high level of confidence results from "strong evidence (established theory, multiple sources, consistent results, well documented and accepted methods, etc.), high consensus" (https://science2017.globalchange.gov/chapter/front-matter-guide/).

of GHGs, in combination with past, current, and future emissions from all other sources globally, and contribute incrementally to future climate change impacts.

Currently, there is no universally accepted methodology to attribute discrete, quantifiable, physical effects on the environment to the project's incremental contribution to GHGs. We have looked at atmospheric modeling used by the EPA, National Aeronautics and Space Administration, the Intergovernmental Panel on Climate Change, and others and we found that these models are not reasonable for project-level analysis for a number of reasons. For example, these global models are not suited to determine the incremental impact of individual projects, due to both scale and overwhelming complexity. We also reviewed simpler models and mathematical techniques to determine global physical effects caused by GHG emissions, such as increases in global atmospheric CO_2 concentrations, atmospheric forcing, or ocean CO_2 absorption. We could not identify a reliable, less complex model for this task, and we are not aware of a tool to meaningfully attribute specific increases in global CO_2 concentrations, heat forcing, or similar global impacts to project-specific GHG emissions. Similarly, it is not currently possible to determine localized or regional impacts from GHG emissions from the project. Absent such a method for relating GHG emissions to specific resource impacts, we are not able to assess potential GHG-related impacts attributable to this project. Without the ability to determine discrete resource impacts, we are unable to determine the significance of the project's contribution to climate change.

We have not been able to find any GHG emission reduction goals established at the federal level.[46] However, the State of Florida established climate change goals that involve GHG reductions via Florida Governor's Executive Orders 07-127 and 07-128 adopted in July 2007 (State of Florida, 2007a, 2007b). The State of Florida's GHG reduction goals established a state-wide target of 248.8 million metric tons of CO_2e by 2025 (to 1990 levels) and 199.0 million metric tons of CO_2e by 2050 (State of Florida, 2007a, 2008). Direct emissions from the project would result in annual CO_2e emissions of about 0.10 million metric tons, which would represent 0.04 percent of Florida's 2025 GHG goal and 0.05 percent of Florida's 2050 GHG goal.

4.13.2.14 Conclusion

Recently completed, ongoing, and planned projects in the Jacksonville Project area were identified for inclusion in this cumulative impact analysis (see table 4.13.1-2). The majority of cumulative impacts would be temporary and minor when considered in combination with past, present, and reasonably foreseeable activities. However, some long-term and permanent cumulative impacts would occur on forested habitat, particularly mature live oak hammock, and project development impacts on the state-listed Worthington's marsh wren, little blue heron, tricolored heron, and least tern. We also identified potential cumulative impacts associated with turbidity from project dredging activities associated with the Port of Jacksonville Channel Deepening Project and associated with construction noise. Some long-term cumulative benefits to the communities in and around the Jacksonville Project area would be realized from increased tax revenues. Short-term cumulative benefits would also be realized through jobs, wages, and purchases of goods and materials.

Due to the implementation of specialized construction techniques and carefully developed resource protection and mitigation plans designed to avoid or minimize environmental impacts from the Jacksonville Project as a whole, minimal cumulative effects are anticipated when the effects of the project are added to the past, present, and reasonably foreseeable future projects within the Jacksonville Project's geographic scope.

46 The national emissions reduction targets expressed in the EPA's Clean Power Plan and the Paris climate accord are pending repeal and withdrawal, respectively.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF THE ENVIRONMENTAL ANALYSIS

The conclusions and recommendations presented in this section are those of the FERC environmental staff. Our conclusions and recommendations were developed with input from the COE, Coast Guard, DOE, and DOT as cooperating agencies in preparation of this EIS. However, the cooperating agencies will present their own conclusions and recommendations in their respective Records of Decision or determinations. The cooperating agencies may adopt this EIS per 40 CFR 1506.13 if, after an independent review of the document, they conclude that their requirements have been satisfied. Otherwise, they may elect to conduct their own supplemental environmental analyses.

We conclude that construction and operation of the Jacksonville Project would result in some limited adverse environmental impacts. Most of these environmental impacts would be temporary or short-term during construction and operation; however, long-term and permanent environmental impacts on soils, water quality, aquatic resources, vegetation, wildlife, land use, air quality, and noise would also result from the project. As part of our review, we developed specific mitigation measures that we determined would appropriately and reasonably reduce the environmental impacts resulting from construction and operation of the project. Therefore, we are recommending that our mitigation measures be attached as conditions to any authorization issued by the Commission. If the project is constructed and operated in accordance with applicable laws and regulations, the mitigating measures discussed in this EIS, and our recommendations, these impacts would not be significant. A summary of the anticipated impacts, our conclusions, and our recommended mitigation measures is provided below, by resource area.

5.1.1 Geology

Construction of the project would require clearing, grading, and filling about 70.7 acres of land using standard earthmoving and compaction equipment to install the LNG terminal facilities on a level platform with sufficient space to execute the work safely. The LNG terminal would also require the dredging of about 179,000 cubic yards of material from a 10.1-acre area within the St. Johns River to construct the marine facilities. Sediment removal would occur using a hydraulic cutterhead and/or mechanical dredging equipment, and would be conducted in accordance with Eagle LNG's *Marine Terminal Dredging and Dredged Material Management Area Plan*, which outlines procedures for dredging, on-site dredged material management, and periodic removal of dredged material to an off-site disposal area. Blasting is not anticipated during construction of the project.

Construction and operation of the project would not materially alter the geologic conditions of the project area, and the project would not affect the extraction of mineral resources during construction or operation. Based on Eagle LNG's proposal, including implementation of the project-specific Plan and Procedures, we conclude that impacts on geologic resources would be adequately minimized and would not be significant.

5.1.2 Soils

Project construction activities such as clearing, grading, excavation, backfilling, heavy equipment traffic, and restoration may affect soil resources. To minimize the impacts of construction on soils, Eagle LNG would implement its project-specific Plan and Procedures. Additional mitigation measures would include the installation and maintenance of temporary erosion and sedimentation controls to prevent sediment flow from construction areas into adjacent, undisturbed areas; dust suppression measures to control and minimize wind erosion; and regular monitoring and inspection of disturbed areas until final stabilization is achieved.

The majority of the soils disturbed within the LNG terminal site would be permanently affected by paved or gravel plant roads, occupied by aboveground facilities, or remain in open water. Soils underlying aboveground facility foundations would be permanently affected by compaction, and alteration of soil drainage characteristics would occur; however, these effects would be highly localized and minor. Eagle LNG would restore temporary work areas to their preconstruction conditions in accordance with its project-specific Plan and Procedures, and would comply with seed, fertilizer, soil additive, and other mitigation recommendations by the NRCS and the City of Jacksonville. Following construction, Eagle LNG would monitor disturbed areas for the at least the first and second growing seasons in upland areas and at least 3 years in wetlands until revegetation is successful.

Soil contamination may result from hazardous material or fuel spills during construction. To prevent soil contamination, Eagle LNG would implement its CSCWM Plan to minimize accidental spills and to ensure that inadvertent spills of fuels, lubricants, or solvents are contained, cleaned up, and disposed of a in an appropriate manner. We have reviewed the CSCWM Plan and find it acceptable. During project operation, Eagle LNG would implement its SPCC Plan, which it has committed to filing with the Secretary prior to the start of construction. Eagle LNG would also require its construction contractor to develop an *Unanticipated Discovery of Contaminated Soils Plan* that would include guidelines for identifying contaminated soils, isolating the contaminated area, notifying the appropriate agencies, and monitoring conditions. We are recommending that, prior to construction, Eagle LNG file a copy of its *Unanticipated Discovery of Contaminated Soils Plan* with the Secretary for review and written approval by the Director of OEP.

Impacts on soils due to construction and operation of the project would be permanent. However, with implementation of the impact minimization and mitigation measures described above and our recommendation, we conclude that impacts would not be significant.

5.1.3 Water Resources

Groundwater

Based on a review of publically available electronic databases, no springs are within 0.5 mile of the project, no public or private groundwater wells are within 150 feet, and no water system assessment areas overlap the project area.

With the exception of the installation of two new water supply wells, dredging within the St. Johns River, and the installation of piles to support the marine facility and marine jetty, construction of the project would involve shallow, temporary, and localized excavation. Shallow surficial aquifers could sustain minor, indirect impacts from changes in overland water flow and recharge caused by clearing and grading of work areas. In areas where groundwater is near the surface, excavation may intersect the water table, in which case dewatering would be required, which could also temporarily affect local water tables. These minor impacts would be temporary and would not significantly affect groundwater resources or change groundwater flow patterns.

Eagle LNG would drill two new on-site water wells to a target depth of 600 feet below land surface to obtain water from the Floridan aquifer to supply water during construction and operation of the LNG terminal. Eagle LNG anticipates using 135,000 gallons per day during the construction period. The concrete and steel piles required for the LNG ship loading and berthing areas would be driven to a depth of about 95 feet below NAVD88. These piles would likely enter the surficial aquifer, but would not intersect the Floridan aquifer. To minimize the risk of potential groundwater contamination in the event of an inadvertent spill of hazardous materials during construction and operation of the LNG terminal, Eagle LNG would implement its project-specific Plan and Procedures and CSCWM Plan during facility construction, and its SPCC Plan during operation. These direct and indirect impacts would have a temporary and minor impact on groundwater resources.

Following construction of the LNG terminal, the operational footprint of the project would be about 81.8 acres, of which about 13.5 acres would be converted to impervious cover. The remaining 68.3 acres would be vegetated land, gravel, or open water. Because a relatively small area of the project would be impervious surface, we conclude that impacts on groundwater recharge to the shallow aquifers would be minimal.

Hydrostatic testing would require a one-time withdrawal from the on-site wells of 8.4 million gallons of groundwater. This proposed volume represents less than one-tenth of a percent of the total daily water withdrawn from the Floridan aquifer in Duval County. After being neutralized and filtered to remove any particulates, discharge of hydrostatic test water would occur to the stormwater retention ponds in a limited number of discrete events. Therefore, we conclude that impacts on groundwater due to hydrostatic testing would be negligible.

Surface Waters

The proposed project is on the north bank of the St. Johns River within the Lower St. Johns River Basin, about 14.5 river miles from the river mouth. The river reverses flow twice daily in response to tidal action from the Atlantic Ocean. Drummond Creek discharges to the St. Johns River on the south side of the project site. These two waterbodies have designated uses for fish consumption, recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife.

Potential impacts on surface waters during construction and operation of the LNG terminal would be associated with dredging, construction of the LNG loading and ship berthing facilities (including pile installation), vessel traffic, site modification and stormwater runoff, hydrostatic testing, and/or spills or leaks of hazardous materials.

Eagle LNG would conduct dredging activities using hydraulic cutterhead suction and/or mechanical dredging techniques, resulting in the removal of 179,000 cubic yards of dredged material. Dredging would result in increased suspended solid and turbidity levels in the St. Johns River. Dredged material would be stored in an on-site DMMA designed to hold the entire volume of dredged material. The DMMA would also store dredged material from subsequent maintenance dredging during the life of the project. Eagle LNG would monitor turbidity levels during dredging operations. Water from the DMMA would be discharged to Drummond Creek and turbidity levels would also be monitored at the DMMA discharge. Should turbidity levels exceed Florida’s surface water quality standard of 29 NTU above ambient background conditions, Eagle LNG would suspend dredging activities until turbidity levels reach acceptable limits. Therefore, we conclude that impacts on water quality due to dredging and discharges from the DMMA would be temporary and not significant.

Construction of the marine facilities would result in localized, temporary increases in turbidity and suspended sediment levels during the installation of pilings and over-water structures. However, these impacts would be temporary (i.e., confined primarily to the period of in-water activity and shortly thereafter) and limited to the area within and immediately adjacent to the access trestle and T-head platform. Therefore, we conclude that no permanent or long-term water quality impacts would occur.

During operation, Eagle LNG anticipates a maximum of 100 LNG vessel calls per year. Vessels calling on the facility during construction and operation would use established shipping channels. Use of the waterway by LNG carriers, barges, and support vessels during construction and operation of the facility could cause wave-induced erosion of shorelines. However, this increase in vessel traffic would be consistent with the planned purpose and use of active shipping channels, the size of the proposed vessels would be consistent with those currently navigating the waterway, and the increase would only represent a less than 6 percent increase of the current vessel traffic. Therefore, we conclude that the associated impacts on water quality within the shipping channel would be minor.

LNG carriers visiting the facility during operations could discharge up to about 3 million gallons of ballast water per vessel into the St. Johns River. LNG carriers visiting the facility area required to have a ballast water management plan adhering to Coast Guard regulations. LNG carriers would be equipped with a Coast Guard-approved ballast water management system designed to process ballast water prior to discharge and to kill, render harmless, or remove harmful aquatic organisms and pathogens. The primary potential impact on water quality due to ballast water discharge would be a temporary and localized change in salinity, temperature, pH, and/or dissolved oxygen near the vessel; however, the estuarine system is naturally subject to variable conditions, and tidal flow and river currents would rapidly dissipate such effects. Therefore, we conclude that ballast water discharge would result in minor, intermittent, and highly localized impacts relative to salinity, temperature, pH, and dissolved oxygen at the facility in the St. Johns River.

During operation, LNG carriers calling on the facility would draw about 2.5 million gallons of water from the St. Johns River for use in cooling the vessel's boilers. Impacts on surface waters from cooling water intake and discharge would be primarily limited to an increase in water temperature of about 3°C near the LNG vessel. Due to the limited temperature differences and the relatively small volume of discharge compared to the total volume in the St. Johns River, we conclude that impacts associated with the cooling water discharge would be intermittent and minor.

Inadvertent spills or leaks of hazardous materials used during construction and operation of the facility pose a potential risk of contamination to surface water near the project. As described under Section 5.1.3 (Groundwater), Eagle LNG would implement its project-specific Plan and Procedures and CSCWM Plan during facility construction, and its SPCC Plan during operation to reduce the risk of contamination of surface waters. With implementation of these impact minimization and mitigation measures, we conclude that the probability of spills or leaks would be small and any resulting impacts on surface waters would be temporary and minor.

5.1.4 Wetlands

Construction of the LNG terminal would affect about 2.2 acres of wetlands, of which about 1.9 acres would be permanently lost, including about 1.2 acres of palustrine forested wetlands and about 0.7 acre of estuarine salt marsh. The remaining less than 0.3 acre, including 0.2 acre of forested wetland and 0.1 acre of salt marsh, would be allowed to revegetate after construction. About 0.3 acre of wetlands (less than 0.1 acre of mixed forested wetland and 0.2 acre of salt marsh) would be disturbed by the installation of the DMMA drain pipe during periodic (every 1 to 2 years) maintenance dredging for the life of the project. Although the DMMA drainpipe would be removed after each dredging event, we have considered this impact to be permanent. During construction, wetlands within the LNG terminal site would be permanently filled and converted to upland industrial land use, including construction of the facility berm, the vapor wall, and the marine terminal. Temporary construction impacts would result from construction activities associated with the LNG terminal and jetty, and the placement of a weir discharge pipe from the DMMA through portions of the forested wetland and saltmarsh before discharging into Drummond Creek. Eagle LNG would allow these wetlands to revegetate naturally.

During project design, Eagle LNG reduced wetland impacts by locating project facilities in upland areas away from wetlands and waterbodies where possible. To ensure temporary impacts on wetlands are reduced, Eagle LNG would implement its project-specific Procedures, which includes limiting the pulling of tree stumps to areas of permanent fill, using low-ground-weight construction equipment or operating normal equipment on timber riprap or construction mats, installing sediment barriers upslope of the wetland boundary to prevent sediment flow into wetlands, and ensuring that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species. All wetlands temporarily affected by construction of the LNG terminal would be allowed to revert to their pre-existing conditions following construction. Given the limited impacts on wetlands, the relative abundance of wetlands in the project area, and Eagle LNG's commitment to restoring the wetlands temporarily affected by construction, we conclude that impacts on wetlands would be permanent, but not significant.

To further reduce impacts on wetlands, Eagle LNG would implement the mitigation measures determined necessary by the COE through the section 10/404 permitting process. In addition, Eagle LNG has committed to purchasing credits from off-site mitigation bank(s) in the approved watershed to offset permanent wetland impacts in accordance with COE requirements, which would result in no net loss of wetlands.

5.1.5 Vegetation

Eagle LNG would clear a total of 81.1 acres of vegetation during construction of the LNG terminal. Following construction, the majority of the vegetation affected at the LNG terminal (70.7 acres) would be converted to developed land for industrial use associated with operation of the facility, resulting in the permanent loss of 67.9 acres of upland forest (27.9 acres of live oak hammock and 40.0 acres of coniferous plantation), 0.9 acre of open land (sand other than beaches), 1.2 acres of mixed wetland forest, and 0.7 acre of salt marsh. The areas outside the LNG terminal site (7.6 acres of live oak hammock, 2.5 acre of coniferous plantation, 0.2 acre of mixed forested wetland, and 0.1 acre each of open land and salt marsh) would be allowed to return to its preconstruction vegetation communities.

No vegetation communities of special concern were identified within the project site; however, one state-listed plant was identified (see section 5.1.7 for additional information).

Eagle LNG would implement the measures in its project-specific Plan and Procedures to minimize impacts on vegetation communities within and adjacent to the LNG terminal, including the use of temporary and permanent erosion control measures, revegetation procedures, and post-construction monitoring during at least the first and second growing seasons in uplands and for 3 years in wetlands until revegetation is successful. As part of this monitoring, Eagle LNG would be required to examine the project area for the presence of invasive species and restore the area to no more than the density of invasive species in the surrounding area. Eagle LNG would implement the mitigation measures included in its *Noxious and Invasive Weed Control Plan* to control noxious weeds.

Due to the presence of similar undeveloped habitats within a 1.0-mile radius of the project, the relatively small size of the LNG terminal, and the implementation of the project-specific Plan and Procedures and Eagle LNG's *Noxious and Invasive Weed Control Plan*, we conclude that impacts on vegetation from construction and operation of the LNG terminal would be permanent but minor. Additionally, Eagle LNG would comply with any permit and mitigation requirements established by the City of Jacksonville.

5.1.6 Wildlife and Aquatic Resources

Wildlife

Construction of the Jacksonville Project would result in both temporary and permanent impacts on wildlife and wildlife habitat. Direct impacts of construction on wildlife include displacement, stress, and direct mortality of some individuals. The cutting, clearing, and/or removal of existing vegetation within the construction work area could also affect wildlife by reducing suitable cover, nesting, and foraging habitat for some wildlife species. The more mobile wildlife, such as birds and mammals, may relocate to similar habitats nearby when construction activities commence. However, smaller, less mobile wildlife (e.g., reptiles, amphibians) could be inadvertently injured or killed by construction equipment. The permanent reduction in available habitat within the LNG terminal as well as the influx of individuals to other nearby areas may increase population densities for certain species, resulting in increased inter- and intra-specific competition and reduced reproductive success of individuals.

A total of about 92.2 acres of wildlife habitat would be affected by construction of the LNG facility, of which about 70.7 acres of vegetated land would be permanently converted to industrial use and 11.1 acres would be converted to industrial use or retained in open water. The remaining habitat on the 193.4-acre parcel would remain intact and would provide similar habitat for wildlife present in the area. Wildlife would be directly displaced from the facility footprint, and some wildlife may be indirectly displaced within a larger area due to the increase in noise and lighting during construction and operation of the LNG facility.

To minimize project-related impacts on wildlife, Eagle LNG would implement its project-specific Plan and Procedures as well as its CSCWM Plan, and would develop and implement its SPCC Plan during operation.

Based on the remaining habitat within and outside of the 193.4-acre tract that includes the LNG terminal site, adequate similar habitat for wildlife is present near the site. Because there is adequate similar wildlife habitat in the vicinity, Eagle LNG has proposed relocation of gopher tortoises and associated commensal species, and Eagle LNG would implement its project-specific Plan, Procedures, CSCWM Plan and SPCC Plan, we have determined that construction and operation of the proposed LNG terminal would have permanent, but not significant impacts on wildlife.

The LNG terminal is within the migratory bird Atlantic Flyway, which terminates in the Caribbean, and is the most densely populated flyway. The vegetation communities within the LNG terminal site include about 37.0 acres of recently cleared and replanted young coniferous plantation, which reduces the habitat value for many species. There would be a one-time direct impact on migratory birds with associated indirect impacts which could include effects on egg and young survival, displacement of birds during migration, and could affect nesting, foraging, and mating behaviors. The remaining forested areas outside the terminal footprint, which comprise a mix of young coniferous plantation, mature live oak hammock, and forested wetlands, would continue to provide suitable habitat for some migratory birds during and after construction. In response to our recommendation in the draft EIS, Eagle LNG filed a copy of its *Migratory Bird Plan* and the associated correspondence with the FWS. To address FWS comments on the *Migratory Bird Plan*, we are recommending in section 4.6.1.3 that, if site clearing occurs during the March through August nesting season, Eagle LNG should develop mitigation measures in consultation with the FWS to minimize impacts on colonial rookeries for review and approval by the Director of OEP. For these reasons and with implementation of the measures included in Eagle LNG's *Migratory Bird Plan* and our recommendation, we have determined that the project would not substantially affect migratory birds or colonial waterbirds.

One bald eagle nest was identified outside the construction limits west of the project site. Construction activities associated with the LNG terminal would not occur within the FWS 660-foot buffer for bald eagle nests. However, nesting bald eagles could be disturbed by noise and activity associated with construction and operation of the LNG terminal, especially noise associated pile driving activities. In response to our recommendation in the draft EIS, Eagle LNG confirmed that, prior to starting any construction activities during the bald eagle October 1 to May 15 nesting season, it would determine if the nest is active. If active, Eagle LNG would monitor the nest during pile driving activities within 0.5 mile of the nest site. If any disruption to the eagles is observed, Eagle LNG would cease pile driving and consult with the FWS for mitigation methods prior to continuing pile driving activities. If no disturbance is apparent, Eagle LNG would complete pile driving activities and submit a final report to the FWS when work is completed. Eagle LNG would file a copy of any correspondence and/or the final report with the Secretary. With implementation of Eagle LNG's proposed mitigation, we conclude that impacts on bald eagles would be short term and not significant.

Aquatic Resources

Habitat for aquatic resources present within the project footprint includes the St. Johns River, Drummond Creek, and the associated saltmarsh on the north shore of the river. Designated essential fish habitat for multiple species is present in the St. Johns River estuary, unconsolidated bottom (soft sediments), tidal creeks, and estuarine emergent wetlands associated with the project area. Dredging of the berthing area would temporarily increase noise, turbidity, and suspended solid levels within the water column, reducing light penetration and primary production, adversely affecting fish eggs and juvenile fish survival, benthic community diversity and health, foraging success, and suitability of spawning habitat. Deposition of water column sediments on nearby substrates could bury aquatic macroinvertebrates. Construction of the berthing area would affect 11.1 acres of submerged off-shore land, and would permanently convert 0.7 acre of saltmarsh to industrial facilities.

Most fish species are highly mobile and would leave the area during dredging activities, which would last about 12 weeks. However, dredging would result in direct mortality of benthic organisms (e.g., aquatic macroinvertebrates, mollusks, crustaceans, which are important food sources for many species of fish), within the dredge footprint that currently provides open water habitat. Eagle LNG would implement measures appropriate for the dredging technique used and would monitor turbidity levels during dredging operations. Eagle LNG would also follow its project-specific Plan and Procedures, and stormwater pollution prevention plan. Further, Eagle LNG would provide compensatory mitigation for the permanent loss of saltmarsh. Therefore, based on the available information, we have determined that impacts on aquatic resources and essential fish habitat due to temporary increases in noise, turbidity, and suspended solid levels from dredging would be localized, temporary, and not significant.

Eagle LNG would conduct maintenance dredging of the recessed berthing area every 1 to 2 years, which would result in direct take and habitat modification as well as temporary increases in noise, turbidity, and suspended solid levels. The impacts would be similar to the initial dredging event but would occur for a shorter duration. In response to our recommendation in the draft EIS, Eagle LNG confirmed it would implement its proposed construction turbidity monitoring and mitigation measures during each periodic maintenance dredging event. For these reasons, we conclude that the maintenance dredging would also have localized, temporary, and minor impacts on aquatic resources.

Construction of the LNG terminal would require installation of 239 piles using pile driving techniques that would increase underwater noise levels. Potential impacts on aquatic resources associated with pile driving would include injury or trauma to fish, sea turtles, and other animals with gas-filled cavities, such as swim bladders and hearing structures. As mitigation, we are recommending that Eagle LNG develop and file an *Underwater Noise Mitigation Plan* to define the measures Eagle LNG would implement to reduce underwater noise by 12 dB (re: 1 uPa) for pre-stressed concrete piles and by 25 dB (re: 1 uPa) for steel piles. Based on incorporation of these mitigation measures and with our recommendation, we conclude that project impacts on aquatic resources would not be significant.

Underwater noise generated by construction barges and LNG carriers would increase near the transiting vessels. Impacts on aquatic resources due to increased noise levels would vary by species; however, the aquatic species present are mobile and most would move away from disturbing noises. Due to the existing industrial and shipping activities within the LNG vessel transit routes and barge work areas, and the mobility of resident species, we have determined that project impacts on aquatic resources associated with engine noise would be intermittent and minor.

Cooling water intakes associated with LNG carriers would result in impingement and entrainment of early life stages of fish (ichthyoplankton) and other small organisms. Eagle LNG conducted an ichthyoplankton study in the project's cooling water intake area during the peak winter and summer spawning periods. Winter sampling results indicated that cooling water intake would affect bay anchovy, weakfish, ladyfish, and Atlantic croaker. Summer sampling results indicated that cooling water intake would affect bay anchovy, spotted seatrout, and weakfish. Based on overall low adult loss equivalent values, we conclude that cooling water intake effects on fisheries would not be significant.

Eagle LNG estimates that cooling water discharged from LNG carriers would be about 3 °C warmer than ambient water temperature. Fish and invertebrates could be temporarily affected by the increase in temperature; however, the impacts would be highly localized and the resident species would be mobile and would relocate. Given the volume of cooling water withdrawn and discharged relative to the total volume of water within the St. Johns River and the mobility of resident species, which could relocate to surrounding waters if necessary, we have determined that impacts on aquatic resources would be intermittent and minor.

Lighting associated with in-water activities during construction and operation of the LNG terminal would affect small organisms attracted to the light and could result in increased predation by larger species. During construction, lighting would be limited to activities that require 24-hour operation. Over-water lighting used during LNG terminal operations would be shielded and limited to the extent necessary to carry out marine operations or facility maintenance. In addition to impacts associated with artificial lighting, shading impacts would occur where the trestle traverses wetlands (about 0.1 acre). The shading impacts would be small compared to the large area of remaining wetlands. Based on the likelihood that smaller aquatic resources would acclimate over time to increased lighting and the small area of shading impacts, we have determined that impacts on aquatic resources from increased lighting and shading would be localized and minor.

5.1.7 Threatened, Endangered, and Other Special Status Species

To comply with section 7 of the ESA, we consulted either directly or indirectly (through Eagle LNG's informal consultation) with the FWS, NOAA Fisheries, and state resource agencies regarding the presence of federally listed and federally proposed species and their habitats that are protected under the ESA, as amended; species that are currently candidates for federal listing under the ESA; state-listed threatened or endangered species; and species otherwise granted special status at the state or federal level (e.g., species protected under the MMPA).

We developed a BA for the Jacksonville Project (see appendix C). We are requesting concurrence with our findings of effect for the federally listed species from the FWS and NOAA Fisheries. Based on a review of publicly available information, agency correspondence, and field surveys, a total of 33 federally listed threatened, endangered, or candidate species, and 38 state-listed threatened and endangered species (28 of which are also federally listed[1]) may occur in the project area. In addition, critical habitat has been designated for three species in Duval County: the Florida manatee, the loggerhead sea turtle, and the North Atlantic right whale. Two wood stork nesting colony core foraging areas also intersect the project area. In addition, potentially suitable habitat for federally listed species is present in the St. Johns River and along portions of the LNG transit route in Duval County and the Atlantic Ocean.

[1] One additional state-listed species is a federal candidate for listing.

Based on Eagle LNG's survey results and proposed mitigation measures, we determined that the project would have *no effect* on 13 federally listed species, *is not likely to adversely affect* 17 federally listed species (West Indian manatee; blue, fin, North Atlantic right, sei, and sperm whales; Atlantic and shortnose sturgeon; smalltooth sawfish; green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles; eastern indigo snake; American alligator; and wood stork), and *is not likely to jeopardize the continued existence* of the 3 candidate species (gopher tortoise, striped newt, and eastern black rail). We have also determined that the project would have *no effect* on the critical habitat for the North Atlantic right whale, the loggerhead sea turtle, or the Florida manatee. Because consultation with the U.S. Fish and Wildlife Service and NOAA Fisheries is ongoing, we are recommending completion of any necessary Endangered Species Act consultation with these agencies prior to construction.

An additional nine species that are state listed as threatened or endangered may be affected by the project. The primary threat to these species is loss of habitat (about 0.7 acre of saltmarsh) and disturbance due to light and noise associated with operation of the facility. We conclude that this disturbance would result in *permanent but minor* impacts on four state-listed species (Worthington's marsh wren, little blue heron, tricolored heron, and least tern), and that there would be no effect on the remaining five species.

5.1.8 Land Use, Recreation, and Visual Resources

The project facilities would occupy about 92.2 acres of land within a 193.4-acre site along the north bank of the St. Johns River. The site is primarily undeveloped and zoned for industrial use. The 92.2 acres of land required for construction of the LNG terminal comprises 79.3 acres of forest/woodland, 1.8 acres of open land, and 11.1 acres of open water. Operation of project would permanently affect 69.1 acres of forest/woodland, 1.6 acres of open land, and 11.1 acres of open water. The remaining 10.4 acres would be allowed to revert to the existing land use type after the completion of construction activities.

There are no currently proposed residential areas or subdivisions within a 0.25-mile radius and no planned commercial or residential developments within a 1.0-mile radius of the project. No public lands, recreation areas, or special interest areas would be directly affected by the project. No designated natural, recreational, or scenic areas, or registered national landmarks would be affected, and no National Wild and Scenic Rivers, National Trails, or National Wilderness Preserves are within 0.25 mile of the project.

The Jacksonville Zoo is about 1.1 miles west of the proposed project site and more than 1.5 miles from the LNG terminal operational area boundary. Visitors accessing the Zoo may experience an increase in traffic along Zoo Parkway during construction and operation of the project. The Reddie Point Preserve, a 102-acre day-use facility providing public fishing docks, picnic facilities, observation areas, multi-use fields, and trails, is across the St. Johns River about 1.3 miles southwest of the project site. Given Reddie Point Preserve's location in relation to the proposed project area, it is unlikely that visitors would experience traffic-related impacts while accessing the preserve. However, recreational users along the coastal portions of the preserve would be able to see both construction and operation of the project and may experience delays in recreational vessel transit times. Because the increase in vessel traffic would be minimal, we determined there would be no significant effect on recreational users of the river.

We received a comment on the draft EIS regarding potential project-related impacts on zoo animals. Due to the distance (1.1 miles) between the zoo and the LNG terminal, the existing industrial nature of the area, and the existing visual screening present between the sites, we conclude that construction of the project would not have any direct impacts on the zoo animals. Furthermore, any perceptible increase in noise associated with construction of the project would be temporary, minor, and primarily limited to daytime hours, and operation of the facility would result in no anticipated regionally significant impacts on air quality. Therefore, we conclude that any potential impacts on zoo animals associated with construction and operation of the project would be temporary and minor.

The project would not affect any nationally or state-designated visual resources or visually sensitive areas such as natural landmarks, scenic roads, trails, or scenic rivers. The residences to the south and southeast of the project (on the south side of the St. Johns River) would be within the viewshed; however, these visual receptors would be at least partially screened by a vegetated island in the middle of the river as well as forested areas that would remain on the east and west side of the property outside the facility footprint. In addition to Reddie Point Reserve and the residences described above, project construction activities and marine traffic associated with the project would be visible to recreationists using the St. Johns River and/or motorists driving along Route 105, including those traveling to and from the Jacksonville Zoo. The presence of large construction equipment and truck traffic would change the visual quality of these areas; however, due to the distance to the site, existing industrial nature of the area, and short duration of impact, we conclude that impacts would be minor, and the project's traffic would not have a significant impact on visual resources.

Permanent changes to the visual character of the area would result from operation of the LNG terminal, which would modify the viewshed. The most prominent visual features would be the LNG storage tank, which would be about 158 feet wide and 130 feet high, and the Cold Vent, which would be about 50 feet high when no flame is present. The maximum flame height is about 24 feet from the top of the Cold Vent. However, these features would only be partially visible and generally less prominent in the viewshed than other industrial facilities. Outdoor lighting would be required for operations and safety, and for elevated structures. Eagle LNG would use directional lighting to minimize the horizontal emission of light. Eagle LNG also conducted visual simulations at KOPs in the vicinity of the project, which were selected based on proximity to and the potential presence of views of the project, as well as concerns from residents. Based on the results of the visual simulations and analysis, we concluded that the project would not adversely affect any visually sensitive areas, and that viewsheds from other areas would not be significantly affected.

In Florida, the FDEP administers the state's Coastal Zone Management Program and is the lead state agency that performs federal consistency reviews. The Florida Coastal Management Program covers the entire state; therefore, a federal consistency review is required for the project. The federal consistency review would be conducted concurrently with the FDEP Environmental Resource Permit process for the proposed project. Eagle LNG has not yet received the consistency determination from the state; therefore, we are recommending that Eagle LNG file this determination prior to construction.

5.1.9 Socioeconomics

Construction of the Jacksonville Project would not have a significant adverse impact on local populations, housing, employment, provision of community services, and property values. In addition, no residences or businesses would be displaced as a result of construction or operation of the LNG terminal. However, construction of the project would result in a temporary positive increase in economic activity in the vicinity of the LNG terminal resulting from direct, indirect, and induced effects. In addition, construction and operation of the project would result in an increase in state, local, and federal tax revenues due to expenditures and property taxes.

Several potential impacts on vehicular and marine traffic may result from the construction and operation of the LNG terminal. Potential impacts on vehicular traffic would generally be related to the construction of the project and would be the result of the influx of workers commuting to and from the various construction sites (average of 307 commuter roundtrips per day) as well as the transport of construction materials (average of 20 truck deliveries per day). To reduce potential traffic congestion associated with construction and operation of the facility, Eagle LNG would construct acceleration and deceleration lanes (consistent with the FDOT requirements) for access to the LNG terminal. Eagle LNG would typically would schedule construction working hours and commuting time during off-peak hours.

Operation of the LNG terminal would result in an average of 12 roundtrips per day associated with worker commutes. Additionally, Eagle LNG anticipates 5 to 10 roundtrips per week of LNG trucks, a maximum of 2 off-site heavy hydrocarbon truck deliveries per week, and 62 truck deliveries for receipt of mixed refrigerant components per year. Because of the relatively small number of vehicle trips and with the implementation Eagle LNG's proposed mitigation measures, we have determined that impacts on roadway transportation associated with construction of the LNG terminal would be temporary and not significant. Additionally, operation of the LNG terminal would have negligible impacts on roadway transportation.

Marine traffic impacts would generally result from increases in vessel movements in the St. Johns River during construction and operation of the LNG terminal. During construction, Eagle LNG anticipates one or two barge deliveries of larger pieces of equipment and fewer than five construction-phase barge deliveries on the St. Johns River during construction. Eagle LNG would use barges for dredging and construction of the marine terminal; however, the number of barges is expected to be relatively low compared to existing vessel traffic on the St. Johns River and these barges would be operating outside of the navigation channel. During operation of the project at full capacity, between 40 and 100 LNG vessels would call on the LNG terminal per year (depending on the size of the vessels that call on the port), which would comprise about 6 percent of existing large vessel traffic in the region. The LNG carrier vessels likely to be used by the project are similar in size to those already present on the St. Johns River. Therefore, we conclude that impacts on marine transit would not be significant during construction or operation of the project.

Although several block groups that would potentially be considered environmental justice communities fall within a 2-mile radius of the proposed project site, the impacts on these block groups do not indicate they would be disproportionately affected. In addition, the block group where the project is proposed would likely bear most of the impacts, and it does not have any disadvantaged populations (i.e., it does not meet the criteria for consideration as an environmental justice community). Therefore, we conclude that the project would not disproportionately affect minority populations or low-income groups.

The long-term socioeconomic effect of the project is likely to be beneficial, although minor, based on the increase in tax revenues that would accrue in the counties affected by the project. Based on the analysis presented, we conclude that the project would not have a significant adverse effect on the socioeconomic conditions of the project area.

5.1.10 Cultural Resources

Eagle LNG completed a records review, a cultural resources assessment survey, and an underwater cultural resources survey of the proposed LNG facility. The terrestrial cultural resources assessment survey covered both archaeological and architectural resources. Three archaeological sites (two multi-component and one historic), one archaeological occurrence, one architectural structure, and one resource group (homestead) were identified during the survey; all of these resources were recommended as not eligible for the NRHP. In an April 14, 2015 letter, the SHPO concurred with the recommendations. We also concur.

The underwater cultural resources survey consisted of a marine magnetometer survey, a side-scan sonar survey, and use of a sub-bottom profiler. The marine magnetometer survey documented 50 magnetic anomalies, 2 of which were considered potentially significant and recommended for either avoidance or diver identification and evaluation. The side-scan sonar documented 34 sonar returns, 1 of which was associated with one of the potentially significant magnetic anomalies. Analysis of the sub-bottom profiler data identified two additional features recommended for avoidance or diver identification and limited subsurface testing. Eagle LNG conducted archaeological diver identification and evaluation of three of the four identified potentially significant submerged targets. One feature would be avoided based on the current project design and was not examined. Two of the features examined were determined to be non-cultural and the remaining feature was determined to be a modern anchor. In a June 16, 2015 letter, the SHPO concurred with the results and requested the anomalies and targets not diver-tested be avoided by establishing buffers around them, in accordance with the recommendations in the survey report. We concur with SHPO's recommendations.

Both we and Eagle LNG consulted with 16 Native American tribes with traditional ties to the area that would be affected by the project, as well as several other potentially interested parties to provide them an opportunity to comment on the proposed project.

Compliance with Section 106 of the NHPA is complete for the project.

5.1.11 Air Quality and Noise

Air Quality

Construction of the project would result in temporary impacts on air quality associated with emissions generated from construction equipment and fugitive dust. Construction activities are comparable to other types of infrastructure projects or industrial facilities. There may be localized minor to moderate elevated levels of fugitive dust and tailpipe emissions near the construction areas during construction of the LNG terminal. However, Eagle LNG would implement mitigation measures, including fugitive dust control measures, to ensure that the construction emissions would not have a long-term effect on air quality in the area.

In the draft EIS, we concluded that estimated project emissions during the first 2 years of construction (i.e., construction of the LNG terminal and commissioning of Train 1) and project emissions during facility operation would be less than General Conformity applicability thresholds. However, to determine if construction emissions during the third and fourth years of construction, when combined with operational emissions, would exceed General Conformity applicability thresholds, we recommended in the draft EIS that Eagle LNG provide estimated construction emissions for construction years 3 and 4 prior to the end of the draft EIS comment period. After reviewing this information, we have concluded that project emissions would be less than General Conformity applicability thresholds during all years of construction; therefore, the project would not require a General Conformity determination.

Residents near the construction areas may have elevated emission levels during the period of construction. However, through implementation of construction work practices, analysis of the estimated emissions from construction and operation, and an analysis of the modeled air quality impacts from operation of the LNG terminal, we conclude that there would be no regionally significant impacts on air quality.

Noise

The most prevalent noise-generating equipment and activity during construction of the LNG terminal is anticipated to be pile driving, although internal combustion engines associated with general construction equipment and dredging would also produce noise that would be perceptible in the vicinity of the site. Most construction activity, including pile driving, would be restricted to daytime working hours with pile driving occurring over a 10-month period. Eagle LNG evaluated the effects of construction noise levels on NSAs using two scenarios. Under both scenarios, sound levels attributable to construction activities at two of five NSAs were predicted to be above 55 dBA, with increases in background noise levels of over 10 dB. These elevated noise levels would be restricted to daytime hours. To minimize pile driving noise impacts, we recommend that Eagle LNG monitor sound levels during pile driving activities, implement noise mitigation measures, and file supporting evidence of the noise mitigation installation with the Secretary before pile driving may resume. With implementation of Eagle LNG's proposed limits on working hours and our recommendation, we conclude that noise impacts on residents and the surrounding communities would be moderate during construction of the LNG terminal.

Mitigation measures would also be needed to reduce underwater noise levels to below injury thresholds for fish. As mitigation, we are recommending in section 4.6.2.2 that Eagle LNG develop and file an *Underwater Noise Mitigation Plan* to define the measures Eagle LNG would implement to reduce underwater noise by 12 dB (re: 1 uPa) for pre-stressed concrete piles and by 25 dB (re: 1 uPa) for steel piles. With implementation of Eagle LNG's proposed mitigation and our recommendation, we conclude that underwater noise impacts would not be significant during construction of the LNG terminal.

Operation of the LNG terminal would produce noise on a continual basis. The results of a noise impact analysis indicate that the noise attributable to the project would be lower than the FERC sound level requirement of 55 dBA L_{dn} at the nearest NSA. To ensure that actual noise levels are consistent with the modeling, we are recommending that Eagle LNG document that its facilities meet our noise standards by filing the results of noise surveys during operation that show compliance with our noise requirement. Because the noise levels generated by facility operation would be below FERC's 55-dBA L_{dn} noise criteria at the nearby NSAs and operation of the LNG terminal would not perceptibly increase the existing sound levels at the NSAs, we conclude that noise impacts on residents and the surrounding communities would be minor during operation of the LNG terminal.

5.1.12 Safety and Reliability

As part of the NEPA review, Commission staff assessed the potential impact of the project on the human environment in terms of safety and whether it would operate safely, reliably, and securely.

As a cooperating agency, the DOT advises the Commission on whether Eagle LNG's proposed design would meet CFR Part 193, Subpart B, siting requirements. On March 13, 2019, the DOT issued an LOD to FERC on the project's compliance with 49 CFR 193, Subpart B regulatory requirements.[2] The LOD provides PHMSA's analysis and conclusions regarding 49 CFR 193 Subpart B regulatory requirements for the Commission's consideration in its decision on the project application. If the project is authorized, constructed, and operated, the facility would be subject to the DOT's inspection and enforcement program and final determination of whether a facility is in compliance with the requirements of 49 CFR 193 would be made by the DOT staff.

As a cooperating agency, the Coast Guard also assisted the FERC staff by reviewing the proposed LNG terminal and the associated LNG marine carrier traffic. The Coast Guard reviewed a WSA submitted by Eagle LNG that focused on the navigation safety and maritime security aspects of LNG carrier transits along the affected waterway. On February 7, 2018, the Coast Guard issued an LOR to FERC staff indicating the St. Johns River would be considered suitable for accommodating the type and frequency of LNG marine traffic associated with this project, based on the WSA and in accordance with the guidance in the Coast Guard's NVIC 01-11. If the project is authorized and constructed, the LNG terminal would be subject to the Coast Guard's inspection and enforcement program to ensure compliance with the requirements of 33 CFR 105 and 33 CFR 127.

The FERC staff conducted a preliminary engineering and technical review of the Eagle LNG design, including potential external impacts based on the site location. Based on the FERC staff review, we recommend a number of mitigation measures to ensure continuous oversight prior to initial site

[2] March 13, 2019 letter "Re: Eagle LNG Project, Docket No. CP17-41-000, 49 CFR, Part 193, Subpart B, Siting – Letter of Determination" from Massoud Tahamtani to Rich McGuire. Filed in Docket Number CP17-41-000 on March 18, 2019. FERC eLibrary accession number 20190318-3004.

preparation, prior to construction of final design, prior to commissioning, prior to introduction of hazardous fluids, prior to commencement of service, and throughout the life of the facility in order to enhance the reliability and safety of the facility to mitigate the risk of impact on the public. With the incorporation of these mitigation measures and oversight, we conclude that the Eagle LNG terminal design would include acceptable layers of protection or safeguards that would reduce the risk of a potentially hazardous scenario from developing into an event that could impact the offsite public.

5.1.13 Cumulative Impacts

Recently completed, presently occurring, and reasonably foreseeable future actions in the temporal and geographic scope of the Jacksonville Project were identified for inclusion in our cumulative impact analysis. Impacts from older projects (completed 5 or more years ago) are considered to have been mitigated over time with the disturbed environment having become part of the baseline character of the region. Therefore, projects completed 5 or more years ago are not considered ongoing contributors to cumulative impacts unless they have ongoing operational impacts (e.g., emissions, discharges) with potential to contribute to a cumulative impact. The majority of the cumulative impacts associated with these projects and with the Jacksonville Project would be minor and temporary during construction. However, some long-term or permanent cumulative impacts would occur in forested habitat, particularly mature live oak hammock, and project development impacts on the state-listed Worthington's marsh wren, little blue heron, tricolored heron, and least tern. We also identified potential cumulative impacts associated with turbidity from project dredging activities associated with the Port of Jacksonville Channel Deepening Project and associated with construction noise. Some long-term cumulative benefits to the communities in and around the Jacksonville Project area would be realized from increased tax revenues. Short-term cumulative benefits would also be realized through jobs, wages, and purchases of goods and materials.

Two projects associated with the Jacksonville Project but not under FERC's jurisdiction, the tie-in to the JEA power transmission line and switch station and the tie-in to the Peoples Gas pipeline to transport feed gas to the project, would occur concurrently with the Jacksonville Project. However, these projects would primarily occur within the active construction site for the Jacksonville Project and, due to the minor nature of these activities, they would not be anticipated to significantly add to any cumulative impacts.

The Port of Jacksonville Channel Deepening Project is within the same subwatershed. If dredging were to occur concurrently with the Jacksonville Project, significant cumulative impacts associated with turbidity and sedimentation could occur. However, both the Jacksonville Project and the Port of Jacksonville Channel Deepening Project would be required to conduct turbidity monitoring and implement best management practices to minimize turbidity contributable to each respective project during dredging activities, which would ensure that the projects would not significantly contribute to additional turbidity impacts on the St. Johns River.

If the construction associated with the Port of Jacksonville Channel Deepening Project and FDOT State Route 104 Project occurred simultaneous to the Jacksonville Project, some additional construction noise impacts would be experienced at nearby noise sensitive areas. However, the Jacksonville Project, which is anticipated to have a moderate impact on surrounding noise sensitive areas, would be the dominant noise source during construction. Cumulative noise impacts associated with construction of the Jacksonville Project, in conjunction with these other projects, would be moderate and primarily associated with daytime construction activities.

Because construction of the marine portion of the LNG terminal would require pile driving activities, cumulative impacts could occur if noise-producing activities overlap with the Port of Jacksonville Channel Deepening Project. However, with implementation of Eagle LNG's noise mitigation measures, we conclude that it is unlikely that any cumulative effects on marine species would occur.

Due to the implementation of specialized construction techniques and carefully developed resource protection and mitigation plans designed to avoid or minimize environmental impacts from the Jacksonville Project as a whole, minimal cumulative effects are anticipated when the effects of the project are added to the past, present, and reasonably foreseeable future projects within the Jacksonville Project's geographic scope.

5.1.14 Alternatives

As alternatives to the proposed action, we evaluated the no-action alternative, system alternatives, and terminal site alternatives. Under the No Action alternative, the environmental impacts associated with constructing and operating the project would not occur; however, equal or greater impacts could occur at other location(s) in the region as a result of another LNG export project seeking to meet the demand identified by the applicants. Therefore, we have dismissed the no-action alternative as a reasonable alternative to meet the objectives of the Jacksonville Project. Furthermore, because the purpose of the Jacksonville Project is to construct and operate a terminal to serve the domestic and export markets for LNG, the development or use of other energy sources would not be a reasonable alternative to the proposed action.

We evaluated 9 existing LNG terminal sites with approved, proposed, and/or planned expansion(s); and 15 new LNG projects with approved, proposed, and/or planned LNG terminals located on greenfield sites. Although it might be feasible to construct the proposed facilities by building additional infrastructure at one of the other locations, the expansion would likely result in similar environmental impacts because the impacts would be merely transferred from the proposed site to the alternative location. Moreover, none of the system alternatives would meet Eagle LNG's project purpose. Therefore, none of these system alternatives were considered further.

We evaluated seven alternative sites for the LNG terminal. We did not receive any comments during scoping suggesting that we evaluate any terminal site alternatives and, based on our review of the project, we did not identify any additional terminal site alternatives that would offer significant environmental advantages over the proposed site. Each alternative site was excluded from further consideration due to size constraints, lease restrictions, and/or presence of additional sensitive resources. Therefore, we conclude that the proposed LNG terminal location is the preferred alternative that can meet the project's objectives.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission authorizes the Jacksonville Project, we are recommending that the following measures be included as specific conditions in the Commission's authorization. We believe that these measures would further mitigate the environmental impacts associated with the construction and operation of the proposed project.

1. Eagle LNG shall follow the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests) and as identified in the EIS, unless modified by the Order. Eagle LNG must:

    a. request any modification to these procedures, measures, or conditions in a filing with the Secretary;

    b. justify each modification relative to site-specific conditions;

c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and

d. receive approval in writing from the Director of OEP **before using that modification**.

2. The Director of OEP, or the Director's designee, has delegated authority to address any requests for approvals or authorizations necessary to carry out the conditions of the Order, and take whatever steps are necessary to ensure the protection of life, health, property, and the environment during construction and operation of the project. This authority shall allow:

   a. the modification of conditions of the Order;

   b. stop-work authority and authority to cease operation; and

   c. the imposition of any additional measures deemed necessary to ensure continued compliance with the intent of the conditions of the Order as well as the avoidance or mitigation of unforeseen adverse environmental impact resulting from project construction and operation.

3. **Prior to any construction,** Eagle LNG 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.

4. The authorized facility locations shall be as shown in the EIS, as supplemented by filed maps. **As soon as they are available, and before the start of construction,** Eagle LNG shall file with the Secretary any revised detailed survey maps at a scale not smaller than 1:6,000. All requests for modifications of environmental conditions of the Order or site-specific clearances must be written and must reference locations designated on these maps.

5. Eagle LNG shall file with the Secretary detailed maps and aerial photographs at a scale not smaller than 1:6,000 identifying all 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 /aerial photographs. Each area must be approved in writing by the Director of OEP **before construction in or near that area.**

   This requirement does not apply to extra workspace allowed by the Commission's Plan and/or minor field realignments per landowner needs and requirements which do not affect other landowners or sensitive environmental areas such as wetlands.

   Examples of alterations requiring approval include all 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.

6. **Within 60 days of the acceptance of the authorization and before construction begins,** Eagle LNG shall file an Implementation Plan with the Secretary for review and written approval by the Director of OEP. Eagle LNG must file revisions to the plan as schedules change. The plan shall identify the following:

a. how Eagle LNG will implement the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests), identified in the EIS, and required by the Order;

b. how Eagle LNG will incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to on-site construction and inspection personnel;

c. the number of EIs assigned to the facility, and how Eagle LNG will ensure that sufficient personnel are available to implement the environmental mitigation;

d. company personnel, including EIs and contractors, who will receive copies of the appropriate material;

e. the location and dates of the environmental compliance training and instructions Eagle LNG will give to all personnel involved in 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 Eagle LNG's organization having responsibility for compliance;

g. the procedures (including use of contract penalties) Eagle LNG will follow if noncompliance occurs; and

h. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram), and dates for:

i. the completion of all required surveys and reports;
ii. the environmental compliance training of onsite personnel;
iii. the start of construction; and
iv. the start and completion of restoration.

7. Eagle LNG shall employ at least one EI for the LNG terminal. The EI shall be:

a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or 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 Commission's authorization, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and

f. responsible for maintaining status reports.

8. Beginning with the filing of its Implementation Plan, Eagle LNG shall file updated status reports with the Secretary on a **monthly** basis until all construction and restoration activities are complete. Problems of a significant magnitude shall be reported to FERC **within 24 hours**. On request, these status reports will also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:

   a. an update on Eagle LNG's efforts to obtain the necessary federal authorizations;

   b. project schedule including the current construction status, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;

   c. a listing of all problems encountered, contractor nonconformance/deficiency logs, and each instance of noncompliance observed by the 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 and remedial actions implemented in response to all instances of noncompliance, nonconformance, or deficiency;

   e. the effectiveness of all corrective and remedial actions implemented;

   f. a description of any landowner/resident complaints 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 Eagle LNG from other federal, state, or local permitting agencies concerning instances of noncompliance, and Eagle LNG's response.

9. Eagle LNG must receive written authorization from the Director of OEP **before commencing construction of any project facilities**. To obtain such authorization, Eagle LNG must file with the Secretary documentation that each has received all applicable authorizations required under federal law (or evidence of waiver thereof).

10. Eagle LNG must receive written authorization from the Director of OEP **prior to introducing hazardous fluids into the LNG terminal facilities**. Instrumentation and controls, hazard

detection, hazard control, and security components/systems necessary for the safe introduction of such fluids shall be installed and functional.

11. Eagle LNG must receive written authorization from the Director of OEP **before placing the LNG terminal facilities into service**. Such authorization will only be granted following a determination that the facilities have been constructed in accordance with the FERC approval, can be expected to operate safely as designed, and the rehabilitation and restoration of the areas affected by the terminal are proceeding satisfactorily.

12. **Within 30 days of placing the authorized facilities in service**, Eagle LNG shall file an affirmative statement with the Secretary, certified by a senior company official:

    a. that the facilities have been constructed in compliance with all applicable conditions, and that continuing activities will be consistent with all applicable conditions; or

    b. identifying which of the conditions in the Order Eagle LNG has complied with or will comply with. This statement shall also identify any areas affected by the project where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

13. **Prior to construction**, Eagle LNG shall file with the Secretary, for review and written approval by the Director of OEP, a copy of its Unanticipated Discovery of Contaminated Soils Plan. *(Section 4.2.3)*

14. **Prior to conducting site clearing activities between March and August,** Eagle LNG shall file with the Secretary, for review and written approval by the Director of OEP, mitigation measures to minimize impacts on colonial rookeries developed in consultation with the FWS and include in the filing documentation of FWS comments on these measures. *(Section 4.6.1.3)*

15. **Prior to construction**, Eagle LNG shall file with the Secretary, for review and written approval by the Director of OEP, an *Underwater Noise Mitigation Plan* that identifies the specific mitigation measures Eagle LNG will implement to achieve its proposed reduction of 12 dB (re: 1 µPa) associated with pre-stressed concrete impact pile driving and its proposed reduction of 25 dB (re: 1 µPa) associated with steel impact pile driving. The *Underwater Noise Mitigation Plan* shall also include an underwater noise monitoring plan to ensure that sound levels associated with pre-stressed concrete and steel impact pile driving achieve target noise levels, as well as additional mitigation that Eagle LNG will implement in the event that target noise levels are not achieved. *(Section 4.6.2.2)*

16. Eagle LNG shall **not begin construction** activities **until**:

    a. FERC staff completes ESA section 7 consultation with NOAA Fisheries and the FWS; and

    b. Eagle LNG has received written notification from the Director of OEP that construction may begin. *(Section 4.7.1)*

17. **Prior to construction**, Eagle LNG shall file with the Secretary a copy of the determination of consistency with the laws and rules of the Florida Coastal Zone Management Program issued by the FDEP. *(Section 4.8.5)*

18. Eagle LNG shall monitor sound levels during pile driving activities, and file **weekly** noise data with the Secretary that identify the noise impact on the nearest NSAs. If any measured noise impacts due to pile driving (L_{max}) at the nearest NSAs are greater than 10 dBA over the L_{eq} ambient levels, Eagle LNG shall:

    a. cease pile driving activities and implement noise mitigation measures; and

    b. file with the Secretary evidence of noise mitigation installation and request written notification from the Director of OEP that pile driving may resume. *(Section 4.11.2.3)*

19. Eagle LNG shall file a full power load noise survey with the Secretary for the LNG terminal **no later than 60 days** after each liquefaction train is placed into service. If the noise attributable to operation of the equipment at the LNG terminal exceeds an L_{dn} of 55 dBA at the nearest NSA, **within 60 days** Eagle LNG shall modify operation of the liquefaction facilities or install additional noise controls until a noise level below an L_{dn} of 55 dBA at the NSA is achieved. Eagle LNG shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. *(Section 4.11.2.4)*

20. Eagle LNG shall file a noise survey with the Secretary **no later than 60 days** after placing the entire LNG terminal into service. If a full load condition noise survey is not possible, Eagle LNG shall provide an interim survey at the maximum possible horsepower load **within 60 days** of placing the LNG terminal into service and provide the full load survey **within 6 months**. If the noise attributable to the operation of the equipment at the LNG terminal exceeds an L_{dn} of 55 dBA at the nearest NSA under interim or full horsepower load conditions, Eagle LNG shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. Eagle LNG shall confirm compliance with the above requirement by filing an additional noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. *(Section 4.11.2.4)*

21. **Prior to initial site preparation**, Eagle LNG shall file with the Secretary a site-specific analysis stamped and sealed by a professional engineer-of-record, registered in the state of Florida, to verify the underlying rock is competent to support the final design of foundations, including identifying the location, orientation, and inclination of any local faults or geological discontinuities in order to better characterize the risk of regional subsidence or surficial deformation.

22. **Prior to construction of final design**, Eagle LNG shall file with the Secretary documentation demonstrating it has received a determination of no hazard (with or without conditions) by DOT FAA for all temporary construction equipment that exceed the height requirements in 14 CFR 77.

23. **Prior to construction of final design**, Eagle LNG shall file with the Secretary the following information, stamped and sealed by the professional engineer-of-record, registered in Florida:

    a. geotechnical investigation and tests that verify subsurface conditions as well as an analysis that confirms Eagle LNG's proposed ground improvement and includes any resulting foundation recommendations;

    b. site preparation drawings and specifications;

    c. LNG storage tank foundation design drawings and calculations;

d. LNG terminal structures and foundation design drawings and calculations (including prefabricated and field constructed structures);

e. seismic specifications for procured equipment; and

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

In addition, Eagle LNG shall file, **in its Implementation Plan**, the schedule for producing this information.

24. **Prior to commencement of service**, Eagle LNG shall file with the Secretary a plan, stamped and sealed by a professional engineer-of-record, registered in the state of Florida, for continuous monitoring of surface and subsurface conditions to detect early signs of sinkhole formation throughout the life of the LNG terminal, as well as a response plan in the event of a sinkhole formation.

Conditions 25 through 127 shall apply to the LNG terminal facilities. Information pertaining to the following specific conditions shall be filed with the Secretary for review and written approval by the Director of OEP, or the Director's designee, within the timeframe indicated by each condition. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 833 (Docket No. RM16-15-000), including security information, shall be submitted as critical energy infrastructure information pursuant to 18 CFR 388.113. See Critical Electric Infrastructure Security and Amending Critical Energy Infrastructure Information, Order No. 833, 81 Fed. Reg. 93,732 (December 21, 2016), FERC Stats. & Regs. 31,389 (2016). Information pertaining to items such as offsite emergency response, procedures for public notification and evacuation, and construction and operating reporting requirements will be subject to public disclosure. All information shall be filed **a minimum of 30 days** before approval to proceed is requested.

25. **Prior to initial site preparation**, Eagle LNG shall file an overall project schedule, which includes the proposed stages of the commissioning plan.

26. **Prior to initial site preparation**, Eagle LNG shall file quality assurance and quality control procedures for construction activities.

27. **Prior to initial site preparation**, Eagle LNG shall file procedures for controlling access during construction.

28. **Prior to initial site preparation**, Eagle LNG shall file an analysis of anticipated traffic loads along the plant entrance/exit roads during construction and operation to determine whether provisions are needed to dissipate the loads on the Peoples Gas natural gas pipeline. The analysis shall be based on API RP 1102 or other approved methodology demonstrating the loads on buried pipelines and utilities at temporary and permanent crossings will be adequately distributed.

29. **Prior to initial site preparation**, Eagle LNG shall develop an ERP (including evacuation) and coordinate procedures with the Coast Guard; state, county, and local emergency planning groups; fire departments; state and local law enforcement; and appropriate federal agencies. This plan shall include at a minimum:

a. designated contacts with state and local emergency response agencies;

b. scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;

c. procedures for notifying residents and recreational users within areas of potential hazard;

d. evacuation routes/methods for residents and public use areas that are within any transient hazard areas along the route of the LNG marine transit;

e. locations of permanent sirens and other warning devices; and

f. an "emergency coordinator" on each LNG marine vessel to activate sirens and other warning devices.

Eagle LNG shall notify the FERC staff of all planning meetings in advance and shall report progress on the development of its ERP at **3‑month intervals**.

30. **Prior to initial site preparation**, Eagle LNG shall file a Cost-Sharing Plan identifying the mechanisms for funding all project-specific security/emergency management costs that will be imposed on state and local agencies. This comprehensive plan shall include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. Eagle LNG shall notify FERC staff of all planning meetings in advance and shall report progress on the development of its Cost-Sharing Plan at **3-month intervals**.

31. **Prior to construction of final design**, Eagle LNG shall file change logs that list and explain any changes made from the FEED provided in Eagle LNG's application and filings. A list of all changes with an explanation for the design alteration shall be provided and all changes shall be clearly indicated on all diagrams and drawings.

32. **Prior to construction of final design**, Eagle LNG shall file information/revisions pertaining to Eagle LNG's response numbers 2, 18, 46, 50, 63, 68, 69, and 71 of its October 17, 2017 filing, response numbers 1–5, 7–18, 23, 25, 27, 28, 30, 32, 36–39, 41–45, and 48 to the March 5, 2019 engineering information request, and response number 1 to the March 20, 2019 engineering information request of its March 25, 2019 filing which indicated features to be included or considered in the final design.

33. **Prior to construction of final design**, Eagle LNG shall file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems.

34. **Prior to construction of final design**, Eagle LNG shall file three-dimensional plant drawings to confirm plant layout for maintenance, access, egress, and congestion. In addition, the access/egress roads shall demonstrate that road widths and turnarounds are adequate to handle fire apparatus and will meet good engineering practices such as NFPA 307 and the International Fire Code (Appendix D).

35. **Prior to construction of final design**, Eagle LNG shall file drawings of the storage tank piping support structure and support of horizontal piping at grade including pump columns, relief valves, pipe penetrations, instrumentation, and appurtenances.

36. **Prior to construction of final design**, Eagle LNG shall file complete drawings of the proposed LNG tank design and installation.

37. **Prior to construction of final design**, Eagle LNG shall file an up-to-date equipment list, process and mechanical data sheets, and specifications. The specifications shall include:

    a. building specifications (e.g., control buildings, electrical buildings, compressor buildings, storage buildings, pressurized buildings, ventilated buildings, blast resistant buildings);

    b. mechanical specifications (e.g., piping including vacuum jacketed piping, valve, insulation, rotating equipment, heat exchanger, storage tank and vessel, other specialized equipment);

    c. electrical and instrumentation specifications (e.g., power system, control system, SIS, cable, other electrical and instrumentation); and

    d. security and fire safety specifications (e.g., security, passive protection, hazard detection, hazard control, firewater).

38. **Prior to construction of final design**, Eagle LNG shall file a list of all codes and standards and the final specification document number where they are referenced.

39. **Prior to construction of final design**, Eagle LNG shall file up-to-date PFDs and one complete set of P&IDs that incorporates the various vendors. The PFDs shall include heat and material balances. The P&IDs shall include the following information:

    a. equipment tag number, name, size, duty, capacity, and design conditions;

    b. equipment insulation type and thickness;

    c. storage tank pipe penetration size and nozzle schedule;

    d. valve high-pressure side and internal and external vent locations;

    e. piping with line number, piping class specification, size, and insulation type and thickness;

    f. piping specification breaks and insulation limits;

    g. all control and manual valves numbered;

    h. relief valves with size and set points; and

    i. drawing revision number and date.

40. **Prior to construction of final design**, Eagle LNG shall file P&IDs, specifications, and procedures that clearly show and specify the tie-in details required to safely connect subsequently constructed facilities with the operational facilities.

41. **Prior to construction of final design**, Eagle LNG shall file a car seal philosophy and a list of all car-sealed and locked valves consistent with the P&IDs.

42. **Prior to construction of final design**, Eagle LNG shall file information that demonstrates the Engineering, Procurement, and Construction (EPC) contractor has verified the HAZID recommendations have been addressed.

43. **Prior to construction of final design**, Eagle LNG shall file a hazard and operability review prior to issuing the P&IDs for construction. A copy of the review, a list of the recommendations, and actions taken on the recommendations shall be filed.

44. **Prior to construction of final design**, Eagle LNG shall specify that all drains from high-pressure hazardous fluid systems will be equipped with double isolation and bleed valves.

45. **Prior to construction of final design**, Eagle LNG shall specify positive isolation (e.g., double isolation and bleed, valve and blind) on high-pressure systems requiring class 600 flanges and higher.

46. **Prior to construction of final design**, Eagle LNG shall provide double isolation and bleed for drain lines ¾”-GH-111444, ¾”-LNG-111011, and ¾”-LNG-111014 at the source.

47. **Prior to construction of final design**, Eagle LNG shall include isolation valves on the discharge lines from the LNG tank pump columns.

48. **Prior to construction of final design**, Eagle LNG shall file plans and procedures that address how the facility would handle ship loading operations in the event a marine transfer arm (i.e., liquid/vapor) experiences a liquid or vapor release or is out of service.

49. **Prior to construction of final design**, Eagle LNG shall include both absolute and barometric pressure transmitters in the LNG storage tank design.

50. **Prior to construction of final design**, Eagle LNG shall include a vacuum breaker gas or pad gas system in addition to LNG storage tank vacuum relief system to mitigate the risk of failures caused by vacuum conditions.

51. **Prior to construction of final design**, Eagle LNG shall provide an insulated flange connection at the battery limit connection between the feed gas pipeline and the facility shown on P&ID 15510-PI-100-001.

52. **Prior to construction of final design**, Eagle LNG shall include a check valve or other means in the feed gas piping, 10”-PG-1104, to the absorber to prevent backflow.

53. **Prior to construction of final design**, Eagle LNG shall specify construction material of line 2”-GH-111444-6AA that is suitable for cryogenic service.

54. **Prior to construction of final design**, Eagle LNG shall include temperature transmitters connected to the DCS on the thermowells located on the inlet and outlet piping for the molecular sieve dehydrators.

55. **Prior to construction of final design**, Eagle LNG shall verify that the displacement of vapor through the LNG in-tank pump minimum flow valves during startup will exceed the minimum flow rate required for stable pump operation.

56. **Prior to construction of final design**, Eagle LNG shall clearly specify the responsibilities of the LNG tank contractor and the EPC contractor for the piping associated with the LNG storage tank and piping associated with the LNG pumps located within the tertiary containment.

57. **Prior to construction of final design**, Eagle LNG shall file the final design of the vacuum jacketed piping that demonstrates how the outer jacket design accounts for the mechanical forces from a

release at maximum pressures and thermal stresses and shock from sudden cryogenic temperatures of an LNG release.

58. **Prior to construction of final design**, Eagle LNG shall file the final design of the vacuum jacketed inner pipe emergency shutdown and isolation valves, pressure relief valves and discharge, drains, vacuum ports, and instrumentation.

59. **Prior to construction of final design**, Eagle LNG shall file the final design of the leak detection and monitoring system of the vacuum jacketed inner pipe including alarm set points and shutdown capabilities.

60. **Prior to construction of final design**, Eagle LNG shall file the safe operating limits (upper and lower), alarm and shutdown set points for all instrumentation (e.g., temperature, pressures, flows, and compositions).

61. **Prior to construction of final design**, Eagle LNG shall file cause-and-effect matrices for the process instrumentation, fire and gas detection system, and emergency shutdown system. The cause-and-effect matrices shall include alarms and shutdown functions, details of the voting and shutdown logic, and set points.

62. **Prior to construction of final design**, Eagle LNG shall file an evaluation of emergency shutdown valve closure times. The evaluation shall account for the time to detect an upset or hazardous condition, notify plant personnel, and close the emergency shutdown valve(s).

63. **Prior to construction of final design**, Eagle LNG shall file an evaluation of dynamic pressure surge effects from valve opening and closure times and pump startup and shutdown operations.

64. **Prior to construction of final design**, Eagle LNG shall demonstrate that, for hazardous fluids, piping and piping nipples 2 inches or less in diameter are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and operator live loads in areas accessible by operators.

65. **Prior to construction of final design**, Eagle LNG shall file electrical area classification drawings.

66. **Prior to construction of final design**, Eagle LNG shall file drawings and details of how process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system meet the requirements of NFPA 59A (2001).

67. **Prior to construction of final design**, Eagle LNG shall file details of an air gap or vent installed downstream of process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap shall vent to a safe location and be equipped with a leak detection device that shall continuously monitor for the presence of a flammable fluid, alarm the hazardous condition, and shut down the appropriate systems.

68. **Prior to construction of final design**, Eagle LNG shall specify that piping and equipment that may be cooled with liquid nitrogen will be designed for liquid nitrogen temperatures, with regard to allowable movement and stresses.

69. **Prior to construction of final design**, Eagle LNG shall include the capability of calculating the total LNG tank fill flow from each liquefaction train in the DCS, or directly measure the LNG tank fill flow, as well as include an associated high flow alarm.

70. **Prior to construction of final design**, Eagle LNG shall file the structural analysis of the LNG storage tank and outer containment demonstrating they are designed to withstand all loads and combinations.

71. **Prior to construction of final design**, Eagle LNG shall file an analysis of the structural integrity of the outer containment of the full containment LNG storage tank demonstrating it can withstand the radiant heat from a roof tank top fire.

72. **Prior to construction of final design**, Eagle LNG shall file a projectile analysis that demonstrates whether the LNG storage tank will withstand projectiles from explosions and high winds, or demonstrate whether protective measures are in place to ensure the structural integrity of the LNG storage tank. If the analysis demonstrates the tank will be perforated, Eagle LNG shall file an analysis indicating the containment dikes will sufficiently contain an LNG spill.

73. **Prior to construction of final design**, Eagle LNG shall specify the minimum distance required for valve maintenance, between the LNG loading header and the first valve in the discharge piping to the loading arm.

74. **Prior to construction of final design**, Eagle LNG shall file the sizing basis and capacity for the final design of the flares and/or vent stacks as well as the pressure and vacuum relief valves for major process equipment, vessels, and storage tanks.

75. **Prior to construction of final design**, Eagle LNG shall provide the following information related to flare L-405: final design details (e.g., purge, pilots); whether the flare will meet API 537 or equivalent; and a quantitative analysis which demonstrates that the redundancy built into the flare pilot design is sufficient to ensure that an operational pilot will be available or alternatively provide a vapor dispersion analysis of the unlit flare demonstrating flammable vapors will not reach any ignition sources, equipment, buildings, or grade.

76. **Prior to construction of final design**, Eagle LNG shall file detailed cooldown plans showing the piping and valve alignment, and instruments used to monitor the initial cooldown and filling of the LNG storage tank.

77. **Prior to construction of final design**, Eagle LNG shall file detailed calculations for the flow rate of the jockey pumps accounting for flow rate losses due to leaks or other losses to ensure that system losses do not exceed the specified design flow rate of the jockey firewater pumps.

78. **Prior to construction of final design**, Eagle LNG shall file a design that includes pressure relieving protection for flammable liquid piping segments (i.e., refrigerants, liquid hydrocarbons, condensate products) that can be isolated by valves.

79. **Prior to construction of final design**, Eagle LNG shall specify that all emergency shutdown valves are to be equipped with open and closed position switches connected to the DCS/SIS.

80. **Prior to construction of final design**, Eagle LNG shall file a drawing showing the location of the emergency shutdown buttons. Emergency shutdown buttons shall be easily accessible, conspicuously labeled, and located in an area which will be accessible during an emergency.

81. **Prior to construction of final design**, Eagle LNG shall file specifications and drawings of the vehicle barriers at each facility entrance for access control and internal road vehicle protections, such as guard rails, barriers, and bollards to protect transfer piping, pumps, and compressors, etc.,

to ensure that they are located away from roadway or protected from inadvertent damage from vehicles.

82. **Prior to construction of final design**, Eagle LNG shall file security fence, camera, intrusion detection, and lighting drawings of the final design. The security fence drawings shall surround the entire LNG plant with a setback that does not allow for the fence to be overcome. The security camera drawings shall show the location, areas covered, and features of the camera (fixed, tilt/pan/zoom, motion detection alerts, low light, mounting height, etc.) to verify camera coverage of the entire perimeter and atop the LNG storage tank with redundancies for cameras interior to the facility to enable rapid monitoring of the LNG plant. The intrusion detection drawings shall show or note the location of the intrusion detection to verify it covers the entire perimeter of the LNG plant. The lighting drawings shall show the location, elevation, type of light fixture, and lux levels of the lighting system and cover the entire perimeter of the LNG plant and at mooring points.

83. **Prior to construction of final design**, Eagle LNG shall evaluate the terminal alarm system and external notification system design to ensure the location of the terminal alarms and other fire and evacuation alarm notification devices (e.g., audible/visual beacons and strobes) will provide adequate warning at the terminal and external off-site areas in the event of an emergency.

84. **Prior to construction of final design**, Eagle LNG shall file an updated fire protection evaluation of the proposed facilities. A copy of the evaluation, a list of recommendations and supporting justifications, and actions taken on the recommendations shall be filed. The evaluation shall specify the warehouse sprinkler system using extra hazard group 2 design densities or justify an alternative design. The evaluation shall also include a hazard detection study to evaluate the effectiveness of their flammable and gas detection system in accordance with ISA 84.00.07 or equivalent methodologies that will demonstrate 90 percent or more of releases (unignited and ignited) that could result in an off-site or cascading impact that could extend off site will be detected by two or more detectors and result in isolation and de-inventory within 10 minutes. The analysis shall take into account the set points, voting logic, and different wind speeds and directions. The justification for firewater shall provide calculations for all firewater demands including firewater coverage on the LNG storage tank, north of HV Substation A-701, and adjacent fire zones if they could result in cascading damage based on design densities, surface area, and throw distance and specifications for the corresponding hydrant and monitors needed to reach and cool equipment.

85. **Prior to construction of final design**, Eagle LNG shall file spill containment system drawings with dimensions and slopes of curbing, trenches, impoundments, and capacity calculations considering any foundations and equipment within impoundments, as well as the sizing and design of the down-comer that will transfer spills from the tank top to the ground-level impoundment system. The spill containment drawings shall show containment for all hazardous fluids, including all liquids handled above their flashpoint, from the largest flow from a single line for 10 minutes, including de-inventory, or the maximum liquid from the largest vessel (or total of impounded vessels) or otherwise demonstrate spill containment will not significantly reduce the flammable vapor dispersion or radiant heat consequences of a spill.

86. **Prior to construction of final design**, Eagle LNG shall file an evaluation that demonstrates an LNG spill will not be directed to the LNG tank impoundment sump (S-814) or how LNG will be prevented from being discharged from S-814.

87. **Prior to construction of the final design**, Eagle LNG shall file a critical equipment and building siting assessment to ensure plant buildings that are occupied or critical to the safety of the LNG plant are adequately protected from potential hazards involving fires and vapor cloud explosions. The evaluation shall assess the potential relocation of the firewater pumps, firewater tank, control

building, and other buildings such that they do not present an ignition source to a release of flammable vapors and that they are not impacted by explosions, pool fires, and jet fires or provide analyses demonstrating they would be adequately protected from such events. The evaluation shall compare against minimum spacing requirements for buildings relative to equipment containing hazardous fluids, distances used in electrical area classification for ignition sources as well as radiant heat distances from pool and jet fires.

88. **Prior to construction of final design**, Eagle LNG shall file an analysis of the localized hazards to operators from a potential liquid nitrogen release and shall also provide spill containment and low oxygen detectors to mitigate liquid nitrogen releases.

89. **Prior to construction of final design**, Eagle LNG shall file an analysis of the localized hazards from a potential hydrogen sulfide release and shall also provide toxic detectors to mitigate hydrogen sulfide releases from the acid gas piping system and potential release points (i.e., vents, relief valves, vent stacks, and thermal oxidizer stack).

90. **Prior to construction of final design**, Eagle LNG shall file detailed calculations to confirm that the final fire water volumes will be accounted for when evaluating the capacity of the impoundment system during a spill and fire scenario.

91. **Prior to construction of final design**, Eagle LNG shall file complete drawings and a list of the hazard detection equipment. The drawings shall clearly show the location and elevation of all detection equipment. The list shall include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment.

92. **Prior to construction of final design**, Eagle LNG shall file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of the hazard detectors when determining the lower flammable limit set points for methane, propane, ethylene, n-butane, and condensate.

93. **Prior to construction of final design**, Eagle LNG shall file a list of alarm and shutdown set points for all hazard detectors that account for the calibration gas of hazard detectors when determining the set points for toxic components such as condensate, heavy hydrocarbon liquids, and hydrogen sulfide.

94. **Prior to construction of final design**, Eagle LNG shall file an evaluation of the voting logic and voting degradation for hazard detectors.

95. **Prior to construction of final design**, Eagle LNG shall file a technical review of facility design that:

    a. identifies all combustion/ventilation air intake equipment and the distances to any possible flammable gas or toxic release; and

    b. demonstrates that these areas are adequately covered by hazard detection devices and indicates how these devices will isolate or shutdown any combustion or heating ventilation and air conditioning equipment whose continued operation could add to or sustain an emergency.

96. **Prior to construction of final design**, Eagle LNG shall file a design that includes hazard detection suitable to detect high temperatures and smoldering combustion products in electrical buildings and control room buildings.

97. **Prior to construction of final design**, Eagle LNG shall file facility plan drawings and a list of the fixed and wheeled dry-chemical, hand-held fire extinguishers, and other hazard control equipment. Plan drawings shall clearly show the location and elevation by tag number of all fixed dry-chemical systems in accordance with NFPA 17, and wheeled and hand-held extinguisher locations are along normal paths of access and egress and in compliance with NFPA 10 travel distances. The list shall include the equipment tag number, type, capacity, equipment covered, discharge rate, and automatic and manual remote signals initiating discharge of the units.

98. **Prior to construction of final design**, Eagle LNG shall file facility plan drawings showing the proposed location of the firewater and any foam systems. Plan drawings shall clearly show the location of firewater and foam piping, post indicator valves, and the location and area covered by, each monitor, hydrant, hose, water curtain, deluge system, foam system, water-mist system, and sprinkler. In addition, firewater coverage shall include the coverage of the entire marine transfer line, LNG storage tank, and HV Substation A-701 by hydrants or monitors and automatic or remotely operated monitors or fixed systems in areas inaccessible or difficult to access in the event of an emergency. The coverage circles shall take into account obstructions to the firewater coverage and shall reflect the firewater needed to reach and cool exposed surfaces potentially subjected to damaging radiant heats from a fire. The drawings shall also include P&IDs of the firewater and foam systems.

99. **Prior to construction of final design**, Eagle LNG shall include or demonstrate the firewater storage volume for its facilities has minimum reserved capacity for its most demanding firewater scenario plus 1,000 gallons per minute for no less than 2 hours. The firewater storage shall also demonstrate compliance with NFPA 22 or equivalent.

100. **Prior to construction of final design**, Eagle LNG shall specify that the firewater flow test meter is equipped with a transmitter and that a pressure transmitter is installed upstream of the flow transmitter. The flow transmitter and pressure transmitter shall be connected to the DCS and recorded.

101. **Prior to construction of final design**, Eagle LNG shall file drawings and specifications for the structural passive protection systems to protect equipment and supports from cryogenic releases.

102. **Prior to construction of final design**, Eagle LNG shall file calculations or test results for the structural passive protection systems to protect equipment and supports from cryogenic releases.

103. **Prior to construction of final design**, Eagle LNG shall file drawings and specifications for the structural passive protection systems to protect equipment and supports from pool and jet fires.

104. **Prior to construction of final design**, Eagle LNG shall file an evaluation and associated specifications and drawings of how they will prevent cascading damage of transformers (e.g., fire walls or spacing) in accordance with NFPA 850 or equivalent.

105. **Prior to construction of final design**, Eagle LNG shall file a detailed quantitative analysis to demonstrate that adequate mitigation will be provided for each significant component within the 4,000 BTU/ft^2-hr zone from pool or jet fires that could cause failure of the component. Trucks at the truck loading/unloading areas shall be included in the analysis. A combination of passive and active protection shall be provided and demonstrate the effectiveness and reliability. Effectiveness of passive mitigation shall be supported by calculations or test results for the thickness limiting temperature rise and active mitigation shall be justified with calculations or test results

demonstrating flow rates and durations of any cooling water will mitigate the heat absorbed by the vessel.

106. **Prior to construction of final design**, Eagle LNG shall file an evaluation and associated specifications and drawings of how cascading damage of transformers (e.g., fire walls or spacing) would be prevented in accordance with NFPA 850 or equivalent.

107. **Prior to commissioning**, Eagle LNG shall file a detailed schedule for commissioning through equipment startup. The schedule shall include milestones for all procedures and tests to be completed prior to introduction of hazardous fluids and during commissioning and startup. Eagle LNG 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.

108. **Prior to commissioning**, Eagle LNG shall file detailed plans and procedures for: testing the integrity of on-site mechanical installation; functional tests; introduction of hazardous fluids; operational tests; and placing the equipment into service.

109. **Prior to commissioning**, Eagle LNG shall file a plan for clean-out, dry-out, purging, and tightness testing. This plan shall address the requirements of the American Gas Association's Purging Principles and Practice, and shall provide justification if not using an inert or non-flammable gas for clean-out, dry-out, purging, and tightness testing.

110. **Prior to commissioning**, Eagle LNG shall file the procedures for pressure/leak tests which address the requirements of ASME VIII and ASME B31.3. The procedures shall include a line list of pneumatic and hydrostatic test pressures.

111. **Prior to commissioning**, Eagle LNG shall file the operation and maintenance procedures and manuals, as well as safety procedures, hot work procedures and permits, abnormal operating conditions reporting procedures, simultaneous operations procedures, and management of change procedures and forms.

112. **Prior to commissioning**, Eagle LNG shall tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves.

113. **Prior to commissioning**, Eagle LNG shall file a plan to maintain a detailed training log to demonstrate that operating staff has completed the required training.

114. **Prior to commissioning**, Eagle LNG shall file settlement results from the hydrostatic tests of the LNG storage container as well as a routine monitoring program to ensure settlements are as expected and do not exceed applicable criteria in API 620, 625, 653, and ACI 376. The program shall specify what actions will be taken after seismic events.

115. **Prior to commissioning**, Eagle LNG shall equip the LNG storage tank and adjacent piping and supports with permanent settlement monitors to allow personnel to observe and record the relative settlement between the LNG storage tank and adjacent piping. The settlement record shall be reported in the semi-annual operational reports.

116. **Prior to introduction of hazardous fluids**, Eagle LNG shall develop and implement an alarm management program to reduce alarm complacency and maximize the effectiveness of operator response to alarms.

117. **Prior to introduction of hazardous fluids**, Eagle LNG shall complete and document all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the DCS and SIS that demonstrate full functionality and operability of the system.

118. **Prior to introduction of hazardous fluids**, Eagle LNG shall complete and document a firewater pump acceptance test and firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant shall be shown on facility plot plan(s).

119. **Prior to introduction of hazardous fluids**, Eagle LNG shall complete and document foam system and sprinkler system acceptance tests.

120. **Prior to introduction of hazardous fluids**, Eagle LNG shall complete and document clean agent acceptance tests.

121. **Prior to introduction of hazardous fluids**, Eagle LNG shall complete and document a pre-startup safety review to ensure that installed equipment meets the design and operating intent of the facility. The pre-startup safety review shall include any changes since the last hazard review, operating procedures, and operator training. A copy of the review with a list of recommendations, and actions taken on each recommendation, shall be filed.

122. Eagle LNG shall file a request for written authorization from the Director of OEP **prior to unloading or loading the first LNG commissioning cargo**. After production of first LNG, Eagle LNG shall file **weekly** reports on the commissioning of the proposed systems that detail the progress toward demonstrating the facilities can safely and reliably operate at or near the design production rate. The reports shall include a summary of activities, problems encountered, and remedial actions taken. The weekly reports shall also include the latest commissioning schedule, including projected and actual LNG production by each liquefaction train, LNG storage inventories in each storage tank, and the number of anticipated and actual LNG commissioning cargoes, along with the associated volumes loaded or unloaded. Further, the weekly reports shall include a status and list of all planned and completed safety and reliability tests, work authorizations, and punch list items. Problems of significant magnitude shall be reported to the FERC **within 24 hours**.

123. **Prior to commencement of service**, Eagle LNG shall label piping with fluid service and direction of flow in the field, in addition to the pipe labeling requirements of NFPA 59A (2001).

124. **Prior to commencement of service**, Eagle LNG shall file plans for any preventative and predictive maintenance program that performs periodic or continuous equipment condition monitoring.

125. **Prior to commencement of service**, Eagle LNG shall develop procedures for off-site contractors' responsibilities, restrictions, and limitations and for supervision of these contractors by Eagle LNG staff.

126. **Prior to commencement of service**, Eagle LNG shall notify the FERC staff of any proposed revisions to the security plan and physical security of the plant.

127. **Prior to commencement of service**, Eagle LNG shall file a request for written authorization from the Director of OEP. Such authorization will only be granted following a determination by the Coast Guard, under its authorities under the Ports and Waterways Safety Act, the Magnuson Act, the MTSA of 2002, and the Security and Accountability For Every Port Act, that appropriate measures to ensure the safety and security of the facility and the waterway have been put into place by Eagle LNG or other appropriate parties.

In addition, conditions 128 through 131 shall apply **throughout the life of the LNG terminal facilities**:

128. 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, Eagle LNG shall respond to a specific data request including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed P&IDs reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, shall be submitted.

129. **Semi-annual** operational reports shall be filed with the Secretary to identify changes in facility design and operating conditions; abnormal operating experiences; activities (e.g., ship arrivals, quantity and composition of imported and exported LNG, liquefied and vaporized quantities, boil off/flash gas); and plant modifications, including future plans and progress thereof. Abnormalities shall include, but not be limited to, unloading/loading/shipping problems, potential hazardous conditions from off-site vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tank, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, hazardous fluids releases, fires involving hazardous fluids and/or from other sources, negative pressure (vacuum) within a storage tank, and higher than predicted boil off rates. Adverse weather conditions and the effect on the facility also shall be reported. Reports shall be submitted **within 45 days after each period ending June 30 and December 31**. In addition to the above items, a section entitled “Significant Plant Modifications Proposed for the Next 12 Months (dates)” shall be included in the semi-annual operational reports. Such information will provide the FERC staff with early notice of anticipated future construction/maintenance at the LNG facilities.

130. In the event the temperature of any region of any secondary containment, including imbedded pipe supports, becomes less than the minimum specified operating temperature for the material, the Commission shall be notified **within 24 hours** and procedures for corrective action shall be specified.

131. Significant non-scheduled events, including safety-related incidents (e.g., LNG, condensate, refrigerant, heavier hydrocarbons, or natural gas releases; fires; explosions; mechanical failures; unusual over pressurization; and major injuries) and security-related incidents (e.g., attempts to enter site, suspicious activities) shall be reported to the FERC staff. In the event that an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification shall be made **immediately**, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification shall be made to the FERC staff **within 24 hours**. This notification practice shall be incorporated into the liquefaction facility’s emergency plan. Examples of reportable hazardous fluids-related incidents include:

    a. fire;

    b. explosion;

    c. estimated property damage of $50,000 or more;

    d. death or personal injury necessitating in-patient hospitalization;

e. release of hazardous fluids for 5 minutes or more;

f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes hazardous fluids;

g. any crack or other material defect that impairs the structural integrity or reliability of a facility that contains, controls, or processes hazardous fluids;

h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes hazardous fluids to rise above its maximum allowable operating pressure (or working pressure for facilities) plus the build-up allowed for operation of pressure-limiting or control devices;

i. a leak in a facility that contains or processes hazardous fluids that constitutes an emergency;

j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;

k. any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or a facility that contains or processes hazardous fluids;

l. safety-related incidents from hazardous fluids transportation occurring at or en route to and from the facility; or

m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an LNG terminal's incident management plan.

In the event of an incident, the Director of OEP has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human life, health, property, or the environment, including authority to direct the liquefaction facility to cease operations. Following the initial company notification, the FERC staff will 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.

APPENDICES

APPENDIX A

U.S. ARMY CORPS OF ENGINEERS – JACKSONVILLE DISTRICT PUBLIC NOTICE FOR THE JACKSONVILLE PROJECT

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, JACKSONVILLE DISTRICT
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

NOVEMBER 16, 2018

PUBLIC NOTICE

Permit Application Number SAJ-2014-03125(SP-MRE)

TO WHOM IT MAY CONCERN: The Jacksonville District of the U.S. Army Corps of Engineers (Corps) has received an application for a Department of the Army permit pursuant to Section 404 of the Clean Water Act (33 U.S.C. §1344) and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. §403) as described below:

APPLICANT: Eagle LNG Partners, LLC
Chasewood Technology Park
20445 State Highway 249, Suite 250
Houston, Texas 77070

WATERWAY AND LOCATION: The project would affect waters of the United States, including wetlands, associated with Drummond Creek and the St. Johns River. The project site is located at 1632 Zoo Parkway, in portions of Sections 17, 20, 47, and 55, Township 1 South, Range 27 East, Jacksonville, Duval County, Florida.

APPROXIMATE CENTRAL COORDINATES: Latitude 30.410393°
Longitude -81.616471°

PROJECT PURPOSE:

Basic: The basic project purpose is commercial development.

Overall: The overall project purpose is the establishment of a Liquid Natural Gas (LNG) distribution facility in Jacksonville Florida with access to navigable waters and interstate roadways.

LEAD FEDERAL AGENCY ROLE:

The Federal Energy Regulatory Commission (FERC) is considered the lead federal agency for the coordination and conduct of environmental reviews under the National Environmental Policy Act (NEPA). Pursuant to NEPA, the FERC is preparing an Environmental Impact Statement (EIS) for Eagle LNG Partners Jacksonville, LLC's proposed Jacksonville Project. The Corps is participating as a cooperating agency in the development of the EIS; however, a separate decision document would be prepared prior to a final decision concerning issuance or denial of the requested Department of the Army permit. Comments received would be used by the Corps in the preparation of any documentation, if required, pursuant to NEPA prior to a final decision concerning issuance or denial of the Department of the Army permit.

Refer to the FERC Draft Environmental Impact Statement (DEIS) available on the FERC website (www.ferc.gov) using the eLibrary link. Click on the eLibrary link (https://www.ferc.gov/docs-filing/elibrary.asp), click on General Search, and enter the docket number in the “Docket Number” field, excluding the last three digits (i.e., CP17 41). Be sure you have selected an appropriate date range.

EXISTING CONDITIONS: Please review the narratives within the FERC DEIS.

General: The project site is approximately 193.4 acres in size. Of this total acreage, the site includes approximately 87 acres of wetlands and 22.5 acres of open-water. The elevation of the project site ranges from about 20.0 feet in the highest areas to a sea level in the eastern portion of the site. Topography is flat to gently sloping for much of the area at a macro-level, however, the topography slopes downward near the river and elevation levels are at sea level in the wetland areas. The natural surface soils have been somewhat altered from historical use of the property as a dredge spoil site during dredging of the St. Johns River channels, but the hydrology and natural sheet flow appears to remain in somewhat natural conditions.

Soils: The applicant’s ecological agent compiled soil series descriptions from information presented in the *U.S Department of Agriculture National Resource Conservation Service* (NRCS) *Soil Survey Geographic* (SSURGO) database for Duval County, Florida (NRCS 2015). The soils present at the site include *Arents, nearly level* (map unit 7), *Boulogne fine sand, 0 to 2 percent slopes* (map unit 14), *Penney fine sand, 0 to 5 percent slopes* (map unit 53), *Pottsburg fine sand, high, 0 to 3 percent slopes* (map unit 58), and *Tisonia mucky peat, 0 to 1 percent slopes, very frequently flooded* (map unit 68).

Arents, nearly level (map unit 7): The Arents series are nearly level and usually occur in the coastal plain flatwoods. The parent material is loamy and sandy marine sediments. The soils are poorly drained and permeability is slow. The common land use is timber lands and shrub scrub areas with close proximity to the coast. They are present mostly in Florida coastal areas.

Boulogne fine sand, 0 to 2 percent slopes (map unit 14): The Boulogne fine sand has slopes of 0 to 2 percent. These soils usually occur in the coastal plains area and the parent material is sandy marine sediments. Depth to the water table ranges from 6 to 18 inches and depth to bedrock is greater than 72 inches. The soil is very poorly drained and the permeability is slow to moderate. Common land use is agriculture where cleared and timberland where forested. Common distribution is throughout the Atlantic and lower Gulf coastal plains.

Penney fine sand, 0 to 5 percent slopes (map unit 53): The Penney unit has slopes of 0 to 5 percent. These soils occur in forested areas within the uplands and are formed from marine deposits. These are upland soils and are quickly drained. Permeability is very rapid. Depth to water table and depth to bedrock varies greatly. The majority of the land use in these areas is shrub scrub and forestlands in a natural state. This series is common in northeast Florida. This soil type does not meet hydric criteria.

Pottsburg fine sand, high, 0 to 3 percent slopes (map unit 58): The Pottsburg unit has high slopes of 0 to 3 percent. These soils occur in the lower coastal plains usually on flats. They are formed from historic marine deposits. These soils are moderately drained with a low runoff potential and can be subject to flooding. Land use includes timberland and developed areas.

Tisonia mucky peat, 0 to 1 percent slopes, very frequently flooded (map unit 68): The Tisonia mucky peat unit has slopes of 0 to 1 percent. These soils occur in large tidal marsh areas with elevations around sea level. The soils are formed from plant remains and deposits of alluvium where seawater is frequently present from high tide inundation. Land use is primarily for wildlife habitat and can be valuable habitat for saltwater finfish and shellfish. These soils occur in tidal marshes. This soil meets hydric criteria.

Vegetation: The project site encompasses eight vegetative communities characterized by the *Florida Land Use, Cover, and Forms Classification System* (FLUCFCS). These communities are *Live Oak Hammock* (FLUCCS code 427), *Coniferous Plantation* (FLUCCS code 441), *Stream and Waterways* (FLUCCS code 510), *Slash Pine Swamp Forest* (FLUCCS code 627), *Wetland Forested Mixed* (FLUCCS code 630), *Freshwater Marsh* (FLUCCS code 641), *Salt Marsh* (FLUCCS code 642), and *Sand - Other than Beaches* (FLUCCS code 720).

Live Oak Hammock (FLUCCS code 427): This upland plant community dominates the upland-wetland interfaces within the site. The tree canopy within this community typically is dominated by live oak (*Quercus virginiana*), but occasionally is co-dominated by slash pine (*Pinus elliottii*). Additional tree species observed include red cedar (*Juniperus virginiana*), cabbage palm (*Sabal palmetto*), sand live oak (*Quercus geminata*), laurel oak (*Quercus hemisphaerica*), Southern magnolia (*Magnolia grandiflora*), sweet gum (*Liquidambar styraciflua*), camphor (*Cinnamomum camphora*), and Chinese tallow (*Sapium sebiferum*). Common understory and shrub species include overstory recruits, saw palmetto (*Serenoa repens*), St. John's wort (*Hypericum spp.*), hairy indigo (*Indigofera hirsute*), American olive (*Osmanthus americanus*), gallberry (*Ilex glabra*), rusty lyonia (*Lyonia fruticosa*), and silverling (*Baccharis glomeruliflora*). Due to widespread dense canopy and thick duff layer, herbaceous groundcover generally is sparse.

Coniferous Plantation (FLUCCS code 441): This habitat designation encompasses all lands recently clear-cut and replanted with pine (*Pinus sp*.). This area is located in the north-central section of the site and contains the highest elevations on-site. The area is characterized by scattered patches of vegetated sand, ruderal/early successional herbaceous species, and coppicing/recruiting tree and shrub species. Common tree and shrub species include laurel oak, live oak, black cherry (*Prunus serotina*), Southern magnolia, mimosa (*Albizia julibrissin*), American beautyberry (*Callicarpa americana*), saw palmetto, winged sumac (*Rhus copallinum*), American pokeweed (*Phytolacca americana*). Groundcover species present include broomsedge (*Andropogon virginicus*), bushy bluestem (*Andropogon glomeratus*), briars (*Smilax spp.*), wiregrass (*Aristida* spp.), grape (*Vitis rotundifolia*), and trumpet vine (*Campsis radicans*).

Stream and Waterways (FLUCCS code 510): This community represents the open-water systems associated with Drummond Creek and the St. Johns River. Drummond Creek forms the southern boundary of the site; and, is a small tributary to the St. Johns River.

Slash Pine Swamp Forest (FLUCCS code 627): This plant community is located in the northwestern section of the site. This wetland community's canopy is dominated by slash pine. Additional species within this community include swamp bay (*Persea palustris*), red maple (*Acer rubrum*), dahoon (*Ilex cassine*), cabbage palm, and sweetbay (*Magnolia virginiana*). Understory and shrub species include overstory recruits, elderberry (*Sambucus nigra* L. *subsp. Canadensis*) and evergreen bayberry *(Myrica caroliniensis).* The duff layer throughout this community is typically deep, replacing most of the ground cover vegetation. Cinnamon fern (*Osmunda cinnamomea)*, Virginia chain fern (*Woodwardia virginica*), and royal fern (*Osmunda regalis* L. var. *spectabilis)* are the most frequent groundcover species.

Wetland Forested Mixed (FLUCCS code 630): This forested wetland community is typically located between the live oak hammock and the salt marsh community designations. This community is typified by a closed canopy, dense understory, and sparse groundcover. Common canopy trees included slash pine, cabbage palm, dahoon, sweetbay, and swamp bay.

Subcanopy and shrub layers contained overstory recruits, red maple, sweetgum, sivlerling, and hairy indigo.

Freshwater Marsh (FLUCCS code 641): This community typically supports sawgrass (*Cladium jamaicense*), cattail (*Typha sp.*), arrowhead (*Sagittaria sp.*), maidencane (*Panicum hemitomon*), buttonbush (*Cephalanthus occidentalis*), cordgrass (*Spartina bakeri*), switchgrass (*Panicum virgatum*), bulrush (*Scirpus sp.*), black needlerush (*Juncus effuses*), and arrowroot (*Thalia sp.*).

Salt Marsh (FLUCCS code 642): This natural saline community is dominated by herbaceous vegetation and is found on the border of saltwater bodies with tidal-fluctuating inundation. These areas are occasionally flooded by high tide, but not flooded during low tide. Salt marsh communities cannot grow where waves are strong, but occur within irregularly flooded, low-energy wetlands. Dominant species observed on-site include smooth cordgrass (*Spartina alterniflora*), needlerush (*Juncus roemerianus*), and marsh-hay cordgrass (*Spartina patens*). Additional species present include sea oxeyes (*Borrichia frutescens*), big cordgrass (*Spartina cynosuroides*), bigleaf sumpweed (*Iva frutescens*), wand loosestrife (*Lythrum lineare*), and saltmarsh fringe-rush (*Fimbristylis castanea*). Numerous unmapped narrow creek channels are located throughout this community.

Sand - Other than Beaches (FLUCCS code 720): This community designation is positioned within the center of the “island” located in the south easternmost corner of the site. This community is sparsely vegetated and is dominated by large areas of bare, sand deposits. Plants species observed within this area include Hercules club (*Zanthoxylum clava-herculis*), yaupon (*Ilex vomitoria*), prickly pear cactus (*Opuntia humifusa*), briar (*Smilax auriculata*), saw palmetto, dogfennel (*Eupatorium capillifolium*), black cherry, pinweed (*Lechea sp.*), reindeer moss (*Cladonia sp.*), Bahia grass (*Paspalum notatum*), rustweed (*Polypremum procumbens*), and American plum (*Prunus americana*).

PROPOSED WORK: Please review the narratives within the FERC DEIS.

In general, the applicant seeks authorization to discharge clean fill material over a total of 1.39 acres of palustrine forested wetlands and 0.83 acres of estuarine salt marsh to facilitate the establishment of an LNG facility. The applicant also seeks authorization to place approximately 3,830 square feet of riprap along the shoreline of the property to stabilize and protect the shoreline. The applicant also seeks authorization to conduct dredge operations, including routine maintenance dredge operations, within 10.11 acres of non-vegetated open-waters of the St. Johns River. The applicant also seeks authorization to construct a docking terminal.

The overall LNG facility would include access/egress drives, internal roads, LNG equipment, parking, offices, scales, and a marine load-out structure. The marine load-out structure would include cryogenic transfer piping, a concrete access trestle structure approximately 885 feet in length by 36 feet in width, a concrete loading platform approximately 72 feet square, a docking terminal, two loading arms, one vapor return arm, associated piping and spill containment facilities, fire and safety equipment, a jetty vapor blower, four berthing dolphins (approximately 22 feet by 30 feet in size), and four mooring dolphins (approximately 22 feet by 20 feet in size). The marine load-out structure would be situated no closer than 225 feet from the near bottom edge of the Federal channel (Cut 50) in the St. Johns River.

The berth would require periodic maintenance dredging. Based on the completed sedimentation analysis, the berth may experience an average sedimentation rate of approximately 30 to 40 inches annually. The berth includes one foot of planned over-dredging to accommodate some initial sedimentation without need for overly frequent maintenance dredging. The estimated sedimentation rate suggests multiple maintenance dredging events annually. Dredged material would be placed within the DMMA as noted below.

AVOIDANCE AND MINIMIZATION INFORMATION: Please review the narratives within the FERC DEIS.

In general, the applicant indicates that work within waters of the United States cannot be avoided due to the establishment of the proposed load-out structure. The applicant also indicates that work affecting wetlands has been reduced to the minimum necessary to establish the various structures and access/egress for equipment associated with the load-out structure. Specifically, the proposed access/egress route was reduced in width from an initially proposed 25 feet to 10 feet (which is the minimum necessary for vehicle use) to minimize adverse effects to wetlands. Additionally, the applicant indicates that the area of shoreline stabilization has been limited to the minimum necessary to protect the existing shoreline, alleviate wave action during storm events, and protect the proposed facility. The project incorporates the establishment of a dredged material management area (DMMA) within uplands at the project site to preclude the placement of dredged material in open waters or wetlands. Dredged material would be removed from the DMMA when dry and permanently disposed of at off-site upland locations.

COMPENSATORY MITIGATION: Please review the narratives within the FERC DEIS.

In general, as compensatory mitigation, the applicant proposes the purchase of mitigation bank credits (palustrine and estuarine credits) from a federally approved mitigation bank with a service area encompassing the project site. The applicant's ecological agent compiled a *Uniform Mitigation Assessment Method* (UMAM) quantifying and qualifying the loss of wetland functions and services associated with the work proposed. The UMAM calculates the functional loss to palustrine forested wetlands as 0.97 units and the functional loss to saltwater marsh wetlands as 0.61 units. Therefore, the applicant would purchase 0.97 palustrine forested credits and 0.61 saltwater marsh credits.

CULTURAL RESOURCES: Please review the narratives within the FERC DEIS.

ENDANGERED SPECIES: Please review the narratives within the FERC DEIS.

ESSENTIAL FISH HABITAT (EFH): Please review the narratives within the FERC DEIS.

NOTE: <u>The applicant is seeking a 10-year permit</u>. This public notice is being issued based on information furnished by the applicant and the FERC. This information has not been verified or evaluated to ensure compliance with laws and regulation governing the regulatory program. The Corps has not yet verified the proposed jurisdictional delineation.

AUTHORIZATION FROM OTHER AGENCIES: Water Quality Certification may be required from the Florida Department of Environmental Protection and/or one of the state Water Management Districts.

COMMENTS regarding the potential authorization of the work proposed should be submitted in writing to the attention of the District Engineer through the Jacksonville Permits Section, Post Office Box 4970, Jacksonville, Florida 32232 within 30 days from the date of this notice.

The decision whether to issue or deny this permit application will be based on the information received from this public notice and the evaluation of the probable impact to the associated wetlands. This is based on an analysis of the applicant's avoidance and minimization efforts for the project, as well as the compensatory mitigation proposed.

QUESTIONS concerning this application should be directed to the project manager, Mark Evans, in writing at the Jacksonville Permits Section, Post Office Box 4970, Jacksonville, Florida 32232; by electronic mail at mark.r.evans@usace.army.mil; by facsimile transmission at (904)232-1940; or, by telephone at (904)232-2028.

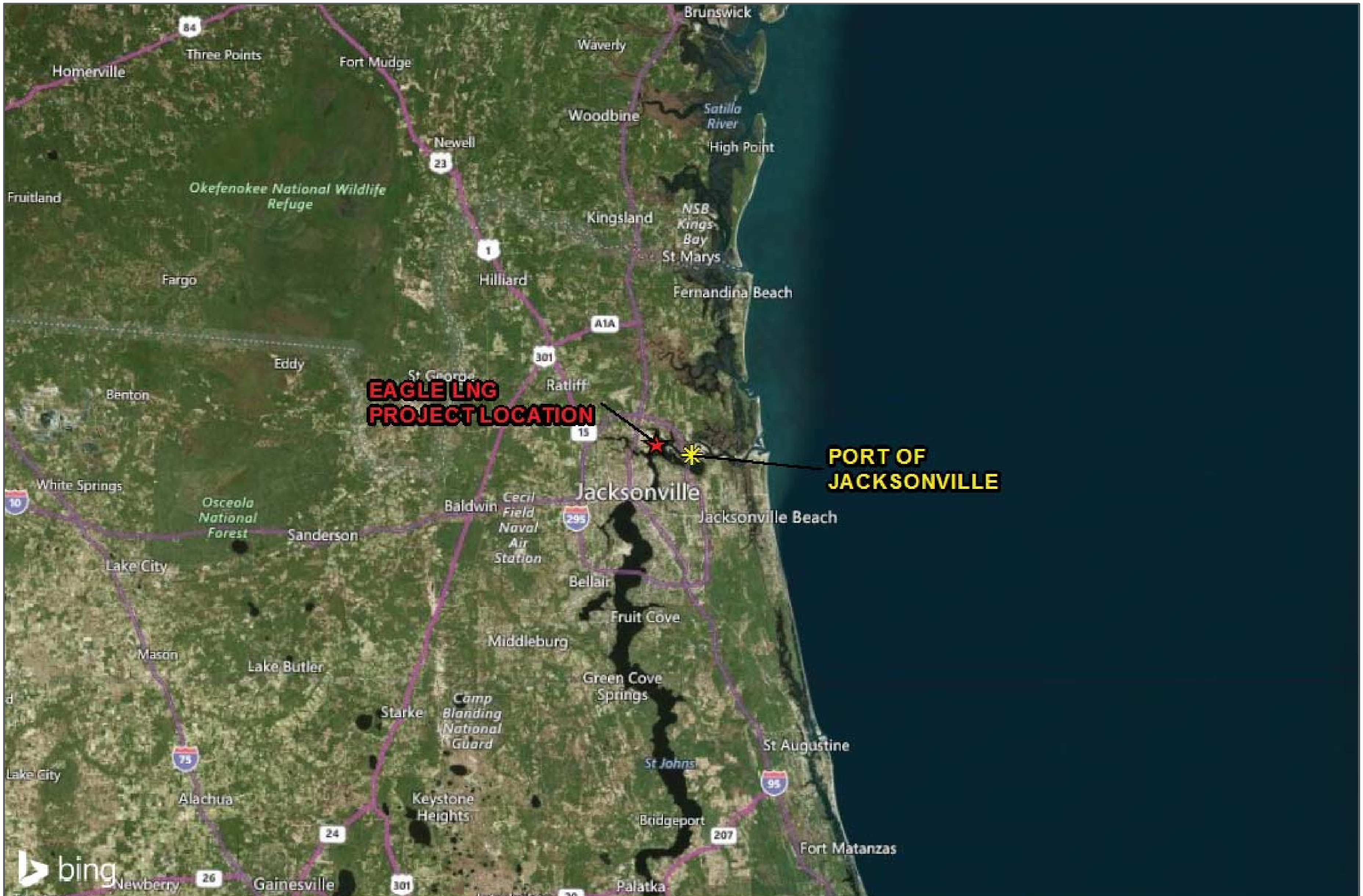
IMPACT ON NATURAL RESOURCES: Coordination with U.S. Fish and Wildlife Service, Environmental Protection Agency (EPA), the National Marine Fisheries Services, and other Federal, State, and local agencies, environmental groups, and concerned citizens generally yields pertinent environmental information that is instrumental in determining the impact the proposed action will have on the natural resources of the area. Please review the narratives within the FERC DEIS.

EVALUATION: The decision whether to issue a permit will be based on an evaluation of the probable impact including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits, which reasonably may be expected to accrue from the proposal, must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including cumulative impacts thereof; among these are conservation, economics, esthetics, general environmental concerns, wetlands, historical properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food, and fiber production, mineral needs, considerations of property ownership, and in general, the needs and welfare of the people. Evaluation of the impact of the activity on the public interest will also include application of the guidelines promulgated by the Administrator, EPA, under authority of Section 404(b) of the Clean Water Act or the criteria established under authority of Section 102(a) of the Marine Protection Research and Sanctuaries Act of 1972. A permit will be granted unless its issuance is found to be contrary to the public interest.

The US Army Corps of Engineers (Corps) is soliciting comments from the public; Federal, State, and local agencies and officials; Indian Tribes; and other Interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps to determine whether to issue, modify, condition, or deny a permit for this proposal. To make this determination, comments are used to assess impacts to endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

COASTAL ZONE MANAGEMENT CONSISTENCY: In Florida, the State approval constitutes compliance with the approved Coastal Zone Management Plan. In Puerto Rico, a Coastal Zone Management Consistency Concurrence is required from the Puerto Rico Planning Board. In the Virgin Islands, the Department of Planning and Natural Resources permit constitutes compliance with the Coastal Zone Management Plan.

REQUEST FOR PUBLIC HEARING: Any person may request a public hearing. The request must be submitted in writing to the District Engineer within the designated comment period of the notice and must state the specific reasons for requesting the public hearing. The decision whether to hold a public hearing is at the discretion of the District Engineer, or his designated appointee, based on the need for additional substantial information necessary in evaluating the proposed project.



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Sec 16, 17, 20 and 21
Twp 01 S
Rng 27 E

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General Project Location

Eagle LNG Jacksonville Project
Duval County, Florida

0 10 20 30 40 50 Miles
0 20 40 60 80 Kilometers

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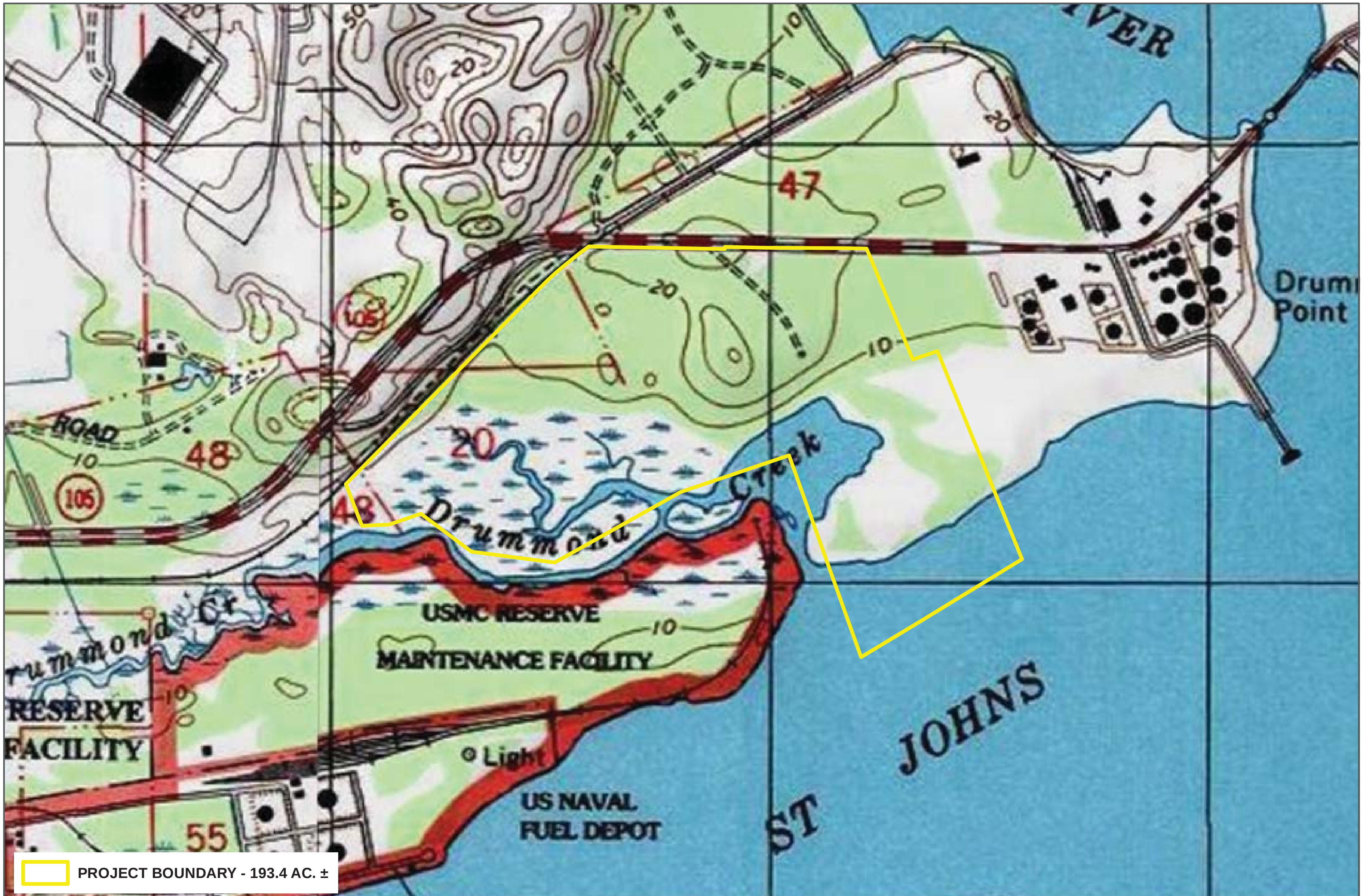

Image: USGS QUAD

Data Source:
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Google Earth
BING

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Rng 27 E

USGS Quadrangle Map

Clean Energy
Duval County, Florida

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A-10

Image: 2015

Data Source:
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Google Earth

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Aerial

Eagle LNG Jacksonville Project
Duval County, Florida

0 600 1,200 1,800 2,400 Feet
0 175 350 525 700 Meters

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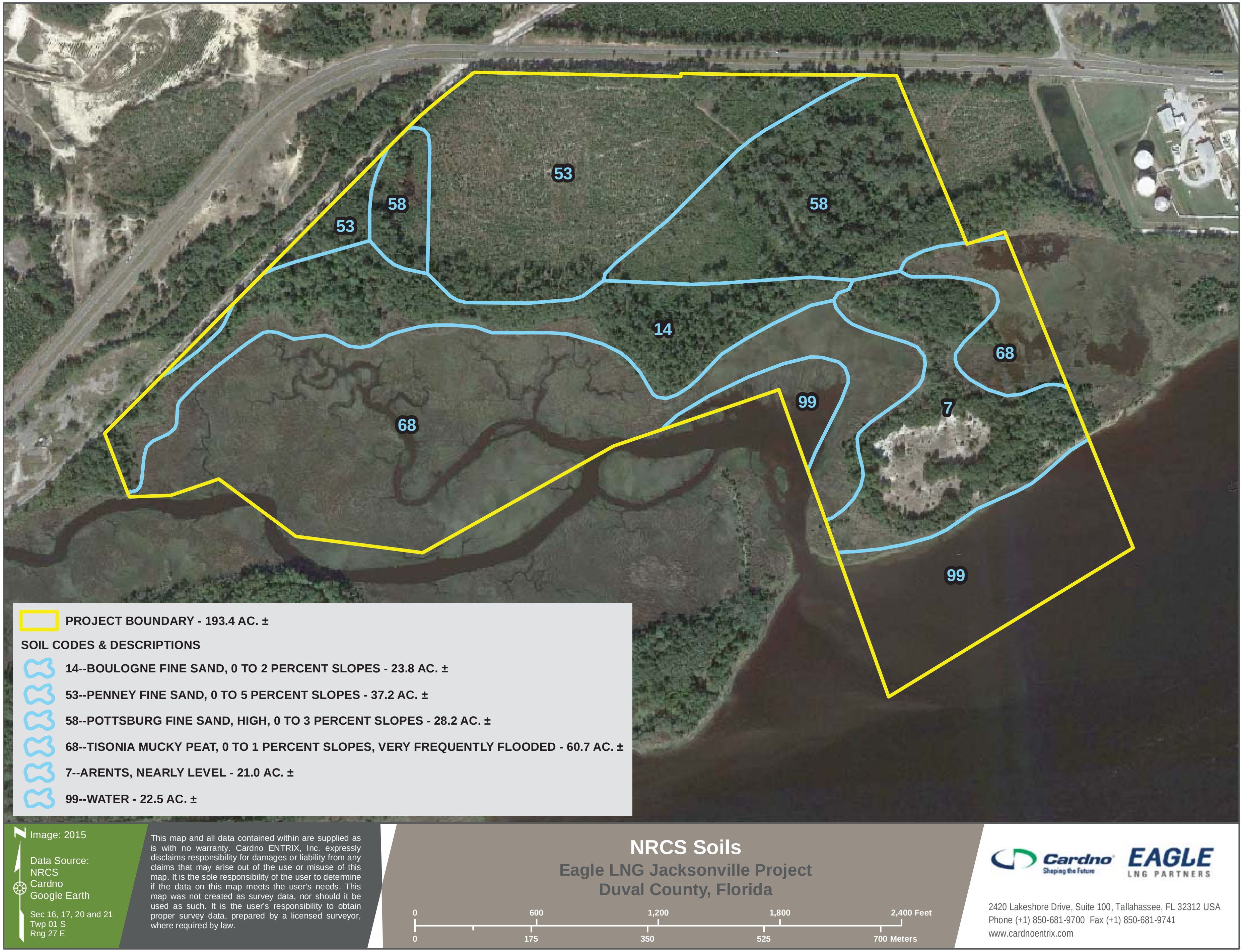

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Image: 2015

Data Source:
Duval County PA
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Google Earth

Sec 16, 17, 20 and 21
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Rng 27 E

Land Use Map

Eagle LNG Jacksonville Project
Duval County, Florida

0 550 1,100 1,650 2,200 Feet
0 165 330 495 660 Meters

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Image: 2014

Data Source:
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Existing Conditions

Eagle LNG Jacksonville Project
Duval County, Florida

0 550 1,100 Feet
0 165 330 Meters

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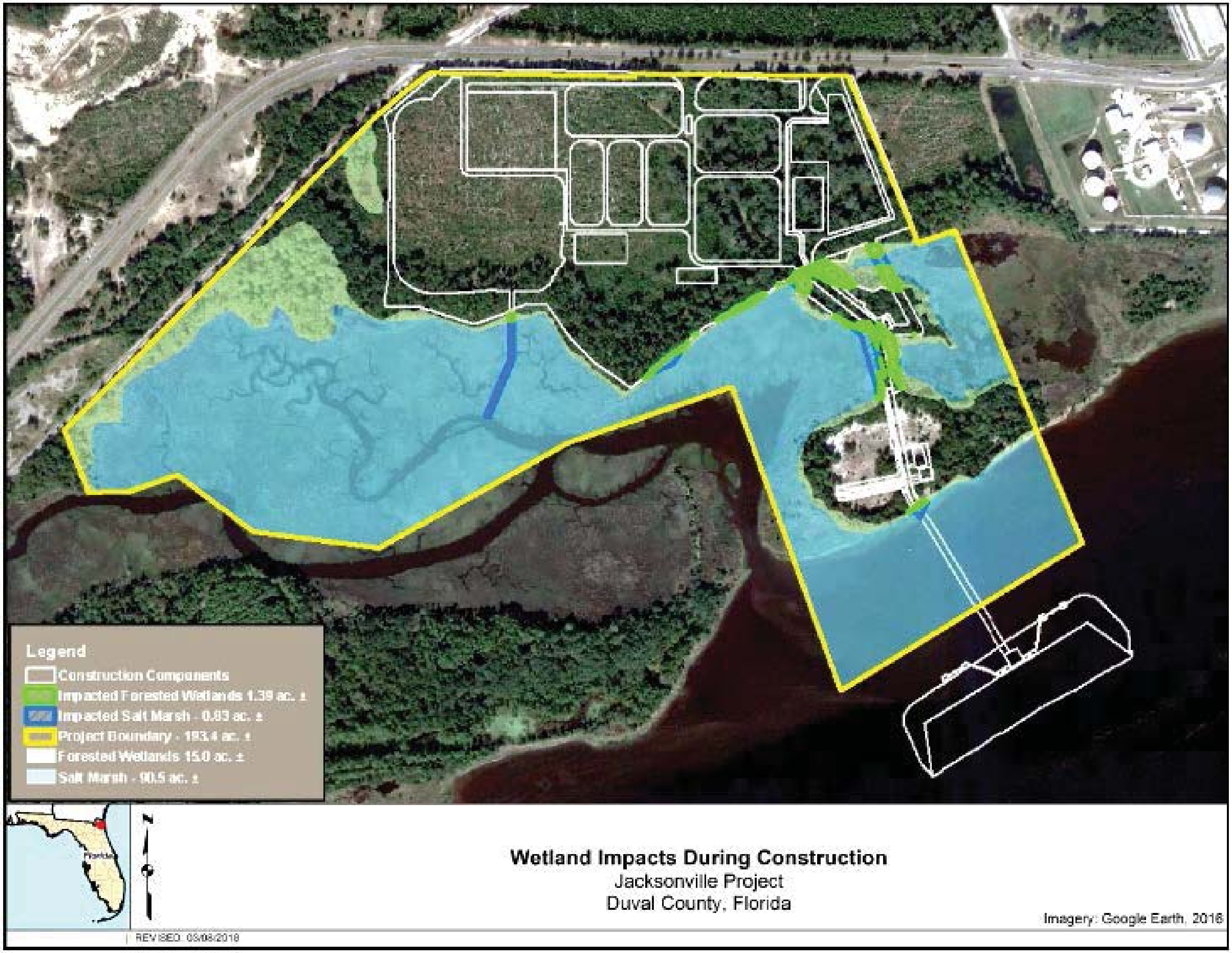
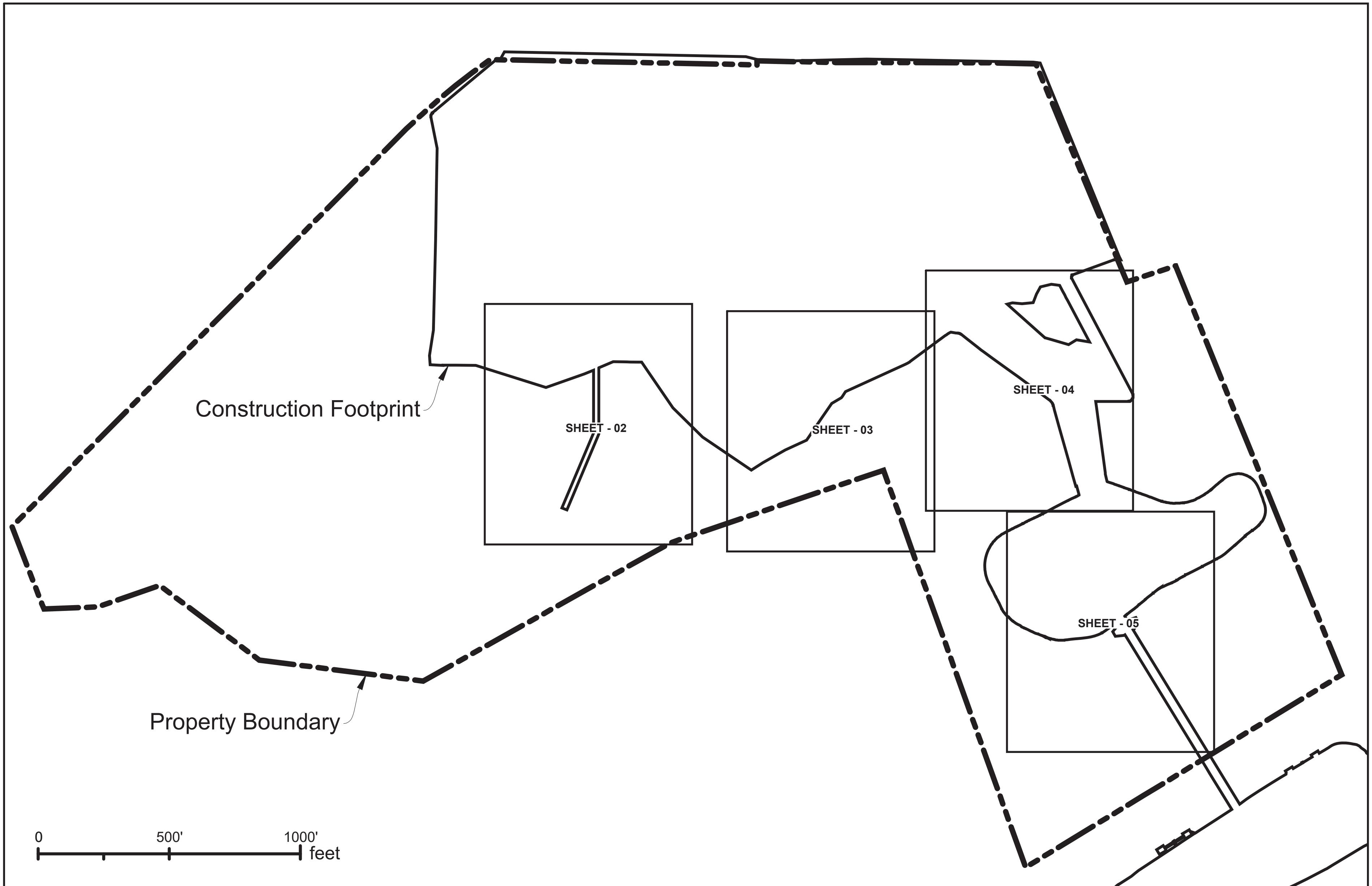

Legend
Construction Components
Impacted Forested Wetlands 1.39 ac. ±
Impacted Salt Marsh - 0.83 ac. ±
Project Boundary - 193.4 ac. ±
Forested Wetlands 15.0 ac. ±
Salt Marsh - 90.5 ac. ±
Florida
Wetland Impacts During Construction
Jacksonville Project
Duval County, Florida
Imagery: Google Earth, 2016
REVISED: 03/08/2018

A-15



Sheet - 01

ACOE
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Key Map

Eagle LNG
Dual County, FL

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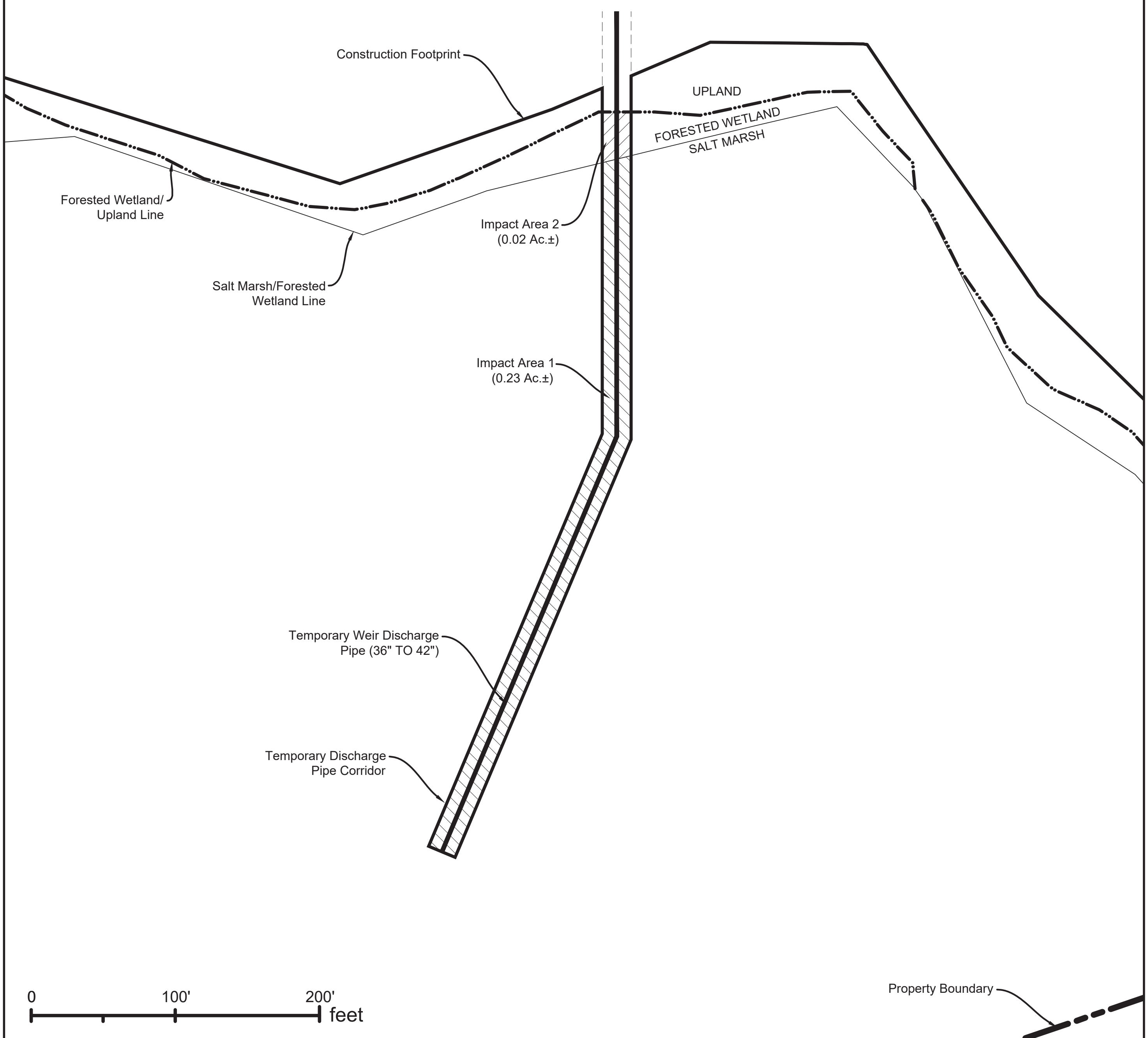
PM: MG CAD Operator: JMB Creation Date: 4/17/2017 Rev. Date: 4/24/2017 Revised By: James.Bottiger File Location:Q:\UnitedStates\Florida\Tampa\Eagle□LNG\working\cad\ACOE Wetland Impact Sheets.dwg



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Sheet - 02

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Sec 16,17,20,21
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Temporary Discharge Impact Exhibit

Eagle LNG
Dual County, FL

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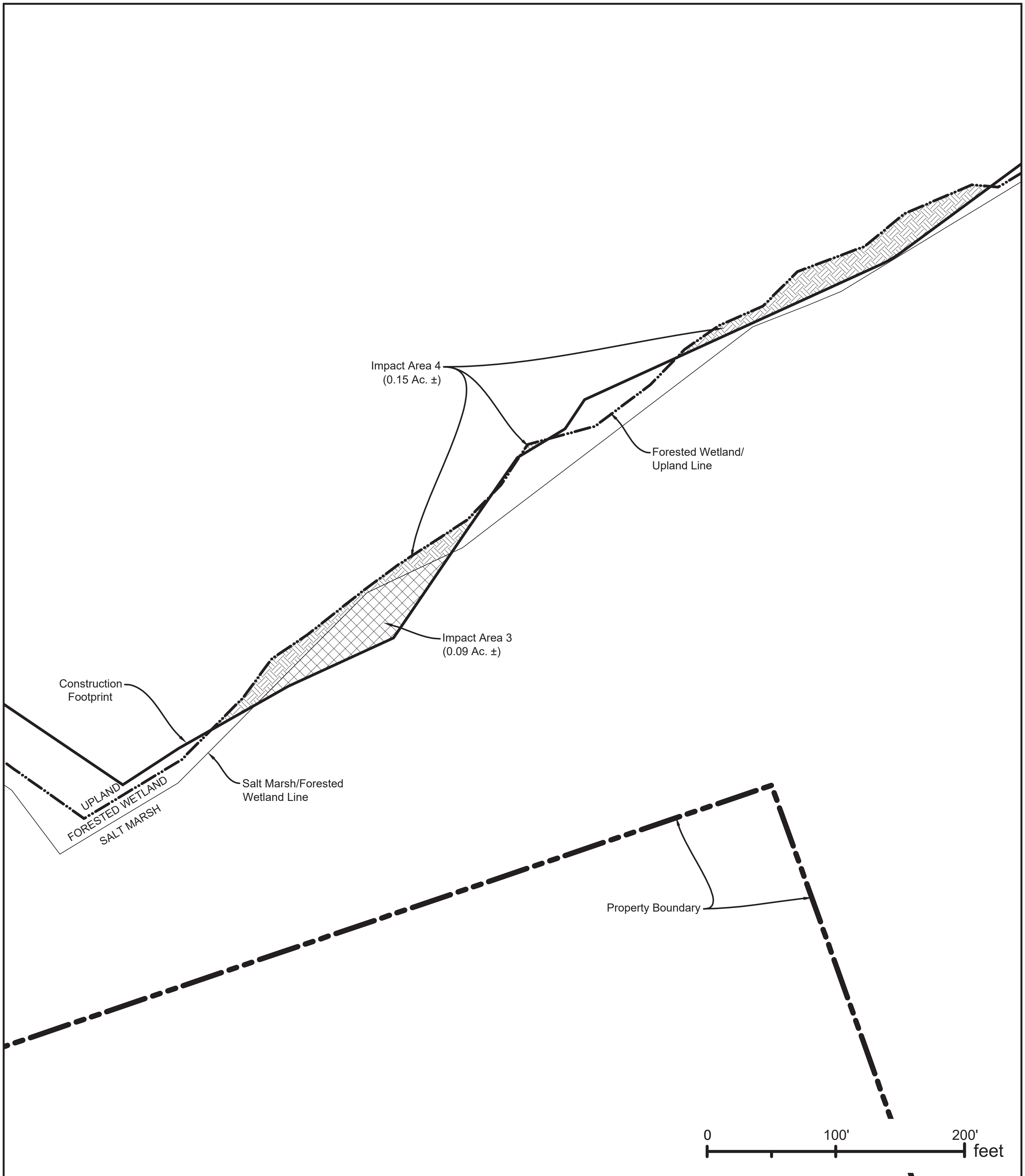

Sheet - 03

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Impact Areas

Eagle LNG
Dual County, FL

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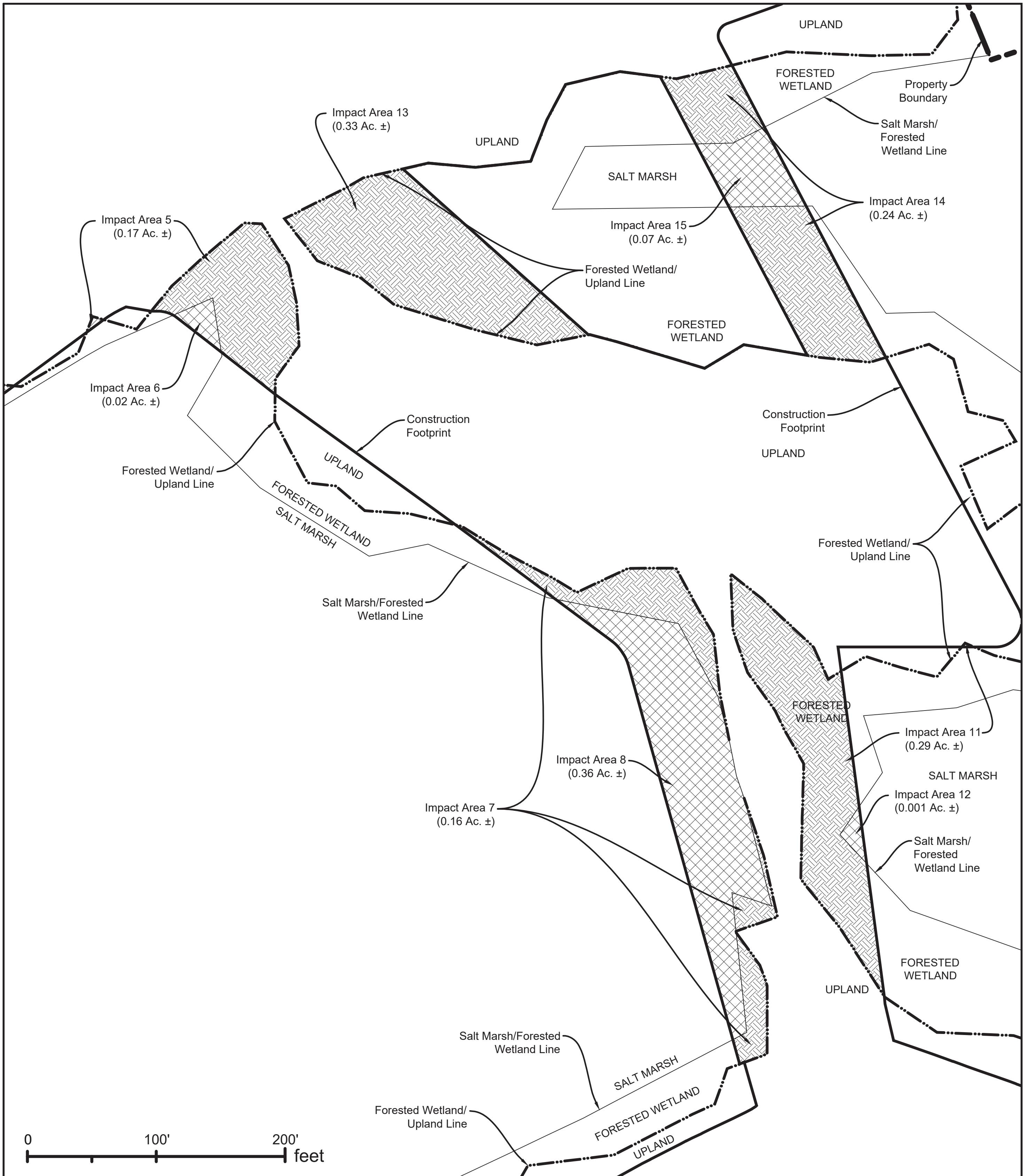
PM: MG CAD Operator: JMB Creation Date: 4/17/2017 Rev. Date: 4/24/2017 Revised By: James.Bottiger File Location:Q:\UnitedStates\Florida\Tampa\Eagle LNG\working\cad\ACOE Wetland Impact Sheets.dwg



Sheet - 04

ACOE
Sec 16,17,20,21
Twn 01 S
Rng 27 E

Impact Areas

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Dual County, FL

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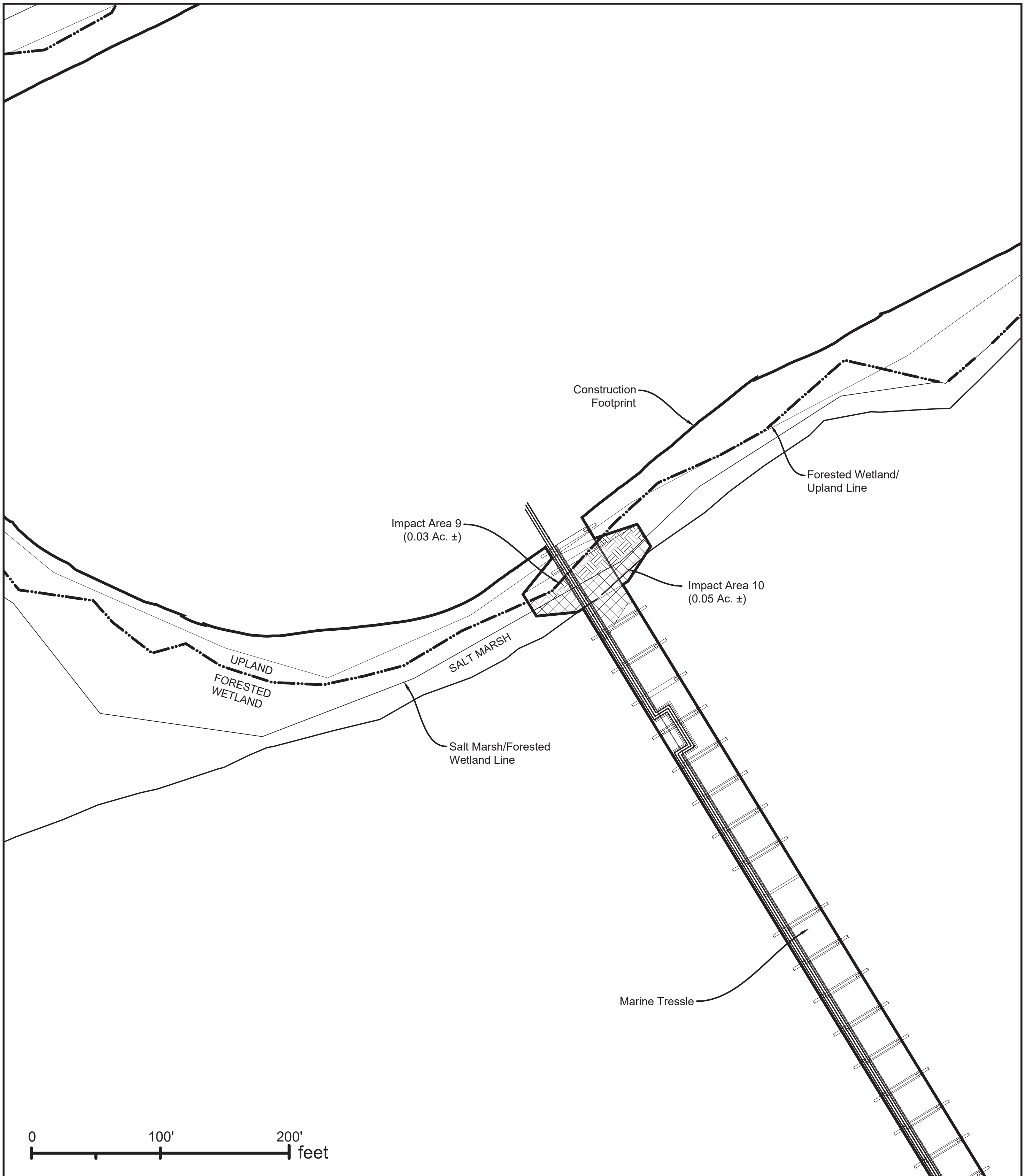

Sheet - 05

ACOE
Sec 16,17,20,21
Twn 01 S
Rng 27 E

Impact Areas

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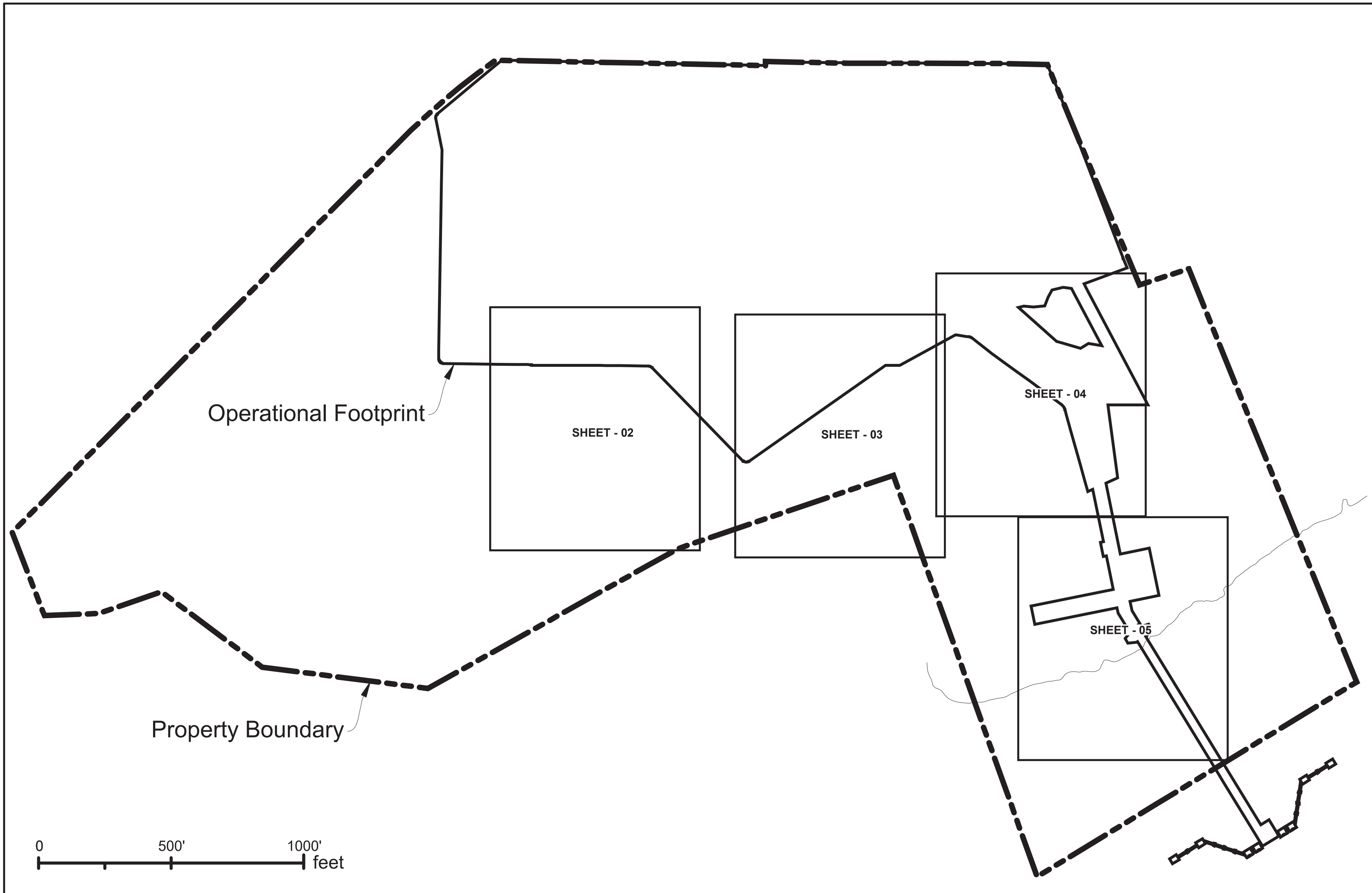

Sheet - 01

ACOE
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Key Map

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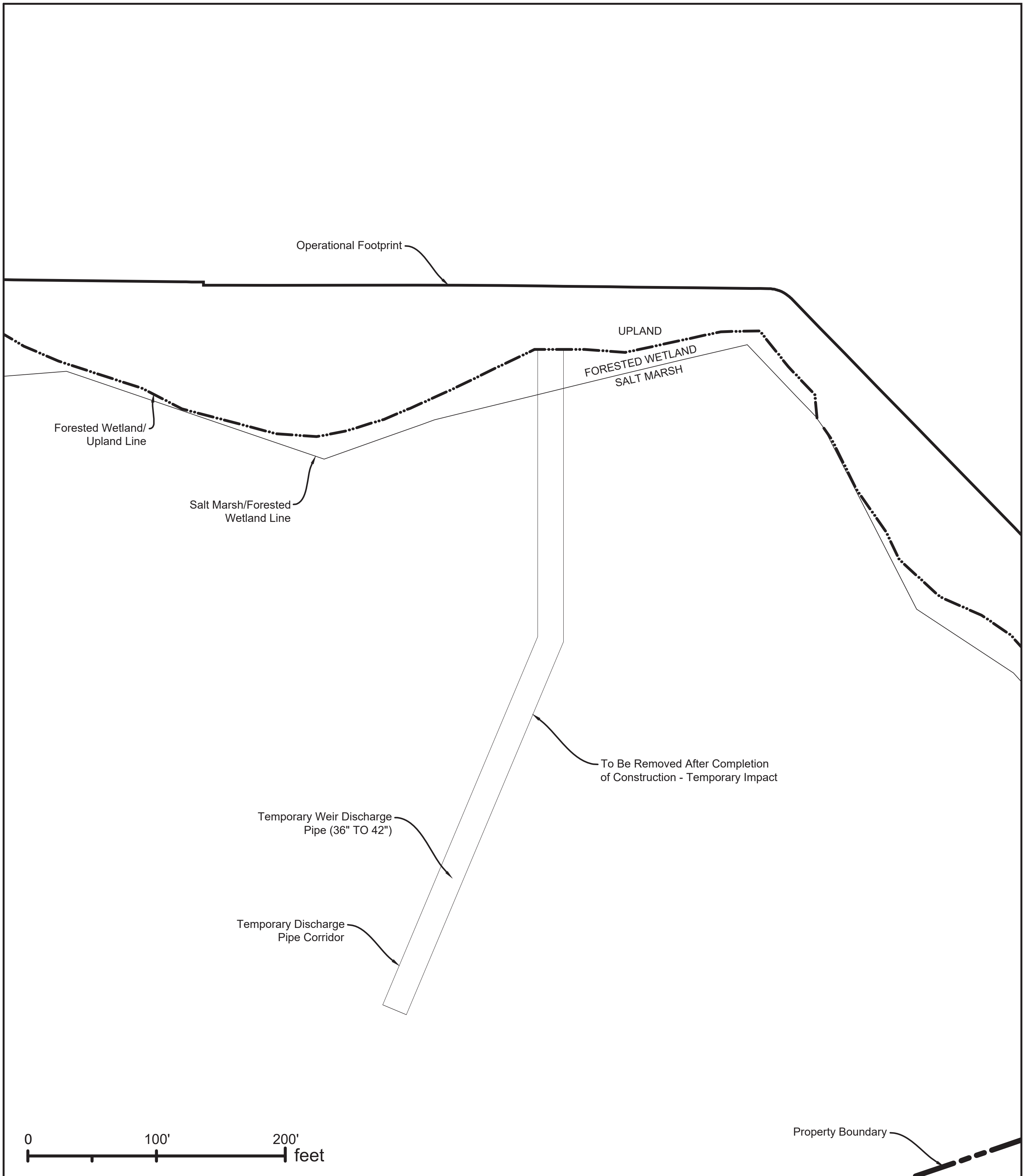
PM: MG CAD Operator: JMB Creation Date: 4/25/2017 Rev. Date: 4/26/2017 Revised By: James.Bottiger File Location:Q:\UnitedStates\Florida\Tampa\Eagle LNG\working\cad\ACOE Operational Wetland Impact Sheets.dwg



Sheet - 02

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Temporary Discharge Impact Exhibit

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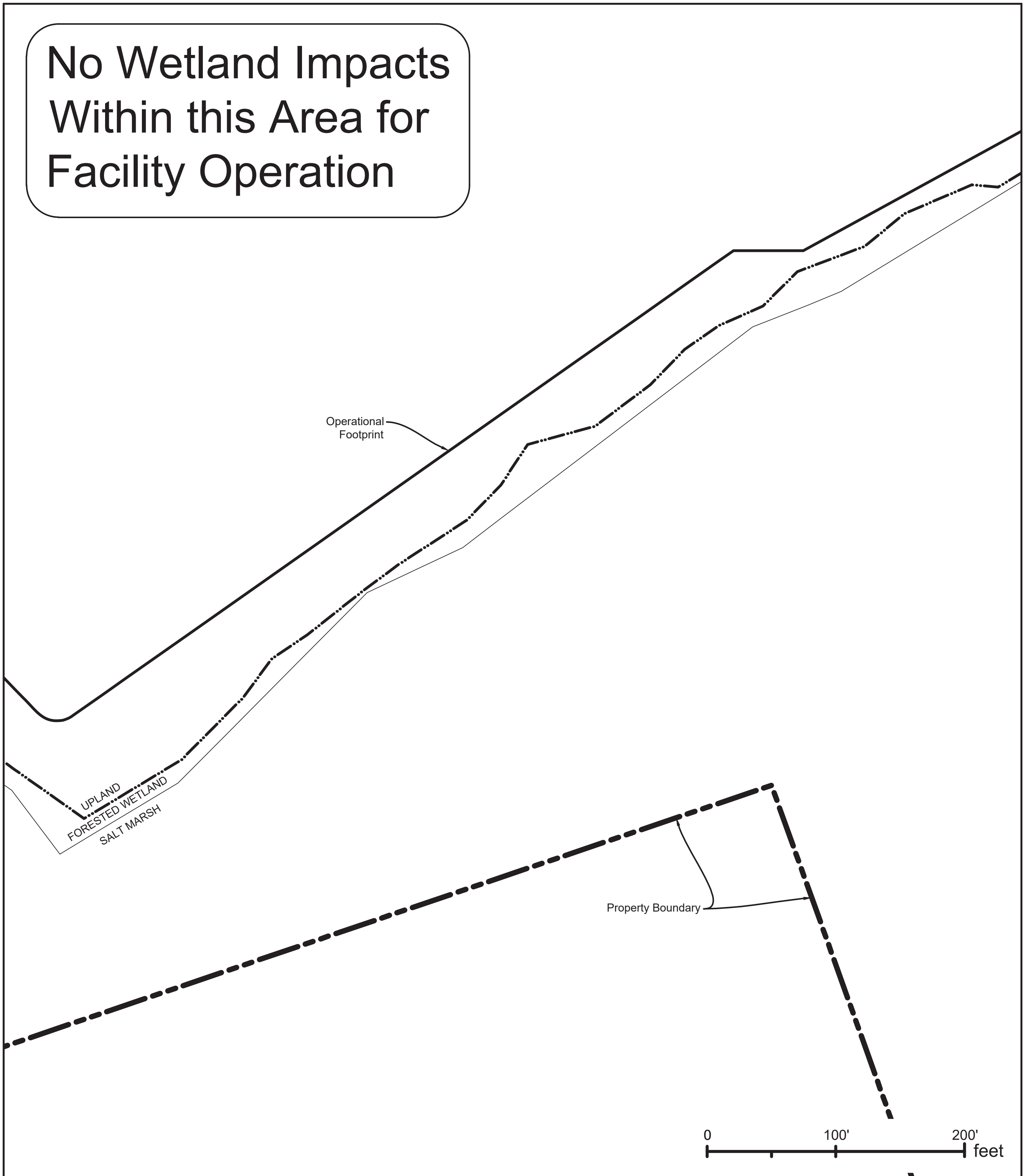

Sheet - 03

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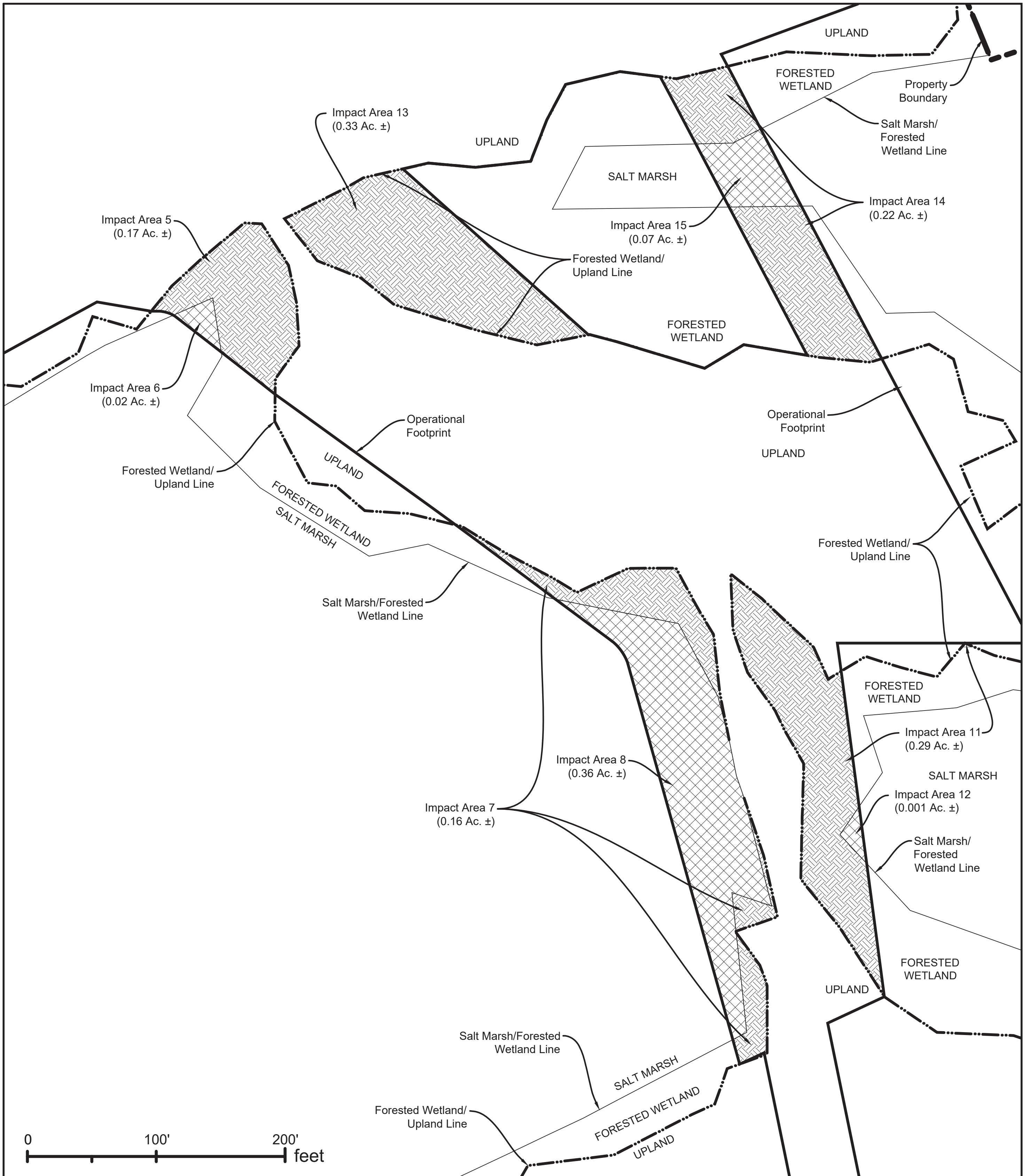

Sheet - 04

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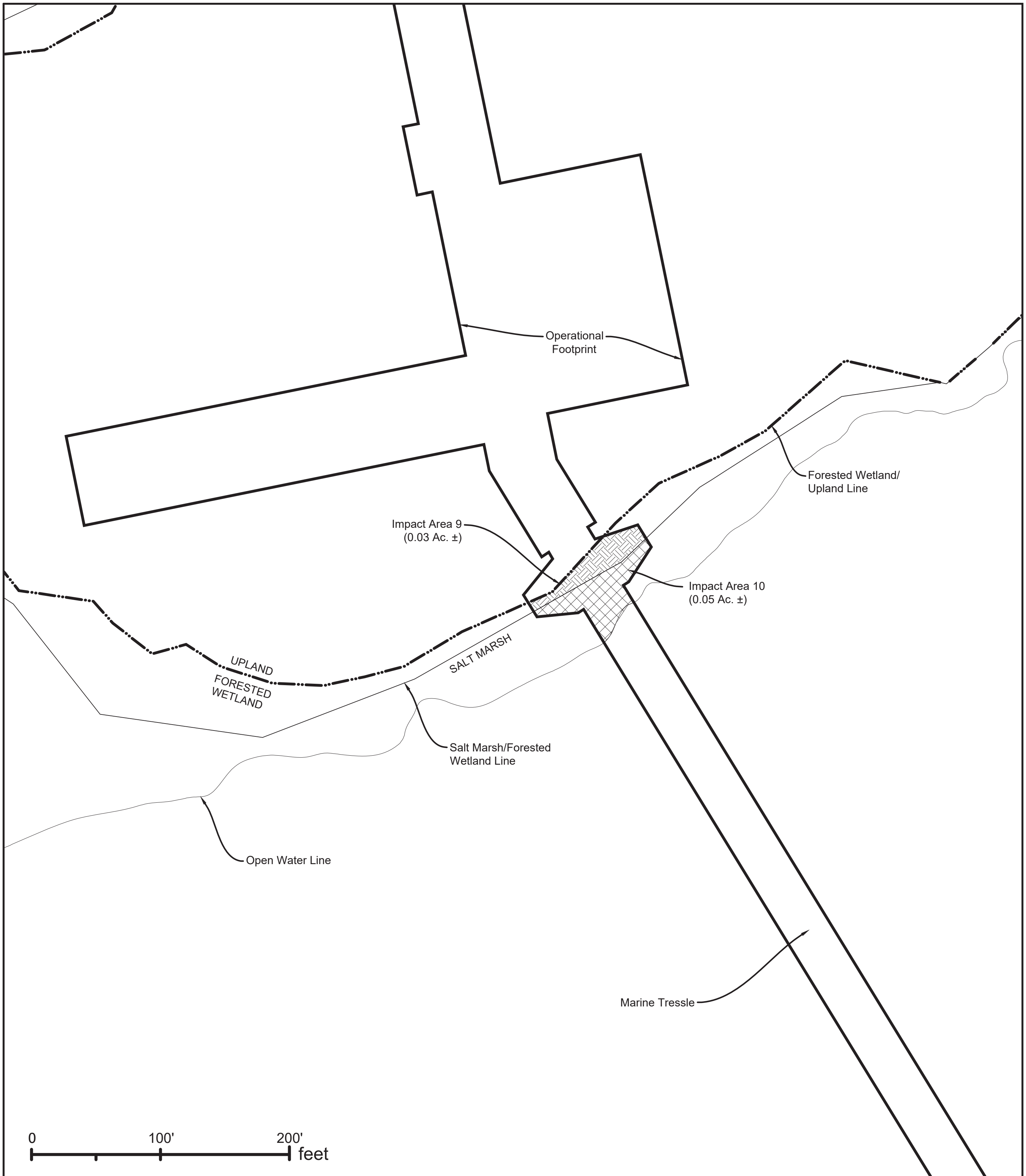

Sheet - 05

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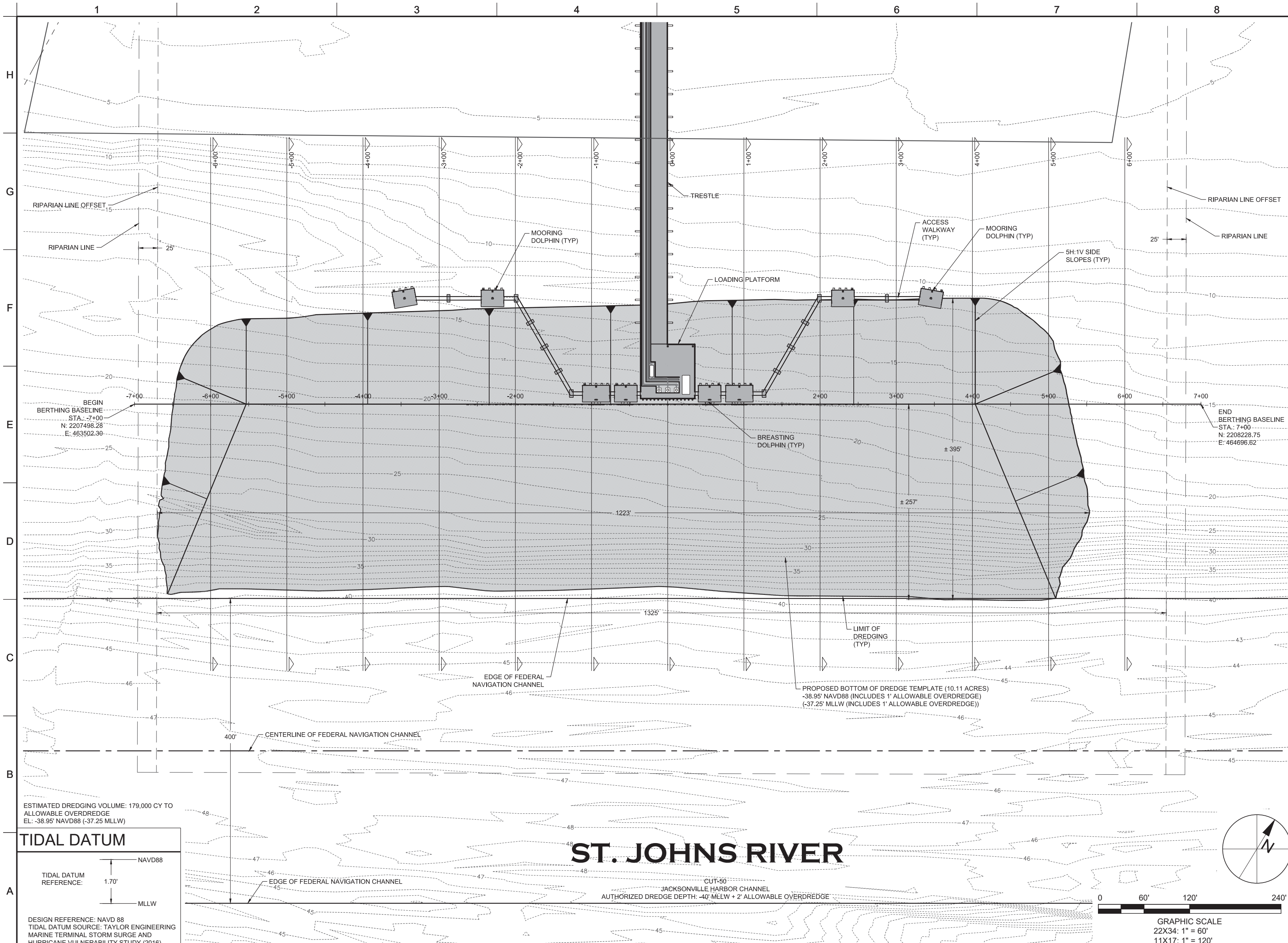
A-25



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(904)-731-7040
1675 PALM BEACH LAKES, SUITE 210
WEST PALM BEACH, FLORIDA 33401
(561)-640-7310
CERTIFICATE OF AUTHORIZATION # 4815

SEAL

60% DRAFT

KEITH A. KNIGHT P.E.# 58084

PROJECT TITLE

EAGLE LNG PARTNERS
JACKSONVILLE MARINE TERMINAL
DUVAL COUNTY, FLORIDA

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PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR OWNER REVIEW.

NO	ZONE	REVISIONS / SUBMISSIONS	DATE

PROJECT NO	C2014-090
DATE	JANUARY 9, 2017
DESIGNED	KAK
DRAWN	CAS
CHECKED	RJD
REVIEWED	JTA
SCALE	AS SHOWN

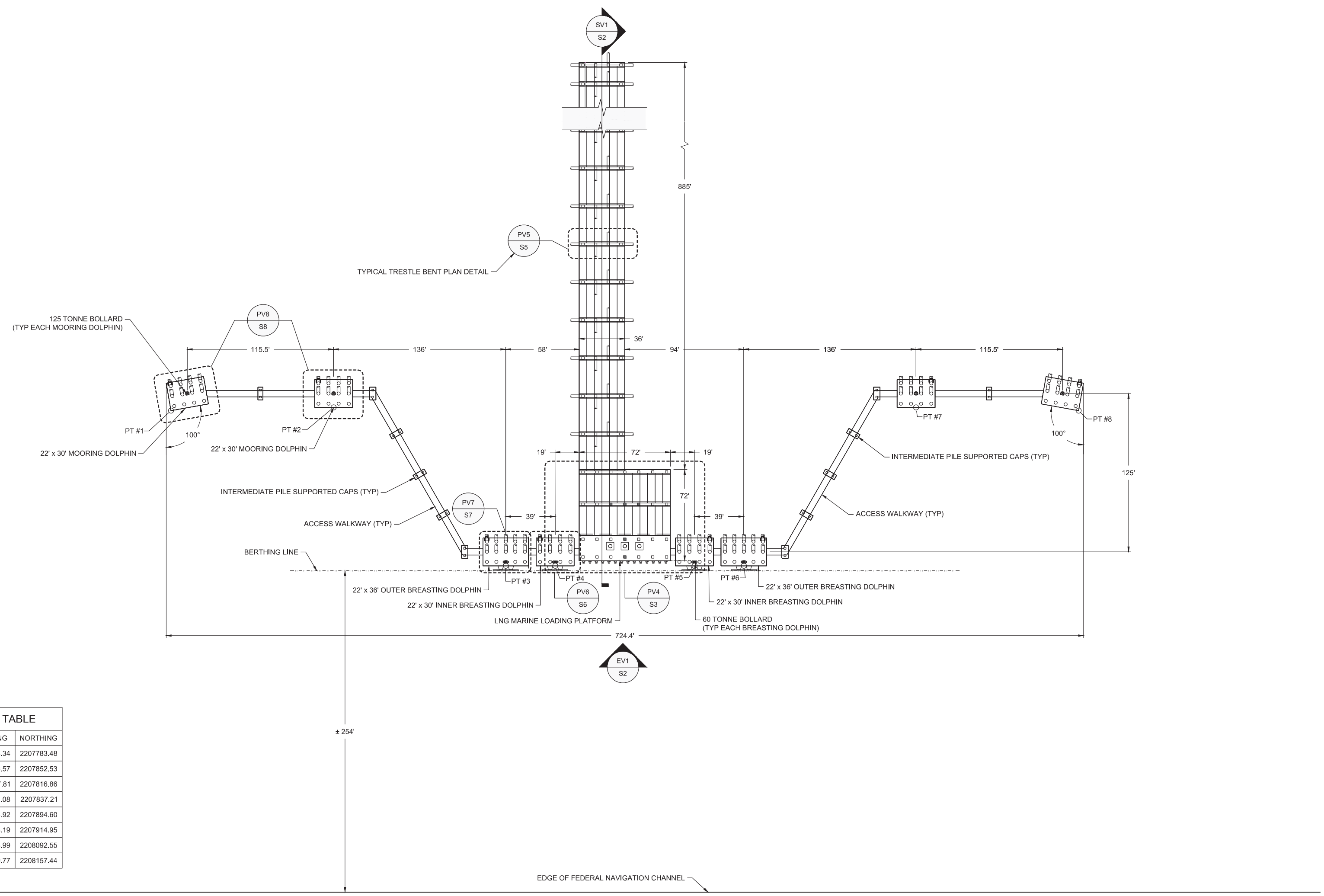
DRAWING TITLE

DREDGE PLAN OVERVIEW

DR1

SHEET 32 OF 41

CATHY SHELL, 1/9/2017 5:00:38 PM, X:\eys\Projects\p2014-185 Eagle LNG\Construction\p2014-185-C-Dredging Plan.dwg



POINT TABLE

POINT	EASTING	NORTHING
1	463728.34	2207783.48
2	463836.57	2207852.53
3	464017.81	2207816.86
4	464051.08	2207837.21
5	464144.92	2207894.60
6	464178.19	2207914.95
7	464228.99	2208092.55
8	464339.77	2208157.44

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PROJECT NO	C2014-090
DATE	JANUARY 9, 2017
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DRAWN	CAS
CHECKED	RJD
REVIEWED	JTA
SCALE	AS SHOWN

DRAWING TITLE

STRUCTURAL PLAN OVERVIEW

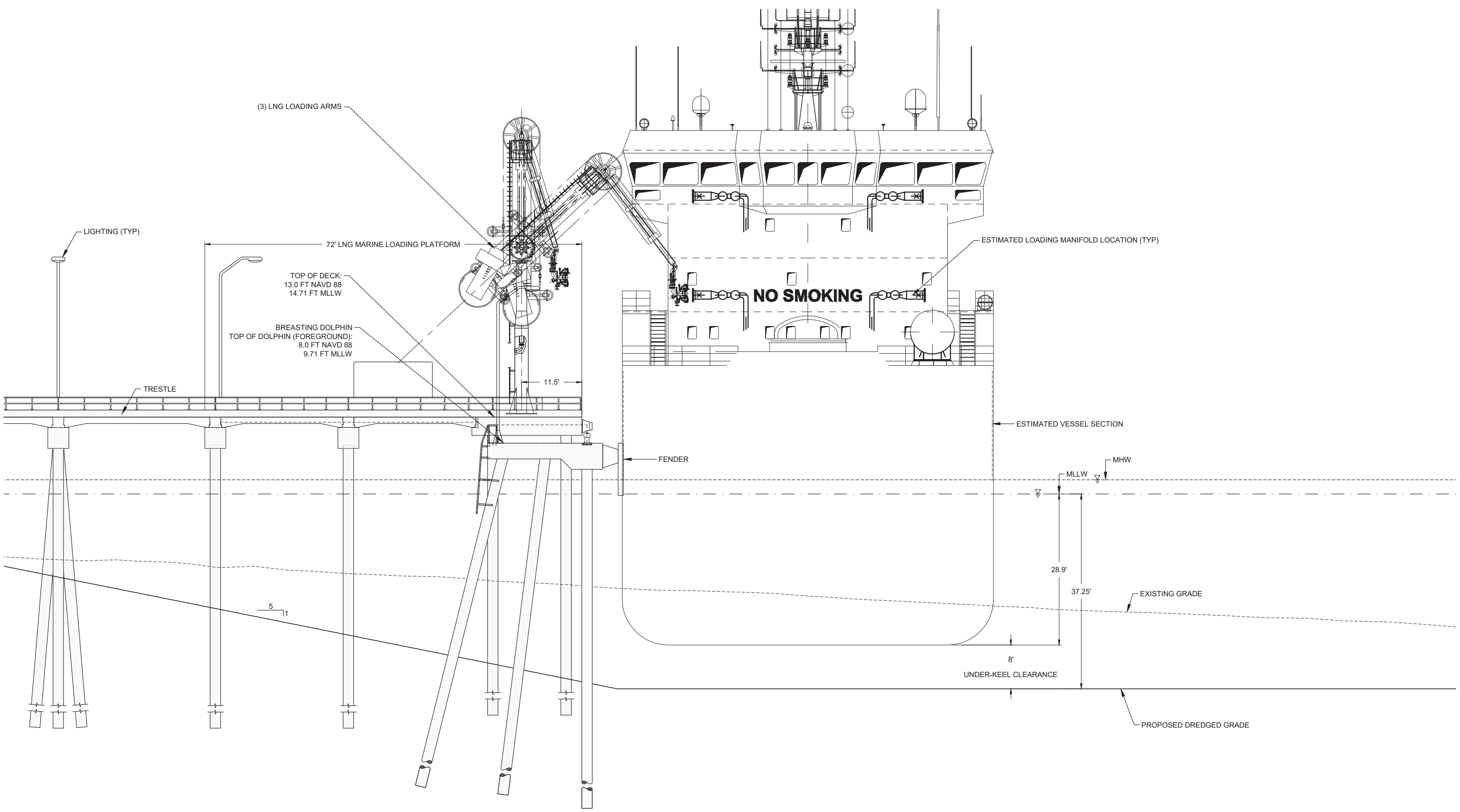
S1

SHEET 23 OF 41

CATHY SHELL, 3/27/2017 10:15:18 AM, X:\sys\Projects\p2014-185 Eagle LNG\Construction\p2014-185-C-Structural Overview.dwg

A-27

SHIP: GENERIC SHIP
CARGO CAPACITY: 30,000 CBM
LOADING CONDITION: DESIGN DRAUGHT (28.9 FT)
TIDAL CONDITION SHOWN: MLLW



30,000 CBM SHIP SECTION DETAIL

22X34: 1" = 10'
11X17: 1" = 20'

0 10 20'

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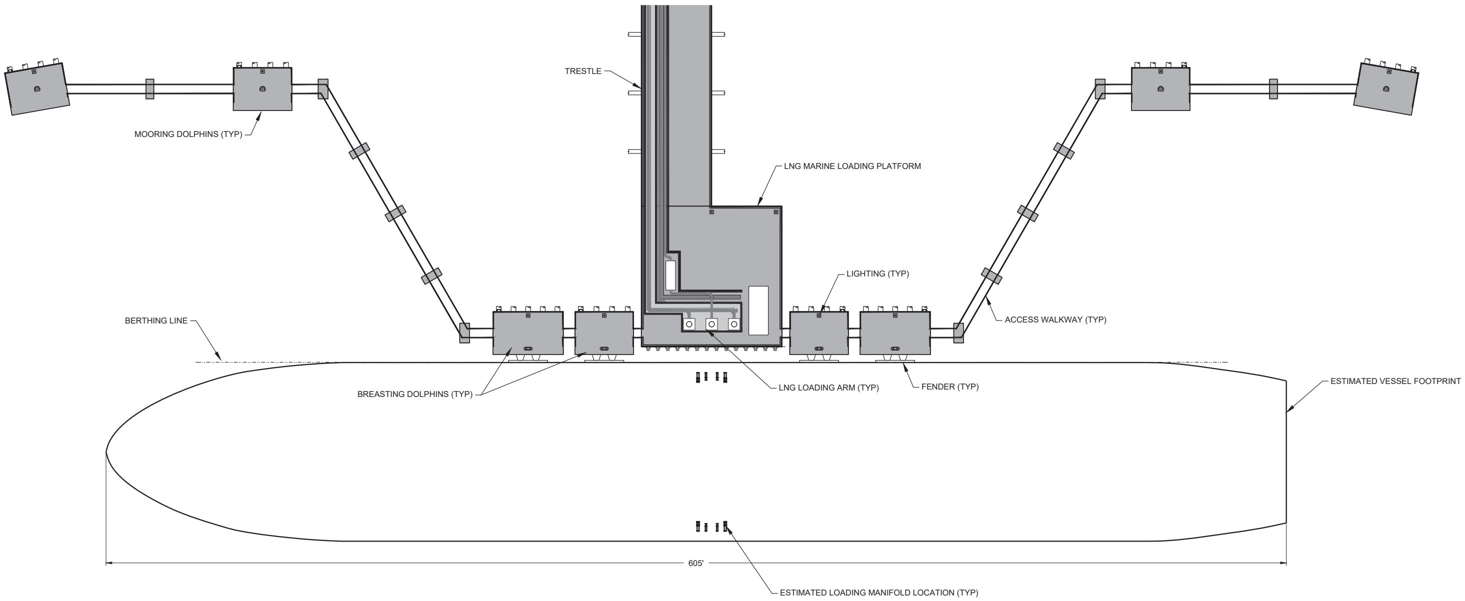
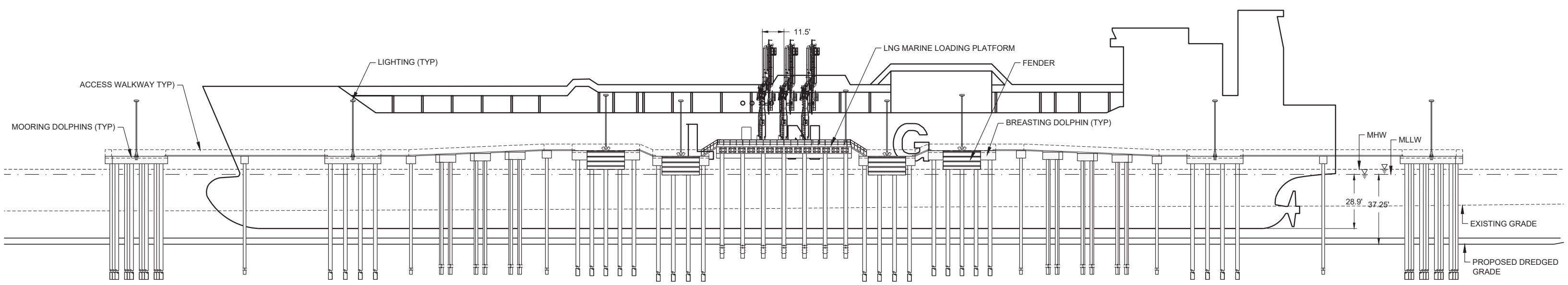
DRAWING TITLE
30,000 CBM SHIP ARRANGEMENT SECTION DETAIL

SA4

SHEET 11 OF 41





30,000 CBM SHIP
PLAN AND ELEVATION (STARBOARD)

22X34: 1" = 30'
11X17: 1" = 60'

0 30 60'

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TERMINAL
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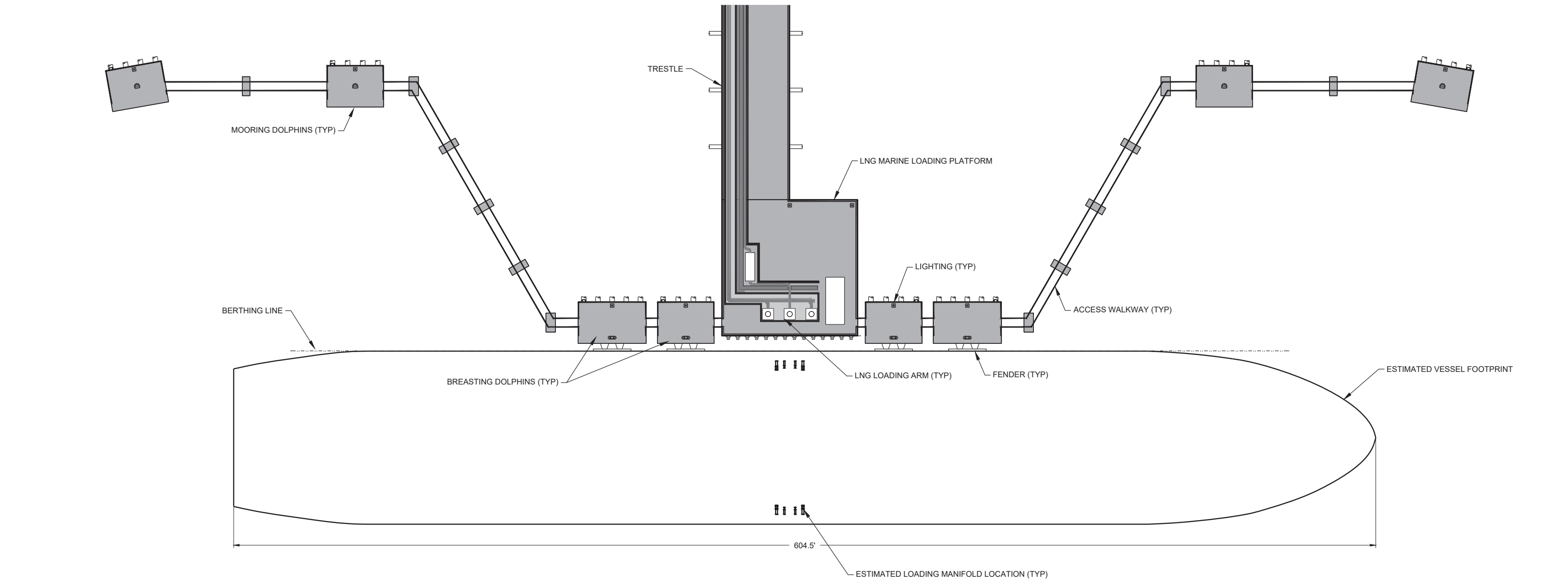
REVIEWED	JTA
SCALE	AS SHOWN

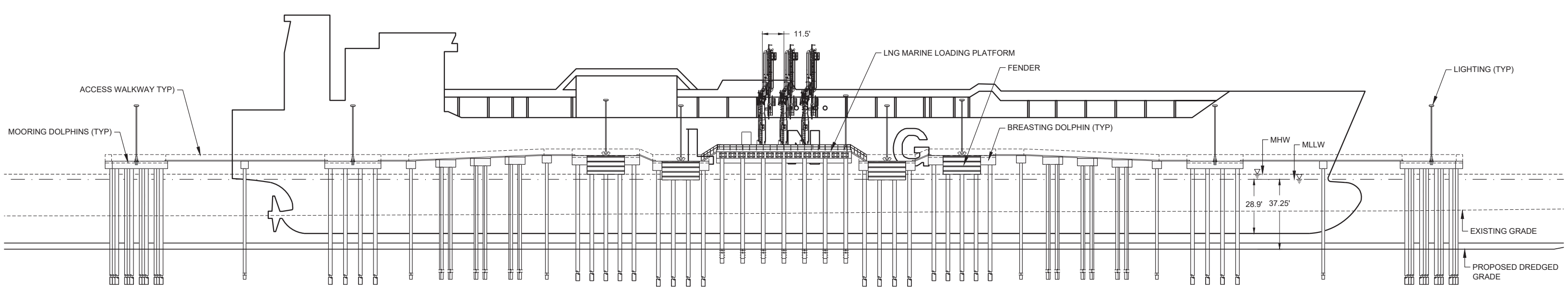
DRAWING TITLE

30,000 CBM SHIP
ARRANGEMENT
STARBOARD

SA5

SHEET 12 OF 41





30,000 CBM SHIP
PLAN AND ELEVATION (PORTSIDE)

22X34: 1" = 30'
11X17: 1" = 60'

0 30 60'

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DRAWN	CAS
CHECKED	RJD
REVIEWED	JTA
SCALE	AS SHOWN

DRAWING TITLE

30,000 CBM SHIP
ARRANGEMENT PORTSIDE

SA6

SHEET 13 OF 41

APPENDIX B

DISTRIBUTION LIST FOR THE NOTICE OF AVAILABILITY

APPENDIX B
DISTRIBUTION LIST FOR THE NOTICE OF AVAILABILITY

Federal Government Agencies

Council on Environmental Quality, Edward Boling, DC

Council on Environmental Quality, Marna McDermott, DC

Office of Federal Programs, Advisory Council on Historic Preservation, Charlene D. Vaughn, DC

Office of the Assistant Secretary of the Army for Civil Works, Assistant for Environment, Tribal & Regulatory Affairs, DC

Office of the Assistant Secretary of the Navy (Energy, Installations and Environment), DC

Office of the Deputy Assistant Secretary of the Air Force (Installations), Liaison, Department of Defense Siting Clearinghouse, DC

Office of the Deputy Assistant Secretary of the Army (Energy & Sustainability), Liaison, Department of Defense Siting Clearinghouse, DC

Office of the Deputy Under Secretary of Defense (Installations & Environment), Chief, Mission Evaluation Branch, DC

Senate Energy and Natural Resources Committee, Lisa Murkowski, DC

U.S. Army Corps of Engineers, Beverlee Lawrence, FL

U.S. Army Corps of Engineers, Planning and Policy Division, John Furry, DC

U.S. Coast Guard, Commandant (CG-OES-4) Chief (Acting), Deepwater Ports Standards Division, Curtis E. Borland, DC

U.S. Coast Guard, Jacksonville, Captain Tom Allan, FL

U.S. Coast Guard, Jacksonville, Lieutenant Allan Storm, FL

U.S. Coast Guard, Jacksonville, Robert Butts, FL

U.S. Department of Agriculture, Conservation, and Environmental Program Division, Farm Service Agency, Nell Fuller, DC

U.S. Department of Agriculture, Forest Service, Ecosystem Management Coordination, Joe Carbone, DC

U.S. Department of Agriculture, Natural Resources Conservation Service, Andree DuVarney, DC

U.S. Department of Commerce, National Oceanic and Atmospheric Administration National Marine Fisheries Service, David Keys, FL

U.S. Department of Commerce, National Oceanic and Atmospheric Administration National Marine Fisheries Service, Robert Hoffman, FL

U.S. Department of Commerce, National Oceanic and Atmospheric Administration National Marine Fisheries Service, MD

U.S. Department of Defense Siting Clearinghouse, Steve Sample, DC

U.S. Department of Energy, John Anderson, DC

U.S. Department of Energy, Office of Environmental Management, Mark Whitney, DC

U.S. Department of Energy, Office of National Environmental Policy Act Policy and Compliance, Carol M. Borgstrom, DC

U.S. Department of Health and Human Services, Edward Pfister, DC

U.S. Department of Health and Human Services, National Center for Environmental Health, Centers for Disease Control and Prevention, Sharunda Buchanan, GA

U.S. Department of Homeland Security, Customs and Border Protection, Christopher Oh, DC

U.S. Department of Justice, Environment and Natural Resources Division, DC

U.S. Department of State, Bureau of Oceans and International Environmental and Scientific Affairs, Alexander Yuan, DC

U.S. Department of the Interior, Bureau of Indian Affairs, Pamela Snyder-Osmun, VA

U.S. Department of the Interior, Bureau of Indian Affairs, Terry L McClung, DC

Federal Government Agencies (cont'd)

U.S. Department of the Interior, Bureau of Land Management, Kerry Rogers, DC

U.S. Department of the Interior, Bureau of Ocean Energy Management, Dr. Jill Lewandowski, VA

U.S. Department of the Interior, Bureau of Safety and Environmental Enforcement, David Fish, VA

U.S. Department of the Interior, National Park Service, Patrick Walsh, CO

U.S. Department of the Interior, National Park Service, Southeast Region, Bryan Faehner, DC

U.S. Department of Transportation, Office of Assistant Secretary for Transportation Policy, Camille Mittelholtz, DC

U.S. Department of Transportation, Office of Assistant Secretary for Transportation Policy, Helen Serassio, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Bryn Karaus, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Jeffrey Wiese, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Karen Lynch, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Kenneth Y. Lee, DC

U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Magdy El-Sibaie, DC

U.S. Department of Transportation, Surface Transportation Board, Victoria Rutson, DC

U.S. Environmental Protection Agency, Cynthia Giles, DC

U.S. Environmental Protection Agency, Jerome Blackman, DC

U.S. Environmental Protection Agency, Susan E. Bromm, DC

U.S. Fish and Wildlife Service, Annie Dziergowski, FL

U.S. Geological Survey, Esther Eng, VA

U.S. Housing and Urban Development Department, Office of Environment and Energy, Danielle Schopp, DC

U.S. Marine Corps, Major Simon J. D'Urso, FL

United States Navy, Matt Schellhorn, FL

Federal Senators and Representatives

U.S. House of Representatives, Representative Ander Crenshaw, FL

U.S. House of Representatives, Representative Corrine Brown, FL

U.S. House of Representatives, Representative Ralph Abraham, DC

U.S. Senate, Senator Bill Nelson, FL

U.S. Senate, Senator Marco Rubio, FL

State Senators and Representatives

Florida House of Representatives, District 1, Representative Tony Hill, FL

Florida House of Representatives, District 11, Representative Janet H. Adkins, FL

Florida House of Representatives, District 12, Representative Lake Ray, FL

Florida House of Representatives, District 13, Representative Reggie Fullwood, FL

Florida House of Representatives, District 14, Representative Mia L. Jones, FL

Florida House of Representatives, District 15, Representative Jay Fant, FL

Florida House of Representatives, District 16, Representative Charles McBurney, FL

Florida House of Representatives, District 4, Representative Aaron Bean, FL

Florida House of Representatives, District 9, Representative Audrey Gibson, FL

State Government Agencies

Florida Department of Environmental Protection, Aaron Sarchet, FL

Florida Department of Environmental Protection, Jim Maher, FL

Florida Department of Environmental Protection, Matt Kershner, FL

Florida Department of Environmental Protection, Rick Rachal, FL

Florida Department of Environmental Protection, TIITF-Private Lease, FL

Florida Department of Transportation, James Knight, FL

Florida Department of Transportation, Robert Parks, FL

Florida Division of Historical Resources, Robert F. Bendus, FL

Florida Division of Historical Resources, Timothy Parsons, Ph.D., RPA, FL

Florida Fish and Wildlife Conservation Commission, Brad Gruver, FL

Local Government Agencies

Historic Preservation Jacksonville Planning and Development Department, Mr. Joel McEachin, AICP, FL

Jacksonville Chamber of Commerce, Alan Mosley, FL

Jacksonville Chamber of Commerce, Daniel Davis, FL

Jacksonville Chamber of Commerce, Jerry Mallot, FL

Jacksonville City Council, Bill Bishop, FL

Jacksonville City Council, Bill Gullfiord, FL

Jacksonville City Council, Clay Yarborough, FL

Jacksonville City Council, Don Redman, FL

Jacksonville City Council, Doyle Carter, FL

Jacksonville City Council, Dr. Johnny Gaffney, FL

Jacksonville City Council, E. Denise Lee, FL

Jacksonville City Council, Greg Anderson, FL

Jacksonville City Council, Jim Love, FL

Jacksonville City Council, John Crescimbeni, FL

Jacksonville City Council, Kimberly Daniels, FL

Jacksonville City Council, Lori Boyer, FL

Jacksonville City Council, Matt Schellenberg, FL

Jacksonville City Council, Ray Holt, FL

Jacksonville City Council, Reginald Brown, FL

Jacksonville City Council, Richard Clark, FL

Jacksonville City Council, Robin Lumb, FL

Jacksonville City Council, Stephen Joost, FL

Jacksonville City Council, Warren Jones, FL

Jacksonville Mayor, Mayor Alvin Brown, FL

Jacksonville Mayor's Chief of Staff, Chris Hand, FL

Jacksonville Port Authority, Brian Taylor, FL

Jacksonville Port Authority, David Stubbs, FL

Jacksonville Transportation Authority, Keith Brown, FL

North Citizens Advisory Council, Bobby Taylor, FL

North Council Chamber of Commerce, Christina McLaughlin, FL

Office of Mayor, City Planning, Office of Economic Development, Ted Carter, FL

Native American Groups

Alabama-Coushatta Tribe of Texas, Tribal Historic Preservation Officer, Bryant Celestine, TX

Alabama-Quassarte Tribal Town, Elected Chief, Augustine Asbury, OK

Chickasaw Nation, Historic Preservation Officer, LaDonna Brown, OK

Choctaw Nation of Oklahoma, Tribal Historic Preservation Officer, Dr. Ian Thompson, OK

Coushatta Tribe of Louisiana, Cultural Preservation Officer, Dr. Linda Langley, LA

Native American Groups (cont'd)

Eastern Band of Cherokee Indians, Tribal Historic Preservation Officer, Russell Townsend, NC

Eastern Shawnee Tribe of Oklahoma, Executive Assistant, Robin Dushane, MO

Jena Band of Choctaw Indians, Tribal Historic Preservation Officer, Dana Masters, LA

Miccosukee Tribe of Indians of Florida, Chairman, Billy Cypress, FL

Miccosukee Tribe of Indians of Florida, Tribal Historic Preservation Officer, Steven Terry, FL

Mississippi Band of Choctaw Indians, Tribal Historic Preservation Officer, Kenneth Carleton, MS

Muscogee (Creek) Nation of Oklahoma, Cultural Preservation Officer, Emman Spain, OK

Poarch Band of Creek Indians, Native American Graves Protection and Repatriation Act Contact, Robert Thrower, AL

Seminole Nation of Oklahoma, Historic Preservation Officer, Natalie Deere Harjo, OK

Seminole Nation of Oklahoma, Principal Chief, Leonard Harjo, OK

Seminole Tribe of Florida, Tribal Historic Preservation Office Compliance Review Section, Andrew J. Weidman, FL

Seminole Tribe of Florida, Tribal Historic Preservation Officer, Dr. Paul Backhouse, FL

Thlopthlocco Tribal Town, Tribal Historic Preservation Officer, Charles Coleman, OK

United Keetoowah Band of Cherokee Indians, Tribal Historic Preservation Officer, Lisa LaRue, OK

Libraries

Jacksonville Public Library, FL

Media

Jacksonville Business Journal, FL

Jacksonville Free Press, FL

The Daily Record, FL

The Florida Star, FL

The Florida Times-Union, FL

Companies and Organizations

Adkinson Towing, Marshall Adkinson, FL

Aerotek, Chris Kublbock, FL

Association of Builders and Contractors, Karen Tucker, FL

C S X Transportation Inc., FL

CBRE, Nathan Rogers, FL

CG 7600 LP, TX

Chartwell Capital, Bobby Stein, FL

Colliers International, Hobart Joost, FL

Continental Equities Inc., Daniel Webb, FL

Eschwi Harry M Et Al., FL

First Coast Manufacturers Association, Debbie Warren, FL

Gate Concrete Co Products Co., FL

Gate Fuel Service Inc., FL

Gate Properties Inc., FL

Gate Properties IV LLC, FL

Hallmark Partners, Christian Harden, FL

Hallmark Partners, Megan Shulin, FL

Heckscher Drive Civic Club, Ed May, FL

Imeson Distribution Center Inc., Mike Bresee, FL

Imeson Investments Ins., Kyle Groves, FL

Industrial Park Development Corp, Daniel Webb, FL

Jacksonville Historical Society, Emily Lisska, FL

Jacksonville Marine Transportation Exchange, James McLaughlin, FL

Companies and Organizations (cont'd)

Jacksonville Zoo and Gardens, Dr. David Loeb, M.D., FL

Jacksonville Zoo and Gardens, Tony Vechhio, FL

JLL, Luke Pope, FL

Marathon Petroleum Company LP for Blanchard Terminal Company LLC, Yvonne Wenning, OH

Member of numerous civic & business groups, Warren Alvarez, FL

Mitigation Development Services, Bill Schroeder, FL

Neptune Fire Protection Engineering, Steve Kowkabany, FL

Northside Business Leaders, Shannon Elian, FL

Northside Civic Association, Dot Mathias, FL

Northside Economic Development Group, Dick Berry, FL

Northside Economic Development Group, Randy Allen, FL

Peoples Gas System, a Division of Tampa Electric Company, Wraye Grimard, FL

Pilot's Office, Bar Pilots, FL

Realco Recycling Co. Inc., Jean Baker, FL

Rotary Club of North Jacksonville, Ray Morre, FL

Sierra Club Florida Regional Office, Janet Stanko, FL

St. Johns River Alliance, Mark Middlebrook, FL

St. Johns River Keeper, Lisa Rianman, FL

TECO/Peoples Gas, FL

The Beeckler Company, Thomas F. Beeckler, FL

Times Union Newsroom, Steve Patterson, FL

Transportation Planning Organization, Jeff Sheffield, FL

W.W. Gay Mechanical Contractor, Inc., Randy Allen, FL

Individuals

Arnold H. Slott, FL

Ashley Cook, FL

David E. Bruderly, FL

Gary Bellamy, FL

Jeff Brell, FL

John Ruple, FL

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APPENDIX C

BIOLOGICAL ASSESSMENT

Eagle LNG Partners Jacksonville, LLC
Jacksonville Project

Biological Assessment

Docket No. CP17-41-000

Federal Energy Regulatory Commission
Division of Gas – Environment and Engineering
888 First Street, NE, Washington, DC 20426

November 2018

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
BA	biological assessment
CMP	coastal migratory pelagic species
Commission	Federal Energy Regulatory Commission
dB re: 1µPa2	time average squared sound pressure
dB	decibel
DMMA	dredged material management area
DPS	distinct population segment
Eagle LNG	Eagle LNG Partners Jacksonville, LLC
EEZ	Economic Exclusive Zone
ESA	Endangered Species Act of 1973, as amended
FERC	Federal Energy Regulatory Commission
FWC	Florida Fish and Wildlife Conservation Commission
FWS	U.S. Fish and Wildlife Service
IPaC System	Information Planning and Conservation System
LNG	liquefied natural gas
m^3	cubic meters
MMPA	Marine Mammal Protection Act of 1972, as amended
NARW	North Atlantic right whale
NOAA Fisheries	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NTU	nephelometric turbidity units
Project	Jacksonville Project
PSC	pre-stressed concrete
RMS	root mean square
SEL	sound exposure level
SPL	sound pressure level
TECO	TECO Energy, Inc.
uPa	microPascal

1.0 INTRODUCTION

On January 31, 2017, Eagle LNG filed an application with FERC for authorization pursuant to section 3(a) of the Natural Gas Act and parts 153 and 380 of the Commission's regulations. The application was assigned Docket No. CP17-41-000. Eagle LNG requested authorization to site, construct, and operate facilities necessary to liquefy natural gas at a proposed site on the St. Johns River in Jacksonville, Florida (referred to as the Jacksonville Project or Project). The purpose of this biological assessment (BA) is to address the effect of the proposed Jacksonville Project on species listed as endangered, threatened, or candidate under the *Endangered Species Act of 1973* (as amended; ESA), or their designated critical habitat. Marine mammal species are protected by the *Marine Mammal Protection Act of 1972* (as amended; MMPA), but those discussed within this BA are also listed as federally threatened or endangered under the ESA. All five species of marine mammals under the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) jurisdiction are considered protected and depleted stock throughout their ranges under the MMPA. The Florida manatee, under the U.S. Fish and Wildlife Service (FWS) jurisdiction, is considered a strategic stock under the MMPA.

If an action agency (in this case, the Federal Energy Regulatory Commission [FERC or Commission]) determines that an action may affect a federally listed species or designated critical habitat, the FERC must submit a request to the FWS and/or NOAA Fisheries for consultation to comply with section 7 of the ESA. In response, the FWS and/or NOAA Fisheries would either concur with our determination that the action would not be likely to adversely affect either a listed species or critical habitat, or it would issue a biological opinion analyzing whether or not the federal action would likely adversely affect or jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat.

As lead agency for the Jacksonville Project; FERC has prepared this BA to initiate section 7 ESA consultation with the FWS and NOAA Fisheries. This BA has been prepared with reference to a species list compiled by an official FWS Information Planning and Conservation System (IPaC System) query, information retrieved from the NOAA Fisheries website, and agency correspondence. The probable presence of listed species was further evaluated by reviewing publically available data from the Florida State Natural Heritage database, fish distribution spatial data, National Hydrography and National Wetlands Inventory data, topographic maps, aerial photographs, recent scientific literature, and anecdotal information. The actual occurrence of a species in the area would depend on multiple factors such as the presence of suitable habitat, the season of the year, and the species' distinct migratory habits.

This consultation also satisfies the ESA obligations of the U.S. Army Corps of Engineers, which is a cooperating agency on the Jacksonville Project. We have separated the federally listed species and critical habitat into tables and discussion by either NOAA Fisheries or FWS jurisdiction for the convenience of NOAA Fisheries and the FWS.

2.0 DESCRIPTION OF THE ACTION AREA

The action area, as defined in Title 50 of the Code of Federal Regulations, Part 402.02, includes "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." This includes the area affected by the construction and dredging activities, as well as the area that liquefied natural gas (LNG) vessels would transit to arrive and depart from the Eagle LNG Partners Jacksonville, LLC (Eagle LNG) facility.

The proposed Project action area includes a 193.4-acre parcel of land at about River Mile 14.5 of the St. Johns River adjacent to Drummond Creek, the 14.5-mile reach of river between Drummond Creek and the mouth of the St. John's River, and the expanse of Atlantic Ocean spanning from the mouth of the St. Johns River to the edge of the U.S. Economic Exclusive Zone (EEZ). Construction activities would be limited to the Eagle LNG site in the St. Johns River. However, increased turbidity from sediment suspended by dredging activities, and noise/pressure waves from pile driving activities would extend further into the river. As presented in this document, the sediment plume that would be generated by a mechanical dredge could exceed background levels of total suspended solids for a distance of 4,200 feet. If hydraulic dredging methods were used, the sediment plume that would be generated could exceed background levels of total suspended solids for a distance of 3,500 feet. With the implementation of noise mitigation measures, pile driving would fall below 150 time average squared sound pressure (dB re: 1μPa^2), which is considered the minimum level that could affect aquatic species, at a distance of 30 feet. Therefore, the action area would also include the portion of the St. Johns River within a 4,200-foot radius from the berths, which represents the largest distance to which impacts are anticipated. This radius would include the portion of the St. Johns River where construction could cause elevated sediment and noise levels.

LNG vessels would travel to the Eagle LNG facility from foreign ports, most likely from Caribbean nations where smaller LNG vessels are used more often. Three main carrier routes to the St. Johns River shipping lane, including shipping lanes serving Fernandina Beach, Jacksonville, and Brunswick, Georgia, could be used by transiting LNG vessels. Once at the mouth of the St. Johns River, the vessels would travel in the St. Johns River Federal Navigation Channel. We are limiting our analysis to the boundary of the U.S. EEZ because of the uncertainty of vessel origin beyond those limits.

2.1 TERRESTRIAL HABITAT

The Jacksonville Project would be constructed in the Southern Coastal Plain on a 193.4-acre parcel in the City of Jacksonville in Duval County, Florida. The Level IV Ecoregion classifications for the 193.4-acre parcel are Sea Island Flatwoods and Sea Islands/Coastal Marsh (U.S. Environmental Protection Agency, 2003). The site borders the north bank of the St. Johns River and is near the western border of the Broward River.

The property is currently zoned as Industrial Water Related; however, the land use designation used for planning purposes is Water Dependent-Water Related. The planning category is intended for land uses that require deep water access to the St. Johns River (City of Jacksonville, 2017).

The properties immediately adjacent to the proposed Project site are undeveloped land zoned for industrial activity. Other properties nearest to either side of the project site include a Marathon Petroleum bulk fuel terminal to the east and a U.S. Navy fuel terminal to the southwest. The north side of the project site is adjacent to Heckscher Drive (Zoo Parkway). Table 2.1-1 provides the existing terrestrial land uses within a 1-mile radius of the project.

Based on conversations with the previous landowner during a site visit in 2015, the property was once a homestead. The original house was torn down years ago, but evidence of the foundation remains on site. The terrestrial Florida Land Use, Cover, and Forms Classification System codes within the 193.4-acre project site include live oak hammock, coniferous plantation, and sand other than beaches.

TABLE 2.1-1

Existing Terrestrial Land Use Categories Within a 1-mile Radius of the Jacksonville Project

Terrestrial Land Use Category	Area (acres)	Percent Cover
Barren land (rock/sand/clay)	170.0	9.3
Deciduous forest	1.6	0.1
Developed, high-intensity	215.6	11.9
Developed, medium-intensity	268.0	14.7
Developed, low intensity	218.7	12.0
Developed, open space	149.8	8.2
Evergreen forest	374.7	20.6
Grassland/herbaceous	87.8	4.8
Mixed forest	54.0	3.0
Pasture/hay	3.1	0.2
Shrub/scrub	275.1	15.1
TOTAL	**1,818.3**	**100.0**

Source: U.S. Geological Survey, National Land Cover Database, 2011.
Note: The totals shown in this table may not equal the sum of addends due to rounding.

2.2 AQUATIC HABITAT

The proposed project site is on the north bank of the St. Johns River, within the Lower St. Johns River Basin, and includes both open water and wetlands. Portions of Drummond Creek are on the southwest side of the site.

Table 2.2-1 provides the existing aquatic land uses within a 1-mile radius of the project.

TABLE 2.2-1

Existing Aquatic Land Use Categories Within a 1-mile Radius of the Jacksonville Project

Aquatic Land Use Category	Area (acres)	Percent Cover
Emergent herbaceous wetland	292.9	14.8
Open water	1,465.9	73.9
Woody wetland	223.8	11.3
TOTAL	**1,982.6**	**100.0**

Source: U.S. Geological Survey, National Land Cover Database, 2011.

The aquatic Florida Land Use, Cover, and Forms Classification System code designations within the 193.4-acre parcel are streams and waterways, slash pine swamp forest, mixed forested wetland, freshwater marsh, and salt marsh.

The marine facilities would be at about River Mile 14.5, about 1.5 miles from the Port of Jacksonville, which was established in 1963, and the Jacksonville Harbor Deepening and Widening Project, which was approved by the U.S. Army Corps of Engineers in 2014. The deepening and widening project involves a 6-year, 13-mile dredging plan to deepen waterways to –49 feet. The first phase of channel deepening began on February 3, 2018 (Benk, 2018; Jacksonville Port Authority, 2018a).

2.3 LAND USE REQUIREMENTS

Construction of the facility would affect about 92.2 acres of land within a 193.4-acre site along the north bank of the St. Johns River. The site is situated on a primarily undeveloped piece of land that includes about 42.4 acres of coniferous tree plantation of which 37 acres was cleared between 2011 and 2013 and replanted in slash pine. Land use communities within the 193.4-acre project site include live oak hammock, coniferous plantation, streams and waterways, slash pine swamp forest, mixed forested wetland, freshwater marsh, salt marsh, and sand other than beaches. Table 2.3-1 summarizes the terrestrial and aquatic community land use impacts that would be associated with construction and operation of the project. Construction of the LNG terminal and associated facilities would not affect all of the land use communities within the 193.4-acre project site.

TABLE 2.3-1

Terrestrial and Aquatic Communities Affected by Construction and Operation of the LNG Terminal (in acres)

	Live Oak Hammock		Coniferous Plantation		Sand Other Than Beaches		Mixed Forested Wetland		Salt Marsh		Streams & Waterways		Total [b]	
Facilities	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
Switchyard area	0.0	0.0	3.9	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9	3.7
Ground flare area	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Feed gas metering/ utilities	0.0	0.0	3.4	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	2.9
Liquefaction trains	0.4	0.4	4.9	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	5.2
Stormwater ponds	2.3	1.2	1.2	1.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	3.7	2.3
LNG storage and impoundment	3.4	3.4	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0
Truck loading and refrigerant storage	2.1	1.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	1.1
Buildings and equipment	0.3	0.3	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.9
Roads and parking	2.7	2.4	5.9	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.6	6.9
Jetty access and operations	0.2	0.2	0.0	0.0	0.8	0.8	1.0	1.0	0.4	0.4	0.0	0.0	2.3	2.3
DMMA	5.2	5.2	10.4	10.4	0.0	0.0	<0.1	<0.1	0.2	0.2	0.0	0.0	15.9	15.9
Construction laydown areas/facility open area fence line and berm	18.4	13.4	11.0	11.0	0.0	0.0	0.4	0.2	0.2	0.1	0.0	0.0	30.0	24.7
Dredging template	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.1	10.1	10.1	10.1
Marine terminal and trestle	0.5	0.5	0.0	0.0	0.0	0.0	<0.1	<0.1	0.1	0.1	1.0	1.0	1.6	1.6
TOTAL [b]	**35.5**	**27.9**	**42.4**	**40.0**	**0.9**	**0.9**	**1.4**	**1.2**	**0.8**	**0.7**	**11.1**	**11.1**	**92.2**	**81.8**

[a] The construction area includes the total acres of workspace required for construction of the project, including the area retained for operation.

[b] Totals may not match the sum of addends due to rounding. Total vegetation impacts are 11.1 acres less than total land impacts due to the removal of streams and waterways from the vegetation impacts analysis.

Vessels would access the project site by proceeding inbound from the Atlantic Ocean via the St. Johns Bar Cut along the main channel of the St. Johns River, to the Drummond Creek Range where the project berth would be located. Vessels would moor at the LNG terminal on the north side of the St. Johns River. The total inbound transit distance is about 14.5 miles from the mouth of the St. Johns River.

3.0 DESCRIPTION OF THE PROPOSED ACTION

The purpose of the Jacksonville Project is to receive domestic natural gas, liquefy and store it, and deliver it to marine vessels and trucks to serve the domestic and export markets for LNG. Eagle LNG states the following are the project's purpose and need:

- provide an efficient and cost-effective outlet for the abundant supplies of U.S. domestic natural gas available in the marketplace;
- support export of LNG via small- to mid-sized LNG carriers to markets that cannot be served by large LNG carriers;
- support domestic waterway transportation of LNG in bunker vessels or self-propelled LNG carriers for use as vessel fuel in the marine bunkering trade; and
- support highway distribution of LNG in trucks to serve the business of providing LNG as fuel for long-haul trucking and other domestic uses of LNG.

Eagle LNG states that Peoples Gas (a subsidiary of TECO Energy, Inc. [TECO]) would construct an interconnect, meter station, and 120 feet of non-jurisdictional lateral pipeline from its transmission system on the northern side of the proposed terminal to provide gas to the LNG terminal.

3.1 PROJECT LOCATION

Eagle LNG proposes to construct and operate an LNG terminal along the north bank of the St. Johns River in Jacksonville, Duval County, Florida. Figure 3.1-1 provides an overview of the LNG terminal site and layout.

3.2 LNG TERMINAL FACILITIES

The LNG terminal would receive natural gas via a new interconnect pipeline and meter station constructed and owned by Peoples Gas. The natural gas would then be treated and liquefied using one of the three LNG liquefaction trains.[1]

[1] An LNG train is a series of processing units used at a facility to purify and liquefy natural gas into LNG. Steps in the purification and liquefaction process are done sequentially; therefore the units that complete these processes are also arranged sequentially (like cars on a train). An LNG plant may have several LNG trains on site, which run independently from each other.

Figure 3.1-1
LNG Terminal Site Plan
Jacksonville Project
Duval County, Florida

Imagery: Google Earth, 2016

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Each LNG train would have the capacity to produce 550,000 U.S. gallons per day of LNG from a range of about 47.3 to 48.0 million standard cubic feet per day of feed gas. Each LNG train would include acid gas, mercaptans, and mercury removal units, a dehydration unit, and a gas liquefaction unit capable of separating heavy hydrocarbons from the inlet gas stream during the initial cool down steps of the liquefaction process.

One full-containment, double-walled LNG storage tank, with a net volume capacity of about 12,000,000 U.S. gallons would store the LNG produced by the three LNG trains. The double-walled tank would consist of an inner tank for storing the refrigerated liquid under normal operating conditions and a secondary, outer container capable of containing the LNG and vapor from a potential inner tank leak.

Other components of the LNG terminal facility include the flare stacks, cold vent, and stormwater and septic systems.

3.2.1 LNG Truck Loading Facility

The LNG terminal would include facilities that allow LNG to be loaded onto LNG trucks, with a capacity of about 12,000 U.S. gallons for road distribution to LNG refueling stations in Florida and the surrounding states. Figure 3.1-1 depicts the LNG truck loading area.

3.2.2 Marine Facilities

The marine facilities would be on the southeastern edge of the LNG terminal site off the north bank of the St. Johns River between the Marathon Petroleum marine terminal and a U.S. Navy Fuel Terminal. The marine facilities structure would consist of a land access trestle terminated by an LNG marine loading platform about 900 feet offshore to allow vessels to approach the federal channel and gain access to deep water.

The marine facilities would include cryogenic transfer piping and the following components:

- a concrete access trestle structure 885 feet long by 36 feet wide with associated shoreline protection;
- a concrete loading platform;
- a docking terminal supported by driven or drilled piles, set back 255 feet from the federal channel (at Cut 50) in the St. Johns River. The 72-foot by 72-foot LNG marine loading platform would be about 13 feet above sea level (North American Vertical Datum 88);
- two liquid loading arms incorporating cryogenic piping, one vapor return arm, associated piping and spill containment facilities, fire and safety equipment, and a jetty vapor blower;
- four berthing dolphins and four mooring dolphins, each measuring 22 feet by 30 feet;
- a gangway for ship access; and
- a 10.1-acre dredging template[2] to accommodate LNG carriers.

[2] The dredge template is the surface area that would be impacted by dredging.

Figure 3.1-1 depicts a general layout of the marine facilities.

The facilities have been designed to safely dock and moor a range of LNG vessels, including ships with an LNG cargo capacity between 6,500 and 45,000 m^3 as well as LNG bunker vessels with capacities of about 3,400 m^3. LNG would be loaded into small- to mid-sized LNG vessels for export and into bunkering vessels for domestic bunkering activities in the Port of Jacksonville and other nearby domestic ports.

3.3 CONSTRUCTION PROCEDURES

3.3.1 Site Preparation

Following mobilization, site preparation would begin by marking wetland and other sensitive areas to be avoided during construction. Immediately following site preparation activities, Eagle LNG would install security fencing and erosion and sediment controls.

3.3.2 Clearing and Grading

Eagle LNG would clear and grub vegetation and remove root systems and debris. Organic laden soils, weak soils, and topsoil would be stripped to reach a subgrade capable of supporting construction activities. Subgrade soil would be evaluated and unsuitable soils would be removed and replaced.

3.3.3 Facility Construction

The east and west stormwater management ponds would then be excavated, and Eagle LNG would use the excavated soils for construction of the jetty access road to the dredged material management area (DMMA). Eagle LNG would simultaneously excavate the DMMA and use suitable materials to raise portions of the site. Excess cut material would be stored in a temporary fill storage area. The DMMA would include:

- an earthen containment dike enclosure;
- interior box weirs and piping system for controlled return water discharge;
- a perimeter road for transport and inspection;
- a perimeter ditch and retention basin for stormwater and seepage water management;
- an exterior working pad for equipment access and stockpiling/loading dewatered dredged material; and
- an earthen ramp to allow ingress and egress from the interior basin.

Figure 3.3.3-1 shows the location of the DMMA within the LNG terminal site. Figure 3.3.3-2 shows an overview of the dredge area within the St. Johns River.

Figure 3.3.3-1
Dredged Material Management Area
Jacksonville Project
Duval County, Florida

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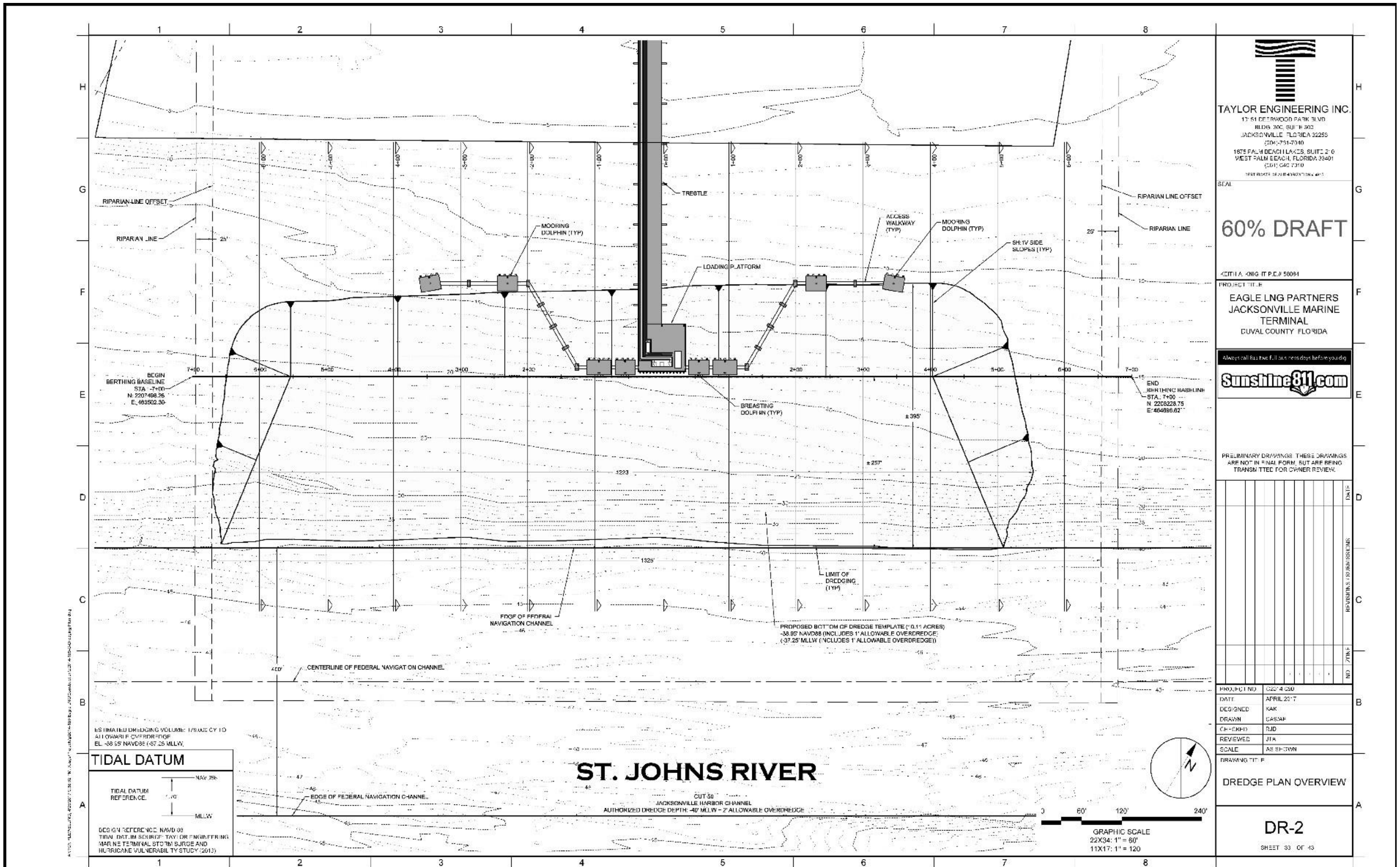

This information is for environmental review purposes only.

Figure 3.3.3-2
Overview of Dredge Area Within the St. Johns River
Jacksonville Project
Duval County, Florida

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DRAWN BY: TG

Electrical, communications, and water systems would then be installed. Eagle LNG would provide temporary stabilization of surface soils using geotextiles and/or aggregate materials (e.g., gravel and crushed stone) to level and finish construction areas and to minimize dust and the potential for erosion and sedimentation.

Foundations

Eagle LNG would use a range of foundation types depending on localized soil, subsurface, and site conditions as well as structural/equipment load requirements. Generally, shallow foundations (e.g., spread and strip footings and mat foundations made of reinforced concrete) would be used, likely placed at a minimum depth of 4 feet below grade on natural, competent soils. Unsuitable materials encountered at the foundation depth would be removed and replaced with compacted granular (sandy) fill, lean concrete, or flowable fill (i.e., soil-cement slurry).

The truck loading skids would be installed upon completion of foundation works at the truck loading area and connected to the facility piping and electrical, control, and utility systems. Weight scales for the loading bay would then be installed for each truck loading lane. Truck loading facilities are shown on figure 3.1-1.

LNG Storage and Processing Facilities

Following the installation of the foundation, construction of the tank base, erection of the inner 9-percent nickel steel shell and outer A516-70 steel liner, and pouring of the outer concrete wall would occur. In parallel, the steel dome roof (including installation of roof nozzles, penetrations, and studs) would be constructed on temporary supports and later air-raised into position and secured to the top of the outer concrete container wall. The outer tank concrete roof would then be poured. Eagle LNG would install internal accessories (e.g., pump columns, bottom and top fill, instrument wells, and purge and cool-down piping), followed by installation of platforms, walkways, pipework, and pipe supports.

The LNG trains would be constructed using a modular approach. Each module would be constructed off site and trucked to the site where cranes would be used to transfer the modules from the truck and into the final position on the piled supports.

LNG Truck Loading Facilities

After site preparation, Eagle LNG would initiate construction of the truck loading facilities. The LNG terminal would have a dual bay loading system for over-the-road LNG transport trucks. Each bay would include cryogenic piping, instrumentation, control panels, and other components that would be skid mounted at a manufacturer’s fabrication shop and transported to the construction site as assembled equipment packages.

Marine Facilities

The Eagle LNG marine facilities would consist of a land access trestle terminated by an LNG marine loading platform. Figure 3.1-1 depicts the marine facilities layout. The access trestle and LNG marine loading platform would include pipe racks and supporting equipment. The LNG marine loading platform would be about 900 feet offshore to approach the federal channel to facilitate access to the deepest available water. Eagle LNG would design the marine facilities structures with a 255-foot setback from the federal channel to ensure that the largest proposed vessel in berth would not encroach on the 150-foot safe setback distance as defined by the U.S. Army Corps of Engineers for Cut 50 of the federal channel.

The LNG marine loading platform would include four berthing dolphins and four mooring dolphins to accommodate the full range of ship designs and to provide the necessary spectrum of mooring arrangements.

Table 3.3.3-1 provides the estimated pile requirements for the marine facilities; however, the final pile size, material, and number of pilings would be determined during the final structural engineering for the project. Eagle LNG anticipates that pile driving would take 100 days to complete over a 10-month period. Pile driving would occur only during daytime hours (approximately 7:00 a.m. to 6:00 p.m.).

TABLE 3.3.3-1

Estimated Pile Requirements for the Marine Facilities

Structure Type	Material	Estimated Pile Count	Piling Diameter (inches)	Estimated Pile Length (feet)	Estimated Length Below River (feet)	Estimated Number of Strikes per Pile	Estimated Number of Piles per Day	Estimated Total Number of Strikes per Day
Trestle	Pre-stressed concrete	85	24	50–70	30–50	600	3	1,800
LNG loading platform	Pre-stressed concrete	28	24	50–70	20–30	600	3	1,800
Breasting dolphin	Steel pipe	54	39	80–100	40–60	800	2	1,600
Mooring dolphin	Steel pipe	48	30	80–100	60–80	800	2	1,600
Walkways	Pre-stressed concrete	24	18	40–45	20–30	500	3	1,500

Installation of concrete pilings typically includes predrilling or jetting to initially position and set each pile, followed by pile driving to reach the specified minimum depth and attain appropriate pile bearing capacity. To attain the significant pile tension loads imposed by high magnitude laterally loaded conditions (ship berthing and mooring), the steel pipe piles would require significant embedment into the limestone and/or underlying marl formation. Pile installation would involve the following generalized procedures:

- Vibrate or drive the pipe pile until competent limestone is reached.
- Advance a rotary drill bit 2 to 3 inches smaller in diameter than the outside of the pile, or similar equipment, through the limestone and dense marl.
- Drive the pipe pile with an impact hammer to the depth required to achieve the allowable bearing and tension capacity.
- Install a steel-reinforced cage.
- Place concrete within the pipe pile using the tremie technique.[3]

[3] The tremie technique involves the placement of concrete under water using a specialized concrete mix and a vertical pipe that extends from above the water surface to the riverbed or seafloor (University of Washington, 2007).

Construction of the marine facilities structure would occur from in-water barges using cranes to facilitate pile driving. The project specifications would allow the contractor to use its discretion regarding construction means and methods. However, the trestle deck would likely feature a structural deck element constructed of pre-stressed/pre-cast concrete, which would allow construction of the trestle from the shore to the LNG marine loading platform using the constructed deck for staging. This construction sequence would allow the contractor to drive materials and construction equipment on the completed portion of the access trestle to facilitate construction of subsequent sections of the access trestle and/or terminal dolphins.

Dredging

Dredging would occur about 900 feet offshore to a depth of 37.25 feet below mean lower low water over a total area of about 10.1 acres. No submerged aquatic vegetation (sea grass) is present within the proposed dredging footprint or the immediate project vicinity (St. Johns River Water Management District, 2012). Eagle LNG estimates that dredging would occur over a 12-week period with no time-of-year restrictions. Dredging would occur only during daylight hours.

Eagle LNG would remove dredged material via hydraulic cutterhead[4] or mechanical dredging equipment and either hydraulically pumped directly into the DMMA basin (hydraulic cutterhead) or slurry pumped from a hopper barge to the DMMA (mechanical dredging). Eagle LNG would construct the permanent DMMA in the upland area west of the LNG terminal's process area to accommodate the entire initial dredge volume. The permanent DMMA is shown on figure 3.1-1.

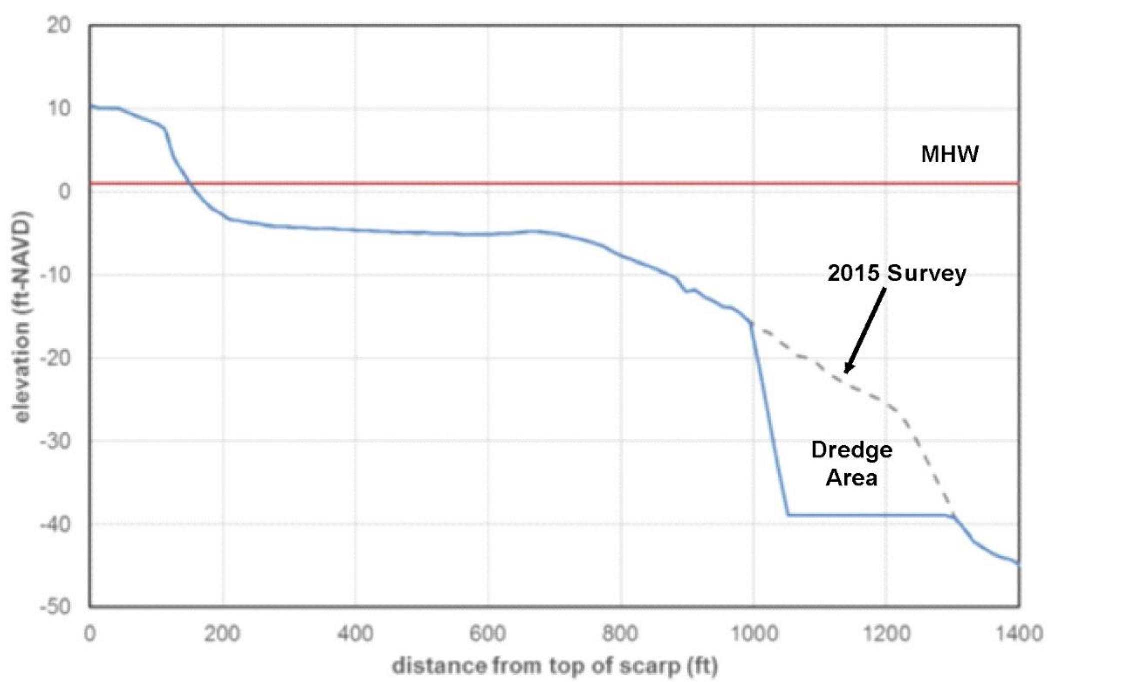
Dredging would remove about 179,000 cubic yards of silt, sands, and weathered limestone with a maximum cut depth of about 20 feet and an average cut depth of about 10 feet (see figure 3.3.3-3). Eagle LNG conducted geotechnical borings of the dredge area and encountered weathered limestone in three shallow borings and all deep borings.

Weakly cemented (weathered) to well-cemented fossiliferous sandy limestone was encountered with layer thickness ranging from 2 to 3.5 feet in the shallow borings and 10 to 30 feet in the deep borings (Taylor Engineering, 2017). The limestone is considered relatively weak and Eagle LNG anticipates being able to use cutting or ripping to remove the limestone without the need for blasting. No blasting is proposed.

Eagle LNG conducted sediment sampling and analysis within the proposed dredging area for the project. Twelve samples were taken and tested for polycyclic aromatic hydrocarbons, organochlorine pesticides, polychlorinated biphenyls, tributyltins, and metals (including arsenic, aluminum, copper, lead, cadmium, mercury, nickel, and zinc). Test results showed that the sediments sampled were below the Soil Cleanup Target Levels for commercial and industrial use (Florida Department of Environmental Protection, 2013).

Eagle LNG would place dredged material in a single-cell DMMA adjacent to the west side of the proposed facility. The DMMA would be surrounded by an earthen containment dike enclosure; interior box weirs and piping system for controlled return water discharge; a perimeter road for dredged material transport and inspection; a perimeter ditch for stormwater and seepage water management; and an exterior working pad for equipment access and dredged material stockpiling and offloading. The DMMA would be a permanent feature that would accommodate both the initial dredging and subsequent maintenance dredging over the life of the project.

[4] A hydraulic cutterhead dredge is "equipped with a rotating cutter apparatus surrounding the intake end of the suction pipe," which allows it to dig and pump all types of alluvial materials including compacted deposits. Dredged material can be pumped long distances to upland disposal areas (Global Security, 2011)



Project Location

Figure 3.3.3-3
Proposed Eagle LNG Terminal Dredge Template
Plotted Against the 2015 Survey Profile
Jacksonville Project
Duval County, Florida

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If hydraulic dredging were used, dredged material would be hydraulically pumped directly into the DMMA basin. For mechanical dredging, materials would be slurry pumped from a holding barge to the DMMA. The DMMA would have sufficient capacity to store the full volume of dredged material before offloading.

Eagle LNG would monitor turbidity levels every 4 hours during dredging activities. If any samples exceed 29 nephelometric turbidity units (NTU) of the ambient (background) river water quality conditions, dredging operations would cease until turbidity levels reach acceptable limits. Additionally, our draft environmental impact statement recommends Eagle LNG confirm that it would implement turbidity monitoring and mitigation measures during each maintenance dredging event.

Eagle LNG anticipates the need for maintenance dredging every 1 to 2 years and estimates removal of about 49,000 cubic yards of sediment per cycle. Prior to maintenance dredging, Eagle LNG would remove the anticipated volume of dredged material from the DMMA and transport it to the Jacksonville Port Authority local dredged material management areas or find another use for it off site. Dredged material from the maintenance dredging would be placed in Eagle LNG's permanent DMMA where dewatering and discharge would occur as described above. As noted above, sediments sampled in the dredge area were below the Soil Cleanup Target Levels for commercial and industrial use (Florida Department of Environmental Protection, 2013). Eagle LNG would use a temporary dewatering pipeline to dewater the DMMA. The 3- to 4-foot-wide proposed pipe would fall within a 10-foot-wide alignment. A flexible pipe would be used to avoid any large trees and minimize the need for clearing. To install the discharge pipe, Eagle LNG would fuse the plastic pipeline segments together in uplands until the total length is sufficient to traverse the saltmarsh. A chain would be connected to the end of the pipe segment and the pipe would be pulled through the saltmarsh. Placement of timber cribbing or rollers under the pipeline may be necessary to aid in smooth installation. Eagle LNG would use the same corridor for each maintenance dredging event. Water from the DMMA would be discharged directly to Drummond Creek. Dewatering would occur under gravity flow and the pipe would include an oversized/upturned pipe discharge fitting to diffuse energy.

To protect water quality, the operation of the containment basin would be designed with sufficient ponding depth to clarify the return water before releasing it to the waterbody. Additionally, turbidity curtains would be installed around the discharge point to maintain water quality as needed. Eagle LNG would monitor discharge water quality throughout the dredging process in compliance with Florida Department of Environmental Protection requirements. If discharges exceed 29 NTU above background conditions, Eagle LNG would halt discharges until the water being released meets the standard.

3.3.4 Water Use Requirements and Hydrostatic Testing

Eagle LNG would hydrostatically test the plant piping and the LNG storage tanks prior to placing the facilities in service. The majority of the hydrostatic test water would be obtained from the proposed on-site groundwater wells. Table 3.3.4-1 identifies the volume of water required, proposed water source, and discharge location for each LNG terminal component.

TABLE 3.3.4-1

Hydrostatic Test Water Requirements for the LNG Terminal

Component Tested	Water Source	Discharge Location	Volume Required (gallons)
LNG Storage Tank	On-site wells	Stormwater detention ponds	7,700,000
Service Fire Water Tank	On-site wells	Stormwater detention ponds	560,000
Potable/Service Water Tank	On-site wells	Stormwater detention ponds	57,000
Underground Systems	On-site wells	Stormwater detention ponds	100,000

The peak withdrawal rate for hydrostatic test water would not exceed 1,500 gallons per minute (collectively from the two wells), and the peak discharge rate would not exceed 1,400 gallons per minute. To minimize potential impacts on water quality, Eagle LNG would neutralize pH through turbulence and filter out any particulates prior to discharge. Hydrostatic test water would be discharged in a limited number of discrete events and in accordance with Eagle LNG's National Pollutant Discharge Elimination System discharge permit.

3.3.5 Cleanup and Restoration

Following construction, Eagle LNG would finish-grade all disturbed areas not covered by permanent facilities, and properly dispose of construction debris at an approved, permitted facility. Most areas in and around the LNG terminal, piping, equipment, and maintenance access roads would be covered with gravel to minimize the amount of maintenance required. The remaining disturbed areas would be fertilized, seeded, mulched, and monitored according to the requirements of Eagle LNG's project-specific *Upland Erosion Control, Revegetation, and Maintenance Plan* and in accordance with applicable permits and/or agency recommendations. In addition, Eagle LNG would implement its *Noxious and Invasive Weed Control Plan* to mitigate the introduction of noxious and invasive species within the LNG terminal site. Temporary/interim erosion control measures would be removed once adequate vegetation cover/soil stabilization is achieved. After the site is permanently stabilized, Eagle LNG would convert the sediment basins used during construction to permanent stormwater control facilities.

4.0 EFFECTS OF THE ACTION

4.1 DREDGING

During dredging operations, the placement of dredge sediments can affect fish, marine mammals, sea turtles, and plants in multiple ways. The actions of the dredging equipment can include cutting, ripping, sediment removal, suction, and hydraulic pumping of water and sediment. The presence of dredge equipment can cause direct physical impact and can create physical barriers. Placement of dredge spoil can cause impacts on upland species due to covering or compaction. The effects of dredging and the potential impacts vary by the type of dredging, the location of dredge sediment placement, and the time of year dredging activities occur.

Sediment plumes caused by dredging activities vary depending on the type of dredge used. Mechanical dredging uses a ‘bucket’ or ‘clamshell’ operated by a crane that lifts excavated sediments through the water column to deposit them in a hopper barge. Sediment plumes caused by mechanical dredging are due to the leakage from the bucket while being lifted to the surface. This leakage causes high total suspended solid levels throughout the water column. Sediment plumes caused by hydraulic cutterhead dredges are primarily in the lower portion of the water column and are generally smaller than the plumes caused by mechanical dredging (U.S. Army Engineer Waterways Experiment Station, 1988).

Eagle LNG provided a dredged sediment fate and transport model for the marine terminal (Taylor Engineering, 2018).[5] The model simulated the addition of sediment to the water column using either hydraulic or mechanical dredging methods due to resuspension of a portion of the dredged volume beginning at four different phases of the tide: maximum ebb flow, maximum flood flow, slack tide following an ebb tide, and slack tide following a flood tide. The model also simulated sediment resuspension at three points within the dredge template: at the southwest end, the center, and the northeast end.

For the hydraulic dredging method, the model assumed a dredging rate of 400 cubic yards per hour, which yields a resuspension rate of 3.1 cubic yards per hour, a void factor of 20 percent, and a sediment density of 2,650 kilograms per cubic meter resulting in an additional 1.38 kilograms per second of resuspended sediments to the water column. To remove 179,000 cubic yards of material with a 400 cubic yard per hour hydraulic dredge operating 8 hours per day would take about 56 days. The model predicts that deposition of resuspended sediments would primarily occur within the dredge template and that about 0.5 to 0.75 inches of sediment would be deposited within 1,000 feet of the edge of the dredge template (see figure 4.1-1).

For the mechanical dredging method, the model assumed a dredging rate of 388 cubic yards per hour, which yields a resuspension rate of 8.2 cubic yards per hour, a void factor of 20 percent, and a sediment density of 2,650 kilograms per cubic meter resulting in an additional 3.66 kilograms per second of resuspended sediments to the water column. To remove 179,000 cubic yards of material with a 388 cubic yard per hour hydraulic dredge operating 8 hours per day would take about 58 days. The model predicts that deposition of resuspended sediments would primarily occur within the dredge template and that about 1.0 to 2.0 inches of sediment would be deposited within 1,000 feet of the edge of the dredge template (see figure 4.1-2).

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[5] The Eagle LNG Liquefied Natural Gas Marine Terminal Dredged Sediment Fate and Transport Modeling Final Report was included as attachment 1 in Eagle LNG’s Submission of Responses to February 22, 2018 Environmental Information Request under CP17-41, which is available at: https://elibrary.ferc.gov/IDMWS/common/OpenNat.asp?fileID=14838255.

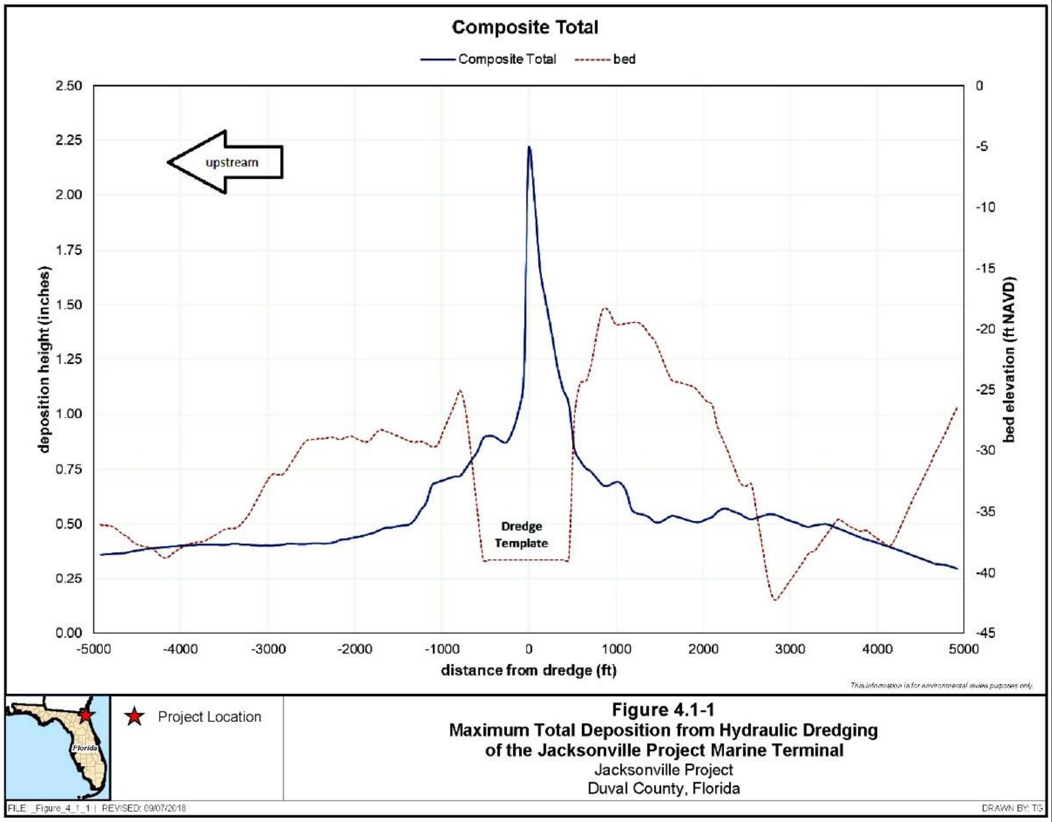


Figure 4.1-1
Maximum Total Deposition from Hydraulic Dredging of the Jacksonville Project Marine Terminal
Jacksonville Project
Duval County, Florida

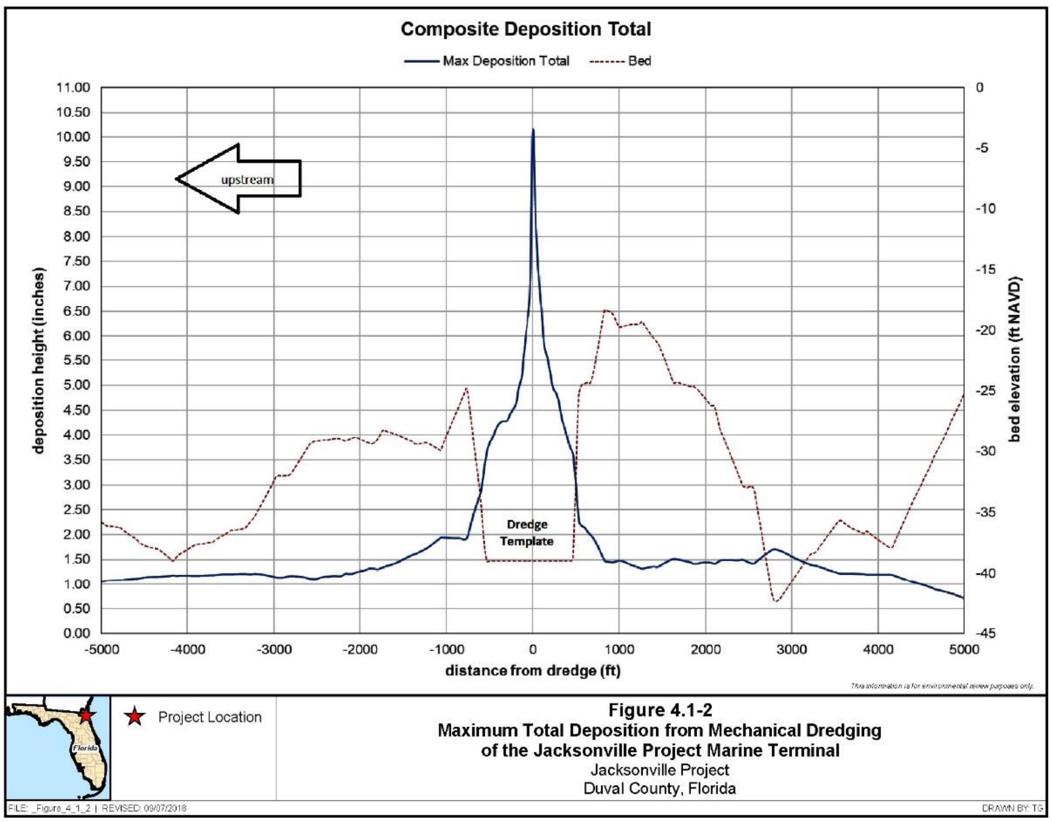


Figure 4.1-2
Maximum Total Deposition from Mechanical Dredging of the Jacksonville Project Marine Terminal
Jacksonville Project
Duval County, Florida

4.1.1 Dredging Conservation Measures

During dredging operations, Eagle LNG would implement measures to reduce turbidity, which could include any combination of the following:

- decreasing the speed of bucket movement through the water column (mechanical dredging);
- taking smaller bucket "bites" (mechanical dredging) so fewer sediments are released while the bucket moves through the water column;
- assuring that barges loaded with dredged material (mechanical dredging) are self-contained or sealed with bin walls to prevent runoff from the dredged spoils;
- using slow and deliberate sweeps of the cutter head suction dredge to minimize stirring up of loose sediment;
- temporarily halting dredging activities during times of extreme tidal change to reduce the possibility of rapid transport of suspended sediments;
- using turbidity curtains around the dredge to restrict the turbidity zone; and/or
- placing dredged material in the DMMA, which is designed with adjustable weir boards to control return water discharge after suspended sediments have settled into the DMMA.

4.2 NOISE

Eagle LNG estimated potential impacts on fish, marine mammals, and sea turtles associated with pile driving activities, dredging, and marine vessel traffic. Table 4.2-1 provides the thresholds for fish injury and disturbance based on the Fisheries Hydroacoustic Working Group's interim criteria (Fisheries Hydroacoustic Working Group, 2008). The acoustic thresholds at which five types of marine mammals would experience temporary or permanent changes to hearing sensitivity from exposure to underwater anthropogenic sources are shown in table 4.2-2. The thresholds to turtle injury and disturbance are shown in table 4.2-3. Because the thresholds to injury and disturbance are higher for turtles than for fish, it is expected that meeting the thresholds for fish would also meet the thresholds for turtles.

TABLE 4.2-1

Acoustic Thresholds for Fish Injury and Disturbance

Onset of Physical Injury			Behavior	
Peak (dB re: 1 µPa)	Cumulative Sound Exposure Level (dB re: 1 µPa^{2}s)		Root Mean Square Pressure (dB re: 1 µPa)	Effective Quiet (dB re: 1 µPa^{2}s)
Fish All Sizes	Fish ≥ 2 grams	Fish < 2 grams		
206	187	183	150	150

Notes: dB re: 1 µPa = decibels at a pressure of 1 microPascal; dB re: µPa^{2}s = decibels at a pressure of 1 microPascal squared second

TABLE 4.2-2

Acoustic Thresholds for Permanent Injury and Disturbance to Marine Mammals

Hearing	Threshold to Permanent Injury (Received Level) Impulsive $L_{peak,flat}$	Impulsive $L_{E,LF,24h}$	Non-Impulsive $L_{E,LF,24h}$	Threshold to Disturbance RMS
Low-frequency (LF) cetaceans [a]	219 dB	183 dB	199 dB	
Mid-frequency (MF) cetaceans [b]	230 dB	185 dB	198 dB	
High-frequency (HF) cetaceans [a]	202 dB	155 dB	173 dB	160 dB
Phocid pinnipeds (PW) [a]	218 dB	185 dB	201 dB	
Otariid pinnipeds (OW) [a]	232 dB	203 dB	219 dB	

[a] Not likely to be present in the impact area associated with pile driving and dredging activities.
[b] May be present in the impact area associated with pile driving and dredging activities.

TABLE 4.2-3

Acoustic Threshold for Sea Turtle Injury and Disturbance

Injury (dB re: 1 µPa RMS)	Behavioral Disturbance (dB re: 1 µPa RMS)
180	166

Note: dB re: 1 µPa = decibels at a pressure of 1 microPascal
RMS = root mean square

4.2.1 Noise Conservation Measures

Eagle LNG stated that by implementing noise mitigation measures that reduce underwater noise associated with pre-stressed concrete (PSC) impact pile driving by 12 decibels (dB) (re: 1 µPa) and reducing underwater noise associated with steel impact pile driving by 25 dB (re: 1 µPa), underwater noise levels associated with pile driving activities would be below injury thresholds for fish, marine mammals, and sea turtles at a distance of 20 meters (about 66 feet)and would be below behavioral disturbance thresholds at a distance of 40 meters (about 131 feet). Eagle LNG identified several mitigation measures it may use to reduce underwater noise impacts, including:

- using vibratory pile driving for steel piles;
- using confined or unconfined bubble curtains;
- installing temporary noise attenuation piles and/or double-walled noise attenuation piles; and
- using a designated observer for certain species during in-water work, including pile driving.

Our draft environmental impact statement recommends Eagle LNG develop an underwater noise mitigation plan that identifies the specific mitigation measures it would implement to reduce underwater noise associated with PSC impact pile driving by 12 dB (re: 1 µPa) and steel impact pile driving by 25 dB (re: 1 µPa). We also recommended that Eagle LNG include an underwater noise monitoring plan to ensure that sound levels achieve target levels intended to protect sensitive species, as well as additional mitigation that would be implemented in the event that target noise levels are not achieved.

5.0 NOAA FISHERIES CONSULTATION

NOAA Fisheries identified 22 ESA federally listed species potentially occurring within the project area under their jurisdiction and 2 areas of critical habitat (table 5-1).

TABLE 5-1

Federally Listed Threatened or Endangered Species Under National Marine Fisheries Service Jurisdiction that Could Be Affected by the Jacksonville Project

Species Common Name	Scientific Name	ESA Status
Marine Mammals		
Blue whale	*Balaenoptera musculus*	Endangered
Fin whale	*Balaenoptera physalus*	Endangered
North Atlantic right whale	*Eubalaena glacialis*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered
Sea Turtles (in marine environment)		
Green sea turtle	*Chelonia mydas*	Threatened – North Atlantic DPS
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened – Northwest Atlantic DPS
Fish		
Atlantic sturgeon	*Acipenser oxyrinchus*	Endangered – South Atlantic DPS
Nassau grouper	*Epinephelus striatus*	Threatened
Shortnose sturgeon	*Acipenser brevirostrum*	Endangered
Smalltooth sawfish	*Pristis pectinata*	Endangered – U.S. DPS
Invertebrates		
Boulder star coral	*Orbicella franksi*	Threatened
Elkhorn coral	*Acropora palmata*	Threatened
Lobed star coral	*Orbicella annularis*	Threatened
Mountainous star coral	*Orbicella faveolata*	Threatened
Pillar coral	*Dendrogyra cylindrus*	Threatened
Rough cactus coral	*Mycetophyllia ferox*	Threatened
Staghorn coral	*Acropora cervicornis*	Threatened
Seagrass		
Johnson's seagrass	*Halophila johnsonii*	Threatened
Critical Habitat		
North Atlantic right whale calving area	NA	NA
Loggerhead sea turtle: Sargassum sp., migratory, breeding, overwintering, and nearshore reproductive habitat	NA	NA

DPS = Distinct Population Segment

5.1 CONSULTATION HISTORY

The ESA allows applicants to serve as nonfederal representatives for an agency's informal consultation process. Eagle LNG conducted informal consultations with the FWS and NOAA Fisheries through a project introduction letter, phone calls, and in-person meetings. A summary of consultations with the FWS and NOAA Fisheries and relevant agency correspondence to date is included in attachment A.

NOAA Fisheries Consultation

- March 2, 2016: S. Fidler, a representative for Eagle LNG, held a telephone call with K. Reece at National Oceanic and Atmospheric Administration, National Marine Fisheries Service to discuss North Atlantic right whales.

- November 1, 2017: FERC held a conference call with K. Reece at National Oceanic and Atmospheric Administration, National Marine Fisheries Service regarding development of the biological assessment for the Jacksonville Project.

5.2 LISTED SPECIES AND CRITICAL HABITAT IN THE ACTION AREA

Five species of whales, five species of sea turtles, four species of fish, seven species of coral, and one species of seagrass under NOAA Fisheries may occur within the project area or marine vessel transit routes (see table 5-1). Additionally, critical habitat for North Atlantic right whales (NARW) and loggerhead sea turtles (Sargassum sp.) are also present along the potential marine vessel transit routes. If new species are listed or identified at the project site, FERC staff would reinitiate consultation with NOAA Fisheries.

5.2.1 Analysis of Species and Critical Habitats That Would Not Be Affected

We have concluded that the project would have ***no effect*** on 9 of the 22 potential species identified by NOAA Fisheries because the Jacksonville Project area is either outside of the species' known range, or the project area does not contain suitable habitat (table 5.2.1-1). Table 5.2.1-1 summarizes our reasoning for this conclusion. These species are not included in further analysis in this BA. We have also determined that the proposed Project would have ***no effect*** on the NARW or loggerhead designated critical habitat because the project does not affect any of the primary constituent elements for either species' critical habitat, as outlined below.

5.2.1.1 North Atlantic Right Whale Critical Calving Habitat

Critical habitat essential features are defined in the ESA as biological or physical features that are essential to the conservation of a given species (section 3(5)(A)(i)). These biological and physical features may include features such as habitat to use as cover or shelter; breeding, reproduction, and offspring rearing locations; food; adequate space for normal behavior and growth (Title 50 of the Code of Federal Regulations Part 424.12(b)).

TABLE 5.2.1-1

No Effect Determination for Federally Listed Species Under National Marine Fisheries Service Jurisdiction for the Jacksonville Project

Species Type/Common Name/*Scientific Name*	Federal Status	Habitat	Effects Determination
Fish			
Nassau grouper *(Epinephelus striatus)*	Threatened	Adults are most commonly found in clear water with high relief coral reefs or rocky substrates while smaller individuals are found nearshore (Cornish and Eklund, 2003; Florida Fish and Wildlife Conservation Commission [FWC], 2017a). Their range includes south Florida, Bermuda, and the Caribbean Sea (Hill, 2016).	***No effect*** Project area is not within the species range; suitable habitat is not present
Invertebrates			
Boulder star coral *(Orbicella franksi)*	Threatened	Boulder star coral is one of the reef-building star corals in the order Scleractinia. Star corals are part of the *Orbicella* species complex and were historically dominant components of coral reefs in the Caribbean. Reef-building corals require a hard substrate, mean temperatures typically between 77 °F to 86 °F, and adequate light and water flow (NOAA Fisheries, 2012a, 2015a).	***No effect*** Project area is not within species range
Elkhorn coral *(Acropora palmate)*	Threatened	This species is a branching coral typically found in shallow water areas with a lot of wave action. Elkhorn coral is one of the Acroporids that was a dominant reef-building species in Florida and the Caribbean. Their distribution includes the Bahamas, south Florida, and the Caribbean (NOAA Fisheries, 2004).	***No effect*** Project area is not within species range
Lobed star coral *(Orbicella annularis)*	Threatened	Lobed star coral is one of the reef-building star corals in the order Scleractinia. Star corals are part of the *Orbicella* species complex and were historically dominant components of coral reefs in the Caribbean. Reef-building corals require a hard substrate, mean temperatures typically between 77 °F to 86 °F, and adequate light and water flow (NOAA Fisheries, 2012a, 2015a).	***No effect*** Project area is not within species range
Mountainous star coral *(Orbicella faveolata)*	Threatened	Mountainous star coral is one of the reef-building star corals in the order Scleractinia. Star corals are part of the *Orbicella* species complex and were historically dominant components of coral reefs in the Caribbean. Reef-building corals require a hard substrate, mean temperatures typically between 77 °F to 86 °F, and adequate light and water flow (NOAA Fisheries, 2012a, 2015a).	***No effect*** Project area is not within species range
Pillar coral *(Dendrogyra cylindrus)*	Threatened	Pillar coral is one of the reef-building corals in the order Scleractinia. They are typically found as scattered, isolated colonies in warm marine waters off the southeast coast of Florida and throughout the Caribbean. These corals require a hard substrate, temperatures typically between 77 to 86 degrees Fahrenheit (°F), and adequate light and water flow (NOAA Fisheries, 2012a, 2015a; FWC, 2012a).	***No effect*** Project area is not within species range

TABLE 5.2.1-1 (cont'd)

No Effect Determination for Federally Listed Species Under National Marine Fisheries Service Jurisdiction for the Jacksonville Project

Species Type/Common Name/*Scientific Name*	Federal Status	Habitat	Effects Determination
Rough cactus coral *(Mycetophyllia ferox)*	Threatened	Rough cactus coral is one of the reef-building corals in the order Scleractinia. They are generally found in shallow reef environments and are one of the least common species. These corals require a hard substrate, temperatures typically between 77 °F to 86 °F, and adequate light and water flow (NOAA Fisheries, 2012a, 2015a).	***No effect*** Suitable habitat is not present
Staghorn coral *(Acropora cervicornis)*	Threatened	This species is a branching coral typically found in shallow water areas with a lot of wave action. Staghorn coral is one of the Acroporids that was a dominant reef-building species in Florida and the Caribbean. Their distribution includes the Bahamas, south Florida, and the Caribbean (NOAA Fisheries, 2004).	***No effect*** Project area is not within species range
Seagrass			
Johnson's seagrass *(Halophila johnsonii)*	Threatened	This seagrass prefers the intertidal zone and deeper water of coast lagoons with course sand and muddy substrates. The species inhabits areas with turbid water and high tidal currents (NOAA Fisheries, 2015b). The northern extent of the species range is Sebastian Inlet in southeast Florida.	***No effect*** Project area is not within species range

NOAA Fisheries designated coastal waters of Georgia and Florida as critical habitat for the NARW in 1994 and expanded critical habitat in 2016. The Southeast U.S. critical habitat is designated as a calving area and extends from Cape Fear, North Carolina, south to Cape Canaveral, Florida (see figure 5.2.1-1). The southeast critical habitat includes the St. Johns River inlet. The northeast critical habitat covers U.S. foraging areas and extends from Maine to south of Massachusetts, including the Gulf of Main and Georges Bank region, and the large embayments of Cape Cod and Massachusetts Bays (NOAA Fisheries, 2016a). The calving habitat physical and biological features designated for NARW calving habitat must occur simultaneously over an area of 231 square nautical miles between November and April and include calm sea surface conditions, a sea surface temperature ranging from a minimum of 44.6 degrees Fahrenheit (°F) to 62.6 °F, and water depth from about 20 to 92 feet. This combination of oceanographic features occurs in the southeastern U.S. in an area known as the South Atlantic Bight, which reaches from West Palm Beach, Florida to Cape Hatteras, North Carolina. Previous section 7 consultations between FERC and NOAA Fisheries for LNG facilities have determined that the facilities would not impact essential features of right whale calving habitat.[6] The Project is not within NARW critical habitat; however, the vessel transit routes do traverse NARW critical habitat.

[6] An August 11, 2016 letter from NOAA Fisheries responding to FERC's request for consultation pursuant to section 7 of the ESA for pile driving and dredging of the Elba LNG facility stated:

> The essential features of right whale calving habitat are calm sea surface conditions, sea surface temperature, and depth. The LNG vessel operations will not impact water depth, sea surface conditions, or the temperature of the ocean. Thus, we believe the proposed action would not affect the physical and biological features (water depth, surface conditions, and water temperature), which are the basis for determining this habitat to be critical. (NOAA Fisheries, 2016b)

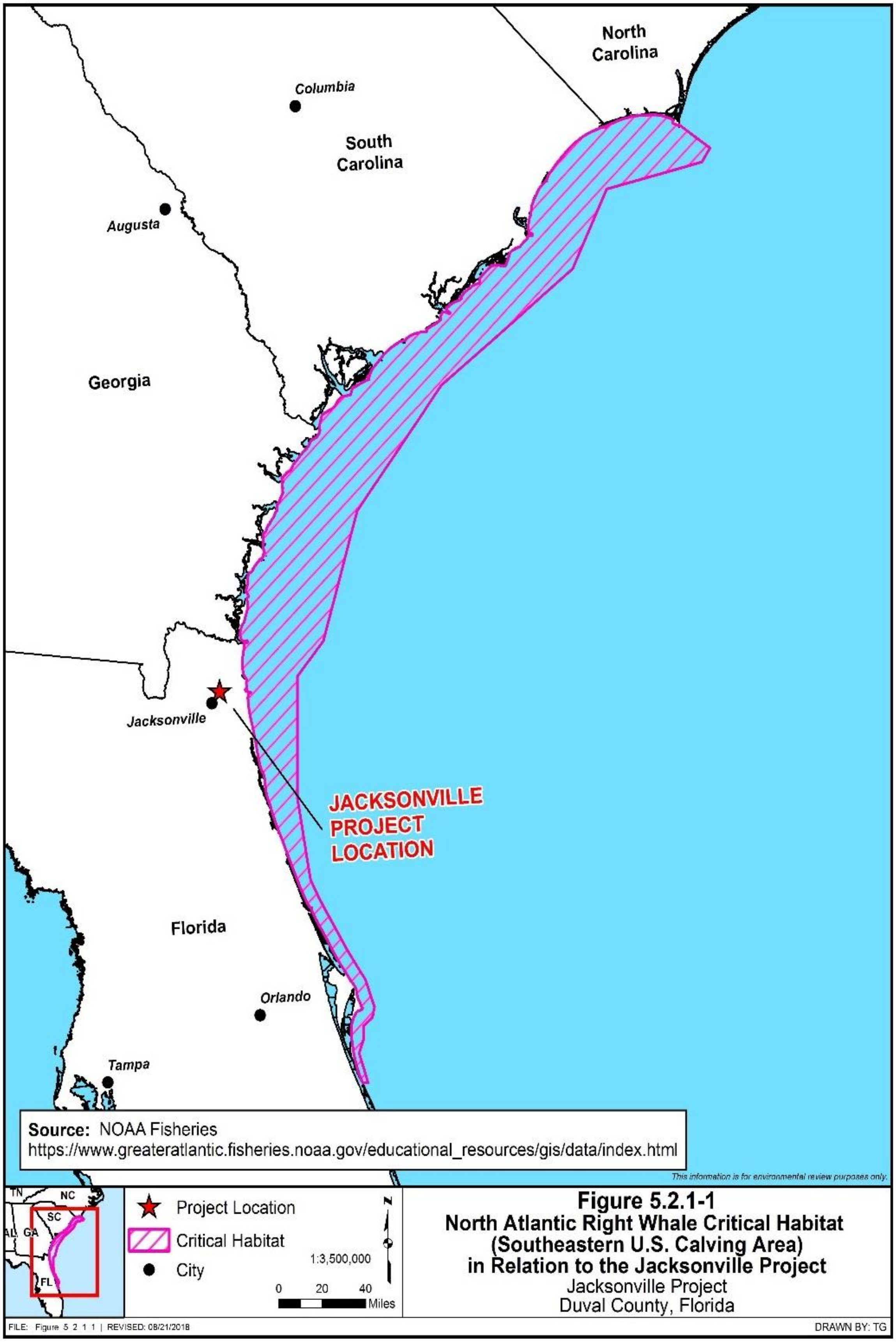


Figure 5.2.1-1
North Atlantic Right Whale Critical Habitat (Southeastern U.S. Calving Area) in Relation to the Jacksonville Project
Jacksonville Project
Duval County, Florida

Because the proposed Project and vessels calling on the facility would not have any effect on sea surface conditions, sea surface temperatures, or water depths, we conclude that the project would have ***no effect*** on designated NARW critical habitat. Therefore we have concluded our responsibilities under section 7 of the ESA and no further consultation for designated NARW critical habitat with NOAA Fisheries is required.

5.2.1.2 Loggerhead Sea Turtle Critical Habitat

The Jacksonville Project construction activities would not occur within any designated critical habitat for loggerhead sea turtles. However, the LNG vessels calling on the facility would transit near or through designated critical habitat for the North Atlantic distinct population segments (DPS) of loggerhead sea turtles. In July 2014, NOAA Fisheries published the final rule designating critical habitat for loggerhead sea turtles (see figure 5.2.1-2). The marine habitats include six different habitat types and their primary constituent elements as described below.

Nearshore Reproductive Habitat

Nearshore habitat is specific to nearshore waters adjacent to nesting beaches. The physical and biological features of nearshore reproductive habitat include nearshore waters up to 1.0 mile offshore of the highest density nesting beaches, waters that are generally free of obstructions and artificial lighting to allow transit through the surf zone toward open water, and waters with minimal manmade structures that could concentrate predators, disrupt wave patterns, and/or create excessive longshore currents (NOAA Fisheries, 2014a).

Nearshore Reproductive Habitat Primary Constituent Element 1: Nearshore Waters Adjacent to Nesting Beaches Extending to 1.0 Mile Offshore

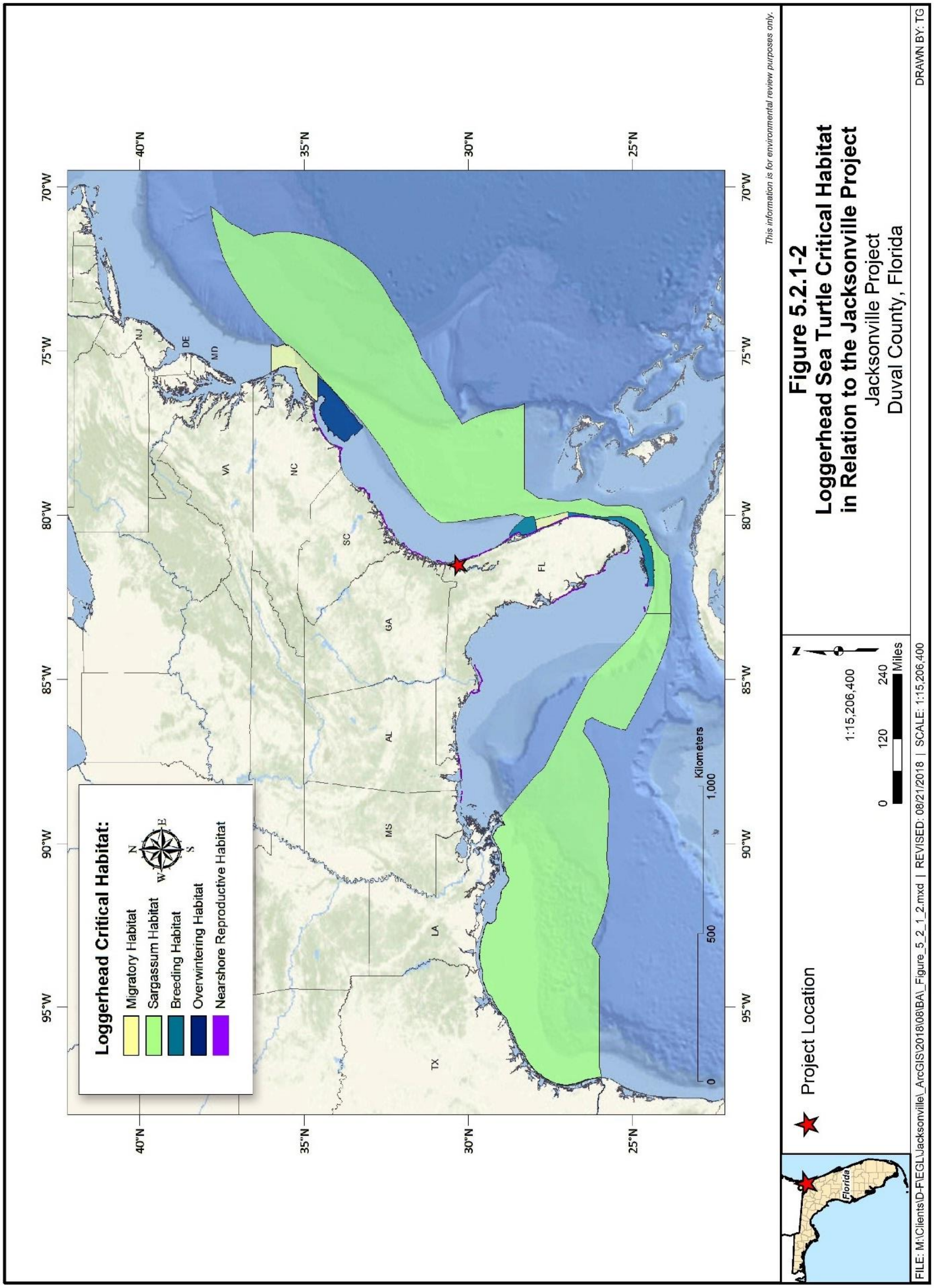
Jacksonville Project construction activities would occur up-river in the St. Johns River. No project components would be constructed in nearshore waters or remove any access to nesting beaches from nearshore waters. Therefore, there would be *no effect* on this essential feature of reproductive habitat.

Nearshore Reproductive Habitat Primary Constituent Element 2: Waters Free of Obstructions and Artificial Lighting, Allowing Transit Through the Surf Zone and Outward Toward Open Water

Jacksonville Project construction activities and operational facilities would not occur in nearshore waters, would not create any obstructions within nearshore waters, and would not increase artificial lighting in nearshore waters. Therefore, the project would have *no effect* on this essential feature of reproductive habitat.

Nearshore Reproductive Habitat Primary Constituent Element 3: Waters with Minimal Manmade Structures that Could Promote Predators, Disrupt Wave Patterns Necessary for Orientation, or Create Excessive Longshore Currents

The Jacksonville Project construction activities would not add any manmade structures to marine waters that could influence the presence of predators, longshore currents, or wave patterns. Therefore, the project would have *no effect* on this essential feature of reproductive habitat.


Loggerhead Critical Habitat:
Migratory Habitat
Sargassum Habitat
Breeding Habitat
Overwintering Habitat
Nearshore Reproductive Habitat
Kilometers
0 500 1,000
This information is for environmental review purposes only.
Project Location
Figure 5.2.1-2
Loggerhead Sea Turtle Critical Habitat
in Relation to the Jacksonville Project
Jacksonville Project
Duval County, Florida
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Florida
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Foraging Habitat

Foraging habitat is designated in specific areas with large numbers of juvenile or adult loggerheads on the continental shelf or in estuarine waters. The physical and biological foraging habitat features include sufficient prey availability and quality such as benthic invertebrates, and water temperatures generally above 50 °F (NOAA Fisheries, 2014a).

Foraging Habitat Primary Constituent Element 1: Sufficient Benthic Invertebrate Prey Availability and Quality

Jacksonville Project construction activities and vessels calling on the facility would not change prey availability or quality of marine benthic invertebrates or other suitable prey species. Therefore, the project would have *no effect* on this essential feature of foraging habitat.

Foraging Habitat Primary Constituent Element 2: Water Temperatures Generally Above 10 °C

Jacksonville Project construction activities and vessels calling on the facility would not change marine water temperatures. Therefore, the project would have *no effect* on this essential feature of foraging habitat.

Winter Habitat

Winter habitat includes warm water areas south of Cape Hatteras, North Carolina near the western edge of the Gulf Stream where high concentrations of loggerheads are found during winter. The habitat features include water temperatures above 50 °F from November through April, continental shelf waters close to the western boundary of the Gulf Stream, and waters between about 65 to 328 feet deep (NOAA Fisheries, 2014a).

Winter Habitat Primary Constituent Element 1: Water Temperatures Above 10 °C From November Through April

Jacksonville Project construction activities and vessels calling on the facility would not change marine water temperatures. Therefore, the project would have *no effect* on this essential feature of wintering habitat.

Winter Habitat Primary Constituent Element 2: Continental Shelf Waters Near the Western Gulf Stream Boundary

Jacksonville Project construction activities and vessels calling on the facility would not change the proximity of continental shelf waters near major currents. Therefore, the project would have *no effect* on this essential feature of wintering habitat.

Winter Habitat Primary Constituent Element 3: Water Depths Ranging Between 20 and 100 Meters

Jacksonville Project construction activities would occur up-river, and dredging activities would not affect marine waters. Vessels transiting to call at the facility would not have impacts on water depths. Therefore, the project would have *no effect* on this essential feature of wintering habitat.

Breeding Habitat

Breeding habitat includes areas with high concentrations of the adult males and females during the breeding season. The habitat features include high densities of reproductive adults, proximity to the primary Florida migratory corridor, and proximity to Florida nesting beaches (NOAA Fisheries, 2014a).

Breeding Habitat Primary Constituent Element 1: High Densities of Reproductive Individuals

Jacksonville Project construction activities and vessels calling on the facility would not have any impact on densities of male and female reproductive loggerhead turtles. Therefore, the project would have *no effect* on this essential feature of breeding habitat.

Breeding Habitat Primary Constituent Element 2: Near to Primary Florida Migratory Corridor

Jacksonville Project construction activities and vessels calling on the facility would not have any impact on the proximity of the area to a primary Florida turtle migratory corridor. Therefore, the project would have *no effect* on this essential feature of breeding habitat.

Breeding Habitat Primary Constituent Element 3: Near to Florida Nesting Grounds

Jacksonville Project construction activities and vessels calling on the facility would not have any impact on the proximity of the area to Florida turtle nesting grounds. Therefore, the project would have *no effect* on this essential feature of breeding habitat.

Constricted Migratory Habitat

Constricted migratory habitat is composed of high use migratory corridors where the corridor is limited to a narrow area between the land on one side and the edge of the continental shelf and Gulf Stream on the other side. The habitat features consist of continental shelf areas that constrict the migratory pathway and where passage conditions allow for the migration of sea turtles to nesting, breeding, and/or foraging areas (NOAA Fisheries, 2014a).

Constricted Migratory Habitat Primary Constituent Element 1: Constricted Continental Shelf Area Concentrating Migratory Pathways

The Jacksonville Project construction activities and vessels calling on the facility would not have any impact on the constriction of continental shelf areas that could concentrate migratory pathways. Therefore, the project would have *no effect* on this essential feature of constricted migratory habitat.

Constricted Migratory Habitat Primary Constituent Element 2: Passage Conditions That Allow Migration Between Nesting, Breeding, And Foraging Areas

The Jacksonville Project construction activities and vessels calling on the facility would not have any impact on conditions allowing or constricting migration between nesting, breeding, and foraging areas. Therefore, the project would have *no effect* on this essential feature of constricted migratory habitat.

Sargassum Habitat

Sargassum habitat includes developmental and foraging habitat for young loggerheads where floating material, especially *Sargassum*, accumulates on the surface of the water. The habitat features are composed of locations where water temperature supports the optimal *Sargassum* growth and loggerhead inhabitance, where *Sargassum* concentrations support abundant prey and cover, available prey and other components associated with *Sargassum* habitat, and sufficient water depth and currents to ensure transport out of the surf zone (NOAA Fisheries, 2014a).

Sargassum Habitat Primary Constituent Element 1: Margins of Major Boundary Currents, Convergence Zones, Surface-Water Downwelling Areas, Appropriate Water Temperatures, Concentrated Amounts of Sargassum

The Jacksonville Project construction activities and vessels calling on the facility would not have any impact on the locations of major boundary currents, convergence and downwelling zones, water temperature, or concentration of *Sargassum*. Therefore, the project would have *no effect* on these essential features of *Sargassum* habitat.

Sargassum Habitat Primary Constituent Element 2: High Enough Concentrations of Sargassum to Support Adequate Prey Abundance and Cover

The Jacksonville Project construction activities would not have any impact on the density of *Sargassum* mats. Vessels transiting the area to call on the facility could scatter *Sargassum* mats when they passed through. Additionally, the wakes and surface water disruption associated with vessel transit could affect the distribution of *Sargassum*. However, this would not affect the amount of *Sargassum* matting, and would not affect prey abundance and cover within the *Sargassum*. Therefore, the project would have *no effect* on this essential feature of *Sargassum* habitat.[7]

Sargassum Habitat Primary Constituent Element 3: Species Native to Sargassum Community Such As Hydroids, Copepods, Plants, Cyanobacteria

The Jacksonville Project construction activities and vessels calling on the facility would not have any impact on the presence or absence of species native to the Sargassum community. Therefore, the project would have *no effect* on these essential features of Sargassum habitat.

Sargassum Habitat Primary Constituent Element 4: Near to Available Currents, Deep Enough Water (More Than 10 Meters) to Ensure Movement Offshore Out of the Surf Zone for Post-Hatchlings, Foraging and Cover Requirements By Sargassum

The Jacksonville Project or vessels calling on the facility would not have any impact on water movement or depth; therefore, the project would have *no effect* on these essential features of Sargassum habitat.

[7] In a June 18, 2015 Biological Opinion for Continued Authorization of the Fishery Management Plan for Coastal Migratory Pelagic (CMP) Resources in the Atlantic and Gulf of Mexico, NOAA Fisheries stated:
The CMP fisheries [which includes associated vessels] do not have the capability to affect the location of convergence zones, surface-water downwelling (the movement of denser water downward in the water column) areas, or other locations where there are concentrated components of the Sargassum community in water temperatures suitable for optimal grow of Sargassum and inhabitance of loggerheads. Likewise, the CMP fisheries would not affect the availability of prey for hatchling loggerhead sea turtles or other material associated with Sargassum habitat…Nor do fisheries have the capability to Affect the water depth or proximity to currents necessary for offshore transport, foraging, and cover. (NOAA Fisheries, 2015c)

Conclusion

Because the proposed Project and vessels calling on the facility would not have any effect on nearshore reproductive, foraging, wintering, breeding, constricted migratory, or Sargassum habitat, we conclude that the project would have ***no effect*** on designated loggerhead critical habitat. Therefore we have concluded our responsibilities under section 7 of the ESA and no further consultation for designated critical habitat for loggerhead turtles with NOAA Fisheries is required.

5.2.2 Analysis of Species Not Likely to be Adversely Affected

We have concluded that the proposed action ***is not likely to adversely affect*** the Atlantic sturgeon, shortnose sturgeon, smalltooth sawfish, five species of whales, and five species of sea turtle. The following discussions support the reasoning for these conclusions.

5.2.2.1 Atlantic and Shortnose Sturgeon

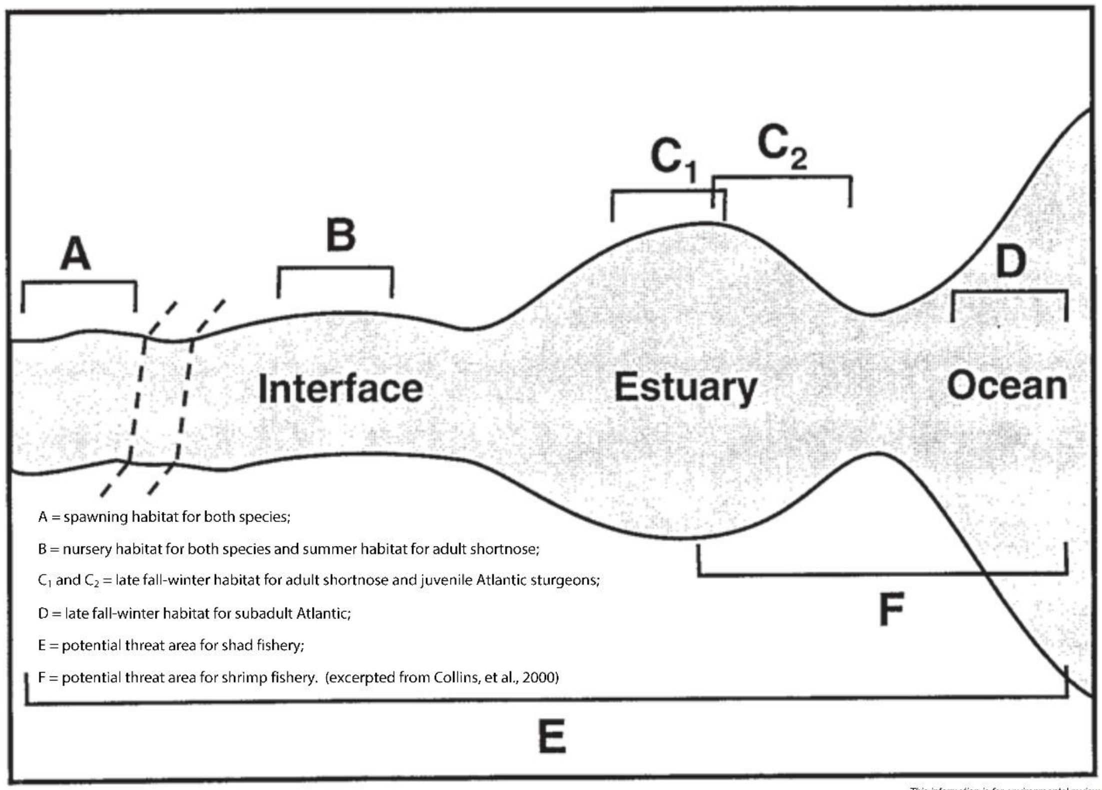
The Atlantic and shortnose sturgeon species share similar life histories and aquatic habitats with overlapping ranges of occurrence.

Sturgeon Habitat

In 2012, the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) was listed under the ESA as having five DPS; four of these DPSs are endangered (the New York Bight, Chesapeake Bay, Carolina, and South Atlantic) and one is listed as threatened (Gulf of Maine DPS) (NOAA Fisheries, 2012b). The shortnose sturgeon has not been listed with DPSs.

On August 16, 2017, NOAA Fisheries designated critical habitat for all five of the Atlantic sturgeon DPSs; however, designated critical habitat for the Atlantic sturgeon does not occur within the project area (NOAA Fisheries, 2017a). No critical habitat has yet been identified for the shortnose sturgeon (NOAA Fisheries, 2015d).

In the southeast, the fresh-brackish water interface appears to serve as the primary summer nursery habitat for Atlantic sturgeon as well as the summer habitat for all ages of shortnose sturgeon (Collins, et al., 2000). Juvenile Atlantic sturgeon utilize oligohaline waters (salinity of 0.5 to 5 parts per trillion) and mesohaline waters (salinity of 5 to 18 parts per trillion) for growth and development before moving to polyhaline waters (18 to 30 parts per trillion) when available in the estuary (NOAA Fisheries, 2017a). Research has also shown that dissolved oxygen levels have a strong impact on both Atlantic and shortnose sturgeon growth and survival. Collins, et al. (2000) also notes that the combination of thermal requirements and dissolved oxygen may be critically important to the effective ecological functioning of the summer habitat and would probably have a greater impact on nursery habitat functions than on adult mortality. Though figure 5.2.2-1 below (excerpted from Collins, et al. [2000]) is intended to show potential threats of bycatch from shad and shrimp fisheries, it is a useful depiction of generalized habitats of Atlantic and shortnose sturgeons in a southern river system.



This information is for environmental review purposes only.

Figure 5.2.2-1
Generalized Atlantic and Shortnose Sturgeon Habitat in a Southern River System
Jacksonville Project
Duval County, Florida

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Primary threats to both Atlantic and shortnose sturgeon include bycatch, habitat degradation, poor water quality, and dams (Florida Fish and Wildlife Conservation Commission [FWC], 2012b; NOAA Fisheries, 2012c). The Rodman Dam, which is south of Palatka, blocks about 63 percent of historical Atlantic sturgeon habitat in the St. Johns River, and only lower quality spawning habitat remains. Active dredging in the St. Johns River can displace sturgeon and can change habitat quality afterwards caused by changes in depth, sediments, and prey availability (NOAA Fisheries, 2012c). Agricultural runoff also degrades habitat and poses an additional threat to sturgeons.

Atlantic sturgeon

Atlantic sturgeons are large (up to 14 feet long), long-lived, anadromous fish. The diet of Atlantic sturgeon is typically composed of benthic invertebrates (e.g., crustaceans, worms, mollusks). Adults spend most of their life in marine waters, but migrate to fresh water in spring and early summer where they spawn in deep parts of large rivers. In the south, migration upriver begins in February to March and a second smaller migration may occur in the fall. Females typically remain in the river for only a few weeks while adult males may remain in the river or lower estuary until fall. Atlantic sturgeon spawn in moderately flowing water and their adhesive eggs are typically deposited on hard surfaces such as cobble. Juveniles move downstream and inhabit estuaries where they can remain for months or years. As they grow, they move into nearshore coastal waters. Research indicates that once immature Atlantic sturgeons emigrate from their birth rivers, they travel widely to other locations (NOAA Fisheries, 2017a).

Potential Presence in the Project Area

In the 1970s and 1980s, commercial fisherman reported capturing several juvenile Atlantic sturgeon in the St. Johns River. In addition, there have been reports that Atlantic sturgeon tagged in the Edisto River, South Carolina, were recaptured in the St. Johns River (Atlantic Sturgeon Status Review Team, 2007). According to NOAA Fisheries (2012c), the spawning population in the St. Johns River has been completely eliminated, but the river is still used as nursery habitat by juveniles spawned in other rivers. Construction of the Rodman dam at River Mile 95 of the St. Johns River blocked a major tributary, the Ocklawaha River, which likely played a role in the loss of the spawning population. Two confirmed sightings have occurred in the St. Johns River in 2011 (NOAA Fisheries, 2012c). One individual was captured during a 2015 sampling survey; that individual sturgeon was genetically identified as being part of the Altamaha River, Georgia population (Fox et al, 2018).

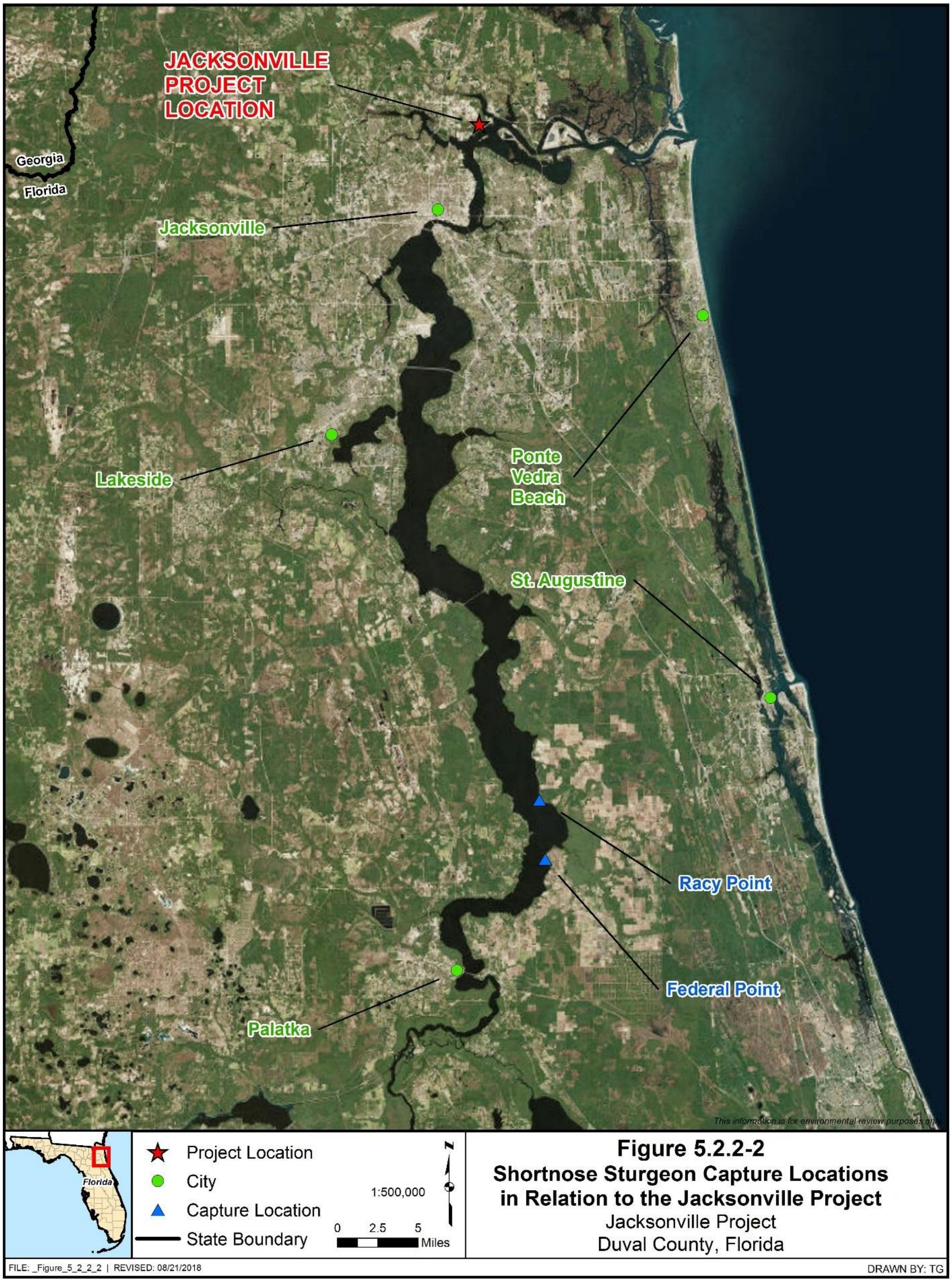
Shortnose sturgeon

The shortnose sturgeon (*Acipenser brevirostrum*) was listed as endangered in 1967. It is the smallest of the North American sturgeon species, only reaching about 4.7 feet long. Its diet comprises benthic invertebrates such as crustaceans, mollusks, and insects. Like Atlantic sturgeons, shortnose sturgeons are anadromous. Shortnose sturgeons prefer the nearshore marine and tidal estuarine or brackish channels of large rivers, but they travel upstream to spawn in fresh water (McCord, 2005; NOAA Fisheries, 2015d). While shortnose sturgeons only occasionally frequent marine habitats, they can tolerate full seawater and migrate between rivers (FWC, 2012b). Where no obstructions exist, spawning occurs in the most upstream reach of the river within the sturgeons range. Water temperatures of 44.6 to 50 °F are required for spawning to occur.

Females spawn every 3 years and can lay as many 208,000 eggs per spawning act. Males can spawn annually. Shortnose sturgeon generally require rocky or gravel substrate, or limestone outcroppings for reproduction where their adhesive eggs can stick to the substrate (FWC, 2012b; NOAA Fisheries, 1998). These habitats are rarely found in the St. Johns River or associated tributaries, and no reproduction of shortnose sturgeon in the St. Johns River has ever been documented.

Potential Presence in the Project Area

From 1949 through 1999, eleven shortnose sturgeon have been documented in the St. Johns River, with eight of the captures occurring between 1977 and 1981. One shortnose sturgeon tagged by the Georgia Department of Natural Resources in 1996 was captured at Racy Point, north of Palatka, Florida, in August 2000 (Shortnose Sturgeon Status Review Team, 2010). A study that included 4,500 hours of gill-net sampling conducted in the river from January 2002 through June 2003 yielded one capture of shortnose sturgeon at Federal Point near Palatka, suggesting that a sizeable population of shortnose sturgeon is unlikely in the river (FWC, 2017b). The capture sites at Racy Point and Federal Point are both located in fresh water. Figure 5.2.2-2 shows the shortnose sturgeon capture sites.


JACKSONVILLE PROJECT LOCATION
Georgia
Florida
Jacksonville
Lakeside
Ponte Vedra Beach
St. Augustine
Racy Point
Federal Point
Palatka
This information is for environmental review purposes only
Florida
Project Location
City
Capture Location
State Boundary
1:500,000
0 2.5 5 Miles
Figure 5.2.2-2
Shortnose Sturgeon Capture Locations in Relation to the Jacksonville Project
Jacksonville Project
Duval County, Florida
FILE: _Figure_5_2_2_2 | REVISED: 08/21/2018
DRAWN BY: TG

Potential Effects on Atlantic and Shortnose Sturgeon

The potential effects on sturgeon are dependent on their presence in the river area that would be affected by construction. At the project site, the primary concern would be potential impacts on juveniles using the area for forage or refuge. During construction, sturgeon could be affected by entrainment, poor water quality due to dredging, noise and pressures associated with pile driving, and vessel strikes. McCord (2005) reports that dredging can reduce prey availability, increase turbidity, change dissolved oxygen levels, and increase bioavailability of contaminants bound in sediments. Reduced prey availability can occur by removing benthic invertebrates in the sediments. Sediment resuspension can increase turbidity and cause a localized drop in dissolved oxygen levels. Suspended sediments can cause both lethal and sub-lethal effects on fishes by causing oxygen deprivation due to gill clogging. Hydraulic and hopper dredges can cause injury or death by entrainment or impingement in drag-arms or impellers.

Entrainment

Dredging is anticipated to occur over a 12-week period with no timing restrictions. Mechanical or hydraulic cutterhead dredging would be employed at the project site. Both types involve less risk than hopper dredging, but there is still a small risk of entrainment during dredging operations if hydraulic cutterhead dredging is used. Barber (2017) studied the effects of hydraulic dredging on Atlantic sturgeon. Barber reported that adults mean swimming velocity increased during active nearby dredging operations, but that the already slower swimming sub-adults mean swimming velocity decreased significantly during active nearby dredging operations, which could put them at greater risk. Sub-adults are also more likely to be found in the shallower water of the river where dredging operations would occur. Barber also found instances where sub-adults passed through the area of the cutterhead which would put them at even greater risk. He suggested that one way to reduce the risk is to reduce the pipe size of the cutterhead dredge. However, Barber found no reports of dead sturgeon in the James River study area. Further, the risk of entrainment is not expected to be a significant factor during dredging. Sturgeon are rarely found in the river and the likelihood of their presence in the project area would be greatest during the fall and winter. We expect that any sturgeon present would avoid the area during dredging operations. Additionally, in their 2011 Final Biological Opinion for the Savannah Harbor Expansion Project, NOAA Fisheries stated:

> The potential for adult and juvenile sturgeon being hit by a hydraulic cutterhead dredge is low. Even when occupying resting areas, adult and juvenile sturgeon are believed to be very mobile and would not be expected to be impacted by cutterhead dredges. There have been rare, documented incidental takes of shortnose and Atlantic sturgeon by mechanical (clamshell) dredges, with one occurring in the South Atlantic region (Wilmington Harbor). However, given the mobility of sturgeon, the lack of a suction field from mechanical dredging will incidentally take sturgeon is small. It is also unlikely that clamshell dredging operation would impact small juvenile and larval sturgeon since there is no suction field generated (NOAA Fisheries, 2011).

Water Quality Degradation

Dredging would cause increases in total suspended solids and turbidity in the water column, which could lead to low dissolved oxygen. These changes could reduce available habitat for sturgeons. Studies have shown that sturgeon exhibit behavioral changes and mortality in response to decreases in dissolved oxygen levels. Sturgeon are sensitive to habitat "squeeze" where their habitat is limited by the synergistic relationship between temperature and dissolved oxygen levels (Secor and Niklitschek, 2001). Sturgeon actively seek habitat with suitable water quality conditions.

Mechanical dredging would cause larger turbidity plumes than cutterhead dredging. Suspended sediments in the water column absorb heat energy and raise water temperature. Turbidity alters light transmission through the water column and decreases photosynthesis of aquatic plants resulting in a decrease in dissolved oxygen levels. Effects of excess suspended sediments on fish include behavioral changes in feeding, predator avoidance, and modified movement; reduced food availability; gill trauma; and metabolic changes (Kjelland, et al., 2015). As the plume settles, there would be a temporary burial of benthic habitat and loss of foraging opportunities. The risk of hypoxia would be greatest during the summer months. However, as stated above, sturgeon are most likely to be in the project area during the fall/winter. This would reduce the risk of hypoxia.

Juvenile sturgeon could be susceptible to predation as a result of their reduced sight distance in turbid water. Sturgeon could also be affected by the temporary loss of foraging habitat in both the dredge footprint and the area where the sediment plume settles. Sturgeons are rare in the St. Johns River and there is no spawning population of either Atlantic or shortnose sturgeon. Any sturgeons present during dredging operations would likely leave the area.

Underwater Noise

The construction of the proposed facility, particularly pile driving and dredging activities, would result in the generation and propagation of underwater noise energy. Eagle LNG anticipates the installation of 239 piles for the marine facilities including 102 steel piles and 137 PSC piles. Sound levels for the two types of pile driving are shown in table 5.2.2-1.

TABLE 5.2.2-1

Sound Levels for Pile Driving Activities Associated with the Jacksonville Project

Pile Driving Activity	Measured Distance (m)	Peak Pressure (dB re: 1 µPa)	RMS SPL (dB re: 1 µPa)	SEL (dB re: 1 µPa^{2}s)
Assessment of Impacts on Marine Mammals				
24-inch PSC [1]	10	185	173	163
30-inch Steel [2]	10	210	190	177
Assessment of Impacts on Sea Turtles				
24-inch PSC [3]	10	188	176	166
30-inch Steel [3]	10	210	190	177

Notes:
RMS = root mean square
SPL = sound pressure level
uPa = microPascal
SEL = sound exposure level
[1] Caltrans, 2015
[2] Washington State Department of Transportation, 2015
[3] NOAA Fisheries Greater Atlantic Regional Fisheries Office, 2018

Eagle LNG estimated potential impacts on fish associated with pile driving activities, dredging activities, and marine vessel traffic. As previously discussed, table 4.2.1-1 provides the thresholds for fish injury and disturbance. Table 5.2.2-2 provides the distances to acoustic thresholds of injury and behavioral disturbance for fish. The table differentiates between 24-inch-diameter PSC piles and 30-inch-diameter steel piles, in both the unmitigated and mitigated scenarios. Eagle LNG plans to implement 12 dB (re: 1 µPa) of mitigation for PSC piles and 25 dB (re: 1 µPa) of mitigation for steel piles. Eagle LNG identified several mitigation measures it may implement to reduce underwater noise impacts during pile driving activities, including:

- using vibratory pile driving for steel piles;
- using confined or unconfined bubble curtains;
- installing temporary noise attenuation pile and/or double-walled noise attenuation piles; and
- using a designated observer for certain species during in-water work.

TABLE 5.2.2-2

Summary of Estimated Noise Impacts on Fish from Pile Driving for the Jacksonville Project

Type of Piles/ Level of Mitigation	Onset of Physical Injury (feet)			Behavior Disturbance (feet)
	Peak (dB re: 1 µPa)	Cumulative Sound Exposure Level (dB re: 1 µPa²s)		Root Mean Square Pressure (dB re: 1 µPa)
	Fish All Sizes	Fish ≥ 2 grams	Fish < 2 grams	
24-inch-diameter PSC				
No Mitigation	0	138	138	203
12 dB	0	1	59	125
30-inch-diameter steel				
No Mitigation	59	210	210	295
25 dB	0	45	445	131

Notes: dB = decibels; dB re: 1 µPa = decibels at a pressure of 1 microPascal; dB re: µPa²s = decibels at a pressure of 1 microPascal squared second

Vessel Strikes

Vessels calling on the facility would access the project site by proceeding inbound from the Atlantic Ocean via the St. Johns Bar Cut along the main channel of the St. Johns River, to the Drummond Creek Range where the project berth would be located. Vessels would moor at the LNG terminal on the north side of the St. Johns River. The total inbound transit distance is about 14.5 miles from the mouth of the St. Johns River.

The risk to sturgeons from vessel strikes is highly unlikely because sturgeon are benthic feeders and are most likely to be found at the river bottom. During facility operations, vessels traveling to or from the site would follow designated shipping channels in the river. The required slow speed zones would be a protective measure and would allow any sturgeons present sufficient time to avoid the vessels.

Conservation Measures

No blasting would occur during construction of the project. Geotechnical studies conducted in the river found weathered limestone that could be removed by cutting or ripping. If mechanical dredging was performed, Eagle LNG would use self-contained barges or barges with sealed bin walls to keep excavated sediments contained until pumped to the upland DMMA. Eagle LNG would also use turbidity curtains around the dredge area to restrict the turbidity zone. Eagle LNG would monitor turbidity levels and, as required by Florida Administrative Code, if levels exceed 29 NTU of ambient river quality conditions, dredging would stop until the compliance station data declines to less than the required NTU.

Eagle LNG would employ additional turbidity protection measures as needed to maintain water quality compliance, including decreasing the speed of bucket movement, small bucket "bites," slow and deliberate sweeps, and halting dredging during extreme tidal changes.

To mitigate for the noise effects from pile driving, Eagle LNG identified several mitigation measures it may use to reduce underwater noise impacts, including:

- using vibratory pile driving for steel piles;
- using confined or unconfined bubble curtains;
- installing temporary noise attenuation piles and/or double-walled noise attenuation piles; and
- using a designated observer for certain species during in-water work.

Our draft environmental impact statement recommends Eagle LNG develop an underwater noise mitigation plan that identifies the specific mitigation measures it would implement to reduce underwater noise associated with PSC impact pile driving by 12 dB (re: 1 µPa) and steel impact pile driving by 25 dB (re: 1 µPa). We also recommended that Eagle LNG include an underwater noise monitoring plan to ensure that sound levels achieve target levels intended to protect sensitive species, as well as additional mitigation that would be implemented in the event that target noise levels are not achieved. Eagle LNG would write into their shipping contracts that shippers must comply with conditions related to the protection of listed species required by NOAA Fisheries and the FWS.

Conclusion

Because of the rare occurrence of Atlantic and shortnose sturgeon in the St. Johns River, the anticipated quick recolonization of benthic organisms in the berthing area that would provide suitable foraging habitat for the benthic feeding sturgeon, the monitoring of turbidity levels during dredging activities, and the requirement to reduce underwater noise to below affecting levels, we conclude the Jacksonville Project ***is not likely to adversely affect*** the Atlantic or shortnose sturgeon.[8]

5.2.2.2 Smalltooth Sawfish

The greatest threats to the sawfish are habitat loss and fisheries bycatch. Development of the coastal area in the southeast has changed or destroyed the habitats necessary for sawfish survival (NOAA Fisheries, 2017b). Sawfish are rarely found on the northeast coast of Florida and none have been documented in the St. Johns River (see figure 5.2.2-3).

[8] The JAXPORT 2014 biological opinion indicated that "Because shortnose sturgeon are a rare occurrence in the project area, effects of the [Jacksonville Harbor Deepening and Widening Project] on shortnose sturgeon are discountable (NOAA Fisheries, 2014b)."

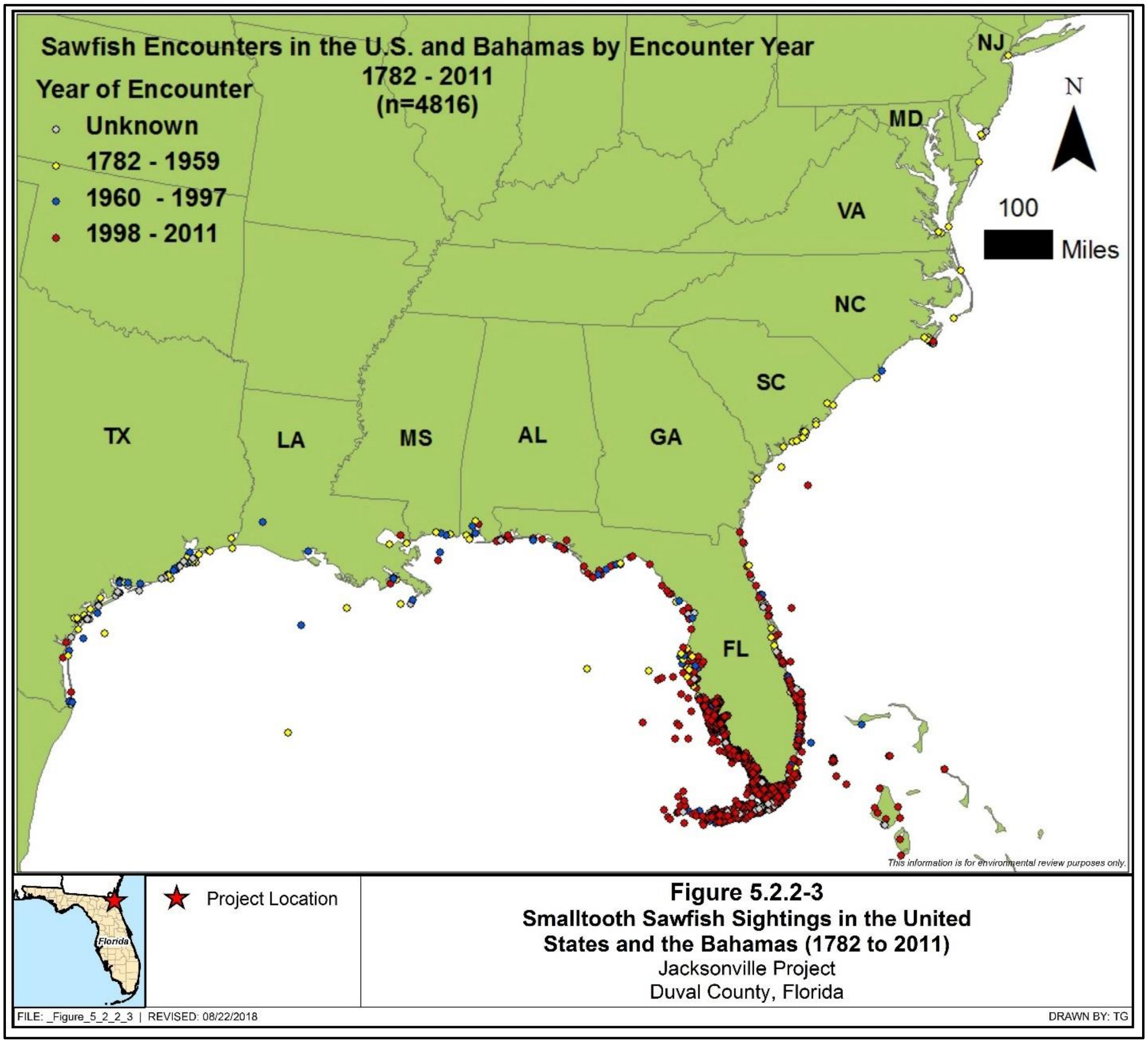


Figure 5.2.2-3
Smalltooth Sawfish Sightings in the United States and the Bahamas (1782 to 2011)
Jacksonville Project
Duval County, Florida

Sawfish Habitat

Smalltooth sawfish (*Pristis pectinata*) are large fish that inhabit shallow coastal waters and estuaries. They utilize habitat with muddy or sandy bottoms in waters that are less than 32 feet deep and show a preference for warm water between 71 °F and 82 °F. Sawfish also travel inland in river systems and prefer salinity ranges of 18 to 24 parts per thousand. Nursery habitat for juvenile sawfish includes highly vegetated shallow waters and mangrove forests (NOAA Fisheries, 2015e).

In 2009, NOAA Fisheries designated critical habitat for the species that includes the Charlotte Harbor Estuary and the Ten Thousand Island/Everglades Units. Both are in southwest Florida between Charlotte Harbor (about 50 miles south of Tampa) and Florida Bay (off of the Florida Keys). NOAA Fisheries (2009) determined that the essential habitat features necessary to recruit juveniles into the adult population include both the presence of red mangroves and shallow (3 feet or less) euryhaline habitats. Smalltooth sawfish critical habitat is not within the Jacksonville Project area.

Potential Presence in Project Area

The smalltooth sawfish was once widely distributed from Texas to North Carolina. However, during the 20th century, fisheries bycatch and habitat loss have reduced the population by about 95 percent. Individuals are now only found regularly in south Florida (Scharer, et al., 2012). Based on available encounter data, there have been no reports of sawfish in the St. Johns River and only rare encounters along the northeast coast of Florida (Burgess et al., 2011).

Based on all available data, sawfish are not expected at River Mile 14.5 in the St. Johns River. There are no reported encounters of sawfish in the river and there is no suitable mangrove habitat to support a juvenile sawfish population. Therefore, dredging and pile driving impacts associated with the project would not affect the smalltooth sawfish, including entrainment, reduction of water quality, or underwater noise.

Potential Effects on Smalltooth Sawfish

There is a chance that sawfish could be struck by vessels in the coastal waters of the transit route. However, because sawfish prefer shallow water, they are not likely to be found along the deeper channels where the vessels would be in transit.

Conservation Measures

Eagle LNG would comply with the NOAA Fisheries *Sea Turtle and Smalltooth Sawfish Construction Conditions*, which further reduces the risk of injury to smalltooth sawfish should they be found in the river. Eagle LNG's terminal regulations would incorporate a Ship Strike Avoidance Measures Document, which would generally require, to the extent international standards or NOAA Fisheries guidance directs, that LNG carrier vessels employ and have on duty wildlife watchstanders who have been trained to spot whales, turtles, manatees, and other species surfacing in the vicinity of the vessel while it is underway.

To minimize the potential for vessel strikes, Eagle LNG would actively communicate requirements relating to vessel strike avoidance to operators before their vessels first call on the facility. Eagle LNG would also make available to all vessel operators calling on the facility the Mariner Training Resources, which NOAA Fisheries makes available at https://www.greateratlantic.fisheries.noaa.gov/protected/shipstrike/training/index.html. Because of the rare occurrence of smalltooth sawfish in the St. Johns River, we conclude the Jacksonville Project ***is not likely to adversely affect*** the smalltooth sawfish.[9]

5.2.2.3 Whales

Whales are long-lived marine mammals that occur throughout the world's oceans. Many species of whales migrate extremely long distances to take advantage of seasonal food resources or calm wintering grounds for rearing young. Five species of whales could use the offshore areas of the Atlantic Ocean along the LNG transit routes for migration and feeding.

9 The JAXPORT 2014 biological opinion indicated that "In the unlikely event a sawfish is present in the [Jacksonville Harbor Deepening and Widening Project] area, sawfish should not be affected by the dredging or construction activities because the dredges advance at a slow pace and are noisy, giving mobile sawfish the opportunity to get out of the way…Thus we have determined that adverse effects on smalltooth sawfish from dredging and construction related activities are discountable (NOAA Fisheries, 2014b)."

Blue Whale (*Balaenoptera musculus*)

Blue whales are the largest mammals on earth, and sightings are infrequent. The primary threats to blue whales are vessel strikes and fisheries interactions, with additional threats including anthropogenic noise, habitat degradation, pollution, vessel disturbance, and climate change (NOAA Fisheries, 2016c). A NOAA Fisheries stock assessment from 2010 estimated that there were 400 to 600 individuals within the western North Atlantic (NOAA Fisheries, 2010); draft 2017 numbers indicate that the population is unknown at this time (NOAA Fisheries, 2018a).

Blue Whale Habitat

In the North Atlantic Ocean, blue whales range from Greenland to the Caribbean; observations in the Caribbean have been uncommon. Their distribution is driven largely by the concentration of krill, which is their primary food source. Blue whales are sometimes found in coastal waters but are believed to occur more frequently in offshore waters, although sightings are infrequent (NOAA Fisheries, 2016c).

Fin Whale (*Balaenoptera physalus*)

Current threats to the fin whale include vessel strikes, entanglement in fishing gear, reduced prey availability due to overfishing, habitat degradation, and low-frequency noise disturbance (NOAA Fisheries, 2015f). The best present estimate is that there are fewer than 1,700 individuals in the western North Atlantic (NOAA Fisheries, 2018a).

Fin Whale Habitat

Fin whales occur in deep, off-shore waters of the world's major oceans. This is a migratory species, generally moving seasonally to high food concentration areas in the higher latitudes, but no specific migration routes have been identified (NOAA Fisheries, 2015f).

Sei Whale (*Balaenoptera borealis*)

This whale is usually found alone or in small groups of two to five far from the coastline. The primary threat to sei whales are ship strikes and interactions with fishing gear (NOAA Fisheries, 2015g). The most recent population estimate in the western North Atlantic was fewer than 400 individuals (NOAA Fisheries, 2018a).

Sei Whale Habitat

Sei whales occur in deep water portions of subtropical to subpolar areas on the continental shelf edge and slope in the Atlantic, Pacific, and Indian Oceans (NOAA Fisheries, 2015g).

Sperm Whale (*Physeter microcephalus*)

The current threats to sperm whales include vessel strikes, anthropogenic noise (especially where shipping activity is high due to oil and gas activity), pollutants, and entanglement in fishing gear (NOAA Fisheries, 2017f). A shipboard survey conducted in June through August 2011 in waters within the U.S. EEZ between central Virginia and central Florida reported 290 sightings primarily along the continental shelf break with lower sighting rates over the continental slope (NOAA Northeast Fisheries Science Center, 2015). The best present estimate for sperm whales in the western North Atlantic is fewer than 2,300 individuals (NOAA Fisheries, 2018a).

Sperm Whale Habitat

The sperm whale is a toothed whale that inhabits the deeper waters of the world's oceans throughout the year, where they feed primarily on squid and other deep sea creatures. Migrations are not as distinct as other species and are thought to primarily follow food resources (NOAA Fisheries, 2017f).

North Atlantic Right Whale (*Eubaleana glacialis*)

The NARW is federally listed as endangered and is one of the most endangered whales in the world. Feeding is not believed to occur in the calving grounds. NARWs primarily occur in coastal or shelf waters, but have been known to occur in deep waters as well. Females give birth to about one calf every 3 years between December and March in the calving grounds off the Atlantic coast (NOAA Fisheries, 2016d, 2017g). Present population estimates indicate that there are fewer than 460 individuals within the western North Atlantic region (NOAA Fisheries, 2018a).

NARWs spend much of their time at or near the water surface, but because they are dark in color and lack a dorsal fin, they are difficult to see. Additionally, their migration route occurs primarily in coastal waters where vessel traffic frequently occurs and NARWs seem oblivious to nearby dangers (NOAA Fisheries, 2013a). The main threat to right whales is entanglement in fishing gear. Other major threats to the species include vessel strikes and underwater noise, which is known to interfere with their communication and disrupt their behavior (FWC, 2012c; NOAA Fisheries, 2017g). The NARW had a particularly devastating year in 2017 with the loss of 16 whales (NOAA Fisheries, 2018b). According to the Marine Mammal Commission, entanglement is now regarded as the greatest anthropogenic threat to the NARW (Lent, 2017). As noted above, vessel strikes and noise also continue to be a threat.

During NARW surveys on January 1, 2005, researchers reported witnessing the birth of a NARW calf in coastal waters 31 kilometers east of the northern tip of Little Talbot Island, Florida which is just north of the mouth of the St. Johns River (Zani et al., 2008). NARW sightings have been documented as far upstream in the St. Johns River as about River Mile 6; however, occurrences in the river are rare (NOAA Fisheries, 2017i). In 2011, a NARW was observed in St. Johns River, where it remained for 9 hours (NOAA Fisheries, 2014b). The majority of documented sightings in the project area occur in Atlantic waters on the east coast of Florida and Georgia (see figure 5.2.2-4) (NOAA Fisheries, 2017i). Data from the NARW sighting website (2017i) indicates occasional presence of NARW in the Jacksonville area between May and November with one confirmed sighting of a mother and calf in July 2007, one confirmed sighting in September 1983, and two confirmed sightings in 1989.

North Atlantic Right Whale Habitat

NARWs are highly migratory. The majority of the western North Atlantic population range from wintering and calving areas in coastal waters off the southeastern United States, to summer feeding grounds as far north as the Canadian Bay of Fundy and include New England, the Scotian Shelf, and the Gulf of St. Lawrence. It is believed that NARWs only feed from spring to fall while in the feeding grounds in the northeast. NARWs are known to congregate seasonally in the coastal waters of the southeastern United States. Recent research shows that NARWs are using waters on the entire east coast year-round (NOAA Fisheries, 2016d, 2017g). Observations have been made that NARWs occur in irregular distribution and in low densities within the designated critical habitat (NOAA Fisheries, 2014b).

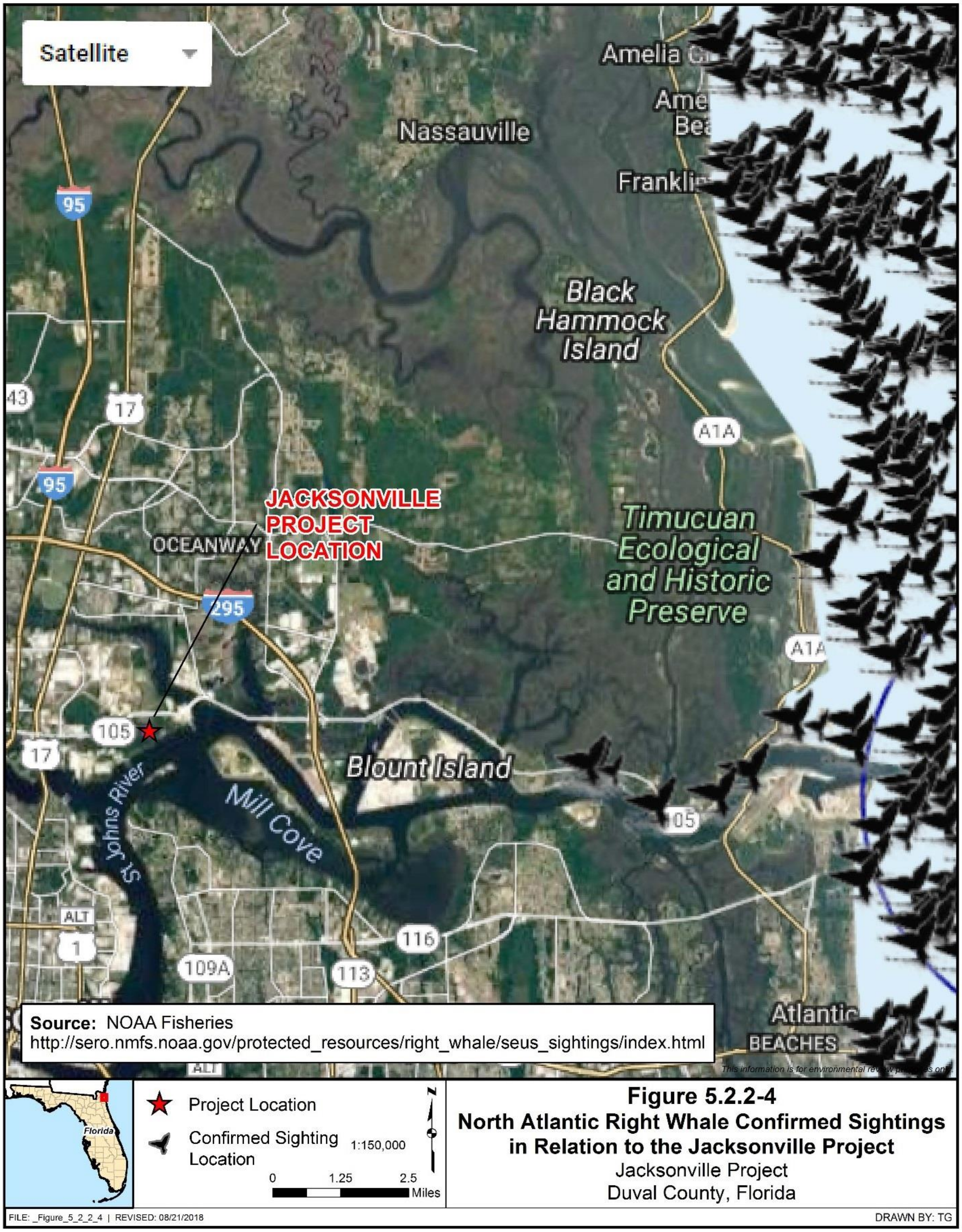


Figure 5.2.2-4
North Atlantic Right Whale Confirmed Sightings in Relation to the Jacksonville Project
Jacksonville Project
Duval County, Florida

Potential Presence in Project Area

Blue, fin, NARW, sei, and sperm whales would not be found at the project facility, but could be encountered along transit routes of vessels calling on the facility while they are still in ocean waters within the U.S. EEZ at any time of year. NARWs could be encountered along the vessel transit route at any time of the year, but sightings would be more likely between December and April during their observed calving season.

Potential Effects on Whales

Project-related dredging and pile driving would not be factors affecting the blue, fin, sei, or sperm whales or the NARW. The injury threshold from project pile driving for marine mammals is 20 meters (about 66 feet) and the behavioral disturbance threshold is 40 meters (about 131 feet). The closest reported whale to the project site was a NARW mother and calf recorded at about River Mile 6 on January 11, 2006 (see figure 5.2.2-4) (NOAA Fisheries, 2017i). Construction activities would be occurring at about River Mile 14.5, 8.5 miles from the location where these whales were reported. Therefore, no direct effects on these species from dredging activities would occur. We conclude that a sediment plume or noise associated with project dredging and/or pile driving would not affect whales.

Whales, especially the NARW, would be vulnerable to vessel strikes during operation of the proposed LNG terminal. LNG transit vessels operating within the U.S. EEZ are generally slower and generate more noise than typical large vessels, and would be more readily avoided by blue, fin, sei, and sperm whales in deeper waters.

Studies and associated models have indicated that a 10-knot speed restriction considerably reduces the risk of whale ship strikes, however it does not eliminate the risk (NOAA Fisheries 2014b). The use of established ship channels, wildlife observers, and the implementation of vessel and wildlife strike avoidance plans further reduce the risk of vessel strikes. Eagle LNG has committed to requiring ships calling on its facility to abide by the voluntary right whale 10-knot speed restriction (no greater than 5-knots at nighttime and during periods of reduced visibility), the use of wildlife watchstanders, and implementing a vessel and wildlife strike avoidance plan. These measures would also assist in the avoidance of other whale species.

Vessel traffic in the shallower coastal water calving area is significant, with three major shipping channels occurring between Brunswick, Georgia and St. Augustine, Florida. The northernmost channel serves the port at Brunswick, Georgia and runs 8 nautical miles offshore; the St. Mary's entrance channel runs 14 nautical miles offshore and serves both the Kings Bay Naval Submarine Base and the port at Fernandina Beach, Florida; and the St. Johns River entrance channel is the southernmost channel that runs 4 nautical miles offshore to serve the Jacksonville Port and the Mayport Naval Base. The St. Johns River shipping channel is the busiest channel in the region and serves many large vessels (see figure 5.2.2-5) (Taylor et al., 2009; Ward-Geiger et al., 2005). A marine vessel traffic summary[10] indicates that the vessels expected to call on the facility would be of similar size or smaller than those currently using the shipping channel. Vessel calls between 2012 and 2017 ranged from 1,656 to 2,083 vessels, which were primarily container ships (Jacksonville Port Authority, 2018b). The Project would nominally increase vessel traffic in the St. Johns River with up to an additional 100 vessels calling on the facility each year, which would represent about 6 percent of the total marine vessel traffic expected within the Jacksonville Harbor.

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10 The Eagle LNG Marine Vessel Traffic Summary was included as Attachment 3 in Eagle LNG's Submission of Responses to January 5, 2018 Environmental Information Request under CP17-41, which is available at: https://elibrary.ferc.gov/idmws/file_list.asp?document_id=14637272.

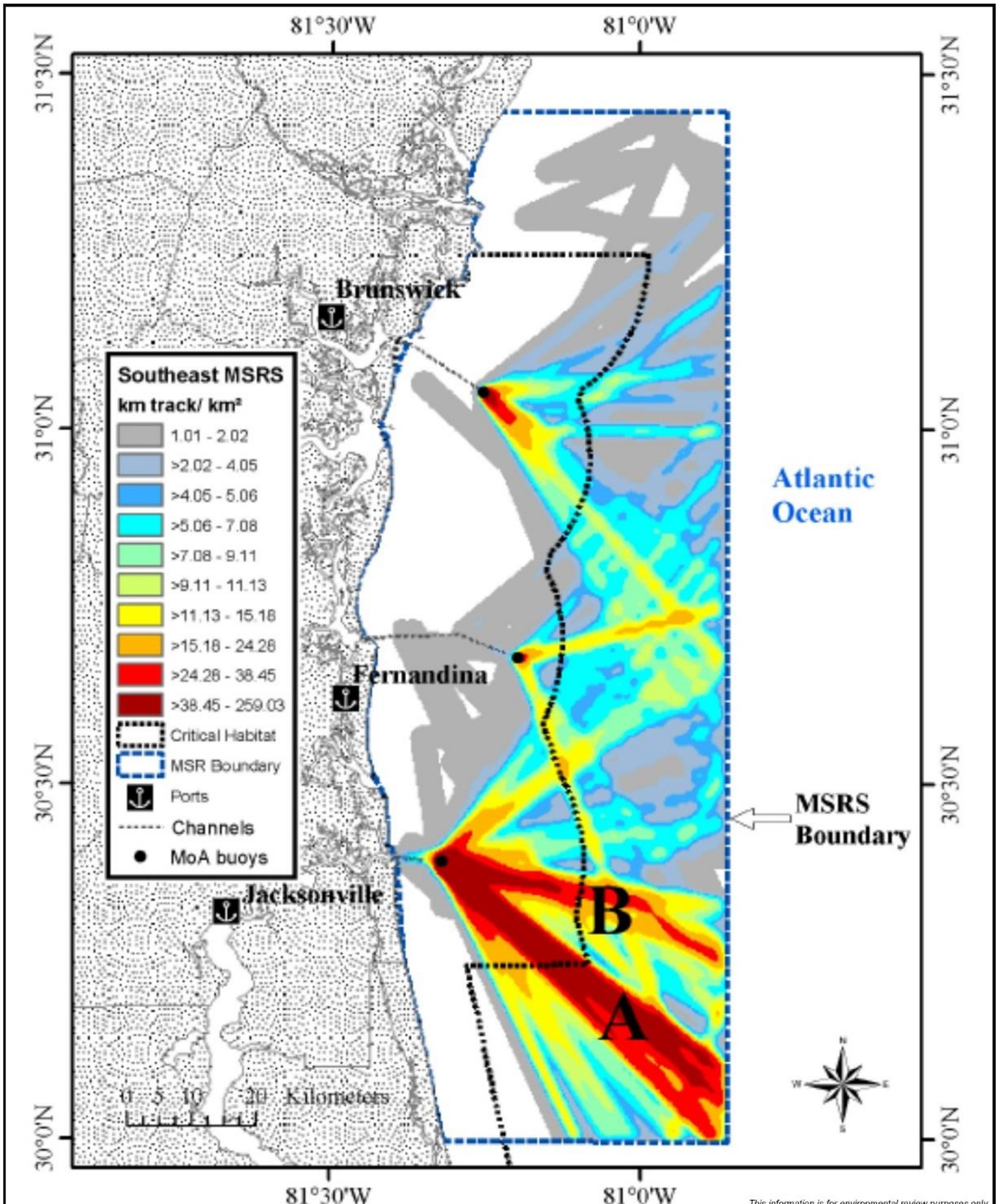

Figure 5.2.2-5
Relative Ship Density of Three Southeastern Ports Between 1999 and 2002, Representing the First Three Seasons of Vessel Traffic Within the Southeast Mandatory Ship Reporting Systems Boundary
Jacksonville Project
Duval County, Florida

★ Project Location

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The letters A and B in figure 5.2.2-5 indicate two high-use corridors. Critical habitat has expanded but in this figure is represented as the limits that existed in 2005. (Figure excerpted from: Ward-Geiger, et al., 2005).

To help ships avoid collisions with NARWs, multi-agency teams conduct aerial surveys over Florida and Georgia coastal waters from December through March to locate NARWs. Additional sighting information is provided from the U.S. Coast Guard, the U.S. Navy, and other volunteers. All sightings are reported to the Early Warning System network where NARW locations are disseminated to mariners in waters of Florida and Georgia within 30 minutes via the typical marine communication network and the right whale pager network. The intention is to provide the NARW locations so vessels can alter course to avoid NARWs (FWC, 2017c). During the calving season from November 15 through April 16, vessels calling on the LNG terminal would comply with recommended vessel routing, and would utilize the Mandatory Ship Reporting Systems developed by the U.S. Coast Guard and endorsed by the International Maritime Organization, which requires vessels weighing 300 gross tons or more entering designated right whale reporting areas to report their arrival by satellite communications and provide their entry location, destination, intended route, and speed (NOAA Fisheries, 2014c; Ward-Geiger, et al., 2005).

Conservation Measures

Eagle LNG would require that the customer comply with NOAA Fisheries' voluntary NARW mitigation measures, a condition of the Custer's LNG carrier charter party, or other agreement. Eagle LNG's terminal regulations would incorporate a Ship Strike Avoidance Measures Document and would write into its shipper contracts that all vessels calling on the facility would comply with NOAA's (2008b) *Vessel Strike Avoidance Measures and Reporting for Mariners* publication. These conservation measures include, in part, the following:

- Actively communicate requirements relating to vessel strike avoidance to operators before their vessels first call on the facility.
- Use the Mandatory Ship Reporting Systems.
- Vessel operators and crews should maintain a vigilant watch for marine mammals and sea turtles and have a trained look-out watching for whales while the vessel is traveling in the seasonal management areas.
- Vessels should maintain a distance of 100 yards or more between the vessel and any whale that is spotted (and 500 yards or more when it is a NARW).
- Try to maintain a distance of 50 yards or more between the vessel and any sea turtles or small cetaceans sighted.
- Reduce vessel speed to 10 knots or less when mother/calf pairs, groups, or large assemblages of cetaceans are observed when safe to do so.
- Vessels 65 feet or longer must travel at speeds of 10 knots or less from November 15 through April 15 in seasonal management areas.
- When an animal is sighted near or in the path of a moving vessel and when safety permits, reduce speed and shift engine to neutral until the animals have cleared the area.
- Immediately report any injured, dead, or entangled right whales to the U.S. Coast Guard.

- Travel in the recommended shipping lanes.
- Avoid intentionally approaching within 500 yards of any right whale.

Once vessels traveling to the facility reach the sea buoy 1.5 miles due east of the river mouth, a river pilot would board the ship and pilot it through the remaining portion of the NAWR calving grounds to the facility location. There, the river pilot would disembark and a docking master would board the vessel to safely dock it at the facility. This process offers an additional level of protection as the pilots operating the vessels are familiar with the rules and regulations to minimize impacts on NARWs.

Eagle LNG would also make available to all vessel operators calling on the facility the Mariner Training Resources, which NOAA Fisheries makes available at: https://www.greateratlantic.fisheries.noaa.gov/protected/shipstrike/training/index.html.

Eagle LNG would create and maintain records establishing that the Marine Operations Manual and the Ship Strike Avoidance Measures Document are given to Customers and LNG vessel operators to ensure there is no dispute about the Customers' and vessel operators' awareness of these requirements and their commitment to honor them.

Finally, Eagle LNG would make the contractual provisions described above applicable to LNG vessel operations and on LNG vessel operators for all periods in which the LNG vessel is underway. Eagle LNG notes that international standards relating to compliance with the International Maritime Organization's Mandatory Ship Reporting Systems govern LNG vessel operations at all times, whether the vessels are in or beyond U.S. waters. Eagle LNG would make the provisions relating specifically to the use of dedicated wildlife watchstanders and compliance with NOAA Fisheries' voluntary NARW mitigation measures and sea turtle avoidance measures, applicable through Eagle LNG's sale/tolling agreements to Customers and their carriers during periods in which an LNG vessel in in transit in U.S. domestic waters.

Conclusion

Because of the unpredictable way that whales may use habitat for foraging, breeding, transiting, and calving, the species' limited population numbers spread across a large expanse of available habitat (the Atlantic Ocean is approximately 41 million square miles), the restriction of ship speeds to 10 knots within known NARW calving grounds, and the use of dedicated wildlife watchstanders, we conclude that the chance of vessel-whale interaction probabilities are low and that the project ***is not likely to adversely affect*** the sei, sperm, blue, fin, or NARW.

5.2.2.4 Sea Turtles

Sea turtles are found throughout the tropical and subtropical seas of the world where they often occur at or near the surface of the water. All of the species are federally listed under the ESA and are under the shared jurisdiction of the FWS and NOAA Fisheries.[11] The major threats to sea turtle populations are overharvesting, fisheries bycatch, disease, pollution, and coastal development of nesting beaches. Five species of federally listed sea turtles are found along the Florida coast, including the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles.

[11] The FWS has jurisdiction over sea turtles on land and NOAA Fisheries has jurisdiction over sea turtles within the marine environment.

Green Sea Turtle (*Chelonia mydas*)

The main threat to green sea turtles at sea is entanglement in fishing gear. Other threats include hits by watercraft, incidental take from channel dredging and commercial fishing operations, increased predation on eggs, and habitat degradation from contaminants and pollutants (FWC, 2012d; FWS, 2017a; NOAA Fisheries, 2016e).

Green Sea Turtle Habitat

Green sea turtles, which are listed as threatened, occur off the east coast of Florida and are part of the North Atlantic DPS, which was listed as threatened on April 6, 2016. Green sea turtles are generally found in shallow waters inside bays, inlets, and reefs with an abundance of seagrass and algae. They use coral reefs and rocky outcrops near feeding areas to rest, and adults feed primarily on seagrass and algae. Hatchlings feed on a variety of plants and animals and have been observed using *Sargassum sp.* mats for food and refuge. Green sea turtles can exhibit high nesting site fidelity, which can lead to common migratory routes between feeding grounds and nesting beaches. Green sea turtles nest on open, sloping beaches with minimal disturbance and can sometimes be found nesting on Jacksonville beaches. The FWC reported two active green sea turtle nests in Duval County in both 2015 and 2016 (FWC, 2012c, 2017d; FWS, 2017a; NOAA Fisheries 2016e).

Hawksbill Sea Turtle (*Eretmochelys imbricata*)

The hawksbill sea turtle is federally listed as endangered throughout its range. This is the rarest sea turtle that occurs in Florida; however, the hawksbill sea turtle has been sighted on the east coast as far north as Massachusetts, though sightings north of Florida are considered rare (FWC, 2012e; NOAA Fisheries, 2014d).

Hawksbill Sea Turtle Habitat

Their habitat includes rocky areas, coral reefs, and shallow, hard bottom coastal areas where they feed on encrusting sponges. They are seldom found in water deeper than 65 feet. They nest in low densities on scattered small beaches in the tropics. Adult females climb over reefs and rocks to nest in beach vegetation. Nesting occurs in south and central Florida, primarily from June to August. Hatchlings are frequently found floating in masses of sea plants (FWS, 2015a; NOAA Fisheries, 2014d).

Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)

The Kemp's ridley sea turtle is federally listed as endangered. This species is one of the smallest marine turtles in the world. The greatest threat to this species is incidental capture in fishing trawls, gill nets, longlines, traps/pots, and dredges (NOAA Fisheries, 2017j).

Kemp's Ridley Sea Turtle Habitat

The Kemp's ridley sea turtle is a shallow water benthic feeder with a diet primarily consisting of crabs and other crustaceans. Outside of nesting, the major habitat is nearshore and inshore waters that contain muddy or sandy bottoms in the northern Gulf of Mexico. Limited nesting occurs on Florida's Atlantic beaches in central and southern portions of the state. Hatchlings quickly swim offshore to open ocean where they associate with floating *Sargassum* vegetation (FWS, 2015b; NOAA Fisheries, 2017j). Some hatchlings in the Gulf of Mexico are swept out of the Gulf and into the Atlantic by the Gulf Stream (NOAA Fisheries, 2017j). This species has been documented in Jacksonville (Caillouet, 1999).

Leatherback Sea Turtle (*Dermochelys coriacea*)

The leatherback sea turtle is federally listed as endangered. The leatherback is the largest sea turtle and spends more of its life in the open ocean environment than other sea turtles. Leatherback sea turtles feed primarily on soft-bodied animals such as jellyfish and salps; however, they are also known to consume sea urchins, crustaceans, fish, blue-green algae, and floating seaweed. The greatest threat to leatherback sea turtles is the incidental capture in fishing gear and dredges. Other threats include harvest of both turtles and eggs (NOAA Fisheries, 2016f).

Leatherback Sea Turtle Habitat

Leatherback sea turtles occur globally, and range farther north and south than other sea turtles, likely due to their ability to maintain warmer body temperatures. Females require sandy beaches with deepwater approach for nesting habitat (FWS, 2015c; NOAA Fisheries, 2016f). The Atlantic coast of Florida is one of the main nesting areas in the continental United States with the most nests occurring in south Florida and medium- to low-density nesting occurring in north Florida. In Duval County, three nests were documented in 2015 and none were documented in 2016 (FWC, 2017e).

Loggerhead Sea Turtle (*Caretta caretta*)

Loggerhead sea turtles found off the east coast of Florida belong to the Northwest Atlantic DPS and are federally listed as threatened. The greatest threat to loggerhead sea turtles is the incidental capture in fishing gear and dredges (NOAA Fisheries, 2017k).

Loggerhead Sea Turtle Habitat

Loggerheads are the most abundant species of sea turtle found in U.S. coastal waters. The loggerhead sea turtle can migrate significant distances between foraging areas, breeding areas, and nesting locations. They can be found in inshore areas such as bays, ship channels, large river mouths, and salt marshes as well as hundreds of miles offshore. Loggerhead sea turtles feed on mollusks, crustaceans, fish, conchs, and other marine animals (FWS, 2016a; NOAA Fisheries, 2017k). Loggerheads nest within the United States from Texas to Virginia, although the largest nesting concentrations are found in Florida, Georgia, South Carolina, and North Carolina. The highest nesting density in the southeastern United States occurs in six south Florida counties. Nesting in Duval County is relatively common, with 142 nests documented in 2015 and 206 nests documented in 2016 (FWC, 2017f). Hatchlings use offshore floating *Sargassum* mats, while juveniles use coastal areas in the western Atlantic where they become benthic feeders in lagoons, estuaries, bays, river mouths, and shallow coastal waters (FWS, 2016a).

Potential Presence of Sea Turtles in the Project Area

Suitable sea turtle foraging and transit habitat is present in the St. Johns River for green, Kemp's ridley, and loggerhead sea turtles. Additionally, all listed sea turtles could be found along the LNG vessel routes, and suitable nesting habitat is present along the LNG vessel transit route at the mouth of the St. Johns River. Anecdotal evidence provided by local fishermen indicates that sea turtles have been found far south of the proposed facility site, one (unknown species) spotted near Doctors Lake inlet around 2012 and one green sea turtle in Hontoon Dead River (a tributary of the St. Johns River) around 1999 (see figure 5.2.2-6) (Bowen, 2017; Richardson, 2017).

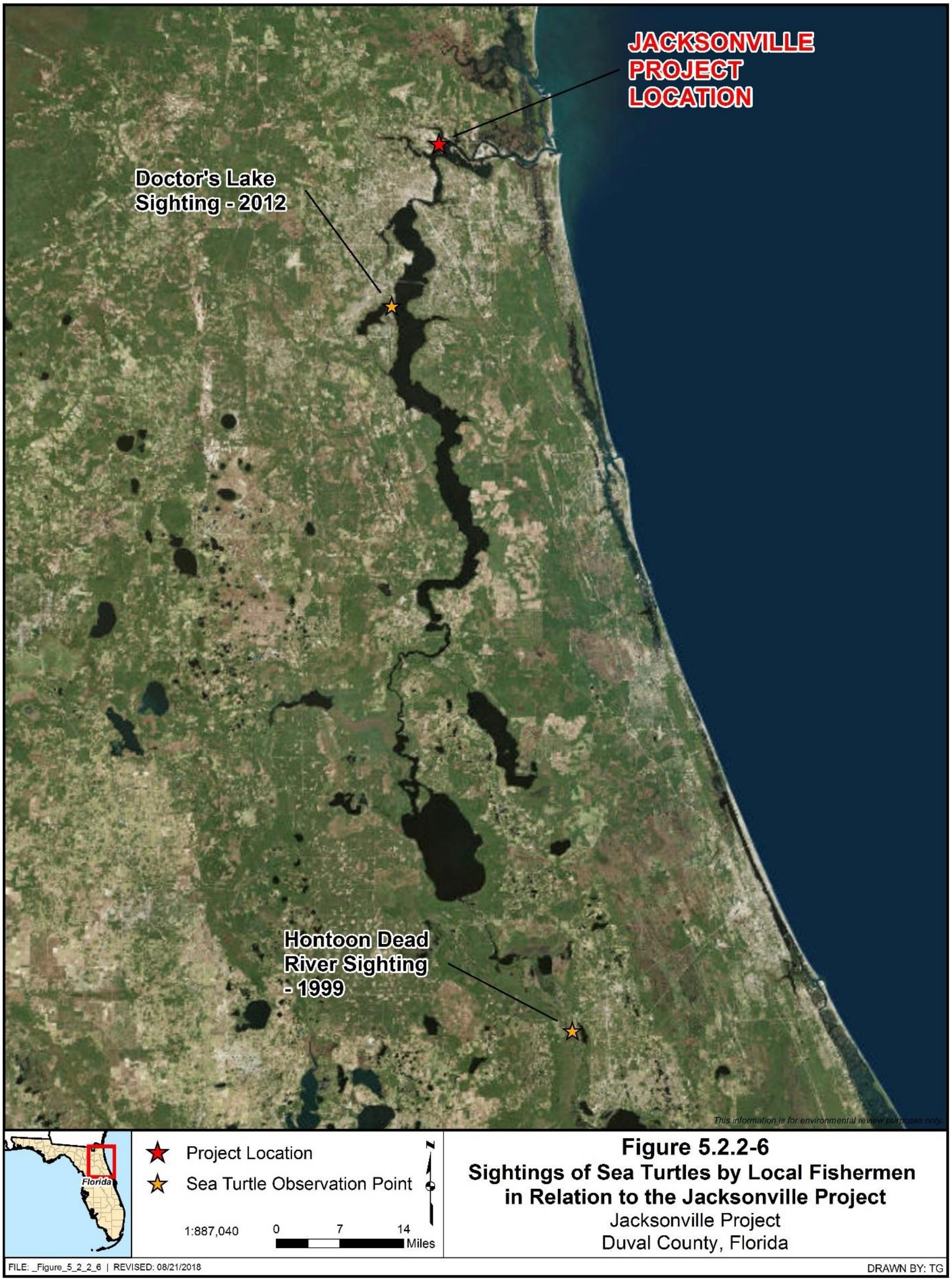


Figure 5.2.2-6
Sightings of Sea Turtles by Local Fishermen in Relation to the Jacksonville Project
Jacksonville Project
Duval County, Florida

Potential Effects on Sea Turtles

During construction, foraging green, Kemp's ridley, and loggerhead sea turtles could be affected by dredging. Due to their pelagic life history, hawksbill and leatherback sea turtles would not be affected by dredging or pile driving. Sea turtle nesting, which could occur about 14 miles from the project site near the mouth of the St. Johns River, is under FWS jurisdiction and is addressed in section 6.2.1.

In January 2014, NOAA Fisheries issued a Biological Opinion for the Jacksonville Harbor Deepening and Widening Project from River Mile 0 to River Mile 13 as shown on figure 5.2.2-7. The project ends 1.5 miles from the proposed LNG facility.

Figure 5.2.2-7 Jacksonville Harbor Deepening and Widening Project Location Map

The channel deepening project would occur along segment 1 (blue) to River Mile 13. The green star indicates the location of the proposed Jacksonville Project. (Figure excerpted from NOAA Fisheries, 2014b).

The Jacksonville Harbor Deepening and Widening Project Biological Opinion evaluated impacts associated with mechanical (clamshell/bucket dredges) and/or cutterhead dredging and found that:

> The project may affect sea turtles by injury or death as a result of interactions with equipment or materials used during dredging; however, NMFS [NOAA Fisheries] believes the chance of injury or death from interactions with clamshell and/or hydraulic dredging equipment is discountable as these species are highly mobile and are likely to avoid the areas during construction. NMFS has received very few reported sea turtle takes associated with these dredging methods in the South Atlantic region: only one live sea turtle has been taken by a clamshell dredge over the past 20 years. The take occurred at Cape Canaveral, Florida, which routinely has very high local turtle abundance. Cold-stunned turtles have also been taken by cutterhead dredging, but this also rarely happens and has been generally limited to shallow, confined waters (e.g., Laguna Madre, Texas) or bays where turtles get trapped and stunned when the rapid passage of a cold front causes the temperature of the shallow water body to drop abruptly. Due to the infrequency of interactions with these gear types and the project location and channel depths, NMFS believes that the likelihood of cold stunning occurring is discountable and also that the possibility of a sea turtle being taken by a hydraulic cutterhead or a clamshell dredge is discountable. (NOAA Fisheries, 2014b)

Underwater Noise Effects

Sea turtles transiting to foraging sites could be affected by noise associated with dredging and pile driving. Eagle LNG compared the threshold for underwater noise to established physical injury and disturbance thresholds for fish, sea turtles, and marine mammals. Because the criteria for turtles are higher than the respective thresholds for fish, meeting the thresholds for fish would result in meeting the criteria for turtles. Eagle LNG would provide mitigation measures to reduce potential noise impacts during pile driving. There is no submerged aquatic vegetation within the dredging footprint to attract sea turtles, and sea turtles would not be expected to be stationary at the project location. Sea turtles are highly mobile and would likely avoid the area during construction. Our draft environmental impact statement recommends Eagle LNG develop an underwater noise mitigation plan that identifies the specific mitigation measures it would implement to reduce underwater noise associated with PSC impact pile driving by 12 dB (re: 1 µPa) and steel impact pile driving by 25 dB (re: 1 µPa).

Vessel Strikes

Increased traffic within the St. Johns River and Atlantic Ocean due to LNG vessel transit to and from the LNG terminal site could pose an increased risk to all listed sea turtles from vessel strikes. In total, LNG transit vessels could make up to 100 trips to the LNG terminal per year. During construction, Eagle LNG would implement the *Sea Turtle and Smalltooth Sawfish Construction Conditions*, which include slow speed, no wake, and use of designated manatee and sea turtle observers who would stop work when a sea turtle is within 50 feet of any in-water construction activity.

During operation, sea turtle vulnerability to collision with an LNG transit vessel would be greatest while feeding, swimming, and resting near the surface of the water. LNG vessels calling on the terminal would use well-traveled shipping lanes and would be piloted by river and docking pilots from the sea buoy to the facility. Generally, vessels travel about 10 to 11 knots on the river but speed can vary based on manatee speed zones, the presence of public docks, and other factors (St. Johns Bar Pilot Association, 2017). Manatee protection areas along the St. Johns River would require slow speeds, which could help protect sea turtles.

Conservation Measures

Eagle LNG would monitor turbidity levels and, as required by Florida Administrative Code, if levels exceed 29 NTU of ambient river quality conditions, dredging would stop until the compliance station data declines to less than the required NTU. Eagle LNG would employ additional turbidity protection measures as needed to maintain water quality compliance, including decreasing the speed of bucket movement, small bucket "bites," slow and deliberate sweeps, and halting dredging during extreme tidal changes.

In order to mitigate for the noise effects from pile driving, Eagle LNG identified several mitigation measures it may use to reduce underwater noise impacts, including:

- using vibratory pile driving for steel piles;
- using confined or unconfined bubble curtains;
- installing temporary noise attenuation piles and/or double-walled noise attenuation piles; and
- using a designated observer for certain species during in-water work.

Additionally, our draft environmental impact statement recommends Eagle LNG develop an underwater noise mitigation plan that identifies the specific mitigation measures it would implement to reduce underwater noise associated with PSC impact pile driving by 12 dB (re: 1 µPa) and steel impact pile driving by 25 dB (re: 1 µPa). We also recommended that Eagle LNG include an underwater noise monitoring plan to ensure that sound levels achieve target levels intended to protect sensitive species, as well as additional mitigation that would be implemented in the event that target noise levels are not achieved.

To further reduce the risk of vessel strikes, Eagle LNG would write into its shipper contracts that all vessels calling on the facility would comply NOAA Fisheries' (2008) *Vessel Strike Avoidance Measures and Reporting for Mariners* as described in section 5.2.2.3 above. Eagle LNG's terminal regulations would incorporate by reference the recommendations of this publication, which sets forth the requirements NOAA Fisheries expects vessels to satisfy in order to protect the NARW. Eagle LNG's terminal regulations would also incorporate a Ship Strike Avoidance Measures Document, which would generally require, to the extent international standards or NOAA Fisheries guidance directs, that LNG carrier vessels employ and have on duty wildlife watchstanders who have been trained to spot whales, turtles, manatees, and other species surfacing in the vicinity of the vessel while it is underway.

To minimize the potential for vessel strikes, Eagle LNG would actively communicate requirements relating to vessel strike avoidance to operators before their vessels first call on the facility. Eagle LNG would also make available to all vessel operators calling on the facility the Mariner Training Resources, which NOAA Fisheries makes available at: https://www.greateratlantic.fisheries.noaa.gov/protected/shipstrike/training/index.html.

Finally, Eagle LNG would make the contractual provisions described above applicable to LNG vessel operations and on LNG vessel operators for all periods in which the LNG vessel is underway. Eagle LNG notes that international standards relating to compliance with the International Maritime Organization's Mandatory Ship Reporting Systems govern LNG vessel operations at all times, whether the vessels are in or beyond U.S. waters. Eagle LNG would make the provisions relating specifically to the use of dedicated wildlife watchstanders and compliance with NOAA Fisheries' voluntary NARW mitigation measures and sea turtle avoidance measures, applicable through Eagle LNG's sale/tolling agreements to customers and their carriers during periods in which an LNG vessel in in transit in U.S. domestic waters.

Conclusion

Construction activities at the Eagle LNG site are not likely to affect turtles, because sea turtles are not commonly found in the river and there is no sea grass present at the project site to attract turtles. Any sea turtles that would be encountered would only be transiting the area. Eagle LNG would monitor turbidity levels during dredging activities and we have recommended that they provide an underwater noise mitigation plan described above to limit impacts from pile driving. Any sea turtles present would likely quickly leave the project area during construction activities. There is a possibility of ship-turtle interactions during vessel transit. Eagle LNG has committed to implementing conservation measures that would reduce, but not omit, the likelihood of turtle-vessel strikes, including the NOAA Fisheries *Sea Turtle and Smalltooth Sawfish Construction Conditions*. Because a risk of vessel strikes or sea turtles avoiding associated vessel traffic (i.e. exhibiting avoidance behaviors) still exists, we conclude that the proposed Project ***is not likely to adversely affect*** the five sea turtle species.

6.0 U.S. FISH AND WILDLIFE SERVICE CONSULTATION

The FWS identified 15 federally listed species under their jurisdiction that could occur in the project area; this includes two candidate species proposed for listing (gopher tortoise and striped newt; table 6-1).

TABLE 6-1

Federally Listed Species Under U.S. Fish and Wildlife Service Jurisdiction that Could be Affected by the Jacksonville Project

Species Common Name	Scientific Name	Status
Mammals		
West Indian manatee	*Trichechus manatus*	Threatened
Birds		
Red knot	*Calidris canutus rufa*	Threatened
Piping plover	*Charadrius melodus*	Threatened
Red-cockaded woodpecker	*Picoides borealis*	Threatened
Wood stork	*Mycteria americana*	Threatened
Reptiles		
Eastern indigo snake	*Drymarchon corais couperi*	Threatened
Green sea turtle	*Chelonia mydas*	Threatened North Atlantic DPS
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened Northwest Atlantic DPS
Gopher tortoise	*Gopherus polyphemus*	Candidate
American alligator	*Alligator missippiensis*	Treated as threatened because of similarity of appearance to the American crocodile (*Crocodylus acutus*).
Amphibians		
Frosted flatwoods salamander	*Ambystoma cingulatum*	Threatened
Striped newt	*Notophthalmus perstriatus*	Candidate

6.1 CONSULTATION HISTORY

The ESA allows applicants to serve as nonfederal representatives for an agency's informal consultation process. The nonfederal representative option is not applicable to formal ESA consultations. Eagle LNG conducted informal consultations with the FWS through a project introduction letter, phone calls, and in-person meetings. A summary of consultations with the FWS and relevant agency correspondence to date is included in attachment A.

FWS Consultation

- January 23, 2015: Eagle LNG submitted project notification letter to U.S. Fish and Wildlife Service.

- May 17, 2017: Eagle LNG submitted survey results letter to U.S. Fish and Wildlife Service.

October 18, 2017: FERC held a conference call with S. Calleson of U.S. Fish and Wildlife Service regarding development of the biological assessment for the Jacksonville Project.

6.2 LISTED SPECIES AND CRITICAL HABITAT IN THE ACTION AREA

Four species of birds, eight species of reptiles, two species of amphibians, and one marine mammal under FWS jurisdiction may occur within the project area or marine vessel transit routes (see table 6-1). Additionally, critical habitat for the Florida manatee is also present along the potential marine vessel transit route within the St. Johns River. If new species are listed or identified at the project site, FERC staff would reinitiate consultation with the FWS.

6.2.1 Analysis of Species and Critical Habitats That Would Not Be Affected

We have concluded that the project would have ***no effect*** on three species of birds, five species of sea turtle, and the frosted flatwoods salamander because the Jacksonville Project area either is outside of the species' known range or it does not contain suitable habitat (table 6.2.1-1). We will not discuss these 9 species further in the FWS portion of this biological assessment. In addition, we determined that the proposed Project would have ***no effect*** on designated Florida manatee critical habitat; our rationale is described below.

6.2.1.1 Florida Manatee (*Trichechus manatus latirostris*) Critical Habitat

The FWS designated critical habitat for the Florida manatee (a subspecies of the West Indian manatee) on September 24, 1976. The St. Johns River is among the areas identified in Florida as critical habitat (see figure 6.2.1-1). The FWS received a petition in 2008 to revise the critical habitat for the manatee. In 2010, the FWS found that a revision is warranted, but other priorities precluded immediate action on a revision. The FWS intends to eventually identify the physical and biological features essential to manatees, including the necessity of available warm-water refugia. However, until changes are made, the currently designated critical habitat will continue to be subject to regulatory protections (FWS, 2010a).

The currently identified critical habitat for the Florida manatee does not identify the essential features necessary for the conservation of the species nor does it designate any specific geographic areas that may require special management or protection. Based on mapped locations of manatee sightings, there have been no manatees identified at the project location and the area is not known to provide thermal refugia for manatees (see section 6.2.2.1). Additionally, there is no submerged aquatic vegetation within the dredge footprint area. Therefore, the project would have ***no effect*** on the designated critical habitat for the manatee.

6.2.2 Analysis of Species Not Likely to be Adversely Affected

We have concluded that the project ***is not likely to adversely affect*** the remaining five species. The sections below outline the rationale for our determinations of not likely to adversely affect these species.

6.2.2.1 West Indian Manatee

The West Indian manatee (*Trichechus manatus*) is federally listed as threatened throughout its range. There are two subspecies of the West Indian manatee, the Antillean manatee (*Trichechus manatus*) and the Florida manatee (*Trichechus manatus latirostris*). This species inhabits both coastal and riverine areas with marine, brackish, and freshwater systems (FWS, 2017c). Current threats to manatees include watercraft collisions; habitat loss, degradation, and fragmentation; loss of warm-water winter habitat; and poaching (FWS, 2017d).

Manatee Habitat

Manatees utilize nearshore habitats where they feed on submerged aquatic vegetation such as eelgrass and seagrass. They typically feed along the edges of grass beds with access to deep water channels. Manatees cannot tolerate water temperatures below 68 °F for extended periods and are often found congregating around warm water from natural springs and power plant discharges during winter months. Their range expands during summer months as water temperatures increase (FWS, 2017c).

TABLE 6.2.1-1

No Effect Determination for Federally Listed Species Under U.S. Fish and Wildlife Service Jurisdiction for the Jacksonville Project

Species Type/Common Name/*Scientific Name*	Federal Status	Habitat	Effects Determination
Birds			
Piping plover *Charadrius melodus*	Threatened	Piping plovers are small shorebirds that overwinter on the Atlantic and Gulf coasts of Florida. They feed on invertebrates in intertidal ocean beach, wrack lines, mud and sand flats, algal flats as well as ephemeral ponds, salt marshes, and lagoons in their winter habitat. Piping plovers roost in adjacent upland beaches and rely on small sand dunes and sparse vegetation for shelter (FWS, 2007). The FWS designated critical habitat for the piping plover on July 10, 2001, which encompassed emergent shoals and shoreline within portions of Duval County including the Timucuan Ecological and Historical Preserve at the mouth of the St. Johns River (FWS, 2001).	***No effect*** Suitable habitat is not present
Red knot *Calidris canutus rufa*	Threatened	Red knots are migratory shorebirds and one of the longest-distance migrants in the world. They are known to utilize wintering grounds along the Atlantic coast of Florida (FWS, 2005, 2013a). Red knots use similar habitats during migration and in wintering areas and generally include coastal marine and estuarine habitats with large areas of exposed intertidal sediments (FWS, 2014).	***No effect*** Suitable habitat is not present
Red-cockaded woodpecker *Picoides borealis*	Endangered	Red-cockaded woodpeckers are cavity nesters that rely on mature pine forests where they excavate cavities in living pine trees that are generally over 80 years old. Red-cockaded woodpeckers prefer longleaf pine, but also inhabit slash and loblolly pines in Florida (FWS, 2016b).	***No effect*** Suitable habitat is not present
Turtles (on nesting beaches)			
Green sea turtle *Chelonia mydas*	Threatened	Green sea turtles nest on open beaches with minimal disturbance and a sloping platform. Nest site fidelity is strong (FWS, 2017a).	***No effect*** Suitable nesting habitat is not present
Hawksbill sea turtle *Eretmochelys imbricata*	Endangered	Hawksbill sea turtles nest on undisturbed deep sand beaches in the tropics (FWS, 2015a).	***No effect*** Suitable nesting habitat is not present
Kemp's ridley sea turtle *Lepidochelys kempii*	Endangered	Kemp's Ridley sea turtles nest primarily in the western Gulf of Mexico, but also use several sand beaches on the east coast of Florida (FWS, 2015b).	***No effect*** Suitable nesting habitat is not present
Leatherback sea turtle *Dermochelys coriacea*	Endangered	Leatherback sea turtles nest on sandy beaches backed by vegetation with sufficient slope to limit the distance to dry sand. Leatherbacks prefer beaches with close access to deep water and rough seas (FWS, 2015c).	***No effect*** Suitable nesting habitat is not present
Loggerhead sea turtle *Caretta*	Threatened	Loggerhead sea turtles nest on open beaches or along narrow bays with suitable sand (FWS, 2016a).	***No effect*** Suitable nesting habitat is not present
Amphibians			
Frosted flatwoods salamander *Ambystoma cingulatum*	Threatened	The frosted flatwoods salamander spends most of its life underground in upland habitat composed of fire-maintained, open-canopied longleaf pine-wiregrass flatwoods and savannas. Breeding occurs in small, isolated, ephemeral wetlands dominated by pond cypress, blackgum, and slash pine that lack predatory fish (FWS, 2008a, 2017b, 2018a; Palis and Hammerson, 2008). Florida's easternmost county within the current range of this species is Baker County; the range does not include Duval County.	***No effect*** Suitable habitat is not present and the propose Project is outside current range

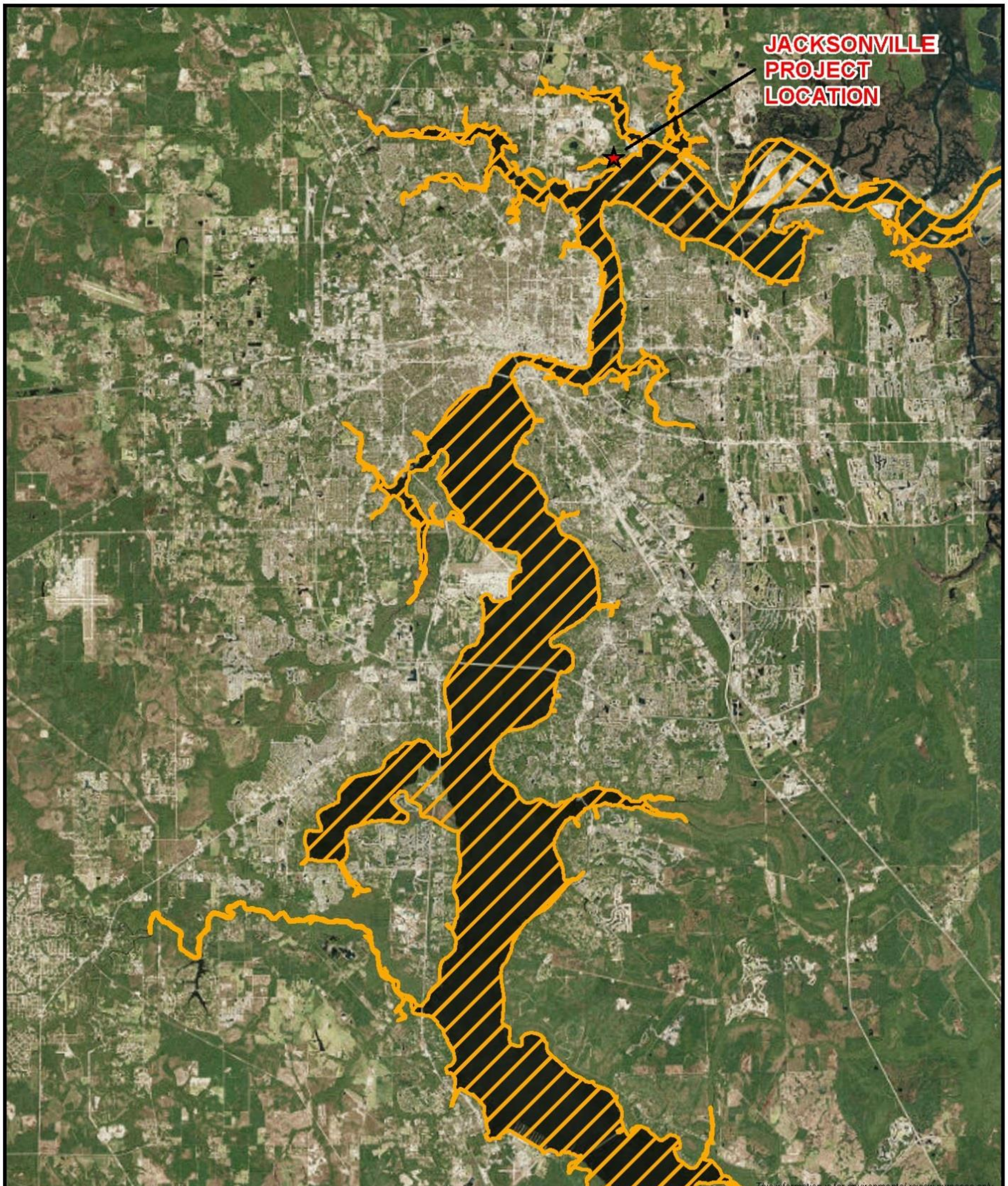


Figure 6.2.1-1
Designated Florida Manatee Critical Habitat in Relation to the Jacksonville Project
Jacksonville Project
Duval County, Florida

Potential Presence in the Project Area

Manatees are commonly found in the St. Johns River but distribution is more common south of the project site. Figure 6.2.2-1 depicts the most current data available from FWC showing the occurrences of manatees in relation to the project site. The synoptic survey observations are used by the FWC to obtain a general count of manatees throughout Florida and are conducted annually between January and March. The 1993-1994 distribution data was conducted from a small aircraft flying at a height of 500 to 1000 feet (FWC, 2017g). Manatees are not likely to forage at the project site due to the absence of submerged aquatic vegetation, however, they could be found in the area as they transit the river during construction and operation of the facility.

Potential Effects on Manatees

Dredging

Eagle LNG's proposed dredging location is not known as a thermal aggregation area for manatees, and there are no seagrasses in the proposed dredge footprint. The sediment plume associated with mechanical dredging would extend about 4,200 feet (3,500 feet for hydraulic dredging) from the dredge activity, but there are no known sea grasses present within the range that would be affected. However, manatees traveling in the area could be disturbed by dredging activities. Loss of foraging habitat is not anticipated because no submerged aquatic vegetation was identified within the project area during field surveys.

Underwater Noise

During construction, manatees could be affected by underwater noise from dredging and pile driving. Eagle LNG anticipates the installation of 239 piles for the marine facilities including 102 steel piles and 137 PSC piles. Sound levels for the two types of pile driving are shown in table 5.2.2-1. Eagle LNG estimated potential impacts on marine mammals associated with pile driving activities, dredging activities, and marine vessel traffic. The acoustic thresholds at which five types of marine mammals would experience temporary or permanent changes to hearing sensitivity from exposure to underwater anthropogenic sources are provided in table 6.2.2-1. Table 6.2.2-1 provides the distances to acoustic thresholds of injury and behavioral disturbance for marine mammals. The table differentiates between 24-inch-diameter PSC piles and 30-inch-diameter steel piles, in both the unmitigated and mitigated scenarios. Eagle LNG plans to implement 12 dB (re: 1 µPa) of mitigation for PSC piles and 25 dB (re: 1 µPa) of mitigation for steel piles.

TABLE 6.2.2-1

Summary of Estimated Noise Impacts on Marine Mammals from Pile Driving for the Jacksonville Project

	Onset of Physical Injury (feet)		Behavior Disturbance (feet)	
Type of Piles/ Level of Mitigation	Peak (dB re: 1µPa)	Cumulative Sound Exposure Level (dB re: 1 $\mu Pa^2 s$)	Peak (dB re: 1µPa)	Cumulative Sound Exposure Level (dB re: 1 $\mu Pa^2 s$)
Impact Pile Driving				
24-inch-diameter PSC				
No Mitigation	0	8	0	241
12 dB mitigation	0	1	0	38
30-inch-diameter steel				
No Mitigation	0	63	0	3,281
25 dB mitigation	0	1	0	71
Vibratory Pile Driving				
No Mitigation	0	187	0	464

Notes: dB = decibels; dB re: 1 µPa = decibels at a pressure of 1 microPascal; dB re: $\mu Pa^2 s$ = decibels at a pressure of 1 microPascal squared second

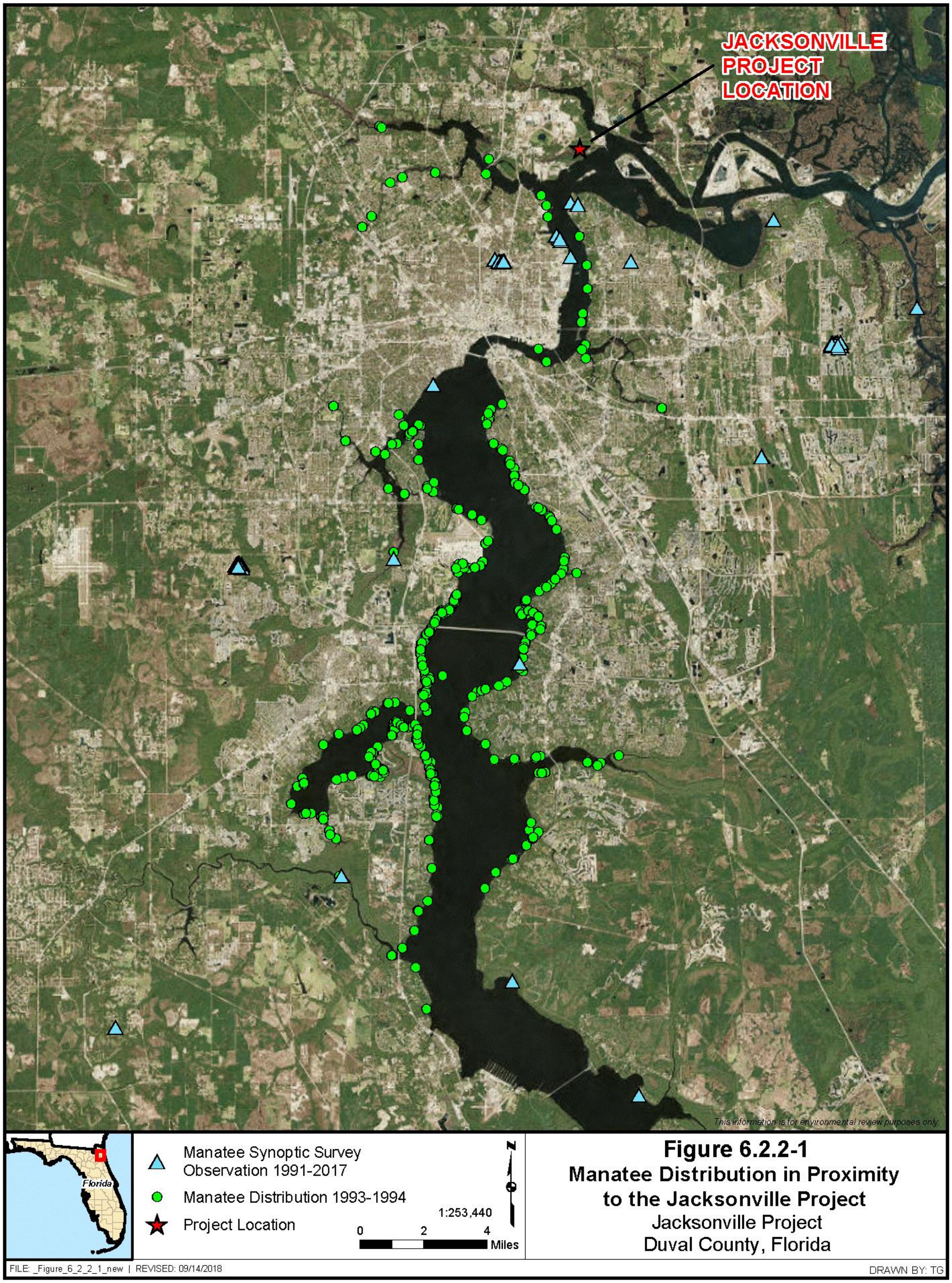


Figure 6.2.2-1
Manatee Distribution in Proximity to the Jacksonville Project
Jacksonville Project
Duval County, Florida

Eagle LNG compared continuous, non-impulsive sounds associated with dredging against the acoustic thresholds for marine mammals. Based on a worst-case assessment of stationary dredging sound source occurring continuously for 24 hours and impacting a stationary manatee over that period, the distance predicted to avoid permanent hearing changes in manatees is 15 meters from the stationary dredging source.

Based on the berthing activity occurring continuously for 1 hour using the sound level equivalent to the logarithmic summation of the sound levels of the four vessels, Eagle LNG estimated that the permanent injury threshold for pinnipeds (considered to be similar to manatees) is expected to occur within 60 meters from the source. For the transiting of the vessels within the 1-mile radius of the marine terminal, estimated to be for a half-hour period, the permanent injury threshold is exceeded within 11 meters of the transiting source. Due to the conservative assumptions involved in these calculations, the actual distances to permanent injury are likely to be less. Furthermore, it is expected that the manatees would display avoidance behavior in response to the moving vessels.

Vessel Strikes

Another threat to manatees resulting from construction and operation of the LNG terminal would be an increased risk of vessel strikes. During construction, Eagle LNG would incorporate the standard protection measures and agency recommendations provided by the FWS, NOAA Fisheries, and the FWC, such as abiding by manatee speed zones, operating at idle speed/no wake at all times, using manatee observers during all in-water work, and the posting of manatee signage on the dock to help protect manatees from vessel strikes. During operation, manatees may be drawn to the site during the cold winter months due to warm water discharges of cooling water from vessels calling on the LNG terminal, which could increase the likelihood of vessel strikes or being crushed at the docking facility. To reduce the risk of being crushed, the maximum compression of fenders at the marine facilities would be 4 feet. Additionally, vessels calling on the LNG terminal would operate within specified speed zones that reduce the risk of vessel strikes. Eagle LNG would comply with all requirements in their state and federal permits, and vessels calling on the LNG terminal would be required to operate according to navigation channel speed zones.

Conservation Measures

Eagle LNG would monitor turbidity levels and, as required by Florida Administrative Code, if levels exceed 29 NTU of ambient river quality conditions, dredging would stop until the compliance station data declines to less than the required NTU. Eagle LNG would employ additional turbidity protection measures as needed to maintain water quality compliance, including decreasing the speed of bucket movement, small bucket "bites," slow and deliberate sweeps, and halting dredging during extreme tidal changes.

To mitigate for the noise effects from pile driving, Eagle LNG identified several mitigation measures it may use to reduce underwater noise impacts, including:

- using vibratory pile driving for steel piles;
- using confined or unconfined bubble curtains;
- installing temporary noise attenuation piles and/or double-walled noise attenuation piles; and
- using a designated observer for certain species during in-water work.

Our draft environmental impact statement recommends that Eagle LNG develop an underwater noise mitigation plan that identifies the specific mitigation measures it would implement to reduce underwater noise associated with PSC impact pile driving by 12 dB (re: 1 µPa) and steel impact pile driving by 25 dB (re: 1 µPa). We also recommend that Eagle LNG provide an underwater noise monitoring plan to ensure that sound levels achieve target levels intended to protect sensitive species as well as additional mitigation that would be implemented in the event that target noise levels are not achieved.

To further reduce the risk of vessel strikes, Eagle LNG would write into its shipper contracts that all vessels calling on the facility would comply NOAA Fisheries' (2008) *Vessel Strike Avoidance Measures and Reporting for Mariners*. Eagle LNG's terminal regulations would incorporate by reference the recommendations of this publication, which sets forth the requirements NOAA Fisheries expects vessels to satisfy in order to protect the NARW, which would also benefit the manatee. Eagle LNG's terminal regulations would also incorporate a Ship Strike Avoidance Measures Document, which would generally require, to the extent international standards or NOAA Fisheries guidance directs, that LNG carrier vessels employ and have on duty wildlife watchstanders who have been trained to spot whales, turtles, manatees, and other species surfacing in the vicinity of the vessel while it is underway.

To minimize the potential for vessel strikes, Eagle LNG would actively communicate requirements relating to vessel strike avoidance to operators before their vessels first call on the facility. Eagle LNG would also make available to all vessel operators calling on the facility the Mariner Training Resources, which NOAA Fisheries makes available at: https://www.greateratlantic.fisheries.noaa.gov/protected/shipstrike/training/index.html.

Eagle LNG would make the contractual provisions described above applicable to LNG vessel operations and on LNG vessel operators for all periods in which the LNG vessel is underway. Eagle LNG notes that international standards relating to compliance with the International Maritime Organization's Mandatory Ship Reporting Systems govern LNG vessel operations at all times, whether the vessels are in or beyond U.S. waters. Eagle LNG would make the provisions relating specifically to the use of dedicated wildlife watchstanders and compliance with NOAA Fisheries' voluntary NARW mitigation measures and sea turtle avoidance measures applicable through Eagle LNG's sale/tolling agreements to customers and their carriers during periods in which an LNG vessel in in transit in U.S. domestic waters.

Finally, Eagle LNG would also comply with standard manatee construction conditions during in-water work and would post manatee signage on the dock. Standard manatee construction conditions include, in part, the following:

- Vessels associated with the construction of the project will operate at "idle speed/no wake" at all times.
- All in-water work would stop if a manatee or sea turtle were within 50 feet of the operation.
- Siltation and turbidity barriers would be made of material in which manatees or sea turtles cannot become entangled, would be properly secured, and would be regularly monitored to avoid manatee or sea turtle entanglement or entrapment.

Conclusion

Construction activities at the Eagle LNG site could affect manatees, because it is within range of known manatee sightings throughout the St. Johns River system, and both pile-driving and dredging could produce noise and turbidity that could affect manatee behavior. However, underwater noise would not preclude manatees from transiting the ship channel. Eagle LNG would monitor turbidity levels during dredging activities and we have recommended that they provide an underwater noise mitigation plan as described above to limit impacts from pile driving. There is also a possibility of ship-manatee interactions during vessel transit. Eagle LNG has committed to implementing conservation measures that would reduce, but not omit, the likelihood of manatee-vessel strikes, including the NOAA Fisheries *Sea Turtle and Smalltooth Sawfish Construction Conditions*, which includes posting wildlife watchstanders during transit looking for surfacing animals. Because a risk of vessel strikes or manatees avoiding associated vessel traffic (i.e. exhibiting avoidance behaviors) still exists, we conclude that the proposed Project ***is not likely to adversely affect*** the manatee.

6.2.2.2 Wood Stork

The wood stork (*Mycteria americana*) is federally listed as threatened. The primary threat to wood storks from construction and operation of the project would be loss of foraging habitat. Construction of the project would temporarily affect about 2.2 acres of wetlands (about 1.4 acres of mixed forested wetlands and 0.8 acre of saltwater marsh), of which about 1.9 acres (about 1.2 acres of mixed forested wetlands and 0.7 acre of saltwater marsh) would be filled for the LNG terminal. These wetlands are within the core foraging areas of two active wood stork colonies.

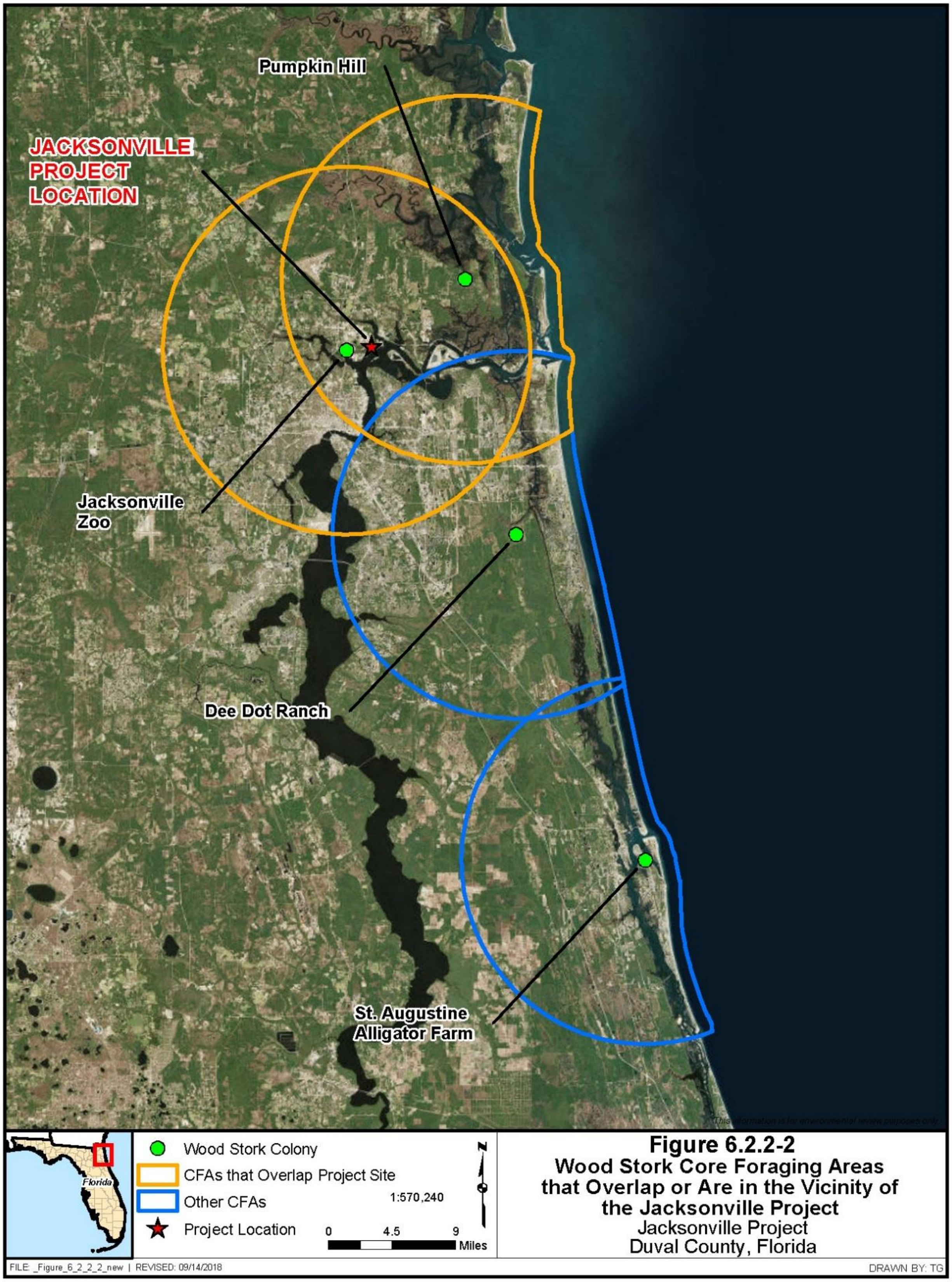
Wood Stork Habitat

Wood storks are a colonial species that nest in large rookeries and feed in flocks. Nesting is restricted to Florida, Georgia, and South Carolina. They nest in mixed hardwood swamps, sloughs, mangroves, and cypress domes/strands in Florida. Wood storks lay eggs from March to late May and the young generally fledge in July through August. The wood stork diet consists primarily of small fish, especially topminnows and sunfish. They feed using a specialized technique known as tacto-location where the stork probes in water 6 to 10 inches deep with its bill partly open. The bill quickly snaps shut when touched by a fish. Storks prefer to feed in marsh or swamp depressions where fish become concentrated during periods of falling water levels, but are also known to feed in narrow tidal creeks and flooded tidal pools. Because of their unique feeding technique, wood storks require higher prey concentrations than other wading birds (FWS, 2016c).

Foraging areas around nesting colonies are important for reproductive success. Consequently, the FWS identified wood stork core foraging areas around all known wood stork nesting colonies. In north Florida, wood stork core foraging areas include wetlands within a 13-mile radius of a colony. The main threat to wood storks is the destruction, fragmentation, and modification of wetland habitat. Wetlands lost through permitted activities within a colony’s core foraging area may not be replaced with like-quality foraging wetlands within the same core foraging area (FWS, 2012).

Potential Presence in the Project Area

Based on the most current data, the project is within the core foraging area of two wood stork colonies, including the Jacksonville Zoo colony (1.3 miles away) and the Pumpkin Hill colony (7.8 miles away) (see figure 6.2.2-2) (FWS, 2017e). Wood storks could forage in the small channels associated with Drummond Creek and in the freshwater marsh on the northeast side of the property, outside the project limits.


Pumpkin Hill
JACKSONVILLE PROJECT LOCATION
Jacksonville Zoo
Dee Dot Ranch
St. Augustine Alligator Farm
Florida
Wood Stork Colony
CFAs that Overlap Project Site
Other CFAs
Project Location
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0
4.5
9
Miles
Figure 6.2.2-2
Wood Stork Core Foraging Areas that Overlap or Are in the Vicinity of the Jacksonville Project
Jacksonville Project
Duval County, Florida
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Potential Effects on Wood Storks

The proposed project would fill about 1.9 acres of wetlands within a core foraging area for two active wood stork colonies, which would reduce prey availability. In addition, noise from construction could cause wood storks to avoid the area. Eagle LNG utilized the FWS (2010b) wood stork effect determination key, which was developed by the FWS Jacksonville Services Field Office to assist agencies in their review of permit applications for impacts on wood storks. According to the wood stork key, if the wetland bank is suitable and provides habitat compensation that replaces foraging value, consisting of wetland enhancement or restoration matching the hydroperiod of the wetlands affected, and provides foraging value similar to, or higher than, that of the affected wetlands, construction and operation of the project *is not likely to adversely affect* wood storks.

Conclusion

Eagle LNG reviewed the requirements of the wood stork effect determination key and committed to purchasing wetland mitigation bank credits to reach a ***not likely to adversely affect*** determination for wood storks.

6.2.2.3 Eastern Indigo Snake

The eastern indigo snake (*Drymarchon corais couperi*) is federally listed as threatened. There were 11 documented cases of eastern indigo snakes in Duval County between 1981 and 2000, and none since then (Enge et al., 2013). Though it is unlikely that eastern indigo snakes would be encountered on the project site during construction, Eagle LNG would follow the guidance in the FWS (2013b) *Standard Protection Measures for the Indigo Snake,* which includes, in part, presence of posters on the construction site and a requirement that, if a live eastern indigo snake is present on site, all activities would cease and the snake would be allowed to move away without interference from construction personnel.

Eastern Indigo Snake Habitat

This species inhabits pine flatwoods, hardwood forests, moist hammocks, and areas that surround cypress swamps (FWC, 2012f; FWS, 2008b). Eastern indigo snakes are vulnerable to desiccation and require habitats that provide refugia to protect from desiccation. They require a mosaic of habitats that includes uplands and wetlands where sheltered retreats are available that can be utilized to escape both cold and desiccating conditions (FWS, 1999). Eastern indigo snakes are commensal with gopher tortoises and use gopher tortoise burrows as refugia and often to deposit their eggs (FWC, 2012f). In their northern range including Georgia and north Florida (north of approximately Gainesville), they prefer xeric longleaf pine sandhills with populations of gopher tortoises (Enge, et al., 2013). According to the FWS (1999), these north Florida sandhill habitats are important because they are the only widely available habitats that support gopher tortoises and thus provide the necessary thermal refugia that protects these snakes from both cold and desiccation.

Eastern indigo snakes require large tracts of land with various habitats throughout the year. The home range of adult males is larger than both adult females and juveniles. Additionally, their range is larger in spring and summer than in winter. In the northern extent of their distribution, the average eastern indigo snake range is about 12 acres in winter and 241 acres in summer (FWS, 1999). However, the range of some snakes has been documented to be as large as 3,000 acres in some areas (FWS, 2010c).

Potential Presence in the Project Area

Suitable habitat for the eastern indigo snake is present at the project site but, as noted above, there have been no documented cases of eastern indigo snakes in Duval County in more than a decade (see figures 6.2.2-3 and 6.2.2-4).

Potential Effects on Eastern Indigo Snake

The removal of wetlands, live oak hammock, coniferous plantation, and mixed forested wetlands would reduce available suitable habitat for this species. Individuals could be killed during construction by heavy machinery. However, this species can have large ranges, so there is also the possibility that this species could avoid the construction area.

Conservation Measures

Eagle LNG would follow the FWS (2013b) *Standard Protection Measures for the Indigo Snake*, which includes, in part, allowing any eastern indigo snake found during construction to move away without interference and contacting the FWS to report the snake and obtain guidance before construction continues. Eagle LNG would also excavate on-site gopher tortoise burrows where indigo snakes could be found. If indigo snakes are encountered during gopher tortoise relocations, the snakes would be allowed to leave the area. Conclusion

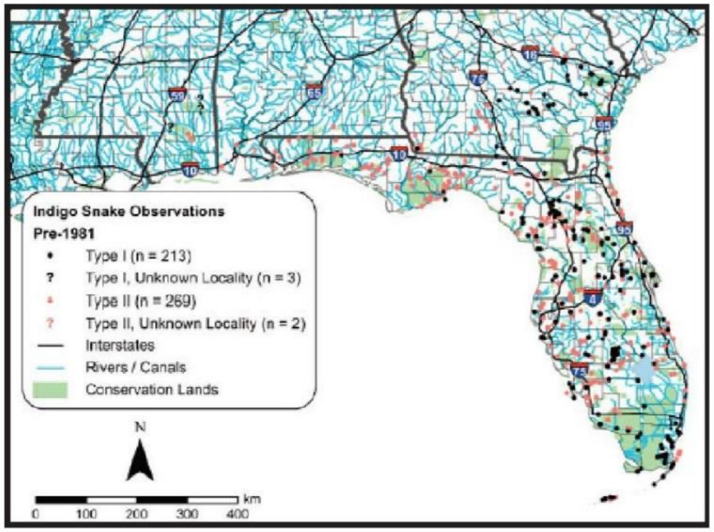
Because no eastern indigo snakes have been observed for over 10 years within Duval County, it is unlikely that this species is within the project area. However, because suitable habitat for this species exists within the project area, we reviewed the FWS (2017f) *Consultation Key for the Eastern Indigo Snake – Revised*, which provides guidance on making effects determinations for the eastern indigo snake. The project would impact more than 25 acres of suitable eastern indigo habitat and Eagle LNG would comply with FWC (2017h) *Gopher Tortoise Permitting Guidelines*; therefore, we have concluded that the project ***is not likely to adversely*** affect the eastern indigo snake.

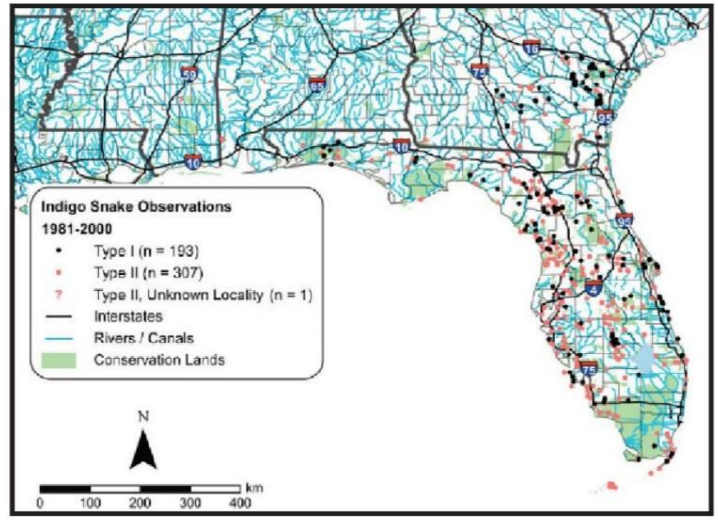
6.2.2.4 Gopher Tortoise

Gopher tortoises (*Gopherus polyphemus*) are federally listed as threatened in the western portion of their range and are candidate species for federal listing in the eastern portion of their range, including Florida. Gopher tortoises are considered a keystone species because their burrows are used by and provide refuge for more than 350 other species (FWC, 2013; FWS, 2016d). The primary threat to this species is habitat destruction, but other threats include habitat fragmentation and degradation, predation, inadequacy of regulatory mechanisms, and incompatible use of herbicides in forest or silviculture management (FWS, 2016d).

Gopher Tortoise Habitat

Gopher tortoises utilize upland habitats where they construct numerous burrows they use as protection from the elements and predators. They utilize a variety of habitats including well-drained sandy soils such as sandhill, scrub, pine flatwoods, dry prairies, and coastal dunes. Gopher tortoises feed on low growing vegetation and do best in areas with prescribed fire that reduces encroachment of hardwoods and shrubby vegetation (FWC, 2013; FWS, 2016d).





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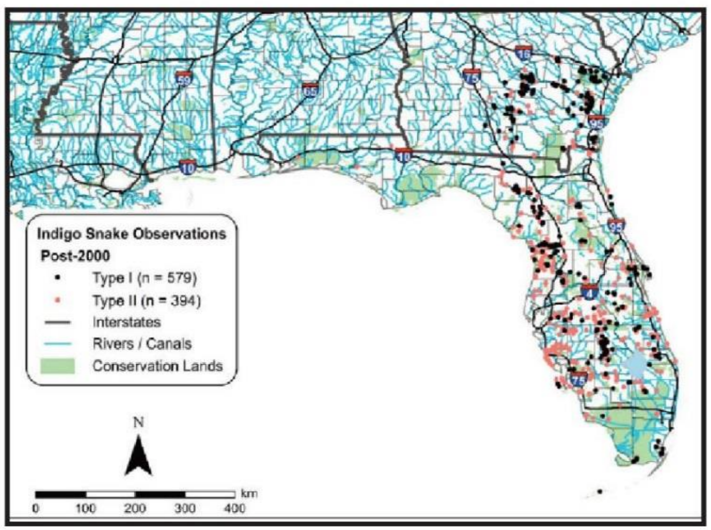

Figure 6.2.2-3
Eastern Indigo Snake Observations from Pre-1981 to Post-2000
Jacksonville Project
Duval County, Florida

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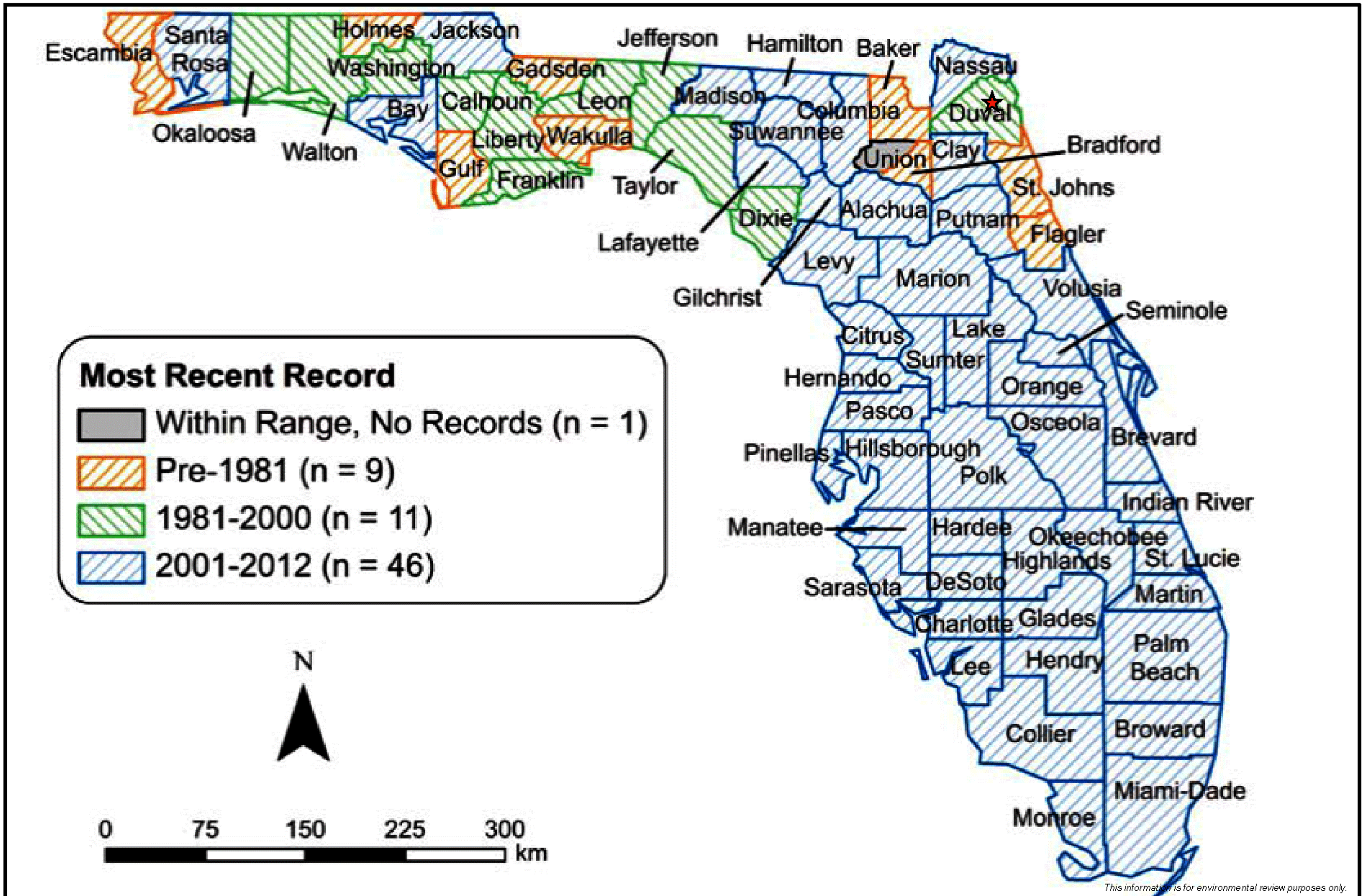

Project Location

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0 40 80 Miles

Figure 6.2.2-4
Number of Documented Eastern Indigo Snakes by County
Jacksonville Project
Duval County, Florida

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Potential Presence in the Project Area

Gopher tortoises are known to be present on the project site with six active and one inactive burrow documented during field surveys.

Potential Effects on Gopher Tortoises

Project construction would result in the loss of habitat and the removal of existing gopher tortoise burrows, which could result in the injury or death of tortoises. Eagle LNG committed to completing a 100 percent survey of all uplands within the construction limits, including a 25-foot buffer zone. Surveys would be conducted by authorized gopher tortoise agents. To protect tortoises from harm during construction, Eagle LNG committed to conducting 100 percent gopher tortoise surveys and would comply with the FWC *Gopher Tortoise Permitting Guidelines* (2017h). Eagle LNG would install and maintain silt fencing throughout project activities to prevent tortoises from moving back onto the development site and would apply for permits to relocate tortoises and tortoise commensals (e.g., gopher frog, pine snake, Florida mouse) to suitable on-site habitat or to an off-site approved recipient site.

Conclusion

Construction would remove suitable habitat for this species. Eagle LNG has committed to implement mitigation measures that would reduce the chance of killing individuals or crushing occupied burrows during construction. Based on these mitigation measures, including the FWS *Gopher Tortoise Permitting Guidelines* which includes the possible relocation of species (which would affect gopher tortoise behavior during relocation), we have concluded that the project ***is not likely to adversely affect*** the gopher tortoise.

6.2.2.5 Striped Newt

The striped newt (*Notophthlamus perstriatus*) is a candidate for federal listing. The species is endemic to north-central Florida, southeast Georgia, and portions of the Florida panhandle and southwest Georgia. Its lifecycle is complex and includes both aquatic and terrestrial stages that utilize ponds and surrounding uplands.

Striped Newt Habitat

Aquatic habitat is composed of isolated, ephemeral ponds in well-drained sands. The ponds are usually vegetated with emergent grasses and lack predatory fish. The preferred upland habitat is composed of longleaf pine-turkey oak communities with existing grasses and forbs as ground cover. Striped newts can also utilize scrub and flatwoods. Their habitat is fire dependent, which serves to maintain an open canopy and reduce litter on the forest floor, allowing for growth of ground cover that newts rely on for forage and shelter (Dodd, 1992; FWS, 2011; Hammerson and Dodd, 2004; Stevenson et al., 2007).

Potential Presence in the Project Area

It is unlikely that striped newts would be present on the project site based on a Florida survey for striped newts (Enge, 2011). The last striped newts reported in the project vicinity occurred in 1961 and 1963 (see figure 6.2.2-5). Historical data suggests that it is unlikely that striped newts would be present on the project site. There is an isolated wetland on the northwest side of the site just outside the construction limits. Aerial imagery shows that this wetland was recently clear cut. Based on the lack of documented cases of newts in the area, and the very marginal habitat that is present on the project site, it is unlikely that striped newts would be affected by the project.

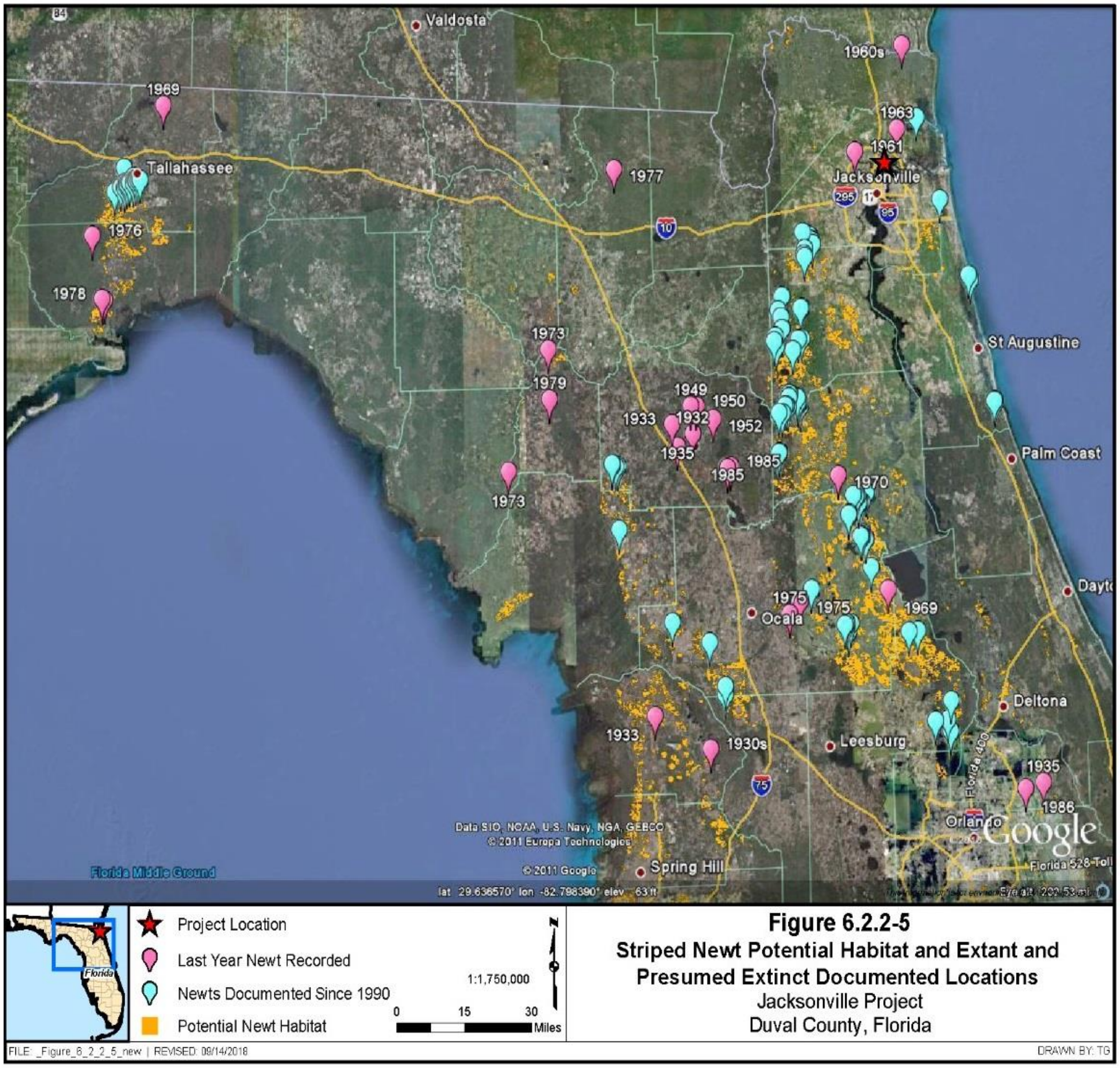

Figure 6.2.2-5
Striped Newt Potential Habitat and Extant and Presumed Extinct Documented Locations
Jacksonville Project
Duval County, Florida

Potential Effects on the Striped Newt

Construction would remove 1.2 acres of fresh water forested wetland habitat, which is not the preferred breeding habitat for this species, but could be used. Individuals could be killed or injured by heavy machinery during construction.

Conclusion

Because of the presence of usable habitat within the construction footprint, there is the potential for this species to occupy the project area. However, because the last documented sightings in this area are from about 50 years ago, it is unlikely that this species is present. Therefore, we have concluded that the Jacksonville Project ***is not likely to adversely affect***, the striped newt.

6.2.2.6 American Alligator

The American alligator (*Alligator mississippiensis*) is abundant throughout Florida, and the FWS removed the species from the ESA endangered listing in 1987 (FWS, 2008c). The species is still protected, because it is often difficult to discern from other crocodilian species, including caimans and the American crocodile, which are still protected. Population estimates number in the millions throughout the Southeast U.S. (Louisiana Department of Wildlife and Fisheries, 2018). Neither caiman nor American crocodile species ranges are within the project area.

American Alligator Habitat

This species primarily uses lakes, ponds, and freshwater and brackish wetlands as habitat to forage, rest, and breed. They can be found in Texas, Florida, the Carolinas, Louisiana, Georgia, Alabama, Arkansas, and Mississippi (FWS, 2008c). There is also a population in southern Oklahoma (FWS, 2018b) and populations are expanding into western Tennessee (Tennessee Wildlife Resources Agency, 2018).

Potential Presence in the Project Area

Construction would remove suitable wetland habitat that the American alligator could occupy. Alligators are prevalent throughout Florida, including the St. Johns River.

Potential Effects on the American Alligator

This species is likely within the vicinity of the project. Construction activities and associated noise, both in the water and near the wetlands, would likely cause the species to avoid the project area. Individuals could possibly be injured by heavy equipment, but because of the alligator's size, it is likely that they would be observed and avoided.

Conclusion

Because of the presence of usable habitat within the construction footprint, there is the potential for this species to occupy the project area. However, this species is fairly mobile, and large, making it more likely that the species could be avoided in the project area. In addition, this species is likely to avoid the project area, thereby exhibiting avoidance behavior. Because of the possibility of this species occupying the project area and the potential to affect alligator behavior, we have concluded that the Jacksonville Project ***is not likely to adversely affect***, the American alligator.

7.0 CUMULATIVE EFFECTS

This section evaluates the potential impacts of reasonably foreseeable actions that are unrelated to the Jacksonville Project but that may affect federally listed species and their designated critical habitats within the Jacksonville Project action area. Cumulative effects are defined as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation" (Title 50 of the Code of Federal Regulations Part 402.02). Many of the large-scale activities that could occur in the action area, such as highway development or other LNG facilities, have a federal nexus that requires consultation under section 7 of the ESA. Additionally, projects that could affect marine species regulated by NOAA Fisheries would also require a federal permit. As such, these projects are not included in this cumulative effects analysis.

Table 7-1 lists known present or reasonably foreseeable future projects in the project area that may contribute to cumulative effects within the Jacksonville Project action area. Non-federal project-related activities are planned in Duval County (Jacksonville, Nocatee, and North Jacksonville) and Nassau County (Fernandina Beach) that could affect the West Indian manatee, wood stork, eastern indigo snake, gopher tortoise, striped newt, and American alligator. If these projects affect habitats with known presence of these species, potential cumulative impacts could occur.

Any of the projects listed in table 7-1 would require, at a minimum, a state permit for construction if any wetlands are present on the site. As part of the state permit process, each application would be reviewed for potential impacts on threatened and endangered species and formal consultation with the FWS would be initiated if potential impacts were identified. The FWS has developed programmatic keys for the wood stork and eastern indigo snake that guide reviewers (and applicants) in determining the potential impacts on these species. In addition, the FWC has developed guidelines for limiting the impacts on manatees and gopher tortoises through standard construction conditions and state permitting guidelines. With the implementation of these tools, the non-federal projects in table 7-1, in conjunction with the Jacksonville Project, would not likely result in cumulative impacts on threatened and endangered species.

8.0 CONCLUSION

In conclusion, we have determined that the proposed action ***is not likely to adversely affect*** the following species:

NOAA Fisheries

- Atlantic sturgeon
- Shortnose sturgeon
- Smalltooth sawfish
- Blue whale
- Fin whale
- Sei whale
- Sperm whale
- NARW
- Green sea turtle
- Hawksbill sea turtle
- Kemp's Ridley sea turtle
- Leatherback sea turtle
- Loggerhead sea turtle

FWS

- West Indian manatee
- Wood stork
- Eastern indigo snake
- Gopher tortoise
- Striped newt
- American alligator

We have also determined that the project would have *no effect* on critical habitat for the NARW, loggerhead sea turtle critical habitat, or for the Florida manatee.

TABLE 7-1

Projects Considered in the Cumulative Impacts Analysis for the Jacksonville Project

	Project (or Owner)	Location	Distance from Site (miles)	Status	Description
Energy Projects					
1	Peoples Gas Cypress Creek Extension Project	Multiple Locations	Varies	On-going	General distribution system maintenance activities regularly undertaken by Peoples Gas that are unrelated to any system upgrades required to serve the Jacksonville Project.
2	Chesapeake Utilities Corporation/Florida Public Utilities	Fernandina Beach	19	Completed and in commercial service	The Eight Flags Energy facility is a combined heat and power plant that will generate steam to be sold to Rayonier Performance Fibers for use in the operation of its facility. Will also produce about 20 megawatts of base load power that will be sold to Florida Public Utilities Company for distribution to its retail electric customers.
Residential, Recreational, and Commercial Development Projects (Including Entertainment Facilities and Hotels)					
3	Walton International Group	North Jacksonville	8.5	Suspended	692-acre residential development, single family homes, retail and office space.
4	HE Otter, LLC	Jacksonville	12.6	Under construction	Mixed-use development, apartments, retail, and office space.
5	Alta Lakes Planned Unit Development (PUD)	Jacksonville	3.3	Under construction	Large residential development, single-family residences.
6	Copper Ridge PUD	Jacksonville	19.2	Planning	Large Residential development, single-family residences.
7	Plantation Oaks/ Longleaf PUD	Jacksonville	18	Under Construction	Residential development, single-family residences.
8	Hampton West PUD	Jacksonville	7.3	Under Construction	Residential development, single-family residences.
9	Sunbeam Road PUD	Jacksonville	14.5	Planning	Large Residential development, single-family residences.
10	Liberty Square South	Jacksonville	16.5	Planning	Residential development, may include townhomes, condominiums, and single-family homes.
11	River City Rehabilitation Center	North Jacksonville	5.5	Planning	Owner is Health Care Managers, Inc. A 9.8-acre parcel with a 75,000-square-foot rehabilitation center with 111 beds.
12	VanTrust Real Estate	Nocatee	23.3	Planning	Four to six buildings, each four to six stories high with 100,000 to 150,000 square feet.
Associated Non-jurisdictional Projects					
13	Jacksonville Electric Authority	Adjacent to project site	0	Planning	Tie-in to power transmission line and switch station.
14	Peoples Gas (transport of feed gas to project)	Adjacent to project site	0	Planning	Transportation of feed gas to the Jacksonville Project.

Sources: City of Jacksonville, 2016a and 2016b; Florida Department of Transportation, 2016; Jacksonville Electric Authority, 2016; Jacksonville Business Journal, 2015; Metro Jacksonville, 2016, DeLallo, 2016, WesPac Midstream, 2016, Florida Public Service Commission, 2016. Financial News & Daily Record, 2015 & 2016a-e; The Florida Times-Union, 2016a-i; Modern Cities, 2016; Jacksonville Business Journal, 2016a and b; Clay Today, 2016; St Johns County Government, 2016

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APPENDIX D

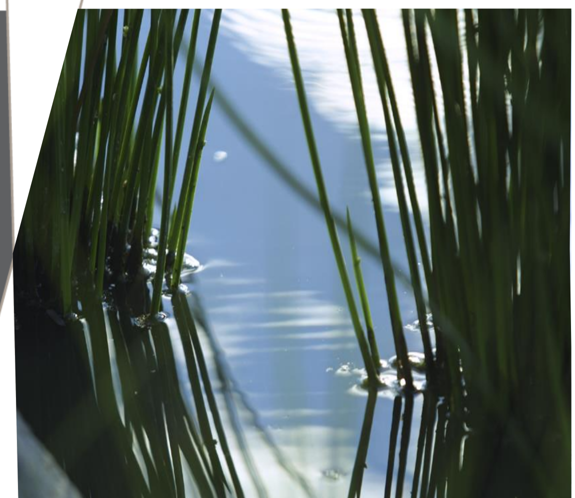
ESSENTIAL FISH HABITAT ASSESSMENT (REVISED)

Essential Fish Habitat Assessment (Revised)

Eagle LNG Partners, L.L.C.

Jacksonville Project

FERC DOCKET NO. PF15-7-000



Shaping the Future

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Acronyms

cbm	ocean freight shipment cubic meters
EFH	Essential Fish Habitat
EFHA	Essential Fish Habitat Assessment
Jacksonville Project	Eagle LNG Partners Jacksonville LLC proposed LNG project
JEA	Jacksonville Electric Authority
MAFMC	Mid-Atlantic Fisheries Management Council
MMPA	Marine Mammal Protection Act of 1972\
FWC	Florida Fish and Wildlife Conservation Commission
Federal Channel	Channel Jacksonville Harbor Federal Navigation Channel
USACE	U.S Army Corps of Engineers

1 Introduction

The purpose of this document is to present an Essential Fish Habitat Assessment (EFHA) for the Eagle LNG project to be constructed near Jacksonville, Florida. The EFHA and information herein includes a description of the Eagle LNG Jacksonville Project, identification of Essential Fish Habitat (EFH) within the project area, a description of the managed aquatic species within the project area, an assessment of the project actions and their effect on the EFH and managed species, and the mitigation measures to be implemented to reduce impacts. For the purposes of this report, findings from an EFHA for the dredging of the navigation channels near the current project area prepared in January 2011 was utilized in conjunction with fisheries data and management council documents.

The EFHA was prepared in January 2017 and revised in October 2017 to include a discussion of the Dredge Material Management Area (DMMA) discharge pipe and discharge location in Drummond Creek.

2 Project Description

The Eagle LNG proposes to construct a facility (The Jacksonville Project) located in the lower basin area of the St. Johns River in Duval County near the City of Jacksonville, Florida. The Jacksonville Project site is located at approximately River Mile 14.5 and northwest of Bartram Island. The lower St. Johns River is a broad and meandering river, within which lies the federal system of navigation channels for Jacksonville Harbor (Federal Channel) and includes a mix of channels dredged to accommodate deep draft vessels; an estuary with extensive salt marshes; adjacent wetlands; and hardwood hammocks that support a diverse community of plants and animals. Regular maintenance dredging of the Federal Channel is performed by the United States Army Corps of Engineers (USACE) to maintain the authorized depth of 40 feet. USACE plans to begin deepening and widening the Federal Channel in 2016 to 47 feet from River Mile 0 to River Mile 13 (east of the Project site) to accommodate larger container ships which will be able to access eastern ports of the United States following the expansion of the Panama Canal. The project site is zoned for industrial use. Other uses in the vicinity of the Jacksonville Project site include a Marathon Petroleum bulk fuel terminal, a Buckeye Partners bulk fuel terminal, and a U.S. Navy fuel terminal.

Based on a boundary survey conducted in April 2015, the site is approximately 193.4 acres with the Jacksonville Project expected to occupy roughly 85 acres at completion. Of the total parcel acreage, approximately 174.1 acres are onshore and approximately 19.3 acres are submerged land within the St. Johns River. Current plans include construction of one LNG storage tank, a marine load-out facility and a dock that could accommodate a single Liquid Natural Gas Carrier (LNGC) up to 45,000 cbm in capacity as well as bunkering barges (for domestic ship fueling at the Port of Jacksonville and other nearby domestic ports), a truck load-out facility, liquefaction train facilities, inlet natural gas boost compression, interconnect piping, flare stack, water facilities, power facilities, communication facilities, and associated facility buildings. The Jacksonville Project will receive natural gas transported by a local utility through existing pipeline facilities located adjacent to the Jacksonville Project site, and will procure electric energy from Jacksonville Electric Authority (JEA), the electric utility that serves the Jacksonville area.

The tract of land where the Jacksonville Project is proposed to be located was previously a residential site. The residential structure has since been torn down. The land is now undeveloped and vacant.

A geotechnical investigation was undertaken and field work was completed to determine the properties of the underlying soils at the proposed Jacksonville Project site. The outcome of this geotechnical investigation allowed evaluation of:

- Suitable ground improvement techniques for the areas of the LNG storage tank and the LNG trains, if necessary;
- Best approach for excavating, dredging and constructing the LNG vessel loading facility and;
- Piling design options.

Figure 2-1 summarizes the currently proposed construction schedule.

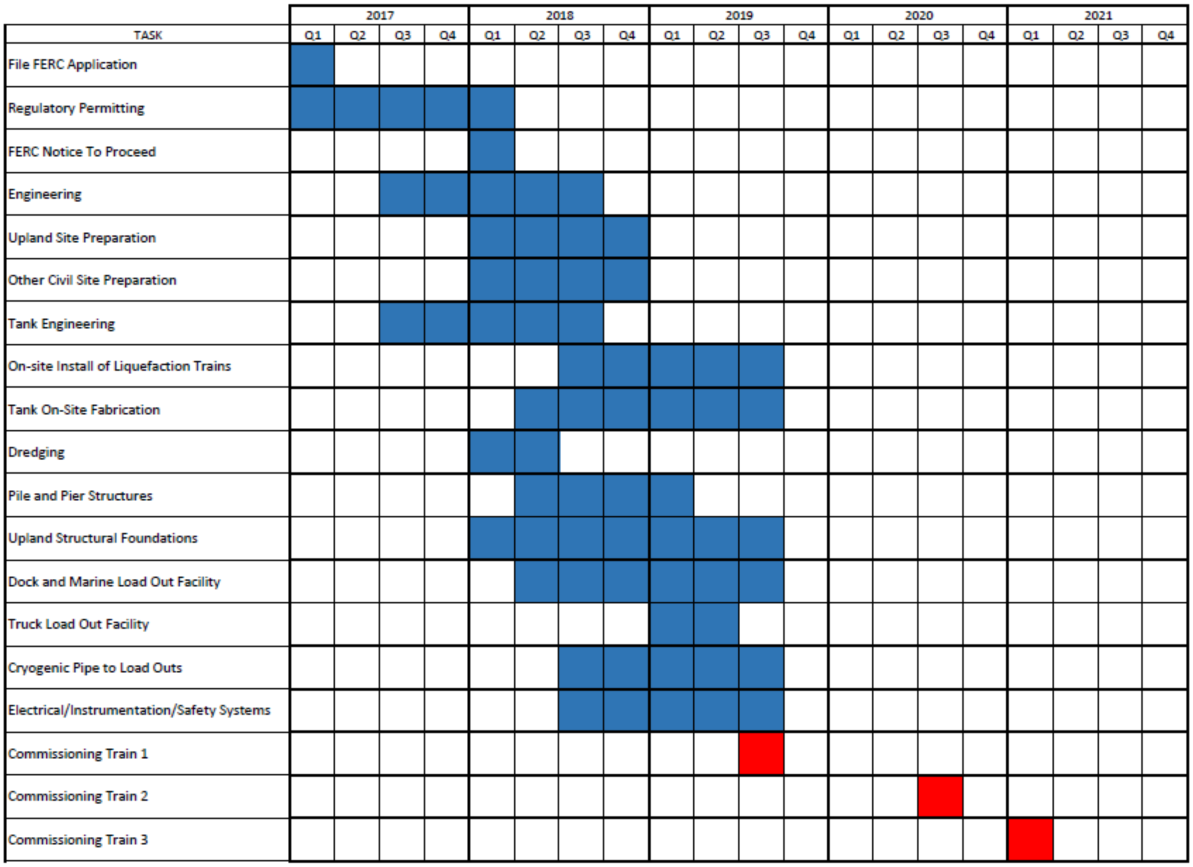

Figure 2-1: Proposed Project Schedule

The LNG trains will be designed, constructed, operated, and maintained in accordance with DOT/PHMSA Federal Safety Standards for Liquefied Natural Gas Facilities, 49 C.F.R. Part 193. The LNG trains will also meet the NFPA 59A LNG Standards. RR 11 includes information about reliability and safety of the Project.

The construction of the Jacksonville Project LNG trains will be undertaken using a modular approach. Each individual LNG train will be broken down into process modules. The modules will be fabricated off-site in a fabrication workshop and then transported to the site via truck. Equipment, pipes, valves, electrical and instrument components will be pre-fabricated, mounted to skids, insulated, painted and tested in the fabrication workshop to reduce on-site installation work and ensure quality. The fabrication workshop(s) is existing and currently performs fabrication for multiple projects and will not be constructed or operated solely for the execution of this Project.

The storage tank(s) will be a single containment tank system comprised of a double wall, with an inner wall being of low temperature 9% Ni stainless steel and the outer wall of A516-70 steel. The LNG storage tank(s) will be designed to meet the requirements of NFPA 59A and other relevant standards.

The Eagle LNG marine terminal will consist of a land access trestle terminated by a LNG marine loading platform. Refer to Appendix 1.A for a depiction of the marine terminal layout. The access trestle and LNG marine loading platform will host necessary pipe racks and supporting equipment. The LNG marine loading platform will be located approximately 900 feet offshore as necessary to approach the Federal Channel and gain access to the deepest available water. The marine terminal structures are expected to set back from the Federal Channel approximately 255 feet. In any case, the marine terminal, with the largest design vessel in berth, will not encroach on the safe setback distance (150 feet) as defined by the USACE for Cut 50 of the Federal Channel.

Symmetrically flanking the LNG marine loading platform, the marine terminal will include four berthing dolphins to accommodate the full range of design ships. Similarly, four mooring dolphins will provide for the necessary spectrum of mooring arrangements.

The marine terminal's final pile size, material, and number of pilings will be determined during the final structural engineering for the Project. However, based on preliminary design assessment, the access trestle, LNG marine loading platform, and dolphin gangways will likely be founded on 24-inch pre-stressed concrete (PSC) piles, and the mooring and berthing will be founded on 30-inch steel pipe piles filled with reinforced steel and concrete. Table 2-1 below outlines the estimated type, number, and length of piles for each major structure category.

Installation of concrete piles will likely include predrilling or jetting to initially position and set each pile. Then pile driving will occur to reach the specified minimum depth and attain appropriate pile bearing capacity.

To attain the significant pile tension loads imposed by high magnitude laterally loaded conditions (ship berthing and mooring), the steel pipe piles will require significant embedment into the limestone and/or underlying marl formation. Local marine contractors have experience installing pipe piles into similar geology, and the installation will involve the following generalized procedure:

> Vibrate or drive the pipe pile until reaching competent limestone;

> Advance a rotary drill bit or similar equipment (with bit approximately 2 – 3 inches smaller in diameter than the outside of the pile) through the limestone and dense marl;

> Drive the pipe pile with an impact hammer to the depth required to achieve the allowable bearing and tension capacity;

> Install a steel reinforcing cage; and

> Place concrete within the pipe pile by use of tremie technique.

Table 2-1: Pile Requirements for Martine Terminal Components

Structure Type	Pile Type	Estimated Pile Count	Diameter (inches)	Estimated Pile Length (ft)	Estimated Length below River (ft)
Trestle	24-inch square PSC	85	24	50-70	30-50
LNG Loading Platform	24-inch square PSC	28	24	50-70	20-30
Breasting Dolphin	30-inch steel pipe	54	30	80-100	40-60
Mooring Dolphin	30-inch steel pipe	48	30	80-100	60-80
Walkways	18-inch square PSC	24	18	40-45	20-30

Based on the results of the structural modeling, the design applies a maximum expected service loading for the steel pipe piles of 75 tons in tension and 150 tons in compression. The design applies a maximum expected service loading for the PSC piles of 37.5 tons in tension and 100 tons in compression.

Most, if not all, construction of the marine terminal structure will take place from in-water barges, and will feature the use of cranes to facilitate pile driving. The project specifications will allow the contractor to use its discretion regarding construction means and methods. The trestle deck likely will feature a structural deck element constructed of prestressed/precast concrete. This could allow for construction of the trestle beginning at the shore and ending at the LNG marine loading platform, while using the constructed deck for staging. This construction sequence will allow the contractor to drive materials and construction equipment on the completed portion of the access trestle to construct subsequent sections of the access trestle or terminal dolphins. At this time, the marine contractor has not yet been chosen. However, the City of Jacksonville benefits from multiple qualified marine contractors who may participate in project construction. These contractors maintain barges and equipment in close proximity to the project site.

Construction of the marine terminal will require dredging of approximately 10.1 acres of river bottom. Dredged materials are expected to include silts, sands, and potentially weathered limestone. Eagle LNG will construct a permanent DMMA to handle both initial dredging and subsequent maintenance dredging events. The DMAA will provide a single-cell dredged material processing facility comprised of an earthen containment dike enclosure, interior box weirs and piping system for controlled return water discharge; a perimeter road for transport and inspection; a perimeter ditch and retention basin for stormwater seepage water management; and an exterior working pad for equipment access, dredged material offloading, stockpile, and truck loading of dewatered dredged material. Water discharged from the DMMA will enter Drummond Creek through a temporary pipeline about 3 to 4 feet wide. The endpoint of the discharge pipeline is located outside the saltmarsh fringe and in the waters of Drummond Creek. Discharges from the DMMA occur under gravity flow and do not include the application of pumps. The design includes an oversized/upturned pipe discharge fitting to further diffuse energy. The system was designed to allow for appropriate settling times to adhere to effluent regulations.

3 Essential Fish Habitat

Game and non-game fish species in Florida are regulated and protected by the United States Fish and Wildlife Service (USFWS), National Marine Fisheries Services (NMFS), and Florida Fish and Wildlife Conservation Commission, in accordance with the United States Fish and Wildlife Conservation Act of 1980 (16 United States Code [USC] 2901-2911), the Magnuson-Stevens Fisheries Conservation and Management Act, as amended through 1996, the Endangered Species Act (ESA), and the United States Fish and Wildlife Coordination Act of 1958. The 1996 amendments to the Magnuson Stevens act set a mandate that NOAA fisheries, regional fisheries management councils, and other federal agencies identify and protect important marine and anadromous fisheries habitat (EFH). These EFHs are to be delineated in Fishery Management Plans and consultation is to be conducted if any activity is to be conducted which adversely affects these habitats and managed species.

Waters associated with the St. Johns River and in the proposed Project area are identified as Essential Fish Habitat (EFH) for the species listed in Table 3-1. These habitats, managed species, and their prey are managed with guidance from the Mid-Atlantic Fisheries Management Council (MAFMC), South Atlantic Fisheries Management Council (SAFMC), NMFS, and Atlantic States Marine Fisheries Commission (ASMFC).

The Jacksonville Project site includes portions of Drummond Creek and experiences freshwater influence from Broward River to the east (downstream) and Trout River to the west (upstream). The St. Johns River and its tributaries adjacent to the proposed Jacksonville Project site are intertidal, estuarine environments that support a warm water estuarine fishery. The Florida Department of Environmental Protection (FDEP) has classified these surface waters as Class III: Fish Consumption, Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife. For species occurring in these waters, Fishery Management Plans (FMPs) exist for Snapper-Grouper complex [SAFMC] (Figure 3-1), Spiny Lobster [SAFMC] (Figure 3-2), Shrimp [SAFMC] (Figure 3-3), Coastal Migratory Pelagics [SAFMC] Figure 3-4), Red Fish [SAFMC in conjunction with GMFMC], Bluefish [MAFMC], and Summer Flounder [MAFMC]. Additionally, Interstate Fishery Management Plans exist for Atlantic Croaker, Atlantic Herring, Atlantic Sturgeon, Black Drum, Horeshoe Crab, Shad and River Herring, Spot, Spotted Sea Trout, and Weakfish.

The site of the proposed marine terminal is primarily a mud, shell hash, or sand bottom with no known seagrass. There are identified rock areas adjacent to the project site as well as salt marsh habitat. Sample analyses suggest mud and clay composition with no chemical concentrations of immediate concern beyond arsenic. The closest public recreational boat ramps identified are across the river at Reddie Point or the Lions Club boat ramp. The surrounding properties appear to be industrial or commercial and do not support recreational piers.

Table 3-1. Essential Fish Habitat Species Located in the Jacksonville Project Area

Managed Species [FMP]	Scientific Name	Common Name	Habitat Areas of Particular Concern (HAPC)	Presence
Snapper-Grouper Complex (73 species)	*Lutjanus analis, Lutjanus griseus, Lutjanus synagris, Centropristis philadelphica, Chaetodipterus faber*	Mutton snapper, Gray/Mangrove Snapper, Lane Snapper, Rock Seabass, Spadefish	Yes	Year round
Spiny Lobster	*Panulirus argus*	Spiny Lobster	No	Year round
Shrimp (3 species)	*Farfantepenaeus aztecus, Farfantepenaeus duorarum, Litopenaeus setiferus*	Brown shrimp, Pink Shrimp, White Shrimp	Yes	Year round
Red Fish	*Sciaenops ocellatus*	Red Fish	No	Year round
Coastal Migratory Pelagics (5 species)	*Scomberomorus cavalla, Scomberomorus maculatus*	King mackerel, Spanish Mackerel	No	Year round
Bluefish	*Pomatomus saltatrix*	Bluefish	No	Year Round
Summer flounder	*Paralichthys dentatus*	Summer Flounder	Yes	Year Round

Source: South Atlantic Fishery Management Council 2015

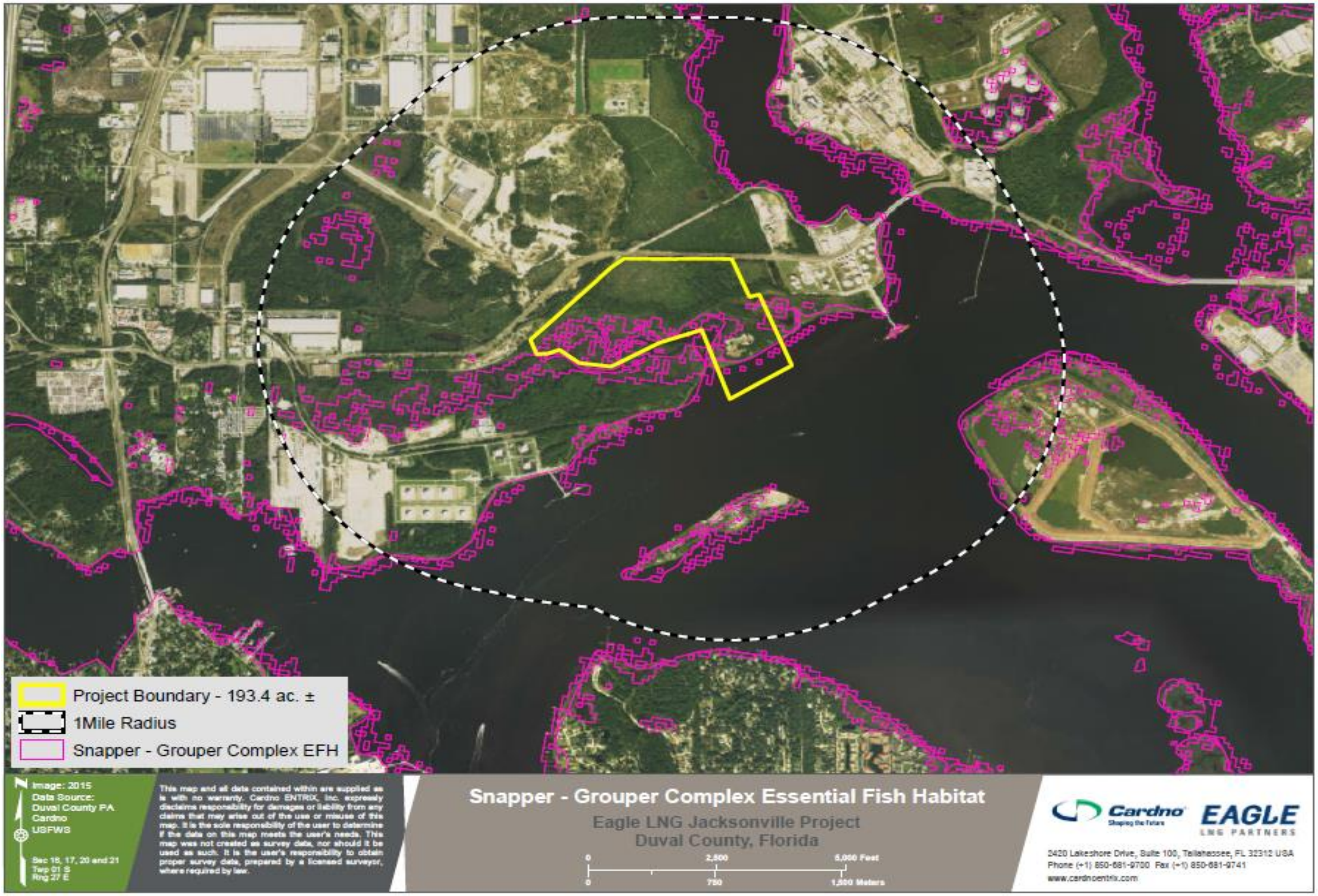

Figure 3-1: Snapper-Grouper Complex EFH

D-14

Figure 3-2: Spiny Lobster EFH

D-15

Figure 3-3: Shrimp EFH-HAPC

D-16

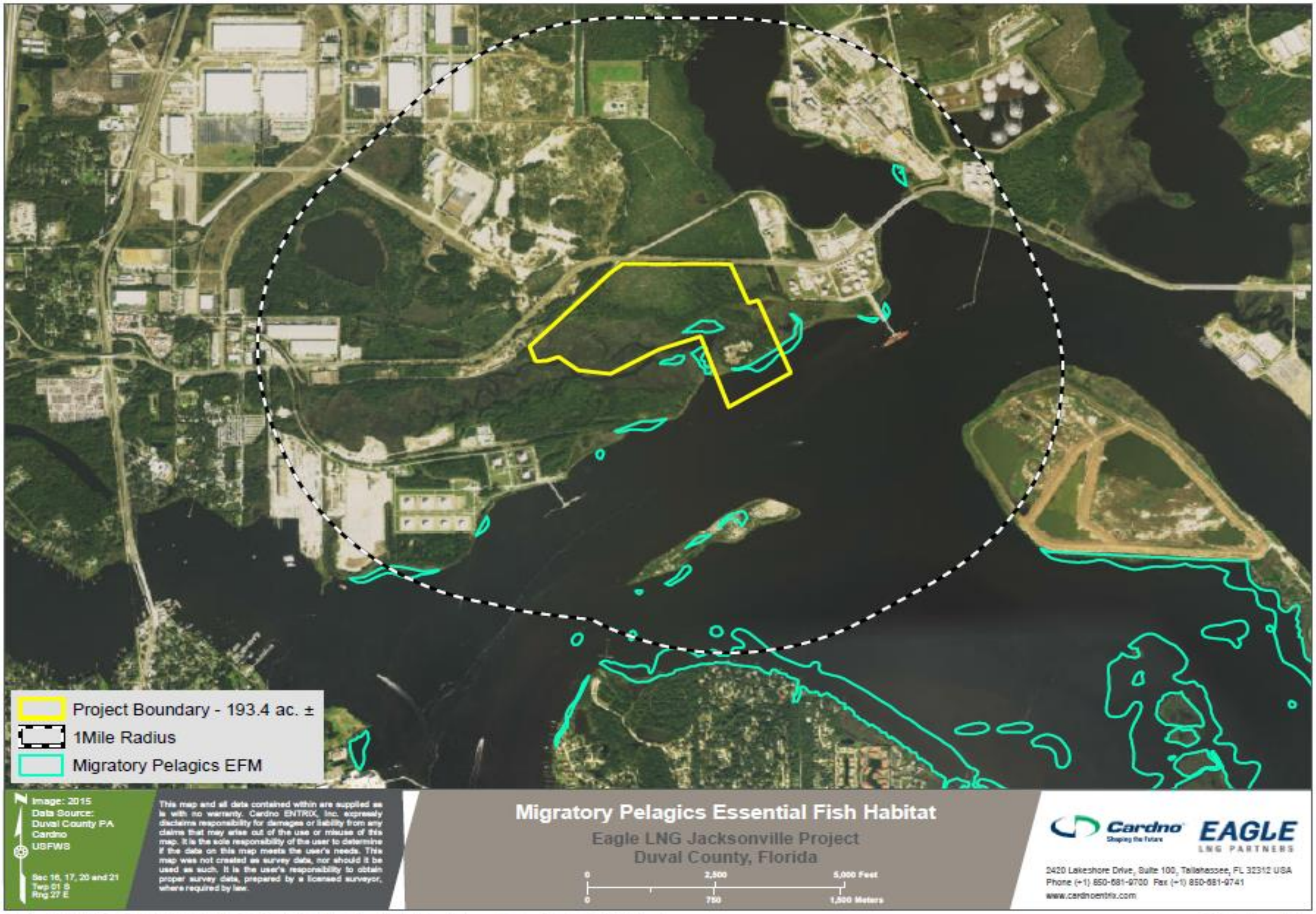

Figure 3-4: Migratory Pelagics EFH

4 Managed Fish Species

Based on Fisheries Independent Monitoring (FIM) data, more than 140 species are observed within the St Johns River Zone C which encompasses the project area (. Beyond those already identified and part of management plans and associated with EFH, other commercially and/or recreational important species present include Blue Crab, Sheepshead, Jack Crevalle, Snook, Southern and Gulf Flounder, Lookdown, Pompano, Permit, Bonefish, White and Striped Mullet, Southern, Gulf, and Northern Kingfish, Stone Crab, American Butterfish, Spotted Hake, and Gafftopsail Catfish. Both Shortnose Sturgeon and Atlantic sturgeon have also been historically documented along the St Johns River though current observation is rare.

FIMs 2010-2013 assessment reports and datasets were utilized to determine presence within the St. Johns River monitoring zone C which contains the project area (Table 4-1). Further, when species life stages were most likely present within the project area were determined with the same assessment reports in conjunction with the Estuarine Living Marine Resource (ELMR) Database for the St. Johns River (Table 4-2, http://www8.nos.noaa.gov/biogeo_public/elmr.aspx). These data were aligned with the known/identified management plans and focus species. The following descriptions focus on those species observed in or near the project area and are associated with the EFH and FMPs.

Table 4-1: FIM 2010-2013 species observed

Species	Common Name	Species	Common Name
Albula vulpes	Bonefish	*Portunus* spp.	Swimming Crab
Alosa mediocris	Hickory Shad	*Rimapenaeus constrictus*	Roughneck Shrimp
Alosa sapidissima	American Shad	*Sardinella aurita*	Round Sardinella
Archosargus probatocephalus	Sheeps Head	*Xiphopenaeus kroyeri*	Atlantic Seabob Shrimp
Bagre marinus	Gafftopsail Catfish	*Achirus lineatus*	Lined Sole
Bairdiella chrysoura	Silver Perch	*ameiurus catus*	White Catfish
Brevoortia spp.	Menhaden	*Ancylopsetta quadrocellata*	Ocellated Flounder
Callinectes ornatus	Ornate Blue Crab	*Ariopsis felis*	Hardhead Catfish
Callinectes sapidus	Blue Crab	*Astroscopus y-graecum*	Southern Stargazer
Callinectes similis	Lesser Blue Crab	*bascanichthys bascanium*	Sooty Eel
Carangidae sp.	Jack/Pompano	*Bathygobius soporator*	Frillfin Goby
Caranx hippos	Jack Crevalle	*Charybdis hellerii*	Indo-Pacific Swimming Crab
Caranx latus	Horse-eye Jack	*Chasmodes bosquianus*	Stripped Blenny
Centropomus undecimalis	Snook	*Chilomycterus schoepfii*	Stripped Burrfish
Centropristis philadelphica	Rock Seabass	*Citharichthys macrops*	Spotted Whiff - Flatfish
Chaetodipterus faber	Spadefish	*Citharichthys spilopterus*	Bay Whiff

Species	Common Name	Species	Common Name
Cynoscion Complex	Weakfishes	Ctenogobius boleosoma	Darter Goby
Cynoscion nebulosus	Spotted Sea Trout	Ctenogobius shufeldti	American Freshwater Goby
Cynoscion nothus	Silver Sea Trout	Ctenogobius smaragdus	Emerald Goby
Dorosoma cepedianum	American Gizzard Shad	ctenogobius stigmaticus	Marked Goby
Dorosoma petenense	Threadfin Shad	*Dasyatis sabina*	Atlantic Stingray
Farfantepenaeus aztecus	Brown Shrimp	*Dasyatis say*	Bluntnose Stingray
Farfantepenaeus duorarum	Pink Shrimp	*Diapterus auratus*	Mojarra
Farfantepenaeus spp.	Penaeid spp.	*Etropus crossotus*	Fringed Flounder
Harengula jaguana	Scaled Herring	*fundulus chrysotus*	Golden Top Minnow
Leiostomus xanthurus	Spot (Croaker fam)	*Fundulus heteroclitus*	Mummichog (Small Killifish)
Limulus polyphemus	Horseshoe Crab	*Fundulus majalis*	Stripped Killifish
Litopenaeus setiferus	White Shrimp	*fundulus seminolis*	Seminole Killifish
Lutjanus analis	Mutton Snapper	*Gambusia holbrooki*	Eastern Mosquitofish
Lutjanus griseus	Gray Snapper	*Gobiesox strumosus*	Skilletfish
Lutjanus synagris	Lane Snapper	*Gobioides broussonetii*	Violet Goby
Menippe spp.	True Crab/Stone Crab	*Gobionellus oceanicus*	Highfin Goby
Menticirrhus americanus	Southern Kingfish - Croaker	*Gobiosoma bosc*	Naked Goby
menticirrhus littoralis	Gulf King Croaker	*Gobiosoma robustum*	Code Goby
Menticirrhus saxatilis	Northern Kingfish - Croaker	*Gobiosoma spp.*	Goby spp.
Micropogonias undulatus	Atlantic Croaker	*Gymnura micrura*	Smooth Butterfly Ray
Mugil cephalus	Stripped Mullet	*Hypleurochilus geminatus*	Crested Blenny
Mugil curema	White Mullet	*hyporhamphus spp.*	Half Beaks
Opisthonema oglinum	Atlantic Thread Herring	*Hypsoblennius hentz*	Feather Blenny
Paralichthys albigutta	Gulf Flounder	*Lucania parva*	Rainwater Killifish
Paralichthys dentatus	Summer Flounder	*Microgobius gulosus*	Clown Goby
Paralichthys lethostigma	Southern Flounder	*Microgobius thalassinus*	Green Goby
Paralichthys squamilentus	Broad Flounder	*Microphis brachyurus*	Short Tailed Pipefish
Peprilus paru	Harvestfish	*Myrophis punctatus*	Speckled Worm Eel
Peprilus triacanthus	American Butterfish	*ogcocephalus cubifrons*	Batfish
Pogonias cromis	Black Drum	*Oligoplites saurus*	Leatherjacket

Species	Common Name	Species	Common Name
Pomatomus saltatrix	Bluefish	*Ophidion marginatum*	Stripped Cusk Eel
Sciaenops ocellatus	Red Fish	*Opsanus tau*	Oyster Toad Fish
Scomberomorus cavalla	Kingfish - Mackeral	*Poecilia latipinna*	Sailfin Molly
Scomberomorus maculatus	Spanish Mackeral	*Prionotus carolinus*	Sea Robbin
Selene vomer	Lookdown	*Prionotus rubio*	Blackwing Searobbin
Trachinotus carolinus	Pompano	*Prionotus scitulus*	Leopard Searobbin
Trachinotus falcatus	Permit	*Prionotus tribulus*	Bighead Searobbin
Urophycis regia	Spotted Hake	*rhinoptera bonasus*	Cownose Ray
Anchoa hepsetus	Broad-Striped Anchovy	*Sphoeroides nephelus*	Southern Puffer
Anchoa lyolepis	Short Finger Anchovy	*Sphoeroides spengleri*	Bandtail Puffer
Anchoa mitchilli	Bay Anchovy	*Sphyraena barracuda*	Great Barracuda
Chloroscombrus chrysurus	Atlantic Bumper	*Sphyraena borealis*	Northern Sennet
Cyprinodon variegatus	Sheephead Minnow	*Sphyraena guachancho*	Guachanche Barracuda
Elops saurus	Ladyfish	*stellifer lanceolatus*	American Stardrum
Eucinostomus gula	Jenny Mojarra	*Stephanolepis hispidus*	Planehead Filefish
Eucinostomus harengulus	Tidewater Mojarra	*Stomolophus meleagris*	Cannonball Jellyfish
Eucinostomus spp.	Mojarra spp.	*Strongylura marina*	Needlefish - Atlantic
Labidesthes sicculus	Brook Silverside	*Symphurus plagiusa*	Black Cheek Toungfish
Lagodon rhomboides	Pinfish	*Syngnathus fuscus*	Northern Pipefish
larimus fasciatus	Banded Drum	*Syngnathus louisianae*	Chain Pipefish
Membras martinica	Rough Silverside	*Syngnathus scovelli*	Gulf Pipefish
Menidia menidia	Atlantic Silverside	*Synodus foetens*	Lizard Fish
Menidia spp.	Silverside spp.	*Trichiurus lepturus*	Large Head Hairtail - Cutlassfish
Mugil cephalus	Stripped Mullet	*Trinectes maculatus*	Hogchoker - Flat Fish
Mugil curema	White Mullet	*Tylosurus crocodilus*	Houndfish
Orthopristis chrysoptera	Pigfish - Grunt		

Table 4-2: Estuarine Living Marine Resources Database for the St. Johns River and available species

Common Name	LifeStage	Salinity	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
AMERICAN SHAD	EGG	0-0.5 ppt	3	3	3	3	3	0	0	0	0	0	0	3
AMERICAN SHAD	LAR	0-0.5 ppt	3	3	3	3	3	3	0	0	0	0	0	3
AMERICAN SHAD	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
AMERICAN SHAD	JUV	>25 ppt	3	0	0	0	0	0	0	0	0	3	3	3
AMERICAN SHAD	JUV	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
AMERICAN SHAD	ADU	0.5-25 ppt	3	3	3	3	3	0	0	0	0	0	3	3
AMERICAN SHAD	ADU	>25 ppt	3	3	3	3	3	0	0	0	0	0	3	3
AMERICAN SHAD	ADU	0-0.5 ppt	3	3	3	3	3	0	0	0	0	0	3	3
AMERICAN SHAD	SPA	0-0.5 ppt	3	3	3	3	3	0	0	0	0	0	0	3
ATLANTIC CROAKER	LAR	0.5-25 ppt	4	4	4	4	0	0	0	0	0	0	0	4
ATLANTIC CROAKER	LAR	>25 ppt	4	4	4	4	0	0	0	0	0	0	0	4
ATLANTIC CROAKER	JUV	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
ATLANTIC CROAKER	JUV	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
ATLANTIC CROAKER	JUV	0-0.5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
ATLANTIC CROAKER	ADU	0.5-25 ppt	3	3	3	3	3	4	4	4	4	4	3	3
ATLANTIC CROAKER	ADU	>25 ppt	3	3	3	3	3	4	4	4	4	4	4	4
ATLANTIC CROAKER	ADU	0-0.5 ppt	3	3	3	3	3	4	4	4	4	4	3	3
ATLANTIC MENHADEN	LAR	0.5-25 ppt	3	3	3	3	3	0	0	0	0	0	0	0
ATLANTIC MENHADEN	LAR	>25 ppt	3	3	3	3	3	0	0	0	0	0	0	0
ATLANTIC MENHADEN	LAR	0-0.5 ppt	3	3	3	3	3	0	0	0	0	0	0	0
ATLANTIC MENHADEN	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ATLANTIC MENHADEN	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ATLANTIC MENHADEN	JUV	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ATLANTIC MENHADEN	ADU	0.5-25 ppt	2	2	2	2	2	4	4	4	4	4	3	2
ATLANTIC MENHADEN	ADU	>25 ppt	2	2	2	2	2	4	4	4	4	4	3	2

Common Name	LifeStage	Salinity	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
ATLANTIC STURGEON	EGG	0.5-25 ppt	0	0	0	0	2	2	2	0	0	0	0	0
ATLANTIC STURGEON	EGG	0-0.5 ppt	0	0	0	0	2	2	2	0	0	0	0	0
ATLANTIC STURGEON	LAR	0.5-25 ppt	0	0	0	0	2	2	2	2	0	0	0	0
ATLANTIC STURGEON	LAR	0-0.5 ppt	0	0	0	0	2	2	2	2	0	0	0	0
ATLANTIC STURGEON	JUV	0.5-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ATLANTIC STURGEON	JUV	>25 ppt	0	0	0	0	0	0	0	0	2	2	2	0
ATLANTIC STURGEON	JUV	0-0.5 ppt	2	2	2	2	2	2	2	2	2	2	2	2
ATLANTIC STURGEON	ADU	0.5-25 ppt	0	0	2	2	2	2	2	2	0	0	0	0
ATLANTIC STURGEON	ADU	>25 ppt	0	0	2	2	2	0	0	0	2	2	2	0
ATLANTIC STURGEON	ADU	0-0.5 ppt	0	0	2	2	2	2	2	2	0	0	0	0
ATLANTIC STURGEON	SPA	0.5-25 ppt	0	0	0	0	2	2	2	0	0	0	0	0
ATLANTIC STURGEON	SPA	0-0.5 ppt	0	0	0	0	2	2	2	0	0	0	0	0
BAY ANCHOVY	EGG	0.5-25 ppt	0	0	0	4	5	5	5	5	4	0	0	0
BAY ANCHOVY	EGG	>25 ppt	0	0	0	4	5	5	5	5	4	0	0	0
BAY ANCHOVY	LAR	0.5-25 ppt	0	0	0	4	4	5	5	5	5	4	0	0
BAY ANCHOVY	LAR	>25 ppt	0	0	0	4	4	5	5	5	5	4	0	0
BAY ANCHOVY	JUV	0.5-25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
BAY ANCHOVY	JUV	>25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
BAY ANCHOVY	JUV	0-0.5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
BAY ANCHOVY	ADU	0.5-25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
BAY ANCHOVY	ADU	>25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
BAY ANCHOVY	ADU	0-0.5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
BAY ANCHOVY	SPA	0.5-25 ppt	0	0	0	4	5	5	5	5	4	0	0	0
BAY ANCHOVY	SPA	>25 ppt	0	0	0	4	5	5	5	5	4	0	0	0
BLACK DRUM	EGG	>25 ppt	3	3	3	3	3	0	0	0	0	0	0	0
BLACK DRUM	LAR	0.5-25 ppt	4	4	4	4	4	4	0	0	0	0	0	0

Common Name	LifeStage	Salinity	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
BLACK DRUM	LAR	>25 ppt	4	4	4	4	4	4	0	0	0	0	0	0
BLACK DRUM	JUV	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
BLACK DRUM	JUV	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
BLACK DRUM	JUV	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLACK DRUM	ADU	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLACK DRUM	ADU	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLACK DRUM	SPA	>25 ppt	3	3	3	3	3	0	0	0	0	0	0	0
BLUE CRAB	EGG	0.5-25 ppt	0	3	4	4	4	4	4	4	4	3	0	0
BLUE CRAB	EGG	>25 ppt	0	3	4	4	4	4	4	4	4	3	0	0
BLUE CRAB	LAR	0.5-25 ppt	0	0	0	3	4	4	4	4	4	3	0	0
BLUE CRAB	LAR	>25 ppt	0	0	0	3	4	4	4	4	4	3	0	0
BLUE CRAB	JUV	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
BLUE CRAB	JUV	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
BLUE CRAB	JUV	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLUE CRAB	ADU	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
BLUE CRAB	ADU	>25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
BLUE CRAB	ADU	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLUE CRAB	MATING	0.5-25 ppt	2	2	4	4	4	3	3	3	4	4	4	3
BLUE CRAB	MATING	>25 ppt	2	2	3	3	3	3	3	3	3	3	3	3
BLUE CRAB	MATING	0-0.5 ppt	2	2	3	3	3	3	3	3	3	3	3	3
BLUEBACK HERRING	EGG	0-0.5 ppt	3	3	3	3	0	0	0	0	0	0	0	0
BLUEBACK HERRING	LAR	0-0.5 ppt	3	3	3	3	3	0	0	0	0	0	0	0
BLUEBACK HERRING	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLUEBACK HERRING	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLUEBACK HERRING	JUV	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLUEBACK HERRING	ADU	0.5-25 ppt	3	3	3	3	0	0	0	0	0	0	0	3
BLUEBACK HERRING	ADU	>25 ppt	3	3	3	3	0	0	0	0	0	0	0	3
BLUEBACK HERRING	ADU	0-0.5 ppt	3	3	3	3	0	0	0	0	0	0	0	3

Common Name	LifeStage	Salinity	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
BLUEBACK HERRING	SPA	0-0.5 ppt	3	3	3	3	0	0	0	0	0	0	0	0
BLUEFISH	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLUEFISH	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLUEFISH	ADU	>25 ppt	3	3	3	3	3	0	0	0	0	3	3	3
BROWN SHRIMP	LAR	0.5-25 ppt	0	3	4	4	4	4	4	3	3	0	0	0
BROWN SHRIMP	LAR	>25 ppt	0	3	4	4	4	4	4	3	3	0	0	0
BROWN SHRIMP	JUV	0.5-25 ppt	0	0	3	3	4	4	4	4	4	3	3	3
BROWN SHRIMP	JUV	>25 ppt	0	0	3	3	4	4	4	4	4	3	3	3
BROWN SHRIMP	JUV	0-0.5 ppt	0	0	0	0	0	2	2	2	2	0	0	0
COBIA	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
COBIA	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
COBIA	ADU	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
COBIA	ADU	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
DAGGERBLADE GRASS SHRIMP	EGG	0.5-25 ppt	0	0	3	3	3	3	3	3	3	3	0	0
DAGGERBLADE GRASS SHRIMP	EGG	>25 ppt	0	0	3	3	3	3	3	3	3	3	0	0
DAGGERBLADE GRASS SHRIMP	EGG	0-0.5 ppt	0	0	3	3	3	3	3	3	3	3	0	0
DAGGERBLADE GRASS SHRIMP	LAR	0.5-25 ppt	0	0	3	3	3	3	3	3	3	3	3	0
DAGGERBLADE GRASS SHRIMP	LAR	>25 ppt	0	0	3	3	3	3	3	3	3	3	3	0
DAGGERBLADE GRASS SHRIMP	LAR	0-0.5 ppt	0	0	3	3	3	3	3	3	3	3	3	0
DAGGERBLADE GRASS SHRIMP	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
DAGGERBLADE GRASS SHRIMP	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
DAGGERBLADE GRASS SHRIMP	JUV	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
DAGGERBLADE GRASS SHRIMP	ADU	0.5-25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
DAGGERBLADE GRASS SHRIMP	ADU	>25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
DAGGERBLADE GRASS SHRIMP	ADU	0-0.5 ppt	5	5	5	5	5	5	5	5	5	5	5	5
DAGGERBLADE GRASS SHRIMP	SPA	0.5-25 ppt	0	0	3	3	3	3	3	3	3	3	0	0
DAGGERBLADE GRASS SHRIMP	SPA	>25 ppt	0	0	3	3	3	3	3	3	3	3	0	0
DAGGERBLADE GRASS SHRIMP	SPA	0-0.5 ppt	0	0	3	3	3	3	3	3	3	3	0	0

Common Name	LifeStage	Salinity	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
EASTERN OYSTER	EGG	0.5-25 ppt	0	0	0	4	4	4	4	4	4	4	4	0
EASTERN OYSTER	EGG	>25 ppt	0	0	0	4	4	4	4	4	4	4	4	0
EASTERN OYSTER	LAR	0.5-25 ppt	0	0	0	4	4	4	4	4	4	4	4	0
EASTERN OYSTER	LAR	>25 ppt	0	0	0	4	4	4	4	4	4	4	4	0
EASTERN OYSTER	JUV	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
EASTERN OYSTER	JUV	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
EASTERN OYSTER	ADU	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
EASTERN OYSTER	ADU	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
EASTERN OYSTER	SPA	0.5-25 ppt	0	0	0	4	4	4	4	4	4	4	4	0
EASTERN OYSTER	SPA	>25 ppt	0	0	0	4	4	4	4	4	4	4	4	0
GRAY SNAPPER	LAR	0.5-25 ppt	0	0	0	3	3	3	3	3	0	0	0	0
GRAY SNAPPER	LAR	>25 ppt	0	0	0	3	3	3	3	3	0	0	0	0
GRAY SNAPPER	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
GRAY SNAPPER	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
GRAY SNAPPER	JUV	0-0.5 ppt	0	0	0	3	3	3	3	3	3	3	0	0
GRAY SNAPPER	ADU	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
GRAY SNAPPER	ADU	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
GRAY SNAPPER	ADU	0-0.5 ppt	0	0	0	3	3	3	3	3	3	3	0	0
GULF FLOUNDER	LAR	0.5-25 ppt	3	3	3	3	0	0	0	0	0	0	3	3
GULF FLOUNDER	LAR	>25 ppt	3	3	3	3	0	0	0	0	0	0	3	3
GULF FLOUNDER	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
GULF FLOUNDER	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
GULF FLOUNDER	ADU	0.5-25 ppt	0	0	3	3	3	3	3	3	3	3	0	0
GULF FLOUNDER	ADU	>25 ppt	0	0	3	3	3	3	3	3	3	3	0	0
LADYFISH	LAR	0.5-25 ppt	3	3	3	3	0	0	0	0	0	0	0	0
LADYFISH	LAR	>25 ppt	3	3	3	3	0	0	0	0	0	0	0	0
LADYFISH	LAR	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
LADYFISH	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3

Common Name	LifeStage	Salinity	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
LADYFISH	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
LADYFISH	JUV	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
LADYFISH	ADU	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
LADYFISH	ADU	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
LADYFISH	ADU	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
PINFISH	LAR	0.5-25 ppt	4	4	4	3	0	0	0	0	0	0	0	3
PINFISH	LAR	>25 ppt	4	4	4	3	0	0	0	0	0	0	0	3
PINFISH	JUV	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
PINFISH	JUV	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
PINFISH	JUV	0-0.5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
PINFISH	ADU	0.5-25 ppt	3	3	3	4	4	4	4	4	4	3	3	3
PINFISH	ADU	>25 ppt	3	3	3	4	4	4	4	4	4	3	3	3
PINFISH	ADU	0-0.5 ppt	3	3	3	4	4	4	4	4	4	3	3	3
PINK SHRIMP	LAR	0.5-25 ppt	2	2	3	3	3	3	3	3	3	3	3	2
PINK SHRIMP	LAR	>25 ppt	2	2	3	3	3	3	3	3	3	3	3	2
PINK SHRIMP	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
PINK SHRIMP	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
PINK SHRIMP	JUV	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
QUAHOG	EGG	0.5-25 ppt	0	0	3	3	3	2	2	2	3	3	3	0
QUAHOG	EGG	>25 ppt	0	0	3	3	3	2	2	2	3	3	3	0
QUAHOG	LAR	0.5-25 ppt	0	0	3	3	3	2	2	2	3	3	3	0
QUAHOG	LAR	>25 ppt	0	0	3	3	3	2	2	2	3	3	3	0
QUAHOG	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
QUAHOG	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
QUAHOG	ADU	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
QUAHOG	ADU	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
QUAHOG	SPA	0.5-25 ppt	0	0	3	3	3	2	2	2	3	3	3	0
QUAHOG	SPA	>25 ppt	0	0	3	3	3	2	2	2	3	3	3	0

Common Name	LifeStage	Salinity	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
RED DRUM	EGG	>25 ppt	4	0	0	0	0	0	0	0	4	4	4	4
RED DRUM	LAR	0.5-25 ppt	4	4	0	0	0	0	0	0	4	4	4	4
RED DRUM	LAR	>25 ppt	4	4	0	0	0	0	0	0	4	4	4	4
RED DRUM	JUV	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
RED DRUM	JUV	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
RED DRUM	JUV	0-0.5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
RED DRUM	ADU	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
RED DRUM	ADU	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
RED DRUM	ADU	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
RED DRUM	SPA	>25 ppt	4	0	0	0	0	0	0	0	4	4	4	4
SHEEPSHEAD	EGG	>25 ppt	0	3	3	3	3	0	0	0	0	0	0	0
SHEEPSHEAD	LAR	0.5-25 ppt	0	3	3	3	3	0	0	0	0	0	0	0
SHEEPSHEAD	LAR	>25 ppt	0	3	3	3	3	0	0	0	0	0	0	0
SHEEPSHEAD	JUV	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
SHEEPSHEAD	JUV	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
SHEEPSHEAD	JUV	0-0.5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
SHEEPSHEAD	ADU	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SHEEPSHEAD	ADU	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
SHEEPSHEAD	ADU	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SHEEPSHEAD	SPA	>25 ppt	0	3	3	3	3	0	0	0	0	0	0	0
SHEEPSHEAD MINNOW	EGG	0.5-25 ppt	0	3	3	3	3	3	0	0	0	0	0	0
SHEEPSHEAD MINNOW	EGG	>25 ppt	0	3	3	3	3	3	0	0	0	0	0	0
SHEEPSHEAD MINNOW	EGG	0-0.5 ppt	0	3	3	3	3	3	0	0	0	0	0	0
SHEEPSHEAD MINNOW	LAR	0.5-25 ppt	0	3	3	3	3	3	3	0	0	0	0	0
SHEEPSHEAD MINNOW	LAR	>25 ppt	0	3	3	3	3	3	3	0	0	0	0	0
SHEEPSHEAD MINNOW	LAR	0-0.5 ppt	0	3	3	3	3	3	3	0	0	0	0	0
SHEEPSHEAD MINNOW	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SHEEPSHEAD MINNOW	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3

Common Name	LifeStage	Salinity	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
SHEEPSHEAD MINNOW	JUV	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SHEEPSHEAD MINNOW	ADU	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SHEEPSHEAD MINNOW	ADU	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SHEEPSHEAD MINNOW	ADU	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SHEEPSHEAD MINNOW	SPA	0.5-25 ppt	0	3	3	3	3	3	0	0	0	0	0	0
SHEEPSHEAD MINNOW	SPA	>25 ppt	0	3	3	3	3	3	0	0	0	0	0	0
SHEEPSHEAD MINNOW	SPA	0-0.5 ppt	0	3	3	3	3	3	0	0	0	0	0	0
SILVERSIDES	EGG	0.5-25 ppt	2	3	4	4	4	4	4	4	4	4	3	2
SILVERSIDES	EGG	>25 ppt	2	3	4	4	4	4	4	4	4	4	3	2
SILVERSIDES	EGG	0-0.5 ppt	2	3	4	4	4	4	4	4	4	4	3	2
SILVERSIDES	LAR	0.5-25 ppt	2	3	4	4	4	4	4	4	4	4	3	2
SILVERSIDES	LAR	>25 ppt	2	3	4	4	4	4	4	4	4	4	3	2
SILVERSIDES	LAR	0-0.5 ppt	2	3	4	4	4	4	4	4	4	4	3	2
SILVERSIDES	JUV	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
SILVERSIDES	JUV	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
SILVERSIDES	JUV	0-0.5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
SILVERSIDES	ADU	0.5-25 ppt	4	4	5	5	5	5	5	5	5	4	4	4
SILVERSIDES	ADU	>25 ppt	4	4	5	5	5	5	5	5	5	5	4	4
SILVERSIDES	ADU	0-0.5 ppt	4	4	4	4	4	4	4	4	4	4	4	4
SILVERSIDES	SPA	0.5-25 ppt	2	3	4	4	4	4	4	4	4	4	3	2
SILVERSIDES	SPA	>25 ppt	2	3	5	5	5	5	5	5	5	5	3	2
SILVERSIDES	SPA	0-0.5 ppt	2	3	4	4	4	4	4	4	4	4	3	2
SOUTHERN FLOUNDER	LAR	0.5-25 ppt	4	4	3	3	3	0	0	0	0	3	4	4
SOUTHERN FLOUNDER	LAR	>25 ppt	4	4	3	3	3	0	0	0	0	3	4	4
SOUTHERN FLOUNDER	LAR	0-0.5 ppt	3	3	3	3	3	0	0	0	0	0	3	3
SOUTHERN FLOUNDER	JUV	0.5-25 ppt	3	3	4	4	4	4	4	4	4	4	3	3
SOUTHERN FLOUNDER	JUV	>25 ppt	3	3	4	4	4	4	4	4	4	4	3	3
SOUTHERN FLOUNDER	JUV	0-0.5 ppt	3	3	4	4	4	4	4	4	4	4	3	3

Common Name	LifeStage	Salinity	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
SOUTHERN FLOUNDER	ADU	0.5-25 ppt	0	0	3	4	4	4	4	4	4	3	0	0
SOUTHERN FLOUNDER	ADU	>25 ppt	0	0	3	4	4	4	4	4	4	3	3	3
SOUTHERN FLOUNDER	ADU	0-0.5 ppt	0	0	3	4	4	4	4	4	4	3	0	0
SOUTHERN KINGFISH	LAR	0.5-25 ppt	0	0	0	3	3	3	3	3	0	0	0	0
SOUTHERN KINGFISH	LAR	>25 ppt	0	0	0	3	3	3	3	3	0	0	0	0
SOUTHERN KINGFISH	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SOUTHERN KINGFISH	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SOUTHERN KINGFISH	ADU	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SOUTHERN KINGFISH	ADU	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SPANISH MACKEREL	LAR	>25 ppt	0	0	0	0	0	0	3	3	3	0	0	0
SPANISH MACKEREL	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SPANISH MACKEREL	ADU	>25 ppt	3	3	3	0	0	0	0	0	0	3	3	3
SPOT	LAR	0.5-25 ppt	3	3	3	3	0	0	0	0	0	0	0	0
SPOT	LAR	>25 ppt	3	3	3	3	0	0	0	0	0	0	0	0
SPOT	JUV	0.5-25 ppt	3	3	3	4	4	4	4	4	4	4	3	3
SPOT	JUV	>25 ppt	3	3	3	4	4	4	4	4	4	4	3	3
SPOT	JUV	0-0.5 ppt	3	3	3	4	4	4	4	4	4	4	3	3
SPOT	ADU	0.5-25 ppt	0	0	0	0	3	3	3	3	3	0	0	0
SPOT	ADU	>25 ppt	0	0	0	0	3	3	3	3	3	0	0	0
SPOT	ADU	0-0.5 ppt	0	0	0	0	3	3	3	3	3	0	0	0
SPOTTED SEATROUT	EGG	>25 ppt	0	0	0	3	3	3	3	0	0	0	0	0
SPOTTED SEATROUT	LAR	0.5-25 ppt	0	0	0	3	3	3	3	3	0	0	0	0
SPOTTED SEATROUT	LAR	>25 ppt	0	0	0	3	3	3	3	3	0	0	0	0
SPOTTED SEATROUT	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SPOTTED SEATROUT	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SPOTTED SEATROUT	JUV	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SPOTTED SEATROUT	ADU	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SPOTTED SEATROUT	ADU	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3

Common Name	LifeStage	Salinity	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
SPOTTED SEATROUT	ADU	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SPOTTED SEATROUT	SPA	>25 ppt	0	0	0	3	3	3	3	0	0	0	0	0
STRIPED BASS	EGG	0-0.5 ppt	3	3	0	0	0	0	0	0	0	0	0	3
STRIPED BASS	LAR	0-0.5 ppt	3	3	3	0	0	0	0	0	0	0	0	3
STRIPED BASS	JUV	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
STRIPED BASS	ADU	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
STRIPED BASS	SPA	0-0.5 ppt	3	3	0	0	0	0	0	0	0	0	0	3
STRIPED MULLET	LAR	0.5-25 ppt	5	5	4	4	0	0	0	0	0	4	5	5
STRIPED MULLET	LAR	>25 ppt	5	5	4	4	0	0	0	0	0	4	5	5
STRIPED MULLET	LAR	0-0.5 ppt	3	3	3	3	0	0	0	0	0	0	3	3
STRIPED MULLET	JUV	0.5-25 ppt	4	4	4	5	5	5	5	5	5	5	5	5
STRIPED MULLET	JUV	>25 ppt	4	4	4	5	5	5	5	5	5	5	5	5
STRIPED MULLET	JUV	0-0.5 ppt	4	4	4	5	5	5	5	5	5	5	5	5
STRIPED MULLET	ADU	0.5-25 ppt	3	3	3	5	5	5	5	5	5	3	3	3
STRIPED MULLET	ADU	>25 ppt	3	3	3	5	5	5	5	5	5	3	3	3
STRIPED MULLET	ADU	0-0.5 ppt	3	3	3	5	5	5	5	5	5	3	3	3
SUMMER FLOUNDER	LAR	0.5-25 ppt	3	3	3	0	0	0	0	0	0	0	0	3
SUMMER FLOUNDER	LAR	>25 ppt	3	3	3	0	0	0	0	0	0	0	0	3
SUMMER FLOUNDER	JUV	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SUMMER FLOUNDER	JUV	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SUMMER FLOUNDER	JUV	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SUMMER FLOUNDER	ADU	0.5-25 ppt	0	0	3	3	3	3	3	3	3	0	0	0
SUMMER FLOUNDER	ADU	>25 ppt	0	0	3	3	3	3	3	3	3	0	0	0
SUMMER FLOUNDER	ADU	0-0.5 ppt	0	0	3	3	3	3	3	3	3	0	0	0
WEAKFISH	EGG	>25 ppt	0	0	4	4	4	4	4	4	0	0	0	0
WEAKFISH	LAR	0.5-25 ppt	0	0	4	4	4	4	4	4	4	0	0	0
WEAKFISH	LAR	>25 ppt	0	0	4	4	4	4	4	4	4	0	0	0
WEAKFISH	JUV	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4

Common Name	LifeStage	Salinity	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
WEAKFISH	JUV	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
WEAKFISH	JUV	0-0.5 ppt	3	3	3	3	3	3	3	3	3	3	3	3
WEAKFISH	ADU	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
WEAKFISH	ADU	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
WEAKFISH	SPA	>25 ppt	0	0	4	4	4	4	4	4	0	0	0	0
WHITE SHRIMP	LAR	0.5-25 ppt	0	0	0	0	4	5	5	5	4	4	4	0
WHITE SHRIMP	LAR	>25 ppt	0	0	0	0	4	5	5	5	4	4	4	0
WHITE SHRIMP	LAR	0-0.5 ppt	0	0	0	0	0	0	0	0	0	0	0	0
WHITE SHRIMP	JUV	0.5-25 ppt	4	4	4	3	3	3	5	5	5	4	4	4
WHITE SHRIMP	JUV	>25 ppt	4	4	4	3	3	3	5	5	5	4	4	4
WHITE SHRIMP	JUV	0-0.5 ppt	0	0	0	0	0	0	3	4	4	4	3	0

Information by life stage, salinity zone, and month. 5= highly abundant, 4= abundant, 3= common, 2= rare, 0= not present

4.1 Ecological Information on the EFH Species

EFH species were determined with management plans available through the South Atlantic Fisheries Management Council, Mid-Atlantic Fisheries Management Council, Greater Atlantic Fisheries Council, Gulf of Mexico Fisheries Council, and Atlantic States Marine Fisheries Council documents available. The species associated with both the management plans and the project area were determined utilizing the datasets previously identified and examples provided in Tables 4-1 and 4-2.

4.1.1 Snapper Grouper Complex

Based on FIMs reports, the species present in or adjacent to the project area and identified in the Snapper-Grouper Complex FMP are the Mutton Snapper, Grey/Mangrove Snapper, Lane Snapper, Rock Seabass, and Spadefish. Other species are associated with the inlet system and river mouth but do not seem to be observed around river mile 14. Juveniles will be the life stage most potentially impacted.

4.1.1.1 Lutjanus

Mutton, Grey, Lane, and Yellowtail snapper make up the majority of the Florida snapper fishery. EFH of snappers ranges from shallow estuarine waters including vegetated sandy bottom, mangroves, jetties, pilings, bays, channels, and mud bottom to offshore areas including hard and live bottom, coral reefs, and rocky bottom. Snapper spawn in offshore aggregates (USACE) with larvae moving inshore after a planktonic period in the water column. The juveniles settle in varied benthic environments inshore including vegetated sand bottom, bays, mangroves, finger coral, and seagrass beds. Their diets consist of crustaceans and fishes. Based on FIM data reports, mutton, grey and lane snapper are observed/collected within the lower St Johns River (monitoring segment C) which the project area is located within.

4.1.1.2 Centropristis

The Rock Seabass has been observed during FIM survey in the waters around the project area. The seabasses are protogynous hermaphrodites which spawn offshore. Their post-larvae occur in shallow inshore waters with the juveniles residing in estuarine environments including seagrass beds, bays, harbors, jetties, piers, shell bottom, and mangrove swamps where they feed on primarily crustaceans. Adults generally reside offshore on reefs and other hard bottoms

4.1.1.3 Chaetodipterous

Spadefish spawn offshore in oceanic waters typically during summer months (May-September) when waters are warm (Thresher 1984). Small fish start recruiting inshore waters during early summer (Walker 1991). Spadefish will use inshore waters during winter months in temperate areas as well as for nursery grounds surviving as opportunistic feeders. Adults mainly inhabit offshore structure as a school member.

4.1.2 Spiny Lobster

Spiny Lobster spawn in nearshore or offshore areas in low turbidity and wave energy environments with ample current to aid in larval transport. Adults do, however, often inhabit bays and estuaries with migrations to offshore areas for mating and egg release as well as during fall and winter as water temperatures decrease (Kanciruk and Hernnkind 1976).

The Spiny Lobster life cycle consists of 5 phases. Phyllosome larvae occur in the epipelagic ocean. The swimming puerulus postlarvae utilize nearshore and estuarine environments and generally settle in vegetated habitats. Early juveniles utilize mangrove creeks and vegetated shallow water environments while the late occur in seagrass beds and oyster reefs for up to 2 years prior migrating to shallow nearshore waters (Marx and Hernkind 1986). Adult lobster are dominant carnivores (Barry and Smale 1980).

4.1.3 Shrimp

The St Johns River, including the project area are designated as shrimp EFH-HAPC. The inshore environment will be most associated with the post-larvae (new recruits) and developing juveniles. All managed shrimp species are observed within the project area. The stages more than likely to occur within the project area and adjacent habitats are the recruiting post larvae and developing juveniles.

4.1.3.1 Brown Shrimp

Brown Shrimp spawn offshore peak migrating post-larvae occurring during January-November and peaking between February and April. The post-larvae recruit into estuaries using the incoming tide and primarily during the night. Their general preferred habitat is soft silty/muddy substrate both vegetated and non-vegetated with highest densities of post-larvae and juveniles observed among emergent marsh and submerged aquatic vegetation. Their diet consists of detritus, algae, and microorganisms at recruitment and consists of detritus, algae, polychaetes, amphipods, nematodes, ostracods, chironomid, and mysids (Lassuy 1983) at juvenile stages. Emigration from the shallow nursery environments to deeper open waters occurs from May through August with peaks during June and July.

4.1.3.2 White Shrimp

White Shrimp spawn offshore during March to November with peaks in May and June. Post-larvae recruitment occurs April-May in Florida estuaries with a further up-estuary migration occurring during the juvenile stage (up to 210 km up estuary). The preferred nursery environment is shallow estuaries with a muddy, peat, and loose sand substrate and moderate salinity. White shrimp are benthic omnivores and mature approximately one year after hatching. Emigration from the estuaries is dependent body size, age, and environmental conditions

4.1.3.3 Pink Shrimp

Pink Shrimp are the dominant species in Florida waters. Spawning takes place in the oceanic waters potentially year round otherwise correlates with maximum bottom water temperatures with recruitment to nurseries occurring during the spring and fall flood tides. The preferred substrates are soft sand or mud where they feed on nauplii and microplankton as post-larvae and transitioning to polychaetes, ostracods, carideans, nematodes, algae, diatoms, amphipods, mollusks, and mysids as juveniles. Pink shrimp emigrate from the estuaries after 2-6 months and occurs year round with a fall peak and another smaller peak in spring.

4.1.4 Redfish

Redfish EFH includes tidal freshwater, estuarine emergent vegetated wetlands, estuarine scrub/shrub, submerged aquatic vegetation, oyster reefs and shell banks, unconsolidated bottom, high salinity surf zones, artificial reefs up to waters 50 m in depth and includes areas from Virginia through the Florida Keys (http://www.greateratlantic.fisheries.noaa.gov/hcd/list.htm). Spawning in Florida generally occurs from mid-August through late November in oceanic waters at bay mouths, inlets, or over nearshore continental shelf (Yokel 1966, Murphy and Taylor 1990). Recruitment into estuarine waters (juveniles) occurs September through February with peaks in October and November. Redfish generally remain in the estuaries for three years where they enter the recreational fishery between age 1-2. At approximately 4 years old, redfish emigrate to oceanic waters to join reproductive schools (FIM 2013)

4.1.5 Coastal Migratory Pelagics

The associated EFH within the project area is exposed sea floor. The project area potentially will be most important to the juvenile and adult stages as well as important prey species.

4.1.5.1 Cobia

Cobia spawn offshore in large aggregations generally mid-May to late August (Shaffer and Nakamura 1989). Eggs and Larvae have been collected in inshore waters and juveniles and adults are common within the St Johns River and near the project site. Primary prey items include crabs and other benthic crustaceans and fishes.

4.1.5.2 King and Spanish Mackerel

Both Scombrid species take place frequently inshore from May through September. Based on the ELMR datasets, juveniles and adults are common in salinities above 25 psu within the St Johns River. They primarily feed on fishes including menhaden, alewives, herring, and anchovies as well as penaeids.

4.1.6 Bluefish

Bluefish occur on the Atlantic coast between Maine and Florida. With wintering and spawning populations proposed to occur near the mid-Atlantic bight (Shepard 2006). EFH has been designated for adults and juveniles in major estuaries between Penobscot Bay, Maine and the St Johns River, though inshore EFH has not been designated. Adult bluefish may be present near the proposed project area.

4.1.7 Summer Flounder

Summer flounder are recognized to occur within shallow and coastal estuarine waters during warm months and within outer continental shelf areas during cold months with a range from Nova Scotia to Florida (Packer et al. 1999). EFH is considered to consist of all areas where larvae, juveniles, and adults are present which includes the St. Johns River (NMFS 2010). All these stages may occur in the St. Johns River during summer and spring months with ingress or egress occurring during the winter months (USACE). HAPC may be present adjacent to the proposed project area outside the navigation channel.

4.2 Associated Species

The range of species commonly observed are presented in Table 4-2. Multiple species of commercial and recreational importance are included, as well as, prey species for many managed species. Interstate Fishery Management Plans exist for Atlantic Croaker, Atlantic Herring, Atlantic Sturgeon, Black Drum, Horeshoe Crab, Shad and River Herring, Spot, Spotted Sea Trout, and Weakfish.

4.2.1 Invertebrates

Those species not included in the EFH descriptions include blue crab, quahog, miscellaneous swimming crabs, stone crabs, etc. Many of the crustaceans spawn within inshore waters but eggs and larvae occur offshore due release in the nearshore environment. The bivalves, when present, will live out their life cycle in the estuary. The primary disruptions from the project will be to the benthic and infaunal invertebrates.

Blue crab inhabit the project area year round and occur in all salinity zonation as identified in Table 4-3. Males tend to stay within lower salinity areas while female mostly reside in higher salinity areas. Spawning takes place in the lower salinity areas and usually occurs once in the life time of a female blue crab. Females will migrate to the river mouth and nearshore waters to promote egg development and larvae release.

Horseshoe crabs have been observed in the project area. These arthropods spawn on beach areas generally coinciding with high lunar tides in the spring. The resulting juveniles spend their first years in the nearshore environment. Adults inhabit estuaries or continental shelf zones dependent season and temperature. The eggs laid on the beaches are of high ecological importance due their role in the food web.

4.1.3 Fishes

The project area is inhabited by many prey species of managed fish species and are listed in Tables 4-1 and 4-2. As noted, multiple species of fishes important to recreation and commercial fisheries inhabit the area with 9 being focus of IFMPs due their general importance as prey, a fishery resource, or ecological importance. Sturgeon also can be observed throughout the St Johns River and migratory routes may include stretches adjacent to the project area.

Atlantic croaker spawn in warm pelagic waters during fall and winter. The resultant larvae and juveniles mature in estuaries.

Black drum spawn in winter and early spring. They use estuaries as nursery habitats and are ecologically important due their role in the food web with eggs and larvae highly predated as well as juvenile stages being prey to many estuarine species including spotted seatrout and jack crevalle. They are bottom feeders and prey upon small fish and invertebrates.

Spotted seatrout are observed primarily in estuaries that spend most their life within close proximity to their natal estuary. Spawning occurs April to September around inlets. Nursery grounds include tidal marsh creeks and grass beds.

Weakfish spawning peaks around April – June. The general nursery areas include deeper regions of coastal rivers, bays, sounds, and estuaries. A general migration to coastal waters occurs in the fall and early winter.

Spot occur in coastal waters and estuaries from The Gulf of Maine to Florida. They are seasonally migratory fish that inhabit bays and estuaries during spring through fall then move offshore for spawning. Juveniles and adults are bottom feeders and an important prey item for species such as striped bass, weakfish, summer flounder, bluefish, and sharks.

Shad and river herring are anadromous fishes which spawn in fresh water in the spring and spend most their adult life in the sea. These fishes have had historic commercial importance and remain an important ecological group due there role as prey to other fishes.

5 Assessment of Impacts and Mitigation

The information presented herein concerns the impacts to the EFH around the project area and potential impacts to the managed species. The potential impacts are reviewed and the measures to minimize impacts presented.

5.1 Impacts to EFH

Some impact to EFH within the project area and those adjacent to the project site are anticipated due the presence of EFH within the proposed project boundary. Though multiple EFHs are within the project area, adjacent areas not to be disturbed and overall footprint should help to minimize the total impacts to the fisheries.

5.1.1 Construction and Operation Impacts and Proposed Mitigation

The primary anticipated impacts to fishery resources and EFH from construction and operation of the proposed Jacksonville Project would be turbidity, noise effects, increased salinity, and potential spills from on-water vessels and equipment. The significance of in-water changes to turbidity or salinity would depend on tidal and freshwater inflow conditions present during the discharge. Minimization measures will include turbidity curtains during all dredging and discharges. Even if alteration in salinity occurs during changing tidal or riverine conditions, impacts would be temporary and localized and would not be outside the optimal or tolerable ranges of the marine species known to occur within the marine berth area.

During construction, land is susceptible to erosion and sedimentation as a result of storm events and construction activities. Eagle LNG will prepare a site-specific stormwater pollution prevention plan (SWPPP) that will include best management practices (BMPs) to prevent mobilization of soil particles during construction and to capture those particles that do become mobilized and entrained in stormwater during rain events. Eagle LNG will perform construction activities in accordance with the Eagle LNG SWPPP and federal and state requirements and will implement BMPs including silt fencing, sediment barriers, and washdown areas to remove soil from vehicles before they exit the Jacksonville Project site.

During construction, stormwater runoff will be directed to onsite ponds within the site. The general locations of these areas are depicted on figures provided in Appendix 1.A, Project Mapping. The particular discharge and treatment plans for stormwater will be determined in consultation with relevant environmental protection agencies and will minimize environmental impacts of the Project.

Eagle LNG has the Project-specific Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) and Wetland and Waterbody Construction and Mitigation Procedures (Procedures) based, respectively, on FERC’s Revised Upland Erosion Control, Revegetation, and Maintenance Plan and Wetland and Waterbody Construction and Mitigation Procedures, dated May 31, 2013. Following FERC’s approval, implementation of the Eagle LNG’s Plan and Procedures during construction and post-construction monitoring will help ensure that ground disturbance and restoration activities are handled in an environmentally responsible and sensitive manner.

Following completion of construction, all disturbed areas not covered by permanent facilities will be finish-graded, and construction debris will be disposed of properly at an approved, permitted facility. Most areas in and around the facility, piping, equipment, and maintenance access roads will be covered with gravel to minimize the amount of maintenance required. The remaining disturbed areas will be fertilized, seeded, mulched, and monitored according to the requirements of the Eagle LNG’s Plan and/or applicable permits.

Temporary and/or interim erosion control measures will be removed once vegetative cover is achieved. Upon reaching permanent stabilization, the sediment basins used during construction will be converted to permanent storm water quantity control facilities.

5.1.2 Dredging

There is no vegetated salt marsh in the proposed dredging area. Potential impacts on fishery resources from dredging activities will be associated with turbidity and sedimentation, as well as impingement and entrainment of fish, invertebrates, and their eggs or larvae, but are considered to be minimal.

Aside from the actions within the areas being actively dredged, discharge from a DMMA into Drummond Creek is also proposed. Primary factors potentially impacting fisheries resources are related to the increase in turbidity. As such, permitting requirements will be followed and measures taken to maintain increased turbidity no more than 29 NTU above background. While tolerances and effects of increased turbidity is species dependent, generally effects of turbidity will depend on length of exposure, frequency of the exposures, and the physical and chemical composition of the suspended solids.

Initial dredging is likely to occur over an approximate 30- to 45-day active dredging period. Each maintenance event will require an approximately 10- to 15-day active dredging period every 1 to2 years. The observed effects on organisms differ from hour time scales to days, but in general, benthic organisms are more tolerant of turbidity increases with primary effects due to abrasion and suspensions complicating respiration. Fishes and more motile organisms can potentially escape or avoid unfavorable conditions, but effects on individual organisms are primarily related to stress responses due changes in water temperature, oxygen levels, and physiological changes due suspension concentrations. On a community level, these factors have potential to alter distributions, reproduction successes, predator-prey interactions, and overall species composition (Kjelland et al. 2015),

Based on the planned time scale and frequency of the dredging activities, the silt, sand, and limestone primary composition of dredged sediments, adherence to state water quality standards (not exceeding 29 NTUs greater than background levels), and additional measures to reduce turbidity increases, the overall impact to EFH is anticipated to be minor. Surrounding areas of EFH will additionally help localize these impacts and as such minimize extended community impacts.

The discharge pipeline from the DMMA to Drummond Creek will traverse a salt marsh area. The proposed corridor will be no more than 10 feet wide. Heavy equipment will not enter the salt marsh area, but rather, a push-pull technique will be used to install the temporary line in all cases of needed discharge. Only underbrush is expected to be cleared within the corridor and recovery of the area expected to occur within one growing season. Pipe orientation and curve in addition to gravity governed flow, will minimize any scouring.

5.1.3 Pile Driving

The resulting noise from driving the piles may temporarily impact fishery resources. To attain the significant pile tension loads imposed by high magnitude laterally loaded conditions (ship berthing and mooring), the steel pipe piles will require significant embedment into the limestone and/or underlying marl formation.

The geotechnical conditions at the proposed Jacksonville Project marine terminal site are not uncommon to the Jacksonville area and local marine contractors have experience installing pipe piles into similar geology. Refer to RR 6 “Geological Resources” for more information on the geotechnical conditions at the Jacksonville Project site. Pile installation may require predrilling followed by pile driving to install piles within or through the limestone layer. Planned geotechnical exploration will include borings extending more than 100 feet below existing sediment grades as necessary to fully characterize the thickness and strength of the limestone stratum. Total impacts from in-water pile driving have been calculated to be 1,218 square feet (0.03 acres). On-land impacts have been calculated to be 1,584 square feet (0.04 acres). Additionally, some noise from pile driving onshore could temporarily affect fishery resources.

5.1.4 Ballast and Cooling Water

Ballast and cooling water will be intermittently withdrawn from and discharged to the St. Johns River in order to stabilize ships while at the LNG marine terminal. Vessels would likely run auxiliary engines at the dock for ship power. Vessels would intake cooling water through the sea chests located under water as the engines require cooling. The cooling water would be discharged through a penetration in the hull at the mid area of the engine room. This discharge would typically be located below the loaded water line. The discharge is typically on the port side, but the specific location can vary depending on vessel design. The volume of cooling water required would depend on the size of the main sea water pumps. At the terminal, with the main engine off line, the vessel typically only requires one main sea water pump running. In some cases, vessels are fitted with a smaller harbor pump for cooling water exchange while at the terminal. Specific cooling water system details will depend on final vessel design parameters and are currently in development.

The ships calling at the Jacksonville Project marine terminal would arrive without cargo and could have substantial amounts of ballast water on board. If ballast is carried, it would be in tanks specifically designed for and dedicated for that use. For most seagoing vessels, ballast is necessary to keep the vessels in safe stability conditions when little or no cargo is on board. The need for ballast is a function of individual vessel design. The ballast water typically is discharged overboard as the vessels load cargo; this is normal practice for virtually all large commercial vessels in most ports.

The specific volume of ballast water to be used per vessel, both inbound and outbound, is not known at this time as LNGC’s for the Jacksonville Project are still being designed. However, an estimate has been determined by review of previous documents prepared by FERC and USCG specific to LNGC’s. In those documents 145,000 cbm LNGC’s would require approximately 13.2 million gallons and 200,000 cbm LNGC’s would require 19.8 million gallons of water. By approximating those ranges and applying to the largest LNGC to call upon the Jacksonville Project, 45,000 cbm, it is estimated that each vessel would require between 4.1 and 4.5 million gallons of water for ballast. The highest number of LNGC’s that would call at the Jacksonville Project in one year is estimated at 100. This would equate to 410 to 450 million gallons of ballast water per year. The discharge rate for this ballast water volume for LNGC’s specific to the Jacksonville Project is not known at this time as LNGC’s for the Jacksonville Project are still being designed.

Ballast Water Management (BWM) standards and associated requirements have been under development at the international and national levels for more than 20 years. Some countries, including the United States, have implemented their own programs for vessels operating in waters under their jurisdiction without waiting for the international standards to come into effect. Some states also have implemented requirements for vessels operating in waters under state jurisdiction, although Florida has not. Ballast water management programs focus primarily on preventing the introduction of nonindigenous organisms and invasive species into the coastal and domestic waters of maritime nations as ballast is discharged. Both international and domestic rules have been developed. Some have already come into force and the others are expected to be in force in the near future. All of the aforementioned requirements would apply to the LNGCs that will call at the Jacksonville Project marine terminal.

The International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) will enter into force 12 months after ratification by 30 states, representing 35 percent of world merchant shipping tonnage. To date more than 30 states have ratified the convention and those represent just over 34 percent of the world fleet. It is generally expected that the 35 percent mark will be reached in the near future. Once in force, the BWM Convention will apply to all ships and offshore structures that carry ballast water and are engaged in international voyages. Compliance dates for individual vessels are based on several factors including the vessel’s build date, its ballast capacity, and whether the convention comes into force before January 1, 2017 or after. As a result, it is expected that all large vessels will be subject to these requirements no later than 2020.

In the United States, the National Invasive Species Act of 1996 (NISA), which reauthorized and amended the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA), called for national BWM guidelines for vessel operations. On March 23, 2012, the United States Coast Guard (USCG) published a Final Rule that established a standard for the allowable concentration of living organisms in ballast water discharged from vessels in United States waters. That rule, which became effective on June 21, 2012, is generally consistent with the International Maritime Organization (IMO) BWM Convention, but includes additional requirements. All ships calling at United States ports and intending to discharge ballast water must either carry out ballast water exchange at sea (normally no less than 200 nautical miles from shore and in water at least 2,000 meters deep, although there are exceptions) or have a ballast water treatment system (BWTS). However, currently, no BWTS has such type approval. Compliance dates are specified in the rules. The exchange of ballast water only will be allowed until the final treatment system deadline dates are reached and approved systems are available.

There are currently no requirements for BWTS on commercial vessels. BWTS requirements are expected to come into force in the foreseeable future. Until that time comes, other ballast water management practices must be employed. BWTS design standards have been developed and provisions have been made for type approval of those systems; however, there is no way to predict when approved systems will be available or to be certain what the final requirements will be.

The regulations also contain operational requirements which consist of cleaning ballast tanks regularly to remove sediments, rinsing anchors and chains when the anchor is retrieved, removing fouling from the hull, piping, and tanks on a regular basis, maintaining a BWM Plan which must be approved by the USCG or the home administration, maintaining records of ballast and hull fouling management, and submitting a report to the USCG 24 hours before calling at a United States port. As with the international standards, it is expected that all large vessels calling at United States ports will be subject to the USCG's BWM requirements by 2020.

While specific ballast water procedures and treatments would depend on the vessel design, Eagle LNG expects that all ship ballast water would be treated as it is pumped on board. Typical treatment systems include ultraviolet treatment or hypochlorite systems. Therefore, any vessel ballast water discharged en-route to or when moored at the terminal already would have had the benefit of treatment. Although difficult to quantify, the uptake of water for both ballast and cooling purposes will represent an intermittent impact, occurring only during times when vessels are moored at the dock.

5.1.5 Spills

Potential for spills of fuel, oil, and lubricants is a potential source of impact on the EFH around the project area. Spills could be consequence of equipment/facility failure, refueling spills, accidental release from storage units, or collision release. In the event of a spill environmental/water quality degradation, habitat destruction, or aquatic life mortalities are potential effects. Eagle LNG has prepared a spill control and waste management plan to be followed to lessen potential for the occurrence of toxic substances entering the St Johns River system and procedures to be implemented in the case of a spill to lessen potential impacts.

5.1.6 Hydrostatic Testing

On-site hydrostatic testing will be performed in accordance with the Industry code or applicable standards which govern the design of the equipment or piping system being tested (i.e. API, ASME, etc.) and as incorporated by reference in 49 CFR Part 193 . Hydrostatic test water will be sourced from on-site wells and will not require diversion of waters from the St. Johns River. If required by the applicable industry standard, water treatment needs will be determined upon completion of a water quality analysis prior to testing. Discharge of hydrostatic test water would be directed to one of the stormwater detainments constructed on-site and would not directly flow into the St. Johns River. Hydrostatic testing would not affect EFH.

5.2 Environmental Consequences of the Proposed Action

The potential degradation of estuarine EFH would be associated with:

- Increased turbidity and sediment load in the water column
- Temporary degradation of water quality
- Alteration of sediment transport and re-deposition
- Temporary disturbance and displacement of fish and invertebrate species (Table 5.2-1)
- Temporary loss of prey items
- Mortality, entrainment, or impingement of species

Due to adjacent operations and other work conducted in the area, this project is not disturbing an area which has not been altered previously. However, the cumulative impacts in association with channel dredging operations and adjacent facility operations does ultimately reduce EFH in the area and promote potential for increased risk. This impact however has been considered and practices and procedures developed to minimize the effects.

Table 5-1: Construction Schedule and ELMR timing/abundance comparison for selected species

Construction			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
dredging			X	X	X	X	X	X	X	X	X	X	X	X
pier			X	X	X	X	X	X	X	X	X	X	X	X
dock/marine loadout			X	X	X	X	X	X	X	X	X	X	X	X
site prep - upland			X	X	X	X	X	X	X	X	X	X		
foundations - upland			X	X	X									
Common Name	**Stage**	**Salinity**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
AMERICAN SHAD	JUVENILES	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
AMERICAN SHAD	JUVENILES	>25 ppt	3	0	0	0	0	0	0	0	0	3	3	3
AMERICAN SHAD	ADULTS	0.5-25 ppt	3	3	3	3	3	0	0	0	0	0	3	3
AMERICAN SHAD	ADULTS	>25 ppt	3	3	3	3	3	0	0	0	0	0	3	3
ATLANTIC CROAKER	LARVAE	0.5-25 ppt	4	4	4	4	0	0	0	0	0	0	0	4
ATLANTIC CROAKER	LARVAE	>25 ppt	4	4	4	4	0	0	0	0	0	0	0	4
ATLANTIC CROAKER	JUVENILES	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
ATLANTIC CROAKER	JUVENILES	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
ATLANTIC CROAKER	ADULTS	0.5-25 ppt	3	3	3	3	3	4	4	4	4	4	3	3
ATLANTIC CROAKER	ADULTS	>25 ppt	3	3	3	3	3	4	4	4	4	4	4	4
ATLANTIC MENHADEN	LARVAE	0.5-25 ppt	3	3	3	3	3	0	0	0	0	0	0	0
ATLANTIC MENHADEN	LARVAE	>25 ppt	3	3	3	3	3	0	0	0	0	0	0	0
ATLANTIC MENHADEN	JUVENILES	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ATLANTIC MENHADEN	JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
ATLANTIC MENHADEN	ADULTS	0.5-25 ppt	2	2	2	2	2	4	4	4	4	4	3	2
ATLANTIC MENHADEN	ADULTS	>25 ppt	2	2	2	2	2	4	4	4	4	4	3	2
ATLANTIC STURGEON	EGGS	0.5-25 ppt	0	0	0	0	2	2	2	0	0	0	0	0
ATLANTIC STURGEON	LARVAE	0.5-25 ppt	0	0	0	0	2	2	2	2	0	0	0	0
ATLANTIC STURGEON	JUVENILES	0.5-25 ppt	2	2	2	2	2	2	2	2	2	2	2	2

ATLANTIC STURGEON	JUVENILES	>25 ppt	0	0	0	0	0	0	0	0	2	2	2	0
ATLANTIC STURGEON	ADULTS	0.5-25 ppt	0	0	2	2	2	2	2	2	0	0	0	0
ATLANTIC STURGEON	ADULTS	>25 ppt	0	0	2	2	2	0	0	0	2	2	2	0
ATLANTIC STURGEON	SPAWNING	0.5-25 ppt	0	0	0	0	2	2	2	0	0	0	0	0
BAY ANCHOVY	EGGS	0.5-25 ppt	0	0	0	4	5	5	5	5	4	0	0	0
BAY ANCHOVY	EGGS	>25 ppt	0	0	0	4	5	5	5	5	4	0	0	0
BAY ANCHOVY	LARVAE	0.5-25 ppt	0	0	0	4	4	5	5	5	5	4	0	0
BAY ANCHOVY	LARVAE	>25 ppt	0	0	0	4	4	5	5	5	5	4	0	0
BAY ANCHOVY	JUVENILES	0.5-25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
BAY ANCHOVY	JUVENILES	>25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
BAY ANCHOVY	ADULTS	0.5-25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
BAY ANCHOVY	ADULTS	>25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
BAY ANCHOVY	SPAWNING	0.5-25 ppt	0	0	0	4	5	5	5	5	4	0	0	0
BAY ANCHOVY	SPAWNING	>25 ppt	0	0	0	4	5	5	5	5	4	0	0	0
BLACK DRUM	EGGS	>25 ppt	3	3	3	3	3	0	0	0	0	0	0	0
BLACK DRUM	LARVAE	0.5-25 ppt	4	4	4	4	4	4	0	0	0	0	0	0
BLACK DRUM	LARVAE	>25 ppt	4	4	4	4	4	4	0	0	0	0	0	0
BLACK DRUM	JUVENILES	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
BLACK DRUM	JUVENILES	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
BLACK DRUM	ADULTS	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLACK DRUM	ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLACK DRUM	SPAWNING	>25 ppt	3	3	3	3	3	0	0	0	0	0	0	0
BLUE CRAB	EGGS	0.5-25 ppt	0	3	4	4	4	4	4	4	4	3	0	0
BLUE CRAB	EGGS	>25 ppt	0	3	4	4	4	4	4	4	4	3	0	0
BLUE CRAB	LARVAE	0.5-25 ppt	0	0	0	3	4	4	4	4	4	3	0	0
BLUE CRAB	LARVAE	>25 ppt	0	0	0	3	4	4	4	4	4	3	0	0
BLUE CRAB	JUVENILES	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4

BLUE CRAB	JUVENILES	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
BLUE CRAB	ADULTS	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
BLUE CRAB	ADULTS	>25 ppt	5	5	5	5	5	5	5	5	5	5	5	5
BLUE CRAB	MATING	0.5-25 ppt	2	2	4	4	4	3	3	3	4	4	4	3
BLUE CRAB	MATING	>25 ppt	2	2	3	3	3	3	3	3	3	3	3	3
BLUEBACK HERRING	JUVENILES	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLUEBACK HERRING	JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLUEBACK HERRING	ADULTS	0.5-25 ppt	3	3	3	3	0	0	0	0	0	0	0	3
BLUEBACK HERRING	ADULTS	>25 ppt	3	3	3	3	0	0	0	0	0	0	0	3
BLUEFISH	JUVENILES	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLUEFISH	JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
BLUEFISH	ADULTS	>25 ppt	3	3	3	3	3	0	0	0	0	3	3	3
BROWN SHRIMP	LARVAE	0.5-25 ppt	0	3	4	4	4	4	4	3	3	0	0	0
BROWN SHRIMP	LARVAE	>25 ppt	0	3	4	4	4	4	4	3	3	0	0	0
BROWN SHRIMP	JUVENILES	0.5-25 ppt	0	0	3	3	4	4	4	4	4	3	3	3
BROWN SHRIMP	JUVENILES	>25 ppt	0	0	3	3	4	4	4	4	4	3	3	3
COBIA	JUVENILES	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
COBIA	JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
COBIA	ADULTS	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
COBIA	ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
GRAY SNAPPER	LARVAE	0.5-25 ppt	0	0	0	3	3	3	3	3	0	0	0	0
GRAY SNAPPER	LARVAE	>25 ppt	0	0	0	3	3	3	3	3	0	0	0	0
GRAY SNAPPER	JUVENILES	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
GRAY SNAPPER	JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
GRAY SNAPPER	ADULTS	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
GRAY SNAPPER	ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
GULF FLOUNDER	LARVAE	0.5-25 ppt	3	3	3	3	0	0	0	0	0	0	3	3

GULF FLOUNDER	LARVAE	>25 ppt	3	3	3	3	0	0	0	0	0	0	3	3
GULF FLOUNDER	JUVENILES	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
GULF FLOUNDER	JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
GULF FLOUNDER	ADULTS	0.5-25 ppt	0	0	3	3	3	3	3	3	3	3	0	0
GULF FLOUNDER	ADULTS	>25 ppt	0	0	3	3	3	3	3	3	3	3	0	0
PINK SHRIMP	LARVAE	0.5-25 ppt	2	2	3	3	3	3	3	3	3	3	3	2
PINK SHRIMP	LARVAE	>25 ppt	2	2	3	3	3	3	3	3	3	3	3	2
PINK SHRIMP	JUVENILES	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
PINK SHRIMP	JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
QUAHOG	EGGS	0.5-25 ppt	0	0	3	3	3	2	2	2	3	3	3	0
QUAHOG	EGGS	>25 ppt	0	0	3	3	3	2	2	2	3	3	3	0
QUAHOG	LARVAE	0.5-25 ppt	0	0	3	3	3	2	2	2	3	3	3	0
QUAHOG	LARVAE	>25 ppt	0	0	3	3	3	2	2	2	3	3	3	0
QUAHOG	JUVENILES	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
QUAHOG	JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
QUAHOG	ADULTS	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
QUAHOG	ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
QUAHOG	SPAWNING	0.5-25 ppt	0	0	3	3	3	2	2	2	3	3	3	0
QUAHOG	SPAWNING	>25 ppt	0	0	3	3	3	2	2	2	3	3	3	0
RED DRUM	EGGS	>25 ppt	4	0	0	0	0	0	0	0	4	4	4	4
RED DRUM	LARVAE	0.5-25 ppt	4	4	0	0	0	0	0	0	4	4	4	4
RED DRUM	LARVAE	>25 ppt	4	4	0	0	0	0	0	0	4	4	4	4
RED DRUM	JUVENILES	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
RED DRUM	JUVENILES	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
RED DRUM	ADULTS	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
RED DRUM	ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
RED DRUM	SPAWNING	>25 ppt	4	0	0	0	0	0	0	0	4	4	4	4

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SHEEPSHEAD	EGGS	>25 ppt	0	3	3	3	3	0	0	0	0	0	0	0
SHEEPSHEAD	LARVAE	0.5-25 ppt	0	3	3	3	3	0	0	0	0	0	0	0
SHEEPSHEAD	LARVAE	>25 ppt	0	3	3	3	3	0	0	0	0	0	0	0
SHEEPSHEAD	JUVENILES	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
SHEEPSHEAD	JUVENILES	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
SHEEPSHEAD	ADULTS	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SHEEPSHEAD	ADULTS	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
SHEEPSHEAD	SPAWNING	>25 ppt	0	3	3	3	3	0	0	0	0	0	0	0
SOUTHERN FLOUNDER	LARVAE	0.5-25 ppt	4	4	3	3	3	0	0	0	0	3	4	4
SOUTHERN FLOUNDER	LARVAE	>25 ppt	4	4	3	3	3	0	0	0	0	3	4	4
SOUTHERN FLOUNDER	JUVENILES	0.5-25 ppt	3	3	4	4	4	4	4	4	4	4	3	3
SOUTHERN FLOUNDER	JUVENILES	>25 ppt	3	3	4	4	4	4	4	4	4	4	3	3
SOUTHERN FLOUNDER	ADULTS	0.5-25 ppt	0	0	3	4	4	4	4	4	4	3	0	0
SOUTHERN FLOUNDER	ADULTS	>25 ppt	0	0	3	4	4	4	4	4	4	3	3	3
SOUTHERN KINGFISH	LARVAE	0.5-25 ppt	0	0	0	3	3	3	3	3	0	0	0	0
SOUTHERN KINGFISH	LARVAE	>25 ppt	0	0	0	3	3	3	3	3	0	0	0	0
SOUTHERN KINGFISH	JUVENILES	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SOUTHERN KINGFISH	JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SOUTHERN KINGFISH	ADULTS	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SOUTHERN KINGFISH	ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SPANISH MACKEREL	LARVAE	>25 ppt	0	0	0	0	0	0	3	3	3	0	0	0
SPANISH MACKEREL	JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SPANISH MACKEREL	ADULTS	>25 ppt	3	3	3	0	0	0	0	0	0	3	3	3
SPOT	LARVAE	0.5-25 ppt	3	3	3	3	0	0	0	0	0	0	0	0
SPOT	LARVAE	>25 ppt	3	3	3	3	0	0	0	0	0	0	0	0
SPOT	JUVENILES	0.5-25 ppt	3	3	3	4	4	4	4	4	4	4	3	3
SPOT	JUVENILES	>25 ppt	3	3	3	4	4	4	4	4	4	4	3	3

SPOT	ADULTS	0.5-25 ppt	0	0	0	0	3	3	3	3	3	0	0	0
SPOT	ADULTS	>25 ppt	0	0	0	0	3	3	3	3	3	0	0	0
SPOTTED SEATROUT	EGGS	>25 ppt	0	0	0	3	3	3	3	0	0	0	0	0
SPOTTED SEATROUT	LARVAE	0.5-25 ppt	0	0	0	3	3	3	3	3	0	0	0	0
SPOTTED SEATROUT	LARVAE	>25 ppt	0	0	0	3	3	3	3	3	0	0	0	0
SPOTTED SEATROUT	JUVENILES	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SPOTTED SEATROUT	JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SPOTTED SEATROUT	ADULTS	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SPOTTED SEATROUT	ADULTS	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SPOTTED SEATROUT	SPAWNING	>25 ppt	0	0	0	3	3	3	3	0	0	0	0	0
STRIPED MULLET	LARVAE	0.5-25 ppt	5	5	4	4	0	0	0	0	0	4	5	5
STRIPED MULLET	LARVAE	>25 ppt	5	5	4	4	0	0	0	0	0	4	5	5
STRIPED MULLET	JUVENILES	0.5-25 ppt	4	4	4	5	5	5	5	5	5	5	5	5
STRIPED MULLET	JUVENILES	>25 ppt	4	4	4	5	5	5	5	5	5	5	5	5
STRIPED MULLET	ADULTS	0.5-25 ppt	3	3	3	5	5	5	5	5	5	3	3	3
STRIPED MULLET	ADULTS	>25 ppt	3	3	3	5	5	5	5	5	5	3	3	3
SUMMER FLOUNDER	LARVAE	0.5-25 ppt	3	3	3	0	0	0	0	0	0	0	0	3
SUMMER FLOUNDER	LARVAE	>25 ppt	3	3	3	0	0	0	0	0	0	0	0	3
SUMMER FLOUNDER	JUVENILES	0.5-25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SUMMER FLOUNDER	JUVENILES	>25 ppt	3	3	3	3	3	3	3	3	3	3	3	3
SUMMER FLOUNDER	ADULTS	0.5-25 ppt	0	0	3	3	3	3	3	3	3	0	0	0
SUMMER FLOUNDER	ADULTS	>25 ppt	0	0	3	3	3	3	3	3	3	0	0	0
WEAKFISH	EGGS	>25 ppt	0	0	4	4	4	4	4	4	0	0	0	0
WEAKFISH	LARVAE	0.5-25 ppt	0	0	4	4	4	4	4	4	4	0	0	0
WEAKFISH	LARVAE	>25 ppt	0	0	4	4	4	4	4	4	4	0	0	0
WEAKFISH	JUVENILES	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
WEAKFISH	JUVENILES	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4

WEAKFISH	ADULTS	0.5-25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
WEAKFISH	ADULTS	>25 ppt	4	4	4	4	4	4	4	4	4	4	4	4
WEAKFISH	SPAWNING	>25 ppt	0	0	4	4	4	4	4	4	0	0	0	0
WHITE SHRIMP	LARVAE	0.5-25 ppt	0	0	0	0	4	5	5	5	4	4	4	0
WHITE SHRIMP	LARVAE	>25 ppt	0	0	0	0	4	5	5	5	4	4	4	0
WHITE SHRIMP	JUVENILES	0.5-25 ppt	4	4	4	3	3	3	5	5	5	4	4	4
WHITE SHRIMP	JUVENILES	>25 ppt	4	4	4	3	3	3	5	5	5	4	4	4

5.3 Proposed Mitigation Measures

Eagle LNG has developed/modified procedures to minimize project related disturbances:

1. Eagle LNG will conduct all in-stream work in consultation with federal and state regulatory agencies. Unless specific issues are identified, Eagle LNG will use its discretion to conduct in-stream work during a time period within its construction schedule. In all events, Eagle LNG will attempt to minimize in-stream impact by adhering to best management practices recommended by regulatory agencies during all in-stream work.
2. Eagle will place spoil in the construction workspace at least 10 feet away from the water/wetland edge unless permitted by FDEP.
3. Use sediment barriers to prevent the flow of spoil or silt-laden water into any wetland/waterbody
4. Install sediment barriers along the edge of the construction workspace as necessary to contain spoil within the construction footprint to prevent sediment flow offsite.
5. Application of riprap for bank stabilization must comply with USACE, or its delegated agency, permit terms and conditions
6. Revegetate disturbed areas with native species of conservation grasses, legumes, and woody species, similar in density to adjacent undisturbed lands where necessary.
7. Implementation of bubble curtains during marine terminal construction and pile driving.
8. Engineering of DMMA to reduce impacts to the environment and water quality
9. Use of turbidity curtains at discharge points as deemed necessary to further minimize turbidity increases and adhere to requirements not to exceed and increase of 29 NTU

5.4 NMFS Issues

In correspondence dated April 30, 2015 the NMFS commented on the Jacksonville Project. In this correspondence the NMFS Habitat Conservation Division (HCD) recommended several issues that should be addressed by this EFHA. These issues are directly addressed in the following sections.

5.4.1 Avoiding Direct Impacts to Drummond Creek

The Jacksonville Project would have a minimal impact to the fringe forested wetland and fringe salt marsh surrounding Drummond Creek. The Jacksonville Project would require a berm elevated marine terminal access road to be built to the marine terminal. The berm supporting the access road would encroach into the fringe forested wetland and fringe salt marsh by approximately 1.47 acres. This acreage will be properly permitted through the USACE and FDEP. Required erosions control devices (ECD's) would be implemented in this encroachment area as well as all areas surrounding the construction footprint.

The discharge of dredge waters back to the area from a point in Drummond Creek has been engineered to minimize impacts to the wetland area as well as water quality. The settling zone has been designed to allow for appropriate settling of sediments, will be discharged through upturned pipes via gravity versus pump systems, and use of turbidity curtains used as necessary. All permit requirements will be followed and monitored.

5.4.2 Avoidance of Shallow Water Dredging

The Jacksonville Project will require some dredging of the St. Johns River. Berth dredging would require removal of approximately 126,000 cubic yards of dredged material. The minimum depth at which dredging would begin is approximately -14 ft. MLW which is not considered high quality forage areas for fishery species by the NMFS and therefore shallow water dredging will not occur during construction of the Jacksonville Project.

5.4.3 Delineation of Wetlands and Waters

NMFS requested Eagle LNG delineate onsite wetlands, salt marsh, oyster aggregations, tidal creeks, intertidal areas, river bottom less than -12 ft. MLW. The proposed footprint of the Jacksonville Project encroaches upon some fringe wetland and fringe salt marsh as delineated. These areas will be permitted for fill by the USACE and FDEP but are not expected to adversely affect the hydrodynamics nor fish habitat of Drummond Creek. Table 2-2 identifies the number and size of piles that will be jetted into the river bottom to construct the marine trestle and marine loading platform. The majority of these piles would occur in areas shallower than -12 ft. MLW. Surveys for sub aquatic vegetation (SAV) found no presence in the pile driving area. Therefore it is anticipated that the presence of piles would not affect the abundant foraging grounds located nearby.

5.4.4 Description of Best Management Practices

Eagle LNG will implement the FERC project specific Plan and Procedures and discussed in Section 5.1.1 to control stormwater runoff and thus minimize turbidity. Additionally, it is anticipated that FDEP and USACE will require Eagle LNG to implement ECD's above and beyond those required in the Plan and Procedures.

Additional issues mentioned by the NMFS are addressed in Section 5.1.

6 Conclusions

The Eagle LNG Jacksonville project is proposed to be implemented on a property zoned for industrial use and adjacent to facilities and projects which conduct similar work and maintenance. The relative proximity to the navigation channel and location of the facilities on the St Johns River would help minimize the areas needing be dredged and disturbed.

EFH within the project boundary and related to the pier structures and vessel accommodation will be altered permanently to serve the ships necessary with regard to total water depths. Based on the EFH maps, this will affect multiple fishery complexes. However, surrounding zones will allow for minimal displacement of the species and the new structures will potentially act as new habitat for use. The construction procedures themselves will not have permanent effect on the fishery species or habitat as they would be mostly due turbidity increase and sound disruption and be recovered in a short time frame.

The primary fish and invertebrate life stage affected will be juveniles utilizing the project area as nursery ground, though this also species specific as discussed. Most likely, the species will locate proximal areas to take refuge during the work. The potential for mortality, impingement, and entrainment will be minimized using BMPs recommended by regulatory agencies and are not expected to have a noticeable effect on any species.

Testing of sediments collected revealed no major concerns with resuspension and introduction to toxins in the environment due dredging operations. No deleterious effect is expected in association with sediment chemistries unless nutrient loads allow a temporary eutrophication of the water column.

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Appendix A

FIM 2013 species observed by month

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Achirus lineatus		1	1	1	6	2	2	6	1	3	1	1	25
Albula vulpes				2								1	3
Ameiurus catus	25	29	19	13	20	20	10	37	20	17	17	39	266
Anchoa hepsetus	47	8	5	14	339	135	2,062	20	433	11	5	32	3,111
Anchoa lyolepis		6			4	31	27	1	151				220
Anchoa mitchilli	2,281	2,643	2,120	6,371	1,931	5,137	8,312	9,825	4,589	8,809	8,886	4,057	64,961
Ancylopsetta quadrocellata		1	5	3	5								14
Archosargus probatocephalus	6	3	6	2	4	16	7	8	6	3	8	5	74
Ariopsis felis		1					1	1	2	1	.		6
Astroscopus y-graecum		1	1		2			1			2		7
Bagre marinus							1	5					6
Bairdiella chrysoura	234	41	35	183	250	664	87	41	40	60	54	65	1,754
Bascanichthys bascanium			1										1
Bathygobius soporator								1		1	1	5	8
Blenniidae sp.					1								1
Brevoortia spp.	31	56	629	53	268	97	7	2	6	25	28	5	1,207
Callinectes ornatus	1					6	13	3	9		1		33
Callinectes sapidus	53	56	121	79	123	139	88	72	57	89	64	42	983
Callinectes similis	6	3	5	7	97	44	9	20	1	18	13		223
Caranx hippos				6	12	12	10	2	3	1	1	1	48
Caranx latus												5	5
Centropomus undecimalis							2		15	1	6	6	30
Centropristis philadelphica			3	1	14	1	1	1	1	3			25
Chaetodipterus faber				4	2	4	6	6	8	4			34

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Chilomycterus schoepfii			5			6	1	3	3				18
Chloroscombrus chrysurus						4	9	8	169	529	35	1	755
Citharichthys macrops						1							1
Citharichthys spilopterus	2	4	11	15	72	67	36	41	30	4	2	1	285
Ctenogobius boleosoma	2	9	3	3		12	2	3	1	31	2	8	76
Ctenogobius shufeldti	4	1	3	1		4	10	4	4	5	24	14	74
Ctenogobius smaragdus			1		1			5	1	1	2	1	12
Ctenogobius spp.						2							2
Cynoscion complex	8	11	6		45	133	30	42	94	14	2	9	394
Cynoscion nebulosus	9	10	7	9	17	13	4	8	21	14	6	5	123
Cyprinodon variegatus									1			1	2
Dasyatis sabina	10	29	28	30	71	52	11	49	23	24	15	21	363
Dasyatis say				9	1	7		25	6	1			49
Diapterus auratus	26	12		9	15	3	32	62	31	53	103	58	404
Dorosoma cepedianum	9	1	1	1	1		8	11		5	3	2	42
Elops saurus	28	7	15	88	17	145	8	16	50	6	4	2	386
Etropus crossotus	12	18	18	14	8	9	5	6	14	36	30	13	183
Eucinostomus gula	6		4	4	11	14	6	9	6	15	12	38	125
Eucinostomus harengulus	29	9	19	22	31	50	132	100	86	103	219	253	1,053
Eucinostomus spp.	29	9	9	7	4	53	129	102	60	156	173	141	872
Farfantepenaeus aztecus	1		1	12	31	237	6	2	2	1	2		295
Farfantepenaeus duorarum		1	6	2	3	3	2				1		18
Farfantepenaeus spp.	1	6	18	108	154	556	8	25	21	57	22	11	987
Fundulus heteroclitus	664	45	115	14	26	538	6	74	4	4	7	44	1,541
Fundulus majalis		23	3	12	12	8		5			10	3	76
Gambusia holbrooki	1,473	87	67	278	6	20	1	1,350	101	302	438	1,622	5,745
Gobionellus oceanicus	5	4	2	8				1	3	1	1		25

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Gobiosoma bosc	2	13	7	9	9	3	4	1		3		3	54
Gobiosoma robustum		2	1	1						1	2		7
Gobiosoma spp.	13	6	10	2	2	3	3	2	33	15	19	13	121
Gymnura micrura			2	2	21	7	5	19	3	6	1		66
Harengula jaguana								2					2
Hypsoblennius hentz	1			1									2
Lagodon rhomboides	40	57	49	194	576	1,099	248	212	98	120	253	81	3,027
Larimus fasciatus							1	2	17		7	.	27
Leiostomus xanthurus	259	4,774	647	1,852	687	291	90	114	63	33	77	24	8,911
Lepisosteus osseus		3	5	1	1		1	3	11	1	4	5	35
Litopenaeus setiferus	45	53	32	1	55	80	424	813	711	409	567	169	3,359
Lutjanus griseus		1	2	1	2	2	3	5	1	7	5	1	30
Lutjanus synagris						1	1		2	4			8
Membras martinica	1		1	1	29	1	10		17	10	15	7	92
Menidia menidia	174	318	156	189	7,898	5,452	4,683	865	1,107	393	227	773	22,235
Menidia spp.	1,441	722	475	736	358	465	89	254	874	290	2,763	845	9,312
Menippe sp.		1											1
Menticirrhus americanus	2		2	1	3	59	54	33	17	5	8	2	186
Menticirrhus saxatilis				2	6	1							9
Micropogonias undulatus	3,903	3,236	5,933	3,754	2,673	1,105	259	134	66	23	775	1,130	22,991
Mugil cephalus	175	575	1,316	221	192	236	97	66	54	51	297	97	3,377
Mugil curema	20	207	30	102	65	395	27	35	32	76	51	155	1,195
Ogcocephalus cubifrons		1								1			2
Oligoplites saurus								2	18	4	4		28
Opisthonema oglinum				2	1	12	20		4	12	3	4	58
Opsanus tau		8	2		10	3	2	7	2	1		1	36
Orthopristis chrysoptera			1	138	15	39	8	2					203

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Paralichthys albigutta	1	2	8	8	25	6	2	1		2	.	1	56
Paralichthys dentatus	1		5	5	9	4		1			1	1	27
Paralichthys lethostigma	11	14	12	18	45	31	35	14	23	8	5	4	220
Paralichthys squamilentus				1									1
Peprilus paru	1	3	1	4	12	1	1		12				35
Poecilia latipinna	65		5	4		3	1	1	2	42	7	23	153
Pogonias cromis	1		2	5	1	8		10	4		2		33
Pomatomus saltatrix	2		5	6	3	1	2			2		18	39
Portunus spp.	4	3	9	1	7	67	3	1		3	2		100
Prionotus carolinus	1	1	2		1							1	6
Prionotus scitulus	1	1			6	13	2	2		1			26
Prionotus tribulus	16	14	27	14	26	2	1		2	3	3	9	117
Rimapenaeus constrictus	10	7	6	3	91	93	90	3	20	6	16	31	376
Sciaenops ocellatus	17	27	15	16	12	11	9	11	17	30	20	11	196
Scomberomorus maculatus				1		1							2
Selene vomer						4			13	3		2	22
Sphoeroides nephelus	5	3	3	4	9	6	1	1	1	3		1	37
Sphoeroides spengleri	1												1
Sphyraena borealis					1		1						2
Sphyraena guachancho							1		1				2
Stellifer lanceolatus		13	1	3	15	9	4,078	18	119	1,809	848	24	6,937
Stephanolepis hispidus	1			2	2		1	1		3			10
Stomolophus meleagris	3			1						1	62	69	136
Strongylura marina	3	1	1	9	2	17	7	11	7	11	3	4	76
Strongylura spp.				1	34	5	11	10	8	5	5	1	80
Symphurus plagiusa	3	2	4	3	17	5	10	3	16	12	28	12	115
Syngnathus louisianae	3		2	1	3	5		3	1	2	6	1	27

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Syngnathus scovelli	6	8	2	3	8	17	6	4	1	1	3	4	63
Synodus foetens	.	1			6	14	5	3	8	8	6	2	53
Trachinotus carolinus				8	2	17		6	4				37
Trachinotus falcatus					1	64		10	38	12	2		127
Trichiurus lepturus										1			1
Trinectes maculatus	151	232	69	29	324	117	248	133	93	66	191	103	1,756
Tylosurus crocodilus											1	.	1
Xiphopenaeus kroyeri							1				10	1	12

APPENDIX E

EAGLE LNG'S PROJECT-SPECIFIC UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN AND WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

EAGLE LNG'S UPLAND EROSION CONTROL, REVEGETATION AND MAINTENANCE PLAN

JACKSONVILLE PROJECT

FERC DOCKET NO. CP17-___-000 (PF15-7-000)

Eagle LNG Partners Jacksonville LLC
20445 State Highway 249, Suite 250
Houston, TX 77070

January 2017

The table below identifies all changes proposed to the FERC Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) (May 2013 version) for the Eagle LNG Partners Jacksonville LLC (Eagle LNG) Jacksonville Project (Project). Within the text of the Plan, the changes are underlined and in bold.

Proposed Changes to the
FERC Upland Erosion Control, Revegetation, and Maintenance Plan (May 2013 Version)

Section	Original Text	Proposed Change (underlined and in bold in text)
VII.A.5.	Routine vegetation mowing or clearing over the full width of the permanent right-of-way in uplands shall not be done more frequently than every 3 years. However, to facilitate periodic corrosion/leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In no case shall routine vegetation mowing or clearing occur during the migratory bird nesting season between April 15 and August 1 of any year unless specifically approved in writing by the responsible land management agency or the U.S. Fish and Wildlife Service.	**Routine vegetation mowing or clearing in open areas within the fenced facility boundary that are not covered by gravel or pavement shall occur more frequently than every 3 years and as often as necessary to maintain the areas in low grasses for safety and security. Routine vegetation mowing or clearing in areas outside of the fenced facility boundary shall not occur more frequently than every 3 years out to the toe of facility berm. In no case shall routine vegetation mowing or clearing in areas outside of the fenced facility boundary occur during the migratory bird nesting season between April 15 and August 1 of any year unless specifically approved in writing by the responsible land management agency or the U.S. Fish and Wildlife Service.**

MODIFIED UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN

TABLE OF CONTENTS

THE EAGLE LNG MODIFIED UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN (PLAN)

I. APPLICABILITY

A. The intent of this Plan is to assist project sponsors by identifying baseline mitigation measures for minimizing erosion and enhancing revegetation. Project sponsors shall specify in their applications for a new FERC authorization and in prior notice and advance notice filings, any individual measures in this Plan they consider unnecessary, technically infeasible, or unsuitable due to local conditions and fully describe any alternative measures they would use. Project sponsors shall also explain how those alternative measures would achieve a comparable level of mitigation.

Once a project is authorized, project sponsors can request further changes as variances to the measures in this Plan (or the applicant's approved plan). The Director of the Office of Energy Projects (Director) will consider approval of variances upon the project sponsor's written request, if the Director agrees that a variance:

1. Provides equal or better environmental protection;

2. Is necessary because a portion of this Plan is infeasible or unworkable based on project-specific conditions; or

3. Is specifically required in writing by another federal, state, or Native American land management agency for the portion of the project on its land or under its jurisdiction.

Sponsors of projects planned for construction under the automatic authorization provisions in the FERC's regulations must receive written approval for any variances in advance of construction.

Project-related impacts on wetland and waterbody systems are addressed in the Wetland and Waterbody Construction and Mitigation Procedures (Procedures).

II. SUPERVISION AND INSPECTION

A. ENVIRONMENTAL INSPECTION

1. At least one Environmental Inspector is required for each construction spread during construction and restoration (as defined by section V). The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected.

2. Environmental Inspectors shall have peer status with all other activity inspectors.

3. Environmental Inspectors shall have the authority to stop activities that violate the environmental conditions of the FERC's Orders, stipulations of other environmental permits or approvals, or landowner easement agreements; and to order appropriate corrective action.

B. RESPONSIBILITIES OF ENVIRONMENTAL INSPECTORS

At a minimum, the Environmental Inspector(s) shall be responsible for:

1. Inspecting construction activities for compliance with the requirements of this Plan, the Procedures, the environmental conditions of the FERC's Orders, the

mitigation measures proposed by the project sponsor (as approved and/or modified by the Order), other environmental permits and approvals, and environmental requirements in landowner easement agreements.

2. Identifying, documenting, and overseeing corrective actions, as necessary to bring an activity back into compliance;

3. Verifying that the limits of authorized construction work areas and locations of access roads are visibly marked before clearing, and maintained throughout construction;

4. Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;

5. Identifying erosion/sediment control and soil stabilization needs in all areas;

6. Ensuring that the design of slope breakers will not cause erosion or direct water into sensitive environmental resource areas, including cultural resource sites, wetlands, waterbodies, and sensitive species habitats;

7. Verifying that dewatering activities are properly monitored and do not result in the deposition of sand, silt, and/or sediment into sensitive environmental resource areas, including wetlands, waterbodies, cultural resource sites, and sensitive species habitats; stopping dewatering activities if such deposition is occurring and ensuring the design of the discharge is changed to prevent reoccurrence; and verifying that dewatering structures are removed after completion of dewatering activities;

8. Ensuring that subsoil and topsoil are tested in agricultural and residential areas to measure compaction and determine the need for corrective action;

9. Advising the Chief Construction Inspector when environmental conditions (such as wet weather or frozen soils) make it advisable to restrict or delay construction activities to avoid topsoil mixing or excessive compaction;

10. Ensuring restoration of contours and topsoil;

11. Verifying that the soils imported for agricultural or residential use are certified as free of noxious weeds and soil pests, unless otherwise approved by the landowner;

12. Ensuring that erosion control devices are properly installed to prevent sediment flow into sensitive environmental resource areas (e.g., wetlands, waterbodies, cultural resource sites, and sensitive species habitats) and onto roads, and determining the need for additional erosion control devices;

13. Inspecting and ensuring the maintenance of temporary erosion control measures at least:

    a. On a daily basis in areas of active construction or equipment operation;

    b. On a weekly basis in areas with no construction or equipment operation; and

    c. Within 24 hours of each 0.5 inch of rainfall;

14. Ensuring the repair of all ineffective temporary erosion control measures within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts;

15. Keeping records of compliance with the environmental conditions of the FERC's Orders, and the mitigation measures proposed by the project sponsor in the application submitted to the FERC, and other federal or state environmental permits during active construction and restoration;

16. Identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase; and

17. Verifying that locations for any disposal of excess construction materials for beneficial reuse comply with section III.E.

III. PRECONSTRUCTION PLANNING

The project sponsor shall do the following before construction:

A. CONSTRUCTION WORK AREAS

1. Identify all construction work areas (e.g., construction right-of-way, extra work space areas, pipe storage and contractor yards, borrow and disposal areas, access roads) that would be needed for safe construction. The project sponsor must ensure that appropriate cultural resources and biological surveys are conducted, as determined necessary by the appropriate federal and state agencies.

2. Project sponsors are encouraged to consider expanding any required cultural resources and endangered species surveys in anticipation of the need for activities outside of authorized work areas.

3. Plan construction sequencing to limit the amount and duration of open trench sections, as necessary, to prevent excessive erosion or sediment flow into sensitive environmental resource areas.

B. DRAIN TILE AND IRRIGATION SYSTEMS

1. Attempt to locate existing drain tiles and irrigation systems.

2. Contact landowners and local soil conservation authorities to determine the locations of future drain tiles that are likely to be installed within 3 years of the authorized construction.

3. Develop procedures for constructing through drain-tiled areas, maintaining irrigation systems during construction, and repairing drain tiles and irrigation systems after construction.

4. Engage qualified drain tile specialists, as needed to conduct or monitor repairs to drain tile systems affected by construction. Use drain tile specialists from the project area, if available.

C. GRAZING DEFERMENT

Develop grazing deferment plans with willing landowners, grazing permittees, and land management agencies to minimize grazing disturbance of revegetation efforts.

D. ROAD CROSSINGS AND ACCESS POINTS

Plan for safe and accessible conditions at all roadway crossings and access points during construction and restoration.

E. DISPOSAL PLANNING

Determine methods and locations for the regular collection, containment, and disposal of excess construction materials and debris (e.g., timber, slash, mats, garbage, drill cuttings and fluids, excess rock) throughout the construction process. Disposal of materials for beneficial reuse must not result in adverse environmental impact and is subject to compliance with all applicable survey, landowner or land management agency approval, and permit requirements.

F. AGENCY COORDINATION

The project sponsor must coordinate with the appropriate local, state, and federal agencies as outlined in this Plan and/or required by the FERC's Orders.

1. Obtain written recommendations from the local soil conservation authorities or land management agencies regarding permanent erosion control and revegetation specifications.

2. Develop specific procedures in coordination with the appropriate agencies to prevent the introduction or spread of invasive species, noxious weeds, and soil pests resulting from construction and restoration activities.

3. Develop specific procedures in coordination with the appropriate agencies and landowners, as necessary, to allow for livestock and wildlife movement and protection during construction.

4. Develop specific blasting procedures in coordination with the appropriate agencies that address pre- and post-blast inspections; advanced public notification; and mitigation measures for building foundations, groundwater wells, and springs. Use appropriate methods (e.g., blasting mats) to prevent damage to nearby structures and to prevent debris from entering sensitive environmental resource areas.

G. SPILL PREVENTION AND RESPONSE PROCEDURES

The project sponsor shall develop project-specific Spill Prevention and Response Procedures, as specified in section IV of the staff's Procedures. A copy must be filed with the Secretary of the FERC (Secretary) prior to construction and made available in the field on each construction spread. The filing requirement does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

H. RESIDENTIAL CONSTRUCTION

For all properties with residences located within 50 feet of construction work areas, project sponsors shall: avoid removal of mature trees and landscaping within the construction work area unless necessary for safe operation of construction equipment, or as specified in landowner agreements; fence the edge of the construction work area for a distance of 100 feet on either side of the residence; and restore all lawn areas and landscaping immediately following cleanup operations, or as specified in landowner agreements. If seasonal or other weather conditions prevent compliance with these time frames, maintain and monitor temporary erosion controls (sediment barriers and mulch) until conditions allow completion of restoration.

I. WINTER CONSTRUCTION PLANS

If construction is planned to occur during winter weather conditions, project sponsors shall develop and file a project-specific winter construction plan with the FERC application. This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

The plan shall address:

1. Winter construction procedures (e.g., snow handling and removal, access road construction and maintenance, soil handling under saturated or frozen conditions, topsoil stripping);

2. Stabilization and monitoring procedures if ground conditions will delay restoration until the following spring (e.g., mulching and erosion controls, inspection and reporting, stormwater control during spring thaw conditions); and

3. Final restoration procedures (e.g., subsidence and compaction repair, topsoil replacement, seeding).

IV. INSTALLATION

A. APPROVED AREAS OF DISTURBANCE

1. Project-related ground disturbance shall be limited to the construction right-of-way, extra work space areas, pipe storage yards, borrow and disposal areas, access roads, and other areas approved in the FERC's Orders. Any project-related ground disturbing activities outside these areas will require prior Director approval. This requirement does not apply to activities needed to comply with the Plan and Procedures (i.e., slope breakers, energy-dissipating devices, dewatering structures, drain tile system repairs) or minor field realignments and workspace shifts per landowner needs and requirements that do not affect other landowners or sensitive environmental resource areas. All construction or restoration activities outside of authorized areas are subject to all applicable survey and permit requirements, and landowner easement agreements.

2. The construction right-of-way width for a project shall not exceed 75 feet or that described in the FERC application unless otherwise modified by a FERC Order. However, in limited, non-wetland areas, this construction right-of- way width may be expanded by up to 25 feet without Director approval to accommodate full construction right-of-way topsoil segregation and to ensure safe construction where topographic conditions (e.g., side-slopes) or soil limitations require it. Twenty-five feet of extra construction right-of-way width may also be used in limited, non-wetland or non-forested areas for truck turn-arounds where no reasonable alternative access exists.

   Project use of these additional limited areas is subject to landowner or land management agency approval and compliance with all applicable survey and permit requirements. When additional areas are used, each one shall be identified and the need explained in the weekly or biweekly construction reports to the FERC, if required. The following material shall be included in the reports:

   a. The location of each additional area by station number and reference to previously filed alignment sheets, or updated alignment sheets showing the additional areas;

b. Identification of the filing at FERC containing evidence that the additional areas were previously surveyed; and

c. A statement that landowner approval has been obtained and is available in project files.

Prior written approval of the Director is required when the authorized construction right-of-way width would be expanded by more than 25 feet.

B. TOPSOIL SEGREGATION

1. Unless the landowner or land management agency specifically approves otherwise, prevent the mixing of topsoil with subsoil by stripping topsoil from either the full work area or from the trench and subsoil storage area (ditch plus spoil side method) in:

   a. Cultivated or rotated croplands, and managed pastures;

   b. Residential areas;

   c. Hayfields; and

   d. Other areas at the landowner's or land managing agency's request.

2. In residential areas, importation of topsoil is an acceptable alternative to topsoil segregation.

3. Where topsoil segregation is required, the project sponsor must:

   a. Segregate at least 12 inches of topsoil in deep soils (more than 12 inches of topsoil); and

   b. Make every effort to segregate the entire topsoil layer in soils with less than 12 inches of topsoil.

4. Maintain separation of salvaged topsoil and subsoil throughout all construction activities.

5. Segregated topsoil may not be used for padding the pipe, constructing temporary slope breakers or trench plugs, improving or maintaining roads, or as a fill material.

6. Stabilize topsoil piles and minimize loss due to wind and water erosion with use of sediment barriers, mulch, temporary seeding, tackifiers, or functional equivalents, where necessary.

C. DRAIN TILES

1. Mark locations of drain tiles damaged during construction.

2. Probe all drainage tile systems within the area of disturbance to check for damage.

3. Repair damaged drain tiles to their original or better condition. Do not use filter-covered drain tiles unless the local soil conservation authorities and the landowner agree. Use qualified specialists for testing and repairs.

4. For new pipelines in areas where drain tiles exist or are planned, ensure that the depth of cover over the pipeline is sufficient to avoid interference with drain tile systems. For adjacent pipeline loops in agricultural areas, install the new pipeline with at least the same depth of cover as the existing pipeline(s).

D. IRRIGATION

Maintain water flow in crop irrigation systems, unless shutoff is coordinated with affected parties.

E. ROAD CROSSINGS AND ACCESS POINTS

1. Maintain safe and accessible conditions at all road crossings and access points during construction.

2. If crushed stone access pads are used in residential or agricultural areas, place the stone on synthetic fabric to facilitate removal.

3. Minimize the use of tracked equipment on public roadways. Remove any soil or gravel spilled or tracked onto roadways daily or more frequent as necessary to maintain safe road conditions. Repair any damages to roadway surfaces, shoulders, and bar ditches.

F. TEMPORARY EROSION CONTROL

Install temporary erosion controls immediately after initial disturbance of the soil. Temporary erosion controls must be properly maintained throughout construction (on a daily basis) and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration is complete.

1. Temporary Slope Breakers

a. Temporary slope breakers are intended to reduce runoff velocity and divert water off the construction right-of-way. Temporary slope breakers may be constructed of materials such as soil, silt fence, staked hay or straw bales, or sand bags.

b. Install temporary slope breakers on all disturbed areas, as necessary to avoid excessive erosion. Temporary slope breakers must be installed on slopes greater than 5 percent where the base of the slope is less than 50 feet from waterbody, wetland, and road crossings at the following spacing (closer spacing shall be used if necessary):

Slope (%)	Spacing (feet)
5 - 15	300
>15 - 30	200
>30	100

c. Direct the outfall of each temporary slope breaker to a stable, well vegetated area or construct an energy-dissipating device at the end of the slope breaker and off the construction right-of-way.

d. Position the outfall of each temporary slope breaker to prevent sediment discharge into wetlands, waterbodies, or other sensitive environmental resource areas.

2. Temporary Trench Plugs

Temporary trench plugs are intended to segment a continuous open trench prior to backfill.

a. Temporary trench plugs may consist of unexcavated portions of the trench, compacted subsoil, sandbags, or some functional equivalent.

b. Position temporary trench plugs, as necessary, to reduce trenchline erosion and minimize the volume and velocity of trench water flow at the base of slopes.

3. Sediment Barriers

Sediment barriers are intended to stop the flow of sediments and to prevent the deposition of sediments beyond approved workspaces or into sensitive resources.

a. Sediment barriers may be constructed of materials such as silt fence, staked hay or straw bales, compacted earth (e.g., driveable berms across travelways), sand bags, or other appropriate materials.

b. At a minimum, install and maintain temporary sediment barriers across the entire construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody, wetland, or road crossing until revegetation is successful as defined in this Plan. Leave adequate room between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition.

c. Where wetlands or waterbodies are adjacent to and downslope of construction work areas, install sediment barriers along the edge of these areas, as necessary to prevent sediment flow into the wetland or waterbody.

4. Mulch

a. Apply mulch on all slopes (except in cultivated cropland) concurrent with or immediately after seeding, where necessary to stabilize the soil surface and to reduce wind and water erosion. Spread mulch uniformly over the area to cover at least 75 percent of the ground surface at a rate of 2 tons/acre of straw or its equivalent, unless the local soil conservation authority, landowner, or land managing agency approves otherwise in writing.

b. Mulch can consist of weed-free straw or hay, wood fiber hydromulch, erosion control fabric, or some functional equivalent.

c. Mulch all disturbed upland areas (except cultivated cropland) before seeding if:

(1) Final grading and installation of permanent erosion control measures will not be completed in an area within 20 days after the trench in that area is backfilled (10 days in residential areas), as required in section V.A.1; or

(2) Construction or restoration activity is interrupted for extended periods, such as when seeding cannot be completed due to seeding period restrictions.

d. If mulching before seeding, increase mulch application on all slopes within 100 feet of waterbodies and wetlands to a rate of 3 tons/acre of straw or equivalent.

e. If wood chips are used as mulch, do not use more than 1 ton/acre and add the equivalent of 11 lbs/acre available nitrogen (at least 50 percent of which is slow release).

f. Ensure that mulch is adequately anchored to minimize loss due to wind and water.

g. When anchoring with liquid mulch binders, use rates recommended by the manufacturer. Do not use liquid mulch binders within 100 feet of wetlands or waterbodies, except where the product is certified environmentally non-toxic by the appropriate state or federal agency or independent standards-setting organization.

h. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat, unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

V. RESTORATION

A. CLEANUP

1. Commence cleanup operations immediately following backfill operations. Complete final grading, topsoil replacement, and installation of permanent erosion control structures within 20 days after backfilling the trench (10 days in residential areas). If seasonal or other weather conditions prevent compliance with these time frames, maintain temporary erosion controls (i.e., temporary slope breakers, sediment barriers, and mulch) until conditions allow completion of cleanup.

   If construction or restoration unexpectedly continues into the winter season when conditions could delay successful decompaction, topsoil replacement, or seeding until the following spring, file with the Secretary for the review and written approval of the Director, a winter construction plan (as specified in section III.I). This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

2. A travel lane may be left open temporarily to allow access by construction traffic if the temporary erosion control structures are installed as specified in section IV.F. and inspected and maintained as specified in sections II.B.12 through 14. When access is no longer required the travel lane must be removed and the right-of-way restored.

3. Rock excavated from the trench may be used to backfill the trench only to the top of the existing bedrock profile. Rock that is not returned to the trench shall be considered construction debris, unless approved for use as mulch or for some other use on the construction work areas by the landowner or land managing agency.

4. Remove excess rock from at least the top 12 inches of soil in all cultivated or rotated cropland, managed pastures, hayfields, and residential areas, as well as other areas at the landowner's request. The size, density, and distribution of rock on the construction work area shall be similar to adjacent areas not disturbed by

construction. The landowner or land management agency may approve other provisions in writing.

5. Grade the construction right-of-way to restore pre-construction contours and leave the soil in the proper condition for planting.

6. Remove construction debris from all construction work areas unless the landowner or land managing agency approves leaving materials onsite for beneficial reuse, stabilization, or habitat restoration.

7. Remove temporary sediment barriers when replaced by permanent erosion control measures or when revegetation is successful.

B. PERMANENT EROSION CONTROL DEVICES

1. Trench Breakers

a. Trench breakers are intended to slow the flow of subsurface water along the trench. Trench breakers may be constructed of materials such as sand bags or polyurethane foam. Do not use topsoil in trench breakers.

b. An engineer or similarly qualified professional shall determine the need for and spacing of trench breakers. Otherwise, trench breakers shall be installed at the same spacing as and upslope of permanent slope breakers.

c. In agricultural fields and residential areas where slope breakers are not typically required, install trench breakers at the same spacing as if permanent slope breakers were required.

d. At a minimum, install a trench breaker at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody or wetland and where needed to avoid draining a waterbody or wetland. Install trench breakers at wetland boundaries, as specified in the Procedures. Do not install trench breakers within a wetland.

2. Permanent Slope Breakers

a. Permanent slope breakers are intended to reduce runoff velocity, divert water off the construction right-of-way, and prevent sediment deposition into sensitive resources. Permanent slope breakers may be constructed of materials such as soil, stone, or some functional equivalent.

b. Construct and maintain permanent slope breakers in all areas, except cultivated areas and lawns, unless requested by the landowner, using spacing recommendations obtained from the local soil conservation authority or land managing agency.

In the absence of written recommendations, use the following spacing unless closer spacing is necessary to avoid excessive erosion on the construction right-of-way:

Slope (%)	Spacing (feet)
5 - 15	300
>15 - 30	200
>30	100

c. Construct slope breakers to divert surface flow to a stable area without causing water to pool or erode behind the breaker. In the absence of a stable area, construct appropriate energy-dissipating devices at the end of the breaker.

d. Slope breakers may extend slightly (about 4 feet) beyond the edge of the construction right-of-way to effectively drain water off the disturbed area. Where slope breakers extend beyond the edge of the construction right-of-way, they are subject to compliance with all applicable survey requirements.

C. SOIL COMPACTION MITIGATION

1. Test topsoil and subsoil for compaction at regular intervals in agricultural and residential areas disturbed by construction activities. Conduct tests on the same soil type under similar moisture conditions in undisturbed areas to approximate preconstruction conditions. Use penetrometers or other appropriate devices to conduct tests.

2. Plow severely compacted agricultural areas with a paraplow or other deep tillage implement. In areas where topsoil has been segregated, plow the subsoil before replacing the segregated topsoil.

If subsequent construction and cleanup activities result in further compaction, conduct additional tilling.

3. Perform appropriate soil compaction mitigation in severely compacted residential areas.

D. REVEGETATION

1. General

a. The project sponsor is responsible for ensuring successful revegetation of soils disturbed by project-related activities, except as noted in section V.D.1.b.

b. Restore all turf, ornamental shrubs, and specialized landscaping in accordance with the landowner’s request, or compensate the landowner. Restoration work must be performed by personnel familiar with local horticultural and turf establishment practices.

2. Soil Additives

Fertilize and add soil pH modifiers in accordance with written recommendations obtained from the local soil conservation authority, land management agencies, or landowner. Incorporate recommended soil pH modifier and fertilizer into the top 2 inches of soil as soon as practicable after application.

3. Seeding Requirements

a. Prepare a seedbed in disturbed areas to a depth of 3 to 4 inches using appropriate equipment to provide a firm seedbed. When hydroseeding, scarify the seedbed to facilitate lodging and germination of seed.

b. Seed disturbed areas in accordance with written recommendations for seed mixes, rates, and dates obtained from the local soil conservation authority or the request of the landowner or land management agency. Seeding is not required in cultivated croplands unless requested by the landowner.

c. Perform seeding of permanent vegetation within the recommended seeding dates. If seeding cannot be done within those dates, use appropriate temporary erosion control measures discussed in section IV.F and perform seeding of permanent vegetation at the beginning of the next recommended seeding season. Dormant seeding or temporary seeding of annual species may also be used, if necessary, to establish cover, as approved by the Environmental Inspector. Lawns may be seeded on a schedule established with the landowner.

d. In the absence of written recommendations from the local soil conservation authorities, seed all disturbed soils within 6 working days of final grading, weather and soil conditions permitting, subject to the specifications in section V.D.3.a through V.D.3.c.

e. Base seeding rates on Pure Live Seed. Use seed within 12 months of seed testing.

f. Treat legume seed with an inoculant specific to the species using the manufacturer’s recommended rate of inoculant appropriate for the seeding method (broadcast, drill, or hydro).

g. In the absence of written recommendations from the local soil conservation authorities, landowner, or land managing agency to the contrary, a seed drill equipped with a cultipacker is preferred for seed application.

Broadcast or hydroseeding can be used in lieu of drilling at double the recommended seeding rates. Where seed is broadcast, firm the seedbed with a cultipacker or roller after seeding. In rocky soils or where site conditions may limit the effectiveness of this equipment, other alternatives may be appropriate (e.g., use of a chain drag) to lightly cover seed after application, as approved by the Environmental Inspector.

VI. OFF-ROAD VEHICLE CONTROL

To each owner or manager of forested lands, offer to install and maintain measures to control unauthorized vehicle access to the right-of-way. These measures may include:

A. Signs;

B. Fences with locking gates;

C. Slash and timber barriers, pipe barriers, or a line of boulders across the right-of-way; and

D. Conifers or other appropriate trees or shrubs across the right-of-way.

VII. POST-CONSTRUCTION ACTIVITIES AND REPORTING

A. MONITORING AND MAINTENANCE

1. Conduct follow-up inspections of all disturbed areas, as necessary, to determine the success of revegetation and address landowner concerns. At a minimum, conduct inspections after the first and second growing seasons.

2. Revegetation in non-agricultural areas shall be considered successful if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands. In agricultural areas, revegetation shall be considered successful when upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field, unless the easement agreement specifies otherwise.

   Continue revegetation efforts until revegetation is successful.

3. Monitor and correct problems with drainage and irrigation systems resulting from pipeline construction in agricultural areas until restoration is successful.

4. Restoration shall be considered successful if the right-of-way surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless otherwise approved by the landowner or land managing agency per section V.A.6), revegetation is successful, and proper drainage has been restored.

5. **Routine vegetation mowing or clearing in open areas within the fenced facility boundary that are not covered by gravel or pavement shall occur more frequently than every 3 years and as often as necessary to maintain the areas in low grasses for safety and security. Routine vegetation mowing or clearing in areas outside of the fenced facility boundary shall not occur more frequently than every 3 years out to the toe of facility berm. In no case shall routine vegetation mowing or clearing in areas outside of the fenced facility boundary occur during the migratory bird nesting season between April 15 and August 1 of any year unless specifically approved in writing by the responsible land management agency or the U.S. Fish and Wildlife Service.**

6. Efforts to control unauthorized off-road vehicle use, in cooperation with the landowner, shall continue throughout the life of the project. Maintain signs, gates, and permanent access roads as necessary.

B. REPORTING

1. The project sponsor shall maintain records that identify by milepost:

   a. Method of application, application rate, and type of fertilizer, pH modifying agent, seed, and mulch used;

   b. Acreage treated;

   c. Dates of backfilling and seeding;

   d. Names of landowners requesting special seeding treatment and a description of the follow-up actions;

   e. The location of any subsurface drainage repairs or improvements made during restoration; and

   f. Any problem areas and how they were addressed.

2. The project sponsor shall file with the Secretary quarterly activity reports documenting the results of follow-up inspections required by section VII.A.1; any problem areas, including those identified by the landowner; and corrective actions taken for at least 2 years following construction.

The requirement to file quarterly activity reports with the Secretary does not apply to projects constructed under the automatic authorization, prior notice, or advanced notice provisions in the FERC's regulations.

MODIFIED WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

JACKSONVILLE PROJECT

FERC DOCKET NO. CP17-___-000 (PF15-7-000)

Eagle LNG Partners Jacksonville LLC
20445 State Highway 249, Suite 250
Houston, TX 77070

January 2017

The table below identifies all changes proposed to the FERC Wetland and Waterbody Construction and Mitigation Procedures (Procedures) (May 2013 version) for the Eagle LNG Partners Jacksonville LLC (Eagle LNG) Jacksonville Project (Project). Within the text of the Procedures, the changes are underlined and in bold.

Proposed Changes to the FERC Wetland and Waterbody Construction and Mitigation Procedures (May 2013 Version)

Section	Original Text	Proposed Change (underlined and in bold in text)
V.B.1.b	Coolwater and warmwater fisheries- June 1 through November 30	**Eagle LNG will conduct all in-stream work in consultation with federal and state regulatory agencies. Unless specific issues are identified, Eagle LNG will use its discretion to conduct in-stream work during a time period within its construction schedule. In all events, Eagle LNG will attempt to minimize in-stream impact by adhering to best management practices during all in-stream work.**

MODIFIED WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

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MODIFIED WETLAND & WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES (PROCEDURES)

I. APPLICABILITY

A. The intent of these Procedures is to assist project sponsors by identifying baseline mitigation measures for minimizing the extent and duration of project-related disturbance on wetlands and waterbodies. Project sponsors shall specify in their applications for a new FERC authorization, and in prior notice and advance notice filings, any individual measures in these Procedures they consider unnecessary, technically infeasible, or unsuitable due to local conditions and fully describe any alternative measures they would use. Project sponsors shall also explain how those alternative measures would achieve a comparable level of mitigation.

Once a project is authorized, project sponsors can request further changes as variances to the measures in these Procedures (or the applicant's approved procedures). The Director of the Office of Energy Projects (Director) will consider approval of variances upon the project sponsor's written request, if the Director agrees that a variance:

1. Provides equal or better environmental protection;
2. Is necessary because a portion of these Procedures is infeasible or unworkable based on project-specific conditions; or
3. Is specifically required in writing by another federal, state, or Native American land management agency for the portion of the project on its land or under its jurisdiction.

Sponsors of projects planned for construction under the automatic authorization provisions in the FERC's regulations must receive written approval for any variances in advance of construction. Project-related impacts on non-wetland areas are addressed in the staff's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan).

B. DEFINITIONS

1. "Waterbody" includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes:
   a. "Minor waterbody" includes all waterbodies less than or equal to 10 feet wide at the water's edge at the time of crossing;
   b. "Intermediate waterbody" includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water's edge at the time of crossing; and
   c. "Major waterbody" includes all waterbodies greater than 100 feet wide at the water's edge at the time of crossing.
2. "Wetland" includes any area that is not in actively cultivated or rotated cropland and that satisfies the requirements of the current federal methodology for identifying and delineating wetlands.

II. PRECONSTRUCTION FILING

A. The following information must be filed with the Secretary of the FERC (Secretary) prior to the beginning of construction, for the review and written approval by the Director:

1. Site-specific justifications for extra work areas that would be closer than 50 feet from a waterbody or wetland; and

2. Site-specific justifications for the use of a construction right-of-way greater than 75-feet-wide in wetlands.

B. The following information must be filed with the Secretary prior to the beginning of construction. These filing requirements do not apply to projects constructed under the automatic authorization provisions in the FERC's regulations:

1. Spill Prevention and Response Procedures specified in section IV.A;

2. A schedule identifying when trenching or blasting will occur within each waterbody greater than 10 feet wide, within any designated cold-water fishery, and within any waterbody identified as habitat for federally-listed threatened or endangered species. The project sponsor will revise the schedule as necessary to provide FERC staff at least 14 days advance notice. Changes within this last 14-day period must provide for at least 48 hours advance notice;

3. Plans for horizontal directional drills (HDD) under wetlands or waterbodies, specified in section V.B.6.d;

4. Site-specific plans for major waterbody crossings, described in section V.B.9;

5. A wetland delineation report as described in section VI.A.1, if applicable; and

6. The hydrostatic testing information specified in section VII.B.3.

III. <u>ENVIRONMENTAL INSPECTORS</u>

A. At least one Environmental Inspector having knowledge of the wetland and waterbody conditions in the project area is required for each construction spread. The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected.

B. The Environmental Inspector's responsibilities are outlined in the Plan.

IV. <u>PRECONSTRUCTION PLANNING</u>

A. The project sponsor shall develop project-specific Spill Prevention and Response Procedures that meet applicable requirements of state and federal agencies. A copy must be filed with the Secretary prior to construction and made available in the field on each construction spread. This filing requirement does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

1. It shall be the responsibility of the project sponsor and its contractors to structure their operations in a manner that reduces the risk of spills or the accidental exposure of fuels or hazardous materials to waterbodies or wetlands. The project sponsor and its contractors must, at a minimum, ensure that:

a. All employees handling fuels and other hazardous materials are properly trained;

b. All equipment is in good operating order and inspected on a regular basis;

c. Fuel trucks transporting fuel to on-site equipment travel only on approved access roads;

d. All equipment is parked overnight and/or fueled at least 100 feet from a waterbody or in an upland area at least 100 feet from a wetland boundary. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;

e. Hazardous materials, including chemicals, fuels, and lubricating oils, are not stored within 100 feet of a wetland, waterbody, or designated municipal watershed area, unless the location is designated for such use by an appropriate governmental authority. This applies to storage of these materials and does not apply to normal operation or use of equipment in these areas;

f. Concrete coating activities are not performed within 100 feet of a wetland or waterbody boundary, unless the location is an existing industrial site designated for such use. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;

g. Pumps operating within 100 feet of a waterbody or wetland boundary utilize appropriate secondary containment systems to prevent spills; and

h. Bulk storage of hazardous materials, including chemicals, fuels, and lubricating oils have appropriate secondary containment systems to prevent spills.

2. The project sponsor and its contractors must structure their operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials. At a minimum, the project sponsor and its contractors must:

a. Ensure that each construction crew (including cleanup crews) has on hand sufficient supplies of absorbent and barrier materials to allow the rapid containment and recovery of spilled materials and knows the procedure for reporting spills and unanticipated discoveries of contamination;

b. Ensure that each construction crew has on hand sufficient tools and material to stop leaks;

c. Know the contact names and telephone numbers for all local, state, and federal agencies (including, if necessary, the U. S. Coast Guard and the National Response Center) that must be notified of a spill; and

d. Follow the requirements of those agencies in cleaning up the spill, in excavating and disposing of soils or other materials contaminated by a spill, and in collecting and disposing of waste generated during spill cleanup.

B. AGENCY COORDINATION

The project sponsor must coordinate with the appropriate local, state, and federal agencies as outlined in these Procedures and in the FERC's Orders.

V. WATERBODY CROSSINGS

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply to the U.S. Army Corps of Engineers (USACE), or its delegated agency, for the appropriate wetland and waterbody crossing permits.

2. Provide written notification to authorities responsible for potable surface water supply intakes located within 3 miles downstream of the crossing at least 1 week before beginning work in the waterbody, or as otherwise specified by that authority.

3. Apply for state-issued waterbody crossing permits and obtain individual or generic section 401 water quality certification or waiver.

4. Notify appropriate federal and state authorities at least 48 hours before beginning trenching or blasting within the waterbody, or as specified inapplicable permits.

B. INSTALLATION

1. Time Window for Construction

   Unless expressly permitted or further restricted by the appropriate federal or state agency in writing on a site-specific basis, in-stream work, except that required to install or remove equipment bridges, must occur during the following time windows:

   a. Coldwater fisheries –June 1 through September 30; and

   b. Coolwater and warmwater fisheries – **Eagle LNG will conduct all in-stream work in consultation with federal and state regulatory agencies. Unless specific issues are identified, Eagle LNG will use its discretion to conduct in-stream work during a time period within its construction schedule. In all events, Eagle LNG will attempt to minimize in-stream impact by adhering to best management practices during all in-stream work.**

2. Extra Work Areas

   a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

   b. The project sponsor shall file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from the water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the conditions that will not permit a 50-foot setback and measures to ensure the waterbody is adequately protected.

   c. Limit the size of extra work areas to the minimum needed to construct the waterbody crossing.

3. General Crossing Procedures

   a. Comply with the USACE, or its delegated agency, permit terms and conditions.

b. Construct crossings as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.

c. Where pipelines parallel a waterbody, maintain at least 15 feet of undisturbed vegetation between the waterbody (and any adjacent wetland) and the construction right-of-way, except where maintaining this offset will result in greater environmental impact.

d. Where waterbodies meander or have multiple channels, route the pipeline to minimize the number of waterbody crossings.

e. Maintain adequate waterbody flow rates to protect aquatic life, and prevent the interruption of existing downstream uses.

f. Waterbody buffers (e.g., extra work area setbacks, refueling restrictions) must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

g. Crossing of waterbodies when they are dry or frozen and not flowing may proceed using standard upland construction techniques in accordance with the Plan, provided that the Environmental Inspector verifies that water is unlikely to flow between initial disturbance and final stabilization of the feature. In the event of perceptible flow, the project sponsor must comply with all applicable Procedure requirements for “waterbodies” as defined in section I.B.1.

4. Spoil Pile Placement and Control

a. Transco will place spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings, in the construction right-of-way at least 10 feet away from the water's edge or in additional extra work areas as described in section V.B.2.a.

b. Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody.

5. Equipment Bridges

a. Only clearing equipment and equipment necessary for installation of equipment bridges may cross waterbodies prior to bridge installation. Limit the number of such crossings of each waterbody to one per piece of clearing equipment.

b. Construct and maintain equipment bridges to allow unrestricted flow and to prevent soil from entering the waterbody. Examples of such bridges include:

(1) Equipment pads and culvert(s);

(2) Equipment pads or railroad car bridges without culverts;

(3) Clean rock fill and culvert(s); and

(4) Flexi-float or portable bridges.

(5) Additional options for equipment bridges may be utilized that achieve the performance objectives noted above. Do not use soil to construct or stabilize equipment bridges.

b. Design and maintain each equipment bridge to withstand and pass the highest flow expected to occur while the bridge is in place. Align culverts to prevent bank erosion or streambed scour. If necessary, install energy dissipating devices downstream of the culverts.

c. Design and maintain equipment bridges to prevent soil from entering the waterbody.

d. Remove temporary equipment bridges as soon as practicable after permanent seeding.

e. If there will be more than 1 month between final cleanup and the beginning of permanent seeding and reasonable alternative access to the right-of-way is available, remove temporary equipment bridges as soon as practicable after final cleanup.

f. Obtain any necessary approval from the USACE, or the appropriate state agency for permanent bridges.

6. Dry-Ditch Crossing Methods

a. Unless approved otherwise by the appropriate federal or state agency, install the pipeline using one of the dry-ditch methods outlined below for crossings of waterbodies up to 30 feet wide (at the water's edge at the time of construction) that are state-designated as either coldwater or significant coolwater or warmwater fisheries, or federally designated as critical habitat.

b. Dam and Pump

(1) The dam-and-pump method may be used without prior approval for crossings of waterbodies where pumps can adequately transfer streamflow volumes around the work area, and there are no concerns about sensitive species passage.

(2) Implementation of the dam-and-pump crossing method must meet the following performance criteria:

i. Use sufficient pumps, including on-site backup pumps, to maintain downstream flows;

ii. Construct dams with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner);

iii. Screen pump intakes to minimize entrainment of fish;

iv. Prevent streambed scour at pump discharge; and

v. Continuously monitor the dam and pumps to ensure proper operation throughout the waterbody crossing.

c. Flume Crossing

The flume crossing method requires implementation of the following steps:

(1) Install flume pipe after blasting (if necessary), but before any trenching;

(2) Use sand bag or sand bag and plastic sheeting diversion structure or equivalent to develop an effective seal and to divert stream flow through the flume pipe (some modifications to the stream bottom may be required to achieve an effective seal);

(3) Properly align flume pipe(s) to prevent bank erosion and streambed scour;

(4) Do not remove flume pipe during trenching, pipelaying, or backfilling activities, or initial streambed restoration efforts; and

(5) Remove all flume pipes and dams that are not also part of the equipment bridge as soon as final cleanup of the stream bed and bank is complete.

d. Horizontal Directional Drill

For each waterbody or wetlands that would be crossed using the HDD method, file with the Secretary for the review and written approval by the Director, a plan that includes:

(1) Site-specific construction diagrams that show the location of mud pits, pipe assembly areas, and all areas to be disturbed or cleared for construction;

(2) Justification that disturbed areas are limited to the minimum needed to construct the crossing;

(3) Identification of any aboveground disturbance or clearing between the HDD entry and exit workspaces during construction;

(4) A description of how an inadvertent release of drilling mud would be contained and cleaned up; and

(5) A contingency plan for crossing the waterbody or wetland in the event the HDD is unsuccessful and how the abandoned drill hole would be sealed, if necessary.

The requirement to file HDD plans does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

7. Crossings of Minor Waterbodies

Where a dry-ditch crossing is not required, minor waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

a. Except for blasting and other rock breaking measures, complete instream construction activities (including trenching, pipe installation, backfill, and restoration of the streambed contours) within 24 hours. Streambanks and unconsolidated streambeds may require additional restoration after this period;

b. Limit use of equipment operating in the waterbody to that needed to construct the crossing; and

c. Equipment bridges are not required at minor waterbodies that do not have a state-designated fishery classification or protected status (e.g., agricultural or intermittent drainage ditches). However, if an equipment bridge is used it must be constructed as described in section V.B.5.

8. Crossings of Intermediate Waterbodies

Where a dry-ditch crossing is not required, intermediate waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

a. Complete in-stream construction activities (not including blasting and other rock breaking measures) within 48 hours, unless site-specific conditions make completion within 48 hours infeasible;

b. Limit use of equipment operating in the waterbody to that needed to construct the crossing; and

c. All other construction equipment must cross on an equipment bridge as specified in section V.B.5.

9. Crossings of Major Waterbodies

Before construction, the project sponsor shall file with the Secretary for the review and written approval by the Director a detailed, site-specific construction plan and scaled drawings identifying all areas to be disturbed by construction for each major waterbody crossing (the scaled drawings are not required for any offshore portions of pipeline projects). This plan must be developed in consultation with the appropriate state and federal agencies and shall include extra work areas, spoil storage areas, sediment control structures, etc., as well as mitigation for navigational issues. The requirement to file major waterbody crossing plans does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

The Environmental Inspector may adjust the final placement of the erosion and sediment control structures in the field to maximize effectiveness.

10. Temporary Erosion and Sediment Control

Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the waterbody or adjacent upland.

Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan; however, the following specific measures must be implemented at stream crossings:

a. Install sediment barriers across the entire construction right-of-way at all waterbody crossings, where necessary to prevent the flow of sediments into the waterbody. Removable sediment barriers (or drivable berms) must be installed across the travel lane. These removable sediment barriers can be removed during the construction day, but must be re-installed after construction has stopped for the day and/or when heavy precipitation is imminent;

b. Where waterbodies are adjacent to the construction right-of-way and the right-of-way slopes toward the waterbody, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the waterbody; and

c. Use temporary trench plugs at all waterbody crossings, as necessary, to prevent diversion of water into upland portions of the pipeline trench and to keep any accumulated trench water out of the waterbody.

11. Trench Dewatering

Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any waterbody. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Use clean gravel or native cobbles for the upper 1 foot of trench backfill in all waterbodies that contain coldwater fisheries.
2. For open-cut crossings, stabilize waterbody banks and install temporary sediment barriers within 24 hours of completing in-stream construction activities. For dry-ditch crossings, complete streambed and bank stabilization before returning flow to the waterbody channel.
3. Return all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the Environmental Inspector.
4. Install erosion control fabric or a functional equivalent on waterbody banks at the time of final bank recontouring. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.
5. Application of riprap for bank stabilization must comply with USACE, or its delegated agency, permit terms and conditions.
6. Unless otherwise specified by state permit, limit the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric.
7. Revegetate disturbed riparian areas with native species of conservation grasses, legumes, and woody species, similar in density to adjacent undisturbed lands.
8. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent that are less than 50 feet from the waterbody, or as needed to prevent sediment transport into the waterbody. In addition, install sediment barriers as outlined in the Plan.
9. In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the waterbody.
10. Sections V.C.3 through V.C.7 above also apply to those perennial or intermittent streams not flowing at the time of construction.

D. POST-CONSTRUCTION MAINTENANCE

1. Limit routine vegetation mowing or clearing adjacent to waterbodies to allow a riparian strip at least 25 feet wide, as measured from the waterbody's mean high water mark, to permanently revegetate with native plant species across the entire construction right-of-way. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In

addition, trees that are located within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in riparian areas that are between HDD entry and exit points.

2. Do not use herbicides or pesticides in or within 100 feet of a waterbody except as allowed by the appropriate land management or state agency.

3. Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of riparian areas.

VI. WETLAND CROSSINGS

A. GENERAL

1. The project sponsor shall conduct a wetland delineation using the current federal methodology and file a wetland delineation report with the Secretary before construction. The requirement to file a wetland delineation report does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

   This report shall identify:

   a. By milepost all wetlands that would be affected;

   b. The National Wetlands Inventory (NWI) classification for each wetland;

   c. The crossing length of each wetland in feet; and

   d. The area of permanent and temporary disturbance that would occur in each wetland by NWI classification type.

   The requirements outlined in this section do not apply to wetlands in actively cultivated or rotated cropland. Standard upland protective measures, including workspace and topsoiling requirements, apply to these agricultural wetlands.

2. Route the pipeline to avoid wetland areas to the maximum extent possible. If a wetland cannot be avoided or crossed by following an existing right-of-way, route the new pipeline in a manner that minimizes disturbance to wetlands. Where looping an existing pipeline, overlap the existing pipeline right-of-way with the new construction right-of-way. In addition, locate the loop line no more than 25 feet away from the existing pipeline unless site-specific constraints would adversely affect the stability of the existing pipeline.

3. Limit the width of the construction right-of-way to 75 feet or less. Prior written approval of the Director is required where topographic conditions or soil limitations require that the construction right-of-way width within the boundaries of a federally delineated wetland be expanded beyond 75 feet. Early in the planning process the project sponsor is encouraged to identify site-specific areas where excessively wide trenches could occur and/or where spoil piles could be difficult to maintain because existing soils lack adequate unconfined compressive strength.

4. Wetland boundaries and buffers must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

5. Implement the measures of sections V and VI in the event a waterbody crossing is located within or adjacent to a wetland crossing. If all measures of sections V

and VI cannot be met, the project sponsor must file with the Secretary a site-specific crossing plan for review and written approval by the Director before construction. This crossing plan shall address at a minimum:

a. Spoil control;

b. Equipment bridges;

c. Restoration of waterbody banks and wetland hydrology;

d. Timing of the waterbody crossing;

e. Method of crossing; and

f. Size and location of all extra work areas.

6. Do not locate aboveground facilities in any wetland, except where the location of such facilities outside of wetlands would prohibit compliance with U.S. Department of Transportation regulations.

B. INSTALLATION

1. Extra Work Areas and Access Roads

a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from wetland boundaries, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

b. The project sponsor shall file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from wetland boundaries, except where adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the site-specific conditions that will not permit a 50-foot setback and measures to ensure the wetland is adequately protected.

c. The construction right-of-way may be used for access when the wetland soil is firm enough to avoid rutting or the construction right-of-way has been appropriately stabilized to avoid rutting (e.g., with timber riprap, prefabricated equipment mats, or terra mats).

In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing shall use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, limit all other construction equipment to one pass through the wetland using the construction right-of-way.

d. The only access roads, other than the construction right-of-way, that can be used in wetlands are those existing roads that can be used with no modifications or improvements, other than routine repair, and no impact on the wetland.

2. Crossing Procedures

a. Comply with USACE, or its delegated agency, permit terms and conditions.

b. Assemble the pipeline in an upland area unless the wetland is dry enough to adequately support skids and pipe.

c. Use "push-pull" or "float" techniques to place the pipe in the trench where water and other site conditions allow.

d. Minimize the length of time that topsoil is segregated and the trench is open. Do not trench the wetland until the pipeline is assembled and ready for lowering in.

e. Limit construction equipment operating in wetland areas to that needed to clear the construction right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction right-of-way.

f. Cut vegetation just above ground level, leaving existing root systems in place, and remove it from the wetland for disposal.

g. The project sponsor can burn woody debris in wetlands, if approved by USACE and in accordance with state and local regulations, ensuring that all remaining woody debris is removed for disposal.

h. Limit pulling of tree stumps and grading activities to directly over the trenchline. Do not grade or remove stumps or root systems from the rest of the construction right-of-way in wetlands unless the Chief Inspector and Environmental Inspector determine that safety-related construction constraints require grading or the removal of tree stumps from under the working side of the construction right-of-way.

i. Segregate the top 1 foot of topsoil from the area disturbed by trenching, except in areas where standing water is present or soils are saturated. Immediately after backfilling is complete, restore the segregated topsoil to its original location.

j. Do not use rock, soil imported from outside the wetland, tree stumps, or brush riprap to support equipment on the construction right-of-way.

k. If standing water or saturated soils are present, or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, use low-ground-weight construction equipment, or operate normal equipment on timber riprap, prefabricated equipment mats, or terra mats.

l. Remove all project-related material used to support equipment on the construction right-of-way upon completion of construction.

3. Temporary Sediment Control

Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the wetland or adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench). Except as noted below in section VI.B.3.c, maintain sediment barriers until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan.

a. Install sediment barriers across the entire construction right-of-way immediately upslope of the wetland boundary at all wetland crossings where necessary to prevent sediment flow into the wetland.

b. Where wetlands are adjacent to the construction right-of-way and the right-of-way slopes toward the wetland, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the wetland.

c. Install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil and sediment within the construction right-of-way through wetlands. Remove these sediment barriers during right-of-way cleanup.

4. Trench Dewatering

Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any wetland. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Where the pipeline trench may drain a wetland, construct trench breakers at the wetland boundaries and/or seal the trench bottom as necessary to maintain the original wetland hydrology.

2. Restore pre-construction wetland contours to maintain the original wetland hydrology.

3. For each wetland crossed, install a trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from the wetland, or as needed to prevent sediment transport into the wetland. In addition, install sediment barriers as outlined in the Plan. In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the wetland.

4. Do not use fertilizer, lime, or mulch unless required in writing by the appropriate federal or state agency.

5. Consult with the appropriate federal or state agencies to develop a project-specific wetland restoration plan. The restoration plan shall include measures for re-establishing herbaceous and/or woody species, controlling the invasion and spread of invasive species and noxious weeds (e.g., purple loosestrife and phragmites), and monitoring the success of the revegetation and weed control efforts. Provide this plan to the FERC staff upon request.

6. Until a project-specific wetland restoration plan is developed and/or implemented, temporarily revegetate the construction right-of-way with annual ryegrass at a rate of 40 pounds/acre (unless standing water is present).

7. Ensure that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species.

8. Remove temporary sediment barriers located at the boundary between wetland and adjacent upland areas after revegetation and stabilization of adjacent upland areas are judged to be successful as specified in section VII.A.4 of the Plan.

D. POST-CONSTRUCTION MAINTENANCE AND REPORTING

1. Do not conduct routine vegetation mowing or clearing over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of pipeline coating may be selectively cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in wetlands that are between HDD entry and exit points.

2. Do not use herbicides or pesticides in or within 100 feet of a wetland or waterbody, except as allowed by the appropriate federal or state agency.

3. Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of wetland areas.

4. Monitor and record the success of wetland revegetation annually until wetland revegetation is successful.

5. Wetland revegetation shall be considered successful if all of the following criteria are satisfied:

   a. The affected wetland satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation);

   b. Vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction;

   c. If natural rather than active revegetation was used, the plant species composition is consistent with early successional wetland plant communities in the affected ecoregion; and

   d. Invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.

6. Within 3 years after construction, file a report with the Secretary identifying the status of the wetland revegetation efforts and documenting success as defined in section VI.D.5, above. The requirement to file wetland restoration reports with the Secretary does not apply to projects constructed under the automatic authorization, prior notice, or advance notice provisions in the FERC's regulations.

   For any wetland where revegetation is not successful at the end of 3 years after construction, develop and implement (in consultation with a professional wetland ecologist) a remedial revegetation plan to actively revegetate wetlands. Continue revegetation efforts and file a report annually documenting progress in these wetlands until wetland revegetation is successful.

VII. HYDROSTATIC TESTING

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply for state-issued water withdrawal permits, as required.

2. Apply for National Pollutant Discharge Elimination System (NPDES) or state-issued discharge permits, as required.

3. Notify appropriate state agencies of intent to use specific sources at least 48 hours before testing activities unless they waive this requirement in writing.

B. GENERAL

1. Perform 100 percent radiographic inspection of all pipeline section welds or hydrotest the pipeline sections, before installation under waterbodies or wetlands.

2. If pumps used for hydrostatic testing are within 100 feet of any waterbody or wetland, address secondary containment and refueling of these pumps in the project's Spill Prevention and Response Procedures.

3. The project sponsor shall file with the Secretary before construction a list identifying the location of all waterbodies proposed for use as a hydrostatic test water source or discharge location. This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

C. INTAKE SOURCE AND RATE

1. Screen the intake hose to minimize the potential for entrainment of fish.

2. Do not use state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and/or local permitting agencies grant written permission.

3. Maintain adequate flow rates to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.

4. Locate hydrostatic test manifolds outside wetlands and riparian areas to the maximum extent practicable.

D. DISCHARGE LOCATION, METHOD, AND RATE

1. Regulate discharge rate, use energy dissipation device(s), and install sediment barriers, as necessary, to prevent erosion, streambed scour, suspension of sediments, or excessive streamflow.

2. Do not discharge into state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and local permitting agencies grant written permission.

APPENDIX F

JACKSONVILLE PROJECT MARINE TERMINAL DREDGING AND DREDGED MATERIAL MANAGEMENT AREA PLAN

TAYLOR ENGINEERING, INC.

Jacksonville Project Marine Terminal Dredging and Dredged Material Management Area Plan

Eagle LNG Marine Terminal
Duval County, Florida

May 2017

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Jacksonville Project
Marine Terminal Dredging and
Dredged Material Management Area Plan
Duval County, Florida

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1.0 INTRODUCTION

At the Eagle LNG proposed terminal location (**Attachment A**, Drawing Sheets GA-3), water depths within the adjacent federal channel will support the full range of design vessel draft without additional channel dredging. However, water depths in the immediate vicinity of the site shoreline are shallow (5 to 10 ft). Farther offshore and adjacent to the federal channel, water depths approach the design draft requirement. However, the marine terminal construction would require dredging to construct and maintain an adequate berth to accommodate the full range of design ships.

The berthing line and landward edge of the dredged berth would occur approximately 900 ft offshore with the marine terminal structures set back from the federal channel approximately 255 ft. In any case, the marine terminal — including the largest design vessel in berth— would not encroach on the safe setback distance (150 ft) as defined by the USACE for Cut 50 of the federal channel. The length of the dredged berth along the berthing line would total approximately 965 ft (approximately 1.5 times the maximum design vessel length). The length of the dredged berth parallel and waterward (i.e. towards the federal channel) of the berthing line would measure approximately 1,223 ft. The resulting dredging area would total approximately 440,280 sf (10.11 ac).

The proposed berth depth — 37.25 ft below Mean Lower Low Water (MLLW) —would accommodate the maximum design vessel draft (29.3 ft) with approximately 3 ft for trim allowance in fully loaded conditions (32.25 ft), and include 4 ft of under keel clearance and 1 foot for overdredge allowance. Dredging would require excavation of native in situ soils with a maximum cut depth of approximately 22 ft and an average cut depth of approximately 11 ft. **Attachment A**, Drawing Sheets DR1 – DR7, provide an overview of the planned dredging.

Initial berth dredging would require removal of approximately 179,000 cubic yards of dredged material. Dredging work would require the use of a hydraulic cutterhead or mechanical dredging equipment.

2.0 CHARACTERIZATION OF DREDGED MATERIAL

In general, to a depth of about 100 ft below water surface, the subsurface conditions are known to exhibit three major soil/rock layers. These layers — from top to bottom — include unconsolidated soils (primarily silt and sand), weathered limestone, and marl.

The weathered limestone layer presents a challenge to the marine terminal if present above target dredging elevation. Dredging through limestone to develop the appropriate depths for the terminal may be difficult. Because dredging is such a critical component to the terminal construction, Eagle LNG's geotechnical investigation includes an evaluation of the submerged soils from within the proposed dredging template. These field investigations (AMEC Foster Wheeler 2017) evaluated the physical characteristics of the expected dredged material and enable further assessment of appropriate dredging and dredged material management strategies and the suitability of the dredged material for upland use. Field investigation included ten Standard Penetration Test (SPT). Seven of these borings were advanced to relatively shallow depths between 10 and 30 ft below existing sediment grades to evaluate the surface sediments. Three borings were advanced to depths ranging from 75 to 120 ft below the mudline to better characterize the underlying limestone. From the existing river mudline to elevations varying from about -30 ft to -43 ft (MLLW), borings show layers of very loose to firm fine sands, slightly silty to silty fine sands, slightly clayey to clayey fine sands, very soft slightly sandy silt, and stiff clay. Weakly cemented (weathered) to well-cemented fossiliferous sandy limestone was encountered in three of the initial borings, with layer thicknesses of approximately 2 to 3½ ft, and in all the subsequent deeper borings with layer thicknesses ranging from approximately 10 to 30 ft.

Based on these results, Eagle LNG expects that dredging activities for the berth would encounter some limestone. Some cutting or ripping with a properly equipped cutter-suction dredge or a force arm mechanical dredge will likely be necessary to remove the limestone caprock encountered above the planned dredging elevation in these areas. The limestone encountered by the borings is generally considered to be relatively weak compared to most rock formations. Therefore, blasting is not anticipated to be necessary.

To assess whether the proposed dredged material includes any deleterious chemical constituents, Eagle LNG completed a study including field sediment sampling and laboratory analysis (Taylor Engineering, Inc. 2015). In short, based on the completed analysis, the dredged material appears free of contaminants that would otherwise limit reuse or disposal alternatives.

3.0 DREDGED MATERIAL MANAGEMENT PLAN

3.1 Onsite Dredged Material Management

Eagle LNG plans to construct a permanent onsite dredged material management area to handle both initial dredging and subsequent maintenance dredging events. **Attachment A**, Drawing Sheets DR8 – DR11, provide an overview of the planned DMMA. The site construction provides a single-cell dredged material processing facility comprised of an earthen containment dike enclosure; interior box weirs and piping system for controlled return water discharge; a perimeter road for transport and inspection; a perimeter ditch and retention basin for stormwater and seepage water management; and an exterior working pad for equipment access, dredged material offloading, stockpile, and truck loading of dewatered dredged material.

The dike crest elevation of 23.49 ft NAVD88 results in a dike height, at its tallest, of approximately 15.5 ft above existing grade. All borrow material necessary to construct the DMMA will originate from onsite grading and excavation of the DMMA basin down to an elevation of approximately 4.4 ft NAVD88.

Before dredging begins, the contractor would construct the DMMA site as shown on the drawings. Once the site is prepared, the dredger would begin excavation of the berth. In the case of hydraulic dredging, the dredger would hydraulically pump sediment slurry directly into the DMMA basin. Optionally, for mechanical dredging, the dredger may excavate the berth and deposit materials into a holding barge. The contractor would then offload the barge to the DMMA by slurry pump.

The DMMA basin provides an area to clarify and decant excess water. Dredging operations and active management of the discharge weirs will allow the contractor to meet discharge water quality standards such that the turbidity of discharge waters do not exceed 29 NTU's above background level. The weir system inside the basin will allow discharge of excess water back to the St. Johns River.

The dredged material basin design supports a maximum pool elevation of 21.25 ft NAVD88 to maintain a minimum freeboard of 2 ft at all times. Assuming a minimum water depth of two feet to allow for gravity clarification and effluent discharge without risk of sediment entrainment, the maximum dredged material storage elevation of 19.25 ft NAVD88 results in a total storage volume of approximately 180,812 cubic yards. Therefore, the DMMA provides sufficient capacity to store the full volume (179,000 cubic yards) of dredged material generated by the initial dredging event before offloading will become necessary.

During offloading, the contractor will dewater and excavate dredged material from within the basin and transport the material from the basin interior to the outside work pad where the materials may undergo further dewatering and loading into truck for transport, either to the main site for construction application or for offsite disposal. Offloading would restore the site's full capacity to provide storage for future maintenance dredging events. Eagle LNG will periodically remove an equivalent volume of material from the DMMA prior to each maintenance dredging event. This material could be disposed of at the Jacksonville Port Authority local dredge material management areas, used to benefit local area construction projects or other equivalent location(s) identified by Eagle LNG during the life of the facility.

3.2 Maintenance Dredging Requirements and Dredged Material Management Plan

The berth will require periodic maintenance dredging. Based on the completed deposition analysis (Taylor Engineering, Inc. 2017), the berth may experience an average sedimentation rate of approximately 30 to 40 inches annually. The berth includes one foot of planned over-dredging to accommodate some initial sedimentation without need for overly frequent maintenance dredging. The estimated sedimentation rate suggests multiple maintenance dredging events annually. However, this condition only dominates for the extreme end of the design vessel spectrum. The 45,000 cbm design vessel has a trim draft of approximately 32.25 ft in its fully loaded condition, and to maintain 4 ft of under keel clearance for this vessel, the berth may require frequent maintenance dredging. However, the 45,000 cbm vessel is understood to represent the absolute maximum size vessel expected to call at this facility. All other design vessels (Coral Energy, Coral Anthelia, Coral Methane, and 30,000 cbm concept vessel) present design drafts between 22.3 and 28.9 ft. Therefore, for the design draft of the remaining design fleet, the dredged berth has the capacity to absorb over 4 ft of sedimentation without any reduction in the proposed under keel clearance (4 ft). For these vessels, the maintenance interval expands to 1 to 2 years.

Actual maintenance intervals will depend on observed sedimentation rates and actual operating berth clearance requirements. Based on the deposition analysis, for a hypothetical annual maintenance interval to remove approximately 3 ft of sedimentation, maintenance volumes are expected to total approximately 49,000 cubic yards. Eagle LNG would manage maintenance dredged materials within its purpose-built upland DMMA. The DMMA could provide storage for 3 to 4 such maintenance events before it reaches capacity and again requires offloading.

REFERENCES

AMEC Foster Wheeler Environmental & Infrastructure, Inc. 2015. Report of Geotechnical Exploration - St. Johns River Dredging, Eagle LNG Processing Terminal (Project 6734-15-9815, Rep.).

Taylor Engineering, Inc. 2015. *Jacksonville Project Marine Terminal Sediment Quality Sampling and Analysis* (Rep. No. TE-RR2-01).

Taylor Engineering, Inc. 2017. *Jacksonville Project Marine Terminal Dredging Effects and Dredge Template Deposition Estimates* (Rep. No. TE-RR2-02).

Jacksonville Project - Marine Terminal Dredging and Dredged Material Management Area Plan

ATTACHMENT A

F-10

TIDAL DATUM

TIDAL DATUM REFERENCE: 1.70' (NAVD88 – MLLW)

DESIGN REFERENCE: NAVD 88
TIDAL DATUM SOURCE: TAYLOR ENGINEERING MARINE TERMINAL STORM SURGE AND HURRICANE VULNERABILITY STUDY (2016)

0 1,000' 2,000' 4,000'
GRAPHIC SCALE
22X34: 1" = 1,000'
11X17: 1" = 2,000'

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60% DRAFT

KEITH A. KNIGHT P.E.# 58084

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JACKSONVILLE MARINE TERMINAL
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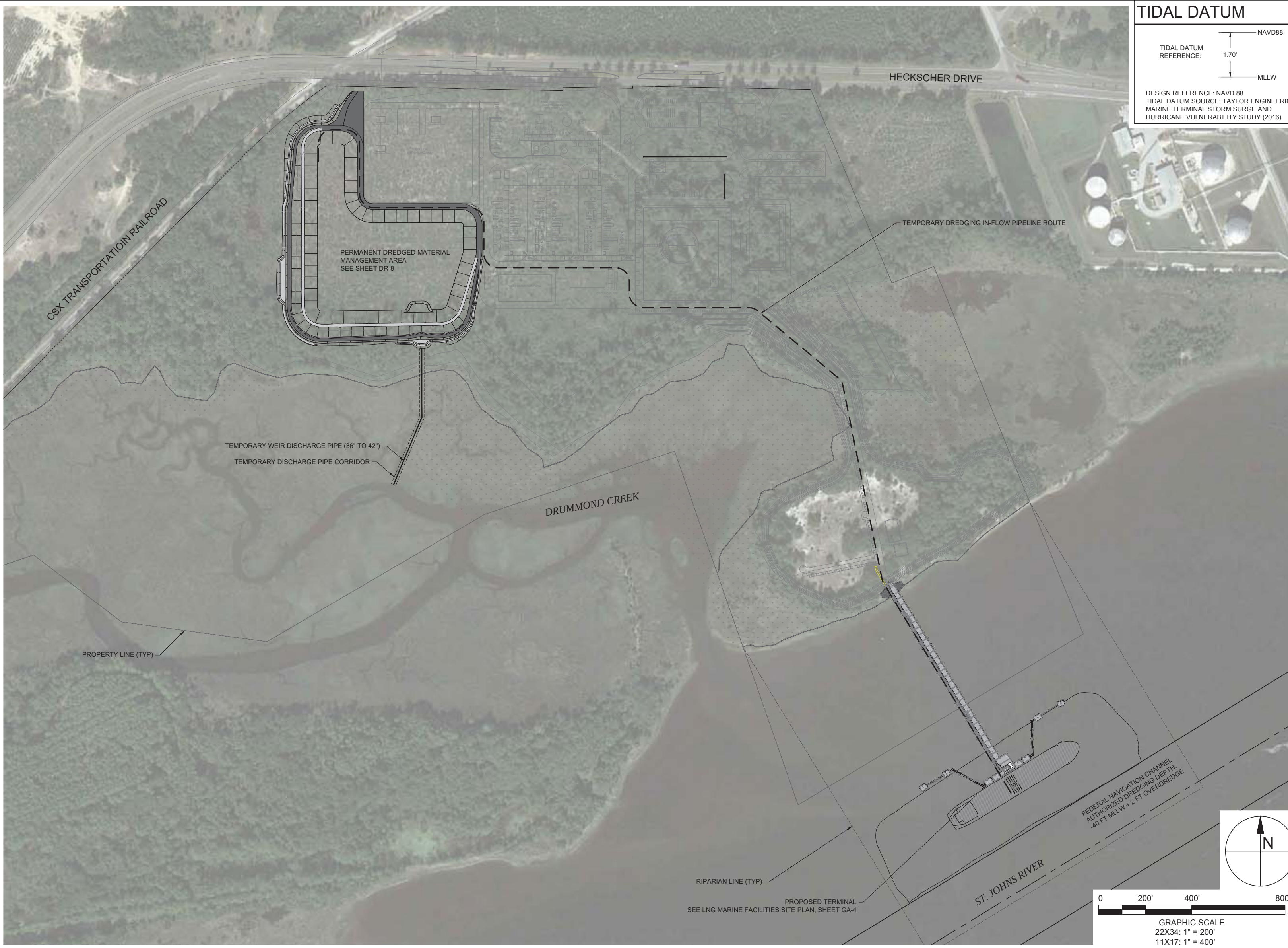
DRAWING TITLE

PROJECT OVERVIEW

GA-3

SHEET 3 OF 43

F-11



TIDAL DATUM

TIDAL DATUM REFERENCE: NAVD88 1.70' MLLW

DESIGN REFERENCE: NAVD 88
TIDAL DATUM SOURCE: TAYLOR ENGINEERING MARINE TERMINAL STORM SURGE AND HURRICANE VULNERABILITY STUDY (2016)

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DREDGING OVERVIEW

DR-1

SHEET 32 OF 43

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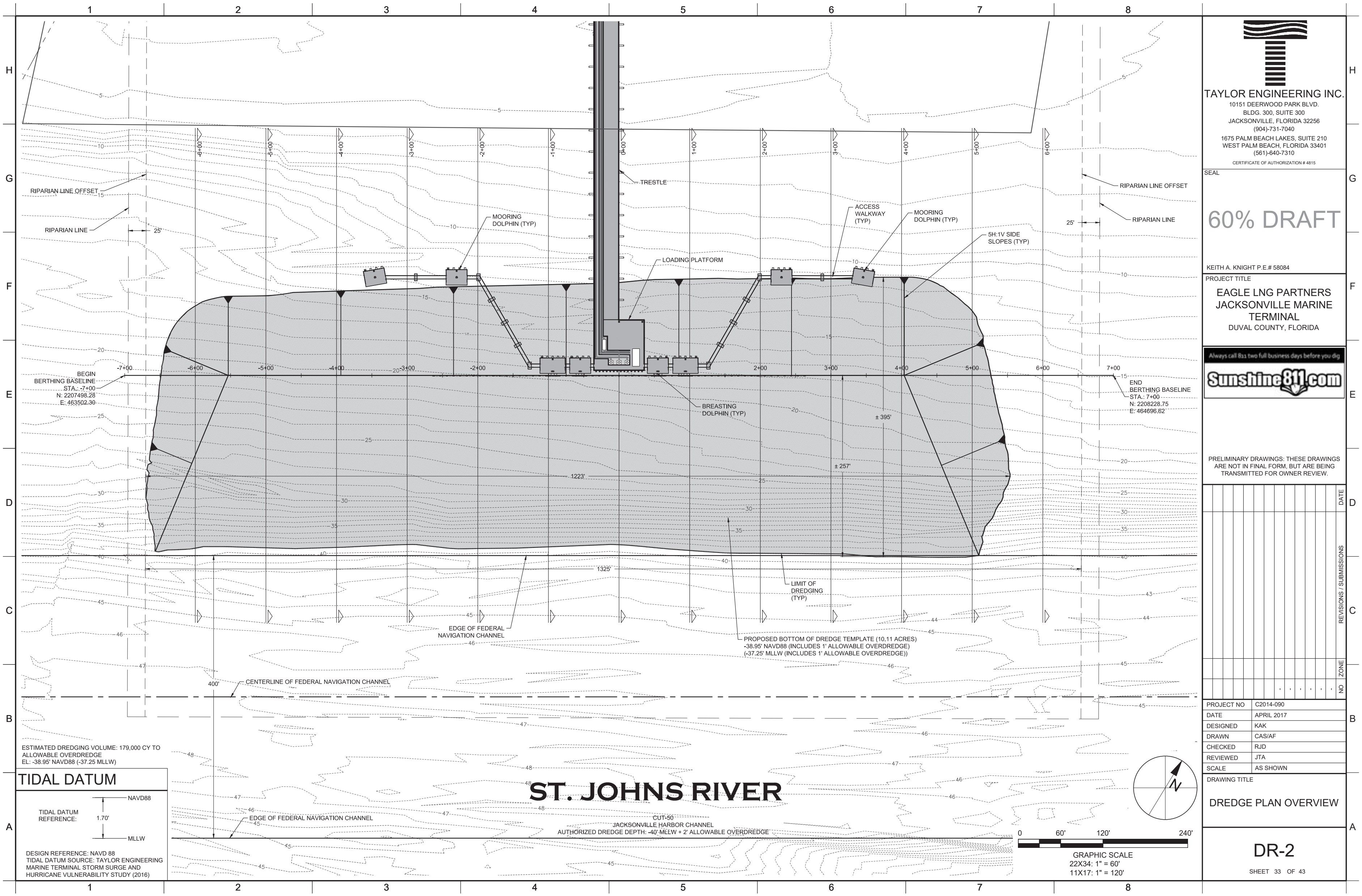
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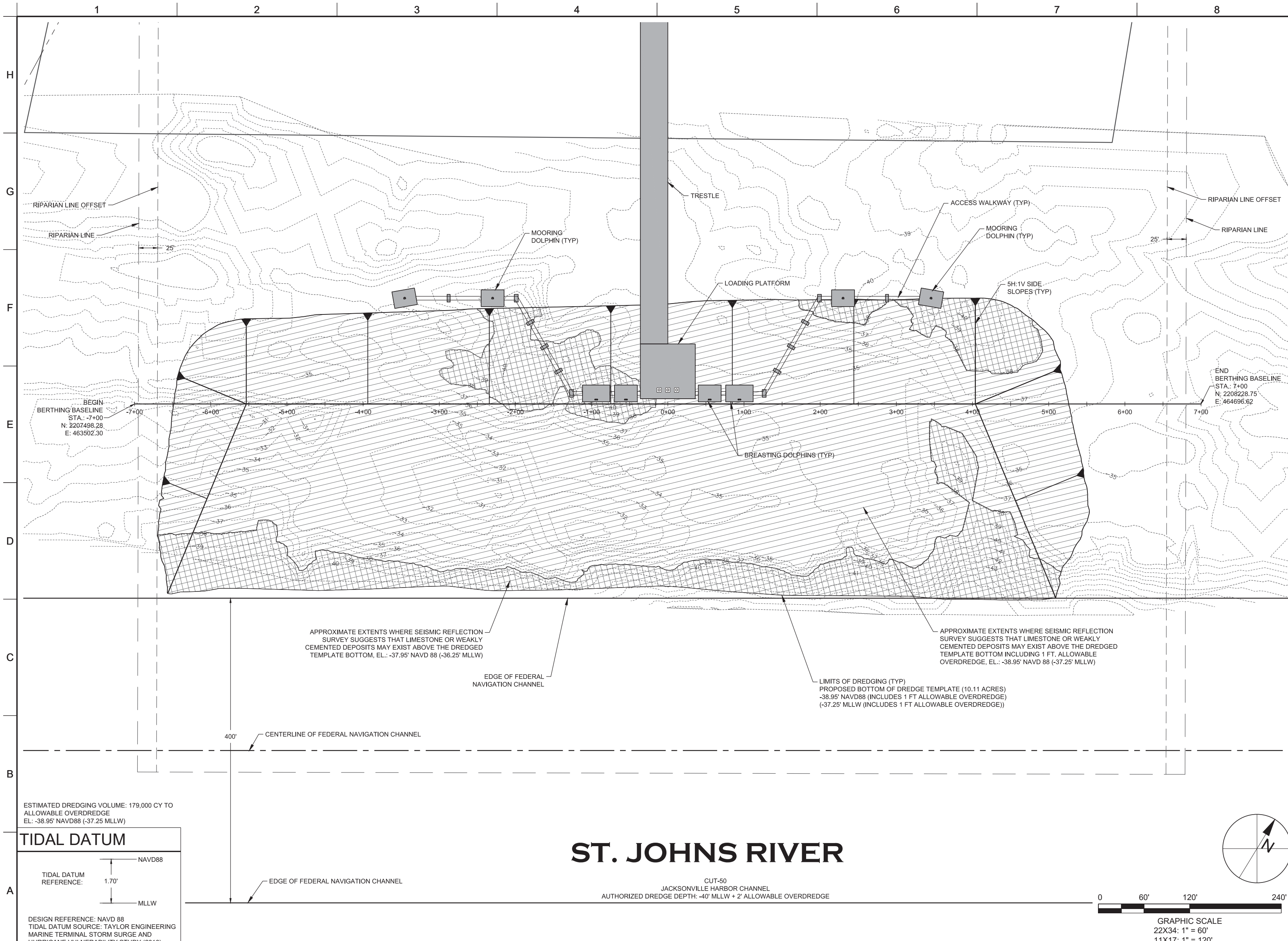
DRAWING TITLE
DREDGE PLAN OVERVIEW
DR-2
SHEET 33 OF 43
TRESTLE
RIPARIAN LINE OFFSET
RIPARIAN LINE
25'
MOORING DOLPHIN (TYP)
ACCESS WALKWAY (TYP)
LOADING PLATFORM
5H:1V SIDE SLOPES (TYP)
BEGIN BERTHING BASELINE
STA.: -7+00
N: 2207498.28
E: 463502.30
END BERTHING BASELINE
STA.: 7+00
N: 2208228.75
E: 464696.62
BREASTING DOLPHIN (TYP)
± 395'
± 257'
1223'
1325'
LIMIT OF DREDGING (TYP)
EDGE OF FEDERAL NAVIGATION CHANNEL
PROPOSED BOTTOM OF DREDGE TEMPLATE (10.11 ACRES)
-38.95' NAVD88 (INCLUDES 1' ALLOWABLE OVERDREDGE)
(-37.25' MLLW (INCLUDES 1' ALLOWABLE OVERDREDGE))
400'
CENTERLINE OF FEDERAL NAVIGATION CHANNEL
ESTIMATED DREDGING VOLUME: 179,000 CY TO ALLOWABLE OVERDREDGE
EL: -38.95' NAVD88 (-37.25 MLLW)
TIDAL DATUM
NAVD88
TIDAL DATUM REFERENCE:
1.70'
MLLW
DESIGN REFERENCE: NAVD 88
TIDAL DATUM SOURCE: TAYLOR ENGINEERING MARINE TERMINAL STORM SURGE AND HURRICANE VULNERABILITY STUDY (2016)
ST. JOHNS RIVER
EDGE OF FEDERAL NAVIGATION CHANNEL
CUT-50
JACKSONVILLE HARBOR CHANNEL
AUTHORIZED DREDGE DEPTH: -40' MLLW + 2' ALLOWABLE OVERDREDGE
N
0
60'
120'
240'
GRAPHIC SCALE
22X34: 1" = 60'
11X17: 1" = 120'

F-13



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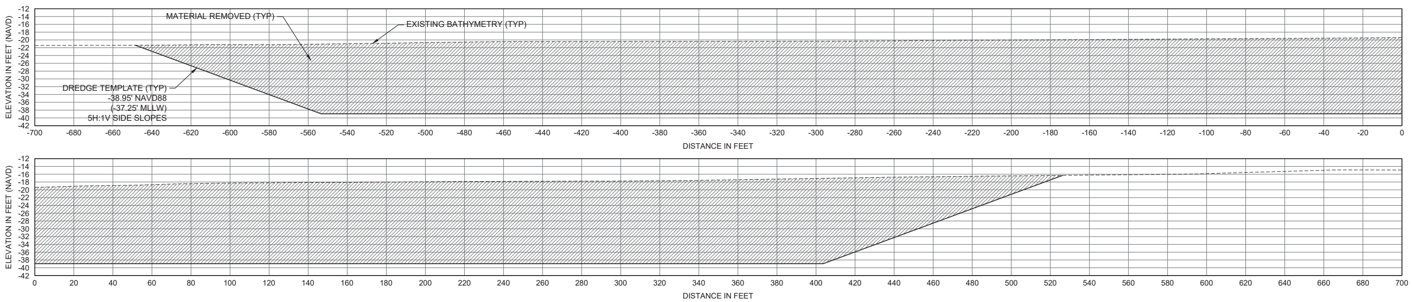
DRAWING TITLE

DREDGE PLAN WITH ROCK/HARD STRATA CONTOURS

DR-3

SHEET 34 OF 43

F-14



BERTHING BASELINE SECTION

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11X17: 1" = 60'
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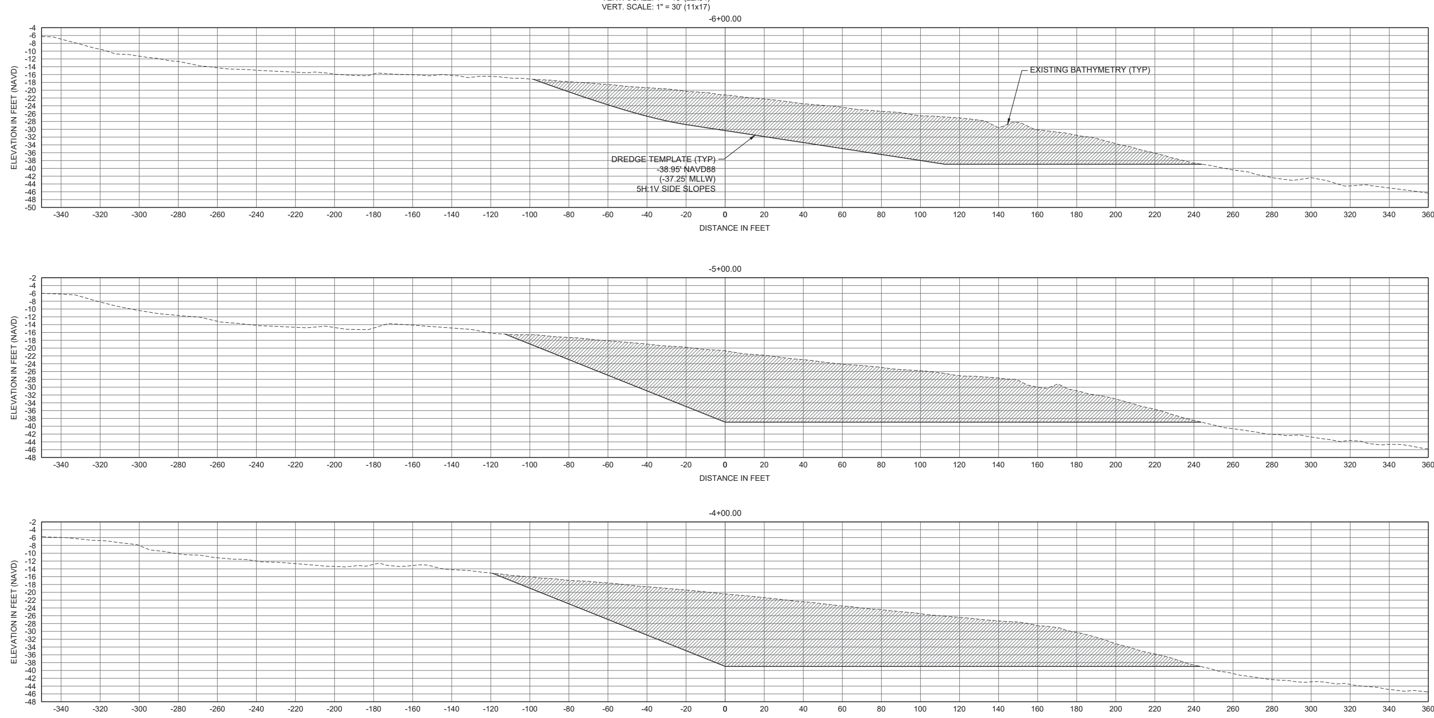
VERT. SCALE: 1" = 30' (11x17)



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DREDGING SECTIONS

DR-4

SHEET 35 OF 43

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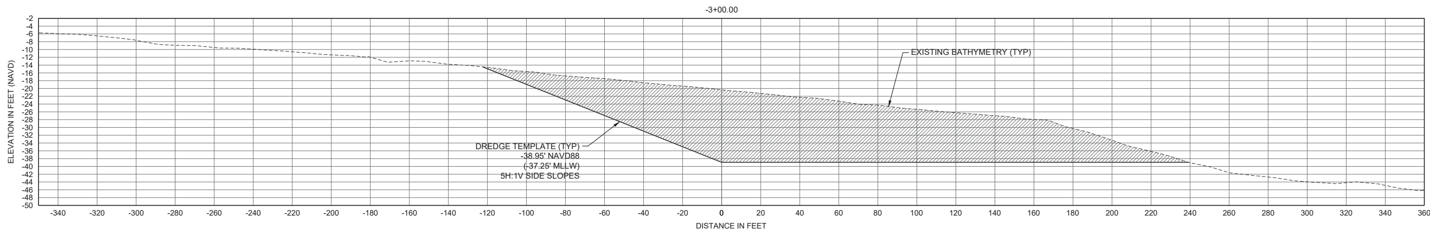

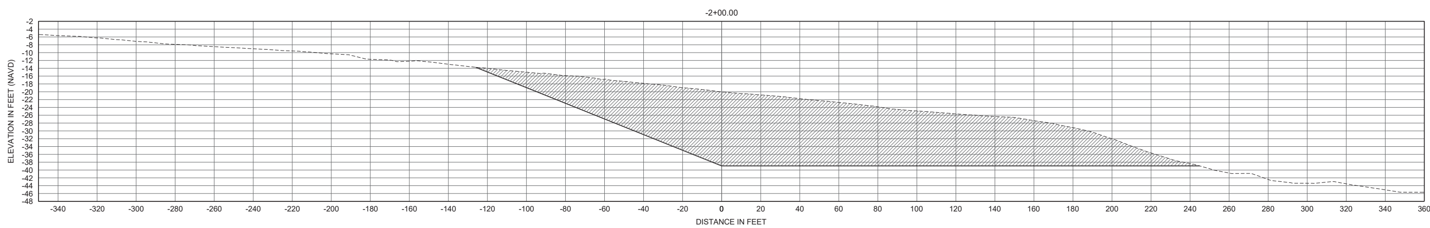

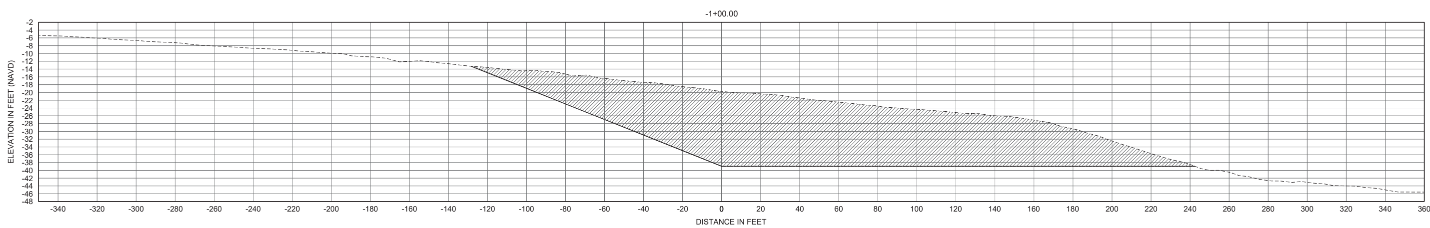

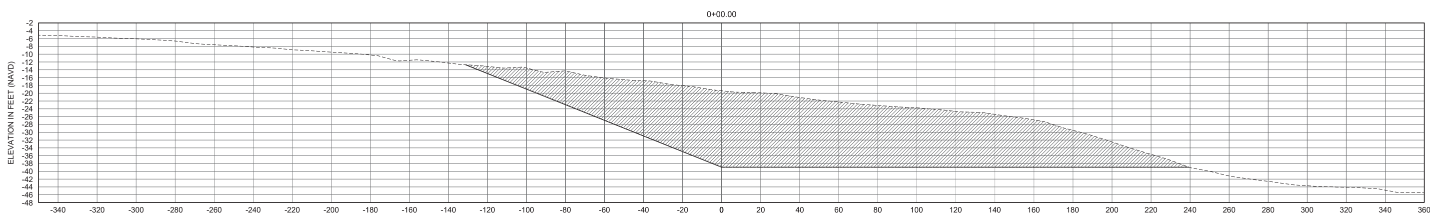

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11X17: 1" = 60'
VERT. SCALE: 1" = 15' (22x34)
VERT. SCALE: 1" = 30' (11x17)

0 30 60'

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DREDGING SECTIONS

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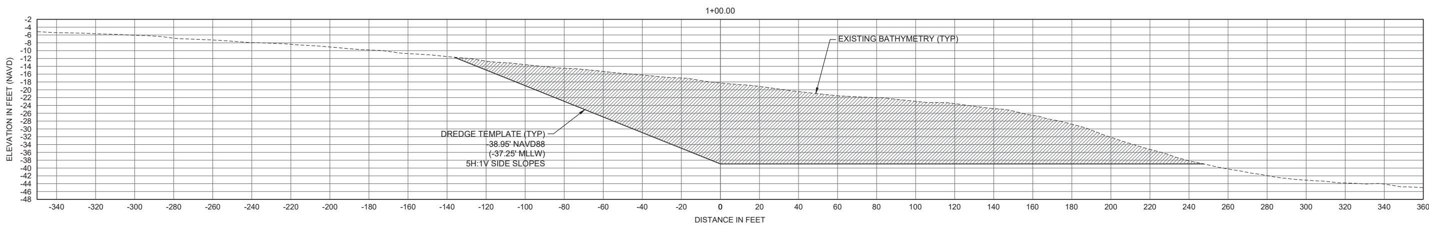

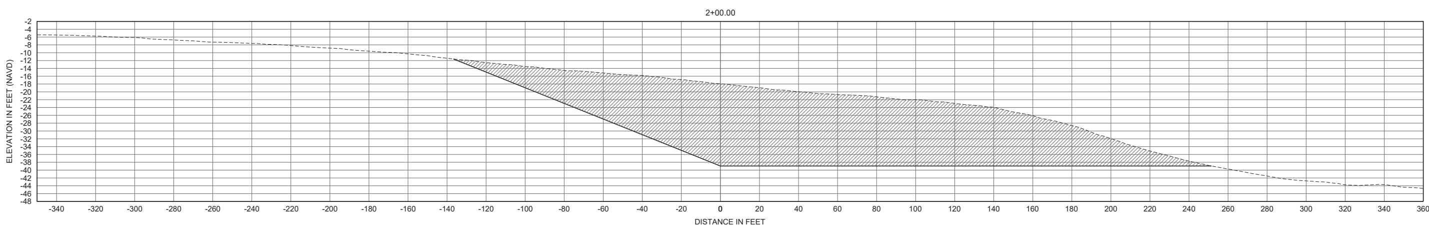

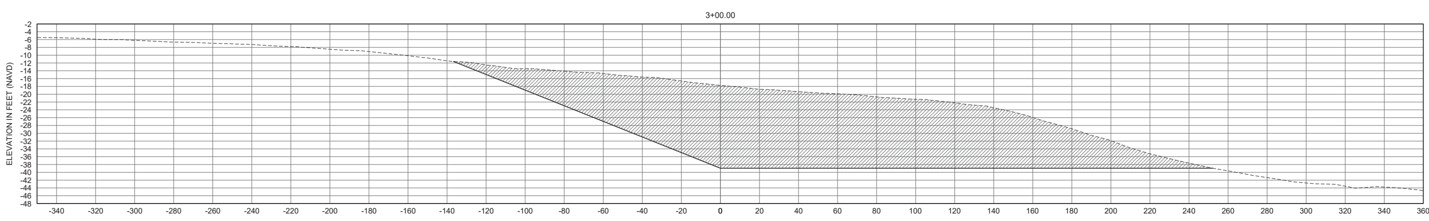

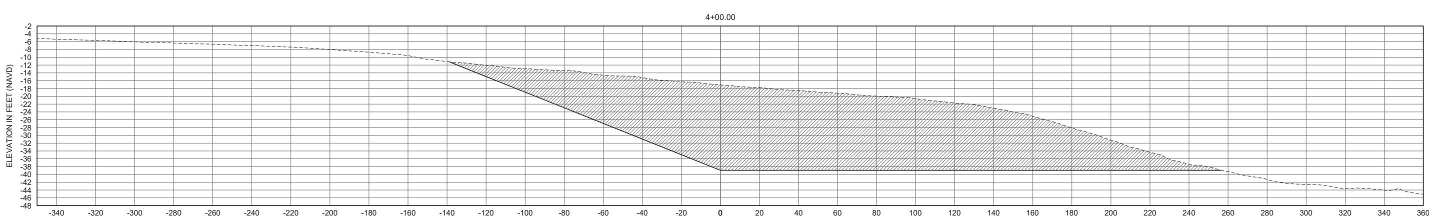

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VERT. SCALE: 1" = 30' (11x17)

0 30 60'

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DREDGING SECTIONS

DR-6

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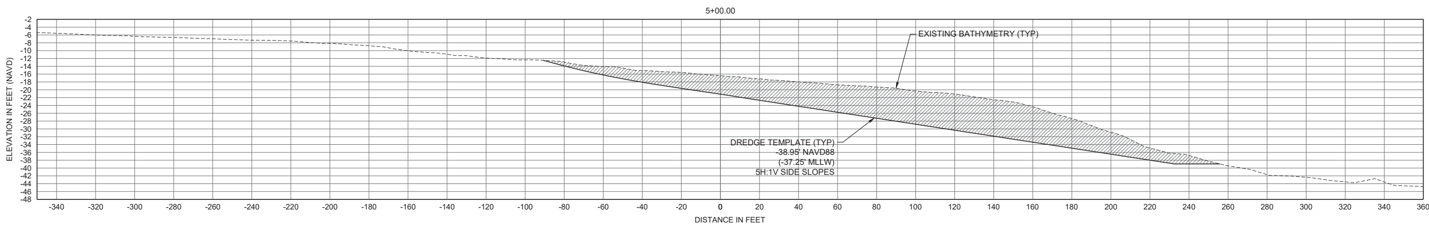

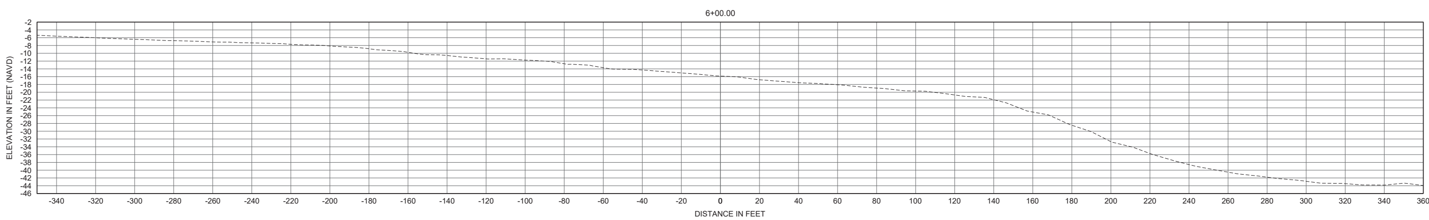

DREDGING SECTIONS

22X34: 1" = 30'
11X17: 1" = 60'
VERT. SCALE: 1" = 15' (22x34)
VERT. SCALE: 1" = 30' (11x17)

0 30 60'

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DREDGING SECTIONS

DR-7

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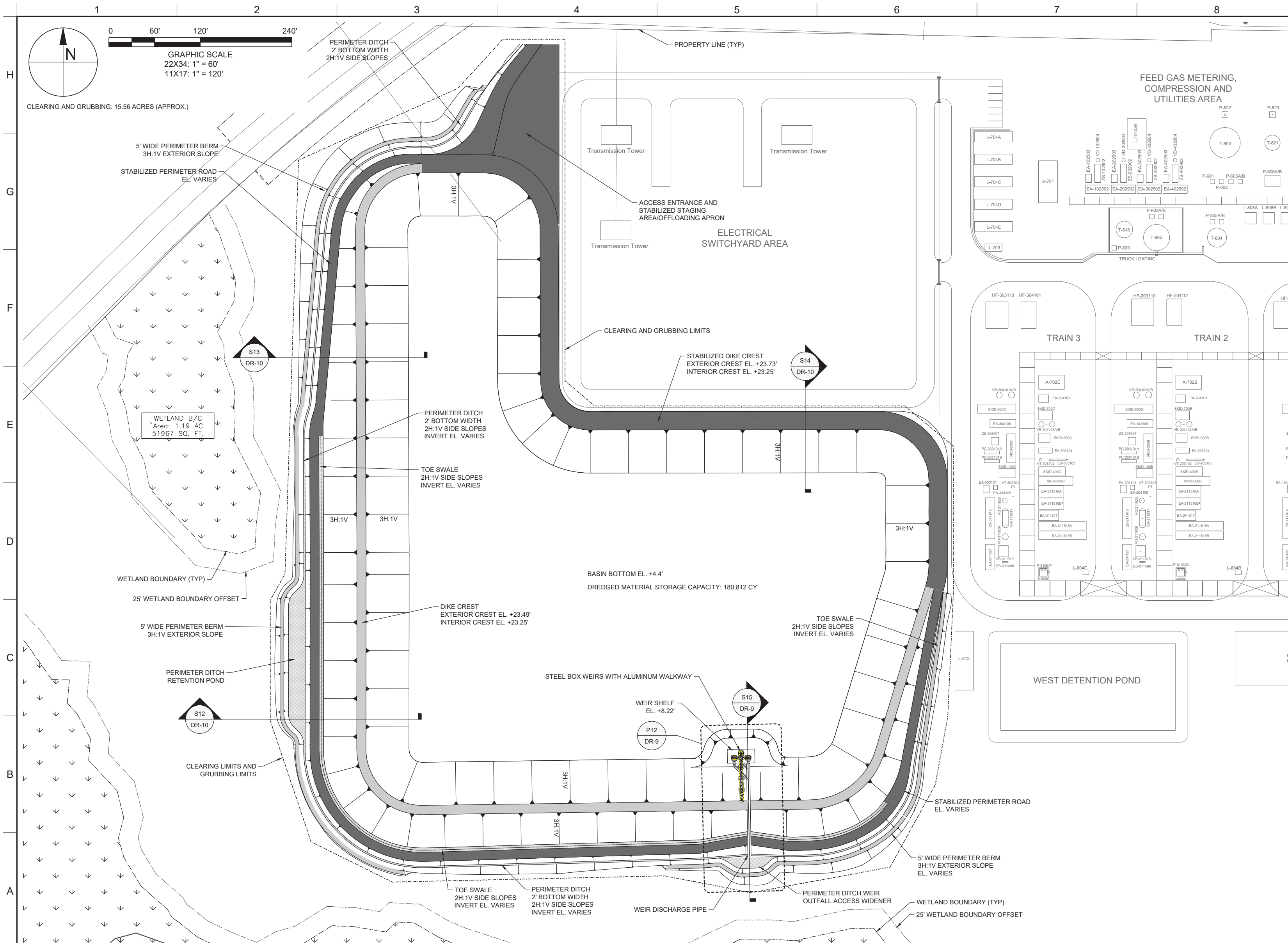

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PERMANENT DMMA SITE PLAN

DR-8

SHEET 39 OF 43

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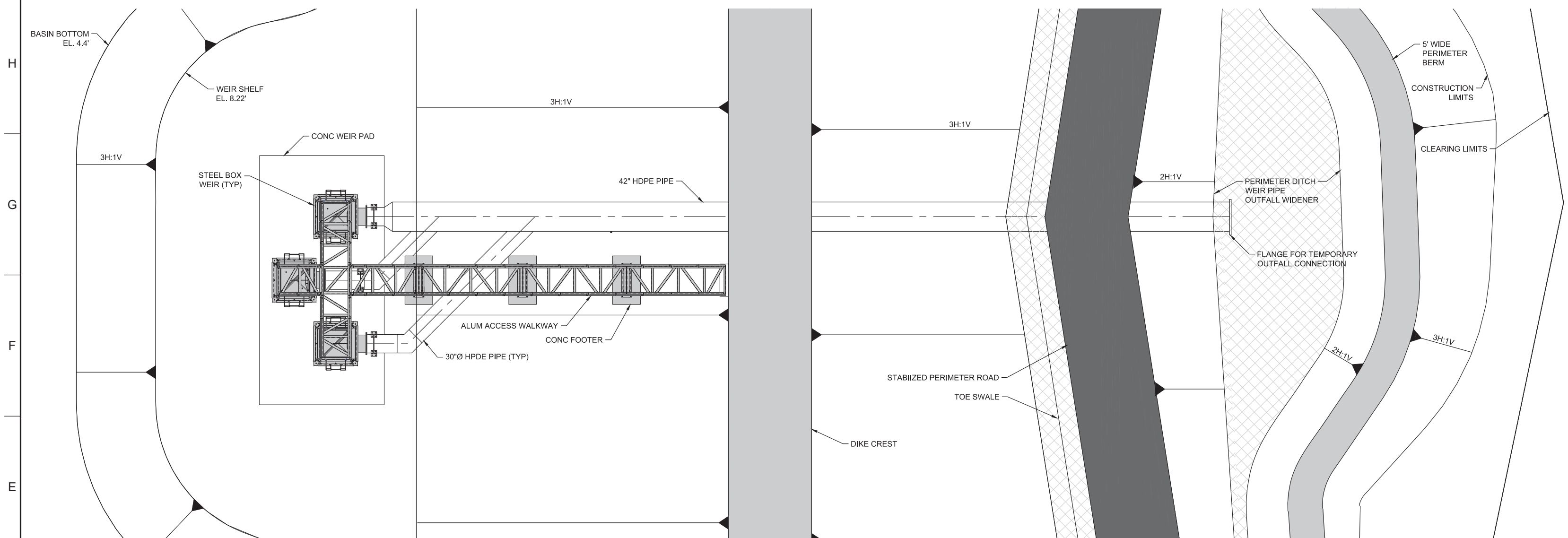
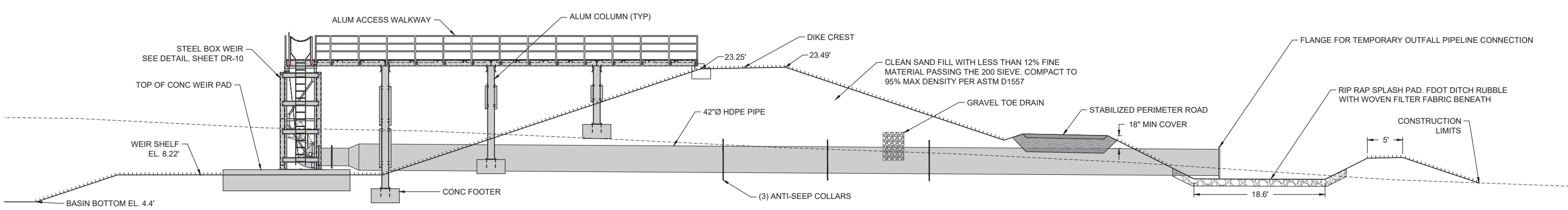


P12 DR-8 WEIR PLAN

22x34: 1" = 8'
11x17: 1" = 16'



S15 DR-8 DIKE OUTFALL PIPE PROFILE

22x34: 1" = 8'
11x17: 1" = 16'

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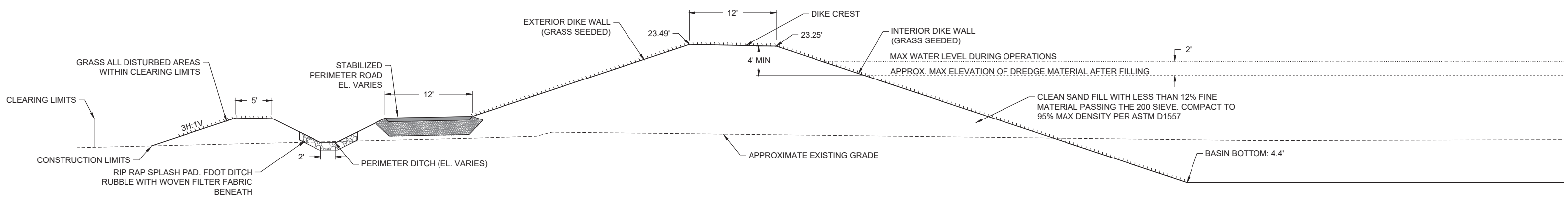
DMMA WEIR PLAN AND PROFILE

DR-9

SHEET 40 OF 43



S13 DR-8 WEST RAMP DIKE SECTION

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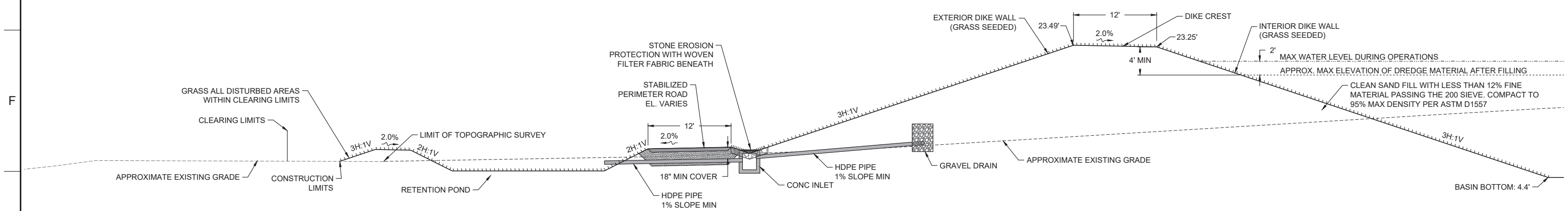

S12 DR-8 WEST POND DIKE SECTION

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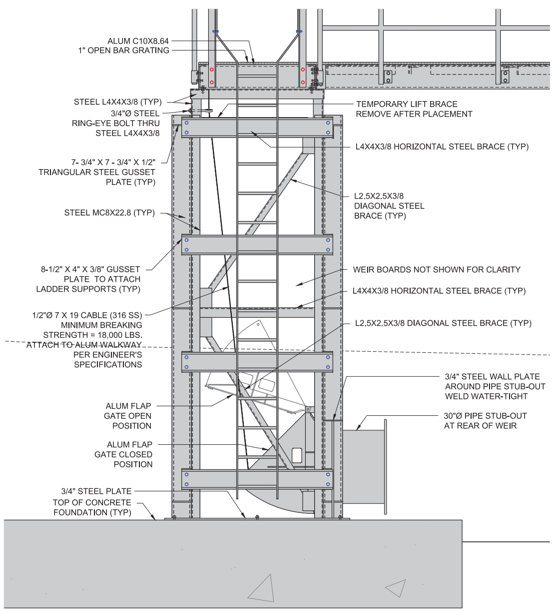
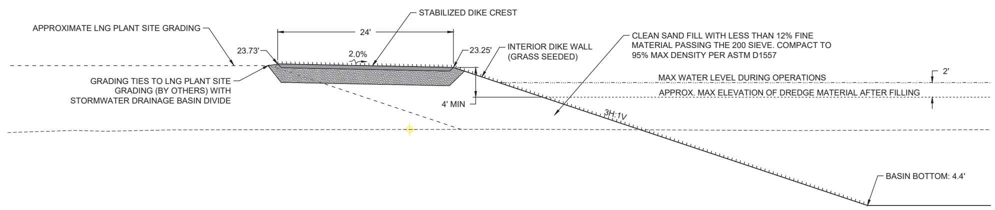


STEEL BOX WEIR SIDE ELEVATION DETAIL

22X34: 1/2" = 1'
11X17: 1/4" = 1'



S14 DR-8 ADJACENT UPLAND SITE DIKE SECTION

22x34: 1" = 8'
11x17: 1" = 16'

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD.
BLDG. 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
(904)-731-7040
1675 PALM BEACH LAKES, SUITE 210
WEST PALM BEACH, FLORIDA 33401
(561)-640-7310
CERTIFICATE OF AUTHORIZATION # 4815

SEAL

60% DRAFT

KEITH A. KNIGHT P.E.# 58084

PROJECT TITLE

EAGLE LNG PARTNERS
JACKSONVILLE MARINE TERMINAL
DUVAL COUNTY, FLORIDA

PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR OWNER REVIEW.

REVISIONS / SUBMISSIONS — NO | ZONE | DATE

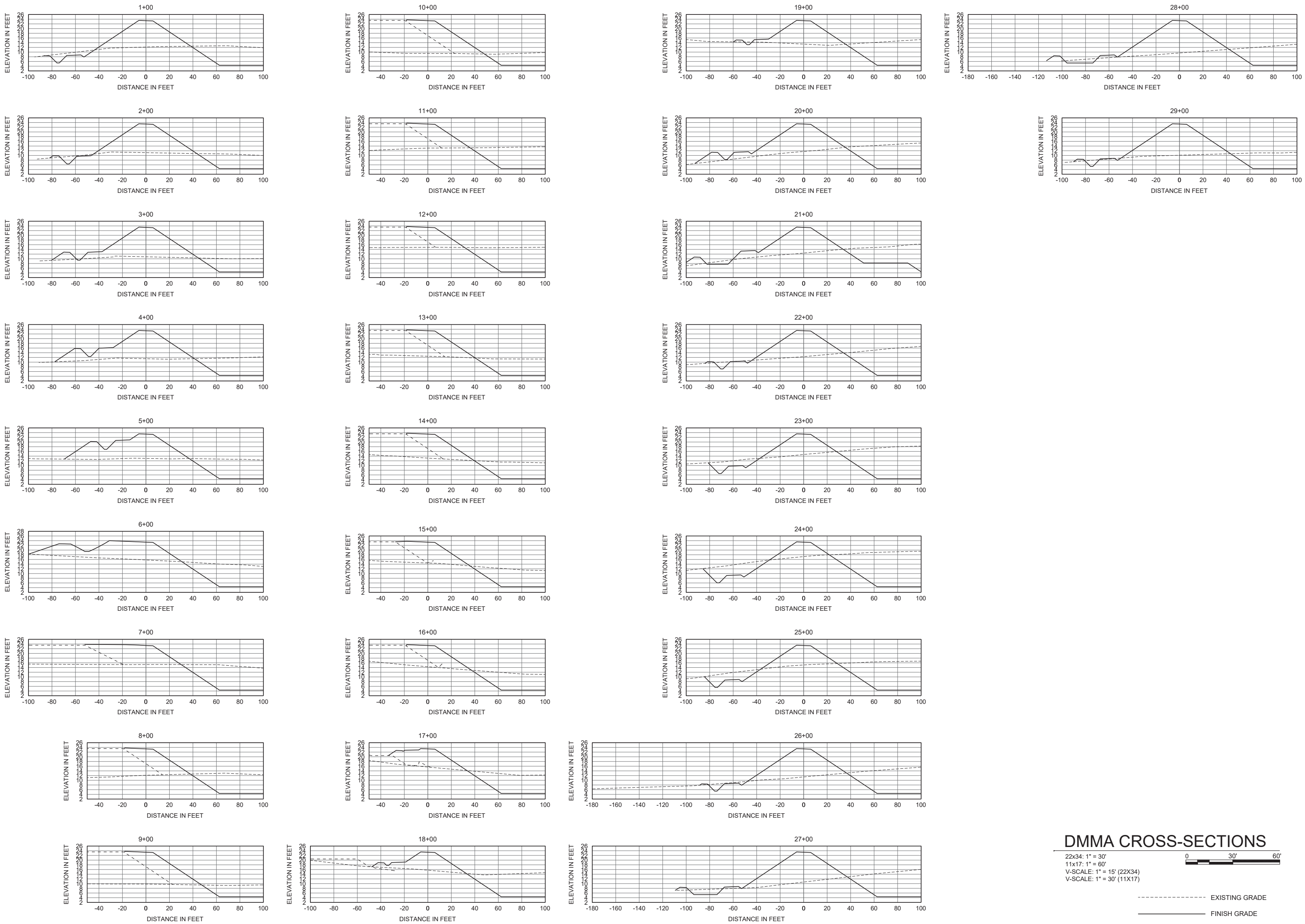
PROJECT NO	C2014-090
DATE	APRIL 2017
DESIGNED	KAK
DRAWN	CAS/AF
CHECKED	RJD
REVIEWED	JTA
SCALE	AS SHOWN

DRAWING TITLE

DMMA TYPICAL SECTIONS AND DETAILS

DR-10

F-21



DMMA CROSS-SECTIONS

22x34: 1" = 30'
11x17: 1" = 60'
V-SCALE: 1" = 15' (22X34)
V-SCALE: 1" = 30' (11X17)

0 30' 60'

EXISTING GRADE
FINISH GRADE
ASSUMED LNG SITE GRADE

TAYLOR ENGINEERING INC.
10151 DEERWOOD PARK BLVD.
BLDG. 300, SUITE 300
JACKSONVILLE, FLORIDA 32256
(904)-731-7040
1675 PALM BEACH LAKES, SUITE 210
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NO | ZONE | REVISIONS / SUBMISSIONS | DATE

PROJECT NO	C2014-090
DATE	APRIL 2017
DESIGNED	KAK
DRAWN	CAS/AF
CHECKED	RJD
REVIEWED	JTA
SCALE	AS SHOWN

DRAWING TITLE

DMMA CROSS-SECTIONS

DR-11

APPENDIX G

NOXIOUS AND INVASIVE WEED CONTROL PLAN

EAGLE LNG PARTNERS JACKSONVILLE LLC

NOXIOUS AND INVASIVE WEED CONTROL PLAN

JACKSONVILLE PROJECT

FERC DOCKET NO. CP17-___-000 (PF15-7-000)

PUBLIC

Prepared for:

Eagle LNG Partners Jacksonville LLC
20445 State Highway 249, Suite 250
Houston, TX 77070

Prepared by:

Cardno

6649 Peachtree Industrial Blvd. Suite I

Peachtree Corners, GA 30092

January 2017

Table of Contents

Appendix A

Tables

Acronyms

Eagle LNG	Eagle LNG Partners Jacksonville LLC
EI	Environmental Inspector
FEPPC	Florida Exotic Pest Plant Council
LNG	Liquefied natural gas
Plan	Noxious and Invasive Weed Control Plan
Project	Jacksonville Project
USDA	U.S. Department of Agriculture

1.0 Introduction

Eagle LNG Partners Jacksonville LLC (Eagle LNG) proposes development of a liquefied natural gas (LNG) production, storage, and export facility at a site on the St. Johns River in Jacksonville, Florida (Project). The Facility will receive domestically produced natural gas, supercool the natural gas into LNG, temporarily store the produced LNG, and periodically load LNG into trucks and containers or onto ocean-going vessels for use in vehicular applications and the marine bunkering trade, and for export from the United States.

The purpose of this Noxious and Invasive Weed Control Plan (Plan) is to prescribe methods to prevent, mitigate, and control the spread of noxious and invasive weeds during ground-disturbing activities associated with and following construction and operation of the Project. Eagle LNG and its contractors will be responsible for carrying out the methods described in this Plan.

1.1 Applicable Noxious and Invasive Weed Laws

Noxious and invasive weeds are opportunistic and often non-indigenous plant species that readily invade disturbed areas, sometimes producing monocultures and preventing native plant species from establishing communities. Federal Invasive Species Executive Order 13112 defines an invasive plant “as an alien species whose introduction causes, or is likely to cause economic or environmental harm or harm to human health” (Federal Register 1999). Many invasive weed species significantly degrade agricultural and natural resources, including soil and water, wildlife habitat, and recreational and wilderness values, often with great economic impact.

The U.S. Department of Agriculture (USDA) currently lists 106 Introduced, Invasive, and Noxious Plants in Florida. Additionally, the Florida Exotic Pest Plant Council (FEPPC) maintains an invasive plant species list that is broken down into two categories:

- Category I – Invasive plants that alter native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives.
- Category II – Invasive plants have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species.

A summary of non-native invasive species observed onsite by Cardno biologists in August 2013 are listed in **Table 1**. Noxious weed lists and control practices for the Project described in this Plan have been developed utilizing USDA and FEPPC data. Because the Project will involve ground-disturbing construction for the new facilities measures to control and prevent the spread of noxious or invasive species will need to be implemented during construction of the Project.

Table 1
Non-Native Invasive Plants of Florida Known to Occur In Project Area

Scientific Name	Common Name
Category I	
Albizia julibrissin	Silk tree, Mimosa
Cinnamomum camphora	Camphor tree
Sapium sebiferum	Chinese tallow tree

1.2 Vegetative Descriptions

Mimosa tree, Silk Tree- *Albizia julibrissin*

Mimosa is a small to medium-sized deciduous tree that varies in height from a few feet to more than 40-feet tall. It is identified by its smooth light brown bark and its small alternating leaves which may appear fern like. The mimosa flowers in the late spring and summer and is very distinguishable due to its bright pink flowers which resemble pom-poms. The mimosa is a legume and produces large elongated seed pods which are spread readily through wildlife and potentially through water transport. The mimosa is a common tree along disturbed areas and along drainage areas where its seeds are easily transported by water. It outcompetes native vegetation due to its rapid growth rate.

Camphor tree- *Cinnamomum camphora*

The Camphor tree is a woody evergreen tree very common in Florida. It has a waxy green leaf and has a camphor odor when rubbed or crushed. The tree can grow very large but is commonly observed under 20-ft tall. The flowers are greenish white and the fruit is a dark purple. The camphor tree is very common in the deep-south and is an opportunistic pioneer species. It is commonly found in ditches and in areas of historic disturbance.

Chinese tallow- *Sapium sebiferum*

The tallow tree is a small to mid-size deciduous tree with poplar like bark and small heart shaped leaves that come to a point. It has small yellow flowers which produce fruit that resembles popcorn which is how it came to be known as the popcorn tree. Tallow occurs in many parts of the state and is highly common in disturbed areas and roadside ditches.

2.0 Noxious Weed Management Plan

2.1 Prevention Methods

Eagle LNG will provide information and training regarding noxious weed management as part of the pre-construction environmental training. The importance of preventing the spread of noxious weeds into areas not already infested and controlling the proliferation of weeds already present will be explained. Prior to construction, areas of concern from the pre-construction noxious weed inventory will be identified and flagged in the field by Eagle LNG's Environmental Inspector (EI). The flagging will alert construction personnel and prevent access into areas until noxious weed control measures have been properly implemented.

In areas with existing noxious weed infestations, vegetation, soils, and excavated material will be stockpiled in a location adjacent to the removal site and, following construction, will be returned to their original location to prevent their spread in other sections of the project area.

Following work at identified noxious weed infested sites, the Contractor will be required to use compressed air or other means to remove soil and propagules from machinery and vehicles to prevent their transport to other sections of the Project Area.

2.2 Treatment Methods

Known weed populations identified during the noxious weed inventory and new populations identified by Eagle LNG's EI prior to and during construction will be treated with appropriate methods to prevent their spread. Treatment methods may include physical removal, mechanical removal and chemical control.

Common hand removal techniques will consist of physically pulling saplings and mechanical methods include removing mature trees with a chain saw. The final cut should be made as close to the ground as possible and as level as possible. This will make an herbicide application easier as well as prevent sprouting from the cut. Seedling trees can be mowed or disked when small. Burning is also very effective for both small and larger trees (University of Florida).

Chemical control can be separated into cut-stump, basal bark, and foliar treatments. Foliar treatments will work well on young trees, less than 10 feet tall. A dilution of triclopyr (Garlon 3A at 2 to 3% solution or Garlon 4 at 0.5 to 2% solution) in water can be an effective control when applied as a foliar application. A non-ionic surfactant at 0.25% (10 mLs or 2 teaspoons per gallon of spray solution) will also be utilized. A 2 to 3% solution of glyphosate (Roundup, etc.) is another method however repeated treatments will be necessary (University of Florida).

To prevent the transport of soil and debris capable of transporting weed seed, roots or other propagules within the Project area, Eagle LNG and its contractors will be required to ensure that vehicles arrive at the work site clean and weed-free. Eagle LNG's EI will conduct inspections to ensure vehicles and equipment are clean.

2.3 Restoration and Revegetation

Restoration of disturbed areas will follow immediately after construction as described in Eagle LNG's Upland Erosion Control, Revegetation, and Maintenance Plan and Wetland and Waterbody Construction and Mitigation Procedures. The Contractor will ensure and certify in writing that all straw bales used for sediment and erosion controls, mulch distribution, and restoration seed mixes are certified as weed-free from the supplier.

3.0 Monitoring and Maintenance

The purpose of Eagle LNG's Noxious and Invasive Weed monitoring and maintenance program is to ensure that Project areas containing identified noxious weeds progress toward the long-term goal of appropriate vegetative cover and diversity, and that existing weed populations do not spread to new areas as a result of Project construction.

Following construction and restoration, Eagle LNG will monitor for and treat noxious weed infestations on the Project. Target species are those identified in **Table 1**. Noxious weed monitoring will occur concurrently with restoration monitoring. Monitoring will commence following completion of construction and after the first and second growing seasons, as applicable, in accordance with Eagle LNG's Upland Erosion Control, Revegetation, and Maintenance Plan. In addition, areas of known infestations will be inspected regularly and treated as necessary. Monitoring data collected will include: identifying the noxious weed species; identifying noxious weed locations; the extent of infestation; results of previous control measures implemented, if any; and recommendations for further control, if needed. Eagle LNG will consult with local conservation districts and land management agencies to determine the most appropriate control measures.

Eagle LNG will share the results of their monitoring program with the local regulatory agencies to facilitate effective treatment of identified noxious weed populations, as applicable. Sharing information will help ensure that all involved parties' control efforts are focused on problem areas. It also will help ensure that treatment efforts are balanced and coordinated so that overuse of control measures, such as herbicides, is avoided.

To prevent potential impacts associated with improper herbicide application or accidental spills, Eagle LNG will use locally certified applicators and develop site-specific herbicide application, handling, and cleanup guidelines. Applications will follow United States Environmental Protection Agency label guidelines and be performed in accordance with federal, state, and local laws and regulations.

In general, the guidelines to be implemented will include:

- Scheduling and implementing control measures for noxious plants before seed maturation/development;
- Suspending herbicide application when:
  - Wind velocities exceed 6 miles per hour for the application of liquid materials and 15 miles per hour for the application of granular materials, or
  - Precipitation is occurring or imminent;
- Transporting to the construction site only the quantity of material necessary to treat the expected weed population. Herbicides will be transported in approved containers that are inspected daily for leaks;
- Mixing of chemical controls at least 100 feet from wetlands, waterbodies, or other known sensitive biological resources (e.g., localities supporting threatened or endangered species);
- Precluding use of herbicides within 100 feet of wetlands or waterbodies unless specifically authorized by an appropriate regulatory agency;
- Carrying material safety data sheets and spill kits in any vehicle transporting or applying herbicides.

4.0 References

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University of Florida Center for Aquatic and Invasive Plants. University of Florida Institute of Food and Agricultural Services. 2016. Available online at:

https://plants.ifas.ufl.edu/ Accessed July 11, 2016.

Tu, M., C. Hurd, and J.M. Randall. 2001. Weed Control Methods Handbook: Tools & Techniques for Use in Natural Areas. The Nature Conservancy Wildland Invasive Species Team, April 2001. http://invasive.org/gist/products/handbook/methodshandbook.pdf

Accessed July 12, 2016

Appendix A

Herbicide Information Sheets

Glyphosate and Triclopyr

(Tu, Hurd, Randall 2001)

GLYPHOSATE

M. Tu, C. Hurd, R. Robison & J.M. Randall

Herbicide Basics

Chemical formula: N-(phosphonomethyl) glycine

Herbicide Family: None generally recognized

Target Species: most annual and perennial plants

Forms: salts

Formulations: SL, EC

Mode of Action: amino acid synthesis inhibitor

Water Solubility: 900,000 ppm

Adsorption potential: high

Primary degradation mech: slow microbial metabolism

Average Soil Half-life: 47 days

Mobility Potential: low

Dermal LD50 for rabbits: >5,000 mg/kg

Oral LD50 for rats: 5,600 mg/kg

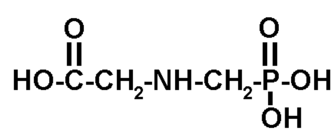
LC50 for bluegill sunfish: 120 mg/L

Trade Names: RoundUp®, RoundUp-Pro®, Rodeo®, GlyPro®, Accord®, Glyphomax®, Touchdown®

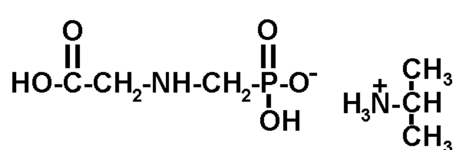
Manufacturers: Monsanto, Cenex/Land O'Lakes, Dow AgroSciences, Du Pont, Helena, and Platte.

Synopsis

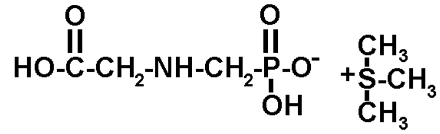
Glyphosate is a non-selective, systemic herbicide that can control most annual and perennial plants. It controls weeds by inhibiting the synthesis of aromatic amino acids necessary for protein formation in susceptible plants. Glyphosate is strongly adsorbed to soil particles, which prevents it from excessive leaching or from being taken-up from the soil by non-target plants. It is degraded primarily by microbial metabolism, but strong adsorption to soil can inhibit microbial metabolism and slow degradation. Photo- and chemical degradation are not significant in the dissipation of glyphosate from soils. The half-life of glyphosate ranges from several weeks to years, but averages two months. In water, glyphosate is rapidly dissipated through adsorption to suspended and bottom sediments, and has a half-life of 12 days to ten weeks. Glyphosate by itself is of relatively low toxicity to birds, mammals, and fish, and at least one formulation sold as Rodeo® is registered for aquatic use. Some surfactants that are included in some formulations of glyphosate, however, are highly toxic to aquatic organisms, and these formulations are not registered for aquatic use. Monsanto's patent for glyphosate expired in 2000, and other companies are already selling glyphosate formulations.



Glyphosate acid



Glyphosate isopropylamine salt



Glyphosate trimethylsulfonium salt

Herbicide Details

Chemical Formula: N-(phosphonomethyl) glycine

Trade Names: Monsanto discovered and held the patent for glyphosate, and was for many years, the only company that manufactured and sold this herbicide. The patent expired in 2000, however, and already several other companies are making and selling glyphosate formulations. Some of the current trade names include: Roundup Ultra®, Roundup Pro®, Accord®, Honcho®, Pondmaster®, Protocol®, Rascal®, Expedite®, Ranger®, Bronco®, Campain®, Landmaster®, and Fallow Master® by Monsanto; Glyphomax® and Glypro® by Dow AgroSciences; Glyphosate herbicide by Du Pont; Silhouette® by Cenex/Land O'Lakes; Rattler® by Helena; MirageR® by Platte; JuryR® by Riverside/Terra; and Touchdown® by Zeneca. As of November 2001, Rodeo® (previously manufactured by Monsanto) is now being manufactured by Dow AgroSciences and Monsanto is now producing Aquamaster®.

Manufacturers: Current manufacturers include Monsanto, Cenex/Land O'Lakes, Helena, Platte, Riverside/Terra, Dow AgroSciences, and Zeneca.

Use Against Natural Area Weeds: Glyphosate is a broad-spectrum, nonselective systemic herbicide that kills or suppresses many grasses, forbs, vines, shrubs, and trees. Care should be taken, especially in natural areas, to prevent it from being applied to desirable, native plants, because it will likely kill them. In terrestrial systems, glyphosate can be applied to foliage, green stems, and cut-stems (cut-stumps), but cannot penetrate woody bark (Carlisle & Trevors 1988). Only certain formulations of glyphosate (e.g., Rodeo®) are registered for aquatic use, as glyphosate by itself is essentially non-toxic to submersed plants (Forney & Davis 1981), but the adjuvents often sold with glyphosate may be toxic to aquatic plants and animals.

Glyphosate is one of the most commonly used herbicides in natural areas, because it provides effective control of many species. Natural area weeds that have been controlled with glyphosate include: bush honeysuckle (*Lonicera maackii*), cogon grass *(Imperata cylindrica*), common buckthorn (*Rhamnus cathartica*), glossy buckthorn *(Frangula alnus*), Japanese honeysuckle (*Lonicera japonica*), and smooth brome (*Bromus inermis*). In TNC preserves, glyphosate has been used to control dewberries (*Rubus* spp.), bigtooth aspen (*Populus grandidentata*), and black cherry (*Prunus serotina*) at Kitty Todd preserve in Ohio, sweetclover (*Melilotus officinalis*) in Indiana preserves, leafy spurge (*Euphorbia esula*) and St. John's wort/Klamath weed (*Hypericum perforatum*) in Michigan preserves, and bindweed (*Convolvulus arvensis*) and velvetgrass (*Holcus lanatus*) in Oregon and Washington preserves.

In aquatic or wetland systems, glyphosate has successfully controlled common reed (*Phragmites australis*) in Delaware, Michigan, and Massachusetts preserves, purple loosestrife (*Lythrum salicaria*) in Indiana and Michigan preserves, reed canarygrass (*Phalaris arundinacea*) in Illinois preserves, and glossy buckthorn (*Frangula alnus*) and hybrid cattail (*Typha x glauca*) in Michigan preserves.

Mode of Action: Glyphosate kills plants by inhibiting the activity of the enzyme 5-enolpyruvylshikimic acid-3-phosphate synthase (EPSP), which is necessary for the formation of the aromatic amino acids tyrosine, tryptophan, and phenylalanine. These amino acids are important in the synthesis of proteins that link primary and secondary metabolism (Carlisle & Trevors 1988). EPSPs are present in the chloroplast of most plant species, but are not present in animals. Animals need these three amino acids, but obtain them by eating plants or other animals.

Glyphosate is therefore, relatively non-toxic to animals (Monsanto Company 1985). Certain surfactants or other ingredients that are added to some glyphosate formulations are toxic to fish and other aquatic species (EXTOXNET 1996).

Glyphosate can also act as a competitive inhibitor of phosphoenolpyruvate (PEP), which is one of the precursors to aromatic amino acid synthesis. It also affects other biochemical processes, and, although these effects are considered secondary, they may be important in the total lethal action of glyphosate.

Dissipation Mechanisms:
Summary: Glyphosate is degraded primarily by microbial metabolism. Glyphosate is believed to be susceptible to photodegradation (Lund-Hoie & Friestad 1986), but the extent to which this occurs is uncertain. Glyphosate is not significantly degraded by other chemical mechanisms in the field. Glyphosate is strongly adsorbed to soil, which can slow microbial metabolism but prevents excessive movement in the environment. Glyphosate is non-volatile (T. Lanini, pers. obs).

<u>Volatilization</u>
Glyphosate does not volatilize readily when applied in the field (T. Lanini, pers. obs.).

<u>Photodegradation</u>
Although originally thought to be unaffected by sunlight (Rueppel et al. 1977), later studies found glyphosate to be susceptible to photodegradation (Lund-Hoie & Friestad 1986; Carlisle & Trevors 1988). Lund-Hoie and Friestad (1986) reported a half-life of four days for glyphosate in deionized water under UV light.

<u>Microbial Degradation</u>
Glyphosate is degraded primarily by microbial metabolism. Two steady rates of degradation have been identified (Rueppel et al. 1977). It has been hypothesized that the more rapid rate of degradation represents the metabolism of unbound glyphosate molecules, while the slower rate represents the metabolism of glyphosate molecules bound to soil particles (Nomura & Hilton 1977; Rueppel et al. 1977). The degradation of glyphosate is slower in soils with a higher adsorption capacity. Degradation rate was also affected by the particular microbial community of each soil (Carlisle & Trevors 1988; Malik et al. 1989). The primarily metabolite of glyphosate is aminomethylphosphonic acid, which is non-toxic and degraded microbially at a somewhat slower

rate than the parent compound (Nomura & Hilton 1977; Rueppel et al. 1977; Carlisle & Trevors 1988). A number of other minor, biodegradable metabolites have also been identified.

Adsorption

Glyphosate is water-soluble, but it has an extremely high ability to bind to soil particles. Adsorption of glyphosate increases with increasing clay content, cation exchange capacity, and decreasing soil pH and phosphorous content (Sprankle et al. 1975a,b; Hance 1976; Nomura & Hilton 1977; Rueppel et al. 1977; Glass 1987). Glyphosate is adsorbed to soil particles rapidly during the first hour following application and slowly thereafter (Sprankle et al. 1975b). Strong adsorption to soil particles slows microbial degradation, allowing glyphosate to persist in soils and aquatic environments. Because glyphosate rapidly binds to soils, it has little or no herbicidal activity ("killing power") once it touches soil (Sprankle et al. 1975a; Hance 1976; Nomura & Hilton 1977). Glyphosate can also be inactivated by adsorption if mixed with muddy water.

Adsorption prevents glyphosate from being mobile in the environment except when the soil particles themselves are washed away (Sprankle et al. 1975b; Rueppel et al. 1977; Roy et al. 1989a). Comes et al. (1976) found that glyphosate sprayed directly into a dry irrigation canal was not detectable in the first irrigation waters flowing through the canal several months later, although glyphosate residues remained in the canal soils. In most cases, glyphosate is quickly adsorbed to suspended and bottom sediments (Feng et al. 1990).

Chemical Decomposition

Glyphosate is not readily hydrolyzed or oxidized in the field (Rueppel et al. 1977; Anton et al. 1993; Zaranyika & Nyandoro 1993).

Behavior in the Environment

Summary: Glyphosate binds readily with soil particles, which limits its movement in the environment. It is degraded through microbial metabolism with an average half-life of two months in soils and two to ten weeks in water. In plants, glyphosate is slowly metabolized.

Soils

Glyphosate is highly water soluble, but unlike most water-soluble herbicides, glyphosate has a very high adsorption capacity. Once glyphosate contacts soil it is rapidly bound to soil particles rendering it essentially immobile (Roy et al. 1989a; Feng & Thompson 1990). Unbound glyphosate molecules are degraded at a steady and relatively rapid rate by soil microbes (Nomura & Hilton 1977; Rueppel et al. 1977). Bound glyphosate molecules also are biologically degraded at a steady, but slower rate. The half-life of glyphosate in soil averages two months but can range from weeks to years (Nomura & Hilton 1977; Rueppel et al. 1977; Newton et al. 1984; Roy et al. 1989a; Feng & Thompson 1990; Anton et al. 1993). Although the strong adsorption of glyphosate allows residues to persist for over a year, these residues are largely immobile and do not leach significantly. Feng and Thompson (1990) found that >90% of glyphosate residues were present in the top 15 cm of soil and were present as low as 35 cm down the soil column in only one of 32 samples. Adsorption to soil particles prevents glyphosate from being taken-up by the roots of plants.

Water

Because glyphosate binds strongly to soils, it is unlikely to enter waters through surface or sub-surface runoff except when the soil itself is washed away by runoff, and even then, it remains bound to soil particles and unavailable to plants (Rueppel et al. 1977, Malik et al. 1989). Most glyphosate found in waters likely results from runoff from vegetation surfaces, spray drift, and intentional or unintentional direct overspray. In most cases, glyphosate will dissipate rapidly from natural water bodies through adsorption to organic substances and inorganic clays, degradation, and dilution (Folmar et al. 1979; Feng et al. 1990; Zaranyika & Nyandoro 1993; Paveglio et al. 1996). Residues adsorbed to suspended particles are precipitated into bottom sediments where they can persist until degraded microbially with a half-life that ranges from 12 days to 10 weeks (Goldsborough & Brown 1993; EXTOXNET 1996). At least one study found that >50% of the glyphosate added directly to the waters of an irrigation canal were still present 14.4 km downstream (Comes et al. 1976).

Vegetation

Glyphosate is metabolized by some, but not all plants (Carlisle & Trevors 1988). It is harmless to most plants once in the soil because it is quickly adsorbed to soil particles, and even when free, it is not readily absorbed by plant roots (Hance 1976). The half-life of glyphosate on foliage has been estimated at 10.4 to 26.6 days (Newton et al. 1984). Roy et al. (1989b) found 14% and 9% of applied glyphosate accumulated in the berries of treated blueberry and raspberry bushes, respectively. These residues dissipated from the fruit with a half-life of <20 days for blueberries and <13 days for raspberries (Roy et al.1989b).

Environmental Toxicity

Birds and Mammals

Glyphosate is of relatively low toxicity to birds and mammals (Evans & Batty 1986). The LD50 of glyphosate for rats is 5,600 mg/kg and for bobwhite quail, >4,640 mg/kg. EPA's Re-registration Eligibility Decision states that blood and pancreatic effects and weight gain were noted during subchronic feeding studies with rats and mice (EPA 1993). Other studies show developmental and reproductive impacts to animals given the highest dose.

Newton et al. (1984) examined glyphosate residues in the viscera of herbivores following helicopter application of glyphosate to a forest in Oregon and found residue levels comparable to those found in litter and ground cover (<1.7 mg/kg). These residue levels declined over time and were undetectable after day 55 (Newton et al. 1984). Although carnivores and omnivores exhibited much higher viscera residue levels (5.08 mg/kg maximum), Newton et al. (1984) concluded that carnivores were at lower risk than herbivores due to the lower relative visceral weights and a proportionally lower level of food intake.

Batt et al. (1980) found no effect on chicken egg hatchability or time to hatch when an egg was submerged in a solution of 5% glyphosate. Sullivan and Sullivan (1979) found that black-tailed deer showed no aversion to treated foliage and consumption of contaminated forage did not reduce total food intake. Significant impacts to bird and mammal populations due to large-scale habitat alterations following treatment of forest clearcuts with glyphosate have been reported (Morrison & Meslow 1984; Santillo et al. 1989a,b; MacKinnon & Freedman 1993).

<u>Aquatic Species</u>
Glyphosate itself is of moderate toxicity to fish. The 96-hour LC50 of technical grade glyphosate for bluegill sunfish and rainbow trout are 120 mg/L and 86 mg/L, respectively. Fish exposed to 5 mg/L of glyphosate for two weeks were found to have gill damage and liver damage was observed at glyphosate concentrations of 10 mg/L (Neskovic et al. 1996). The technical grade of glyphosate is of moderate toxicity to aquatic species, and the toxicity of different glyphosate formulations can vary considerably. For example, Touchdown 4-LC® and Bronco® have low LC50s for aquatic species (<13 mg/L), and are not registered for aquatic use. On the other hand, Rodeo® has relatively high LC50s (>900 mg/L) for aquatic species and is permitted for use in aquatic systems. The surfactant in Roundup® formulations is toxic to fish, however, Rodeo® has no surfactant, and is registered for aquatic use.

The surfactant X-77 Spreader®, which is often used in conjunction with Rodeo®, is approximately 100 times more toxic to aquatic invertebrates than Rodeo® alone (Henry et al. 1994). The surfactant MONO818® is included in Roundup® formulations because it aids the break-down of surface tension on leaf surfaces, but it may also interfere with cutaneous respiration in frogs and gill respiration in tadpoles (Tyler 1997 a,b). In addition, MONO818® is highly toxic to fish (Folmar et al. 1979; Servizi et al. 1987). The LC50 of MONO818® is 2-3 mg/L for sockeye, rainbow, and coho fry (Folmar et al. 1979; Servizi et al. 1987; Tyler 1997 a,b). The LC50 of Roundup® for bluegill sunfish and rainbow trout is only slightly higher at 6-14 mg/L and 8-26 mg/L, respectively. Similarly for *Daphnia*, the 96-hour LC50 of glyphosate alone is 962 mg/L, but the LC50 of Roundup® drops to 25.5 mg/L (Servizi et al. 1987). Roundup® is therefore not registered for use in aquatic systems.

Despite these toxicity levels, Hildebrand et al. (1980) found that Roundup® treatments at concentrations up to 220 kg/ha did not significantly affect the survival of *Daphnia magna* or its food base of diatoms under laboratory conditions. In addition, Simenstad et al. (1996) found no significant differences between benthic communities of algae and invertebrates on untreated mudflats and mudflats treated with Rodeo® and X-77 Spreader®. It appears that under most conditions, rapid dissipation from aquatic environments of even the most toxic glyphosate formulations prevents build-up of herbicide concentrations that would be lethal to most aquatic species.

<u>Other Non-Target Organisms</u>
Roberts and Berk (1993) investigated the effects of Roundup® on chemoattraction of the protozoa *Tetrahymena pyriformis* and found that it significantly interfered with chemoreception but not motility. Doses of glyphosate <10 ppm were stimulatory to soil microflora including actinomycetes, bacteria, and fungi, while concentrations > 10 ppm had detrimental impacts on microflora populations in one study (Chakravarty & Sidhu 1987). While some short-term studies (< 30 days) found glyphosate caused significant impacts to microbial populations, Roslycky (1982) found that these populations rebound from any temporary increase or decrease within 214 days. Similarly, Tu (1994) found that microorganisms recovered rapidly from treatment with glyphosate and that the herbicide posed no long-term threat to microbial activities.

Application Considerations:
Glyphosate can be applied using conventional, recirculating, wet apron, hooded and hand-operated sprayers; controlled drop, rope-wick, roller, and carpet applicators; mistblowers; injectors; and wipe-on devices (Carlisle & Trevors 1988). Feng et al. (1990) found that 10 meter buffer zones limited unintentional effects through chemical drift and off-target deposits into streams during application, while Marrs et al. (1993) concluded that 20 meters was a safe buffer width. Liu et al. (1996) found that increasing the glyphosate concentration was more effective in controlling weeds than increasing the droplet size. Thielen et al. (1995) concluded that the cations of hard water, including Ca^{++} and Mg^{++}, can greatly reduce the efficacy of glyphosate when present in a spray solution. Addition of ammonium sulfate or other buffer can precipitate out heavy elements in "hard" water if added before the herbicide is mixed with water.

When glyphosate is used as an aquatic herbicide, do not treat the entire water body at one time. Treat only one-third to one-half of any water body at any one time, to prevent fish kills caused by dissolved oxygen depletion.

Safety Measures:
Some glyphosate formulations are in EPA toxicity categories I and II (the two highest categories) for eye and skin exposure. Care should be taken and protective clothing worn to prevent accidental contact of these formulations on skin or eyes.

Human Toxicology:
EPA classified glyphosate as a "Group E" carcinogen or a chemical that has not shown evidence of carcinogencity in humans (EPA 1993).

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TRICLOPYR

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Herbicide Basics

Chemical formula: [(3,5,6-trichloro-2-pyridinyl)oxy] acetic acid

Herbicide Family:
Pyridine (Picolinic acid)

Target Species: Broadleaf herbs and woody species

Forms: salt & ester

Formulations: EC, SL

Mode of Action: Auxin mimic

Water solubility: 430 ppm (acid), 23 mg/L (ester), 2,100,000 mg/L (salt)

Adsorption potential:
Intermediate (higher for ester than salt)

Primary degradation mech:
Microbial metabolism, photolysis, and hydrolysis

Average Soil Half-life: 30 days

Mobility Potential: Intermediate

Dermal LD50 for rabbits:
>2,000 mg/kg

Oral LD50 for rats:
713 mg/kg

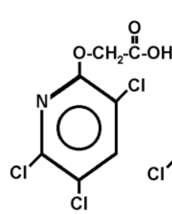
LC50 for bluegill sunfish:
148 mg/L

Trade Names: Garlon® and Access®

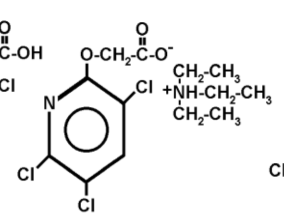
Manufacturers: Dow Agro-Sciences and Platte

Synopsis

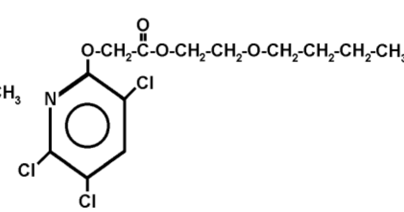
Triclopyr is a selective systemic herbicide used to control woody and herbaceous broadleaf plants along right-of-ways, in forests, and in grasslands and parklands. It has little or no impact on grasses. Triclopyr controls target weeds by mimicking the plant hormone auxin, causing uncontrolled plant growth. There are two basic formulations of triclopyr - a triethyamine salt, and a butoxyethyl ester. In soils, both formulations degrade to the parent compound, triclopyr acid. Degradation occurs primarily through microbial metabolism, but photolysis and hydrolysis can be important as well. The average half-life of triclopyr acid in soils is 30 days. Offsite movement through surface or sub-surface runoff is a possibility with triclopyr acid, as it is relatively persistent and has only moderate rates of adsorption to soil particles. In water, the salt formulation is soluble, and with adequate sunlight, may degrade in several hours. The ester is not water-soluble and can take significantly longer to degrade. It can bind with the organic fraction of the water column and be transported to the sediments. Both the salt and ester formulations are relatively non-toxic to terrestrial vertebrates and invertebrates. The ester formulation, however, can be extremely toxic to fish and aquatic invertebrates. Because the salt cannot readily penetrate plant cuticles, it is best used as part of a cut-stump treatment or with an effective surfactant. The ester can be highly volatile and is best applied at cool temperatures on days with no wind. The salt formulation (Garlon 3A®) can cause severe eye damage.



Triclopyr acid



Triethylamine salt



Butoxyethyl ester

Herbicide Details

Chemical Formula: [(3,5,6-trichloro-2-pyridinyl)oxy]acetic acid

Trade Names: There are two basic formulations of triclopyr: a triethylamine salt (triclopyr amine or salt), and a butoxyethyl ester (triclopyr ester). The amine formulation is sold under the trade name Garlon 3A® and is marketed in garden shops and hardware stores as Turflon Amine® or as Brush-B-Gone®. The ester formulation is sold under the trade name Garlon 4® and is marketed in garden shops and hardware stores as Turflon Ester®. Other trade names include Access®, Crossbow®, ET®, PathFinder II®, Redeem®, and Remedy®. These products also may be mixed with picloram or 2,4-D to increase their versatility.

Manufacturers: Dow Agrosciences (formerly known as DowElanco or Dow Chemical), Platte

Use Against Natural Area Weeds: Triclopyr is used to control broadleaf herbs and woody species (WSSA 1994). It is particularly effective at controlling woody species with cut-stump or basal bark treatments. Susceptible species include the brooms (*Cytisus* spp., *Genista* spp., and *Spartium* spp.), the gorses (*Ulex* spp.), and fennel (*Foeniculum vulgare)*. Triclopyr ester formulations are especially effective against root- or stem-sprouting species such as buckthorns (*Rhamnus* spp.), ash (*Fraxinus* spp.), and black locust (*Robinia pseudoacacia*), because triclopyr remains persistent in plants until they die.

Even though offsite movement of triclopyr acid through surface or sub-surface runoff is a possibility, triclopyr is one of the most commonly used herbicides against woody species in natural areas. Bill Neil, who has worked extensively on tamarisk/saltcedar (*Tamarix* spp.) control, concluded that Pathfinder II®, a triclopyr ester formulation by DowElanco, is the most cost effective herbicide for combating saltcedar. On preserves across the U.S., triclopyr has provided good control of tree-of-heaven (*Ailanthus altissima*), salt cedar (*Tamarix* spp.), glossy buckthorn (*Frangula alnus*), common *buckthorn (Rhamnus cathartica*), sweet fennel (*Foeniculum vulgare*), Brazilian peppertree (*Schinus terebinthifolius*), and Chinese tallow tree (*Sapium sebiferum*). TNC preserves in Hawaii have successfully used triclopyr to control blackwood acacia (*Acacia melanoxylon*), bush honeysuckle (*Lonicera maackii*), Chinese banyan (*Ficus microcarpa*), corkystem passionflower (*Passiflora suberosa*), eucalyptus (*Eucalyptus globulus*), Florida prickly blackberry (*Rubus argutus*), Mexican weeping pine (*Pinus patula*), Monterey pine (*Pinus radiata*), strawberry guava (*Psidium cattleianum*), tropical ash (*Fraxinus uhdei*), and velvet leaf (*Miconia calvescens*). Triclopyr can also be used in forest plantations to control brush without significant impacts to conifers (Kelpsas & White). Spruces (*Picea* spp.) can tolerate triclopyr, but some species of pine (*Pinus* spp.) however, can only tolerate triclopyr during the dormant fall and winter months (Jotcham et al. 1989).

Mode of Action: Triclopyr is an auxin mimic or synthetic auxin. This type of herbicide kills the target weed by mimicking the plant growth hormone auxin (indole acetic acid), and when administered at effective doses, causes uncontrolled and disorganized plant growth that leads to plant death. The exact mode of action of triclopyr has not been fully described, but it is believed to acidify and "loosen" cell walls, allowing cells to expand without normal control and coordination. Low concentrations of triclopyr can stimulate RNA, DNA, and protein synthesis leading to uncontrolled cell division and growth, and, ultimately, vascular tissue destruction. Conversely, high concentrations of triclopyr can inhibit cell division and growth.

Dissipation Mechanisms:

Summary: Both the ester and amine formulations are degraded by sunlight, microbial metabolism, and hydrolysis. In soils, both the ester and amine formulations will degrade rapidly to the parent compound, triclopyr acid. The acid and ester formulations bind well with soils, and therefore, are not likely to be mobile in the environment. The salt however, does not readily adsorb and can be mobile. The ester can be highly volatile (T. Lanini, pers. com.).

Volatilization

Ester formulations of triclopyr can be highly volatile, and care should be taken in their application. The potential to volatilize increases with increasing temperature, increasing soil moisture, and decreasing clay and organic matter content (Helling et al. 1971).

Photodegradation

Both the ester and salt formulations are degraded readily in sunlight to the parent compound, triclopyr acid, which is also photodegradable. A study of photolysis found the half-life of triclopyr acid on soil under midsummer sun was two hours (McCall & Gavit 1986). Photodegradation can be particularly important in water. Johnson et al. (1995) found triclopyr acid dissolved in water had a half-life due to photolysis of one to 12 hours.

Microbial Degradation

Microbial metabolism accounts for a significant percentage of triclopyr degradation in soils. In general, warm, moist soils with a high organic content will support the largest microbial populations and the highest rates of herbicide metabolism (Newton et al. 1990). Johnson et al. (1995a) found that microbial degradation of triclopyr was significantly higher in moist versus dry soils, and higher at 30º C than at 15º C (DT50 is 46 days versus 98 days in dry soils, and 57 days versus 199 days in moist soils, respectively. Additionally, the presence of sunlight plays a role in the rates of microbial metabolism of triclopyr. Johnson et al. (1995a) found that microbial metabolism was slowed when soil was deprived of light.

Chemical Decomposition

Hydrolysis of both the salt and ester to the acid form occurs readily in the environment and within plants (Smith 1976). McCall and Gavit (1986) reported that the ester was converted to an acid with a half-life of three hours, and that the rate of hydrolysis in water increased with an increase in pH.

Adsorption

Adsorption temporarily or permanently immobilizes triclopyr, but adsorption is not degradation. Adsorption is more important for the immobilization of the ester than of the salt formulation. The ester binds readily with the organic component of the soil, with adsorption rates increasing as organic content increases and soil pH decreases (Pusino et al. 1994; Johnson et al. 1995a).

The salt form is soluble in water and binds only weakly with soil (McCall & Gavit 1986). The strong bond between the ester and soils accounts for the relatively low mobility of the ester in soils, whereas the salt form is much more mobile (McCall & Gavit 1986). In practice, however, both compounds are degraded rapidly to triclopyr acid, which has an intermediate adsorption capacity.

Behavior in the Environment

Summary: In soils, both formulations are degraded by photolysis, microbial metabolism, and hydrolysis to the parent compound, triclopyr acid. Triclopyr acid has an intermediate adsorption potential, limiting movement of the acid in the environment. The acid degrades with an average half-life of 30 days. In water, the salt will remain in the water column until it is degraded, which can occur in as little as a few hours under favorable conditions. The ester formulation, however, is not water-soluble and can take significantly longer to degrade in water. Within plants, both the salt and ester formulations are hydrolyzed to the acid form, and transported through the plant. Residues can persist in the plant until the tissues are degraded in the environment.

Soils

Both the ester and salt formulations degrade rapidly in soils to triclopyr acid, and thereafter, behave similarly in soils. Adsorption, photodegradation, microbial metabolism, and volatility, can all play a role in the dissipation of triclopyr from soils. The reported half-life of triclopyr in soils varies from 3.7 to 314 days, but averages 30 days, depending on the formulation applied and the specific soil and environmental conditions. If soil conditions are warm and moist, microbial metabolism can be the primary means of degradation (Newton et al. 1990).

Johnson et al. (1995a) reported an average half-life of triclopyr acid in four laboratory soils of 138 days, but this time varied significantly with soil temperature. At 15ºC half-lives ranged from 64-314 days, while at 30ºC half-lives were 9-135 days (Johnson et al. 1995). In Southwest Oregon, Newton et al. (1990) found 24-51% of triclopyr residues remained after 37 days in a dry and cool climate. Following an increase in warmth and moisture, however, dissipation increased dramatically and triclopyr residues exhibited a half-life of 11-25 days. In a study of triclopyr persistence in soil and water associated with rice production, triclopyr had a half-life of less than ten days in the three soil types tested (Johnson et al. 1995b). In a pasture near Corvallis, Oregon, the half-life of triclopyr acid was estimated to be 3.7 days (Norris et al. 1987).

Because of the importance of photodegradation and a decrease in the size of microbial populations with soil depth, triclopyr located deeper in the soil column (>15 cm) degrades more slowly than residues near the surface (Johnson et al. 1995a). Traces of triclopyr residues have been found at soil depths of 45 cm as late as 477 days after application (Newton et al. 1990). Sandy soils that are highly permeable may therefore, retain triclopyr longer. Most studies, however, found that triclopyr generally does not tend to move in significant quantities below the top 15 cm of soil (Norris et al. 1987; Newton et al. 1990; Stephenson 1990; Johnson et al. 1995a).

Water

In water, the two formulations can behave very differently. The water-soluble salt is degraded in the water column through photolysis and hydrolysis (McCall & Gavit 1985). The ester, however, is not water-soluble and can be persistent in aquatic environments. The ester binds to organic particles in the water column and precipitates to the sediment layers (McCall & Gavit 1986). Bound ester molecules will degrade through hydrolysis or photolysis to triclopyr acid (Smith 1976), which will move back into the water column and continue to degrade. The rate of degradation is dependent on the water temperature, pH, and sediment content.

Triclopyr acid has an intermediate soil adsorption capacity. Thus, movement of small amounts of triclopyr residues following the first significant rainfall are likely (McCall & Gavit 1986), but further leaching is believed to be minor (Newton et al. 1990; Stephenson et al. 1990; Thompson et al. 1991). Movement of triclopyr through surface and subsurface runoff in areas with minimal rainfall is believed to be negligible (Newton et al. 1990; Stephenson et al. 1990). In southwest Oregon, Norris et al. (1987) found that neither leaching nor long-distance overland water flow contributed significant amounts of the herbicide into a nearby stream, and concluded that the use of triclopyr posed little risk for non-target organisms or downstream water users. Triclopyr can, however, enter waterways via aerial drift and inadvertent overspray. When the acid was applied to rice paddy fields, residues remained in the water column and were not found in significant amounts in the soil (Johnson et al. 1995b). Degradation in water was rapid and showed a half-life of four days.

Vegetation

Both the ester and salt formulations are hydrolyzed to the acid after entering plant tissue. The acid tends to remain in plants until they die or dop leaves and begin to decay (Newton et al. 1990). Newton et al. (1990) reported that triclopyr in evergreen foliage and twigs showed remarkable persistence. Although concentrations of triclopyr in the soil will decrease quickly and remain low through the winter, levels can rise again in the spring if a new supply of contaminated foliage falls from defoliating crowns (Newton et al. 1990). The residues of some herbicides in fruit have been shown to persist up to one month (Holmes et al. 1994). There is therefore a potential for long-term exposure of triclopyr to animal species that eat wild fruit. In non-target plants, triclopyr soil residues can cause damage via root uptake (Newton et al. 1990).

Environmental Toxicity

Birds and Mammals

Triclopyr is regarded as only slightly toxic to birds and mammals. The oral LD50 for rats is 630-729 mg/kg. The LD50s for mallard ducks and bobwhite quail are 1,698 mg/kg and 2,935 mg/kg, respectively. Newton et al. (1990) predicted that triclopyr would not be present in animal forage in doses large enough to cause either acute or chronic effects to wildlife, and concluded that the tendency for triclopyr to dissipate quickly in the environment would preclude any problems with bioaccumulation in the food chain. Garlon 3A® can cause severe eye damage to both humans and wildlife, due to the high pH of its water-soluble amine salt base. Care must be taken during mixing and application to prevent accidental splashing into eyes.

In a study of the potential effects of herbicide residues on forest songbirds, sub-lethal doses of triclopyr ester (500 mg/kg in the diet for 29 days) were found to cause weight loss and behavior alterations in zebra finches (Holmes et al. 1994). In a 1987 study of triclopyr metabolism using one cow, all traces of triclopyr were eliminated from the cow's urine within 24 hours, and no residues were detected in its milk or feces. This study, however, did not track whether any triclopyr was absorbed into the cow's tissues, or whether the triclopyr recovered in the urine was still active (Eckerlin 1987).

Aquatic Species

Triclopyr acid and the salt formulation are slightly toxic to fish and aquatic invertebrates. The LC50 of the acid and the salt formulation for rainbow trout are 117 mg/L and 552 mg/L, respectively, and for bluegill sunfish 148 mg/L and 891 mg/L, respectively. The ester formulation is highly toxic to fish and aquatic invertebrates, with an LC50 (96-hour) of 0.74 mg/L in rainbow trout and 0.87 mg/L in bluegill sunfish (WSSA 1994; EPA 1998). The hydrophobic nature of the ester allows it to be readily absorbed through fish tissues where is it rapidly converted to triclopyr acid. The acid can be accumulated to a toxic level when fish are exposed to sufficient concentrations or for sufficient durations.

The extent to which the toxic effects of the ester are reduced by degradation is poorly understood. Studies have shown that the ester formulation degrades rapidly to less toxic forms (Thompson et al. 1991). Kreutzweiser et al. (1994) however, has shown that there is a significant chance of acute lethal effects to fish exposed to low level residues for more than six hours. In addition, delayed lethal effects were seen in fish exposed to high concentrations for a short duration. Considering that Thompson et al. (1991) concluded that organisms subjected to direct overspray were exposed to a high level of herbicide for short periods of time while organisms downstream were exposed to low levels for longer periods, the findings of Kreutzweiser et al. (1994) are of concern.

Nevertheless, most authors including the authors of the fish mortality study have concluded that if applied properly, triclopyr would not be found in concentrations adequate to kill aquatic organisms. As a measure of precaution, however, Kreutzweiser et al. (1991) suggest that some water bodies remain at risk of lethal contamination levels including shallow and slow moving water bodies where dissipation is slow, and heavily shaded streams that experience reduced photodegradation.

Other Non-Target Organisms

Triclopyr inhibited growth of four types of ectomycorrhizal fungi associated with conifer roots at concentrations of 1,000 parts per million (ppm) and higher (Estok et al. 1989). Some evidence of inhibition of fungal growth was detected in bioassays with as little as 100 ppm triclopyr. Typical usage in forest plantations, however, results in triclopyr residues of only four to 18 ppm on the forest floor (Estok et al. 1989).

Application Considerations:

Application Under Unusual Conditions:

Several natural area managers have found that Garlon 4® and 3A® are effective when applied in mid-winter as a cut-stump treatment against buckthorns (*Rhamnus cathartica* and *R. frangula*). It is often easier to get to these plants when boggy soils around them are frozen. Randy Heidorn, Deputy Director for Stewardship of the Illinois Nature Preserve Commission (INPC), recommends three protocols to increase the safety of triclopyr ester application in winter:

(1) use a mineral oil based carrier;

(2) make sure that at the time of application, no water is at or above the ground surface, and no snow or ice is present that might serve as a route to spread the herbicide following a thaw, and;

(3) initiate a monitoring program to assess ambient water concentrations of triclopyr ester in communities that seasonally have water at or above the ground surface with little or no discharge (i.e. bogs).

Safety Measures

The salt formulation in Garlon 3A® can cause severe eye damage because of the high pH of its water-soluble amine salt base. Care should be taken to prevent splashing or other accident contact with eyes.

Human Toxicology

Because studies into the carcinogenicity of triclopyr have produced conflicting results, EPA has categorized triclopyr as a "Group D" compound, or a chemical that is not classifiable as to human carcinogenicity. The salt formulation in Garlon 3A® can cause severe eye damage.

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APPENDIX H

VIEWSHED ANALYSIS AND VISUAL RESOURCE MANAGEMENT ASSESSMENT

VIEWSHED ANALYSIS AND VISUAL RESOURCE MANAGEMENT ASSESSMENT

JACKSONVILLE PROJECT

FERC DOCKET NO. CP17-___-000 (PF15-7-000)

PUBLIC

Eagle LNG Partners Jacksonville LLC
20445 SH 249, Suite 250
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January 2017

Viewshed Analysis

Four observation points across the river were chosen to depict what the Eagle LNG Partners Jacksonville LLC (Eagle LNG) Jacksonville Project will look like from residences and a park to the south. These locations were chosen based on their accessibility to retrieve the photo, proximity to the proposed facility, and were prompted by concerns from residents on their view overlooking the St. Johns River. Unfortunately, daytime photo locations were not accessible for the night time photos although the night time images were captured very close to the day time locations.

Methods

A site plan, dimensions of prominent components contained on the Project site – including the storage tank, flare stack, LNG trains, and buildings – were provided to Cardno by Eagle LNG. The attributes of these components were imported into a 3D modeling program. The 3D models were then exported to Google Earth, so the correct viewing angle and focal length could be matched up with the exact locations of the photos. The resulting views of the Project were then artistically rendered using computer generated imagery. For night time illumination representation, lighting requirements were derived from Facility site plans and a circular, partially translucent, gradient was added to the pictures to provide a night halo effect.

Figure 1 – Artist's rendering of the view of the Jacksonville Project from the western shore of the Reddie Point Preserve (Project is Right of Center)

Figure 2 – Artist's rendering of the view of the Jacksonville Project from the end of the pier at Reddie Point Preserve (Project is Left of Center)

Figure 3 – Artist's rendering of the view of the Jacksonville Project from the northern shore just off of Oak Bay Dr. N (Project is Left of Center)

Figure 4 – Artist's rendering of the view of the Jacksonville Project from a vacant lot off of Boat Club Dr. (Project is Behind Vessel Shown)

Figure 5 – Artist's rendering of the view of the Jacksonville Project from the northern shore just off of Oak Bay Dr. N (Project is Right of Center)

Figure 6 – Artist's rendering of the view of the Jacksonville Project from the western shore of the Reddie Point Preserve (Project is Right of Center)

Figure 7 – Artist's rendering of the view of the Jacksonville Project from the shore of the Sundance Point (Project is Center)

Visual Resource Management Assessment

To assess the impact of Project operation on other existing visual resources, the Bureau of Land Management (BLM) Visual Resource Management (VRM) methodology has been employed. BLM defines visual resources as the visible physical features of a landscape (*e.g*. land, water, vegetation, animals, structures, and other features). The VRM methodology is typically used to evaluate scenic resources under BLM jurisdiction (mostly western United States), however, Eagle is using this methodology to quantify the value of public visual resources in the vicinity of the Project that may not otherwise be included in a database or other analysis.

Methods

The visual resource inventory process provides a means for determining visual values. The inventory consists of a scenic quality evaluation, sensitivity level analysis, and a delineation of distance zones. Based on these three factors, lands are placed into one of four visual resource inventory classes. These inventory classes represent the relative value of the visual resources. Classes I and II being the most valued, Class III representing a moderate value, and Class IV being of least value. For BLM, the inventory classes provide the basis for considering visual values in the resource management planning (RMP) process. For the Project's purposes, the inventory classes will provide a value to potentially affected public lands which will help determine to what degree the visual impacts will need to be mitigated.

Scenic quality is a measure of the visual appeal of a tract of land. In the visual resource inventory process, public lands are given an A, B, or C rating based on the apparent scenic quality which is determined using seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications.

Sensitivity levels are a measure of public concern for scenic quality. Public lands are assigned high (H), medium (M), or low (L) sensitivity levels by analyzing the various indicators of public concern. Factors that are considered in the sensitivity levels are: type of users (sightseers, workers), amount of use, public interest, adjacent land uses, special areas, and other factors.

Landscapes are subdivided into three distanced zones based on relative visibility from travel routes or observation points. The three zones are: foreground-middleground, background, and seldom seen. The foreground-middleground (fm) zone includes areas seen from highways, rivers, or other viewing locations which are less than three to five miles away. Seen areas beyond the foreground-middleground zone but usually less than 15 miles away are in the background (bg) zone. Areas not seen as foreground-middleground or background (*i.e.*, hidden from view) are in the seldom-seen (ss) zone.

Visual resource classes are categories assigned to public lands, which serves two purposes: (1) an inventory tool that portrays the relative value of the visual resources, and (2) a management tool that portrays the visual management objectives. There are four classes (I, II, III, and IV). For the Project, these classes only serve the first purpose because the land that has been identified is not owned by Eagle.

Visual resource inventory classes are assigned through the inventory process. Class I is assigned to those areas where a management decision has been made previously to maintain a natural landscape. This includes areas such as national wilderness areas, the wild section of national wild and scenic rivers, and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Classes II, III, and IV are assigned based on a combination of scenic quality, sensitivity level, and distance zones. This is accomplished by combining the three overlays for scenic quality, sensitivity levels, and distance zones. The end product is a visual resource inventory class overlay

For the purposes of the Project, the inventory classes will only be utilized to rank the public lands based on the first part of the analysis and will not include management objectives as described further in BLM VRM manuals.

Results

An inventory has been completed for public lands in the Project area that are within viewing distance of the Project and along the shipping channel that will be utilized by Project vessels. It should be noted that the areas in this assessment are far smaller than, and are not in the typical geographical range of those areas for which the BLM process was designed. An earnest effort was made to accommodate the differences in procedure.

The areas that have been analyzed are shown in Figure 8 with their corresponding inventory class. Table 1 provides a summary of the results. Scenic quality and sensitivity level rating forms are available at the end of this document. All public areas in this analysis were designated as an FM distance zone.

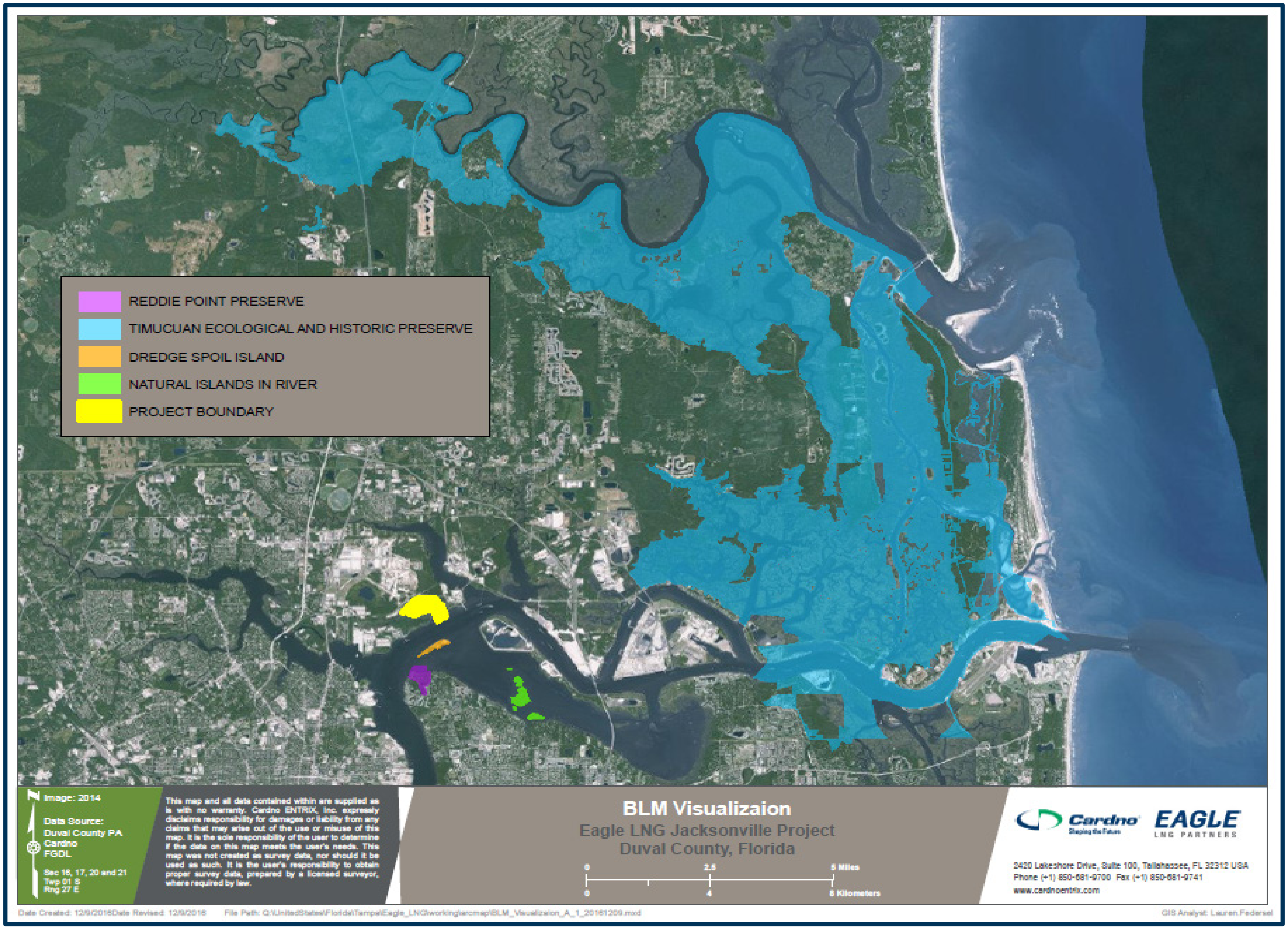

Figure 8 – BLM Visualization Locations

Table 1: Visual Resource Management Assessment Summary

Unit	Scenic Quality	Sensitivity Rating	Distance Zone	Inventory Class
001 – Reddie Point Preserve	C	M	FM	IV
002 – Timucuan Ecological and Historic Preserve	C	H	SS	I*
003 – Dredge spoil island	B	L	FM	IV
004 – Natural islands in River	C	M	FM	IV
* This is an ecological preserve owned by the National Park Service (NPS). Due to the objectives of the NPS to maintain a natural environment, this area automatically gets an inventory class designation of I.				

Analysis

Following the development of the inventory classes of public lands in the Project area, it has been concluded that the Jacksonville Project would not pose negative impacts to any visually sensitive areas. Three of the four areas analyzed in this assessment (Units 001, 003, and 004) were designated as inventory class IV, the lowest priority class. Due to the low priority to preserve the viewing quality of these areas, the impact that the Jacksonville Project would have on these resources is of low importance.

Unit 001 was given a designation of class I. This class was given as a default due to the preserve being an NPS ecological preserve with its own objectives to maintain the natural condition of the area. The Project site will not be within the viewshed of the Timucuan Ecological and Historic Preserve due to the significant distance (> 3.5 mi), vegetation, topography, and development that impedes the line of sight. The preserve would be within the viewshed of the ship traffic from the Jacksonville Project, however this ship traffic is not anticipated to be significantly different from what the resources along the federal channel have become accustomed to experiencing. Expected vessel traffic increases are discussed in Section 8.1.7 of RR 8.

No mitigation for affects to visual resources in these areas would be implemented. The Project design by default does not exhibit characteristics that would create a negative impact to nearby sensitive visual resources. Therefore, no additional mitigation would be required.

APPENDIX I

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LIST OF PREPARERS

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APPENDIX J

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APPENDIX K

RESPONSES TO COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

Eagle LNG Partners Jacksonville, LLC
Jacksonville Project

Responses to Comments on the Draft Environmental Impact Statement

INDEX

<u>Document Number/Commentor</u> <u>Page</u>

COMMENT SESSION (CS)

CS1 – Jacksonville, Florida Comment Session, December 12, 2019

UNITED STATES OF AMERICA

FEDERAL ENERGY REGULATORY COMMISSION

Office of Energy Projects

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Eagle LNG Partners Jacksonville, LLC Docket No. CP17-41-000

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JACKSONVILLE PROJECT

Jacksonville Public Library

303 North Laura Street

Jacksonville, Florida 32202

Wednesday, December 12, 2018

The public scoping meeting, pursuant to notice, convened at 3:40 p.m.

CS1 – Jacksonville, Florida Comment Session, December 12, 2019 (cont'd)

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VERBAL COMMENTS

MR. FOWLER: My name is Glenn Fowler, [spelling].

I am a CPA on Northside Jacksonville, have a firm on the north side of Jacksonville. I am President of the Northside Business Leaders Club.

CS1-1 My comments are, I've reviewed all the environmental studies that have been performed on the site that's known as EagleLNG proposed site, out on Hatcher Drive, and it is my opinion that everything seems to be in good shape. That I have no objections nor do I represent anyone who has any objections to going forward with this project.

Anything else you need?

FERC: No.

MR. FOWLER: That will do it.

[3:42 p.m.]

MS. MATHIAS: My name is Dot Mathias, it's Dorothy but everyone calls me Dot. And the last name is Mathias, and that's M a t h i a s.

I'm President of the North Jacksonville Civic Association, and we're an umbrella organization; we're a little different from some civic organizations because we are an umbrella organization, over 17 homeowner and civic organizations in the North Jacksonville area. So anytime we

CS1-1 Comment noted.

CS1 – Jacksonville, Florida Comment Session, December 12, 2019 (cont'd)

have any issues that come up they bring them to us, and then we go with them, if it's necessary, to the city council meetings or to the mayor if necessary -- in fact, we sometimes have to go to Tallahassee with some of our issues.

And naturally, any new business that comes in to the North Jacksonville area, we can't keep track of the City of Jacksonville because it's growing too fast. But in our area, we like to know what type of business it's going to be and what type of impact it's going to have on our community.

So of course when we heard about the -- your company, I guess it's, the EagleLNG, and we were really worried about it because we had one plant that was -- I don't know what it was; it wasn't natural gas; it was some type of I guess propane gas; but we had a really, really bad experience with that because they had a explosion there. And it wiped out a couple of blocks in the area. And fortunately and unfortunately there was only one person that was killed, but there were quite a few people that worked there. So it was very sad for that person, of course, and their family; and we were very upset because of the fact that it took quite a number of years to build back up that area.

CS1-2 We have a subdivision, several subdivisions that are located near where your plant is being built, and we want to make sure that there would not be any, what would

CS1-2 The U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) issued a Letter of Determination (LOD) and analysis on March 13, 2019, which evaluated the overpressure or blast wave effects due to an explosion of flammable vapor. Specifically, section 9.5 of the LOD analysis showed that the overpressure hazards would remain within the liquefied natural gas (LNG) terminal's property line. In addition, we evaluated whether layers of protection would be in place to reduce the risk of off-site impacts to the public from hazards, including explosions. Based on the proposed layers of protection, the recommendations adopted as Environmental Conditions to this order, and PHMSA's LOD, we find that the risks of potential impact from explosions were sufficiently evaluated.

CS1 – Jacksonville, Florida Comment Session, December 12, 2019 (cont'd)

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CS1-2 (cont'd)

you call it, a big explosion or explosives that would be stored there, or if the natural gas would -- the effect that

CS1-3

it will have -- it will be near our Jacksonville zoo, as you probably have already experienced that; and would there be any adverse effects for any of the animals there, would

CS1-4

there be any emissions that would adversely affect any of our citizens in the North Jacksonville area?

So I don't know whether you can answer those questions or not, but -- oh, you can't. Okay. Then I just have to talk, right? Oh, my goodness.

THE REPORTER: I'm just a court reporter.

MS. MATHIAS: So anyway, after we found out that you were coming in, we started with our Board, reading every document that we got that came in in regards to it, and found out that this was going to be a clean source of air, I guess you would call it, a clean source of emissions -- maybe that would be the best word. And also it's going to be the new wave for the future. I guess I should have said clean source of fuel, maybe; not emissions. A clean source of fuel.

And I guess that's just about it. You can ask me any questions, and I can tell you no lies. Anyway, we have been very pleased with the information that we have received, and very, very pleased that we have been kept apprised of all that is going on. And of course we were

CS1-3 As described in section 4.8.4.1 of the environmental impact statement (EIS), the Jacksonville Zoo is about 1.1 miles west of the proposed Jacksonville Project site. Potential impacts on the zoo would include an increase in traffic along Zoo Parkway during construction, which may increase travel time for visitors accessing the zoo facilities. Due to the distance between the zoo and the LNG terminal site, the existing industrial nature of the area, and the existing visual screening (i.e., forested land) present between the sites, we conclude that construction of the project would not have any direct impacts on the zoo animals. Any perceptible increase in noise associated with construction of the project would be temporary, minor, and primarily limited to daytime hours (see section 4.11.2.3 of the EIS). Acoustic modeling indicates that operation of the LNG terminal would result in no predicted increase to ambient noise levels at noise-sensitive area 6, which is adjacent to the Jacksonville Zoo. Further, operation of the facility would result in no anticipated regionally significant impacts on air quality (see section 4.11.1.5 of the EIS). Therefore, we conclude that any potential impacts on zoo animals associated with construction and operation of the project would be temporary and minor.

CS1-4 Section 4.11.1.5 of the EIS presents the facility ambient air quality modeling analysis that demonstrates that the air emissions associated with the project, when combined with current background concentrations of air pollutants, would be below National Ambient Air Quality Standards, which are protective of human health and the environment.

CS1 – Jacksonville, Florida Comment Session, December 12, 2019 (cont'd)

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anxious to know how much longer it would take.

CS1-5 One thing that we do not like is the dredging of our St. Johns River, and I know that there's going to have to be some dredging there for your ships to come in. But I don't think that you're planning on dredging any of the river itself, because we're going through that right now with Jaxport and the ships that are coming in that we are very, very, very opposed to, to the dredging, because the St. Johns River is our gem and we're very, very proud of it here in Jacksonville. In fact our nickname is The River City because of the St. Johns River.

So we would not want anything that would be detrimental to the environment. And I am pleased to say that y'all have looked into that, and as far as we can tell, there would not be any problem as far as the St. Johns River was concerned.

I guess that's about it. I thought perhaps y'all were going to be asking me questions and then I would be able to answer them, but all I can do is tell you that what we have done, and we have been looking into it, and our organization has not found any fault with the building of the facility. And that's going to be it.

(Pause)

MR. WALLACE: My name is Andre Wallace. I am the President of Jax USA Partnership. It is the Northeast

CS1-5 As described in section 4.3.2.3 of the EIS, construction of the marine facility would require dredging of about 179,000 cubic yards of material from a 10.1-acre area within the St. Johns River over a 12-week period, with maintenance dredging occurring every 1 to 2 years. Although dredging would result in a temporary increase in suspended sediment and turbidity levels, these impacts are expected to be temporary and limited to the vicinity of the project area within the St. Johns River. With implementation of turbidity monitoring and Eagle LNG Partners Jacksonville, LLC's (Eagle LNG) other mitigation measures to reduce turbidity during dredging activities, we conclude that impacts on water quality due to dredging would be temporary and not significant.

CS1 – Jacksonville, Florida Comment Session, December 12, 2019 (cont'd)

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Florida region's economic development corporation that's responsible for attracting businesses into the seven county region of Northeast Florida itself. So I'm here to talk about, some people may know it as the Eagle liquid natural gas project. So my comments will be the following.

CS1-6 I have reviewed the EIS, mitigation plan submitted by the company, and in my opinion it adequately addresses the concerns raised in the environmental review process. Furthermore, I certainly believe that this particular project moving forward is a great project for our region, considering the fact that the company is slated to invest well over half a billion dollars into this particular project, the economic impact for our region will be tremendous from a job creation standpoint and from a capital investment standpoint.

So based upon my review of the information, it adequately addresses any particular environmental concerns that might have been raised in the report. My statement.

(Pause)

MR. WENDLAND: My name is Kirk, K i r k, wendland, w e n d l a n d.

I'm the Economic Development Officer for the City of Jacksonville; I run the Office of Economic Development, and obviously projects of this nature that are major job creators are important to the city. And by nature, I'm

CS1-6 Comment noted.

CS1 – Jacksonville, Florida Comment Session, December 12, 2019 (cont'd)

7

supportive of it in my job capacity. Having said that, we're also citizens, and want to make sure that we're all

CS1-7 good stewards of the environment. And I have read the documentation that's been provided, and it certainly appears to me as a layman that any of the concerns have already been addressed by the company or there is a very viable mitigation plan that is in place and can be implemented.

So I commend the company and FERC for working together, and hope that the result is a successful project.

[No further comments. Meeting ended at 7:30 p.m.]

CS1-7 Comment noted.

CS1 – Jacksonville, Florida Comment Session, December 12, 2019 (cont'd)

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CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceeding before the FEDERAL ENERGY REGULATORY COMMISSION in the Matter of:

Name of Proceeding: Jacksonville Project

Docket No.: CP17-41-000

Place: Jacksonville, FL

Date: Wednesday, December 12, 2018

were held as herein appears, and that this is the original transcript thereof for the file of the Federal Energy Regulatory Commission, and is a full correct transcription of the proceedings.

Dan Hawkins

Official Reporter

FEDERAL AGENCIES (FA)

FA1 – U.S. Environmental Protection Agency, Region 4

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

DEC 1 7 2018

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

Re: EPA Comments on the Eagle LNG Partners Jacksonville, LLC Draft Environmental Impact Statement (DEIS), Jacksonville, Duval County, Florida; FERC Docket No. CP17-41-000; CEQ# 20180280

Dear Ms. Bose:

The U.S. Environmental Protection Agency has reviewed the above referenced document pursuant to Section 102(2)(C) of the National Environmental Policy Act and Section 309 of the Clean Air Act. The Federal Energy Regulatory Commission (FERC or the Commission) prepared the DEIS on behalf of Eagle LNG Partners Jacksonville, LLC (Eagle LNG). Eagle LNG proposes to site, construct and operate a liquified natural gas (LNG) facility on the north bank of the St. Johns River that will serve domestic and international markets. Eagle LNG will receive and liquefy natural gas transported by a local utility through pipelines, store the produced LNG, and load LNG onto vessels for export and for domestic marine fueling.

FA1-1 Per the EPA's discussion with the FERC, the FERC's filing of the Eagle LNG DEIS does not conform to the filing requirements. The EPA Region 4 NEPA Program Office did not receive two hardcopies (or 1 hardcopy and 1 CD) of the DEIS for our review. Please see the following: https://www.epa.gov/nepa/environmental-impact-statement-filing-guidance. Also, please submit two hardcopies of the Final Environmental Impact Statement (FEIS) when it becomes available for review.

The DEIS includes an evaluation of a no-action alternative, system alternatives, and terminal site alternatives. The DEIS identifies a 193.4 acres site (Alternative A), as the preferred site. The proposed LNG terminal would require 92.2 acres (81.1 acres onshore and 11.1 acres of submerged offshore land) of the preferred site for construction of the terminal. The project area is currently undeveloped, zoned industrial, and houses other bulk fuel terminals within the projects vicinity.

The proposed project includes the following facilities: three LNG trains resulting in 1.0 million tonnes of LNG per year; one LNG storage tank with a net capacity of 45,000 cubic meters; marine facilities with a concrete access trestle and loading platform, and two liquid loading arms capable of docking and mooring a range of LNG vessels with a cargo capacity of 45,000 cubic meters; LNG truck loading facilities with a dual bay capable of loading 260 to 520 LNG trucks per year; and a boil-off gas compression system; on-site refrigerant storage; ground flare and cold vent systems; and utilities and support facilities.

The EPA recognizes the importance of infrastructure development while assuring environmental and public health protection. Based on a review of the DEIS, we have enclosed technical comments and

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FA1-1 As of August 2018, the Federal Energy Regulatory Commission (FERC or Commission) moved to electronic issuance of environmental documents for FERC's natural gas and hydropower programs to save valuable resources, align FERC with the digital age, and continue to ensure that information is accessible to stakeholders.

FA1 – U.S. Environmental Protection Agency, Region 4 (cont'd)

recommendations for your consideration (Please see enclosure). The EPA identified several issues that could potentially help to improve the Final Environmental Impact Statement (FEIS).

Please note that effective October 22, 2018, the EPA no longer includes ratings in our comment letters. Information about this change is explained in the Memorandum on Changes to EPA's Environmental Review Rating Process, available at https://www.epa.gov/nepa/policy-and-procedures-review-federal-actions-impacting-environment-under-section-309-clean-air.

Thank you for the opportunity to provide comments on the DEIS. If you have any questions, please contact Ms. Ntale Kajumba, of the NEPA Program Office, at (404) 562-9620 or kajumba.ntale@epa.gov.

Sincerely,

Christopher A. Militscher
Chief, NEPA Program Office
Resource Conservation and Restoration Division

Enclosure: Technical Comments and Recommendations

FA1 – U.S. Environmental Protection Agency, Region 4 (cont'd)

ENCLOSURE

Technical Comments and Recommendations on the DEIS for the Eagle LNG Partners Project,
Jacksonville, Duval County, Florida
FERC Docket No. CP17-41-000; CEQ# 20180280

General Comment: The FERC and Eagle LNG evaluated the significant environmental impacts and safety concerns associated with the proposed project and proposed measures to address many of their potential effects. With the implementation of these measures, the FERC determined that construction and operation of the project would result in impacts that would not be environmentally significant.
Recommendations: The EPA agrees that the implementation of the mitigation measures will reduce the
FA1-2 potential environmental impact of the proposed measures. The EPA recommends that the FERC include a sheet summarizing a list of environmental commitments in the summary of the FEIS that includes the entities that will be responsible for ensuring the commitments are met and the project phase in which the commitments will be met.

Environmental Justice (EJ): From the review of the DEIS, the project maps do not indicate identified areas with high low-income and/or minority populations.
FA1-3 **Recommendation:** The EPA recommends that the FEIS include a map of the proposed project in proximity to identified areas with high low-income and/or minority populations. The EPA also encourages Eagle LNG Partners and the FERC to continue to engage and consider the input of residents living within the vicinity of the proposed project. Efforts should be made to further lessen any potential adverse impacts.

FA1-4 **Air Quality**: The DEIS states the project will emit less than 250 tons per year (TPY) of any regulated pollutant, and therefore, will not trigger New Source Review (NSR)-Prevention of Significant Deteriorations (PSD) (DEIS, p.4-94). The project plans to have three natural gas and plant fuel gas-fired boilers. The DEIS does not list the size of these boilers. According to 40 CFR 52.21(b) (1)(i)(a) "*Major stationary source means Any of the following stationary sources of air pollutants which emits, or has the potential to emit, 100 tons per year or more of any regulated NSR pollutant: ... fossil-fuel boilers (or combinations thereof) totaling more than 250 million British thermal units per hour heat input.*" In addition, Section 4.11.1.5, Operation Air Emissions Impact and Mitigation, includes the estimated emissions and modeled ambient impacts. However, this section does not appear to include mitigation measures for operation.
Recommendation: The EPA recommends that the FEIS clarify the size of the boilers to ensure that PSD review is not required and include mitigation measures for operation similar to the mitigation proposed for construction.

Threatened, Endangered, and Other Special Status Species: According to the DEIS, project construction could affect one federally-listed bird species and several upland species within the project area. The DEIS states that Eagle LNG Partners would provide compensatory mitigation or other mitigation measures to reduce the risk of harm to listed species. Based on these mitigation measures, FERC determined that the project is not likely to adversely affect 19 federally-listed or candidate species, but consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) is ongoing, the FERC recommends completion of any necessary Endangered Species Act (ESA) consultation with these agencies prior to construction.
FA1-5 **Recommendations:** The EPA recommends that the FEIS include the results of the ESA consultations with NIMFS and USFWS. The EPA recommends that agency consultations continue and the FEIS

FA1-2 Section 1.5 of the EIS includes a list of the major permits, approvals, and consultations required for the project, the agency involved, and the status of each permit, approval, and consultation. Section 5.2 of the EIS includes our additional recommendations to further mitigate the environmental impacts associated with the construction and operation of the Jacksonville Project, including the required timing if applicable.

FA1-3 Comment noted. Section 4.9.8 of the EIS concludes that there are no environmental justice communities that would be disproportionately affected by the project. Although several block groups that would potentially be considered Environmental Justice communities fall within the 2-mile radius of the project site, the impacts of the project on these block groups would be the same as the impact on the other block groups that do not meet criteria to be considered Environmental Justice communities. Therefore, we conclude that a map of the environmental justice communities in relation to the project site would add little value to the section. Section 1.3 of the EIS describes the opportunities for public review and comment during the pre-filing period, scoping, and during preparation of the EIS for the Jacksonville Project. In addition to sending the Notice of Availability to all affected landowners (as defined in the Commission's regulations) who own homes within certain distances of aboveground facilities, we are sending the Notice of Availability to public libraries and newspapers to help distribute the information to anyone who may have an interest in the project.

FA1-4 As described in section 4.11.1.3 of the EIS, Eagle LNG proposes to install three steam-generating units, rated at 16 million British thermal units per hour each, that would result in a combined capacity of less than 250 million British thermal units per hour, which would not trigger Prevention of Significant Deterioration review. Section 4.11.1.5 of the final EIS has been updated to include mitigation measures proposed by Eagle LNG associated with operation of the facility.

FA1-5 FERC is the lead federal agency for Endangered Species Act (ESA) compliance, and the ESA encourages consolidating the Biological Assessment and ESA processes. In section 4.7.1 of the EIS, we recommend that consultation with the U.S. Fish and Wildlife Service (FWS) and the National Oceanic and Atmospheric Administration, National Marine Fisheries Service is completed prior to construction. The Commission issues conditional authorizations; therefore, we are not required to hold issuance of the final EIS until ESA consultation is complete.

FA1 – U.S. Environmental Protection Agency, Region 4 (cont'd)

FA1-5 (cont'd) should not be issued until all consultations are completed. Consistent with Executive Order 13807, 'One Federal Decision', FERC should consider concurrent environmental review efforts under NEPA and a commitment to process enhancements.

FA1-6 **Additional Technical Recommendations:** In 2014, EPA estimated that the transmission and storage sector accounts for 13% of the total methane emissions from the oil and natural gas industry. The EPA reported that Reciprocating Compressors account for 35% of the emissions from this sector. The EPA created the Natural Gas STAR Program that provides a framework for partner companies with U.S. oil and gas operations to implement methane reducing technologies and practices. We would like to encourage the applicant to join this program and find out its many benefits at: https://www.epa.gov/natural-gas-star-program

The EPA has issued three final rules that together will curb emissions of methane, smog-forming volatile organic compounds (VOCs) and toxic air pollutants such as benzene from new, reconstructed, and modified oil and gas sources, while providing greater certainty about Clean Air Act permitting requirements for the industry. To comply with these rules please see: https://www3.epa.gov/airquality/oilandgas/actions.html. Please note: *these rules are under review and public comments are due December 17, 2018. Please follow the link above for present compliance of rules until the review is final.*

The EPA recommends that FERC's applicant consider the 'Clean Diesel' initiative by implementing diesel controls, cleaner fuel, and cleaner construction practices for on-road and off-road equipment used for transportation, soil movement, or other construction activities, including:

- Strategies and technologies that reduce unnecessary idling, including auxiliary power units, the use of electric equipment, and strict enforcement of idling limits; and
- Use of clean diesel through add-on control technologies like diesel particulate filters and diesel oxidation catalysts, repowers, or newer, cleaner equipment.

For more information on diesel emission controls in construction projects, please see: http://www.northeastdiesel.org/pdf/NEDC-Construction-Contract-Spec.pdf

FA1-7 Regarding pipeline safety technologies, the EPA would like to take the opportunity to inform you about technologies that provide an advanced risk analysis tool called the 'intelligent pipeline' that could help determine preventative measures along the pipeline system without reaching the point of an emergency shut-down of the system. The Eagle LNG Partners project could benefit from this type of technology due to its environmental location.

FA1-8 **Additional Documents:** The EPA recommends including concurrence point letters/emails in the FEIS from relevant agencies in charge of affected resources, such as endangered species issues.

FA1-6 Comment noted. Eagle LNG has stated it would comply with all state emissions requirements during construction and would continue to evaluate implementing the construction practices outlined in the "Clean Diesel" initiative and the Natural Gas STAR methane emission reductions, but did not commit to implementing these programs.

FA1-7 Comment noted. Sections 4.12.5 and 4.12.6 of the EIS have been revised and address this comment.

FA1-8 Executive Order 13807 (One Federal Decision) does not apply to this project. However, we recommend in section 5.2 of the EIS (recommendation no. 9) that Eagle LNG file with the Commission documentation that it has received all applicable authorizations required under federal law (or evidence of waiver thereof) prior to receiving written authorization from the Director of the Office of Energy Projects to commence construction of any project facilities.

FA2 – U.S. Department of the Interior, Office of Environmental Policy and Compliance

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Richard B. Russell Federal Building
75 Ted Turner Drive, S.W., Suite 1144
Atlanta, Georgia 30303

ER 18/0540
9043.1

December 21, 2018

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

Re: Comments on the Draft Environmental Impact Statement (DEIS) for the Proposed Jacksonville Project, FERC No. CP17-41, Jacksonville, Florida

Dear Ms. Bose:

FA2-1 The U.S. Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (DEIS) for the Proposed Jacksonville Project located in Jacksonville, Florida. We have no comments at this time.

Thank you for the opportunity to provide comments on this project. I can be reached on (404) 331-4524 or via email at joyce_stanley@ios.doi.gov.

Sincerely,

Joyce Stanley, MPA
Regional Environmental Officer

cc: Christine Willis – FWS
Michael Norris - USGS
Anita Barnett – NPS
Chester McGhee - BIA
OEPC WASH

FA2-1 Comment noted.

NATIVE AMERICAN TRIBES (NA)

NA1 – Seminole Tribe of Florida, Tribal Historic Preservation Office

SEMINOLE TRIBE OF FLORIDA
TRIBAL HISTORIC PRESERVATION OFFICE
AH-TAH-THI-KI MUSEUM

TRIBAL HISTORIC PRESERVATION OFFICE
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MUSEUM WEBSITE: WWW.AHTAHTHIKI.COM

January 03, 2019

Kimberly D Bose
Secretary
FERC

Subject: FERC Eagle LNG Partners Jacksonville Project, Duval County FL
Docket No: CP17-41-000
THPO #: 0028399

Dear Ms. Bose,

NA1-1 Thank you for contacting the Seminole Tribe of Florida – Tribal Historic Preservation Office (STOF-THPO) regarding the FERC Eagle LNG Partners Jacksonville Project, Duval County FL. The proposed undertaking does fall within the STOF Area of Interest. We have reviewed the documents provided and we concur with the conclusions and recommendations of the Florida Division of Historical Resources.

Thank you and feel free to contact us with any further questions.

Respectfully,

Victoria L. Menchaca, MA, Compliance Review Specialist
STOF-THPO, Compliance Review Section
30290 Josie Billie Hwy, PMB 1004
Clewiston, FL 33440
Office: 863-983-6549 ext 12216
Email: victoriamenchaca@semtribe.com
Web: www.stofthpo.com

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NA1-1 Comment noted.

STATE AGENCIES (SA)

SA1 – Florida Department of State

FLORIDA DEPARTMENT of STATE

RICK SCOTT
Governor

KEN DETZNER
Secretary of State

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

December 21, 2018

RE: DHR Project File No.: 2016-0978-E, Received by DHR: November 30, 2018
Docket No.: CP17-41-000
Project Name: *Eagle LNG Partners Jacksonville, LLC, Jacksonville Project*
County: Duval

To Whom It May Concern:

The Florida State Historic Preservation Officer reviewed the referenced project for possible effects on historic properties listed, or eligible for listing, on the *National Register of Historic Places*. The review was conducted in accordance with Section 106 of the *National Historic Preservation Act of 1966*, as amended, and its implementing regulations in *36 CFR Part 800: Protection of Historic Properties*.

Our office has reviewed the draft environmental impact statement (EIS) for the Jacksonville Project, proposed by the Eagle LNG Partners Jacksonville, LLC (Eagle LNG) in docket number CP17-41-000. The EIS addresses our concerns in regard to potential effects on cultural resources within the project area.

SA1-1 A review of the Florida Master Site File indicates that the project area, encompassing the preferred proposed terminal "Site A," was subjected to cultural resource terrestrial and underwater assessment surveys (DHR# 2015-1330 and DHR# 2015-2566). No sites that are eligible for listing in the *NRHP* were located in the terrestrial portion of the project area. Results of the underwater survey indicate that there are six (6) anomalies that have not been diver verified. Conditional upon the observation of the recommended 50-foot and 150-foot buffer zones around these anomalies (Florida Master Site File # 21837, DHR# 2015-2565). it is the opinion of this office that the proposed project is unlikely to adversely affect historic resources. Our office concurs with the conclusion in the draft EIS that the proposed LNG terminal location, "Site A," is the preferred alternative that can meet the project's objectives. Should the proposed dredging encompass the anomalies and their respective buffers, we request further consultation prior to the commencement of ground-disturbing activities in the submerged bottomland.

In addition, unexpected finds may occur during ground disturbing activities, and we request that the permit, if issued, should include the following special condition regarding inadvertent discoveries:

- If prehistoric or historic artifacts, such as pottery or ceramics, projectile points, dugout canoes, metal implements, historic building materials, or any other physical remains that could be associated with Native American, early European, or American settlement are encountered at any time within the project site area, the permitted project shall cease all activities involving subsurface disturbance in the vicinity of the discovery. The applicant shall contact the Florida Department of State, Division of Historical

Division of Historical Resources
R.A. Gray Building • 500 South Bronough Street• Tallahassee, Florida 32399
850.245.6300 • 850.245.6436 (Fax) FLHeritage.com

Historical Resources

SA1-1 As described in section 4.10.2 of the EIS, Eagle LNG prepared an Unanticipated Discoveries Plan that it would implement in the event that cultural resources or human remains are encountered during construction of the project. The plan includes the requested notification to the Florida Department of State, Division of Historical Resources, Compliance Review Section/State Historic Preservation Office, as well as confirmation that, in the case of the discovery of human remains, the relevant procedures outlined in Chapter 872, Florida Statutes would be followed.

SA1 – Florida Department of State (cont'd)

Federal Energy Regulatory Commission
DHR# 2016-0978-E
12/21/18
Pg. 2

SA1-1 (cont'd) Resources, Compliance Review Section at (850)-245-6333. Project activities shall not resume without verbal and/or written authorization. In the event that unmarked human remains are encountered during permitted activities, all work shall stop immediately and the proper authorities notified in accordance with Section 872.05, *Florida Statutes*.

If you have any questions, please contact Kristen Hall, Historic Sites Specialist, by email at *Kristen. Hall @dos.myflorida.com*, or by telephone at 850.245.6342 or 800.847.7278.

Sincerely,

For

Timothy A Parsons, Ph.D.
Director, Division of Historical Resources & State Historic Preservation Officer

APPLICANT (A)

A1 – Eagle LNG Partners Jacksonville, LLC

KING & SPALDING

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January 4, 2019

VIA EFILING

Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Re: **Eagle LNG Partners Jacksonville LLC, Docket No. CP17-41-000 Comments on Draft Environmental Impact Statement and Supporting Documents**

Ladies and Gentlemen:

On behalf of Eagle LNG Partners Jacksonville LLC ("Eagle LNG"), I submit with this letter comments and supporting documents regarding the Draft Environmental Impact Statement on the Eagle LNG Jacksonville LNG terminal project, which the Commission issued in the captioned proceeding on November 16, 2018.

I am simultaneously providing copies of this submission electronically and in hard copy to the Staff's third-party environmental contractor, Environmental Resources Management, to the attention of Barry Gillespie and Janet Nunley.

A1 – Eagle LNG Partners Jacksonville, LLC (cont'd)

Kimberly D. Bose. Secretary
January 4. 2019
Page 2

If you have any questions regarding this filing, please contact me at your convenience.

Sincerely,

James F. Bowe, Jr.

Attorney for Eagle LNG Partners Jacksonville LLC

JFB:

Enclosures

cc: Elaine P. Baum, FERC (OEP)
Capt. Todd Wiemers, USCG Sector Jacksonville
Matt Kershner, Florida Department of Environmental Protection
Capt. Tom Rodino, USCG (Ret.), Rodino Inc.
Jim Gilmore, Infinity Global Solutions, LLC
Jack Chang, Eagle LNG Partners LLC
Richard Cheng, Eagle LNG Partners LLC
Sean Lalani, Eagle LNG Partners LLC
Darren Bishop, Cardno
Stephanie Fidler, Cardno
All parties, Docket No. CP17-41-000

A1 – Eagle LNG Partners Jacksonville, LLC (cont'd)

Eagle LNG Comments

A1 – Eagle LNG Partners Jacksonville, LLC (cont'd)

	FERC Conditions	Eagle LNG Comment
A1-1	*14.* **Prior to and during construction**, Eagle LNG shall monitor the bald eagle nest west of the LNG terminal during the October 1 to May 15 nesting season and, if bald eagle nesting is observed, Eagle LNG shall not conduct pile driving activities until it has consulted the FWS regarding any recommended mitigation measures or the nesting eagles have fledged. **Prior to starting or resuming pile driving activities during nesting**, Eagle LNG shall file with the Secretary, for review and written approval by the Director of OEP, copies of the associated correspondence with the FWS, including any mitigation measures developed to protect the nesting bald eagles. *(Section 4.6.1.3)*	Eagle LNG is adhering to recommendations for new construction found within the National Bald Eagle Management Guidelines (USFWS 2007) to avoid disturbance to bald eagles. All activities and components for construction related to the project will not occur within 660 feet of an active or alternate bald eagle nest. Furthermore, the known nest located west of the project will be screened from the proposed activity by natural landscape buffers (i.e., forested habitat) that will remain intact within 660 feet of the nest. Eagle LNG has obtained the attached final determination (Attachment #14) from the USFWS Technical Assistance tool which covers all activities similar to those expected during construction of the project. As all recommended measures to avoid disturbance to nesting bald eagles are being followed, a disturbance (incidental take) permit under the Bald and Golden Eagle Protection Act (BGEPA) is not required or recommended. Prior to commencement of any construction activities occurring during the breeding season (October 1 – May 15), Eagle LNG will conduct an initial monitoring event to determine the activity status of the known nest and to confirm the nesting location within the territory has not changed since initial project planning phases. If an active or alternate bald eagle should become established in the future within 660 feet of the construction area, Eagle LNG will contact USFWS for additional guidance. Although the attached final determination is considered to include activities associated with construction of the project (i.e., building construction, 3 or more stories; building construction, 1 or 2 story, with a project footprint of more than ½ acre; mining; oil and natural gas drilling and refining; installation or expansion of marinas with a capacity of 6 or more boats), the National Bald Eagle Management Guidelines further references blasting and other loud, intermittent noises and recommends that such activities be avoided within ½ mile of an active nest, unless greater tolerance to the activity (or similar activity) has been demonstrated by the eagles in the nesting area. The eagle pair (or subsequent pair) residing in this territory have nested since at least 2015 at the location west of the project. This general area sits just north of the busy Port of Jacksonville on the St. John's River. Within 1-mile of the nest location there are industrial activities including a recycling plant, a military fuel depot, and multiple buildings with operations on land and water for packaging, shipping and distribution of goods and equipment. An active railroad is within 175 ft. of the nest location in addition to a busy 4-lane road, Zoo Parkway. The eagles have tolerated a level of human activity, light, and noise.

A1-1 Section 4.6.1.3 of the EIS has been revised to incorporate this information.

A1 – Eagle LNG Partners Jacksonville, LLC (cont'd)

A1-1 (cont'd)		According to the Florida Fish and Wildlife Conservation Commission (FWC) bald eagle database, bald eagles are known to nest in high density along the St. John's River and south to Lake George, with territories maintained year after year. Pile driving activities for this project are expected to be a short-term activity and are not expected to disturb eagles considering the distance in which they will be conducted from the nest, the level of human activity currently tolerated by the pair, and considering that a natural forested vegetative buffer will remain intact around the nest and screen the noise. The bald eagles are unlikely to abandon their territory at this location considering the high level of competition with other pairs in the area. However, to provide assurances that bald eagles will not be disturbed as a result of their pile driving activities specifically, Eagle LNG will provide official monitoring in accordance with the USFWS Bald Eagle Monitoring Guidelines during any pile driving activities that occur during the breeding season (October 1 – May 15) within the portion of the project that falls within ½ mile of the known nest (if nest status is determined active). If any disruption is apparent during these activities, Eagle LNG will stop pile driving activities at the direction of the monitor and will consult with USFWS for guidance on implementation of additional minimization measures or alternative methods prior to continuing the activity. If disturbance is not apparent during pile driving activities, Eagle LNG will continue with such activities to completion and will submit a final report to the USFWS within 30 days of completion of the pile driving activities documenting that these activities occurred without incident and will file with the Secretary, for review and written approval by the Director of OEP, copies of the associated correspondence with the USFWS. Eagle LNG is committed to conducting its activities consistent with the National Bald Eagle Management Guidelines and standards set forth by the USFWS and has provided assurances that all activities associated with construction of the project, including pile driving activities, are not reasonably certain to disrupt eagles at this time nor will they result in take as defined under the BGEPA.
A1-2	*15.* **Prior to the end of the draft EIS comment period**, Eagle LNG shall file with the Secretary documentation of its consultation with the FWS regarding MBTA. *(Section 4.6.1.3)*	Eagle LNG has filed a Migratory Bird Plan (MBP) with the US FWS and is coordinating with FWS to schedule a consultation meeting. Due to the Federal Shutdown, the FWS is currently closed; Eagle LNG will continue to follow up with FWS regarding a consultation meeting once the FWS reopens. Attachment #15 contains email correspondence between Eagle LNG's environmental contractors and the FWS demonstrating the submission of the MBP..

A1-2 Section 4.6.1.3 of the EIS has been revised to incorporate the information provided in Eagle LNG's response to the January 2019 data request.

A1 – Eagle LNG Partners Jacksonville, LLC (cont'd)

A1-3	16. **Prior to construction**, Eagle LNG shall file with the Secretary confirmation that it will adhere to the June 1 through November 30 waterbody construction time window in the FERC Procedures, or file documentation from the appropriate federal and state agencies in writing demonstrating their approval to construct in waterbodies outside the June 1 through November 30 timeframe.	Prior to construction, Eagle LNG will file with the Secretary confirmation that it will adhere to the June 1 through November 30 waterbody construction time window or, if necessary, Eagle will request approval from the United States Fish and Wildlife Service (USFWS) and/or the Florida Fish and Wildlife Conservation Commission (FWC) to construct outside of the June 1 through November 30 waterbody construction time window and provide documentation to FERC.
A1-4	*18.* **Prior to construction**, Eagle LNG shall file with the Secretary, for review and written approval by the Director of OEP, an *Underwater Noise Mitigation Plan* that identifies the specific mitigation measures Eagle LNG will implement to achieve its proposed reduction of 12 dB (re: 1 μPa) associated with pre-stressed concrete impact pile driving and its proposed reduction of 25 dB (re: 1 μPa) associated with steel impact pile driving. The *Underwater Noise Mitigation Plan* shall also include an underwater noise monitoring plan to ensure that sound levels associated with pre- stressed concrete and steel impact pile driving achieve target noise levels, as well as additional mitigation that Eagle LNG will implement in the event that target noise levels are not achieved. *(Section 4.6.2.2)*	Eagle LNG requests that recommendation 18 is modified as described below. 18. Prior to construction, Eagle LNG shall file with the Secretary, for review and written approval by the Director of OEP, an Underwater Noise Mitigation Plan that identifies the specific mitigation measures Eagle LNG will implement to achieve its proposed reduction of 12 dB (re: 1 μPa) associated with pre-stressed concrete impact pile driving and its proposed reduction of 25 dB (re: 1 μPa) associated with steel impact pile driving. **Alternatively, Eagle LNG shall provide an analysis that indicates the pile driving activities will not cause injury to marine mammals, sea turtles and fish within 20 meters and not cause behavioral disturbance within 30 meters.** The Underwater Noise Mitigation Plan shall also include an underwater noise monitoring plan to ensure that sound levels associated with pre- stressed concrete and steel impact pile driving achieve target noise levels, as well as additional mitigation that Eagle LNG will implement in the event that target noise levels are not achieved. (Section 4.6.2.2)
A1-5	*21.* **Prior to the end of the draft EIS comment period**, Eagle LNG shall file with the Secretary the total estimated emissions (including emissions calculation methodology and spreadsheets) while construction of liquefaction Trains 2 and 3 and operations of liquefaction Train 1 are occurring concurrently, and while construction of liquefaction Train 3 and operations of liquefaction Trains 1 and 2 are occurring concurrently. Eagle LNG shall include a regulatory analysis of compliance and any additional mitigation required, including aggregating VOC and NOX emissions for each calendar year where	See Attachment #21 for emissions analysis of concurrent construction and operations as well as a comparison to the General Conformity applicability thresholds.

A1-3 Section 4.6.2.2 of the EIS has been revised to incorporate this information.

A1-4 We disagree with Eagle LNG's request to modify recommendation 18 of the draft EIS. We believe that this recommendation would ensure that appropriate mitigation is developed to protect fish, marine mammals, and sea turtles based on the underwater noise impact levels currently proposed. In the event that Eagle LNG intends to modify pile driving activities to lessen the intensity of underwater noise generation, this information should be provided in the Underwater Noise Mitigation Plan.

A1-5 The General Conformity applicability analysis in section 4.11.1.3 of the final EIS has been updated to include this information.

A1 – Eagle LNG Partners Jacksonville, LLC (cont'd)

A1-5 (cont'd)	construction and operation occurs concurrently to compare to General Conformity applicability thresholds. If VOC or NOX emissions would exceed the General Conformity applicability thresholds for any calendar year, Eagle LNG shall document that the annual project emissions will conform to the applicable State Implementation Plan, as outlined in 40 CFR 93.158. *(Section 4.11.1.3)*	
A1-6	24. **Prior to the end of the draft EIS comment period**, Eagle LNG shall file with the Secretary documentation demonstrating it has filed for an Aeronautical Study under 14 CFR 77 for all permanent structures, temporary construction equipment, and mobile objects that exceed the height requirements in 14 CFR 77.9.	See Attachment #24 for confirmation of the initiation of an Aeronautical Study under 14 CFR 77 for permanent structures. Eagle LNG was not able to formally submit the application due to the Federal Aviation Administration Obstruction Evaluation Group being currently closed due to the Federal Shutdown, but will submit the application within seven (7) days of the FAA OEG reopening. Temporary construction equipment will be filed more than 45 days before construction as required by the Federal Aviation Administration.
A1-7	25. **Prior to the end of the draft EIS comment period**, Eagle LNG shall file with the Secretary whether L-405 will be a vent stack or flare stack.	L-405 will be a flare stack with a continuous pilot.
A1-8	27. **Prior to initial site preparation**, Eagle LNG shall file with the Secretary a site-specific analysis to identify the location, orientation, and inclination of any local faults of geological discontinuities in order to better characterize the risk of regional subsidence or surficial deformation that is stamped and sealed by a professional engineer-of-record, registered in the state of Florida.	Fugro Report 04.10165008, dated August 17, 2016 (Appendix 13.J.3), is a geophysical report using electrical resistivity and seismic refraction to check subsurface conditions. Eagle LNG will have this report reviewed and stamped by a Florida PE and submitted to the Secretary prior to initial site preparation
A1-9	a. geotechnical investigation with cone penetration tests (CPTs), seismic cone penetration tests (SCPTs), and/or standard penetration tests (SPTs) along with verification tests with accompanying results that confirm ground improvement and foundation recommendations; b. site preparation drawings and specifications;	Based on the geology of the Jacksonville Project site (limestone bedrock), CPT / SCPT/ SPT would only be effective to ~10m. We propose to use seismic reflection to scan the subsurface conditions to a depth of 20-30m. Eagle LNG will have this report reviewed and stamped by a Florida PE and submitted to the Secretary prior to construction of final design.

A1-6 Comment noted. Sections 4.12.5 and 4.12.6 of the EIS have been revised to incorporate this information.

A1-7 Comment noted. Sections 4.12.5 and 4.12.6 of the EIS have been revised to incorporate this information.

A1-8 Comment noted. However, FERC staff notes that although appendix 13.J.3 included seismic refraction data and referenced appendix 13.J.1 for the seismic refraction analysis, no such analysis was provided. Therefore, because no analysis of the seismic refraction data has been provided, FERC staff maintains this recommendation in order to evaluate the presence of local faults, fractures, or geological discontinuities.

A1-9 Comment noted. We agree that other tests could be used to verify the subsurface conditions and agree that the potential for soil liquefaction is low given the subsurface conditions and low seismicity of the site. As a result, we have revised sections 4.12.5 and 4.12.6 of the EIS to be more broad on the tests used to verify subsurface conditions and have removed the need to demonstrate whether soil improvement is necessary to counteract soil liquefaction.

A1 – Eagle LNG Partners Jacksonville, LLC (cont'd)

	c. LNG storage tank foundation design drawings and calculations;	
	d. LNG terminal structures and foundation design drawings and calculations (including prefabricated and field constructed structures);	
	e. seismic specifications for procured equipment; f. quality control procedures to be used for civil/structural design and construction; and	
A1-10	g. a determination of whether soil improvement is necessary to counteract soil liquefaction.	Liquefaction analyses were performed for the on-shore side and our recommendations were provided in Fugro Report 04.10160014-2, dated January 17, 2017 (Appendix 13.I.1). Based on the report, there will not be a serious liquefaction potential at the site. Eagle LNG will have this report reviewed and stamped by a Florida PE and submitted to the Secretary prior to construction of final design.
A1-11	53. **Prior to construction of final design,** Eagle LNG shall evaluate the need for a hybrid (i.e., liquid/vapor) LNG loading/unloading arm.	Eagle LNG requests that recommendation 53 is removed. The need/use of a hybrid loading arm is not required by the applicable regulation or industry codes. Eagle LNG will assess the technical and commercial viability to implement a hybrid loading arm during detail engineering to further enhance the operational flexibility of the terminal.
A1-12	55. **Prior to construction of final design,** Eagle LNG shall include a vacuum breaker gas or pad gas system in addition to LNG storage tank vacuum relief system to mitigate the risk of failures caused by vacuum conditions. Additionally, Eagle LNG shall provide an analysis that verifies the use of ambient air in lieu of vacuum breaker gas on the LNG storage tank vacuum relief valves will not result in a flammable atmosphere in the tank.	Eagle LNG requests that recommendation 55 is modified as described below. Prior to construction of the final design, Eagle LNG shall include a vacuum gas or pad gas system in addition to LNG storage tank vacuum relief system to mitigate the risk of failures caused by vacuum conditions. **Alternatively**, Eagle LNG shall provide an analysis that verifies the use of ambient air in lieu of vacuum gas on the LNG storage tank vacuum relief valves will not result in a flammable atmosphere in the tank.
A1-13	61. **Prior to construction of final design,** Eagle LNG shall clearly specify the responsibilities of the LNG tank contractor and the EPC contractor for the piping associated with the LNG storage tank and piping associated with the LNG pumps located within the tertiary containment.	Eagle LNG requests that recommendation 61 is removed. The division of scope between EPC contractor, LNG Storage Tank Contractor (if different than EPC Contractor) and equipment suppliers does not have an impact on the technical or environmental assessment of the Project and will be determined by Eagle LNG based on technical and commercial criteria prior to finalization of the EPC Contract. As is customary in

A1-10 See the response to comment A1-9.

A1-11 Comment noted. Section 4.12.5 of the EIS has been revised to address this comment.

A1-12 Comment noted. Section 4.12.5 of the EIS has been revised to address this comment.

A1-13 Comment noted. Section 4.12.5 of the EIS has been revised to address this comment.

A1 – Eagle LNG Partners Jacksonville, LLC (cont'd)

		EPC contracts, Eagle LNG reserves the right as Owner of the project to modify the scope of supply from its contractor and subcontractors.
A1-14	66. **Prior to construction of final design,** Eagle LNG shall demonstrate that, for hazardous fluids, piping and piping nipples 2 inches or less in diameter are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and operator live loads in areas accessible by operators.	Eagle LNG requests that recommendation 66 is modified to provide an option to specify that for the piping and piping nipples of hazardous fluids, 2 inches or less are to be no less than schedule 160 for carbon steel and schedule 80 for stainless steel. This requirement has been requested by FERC from previous LNG projects.
A1-15	71. **Prior to construction of final design,** Eagle LNG shall include LNG tank fill flow measurement with high flow alarm.	Eagle LNG requests that recommendation 71 is removed. FE038 on PID 7112799-18-PID-111017 measures the flow of LNG per train and will be totalized in the DCS to measure the maximum total flow to the tank, so no additional instrumentation is needed.
A1-16	73. **Prior to construction of final design,** Eagle LNG shall file an analysis of the structural integrity of the outer containment of the full containment LNG storage tank demonstrating it can withstand the radiant heat from a roof tank top fire.	Eagle LNG will perform an analysis of the effects of a relief valve fire on the outer containment of the LNG storage tank and submit to FERC prior to construction of final design.
A1-17	74. **Prior to construction of final design,** Eagle LNG shall file a projectile analysis for review and approval to demonstrate that the outer concrete impoundment wall of a full-containment LNG storage tank could withstand wind-borne projectiles. The analysis shall detail the projectile speeds and characteristics and method used to determine penetration or perforation depths.	Eagle LNG will perform an analysis to determine the ability of the outer tank wall to resist an impact from a 110 lb rigid body moving at a velocity of 100 mph. The impact loading will be evaluated and analyzed for the acceptance criteria stated in ACI 376 Section 8.4.12. The commentary section of ACI 376, Section R8.4.12 provides direction on how impact loadings are to be analyzed. This analysis will be performed prior to the construction of the outer tank shell.
A1-18	75. **Prior to construction of final design,** Eagle LNG shall specify the minimum distance required for valve maintenance, between the LNG loading header and the first valve in the discharge piping to the loading arm.	Eagle LNG requests that recommendation 75 is removed. Eagle LNG will review the location of all valves during detail design to ensure that proper accessibility for maintenance is considered in the plant layout based on final valve design selections.

A1-14 Comment noted. Section 4.12.5 of the EIS has been revised to address this comment.

A1-15 Comment noted. Section 4.12.6 of the EIS has been revised to address this comment.

A1-16 Comment noted. However, the recommendation specifies a roof tank top fire, not a relief valve fire.

A1-17 Comment noted. Section 4.12.5 of the EIS has been modified to address this comment.

A1-18 Comment noted. However, the FERC staff believes it is important to verify the minimum distance required for valve maintenance. Therefore, FERC staff maintains this recommendation.

A1 – Eagle LNG Partners Jacksonville, LLC (cont'd)

A1-19	77. **Prior to construction of final design,** Eagle LNG shall provide a vapor dispersion analysis of L- 405 releases from a combination of relief scenarios in accordance with API 521 or equivalent to demonstrate flammable vapors will not reach grade or any areas that could pose an explosion risk. The analysis shall take into account the uncertainty in any models used in the vapor dispersion analyses. Alternatively, if operating L-405 as a flare, Eagle LNG shall provide the flare details (e.g., purge, pilots, etc.) and specify the flares will meet API 537 or equivalent.	Refer to Eagle LNG's response to condition #25. Eagle will provide the details of the flare prior to construction of final design to ensure compliance of API 537 or equivalent.
A1-20	84. **Prior to construction of final design,** Eagle LNG shall file an updated fire protection evaluation of the proposed facilities. A copy of the evaluation, a list of recommendations and supporting justifications, and actions taken on the recommendations shall be filed. The evaluation shall specify the warehouse sprinkler system using extra hazard group 2 design densities or justify an alternative design. The evaluation shall also include a hazard detection study to evaluate the effectiveness of their flammable and gas detection system in accordance with ISA 84.00.07 or equivalent methodologies that will demonstrate 90% or more of releases (unignited and ignited) that could result in an offsite or cascading impact that could extend offsite will be detected by two or more detectors and result in isolation and deinventory within 10 minutes. The analysis shall take into account the set points, voting logic, and different wind speeds and directions.	Eagle LNG requests that recommendation 84 is modified as described below. The recommendation included in Section 4.12.5 of the DEIS to evaluate the effectiveness of the flammable and gas detection system in accordance with ISA 84.00.07 is not required by a regulation or industry code requirement applicable to the project. The proposed flammable gas detection system will meet the requirements of NFPA59A (2001) and NFPA 72. 84. Prior to construction of final design, Eagle LNG shall file an updated fire protection evaluation of the proposed facilities. A copy of the evaluation, a list of recommendations and supporting justifications, and actions taken on the recommendations shall be filed. The evaluation shall specify the warehouse sprinkler system using extra hazard group 2 design densities or justify an alternative design. ~~The evaluation shall also include a hazard detection study to evaluate the effectiveness of their flammable and gas detection system in accordance with ISA 84.00.07 or equivalent methodologies that will demonstrate 90% or more of releases (unignited and ignited) that could result in an offsite or cascading impact that could extend offsite will be detected by two or more detectors and result in isolation and deinventory within 10 minutes. The analysis shall take into account the set points, voting logic, and different wind speeds and directions.~~

A1-19 Comment noted. Sections 4.12.5 and 4.12.6 of the EIS have been revised to address this comment.

A1-20 Comment noted. Section 4.12.5 of the EIS has been modified to address this comment.

A1 – Eagle LNG Partners Jacksonville, LLC (cont'd)

A1-21	87. **Prior to construction of final design,** Eagle LNG shall file an analysis of the localized hazards to operators from a potential liquid nitrogen release and shall also provide spill containment and low oxygen detectors to mitigate liquid nitrogen releases.	Eagle LNG requests that recommendation 87 is removed. Section 10.1 of the Hazard Analysis (15510-TR-600-010) discusses the results of the nitrogen dispersion analysis and provide details of the proposed low oxygen detector locations. The analysis indicates that there is no liquid rainout from the piping upstream of the N2 vaporizers and therefore spill containment is not necessary; the proposed liquid nitrogen storage tank will be of a double wall design with stainless steel outer tank (vacuum insulated). PHMSA has reviewed the design spill methodology for the Project and issued a letter of no objection to FERC on February 23, 2018 indicating that the design spills considered for the hazard analysis are in compliance with 49 CFR 193. Furthermore, Eagle LNG will continue supporting PHMSA in the Part 193, Subpart B review as detailed in the Memorandum of Understanding (MOU) between FERC and PHMSA issued on August 31, 2018.
A1-22	88. **Prior to construction of final design,** Eagle LNG shall file an analysis of the localized hazards from a potential hydrogen sulfide release and shall also provide toxic detectors to mitigate hydrogen sulfide releases from the acid gas piping system and potential release points (i.e. vents, relief valves, vent stacks, and thermal oxidizer stack).	Eagle LNG requests that recommendation 88 is removed. Section 11.1-11.4 of Hazard Analysis (15510-TR-600-010 Rev 3) discusses the results of the analysis of a potential hydrogen sulfide release and how toxic detectors will be located in affected areas. Eagle LNG would still provide the locations of toxic detectors prior to construction of final design.
A1-23	98. **Prior to construction of final design,** Eagle LNG shall include or demonstrate the firewater storage volume for its facilities has minimum reserved capacity for its most demanding firewater scenario plus 1,000 gpm for no less than 2 hours. The firewater storage shall also demonstrate compliance with NFPA 22 or equivalent.	Eagle LNG requests that recommendation 98 is removed or modified, according to the information provided below: The Firewater System Sizing Calculations (15510-CA-600-001 Rev 1) included with RR13 demonstrate that the proposed FW tank capacity considers the maximum single firewater demand for a 2-hour duration in accordance with NFPA 59A (2001) including a 1000 gpm hose allowance. Section 5 of the Firewater System Sizing Calculation confirms that Eagle LNG will specify an NFPA 22 compliant Firewater tank design.

A1-21 Comment noted. Section 4.12.5 of the EIS has been modified to address this comment.

A1-22 Comment noted. Section 4.12.5 of the EIS has been modified to address this comment.

A1-23 Comment noted. However, FERC staff notes that section 5 of the referenced Firewater System Sizing Calculation (in Resource Report 13, appendix P.2) only addresses firewater equipment sizing and does not address other requirements included in National Fire Protection Association (NFPA) 22. Therefore, the FERC staff maintains this recommendation.

A1 – Eagle LNG Partners Jacksonville, LLC (cont'd)

The attachments to this document have been removed from this environmental impact statement. They are available for viewing on the Federal Energy Regulatory Commission's (FERC) website at http://www.ferc.gov. Using the "eLibrary" link, select "General Search" from the eLibrary menu, enter the selected date range and "Docket No." excluding the last three digits (i.e., CP17-41, PF15-7), and follow the instructions. For assistance please contact FERC Online Support at FERCOnlineSupport@ferc.gov or toll free at 1-866-208-3676 or, for TTY, contact 202-502-8659. The category/accession number for this submittal is 20190104-5115.

APPENDIX L

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