VENTURE GLOBAL LNG

CALCASIEU PASS

Venture Global Calcasieu Pass, LLC
Calcasieu Pass Project

Preliminary Draft
Resource Report 1

General Project Description

November 2014

Docket No.
PF15-2-000

Prepared by

NATURAL RESOURCE GROUP

Resource Report 1 – General Project Description
FERC Environmental Checklist

	Part 380-Appendix A Minimum Filing Requirements for Environmental Reports	Company Compliance or Inapplicability of Requirement
☐	Provide a detailed description and location map of the Project facilities. (§380.12(c)(1))	Section 1.3 and Figures 1.1-1,1.1-2, 1.3-1, and 1.3-2
☐	Describe any nonjurisdictional facilities that would be built in association with the Project. (§380.12(c)(2))	Section 1.8
☐	Provide current original U.S. Geological Survey (USGS) 7.5-minute series topographic maps with mileposts showing the Project facilities. (§380.12(c)(3))	Figures 1.3-2, 1.3-5 , 1.3-5D, 1.3-6 and 1.3-6D
☐	Provide aerial images or photographs or alignment sheets based on these sources with mileposts showing the Project facilities. (§380.12(c)(3))	Figures 1.3-1, 1.3-3, 1.3-3D, 1.3-4 and 1.3-4D
☐	Provide plot/site plans of compressor stations showing the location of the nearest noise-sensitive areas (NSA) within 1 mile. (§380.12(c)(3,4))	Not applicable
☐	Describe construction and restoration methods. (§380.12(c) (6))	Section 1.5.2
☐	Identify the permits required for construction across surface waters. (§380.12(c)(9))	Section 1.9
☐	Provide the names and addresses of all affected landowners and certify that all affected landowners will be notified as required in §157.6(d). (§380.12(a)(4) and (c)(10))	Section 1.10 and Appendix 1-B (Filed as Privileged Information – Do Not Release)
☐	Describe all authorizations required to complete the proposed action and the status of applications for such authorizations.	Section 1.9
☐	Provide plot/site plans of all other aboveground facilities that are not completely within the right-of-way.	Appendix 1-A
☐	Provide detailed typical construction right-of-way cross-section diagrams showing information such as widths and relative locations of existing rights-of-way, new permanent right-or-way, and temporary construction right-of-way. See Resource Report 8.	Figures 1.4-2 a-c
☐	Summarize the total acreage of land affected by construction and operation of the project	Section 1.4.3 and Table 1.4-5
☐	If Resource Report 5, Socioeconomics is not provided, provide the start and end dates of construction, the number of pipeline spreads that would be used, and the workforce per spread.	Section 1.5.1 and Resource Report 5.

CALCASIEU PASS PROJECT

RESOURCE REPORT 1 – GENERAL PROJECT DESCRIPTION

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ACRONYMS AND ABBREVIATIONS

ANR	ANR Pipeline Company
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ATWS	additional temporary workspace
Bcf/d	billion cubic feet per day
CFR	Code of Federal Regulations
CI	Chief Inspector
CMMS	computerized maintenance management system
CO_2	carbon dioxide
Commission	Federal Energy Regulatory Commission
DOT	U.S. Department of Transportation
EI	Environmental Inspector
EPA	U.S. Environmental Protection Agency
ER	Environmental Report
ESD	emergency shutdown
FBE	fusion bonded epoxy
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
HDD	horizontal directional drill *or* horizontal directional drilling
HFO	heavy fuel oil
LAC	Louisiana State Code
LDNR	Louisiana Department of Natural Resources
LNG	liquefied natural gas
m^3	cubic meter
MAOP	maximum allowable operating pressure
MLV	mainline valve
msl	mean sea level
MLG	Mean Low Gulf
mtpa	million tonnes per annum
MW	megawatt
NFPA	National Fire Protection Association
NGA	Natural Gas Act
ODMDS	ocean dredged material disposal site
Plan	Upland Erosion Control, Revegetation, and Maintenance Plan
ppmv	parts per million by volume
Procedures	Wetland and Waterbody Construction and Mitigation Procedures
PSD	Prevention of Significant Deterioration
psig	pounds per square inch gauge

SH	State Highway
SMR	single mixed refrigerant
SWPPP	Stormwater Pollution Prevention Plan
Terminal	proposed Calcasieu Pass Terminal on Calcasieu Ship Channel near Cameron, Louisiana
Transco	Transcontinental Gas Pipe Line Company, LLC
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USGS	U.S. Geological Survey
Venture Global Calcasieu Pass	Venture Global Calcasieu Pass, LLC
yds^3	cubic yards
^{o} F	degrees Fahrenheit

1.0 RESOURCE REPORT 1 – GENERAL PROJECT DESCRIPTION

1.1 Introduction

Resource Reports 1 through 13 collectively make up the Environmental Report (ER) submitted to the Federal Energy Regulatory Commission (FERC or Commission) as part of the Application of Venture Global Calcasieu Pass, LLC (Venture Global Calcasieu Pass)[1] for authorization to site, construct, and operate natural gas liquefaction and export facilities at a proposed liquefied natural gas (LNG) terminal on the Calcasieu Ship Channel in Cameron Parish, Louisiana (Terminal). The Application is submitted in accordance with Title 18 Code of Federal Regulations (CFR) Section 380.12 and Sections 3(a) and 7(c) of the Natural Gas Act (NGA).

Venture Global Calcasieu Pass's proposed development is composed of multiple LNG facility components at the approximately 203.6-acre greenfield site (Terminal Site or Site), together with two large-diameter gas pipelines and appurtenant aboveground facilities (collectively, "Pipeline System") to bring feed gas to the Terminal from interconnection points with existing interstate and intrastate pipelines in Cameron Parish. The main liquefaction components, located at the Terminal Site, will be 10 integrated pre-cooled single mixed refrigerant (SMR) blocks, each with a nominal capacity of 1.0 million tonnes per annum (mtpa) of LNG (10.0 mtpa in aggregate) for export, which equates to a total liquefaction capacity of approximately 487.2 billion cubic feet per year (Bcf/yr) of natural gas.[2] These blocks and their support facilities, including integrated gas pretreatment units, are collectively referred to as the "Liquefaction Plant".

In addition to the Liquefaction Plant described above, Venture Global Calcasieu Pass proposes to construct various other facilities at the Terminal Site to support the liquefaction and export operation, including two 200,000 cubic meter (m^3) aboveground LNG storage tanks, two LNG berthing docks within a common LNG berthing area, and an electric generation facility (or "power island") to provide approximately 600 megawatts (MW) of power for the site facilities. The Liquefaction Plant, Pipeline System, LNG storage tanks, LNG berthing facilities, electric generation facility, and other appurtenant structures, are collectively referred to as the "Calcasieu Pass Project" or "Project". All these facilities are recognized as FERC jurisdictional and therefore requiring authorization under the NGA. The determination of jurisdictional and non-jurisdictional status is discussed in Section 1.8. Figures 1.1-1 and 1.1-2 illustrate the Project's regional location.

The Calcasieu Pass Project will allow Venture Global Calcasieu Pass to convert domestically produced natural gas to LNG for storage and export, encouraging the development of new domestic resources and promoting a liberalized global natural gas trade and greater diversification of global gas supplies. Numerous reports have projected that sufficient volumes

[1] Venture Global Calcasieu Pass, LLC is a wholly-owned subsidiary of Venture Global LNG, Inc.

[2] The liquefaction system is designed to liquefy more than 1.5 billion cubic feet per day (Bcf/d) over a nominal operating year. The additional design output compensates for maintenance down-time and losses due to heat leak boil-off to enable VC Calcasieu Pass to deliver its DOE/FE authorized export quantities.

of domestic natural gas will be produced over the next several decades to satisfy domestic demand and provide a surplus for international export.[3]

On September 27, 2013, Venture Global LNG, Inc. (VG LNG) received approval from the Department of Energy/Office of Fossil Energy (DOE/FE) in FE Docket 13-69-LNG to export up to 5 mtpa (equivalent to approximately 243.6 Bcf/yr of vaporized natural gas) to Free Trade Agreement (FTA) nations over 25 years. VG LNG's application in that docket for DOE/FE authorization to export those same volumes of LNG to non-FTA nations is pending.

After the initial receipt of FTA approval, VG LNG determined that market demand for the Project was stronger than anticipated and that a larger project than originally proposed was appropriate. Accordingly, on May 13, 2014, VG LNG submitted, in FE Docket No. 14-88-LNG, a second application to the DOE/FE to export an additional 5 mtpa of LNG to both FTA and non-FTA nations. On October 10, 2014, VG LNG received approval from the DOE/FE in FE Docket No. 14-88-LNG to export an additional 5 mtpa of LNG to FTA nations over 25 years. Thus, current DOE/FE authorizations permit VG LNG to export a total of 10 mtpa (equivalent to approximately 487.2 Bcf/yr). VG LNG's application in Docket No. 14-88-LNG to export an additional 5 mtpa of LNG to non-FTA nations is pending before DOE/FE.[4]

On October 7, 2014, Venture Global Calcasieu Pass requested that the FERC initiate the pre-filing process for review of the Project under the National Environmental Policy Act. This request was approved on October 10, 2014.

1.2 Purpose and Need

Venture Global Calcasieu Pass is developing the Calcasieu Pass Project to enable it to produce LNG for export under the authorities granted to Venture Global Calcasieu Pass by the DOE/FE.

Based on various recent economic studies[5] of the United States' current and projected patterns of supply and demand of domestically produced natural gas, the Calcasieu Pass Project will provide benefits that will outweigh any impacts on gas consumption and costs. Further, in addition to the global benefits discussed above, the Project is consistent with the public interest

[3] See 2012 DOE/FE LNG Export Study, 77 Federal Register 73, 627 (December 11, 2012), available at http://energy.gov/sites/prod/files/2013/04/f0/fr_notice_two_part_study.pdf (Federal Register Notice of Availability of the LNG Export Study).

Initial Comments – DOE/FE LNG Export Study (http://www.fossil.energy.gov/programs/gasregulation/authorizations/export_study/export_study_initial_comments.html).
Reply Comments – DOE/FE LNG Export Study (http://www.fossil.energy.gov/programs/gasregulation/authorizations/export_study/export_study_reply_comments.html).
See "Effect of Increase Levels of Liquefied Natural Gas Exports on US Energy Markets," available at http://www.eia.gov/analysis/requests/fe/.

[4] For the purposes of further developing and financing the Project, VG LNG converted into a Delaware corporation and created Venture Global Calcasieu Pass as a wholly-owned, single purpose subsidiary to be the owner of the Project. On September 22, 2014, VG LNG, in FE Docket No. 13-69-LNG and Docket No. 14-88-LNG, filed an application to transfer the initial FTA Authorization to Venture Global Calcasieu Pass and to modify the pending applications with the DOE/FE by changing the applicant to Venture Global Calcasieu Pass. Accordingly, the assets of the Project were subsequently transferred to Venture Global Calcasieu Pass, other than the Initial FTA Authorization, the transfer of which is contingent upon DOE/FE approval. Venture Global Calcasieu Pass expects DOE/FE approval of the transfer of the Initial FTA Authorization to be issued in due course.

[5] See footnote 3 above.

on a local, regional, and national level. The main benefits associated with the Project are summarized below.

- *Direct Job Creation/Employment Sustainability*

  This benefit is reflected in the need for up to 1,500 (peak) construction workers for the Project over the 38-month construction timeframe, approximately 100 full-time staff, and hundreds of off-site workers to support the Project.

- *Environmental Benefits*

  Importation of LNG by foreign countries and its consequent increased availability as fuel for power generation and transportation will permit the displacement of existing and future coal, heavy fuel oil and diesel power generation and displacement of heavy fuel oil, diesel, and gasoline for vehicles and marine engines, thereby reducing greenhouse gas, sulfur oxides, nitrogen oxides, and other emissions.

- *National Security and Foreign Relations*

  By promoting a global, liquid, and robust market for natural gas, the United States will increase economic trade and ties with foreign nations by providing them with access to a clean, reliable, and less expensive alternative fuel. This trade will enhance the national security of the United States by encouraging positive foreign relations with our trading partners.

- *Economic Benefits*

  In addition to job creation and employment sustainability, the Project will generate substantial tax revenues and improve the United States' balance of trade.

1.3 Location and Description of Proposed Project Facilities

The proposed Calcasieu Pass Project facilities are illustrated in the series of figures contained in Appendix 1-A, as described below.

Figures 1.1-1 and 1.1-2 show the regional location of the facilities on an aerial map and a U.S. Geological Survey (USGS) topographic map, respectively. A more detailed layout of the Terminal facilities is provided in Figures 1.3-1 (aerial map) and 1.3-2 (topographic map). The two proposed lateral pipelines are depicted on the aerial route sheets in Figures 1.3-3 and 1.3-3D (19 Sheets) and 1.3-4 and 1.3-4D (14 Sheets), and the topographic route sheets in Figures 1.3-5 and 1.3-5D (19 Sheets) and 1.3-6 and 1.3-6D (14 Sheets).

Figures 1.3-7 through 1.3-12 provide engineering design plot plans for proposed facilities at the Terminal Site. Figure 1.4-1 illustrates workspace layouts for the Terminal facilities. Figures 1.4-2 a-c contain depictions of the construction right-of-way for representative sections of the proposed lateral pipelines. Additional maps, illustrations, and plans of Project components are found throughout the ER, including the detailed design plans contained in Resource Report 13 (Engineering and Design Material).

1.3.1 Terminal Site and Facilities

The proposed Terminal facilities will be constructed on an approximately 203.6-acre greenfield Terminal Site on the east side of the Calcasieu Ship Channel, approximately 1,000 feet north of the Gulf of Mexico in Cameron Parish, Louisiana. The Site is bordered by the Calcasieu Ship Channel to the west, private property used for raising cattle to the north and east, and the Cameron Jetty Pier Facility and state lands along the Gulf of Mexico shoreline to the south. The Site extends for approximately 3,700 feet along the Calcasieu Ship Channel and has a maximum width (west to east) of approximately 3,400 feet. Venture Global Calcasieu Pass holds an exclusive right to lease the Site, which is characterized by relatively flat coastal terrain with low scrub/herbaceous vegetative cover. Historically, the primary land use has been cattle grazing.

The major proposed facilities at the Terminal Site are summarized below; a more detailed listing is provided in Section 1.3.3.1.

- Liquefaction Plant - consisting of 10 liquefaction blocks,[6] with each block consisting of one gas pretreatment system, two SMR liquefaction units and ancillary support facilities. Each block is capable of producing a nominal 1.0 mtpa of LNG.

- Two 200,000 m^3 LNG aboveground storage tanks with cryogenic pipeline connections to the Liquefaction Plant and berthing docks.

- Two LNG berthing docks on the Calcasieu Ship Channel - capable of receiving LNG carriers of between 120,000 m^3 and 185,000 m^3 capacity and occupying a common recessed berthing area to be excavated and dredged on and adjacent to the Terminal Site.

- One temporary floating LNG storage vessel berthed at one of the LNG berthing docks to facilitate LNG export deliveries expected to be discontinued after the first permanent LNG storage tank becomes operational.

- Turning basin on the Calcasieu Ship Channel, with deep-water access to the above-referenced LNG berthing docks.

- Utility dock on the Calcasieu Ship Channel - to handle waterborne deliveries of equipment and material during construction and retained for related marine operations.

- Natural gas-fired electric generation facility - to provide a nominal 600 MW of power for the liquefaction block compressors and other plant systems.

As indicated in Figures 1.3-3 and 1.3-4, the 10 liquefaction blocks will be arranged longitudinally in the west-central sector of the Site. The blocks are collectively referred to as the "Liquefaction Plant". In each block, the main components of each of the two SMR liquefaction units are the cold box and the electric-driven mixed refrigerant (MR) compressor, while the gas pretreatment unit for each block includes an electric-driven boost compressor and removal units

[6] Venture Global Calcasieu Pass references liquefaction "blocks" and "units" rather than "trains" because the term "train" is commonly used to denote a singular, independently-operating process facility involving liquefaction, pretreatment, and compression. This is not the case for the Calcasieu Pass Project, where two liquefaction process units share compression and pretreatment facilities to comprise a single liquefaction block.

for acid gas, water, and heavy hydrocarbons (see Section 1.3.5 for additional details). Each block will also contain conventional air coolers (fin fans), which will provide cooling for the liquefaction process. Current design plans indicate that a separate series of fans will be required for each liquefaction block. Make-up refrigerant storage for the blocks will be in an adjacent area.

The LNG storage tanks will be located between the liquefaction blocks and the LNG berthing area to the west. Each tank will be approximately 300 feet in diameter and 180 feet in height from grade to the top of the dome roof, with a net usable capacity of approximately 200,000 m^3. The tanks will be full containment type, with the inner primary container constructed of 9 percent nickel alloy steel and the outer secondary container (base, walls, and roof) constructed of steel-reinforced and post-tensioned concrete. The storage tanks, like other LNG facilities at the Terminal Site, will be built to the requirements of National Fire Protection Association (NFPA) Standard 59A, U.S. Department of Transportation (DOT) regulations at 49 CFR Part 193, and other applicable standards.

As indicated in Figures 1.3-3, 1.3-4, and 1.3-12, the LNG berthing area will be recessed into the Terminal Site's shoreline on the east side of the Calcasieu Ship Channel. Excavation and dredging to create the recess will extend over a land area with a length of approximately 2,950 feet (north/south) and a maximum width of approximately 275 feet (east/west). Each of the two docks within the berthing area will feature a 150-foot-long by 115-foot-wide concrete jetty head platform, which will be mounted on piles. The platform will support three loading arms and one vapor return arm, to allow LNG transfer to berthed carriers.

LNG carriers will access the Terminal from the Gulf of Mexico through the existing 400-foot-wide navigation channel in the Calcasieu Ship Channel. Carriers calling on the Terminal will turn in an approximately 1,575-foot-diameter turning basin that Venture Global Calcasieu Pass will develop off the northwest corner of the Terminal Site. This will allow carriers to be moored at the LNG berthing docks with their bows facing southwards toward the Gulf of Mexico.

During construction, Venture Global Calcasieu Pass anticipates that a significant portion of materials, equipment, and modular plant components (including the liquefaction units) will be brought to the site by barge. This will require development of a permanent utility dock to allow barge visits during construction and later serve as tug boat berths.

Figures 1.3-3 and 1.3-4 show the location and layout of the electric generation facility in the northeast sector of the Terminal Site. The current design is based on a combined cycle gas turbine (CCGT). An air-cooled condenser, located in the southeast corner of the generation facility's footprint, will provide air cooling for steam turbine exhaust. Two substations and a transformer yard will be located west of and adjacent to the main facility.

Peripheral facilities and structures at the Terminal Site will include the following: gate station to receive incoming feed gas; firewater pump building; flare (located in the northwest corner of the site); flare knock-out drum; boil-off gas compressors; control rooms; substations; utility area; administrative center; warehouse; oily water treatment unit; miscellaneous piping, racks, sumps, and troughs; parking areas; and plant roads.

1.3.2 Pipeline System

The proposed Pipeline System includes two separate lateral natural gas pipelines that will connect to the existing interstate pipeline network in the Project area and will provide feed

gas for the liquefaction and power generation facilities. The major components of the proposed system are described below.

- Calcasieu Pass East Lateral Pipeline (East Lateral Pipeline) – an approximately 23.8-mile-long, 42-inch-diameter pipeline to deliver gas westwards to the Terminal Site from a new interconnection in the vicinity of ANR Pipeline Company's (ANR's) Grand Chenier facility in eastern Cameron Parish.

- Calcasieu Pass West Lateral Pipeline (West Lateral Pipeline) – an approximately 18.5-mile-long, 42-inch-diameter pipeline to deliver gas eastwards to the Terminal Site from a new interconnection in the vicinity of Transcontinental Gas Pipe Line Company LLC's (Transco's) Cameron Meadows facility in western Cameron Parish.

- Meter station, with pig launcher and pressure regulating valve, located in the vicinity of the interconnection between the East Lateral Pipeline and ANR's existing upstream pipeline system.

- Meter station, with a pig launcher and pressure regulating valves, located in the vicinity of the interconnections between the West Lateral Pipeline and Transco's existing upstream pipeline system, and providing separate metering facilities for gas received from Transco's system and a proximate pipeline system operated by Natural Gas Pipeline Company of America (NGPL).

- Eight mainline valves (MLVs), one located at each end and two more centrally located on each lateral pipeline.

The East Lateral Pipeline will have a nominal gas supply capability of 1.5 Bcf/d, delivered from ANR's Mermentau River Compressor Station at the Grand Chenier facility, assuming a battery limit design pressure (BLDP) of approximately 550 to 850 pounds per square inch gauge (psig) at the Gas Gate Station on the Terminal Site. The West Lateral Pipeline will have a nominal gas supply capability of 1.5 Bcf/d, delivered from Transco's Compressor Station 44 at the Cameron Meadows facility and/or NGPL's existing pipeline system near Cameron Meadows, assuming a BLDP of approximately 550 to 850 psig at the Gas Gate Station on the Terminal Site. Both of the proposed pipeline laterals have been routed to minimize impacts to sensitive environmental features (primarily wetlands) and maximize collocation with roads and existing pipeline corridors.

1.3.3 Facility Component Listings

Detailed listings of new components for the Project's proposed Terminal facilities and Pipeline System are provided in Sections 1.3.3.1 and 1.3.3.2, respectively.

1.3.3.1 Terminal Facilities

Gas Gate Station

- Liquid separators and filters
- Metering facilities
- Fuel gas system
- Flow control and pressure regulators
- Gas analyzers

- Gas heaters
- Isolation and emergency shutdown (ESD) valves
- Gas booster compressors (as required)

Liquefaction Blocks and Refrigerant Storage

- Ten liquefaction blocks, each block containing the following gas pretreatment and liquefaction equipment:

  Pretreatment

  - Acid gas removal unit with amine sweetening system to remove carbon dioxide (CO_2)
  - Dehydration unit with molecular sieve system to remove water
  - Removal unit for heavy hydrocarbons (pentane and heavier)
  - Boost gas compression (as required)

  Liquefaction

  - Two SMR process units, each with a nominal LNG production rating of 0.5 mtpa and including:

    - Multi-stage MR centrifugal compressor with electric motor driver
    - MR vapor and liquid separator vessels
    - Multi-core, aluminum plate-fin heat exchangers
    - Multiple fin-fan units to provide air cooling for partial condensing of compressor discharge
    - Refrigerant make-up system

- Refrigerant storage vessels at one site location for all 10 liquefaction blocks
- Distribution piping between liquefaction blocks and refrigerant storage site

LNG Storage Facilities

- Two full containment LNG aboveground storage tanks, each with a usable capacity of approximately 200,000 m^3
- Six or eight (depending on manufacturer) LNG storage tank send-out pumps
- Approximately 5,000 feet of 20-inch- to 24-inch-diameter aboveground cryogenic piping between the tank LNG pumps and the two LNG loading docks
- Temporary floating LNG storage vessel to be berthed at one of the two LNG berthing docks during initial plant operation that is expected to be discontinued after the first permanent LNG storage tank becomes operational
- Isolation valves, removable pipe spools, and other measures to facilitate the operation of the temporary floating LNG storage vessel during construction of the permanent LNG storage tanks

Boil-off, Flash, and Gas Relief Systems

- Multiple electric-driven boil-off gas compressors for recovering vapors generated from tank and pipeline heat leak, displaced gas from ship filing, and liquefaction flash gas (the recovered boil-off gases will be used as fuel by the Project's electric power generation facility)
- Elevated flare and associated piping, for venting of purge gas during plant start-up and venting/flaring of gas during emergency operational situations

LNG Berthing Area and Docks

- Two LNG berthing docks in a common recessed berthing area – each dock designed to handle carriers of 120,000 m^3 to 185,000 m^3 cargo capacity and featuring:
    - The loading platform with -
        - LNG loading arms
        - Vapor return arm
        - Service crane
        - Berthing fenders
        - Mooring hooks and tension system
        - Berthing monitoring systems
        - Fire protection equipment with fire water monitor towers
        - LNG cryogenic piping and spill collection troughs
        - Causeway for land access
        - Gangway for ship access
    - Four breasting dolphins
    - Six mooring dolphins
- Berthing area LNG spill collection with stormwater pump

Power Generation and Electric Distribution

- Natural gas-fired CCGT electric generation facility, featuring air-cooled steam condensers and electric substation
- Uninterruptible power supply system
- Emergency and black start diesel-fired electric generator
- Fuel gas system
- Low capacity local utility interconnection for electric power during construction and for select buildings during operation

Safety and Security Systems

- ESD system – to prevent escalation of hazards from accidents or equipment failure
- Spill and leak containment and alarm systems for LNG and other liquids
- Flammable gas detection systems
- Fire protection systems -
    - Heat detection
    - Ultra-violet radiation detection
    - Smoke detection
- Firewater delivery systems with seawater loop and hydrants
- Security systems:
    - Intrusion detection system with -
        - Closed circuit TV system

    - Fence intrusion monitors
    - Low intrusion plant perimeter lighting
- Lightning arrestors

Utility Systems

- Instrument and service air system
- Nitrogen generation system – for supply of inert purge gas
- Hot oil system
- Water supply system for potable use, amine make-up, power island boiler make-up, and construction
- Sanitary sewer system
- Stormwater drainage and containment system
- Communication systems

Buildings

- Terminal ship loading control rooms
- Main process and power plant control room
- Administrative offices
- Workshop
- Warehouse
- Various ancillary equipment buildings and shelters

Civil Facilities and Common Infrastructure

- Elevation and augmentation of soils
- Piles and/or stone columns
- Main plant roads (paved)
- Secondary plant roads (graveled or shelled)
- Temporary concrete batch plant
- Temporary equipment storage and laydown areas

1.3.3.2 Pipeline Systems Facilities

Natural Gas Lateral Pipelines

- 42-inch-diameter, 23.8-mile-long East Lateral Pipeline from ANR interconnect to Terminal Site
    - Maximum nominal delivery volume: approximately 1.5 Bcf/d
    - BLDP at Gas Gate Station on the Terminal Site: approximately 550 to 850 psig
    - Maximum allowable operating pressure (MAOP): 1,440 psig
- 42-inch-diameter, 18.5-mile-long West Lateral Pipeline from Transco and NGPL interconnects to Terminal Site
    - Maximum nominal delivery volume: approximately 1.5 Bcf/d
    - BLDP at Gas Gate Station on the Terminal Site: approximately 550 to 850 psig
    - MAOP: 1,440 psig

Appurtenant Facilities

- Meter station with pressure regulating valve on East Lateral Pipeline, near ANR interconnect
- Meter station with separate metering facilities and pressure regulating valves for receipts from Transco and NGPL, on West Lateral Pipeline near Transco and NGPL interconnects
- Four MLVs located on East Lateral Pipeline, one near ANR interconnect, one at Gas Gate Station on the Terminal Site, and two more centrally located on pipeline lateral
- Four MLVs located on West Lateral Pipeline, one near Transco/NGPL interconnects, one at Gas Gate Station on the Terminal Site, and two more centrally located on pipeline lateral
- Pig launcher at meter station on East Lateral Pipeline
- Pig launcher at meter station on West Lateral Pipeline
- Pig receiver for East Lateral Pipeline at Gas Gate Station on the Terminal Site
- Pig receiver for West Lateral Pipeline at Gas Gate Station on the Terminal Site

1.3.4 Facility Operational Design

Venture Global Calcasieu Pass is proposing to build liquefaction infrastructure at the proposed Terminal Site to provide export capacity of a nominal 10.0 mtpa of LNG. Pipeline-quality natural gas from the existing market hubs and pipeline networks in southern Louisiana and delivered to the Terminal through either one or both of the two new 42-inch-diameter lateral pipelines as described in Section 1.3.2. The current design of the liquefaction and pipeline facilities is based on a BLDP for each pipeline of at least 550 psig at the Gas Gate Station on the Terminal Site.

Upon arrival at the Terminal Site, the gas will enter the gate station, which will include isolation and ESD valves, filter/separators, flow meters, fuel gas supply systems, and a gas analyzer. Here, it will be split into two streams, one for process feed to the Liquefaction Plant and the other for fuel supply[7] to the electric generation facility. The pipeline-quality gas delivered to the site will be composed primarily of methane (between 95 and 97 percent), but will also contain ethane, propane, butane, and other heavy end hydrocarbons (between 2 and 3 percent), in addition to small quantities of nitrogen, oxygen, CO_2, and water. To ensure that the Liquefaction Plant can function properly, the process feed gas will be treated beforehand (see Section 1.3.5) to remove the heavy hydrocarbons, CO_2, and water. This process will take place in pretreatment units, one of which will be located in each of the 10 liquefaction blocks comprising the Liquefaction Plant. The pretreated gas will be liquefied in the two SMR units in each liquefaction block (see Section 1.3.6 for additional details) and then stored in the two LNG storage tanks or a temporary floating LNG storage vessel.

To facilitate early operation of the Terminal, Venture Global Calcasieu Pass will use a temporary floating LNG storage vessel at one of the berthing docks to receive LNG from the liquefaction blocks. The use of the temporary floating LNG storage vessel is expected to be discontinued after the first permanent LNG storage tank becomes operational. LNG will be pumped from either the temporary floating LNG storage vessel or the LNG storage tanks, as applicable, to either of the two LNG berthing docks, where it will be transferred to ocean-going

[7] Natural gas feed for power generation will be supplemented with boil-off gas and other fuel gas streams generated in the Liquefaction Plant.

carriers and exported overseas. The pumping rate will be up to 12,000 m^3/hr. At each berthing dock, transfer to carriers will be achieved through loading arms. A vapor return arm is provided to route displaced gas back to the LNG storage tanks. Each arm will have a powered emergency release coupling.

Electrical power will be generated on the Terminal Site by the CCGT power island sized to provide a reliable supply of up to 600 MW net of electricity. The main power load will be the 20 mixed refrigerant compressor drivers (one driver for each of the two liquefaction units on each of the 10 liquefaction blocks). Other plant loads will include LNG pumps, boil-off and boost compressors, and the multiple fan motors that will be used for air cooling during the liquefaction process. The power island will supply its own auxiliary electric loads, including fans in the air cooled steam condenser, and will have a generator for black start capability.

For both construction and operation, the Terminal facilities will require utility connections, including electric supply (during construction and, with respect to operation, for certain buildings and as a back-stop for emergency generator failure), water supply (during construction and operation), and sanitary waste disposal (during operation only). Venture Global Calcasieu Pass is currently evaluating existing municipal and new groundwater source options for the estimated 600,000 gallons per day of water that will be required at the Terminal, mainly for industrial process uses (e.g., LNG amine system and power island feed water) but also for domestic water supply. It is anticipated that water will be supplied by Cameron Parish through an interconnect on the Terminal Site with an existing 10-inch-diameter municipal pipeline that services the Cameron Jetty Pier Facility to the south. Seawater will be used for firewater if the firewater pumps are activated. Normally, the firewater system will be purged and pressurized with fresh water from the municipal supply.

1.3.5 Pretreatment Process Description

As discussed in Section 1.3.4, pipeline-quality feed gas arriving at the Terminal Site will require the removal of various trace constituents ahead of the liquefaction process, including heavy hydrocarbons (pentane and heavier), CO_2, and water. Natural gas characteristically contains very small quantities of these constituents, the presence of which has no significant effect on operational efficiency when the gas is used as an energy source for domestic, commercial, or industrial applications, but which can negatively affect liquefaction equipment and product purity when the same gas is used as feed stock for LNG production. The pretreatment process is designed to remove trace constituents from the feed gas to enable the liquefaction process to proceed.

The pretreatment process involves three sequential steps: (1) treatment to remove CO_2; (2) treatment to remove water; and (3) treatment to remove heavy hydrocarbons. After arriving at the Terminal Site and leaving the Gas Gate Station, the feed gas will be piped to the pretreatment facilities at each of the 10 liquefaction blocks. Here, the gas will flow first through an Acid Gas Removal Unit, then a Dehydration Unit, and finally a Heavy Hydrocarbon Removal Unit, as described in further detail below.

The trace amounts of CO_2 present in natural gas would freeze in the cryogenic liquefaction process if not removed beforehand. After arriving at the Terminal Site and leaving the gas gate station, the feed gas will enter the Acid Gas Removal Unit, which will be designed to treat feed gas containing levels of CO_2 of up to 2 percent. Generally, all pipeline-quality natural gas supplies meet this specification (i.e., these supplies are not expected to exceed the 2 percent threshold).

In the Acid Gas Removal Unit, acid gases are removed as the feed gas flows upward, counter current to the lean amine solution in a contactor tower. Rich amine solution from the bottom is depressurized and heated for regeneration in a separate stripping tower. The CO_2 that is removed is vented to the atmosphere. The clean, lean amine solution is cooled and then pumped back to the contactor tower. The sweet water saturated gas from the top of the contactor is cooled and sent to the Dehydration Unit. The amine system reduces the CO_2 content to less than 50 parts per million by volume (ppmv).

The Dehydration Unit will be located downstream of the Acid Gas Removal Unit and is designed to remove water from the water-saturated feed gas leaving the amine tower. Water would freeze during natural gas liquefaction if not removed beforehand. The gas dehydration system will consist of two molecular sieve vessels; the process flow is routed through a valve system to one of the vessels while the other vessel's sieve material is regenerated with a small flow of dry hot gas. The heat releases the water from the sieve as vapor. The hot wet regeneration gas is cooled causing the water to be condensed. The water is reused in the amine unit and the regeneration gas is returned to the front end of the amine unit.

At any given time, one molecular sieve bed will be in water adsorption mode, while the other will be in regeneration mode. Each bed has an adsorption capacity of 6 to 12 hours, after which time the clean regenerated vessel is switched to adsorbing and the used vessel starts the regeneration process. The regeneration process first has a heating cycle with hot gas, then a cooling cycle with cool gas. The regeneration gas is heated by central hot oil units serving all ten blocks. The dried treated gas is filtered downstream of the molecular sieve vessel and then sent to the Heavy Hydrocarbon Removal Unit. The water content of the gas is reduced to about 1 ppmv.

Finally, the natural gas is further purified to remove heavy hydrocarbons (pentane and heavier), which would freeze during the liquefaction process if not removed beforehand. The acid- and water-free feed gas enters the Heavy Hydrocarbon Removal Unit where it is chilled to a point where most of these heavy components condense and are then separated in a distillation process. The small quantities of products removed are recovered and used by the Project's electric power generation plant as fuel.

Following pretreatment, the clean gas is routed to booster compressors to raise the pressure to the inlet conditions required by the liquefaction units.

1.3.6 Liquefaction Process Description

As discussed previously, pipeline-quality natural gas will be shipped to the Terminal through two new lateral pipelines. If the transmission pressure is too high, it will be reduced to below its critical pressure of about 650 psig at the Gas Gate Station. Feed gas pressure will be boosted as necessary by electric motor-driven compressors to achieve 700 to 900 psig after pretreatment (see Section 1.3.5) and before the gas enters the liquefaction system. Air-cooled heat exchangers will cool the gas to near ambient temperature to remove the heat of compression. Gas leaving the booster compressors will be split into streams to feed the two liquefaction units at each of the 10 liquefaction blocks.

Each of the 20 liquefaction units (2 for each of the 10 liquefaction blocks) will utilize the SMR process to produce a nominal 0.5 mtpa of LNG (collectively 10.0 mtpa of LNG). This equates to a design production rate of about 0.075 Bcf/d[8] of LNG for each liquefaction unit.

When the pretreated gas enters the liquefaction unit, it is de-superheated, condensed to liquid, then sub-cooled to near -260 degrees Fahrenheit (º F) in aluminum plate-fin heat exchangers, which are enclosed and insulated with perlite powder in steel cold-boxes. Refrigeration for this process is produced by a specially designed single loop MR system. The refrigerant, a mixture of hydrocarbon gases (e.g., methane, ethylene, propane, butane, and pentane) and nitrogen, is pressurized by a multi-stage electric motor-driven compressor then partially condensed in air-cooled heat exchangers. The resultant cooled and pressurized vapors and liquids are separated into various streams and continue to be condensed and sub-cooled in the cold-box plate-fin heat exchangers. The cooling source for these MR streams and the natural gas liquefaction stream is created by flashing cold MR to lower pressures then passing those colder MR streams in counter current to the streams to be cooled in the plate-fin heat exchangers. The lower pressure MR is warmed to near ambient and returned to the suction of the compressors to complete the cycle.

Each liquefaction unit will contain a refrigerant make-up system with gas analyzers and controls that allow plant operations to keep the refrigerant components in proper proportion. The refrigerant make-up system is also designed to recover refrigerant during equipment shutdown. Distribution piping will connect vessels in the common refrigerant storage area to each liquefaction unit. Except for certain safety systems, one distributed control system in the Liquefaction Plant control building will be used for all process and power control.

When the LNG exits the cold-box, it is depressurized and delivered near ambient pressure to the either the temporary floating LNG storage vessel or the LNG storage tanks, as applicable. The LNG can then be pumped from the storage tanks through cryogenic transfer piping to one or other of the LNG berthing docks, to be loaded onto ocean-going carriers for export.

1.4 Land Requirements

As discussed in Sections 1.1 through 1.3, and as illustrated in Figures 1.1-1 and 1.1-2, the proposed Calcasieu Pass Project consists of Terminal facilities and an off-site pipeline system. Land requirements in terms of construction workspace and operational footprint acreages are addressed in Sections 1.4.1 and 1.4.2 for Terminal and pipeline facilities respectively, and are summarized for the Project as a whole in Section 1.4.3.

1.4.1 Terminal Facilities

The Terminal facilities will occupy an approximately 203.6-acre property secured by Venture Global Calcasieu Pass for up to 70 years. The Terminal Site lessor/landowner is identified in the Project landowner information provided in Appendix 1-B. The entire 203.6-acre site will be utilized for temporary workspace or permanent operational facilities; the currently proposed configuration is illustrated in Figure 1.4-1. Of the 203.6 acres, 86.8 acres will support permanent operational facilities and 116.8 acres will be used for temporary workspace. Of the 86.8 acres supporting permanent operational facilities, 8.6 acres will be converted to open water

[8] See Footnote 2.

through excavation and dredging to create the LNG berthing area. Acreages for individual facility and workspace areas are provided in Table 1.4-1.

TABLE 1.4-1

Calcasieu Pass Project
Summary of Land Requirements for Proposed Facilities at the Terminal Site

Permanent Facilities	Operational Footprint (acres)
Liquefaction Process Area	22.4
LNG Storage Tank Area	23.0
LNG Berthing Area and Docks	9.1
Electric Generation Facility Area	19.8
Flare and Flare Wall	5.6
Administration Area	2.1
Other: - Gas Gate Station - Oily Water Treatment Unit - Flare Knock-Out Drum - Utility Dock	4.8
Subtotal:	86.8
Temporary Facilities and Workspace	**Temporary Footprint (acres)**
First Temporary Facilities Area [a/]	4.3 [b]
Second Temporary Facilities Area [c/]	11.3
Temporary construction workspace [d/, e/]	101.2
Subtotal:	116.8
Total:	203.6

Notes

[a] Facilities required for preliminary works (construction of new access road, removal of existing road section, site preparation, construction dock, placement of new backfill sand/structural fill for final grade).

[b] Approximately 3.7 acres of the 8.0-acre First Temporary Facility Area will be subsequently developed to support the flare and flare wall; as such, only 4.3 acres of the area has been used in the calculation of overall temporary workspace.

[c] Facilities required for plant construction (temporary concrete batch plant, construction site offices, warehouse and covered storage sites, open laydown for storage, workshops for pre-assembly areas, and parking, canteen and sanitary facilities for construction personnel).

[d] 30 acres will be used for East Lateral pipeline construction activities (pipe, material, and equipment storage, laydown, and contractor and inspection offices).

[e] Currently includes both temporary and operational plant roads, latter to be added to operational footprint total when acreage determined.

As indicated in Table 1.4-1, the temporary workspace will include two areas in which defined support facilities will be located. These areas are referred to as the “First Temporary Facility Area” and the “Second Temporary Facility Area”, based on the chronological sequence of their development and use. The First Temporary Facility Area will occupy an approximately 8-acre rectangle that will overlap the operational footprint for the flare and flare wall in the northwest sector of the Terminal Site. This area will include mobile offices, sanitary facilities, parking, and spoil storage during preliminary site preparation activities, construction of access roads, and development of the construction dock. The Second Temporary Facility Area will occupy an approximately 11.3-acre rectangle in the central sector of the Terminal Site. This area will include site offices, canteen and sanitary facilities, first-aid facilities, laydown areas, workshops,

pre-assembly areas, a quality control laboratory, a warehouse, and a concrete batch plant. These facilities will be used during subsequent site construction.

Beyond the First Temporary Facility Area and the Second Temporary Facility Area, the remaining 101.2 acres of temporary workspace at the Terminal Site consists of those areas peripheral to the permanent footprints of the operational facilities listed in Table 1.4-1. These areas will be used for general construction activities, including equipment/materials handling, vehicle maneuvering, and an approximately 30.0-acre pipe storage/laydown yard for the East Lateral Pipeline. They will remain as open ground after Terminal development is completed, but will display topographic, drainage, and surface cover modifications during both construction and operation, including those associated with the development of plant roads.

1.4.2 Pipeline Systems

1.4.2.1 Pipelines

Figures 1.3-3 and 1.3-3D[9] (19 Sheets) (East Lateral Pipeline) and 1.3-4 and 1.3-4D (14 Sheets) (West Lateral Pipeline) are preliminary aerial routing sheets showing the layout of the proposed pipeline facilities and construction workspace boundaries. Figures 1.3-5 and 1.3-5D (19 Sheets) and 1.3-6 and 1.3-6D (14 Sheets) provide the same information for each pipeline facility, but on a topographic map background. Typical cross-section drawings of workspace layout and dimensions are provided in Figures 1.4-2 a-c.

Table 1.4-2 presents a summary of the right-of-way acreage impacts associated with construction and operation of the proposed pipelines. For each section, it also indicates the extent of collocation with other existing pipelines.

TABLE 1.4-2

Calcasieu Pass Project
Summary of Right-of-Way Land Requirements
for Proposed Pipeline System

Route Section	Milepost		Collocated Pipelines/Utility Lines	Temporary Workspace (acres)	Operational Footprint [a/] (acres)
	From	To			
East Lateral Pipeline	0.0	3.5	-	212.0	141.4
	3.5	23.8	Interstate and intrastate pipelines		
West Lateral Pipeline	0.0	11.0	Interstate and intrastate pipelines	162.8	108.6
	11.0	18.5	-		
			Total:	374.8	250.0

Notes
[a] Temporary workspace acreage is exclusive of operational footprint acreage.

Based on preliminary route design and a nominal 125-foot-wide construction right-of-way (50-foot-wide permanent right-of-way and 75-foot-wide temporary workspace), the approximately 23.8-mile-long East Lateral Pipeline will require 353.4 acres of construction workspace (of which 212.0 acres will be temporary workspace and 141.4 acres will remain as the permanent operational right-of-way) and 28.1 acres of ATWS, whereas the approximately

[9] The "D" suffix in the figure numbers denotes "detail".

18.5-mile-long West Lateral Pipeline will require 271.4 acres of construction workspace (of which 162.8 acres will be temporary workspace and 108.6 acres will remain as the permanent operational right-of-way) and 12.8 acres of ATWS. Collectively, the approximately 42.3-mile-long Pipeline System will require 624.8 acres of construction workspace (of which 374.8 acres will be temporary workspace and 250.0 acres will remain as the permanent operational right-of-way) and 40.9 acres of ATWS.[10] A definitive determination of operational right-of-way acreage is subject to pending landowner negotiations.

1.4.2.2 Associated Appurtenances

Table 1.4-3 lists the construction and operational land requirements for the aboveground facilities associated with the proposed Pipeline System.

TABLE 1.4-3

Calcasieu Pass Project
Summary of Land Requirements for
Aboveground Facilities Associated with Proposed Pipeline System

Facility	Milepost/Site	Dimensions (feet)	Temporary Workspace (acres)	Operational Footprint (acres)
East Lateral Pipeline				
Meter Station	23.6	467 x 467	N/A	5.0
Pig Launcher/Receiver [a/]	0.0	N/A	N/A	N/A
Mainline Valve [b/]	8.2	100 x 100	1.0	0.2
Mainline Valve [b/]	16.3	100 x 100	1.0	0.2
		Subtotal:	2.0	5.4
West Lateral Pipeline				
Meter Station	0.3	467 x 467	N/A	5.0
Pig Launcher/Receiver [a/]	0.3	N/A	N/A	N/A
Mainline Valve [b/]	8.1	100 x 100	1.0	0.2
Mainline Valve [b/]	16.3	100 x 100	1.0	0.2
		Subtotal:	2.0	5.4
		Total:	4.0	10.8

Notes

a Pig launchers are located at meter station sites and included in meter station land requirements; pig receivers are located at Gas Gate Station on the Terminal Site and included in Gas Gate Station land requirements.

b MLVs located at meter station sites and Gas Gate Station on the Terminal Site are included in the respective location land requirements and are not listed here.

N/A – Not Applicable

1.4.2.3 Pipe Yards/Contractor Yards/Staging Areas

For the East Lateral Pipeline, approximately 30 acres in the northern and southern sectors of the 203.6-acre Terminal Site will be designated for pipe, material, and equipment storage and laydown; the same area will also support contractor and inspection offices. For the West Lateral Pipeline, Venture Global Calcasieu Pass is currently evaluating location options for a similarly-sized site in the general vicinity of the Transco/NGPL interconnects.

[10] ATWS details, including specific locations and dimensions, will be provided in a subsequent version of this resource report.

1.4.2.4 Access Roads

Venture Global Calcasieu Pass is proposing to use existing public and private roads to provide access to the lateral pipeline rights-of-way during construction and operation. Figures 1.3-3 and 1.3-3D (19 Sheets), 1.3-4 and 1.3-4D (14 Sheets), 1.3-5 and 1.3-5D (19 Sheets), and 1.3-6 and 1.3-6D (14 Sheets) show the provisional locations of access roads. A determination of the need for and extent of any road modifications (e.g., localized grade improvements and width increases) to accommodate construction traffic is currently underway.

1.4.3 Summary of Land Use Impact Acreages

Based on the acreage impacts described in Sections 1.4.1 and 1.4.2, and as indicated in Table 1.4-4, the Calcasieu Pass Project will require an overall construction workspace of 914.1 acres, of which 86.8 acres will constitute the operational footprint of the proposed facilities at the Terminal Site.

TABLE 1.4-4

Calcasieu Pass Project
Summary of Project Land Requirements

Facilities	Temporary Workspace (acres)	Permanent Footprint (acres)	Total
Terminal			
Site facilities	116.8	86.8	203.6
Subtotal:	116.8	86.8	203.6
East Lateral Pipeline			
Pipeline Facilities	212.0	141.4	353.4
Aboveground Facilities (Meter Stations and MLVs)	2.0	5.4	7.4
ATWS	28.1	N/A	28.1
Pipe Yards/ Contractor Yards/ Staging Areas [a/]	N/A	N/A	N/A
Subtotal:	242.1	146.8	388.9
West Lateral Pipeline			
Pipeline Facilities	162.8	108.6	271.4
Pipeline Facilities (Meter Stations and MLV)	2.0	5.4	7.4
Pipe Yards/Contractor Yards/ Staging Areas	30.0	0.0	30.0
ATWS	12.8	N/A	12.8
Subtotal:	207.6	114.0	321.6
Total:	566.5	347.6	914.1

Notes
a Included in temporary workspace acreage for Terminal Site facilities

N/A – Not Applicable

1.5 Construction Schedule and Procedures

1.5.1 Construction Schedule

Venture Global Calcasieu Pass anticipates that FERC authorization to site, construct, and operate the proposed facilities will be issued by September 2016. Construction is scheduled to commence in October 2016 and last for 38 months, with a full facility in-service target date of December 2019 (with partial operations commencing before the full in-service date using the temporary floating LNG storage vessel described in Section 1.3.3.1).

During the peak of construction at the Terminal Site, 1,500 on-site workers will be required. However, the number of workers present at different stages of construction will vary significantly. Initial mobilization will involve 100 to 400 workers. As site activity increases, the workforce will average 1,200, increasing during construction and decreasing as the facilities near completion and pre-commissioning, commissioning, and plant start-up. Development of the Pipeline System will involve an additional workforce of between 50 and 100; as at the Terminal Site, this workforce will also vary in size according to the stage of construction.

In total, the Project's initial workforce will number approximately 150 to 450, with a workforce of about 1,600 during peak construction, and an average workforce of approximately 1,275 over the full construction period.

1.5.2 Construction Procedures

1.5.2.1 Environmental Compliance, Training, and Inspection

All facilities will be designed, installed, tested, operated, and maintained in accordance with applicable laws, regulations, and standards that are intended to prevent facility accidents and failures, ensure public safety, and protect the environment. With respect to the liquefaction, storage, and export infrastructure at the Terminal Site, these standards and regulations include the DOT's Federal Safety Standards for Liquefied Natural Gas Facilities (49 CFR Part 193), the NFPA Standard for the Production, Storage and Handling of LNG (Standard 59A), and applicable sections of the U.S. Coast Guard's (USCG's) regulations for Waterfront Facilities Handling LNG (33 CFR Part 127 and Executive Order 10173). For the Pipeline System, safety requirements are embodied in, but are not limited to, the DOT regulations in 49 CFR, Part 192 and the Louisiana Department of Natural Resources (LDNR), Office of Conservation pipeline safety regulations found in Louisiana State Code (LAC), Title 43, Part XIII.

Venture Global Calcasieu Pass will modify the FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) as necessary for the Calcasieu Pass Project. The Project-specific Plan and Procedures will be submitted to the FERC's Director of the Office of Energy Projects for review and approval prior to construction. Implementation of the Plan and Procedures during construction and post-construction monitoring will help ensure that ground disturbance and restoration activities are handled in an environmentally appropriate manner.

During construction, some potential exists for spills of hazardous materials, such as hydraulic fluid and diesel fuel for equipment and vehicles; in addition, stormwater runoff from the construction workspace could carry unconfined debris or materials. To address these concerns, Venture Global Calcasieu Pass will develop and adhere to a *Spill Response Plan* and *Stormwater Pollution Prevention Plan* (SWPPP), in line with applicable regulations and permit

requirements. Plans for unique construction techniques (e.g., horizontal directional drilling [HDD]) will also be developed and will include environmental protection measures.

Venture Global Calcasieu Pass will review Project-specific environmental conditions with prospective contractors during pre-bid meetings and will incorporate such conditions into construction bid documents. Contractors will be obligated to comply with all relevant environmental conditions, whether or not they are explicitly stated in bid specifications. As soon as Venture Global Calcasieu Pass becomes aware of any non-compliance during construction, it will direct the contractor to comply and may take other corrective actions as necessary, including issuance of stop-work orders.

For purposes of quality assurance and to support regulatory compliance, Venture Global Calcasieu Pass will be represented by two chief inspectors (CIs): one for the Terminal Site and one for the Pipeline System. One or more craft inspectors and one or more environmental inspectors (EIs) will assist each CI. In addition, Venture Global Calcasieu Pass will use craft inspectors for inspection services at manufacturing and fabrication facilities handling process modules, equipment, and piping prior to delivery to the Terminal Site. All Venture Global Calcasieu Pass inspectors will have access to the compliance specifications and other relevant material contained in the construction contracts.

The EIs' duties will be fully consistent with those outlined in paragraph III.B (Responsibilities of the Environmental Inspector) of the Plan. The primary role of the EIs is to ensure that the environmental conditions associated with permits and other authorizations are satisfied. The EIs will have authority to stop work or require other corrective action(s) to achieve environmental compliance. In addition to monitoring compliance, the EIs will assist with environmental training for Project personnel and report compliance status on a daily, weekly, and biweekly basis. The environmental training program will be designed to ensure that all individuals receive training tailored to their particular role before beginning on-site work, adequate training records are maintained, and refresher training is provided as needed.

1.5.2.2 Terminal Site

1.5.2.2.1 Site Preparation and Temporary Construction Facilities

The proposed Terminal Site will require significant area-wide improvements, including clearing, grubbing, grading, soil stabilization, and filling to increase ground elevation, some of which must be performed ahead of foundation development and plant construction. The full scope of these activities will be partly dependent on the results of Venture Global Calcasieu Pass's geotechnical study, which will evaluate geotechnical soil properties (e.g., bearing capacity, deformability, liquefaction potential, moisture content, compaction, and slope stability), not only for the existing soil at the Site, but also for any imported soil required for general and structural backfilling.

According to Federal Emergency Management Agency (FEMA) floodplain maps, the site is located in zones VE-EL17-19 and AE-EL 16, indicating a significant flood hazard potential. USGS maps and a topographic survey recently undertaken by Venture Global Calcasieu Pass indicate low elevations across the site, consistent with its coastal plain location. Based on the topographic survey, the site elevation is generally between 2 and 5 feet above mean sea level (msl) with an average elevation of 3.5 feet above msl.

To reduce the risk of flooding, the elevation of the facility equipment, piping and structures subject to storm water damage will be elevated to between 16.0 feet and 20.0 feet above msl on concrete and steel structures supported on piles. This represents an elevation of approximately 4.5 feet relative to the base flood elevation of between 12.5 feet and 15.5 feet.

Elsewhere, site ground elevations will be raised up to 6 feet or greater above msl by grading and potential import of fill materials, although this will be confirmed following completion of a meteorological/flood study that Venture Global Calcasieu Pass will commission. The proposed source(s) of additional fill material has/have not been confirmed, although potential sources include dredged and excavated material from construction of the LNG berthing area and/or turning basin. Venture Global Calcasieu Pass is also considering the use of commercially available aggregate materials, including gravel, oyster shell, and crushed stone. The volume of material required will be identified at a later stage in project design.

It is anticipated that the existing soil at the Terminal Site will require improvement and stabilization to provide a load-bearing surface during construction. Commonly used stabilizers include Portland cement and hydrated lime. Soil consolidation may also be achieved through the use of other methods, such as the installation of wick drains and stone columns. Soil improvement requirements will be established after Venture Global Calcasieu Pass's geotechnical and seismic investigations are completed. Aggregate materials (e.g., gravel, oyster shells, and/or crushed stone) and geotextile layers will be used to level and finish temporary workspace and operational areas, as necessary. Aggregate materials will be delivered to the Terminal Site by truck, or by barge via the new utility dock.

At the outset of construction, Venture Global Calcasieu Pass will install the First Temporary Facility Area in the northwest sector of the Terminal Site. This will be required for developing "preliminary works", which include construction of the new access roads, any required removal of existing access roads that cross the site, preliminary site preparation, and development of the new utility dock. The First Temporary Facility Area will house mobile offices, sanitary facilities, a parking area, and a laydown area for spoil storage associated with initial earthworks.

As site preparation proceeds, a Secondary Temporary Facility Area will be developed in the central sector of the Terminal Site. This area will include offices, a canteen, a warehouse, sanitary facilities, concrete batch plant, and parking areas, with sufficient capacity and resources to support the peak workforce during construction. Once these secondary facilities are established, the first facilities will be reused for a pipeline contactor yard.

Preparation of construction workspace across the whole Terminal Site will involve cutting and filling to rough grade and soil stabilization/improvement as referenced above, followed by erection of temporary fencing to isolate construction activities from peripheral areas. Temporary site roads and parking areas will also be stabilized and compacted for heavy load traffic. The temporary site roads will generally follow the anticipated layout of the permanent plant roads, and will be paved with asphalt, shell or gravel depending on anticipated traffic loads. In addition to plant roads, any electrical, communications, and water systems needed during construction will be installed at this time.

During site preparation, topographic grading plans will be designed to ensure efficient and environmentally protective stormwater drainage. The site will be sloped to direct discharges towards perimeter outfalls through a system of ditches and, if necessary, holding basins and filtration devices during construction, allowing sufficient retention time to preclude

high sediment loads from reaching receiving waters. Stormwater controls (including placement of gravel or other suitable material to provide a stable, well-drained surface) will be installed. Throughout construction, Venture Global Calcasieu Pass will follow the erosion and sedimentation control procedures described in its Plan, Procedures, and SWPPP.

1.5.2.2.2 Plant Facilities

At the current preliminary stage of project design, detailed site-specific construction procedures for each plant facility or structure remain under development. However, the general construction procedures described below for the Liquefaction Plant are generally applicable to other major site facilities requiring pile foundations and involving the transportation of large equipment units by truck and/or barge. For ancillary site facilities, such as utility storage areas, administrative buildings, and warehouses, construction would also commence with foundation preparation, which may require the installation of piles.

The Liquefaction Plant will consist of 10 liquefaction blocks positioned in parallel and occupying an approximately 450-foot-long by 200-foot-wide rectangular footprint in the central-western sector of the Terminal Site. Following site grading, soil stabilization, and plant road installation (see Section 1.5.2.2.1), foundation construction will commence with installation of piles to provide a firm base for the structures supporting the liquefaction blocks. Pile specifications will be based on guidance in the FERC's most recent draft seismic guidelines (FERC, 2007) and Section 7.2.2 of NFPA Standard 59A (2006). After the piles have been positioned, using pre-drilled holes and/or pile-driving, caps will be installed and the concrete pad poured. The piles will be delivered to the site by barge and/or truck.

The liquefaction blocks will be interconnected with the Gas Gate Station and LNG storage tanks by buried and aboveground piping interconnects, the latter on steel-framed support racks. The individual frame members for the support racks will be prefabricated off site, whereas the racks will be assembled on site.

Pipe spool fabrication will be undertaken mainly off site. Spools fabricated off site will be delivered by truck and barge. Most straight-run pipe sections will be fabricated in the field alongside the racks, whereas expansion loops (bellows) will be pre-fabricated in a workshop, moved to position, and then installed with the straight-run piping. Pipe sections will be painted, coated, or insulated, as necessary, after welds have been tested according to applicable codes.

Certain larger equipment units, such as pretreatment systems, liquefaction cold-boxes and refrigerant compressors, will be assembled as modules in several off-site prefabrication yards, most of which will likely be located in Texas, Oklahoma, and Louisiana. This off-site modular approach allows equipment assembly in a more controlled environment than that encountered under the on-site "stick-built" approach, facilitating final hook-up and testing. Larger modular units will be barged to the new utility dock on the Calcasieu Ship Channel, off-loaded, and transported to their respective foundations. Other equipment will be shipped to the Terminal by truck. All equipment will undergo quality assurance/quality control inspection and testing at its place of origin and upon installation at the Terminal Site.

Once foundations have been set, work on the liquefaction blocks, piping interconnects, and associated utility systems can occur within the same general timeframe, but will be coordinated such that various inter-dependent systems (e.g., electrical and instrumentation) can be installed and tested according to an appropriately sequenced schedule. After the equipment and piping has been set in place, cable systems will be installed. Ultimately, road paving, final

site grading, seeding, and clean-up will be completed. Temporary construction facilities will be disassembled and removed on a progressive basis when they are no longer needed.

Pipe sections will be either hydrostatically or pneumatically tested (see Resource Report 2 for additional details) depending on the type and intended function of the pipe. Depending on the volume required, water for hydrostatic testing of plant piping will be obtained from the local municipal supply or a groundwater source.

When the construction program is near 70 percent complete, its focus will shift from construction by area to completion by systems. At this point, civil and structural work will be substantially complete and equipment and piping set in place. The main schedule drivers will be mechanical completion and pre-commissioning requirements. A turnover coordinator will prepare system completion and turnover packages, which will include:

- Marked-up drawings to show the limit of each system and the location of blind flanges;
- Line list by system with pressure testing documentation;
- List of equipment including motors with data sheets and inspection reports;
- Marked-up single line diagrams with inspection/test reports for electrical equipment;
- Cable reports;
- Instrument index with data sheets and calibration sheets;
- Loop diagrams;
- Vendor documentation/drawings;
- Turnover exceptions lists;
- Detailed punch-list of items requiring correction; and
- Operation and maintenance manuals.

1.5.2.2.3 Dredging Requirements

Excavation and dredging in the Calcasieu Ship Channel will be required for construction of the LNG berthing area and associated turning basin. The LNG berthing area will be recessed into the existing shoreline of the Terminal Site, as illustrated in Figures 1.3-1, 1.3-2, and 1.3-12. Initial estimates indicate that approximately 1,000,000 cubic yards (yds^3) of material will be excavated and dredged from this location to reach the required water depth of 40 feet below Mean Low Gulf (MLG). To reach the same water depth for the turning basin and interconnecting access channel, approximately 1,500,000 yds^3 of material will be dredged over an area of approximately 96.4 acres. Therefore, 2,500,000 yds^3 of material will be excavated or dredged to create the marine facilities for the Project overall.

Venture Global Calcasieu Pass is currently evaluating various potential disposal options for the excavated and dredged material, including on-site use to increase ground elevation; off-shore disposal in an Ocean Dredged Material Disposal Site (ODMDS), upland disposal in one or more dredged material placement areas, and beneficial use. At least some of the material will be used for on-site fill.

Venture Global Calcasieu Pass will perform the necessary sediment analyses to comply with applicable regulations for disposal. These include pre-dredge analyses associated with disposal in an ODMDS, in accordance with the requirements of the permitting and review authorities (U.S. Army Corps of Engineers [USACE], New Orleans District and U.S. Environmental Protection Agency [EPA], Region VI) under Section 103 of the Marine Protection, Research and Sanctuaries Act (MPRSA) and other laws and regulations (see Table 1.9.1)

1.5.2.2.4 Drainage of the Finished Site

The Terminal Site will be graded such that storm water flow from process areas will enter a peripheral system of shallowly sloped swales that will collect and carry the runoff to perimeter outfall locations. Before arriving at the outfalls, the stormwater will pass through surficial containment sump devices, which are designed to remove oil and sediments from the stormwater. Areas that do not have a potential for contamination will be carried directly to outfalls. Portions of the site where the topography remains unchanged will retain their natural drainage. A detailed stormwater conveyance plan will be designed at a later stage in project development.

The design and operation of all stormwater discharge and treatment facilities will be in accordance with applicable regulations and permits, including Louisiana Pollutant Discharge Elimination System regulations under the Clean Water Act and FEMA regulations embodied in the local requirements of Cameron Parish.

1.5.2.3 Pipeline System

1.5.2.3.1 Pipeline Specifications

The 42-inch-diameter pipelines (East Lateral Pipeline and West Lateral Pipeline) constituting the Pipeline System will be made of carbon steel pipe joints, manufactured in accordance with American Petroleum Institute (API) and/or American Society of Mechanical Engineers (ASME) specifications. The pipelines will be designed to comply with DOT safety regulations contained in 49 CFR Part 192 and LDNR safety regulations contained in LAC Title 43, Part XIII. The pipelines and associated appurtenances will be coated below grade with fusion bonded epoxy (FBE), field-applied sleeves, or an equivalent protective coating and painted above grade. In some areas, the buried pipeline may be coated with a second layer of FBE or concrete (the latter coating providing negative buoyancy in aquatic areas, where the pipeline could otherwise have a tendency to rise).

1.5.2.3.2 General Construction Procedures

In general, Venture Global Calcasieu Pass will use conventional construction techniques for buried pipelines and will follow the requirements set forth in the FERC's Plan and Procedures, with any project-specific modifications included and authorized by the FERC during the application review and approval process. Construction specifications will also require adherence to Venture Global Calcasieu Pass's SWPPP for construction stormwater discharges, Spill Response Plan, and procedures for specialized construction techniques (e.g., HDD).

As described in this section, conventional construction typically involves the following sequential activities:

- Right-of-way surveying;
- Clearing and grading;
- Trenching;
- Stringing, welding, and installation;
- Backfilling and grade restoration;
- Hydrostatic testing and tie-ins; and
- Cleanup and restoration.

Right-of-Way Surveying

The pipeline alignment will be identified and surveyed prior to construction. This task will include staking the proposed pipeline centerline, foreign line crossings, workspace limits, and the boundaries of wetlands and other environmentally sensitive areas.

Clearing and Grading

Prior to clearing of the construction workspace, appropriate temporary erosion controls will be installed. Typically, silt fences, check dams, fiber rolls, and sediment traps are positioned along the limits of disturbance. The EIs will monitor field conditions daily to ensure that appropriate erosion and sedimentation control measures are maintained until the construction workspace is fully stabilized.

Prior to trench excavation in upland areas, vegetation will be cut and removed from the construction workspace. Generally, tree stumps will be cut flush with the ground surface and left in place, except where their removal is necessary to create a safe and level work surface. Cleared vegetation will be burned (if permitted under state or local regulations), chipped, or hauled off site to a commercial disposal facility. Chipped material will be spread across the work area during revegetation. No cleared material will be placed in wetlands unless approved by the appropriate agencies.

After clearing, upland sections of the construction right-of-way will be graded as necessary with a bulldozer or similar equipment to create a safe and level work surface, although given the relatively uniform topography of both pipeline routes, extensive grading is not anticipated. Grading will include the removal of tree stumps (where necessary), ridges, and topographic irregularities. Generally, machinery will operate on one side of the trench and excavated materials will be stockpiled on the other. Grading will be scheduled to minimize the time between initial clearing operations and pipe installation.

Clearing and grading operations will incorporate procedures to: 1) minimize vegetation removal from slopes, wetlands, and channel banks; 2) prevent undue soil profile disturbance; 3) restore pre-construction ground contours; and 4) prevent topsoil erosion. In emergent wetlands, vegetation within the construction workspace will be flattened during the course of construction but will not be purposely cleared, other than through trench excavation.

Trenching

Trenching involves excavating a pipeline ditch and will be accomplished with backhoes and/or similar excavation machinery. Spoil will be deposited within the construction workspace, adjacent to the trench and on the opposite side from the excavation equipment. The trench will be excavated to a minimum depth that allows at least 4 feet of cover over the pipe. The bottom width of the trench will be cut to accommodate the specific diameter of pipe to be installed. The top width of the trench will vary depending on local soil conditions at the time of construction. The need for special bedding or blasting is not anticipated. Typical cross-section drawings of the construction right-of-way are provided in Figures 1.4-2 a-c.

Crossing of foreign pipelines will generally require the new pipeline to be buried at a greater depth than the existing pipelines, which will be identified and flagged during the pre-construction phase. Trenching in the vicinity of an existing pipeline will proceed only after appropriate field testing has been completed to determine the pipeline's exact location.

In active cropland, residential areas, or at the landowner's discretion, topsoil is routinely segregated from subsoil during trenching and remains segregated during storage to avoid loss though mixing with stockpiled subsoil.

In accordance with Venture Global Calcasieu Pass's Project-specific Plan and Procedures, measures will be used to minimize erosion and sedimentation during trenching. These will include measures to minimize the free flow of surface water into the trench and through the trench from upland areas into waterbodies. Erosion control measures will also be implemented as necessary for bank stabilization at waterbody crossing locations.

If trench dewatering is necessary, discharge to the ground generally is permitted where there is adequate vegetation along the right-of-way to function effectively as a filter medium. In areas adjacent to waterways or where there is minimal vegetation, bale filters, filtration bags, or other appropriate measures will be used to limit sediment dispersion. Trench dewatering will be performed in accordance with applicable permit specifications.

Stringing, Welding, and Installation

Stringing involves moving pipe joints into position along the prepared construction right-of-way. The joints will be moved by truck and loaders from the source areas and placed along the construction right-of-way, parallel to the trench line, for subsequent line-up and welding. Stringing activities will be coordinated with the trenching and pipe laying crews. Certain pipe joints may be bent to conform to changes in the direction of the pipeline alignment and natural ground contours. Individual pipe joints will be bent to the desired angle in the field and/or pre-fabricated fittings may be used.

Welding will be performed in accordance with 49 CFR, Part 192, Subpart E "Welding of Steel in Pipelines" and API Standard 1104. Completed welds will be visually and radiographically or ultrasonically inspected to determine integrity. If a weld does not meet defined requirements, it will be marked for repair or replacement. The weld joint areas will be coated and the entire pipe coating will be inspected by jeeping for defects (holidays) and repaired as needed. Following integrity inspections, the pipe will be lowered into the trench using sideboom tractors or similar equipment and bedded with padding material (screened native material) prior to backfilling.

Backfilling and Grade Restoration

After the pipe is lowered into the trench and bedded with padding material, the trench will be backfilled with previously excavated material, using bulldozers, loaders, and compactors. Any excess excavated material, or components unsuitable for backfill, will be disposed of in accordance with applicable regulations.

In areas where topsoil has been segregated, the backfilling operation will involve the replacement of subsoil in the bottom of the trench, followed by the replacement of topsoil over the subsoil layer. In upland areas, a soil mound will be left over the trench to allow for soil settlement, unless the landowner requires otherwise. During backfilling, particular care will be taken to minimize erosion, restore the natural ground contours, and restore surface drainage patterns as close to pre-construction conditions as practicable. Upon completion of trench backfilling, topsoil will be replaced as necessary and the pre-construction soil profile restored across the construction workspace.

Clean-up and Restoration

After the completion of backfilling and topsoil replacement across the construction workspace, all disturbed areas will be final graded and any remaining trash, debris, or unsuitable backfill will be disposed of in a proper manner. Subsequently, the workspace will be protected by the implementation of appropriate erosion control measures, including site-specific contouring and reseeding with an approved seed mix.

1.5.2.3.3 Road Crossing Construction Procedures

Table 1.5-1 lists the road crossings identified on each of the two proposed pipeline routes. Most public road crossings will likely be completed by conventional bore. In all cases, applicable state and local regulations will be followed and traffic interruption will be minimized to the extent practicable. The minimum pipeline clearance for both unsurfaced and paved public roads will be 5 feet under the roadbed and 4 feet under any side borrow/drainage ditches. Pipeline warning signs/markers will be installed at each crossing location.

TABLE 1.5-1

Calcasieu Pass Project
Road Crossing Locations and Methods for Pipeline Construction

Road Name	Milepost	Type (Public/Private)	Surface	Proposed Crossing Method[11]
East Lateral Pipeline				
Mermentau River Road / Pr 217	0.5	Public Road	Blacktop	
Unnamed Private Road	0.6	Private Drive	Gravel	
Unnamed Private Road	0.8	Private Drive	Gravel	
Unnamed Private Road	3.5	Private Drive	Gravel	
Unnamed Parish Road	4.15	Public Road	Gravel	
Unnamed Parish Road	4.25	Public Road	Gravel	
Unnamed Parish Road	4.4	Public Road	Gravel	
Louisiana Highway 1143	8.15	Public Road	Blacktop	
W Creole Rd Highway 27	8.6	Public Road	Blacktop	
Raymond Richard Road	9.8	Public Road	Blacktop	
Cameron Parish 332	12.8	Public Road	Gravel	
Malcolm Road	14.5	Public Road	Gravel	
Oil Field Road	14.7	Public Road	Blacktop	
Mudd Road	15.0	Public Road	Gravel	
Murphy Lane	15.5	Public Road	Gravel	
Unnamed Road	15.7	Private Drive	Gravel	
Unnamed Parish Road	16.5	Public Road	Gravel	
Earl Road	17.7	Public Road	Gravel	
Unnamed Private Road	19.9	Private Drive	Gravel	
Louisiana Highway 27	21.2	Public Road	Blacktop	
Unnamed Private Road	23.0	Private Drive	Gravel	
West Lateral Pipeline				
Cameron Meadows Oil Field Road	0.9	Private Drive	Gravel	
Unnamed Private Road	2.5	Private Drive	Gravel	
Unnamed Private Road	2.5	Private Drive	Gravel	
Unnamed Private Road	3.0	Private Drive	Gravel	
Unnamed Private Road	3.5	Private Drive	Gravel	
Unnamed Private Road	4.15	Private Drive	Gravel	
Unnamed Private Road	4.5	Private Drive	Gravel	
Louisiana Highway 27	10.8	Public Road	Blacktop	
Unnamed Private Road	12.4	Private Drive	Gravel	
Unnamed Private Road	13.2	Private Drive	Gravel	
Unnamed Private Road	14.4	Private Drive	Gravel	
Unnamed Private Road	15.0	Private Drive	Gravel	
Louisiana Highway 27	16.3	Public Road	Blacktop	
Unnamed Private Road	17.3	Private Drive	Gravel	
Unnamed Private Road	17.8	Private Drive	Gravel	
Unnamed Private Road	17.9	Private Drive	Gravel	
Davis Road	18.4	Public Road	Blacktop	

[11] Proposed crossing method to be provided in a subsequent version of this resource report.

1.5.2.3.4 Waterbody and Wetland Crossing Construction Procedures

Open Cut Method

Construction methods at waterbody crossings will vary according to the physical and environmental characteristics of the crossing. Minor waterways (water channel width less than or equal to 10 feet) and intermediate waterways (water channel width greater than 10 feet but less than or equal to 100 feet) will generally be crossed by open trench excavation with equipment operating from the banks as the width of the waterbody allows. During these operations, existing water flow will be maintained. Venture Global Calcasieu Pass anticipates that all open cut crossings will be "wet" crossings without the need for trench isolation techniques such as dam and pump or fluming. Trench spoil will be placed bank-side above the high water mark for use as backfill. The pipeline will be installed below scour depth. Any federal and state backfill cover requirements will be met. The pipe will be weight coated, as needed, to provide negative buoyancy. Once the trench is backfilled, the banks will be stabilized through seeding, sodding, riprap deposition, or other techniques. Excavated material not required for backfill will be removed to an upland disposal site.

Conventional Boring and Horizontal Directional Drilling

Other waterbody crossing methods that will be utilized for specific circumstances include conventional boring and HDD. Where a waterbody lies adjacent to a road, a bore is often used to avoid surface impacts to both the road and the waterbody. HDD crossings are generally over longer distances than bores and also avoid surface impacts, including in-stream and riparian disturbance.

A bore is implemented by excavating a bore pit to the proposed pipeline depth on both sides of the feature being crossed, boring a hole under the feature from one side to the other, and installing a prefabricated segment of pipe through the borehole.

For HDD crossings, the first stage involves laying electric grid wire guides by hand along the pipeline right-of-way between the proposed drill entry and exit locations. Only minimum ground and vegetation disturbance will result from this procedure. Following guide wire installation, a slant drill unit will be set up and a small diameter pilot hole will be drilled under the waterbody along a prescribed profile. Electromagnetic sensors will be used to guide the drill bit.

Once the pilot hole is completed, it will be enlarged using reaming tools to accept the pipeline. The reaming tools are attached to the drill string at the exit point of the pilot hole and are rotated and drawn back to the drilling rig, thus enlarging the pilot hole with each pass. During this process, drilling mud consisting of bentonite clay and water will be continuously pumped into the hole to remove cuttings and to maintain the integrity of the hole. Once the hole has been sufficiently enlarged, a prefabricated segment of pipe will be attached behind the reaming tool on the exit side of the crossing and pulled back through the drill hole toward the drill rig, completing the crossing.

The only major waterbody (water channel width greater than 100 feet) on the pipeline routes is the Calcasieu Ship Channel and this will be crossed by HDD. A site-specific plan for this crossing will be developed at a later stage in project design.

Venture Global Calcasieu Pass's *HDD Monitoring and Contingency Plan* (to be provided) will outline the procedures that will be followed to minimize the potential for an inadvertent release of drilling mud and to undertake effective cleanup should a release occur.

Wetland Construction

Depending on the degree of saturation or inundation, the "push" method will be utilized for pipeline construction through certain wetlands. Equipment on the construction right-of-way will be minimized and when used, will be of the type having the least environmental impact in any given conditions. This equipment includes mats, marsh buggies, air boats, amphibious equipment, tracked equipment, and barges. The contractor will use discretion in choosing the equipment that will create the least ground pressure for the specific application. Construction will be in full accordance with the Project-specific *Procedures* and applicable permit requirements.

During construction preparation, suitable "push sites" will be identified that are near existing roads, have all weather access, and are preferably on higher ground. In addition, mats may be utilized to provide for a more firm foundation for equipment storage and for pipe staging and pipe pushing. To locate an appropriate push site, it may be necessary to lash barges together anchored with pilings, but this will be avoided if possible.

Once the push sites are established, the right-of-way work can begin. When the right-of-way conditions are determined, the appropriate clearing equipment (amphibious or tracked) will be selected to prepare the right-of-way for the pipe. Where there is standing water, only enough clearing and trenching will be done to accommodate the pipe. At the push site various pipeline operations will take place, including welding, non-destructive testing, joint coating and coating repairs, and installation of floatation apparatus.

The joints of pipe, which are typically concrete-coated 40-foot lengths, will be transported as needed from the pipe staging area to the push sites. At the push sites, after the pipe joints are welded together, the weld joints coated, and the floats attached, the pipe string will be floated out into the cleared right-of-way as part of the pipeline push operation. If necessary, a cable will be attached to the front of the pipe string and pulled from the other end of the right-of-way section to assist the push operation. There should be no vehicular traffic on the right-of-way during this operation, except to remove the floats once the pipe is in place. This would be done only with equipment providing minimal impact. Trench backfilling will begin once the pipe is in place. No soils or fill will be imported from outside the workspace.

1.5.2.4.5 Hydrostatic Testing and Tie-ins

After construction and prior to placing the pipelines and associated appurtenances in service, the completed pipelines will be hydrostatically tested to ensure that the systems are leak proof and to provide the necessary safety margin for high pressure operation. Testing will be conducted in accordance with Venture Global Calcasieu Pass's Project-specific Plan, Procedures, and testing specifications, together with state hydrostatic test discharge permit conditions and DOT requirements set forth at 49 CFR Part 192.

The in-place pipeline will be filled with water and kept at the requisite operating pressure throughout the test. After the completion of a satisfactory test, the water will be discharged over land into containment structures. Valves and appropriate energy-dissipation devices, containment structures, or other measures will be used to regulate discharge rates and to

minimize erosion and sedimentation. Venture Global Calcasieu Pass does not anticipate that any chemical agents will be added to the test water. Additional details will be provided in Resource Report 2 (Water Use and Quality) regarding source, uptake and discharge rates, discharge location, holding time, and estimated volume of water needed for the hydrostatic testing of each pipeline.

1.5.2.4.6 Aboveground Appurtenant Facilities

At the sites of aboveground facilities associated with the two lateral pipelines, construction will involve clearing and grading, placement of a concrete pad foundation, installation of equipment, erection of equipment housing, installation of permanent perimeter fencing, and surface clean-up during which open areas within the fenceline will be covered with gravel, oyster shell, limestone aggregate, or similar material. Where a pig launcher is installed, a concrete containment area will be constructed below the launcher's barrel.

1.5.3 Site Access and Traffic

Venture Global Calcasieu Pass will prepare a *Traffic Management Plan* to address worker and materials/equipment transportation for the Terminal Site and Pipeline System construction areas. The plan will comply with state and local regulatory requirements and will contain specific routing information and delivery timelines. Prior to implementation, it will be reviewed and commented on by Louisiana Department of Transportation and Development (LDOTD), area law enforcement and emergency response authorities, and parish and local municipal administrators. The overall intent of the plan will be to minimize disruption to local traffic flow and communities and ensure that construction-related road use proceeds in a safe and efficient manner.

1.5.3.1 Terminal Site

Road access to the Terminal Site from Interstate 10 and Lake Charles will be via State Highway (SH) 27 east of the Calcasieu Ship Channel and an alternate route following SH 27 on the west side of the Calcasieu Ship Channel (involving a ferry crossing of the channel). From the Town of Cameron, which is approximately 1.7 miles north of the Terminal Site, current access is via Davis Road, a parish road that runs south, through the west side of the Terminal Site, to the Cameron Jetty Pier Facility located at the mouth of the Calcasieu Ship Channel (see Figures 1.3-1 and 1.3-2).

Plans include a proposed new road built to provide site access from the east; the same road is planned to provide access to the Cameron Jetty Pier Facility and other properties to the south and east of the site. Access to the Terminal Site during construction will be directly off existing public roads, through an entrance in the northwest corner of the site, or through the new road, if it is built within a compatible timeframe.

Venture Global Calcasieu Pass anticipates that, during construction, most major material supplies and equipment will be delivered by barge, via the new utility dock in the northwest corner of the Terminal Site. Other deliveries of material and equipment during construction will be by road. Venture Global Calcasieu Pass is currently estimating the number of truck visits required and will provide additional information in a subsequent version of this resource report.

Venture Global Calcasieu Pass is currently assessing logistical options for workforce transportation during construction. One option under review involves workers leaving their

vehicles at an off-site parking area and being bussed to and from the Terminal Site. This would limit the amount of construction-related traffic on Davis Road, the current means of road access to the Site and the Cameron Jetty Pier Facility to the south. Venture Global Calcasieu Pass will provide additional information in a subsequent version of this resource report.

1.5.3.2 Pipeline System

Provisionally, access to the Pipeline System construction areas will be via the existing local road network, as described in Section 1.4.2.4. Venture Global Calcasieu Pass will identify additional requirements for access roads, storage/laydown yards, and contractor parking areas during ongoing project design.

1.6 Operations and Maintenance

1.6.1 Operations

All facilities will be operated and maintained in accordance with government safety standards and regulations that are intended to ensure adequate protection for the public and to prevent facility accidents and failures. With respect to the liquefaction, storage, and export facilities, these standards and regulations include the DOT Federal Safety Standards for Liquefied Natural Gas Facilities (49 CFR Parts 192 and 193), the NFPA Standard for the Production, Storage and Handling of LNG (Standard 59A), and applicable sections of the USCG's regulations for Waterfront Facilities Handling LNG (33 CFR Part 127 and Executive Order 10173). For the Pipeline System they include, but are not limited to, the standards and regulations set forth by the DOT in Title 49 CFR, Part 192 and the LDNR's pipeline safety regulations found in LAC Title 23, Part XIII.

Operating procedures will be prepared for the Calcasieu Pass Project after final design is completed. Comprehensive training will be provided to ensure that all facility personnel are familiar with and adhere to safe procedures. These procedures will address safe startup, shutdown, cool down, purging, etc., as well as routine operation and monitoring. Particular attention will be taken to coordinate with and involve appropriate local officials to ensure effective integration with local communication and emergency response systems.

Venture Global Calcasieu Pass estimates that the Calcasieu Pass Project will require the addition of approximately 100 full-time personnel. However, this is a preliminary estimate only and may change as operational plans are further developed during Front End Engineering Design.

1.6.2 Maintenance

Maintenance of the Terminal and pipeline facilities will be conducted in accordance with procedures and programs developed by Venture Global Calcasieu Pass. Full-time staff will conduct routine maintenance and minor overhauls, whereas major overhauls and non-routine maintenance will be handled by qualified contractors. Both scheduled and unscheduled maintenance will be entered into a computerized maintenance management system (CMMS) and disseminated to the appropriate personnel for follow-up. All operations and maintenance personnel will be trained in the use of the CMMS. Scheduled preventive and predictive routine maintenance will include equipment rotation and inspection of safety equipment, environmental equipment, and instrumentation.

1.7 Future Expansion and Abandonment Plans

Beyond the currently proposed Project, Venture Global Calcasieu Pass has not identified any future additions at the Terminal Site. Moreover, there are no current plans relating to abandonment or removal of any of the proposed facilities other than the temporary floating storage vessel described in Sections 1.3.3 and 1.3.4.

1.8 Non-Jurisdictional Facilities

Under certain circumstances, non-jurisdictional facilities may be subject to the Commission's review. In determining whether to assert jurisdiction, the Commission considers the following four factors:

i. Whether or not the regulated activity comprises "merely a link" in a corridor type project (e.g., a transportation or utility transmission project);
ii. Whether there are aspects of the non-jurisdictional facility in the immediate vicinity of the regulated activity that uniquely determine the location and configuration of the related activity;
iii. The extent to which the entire project will be within the Commission's jurisdiction; and
iv. The extent of cumulative Federal control and responsibility.

Venture Global Calcasieu Pass has identified all of the proposed facilities at the Terminal Site and on the Pipeline System as jurisdictional and subject to FERC authorization. Non-jurisdictional facilities, which will be authorized and regulated by federal, state, and/or local agencies other than the FERC, may include new utility service connections to local electric, water, and sewer systems if any such connection involves the construction of off-site facilities. In addition, any proposed new road providing alternate access to the Cameron Jetty Pier Facility and public lands along the Gulf of Mexico shoreline could be considered a non-jurisdictional facility.

1.9 Permits and Approvals

Venture Global Calcasieu Pass will obtain all necessary permits, clearances, and licenses for construction and operation of the Calcasieu Pass Project. Table 1.9-1 provides a list of required authorizations and identifies the applicable federal, state, or local agency or other authority in each case. Copies of agency correspondence and approvals received by Venture Global Calcasieu Pass prior to submittal of the formal application will be appended to the appropriate resource reports in the ER. Additional correspondence and approvals will be filed with the Commission upon receipt.

TABLE 1.9-1

Calcasieu Pass Project
Permits, Approvals, and Clearances

Agency	Permit/Approval - Regulatory Scope	Project / Facility Applicability	Authorization/ Interaction Required	Authorization/ Communication Timeline
FEDERAL				
Federal Energy Regulatory Commission (FERC)	Authorization to Construct and Operate Facilities under section 3(a) and section 7(c) of the Natural Gas Act	Terminal & Pipelines	Authorization	Anticipated filing of Formal Application: August 2015 Anticipated Authorization: October 2016
U.S. Department of Energy, Office of Fossil Energy (DOE/FE)	Authorization to export LNG by vessel to Free Trade Agreement (FTA) and non-FTA nations	Terminal	Authorization	Receipt of Authorization to Export 5.0 MTPA of LNG to FTA nations: 09-27-13 Receipt of Authorization to Export an Additional 5.0 mtpa of LNG to FTA nations: 10-10-14 Receipt of Authorizations to Export 10.0 mtpa of LNG to non-FTA nations: *Pending*
U.S. Department of Homeland Security – U.S. Coast Guard (USCG)	Waterfront Facilities Handling Liquefied Natural Gas and Liquefied Hazardous Gas (33 CFR 127), which includes Letter of Intent submission (33 CFR 127.007), Waterway Suitability Assessment consultation, and Letter of Recommendation from the USCG (18 CFR 157.21)	Terminal	Letter of Recommendation	Anticipated receipt of Letter of Recommendation: August 2015
U.S. Environmental Protection Agency (EPA) - Region VI, Dallas, TX	Consultation role to LDEQ on air emissions permitting Floodplain management and protection of wetlands (44 CFR 9) Review of wetlands impacts for U.S. Army Corps of Engineers Clean Water Act (CWA) Section 404 permit	Terminal & Pipelines	Consultation	
U.S. Army Corps of Engineers (USACE) – New Orleans District	CWA Section 404 Permit for impacts on waters of the U.S., including wetlands (33 USC § 1344) Rivers and Harbors Act Section 10 Permit for construction and operation of structures in and across federally navigable waterways (33 USC § 403)	Terminal & Pipelines	Permit Approval/ Coordination for Dredge Spoil Disposal	Anticipated submittal of Section 404/Section 10 Permit Application: May 2015 Anticipated receipt of Section 404/10 Permit: August 2016 Anticipated request for Section 408 Authorization:

TABLE 1.9-1

Calcasieu Pass Project
Permits, Approvals, and Clearances

Agency	Permit/Approval - Regulatory Scope	Project / Facility Applicability	Authorization/ Interaction Required	Authorization/ Communication Timeline
	Section 408 authorization for work in federal project waters and federally navigable waters (33 USC Section 408)			April 2015 Anticipated receipt of Section 408 Authorization: October 2015
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS)	Marine Mammal Act Consultation (16 USC § 1382) (ESA) Section 7 Consultation (16 USC § 1856 et seq) Magnuson-Stevens Fishery Conservation and Management Act Consultation Essential Fish Habitat (EFH) Consultation (50 CFR Part 600) Fish and Wildlife Coordination Act Consultation (16 USC Chapter 5a, Subchapter I)	Terminal & Pipelines	Consultation	Anticipated receipt of Listed Species Clearance (assuming no significant impacts): February 2015
U.S. Fish and Wildlife Service (FWS), Southeast Region 4	Endangered Species Act (ESA) Section 7 Consultation (16 USC Chapter 35) Migratory Bird Treaty Act Consultation (16 USC Chapter 7, Subchapter II) Fish and Wildlife Coordination Act Consultation (16 USC Chapter 5a, Subchapter I)	Terminal & Pipelines	Consultation	Anticipated receipt of Listed Species Clearance (assuming no significant impacts): February 2015
STATE				
Louisiana Department of Environmental Quality (LDEQ) – Water Permits Division	Hydrostatic Test Water Discharge General Permit (La. R.S. 30:2001 et seq) Section 401 Water Quality Certification (33 USC Chapter 26) Industrial Wastewater Discharge Permit, Section 402 (33 USC § 1342)	Terminal & Pipelines	Permits	Anticipated submittal of Hydrostatic Test Water Discharge Permit (for LNG Tanks) Notice of Intent (NOI): *To be Determined* Anticipated submittal of Hydrostatic Test Water Discharge Permit (for Pipelines) NOI: *To be Determined* Anticipated receipt of Section 401 Water Quality Certification: No later than August 2016 *(Concurrent with USACE Application submittal/review)*

TABLE 1.9-1

Calcasieu Pass Project
Permits, Approvals, and Clearances

Agency	Permit/Approval - Regulatory Scope	Project / Facility Applicability	Authorization/ Interaction Required	Authorization/ Communication Timeline
				Anticipated submittal of Industrial Wastewater Discharge Permit Application (if required): *To be Determined* Anticipated receipt of Industrial Wastewater Discharge Permit (if required): *To be Determined*
Louisiana Department of Environmental Quality (LDEQ) – Office of Environmental Quality	Title V and Prevention of Deterioration of Significant (PSD) Air Permits (40 CFR part 70)	Terminal	Permits	Anticipated submittal of Title V and PSD Permit Application: July 2015 Anticipated receipt of Title V and PSD Permit: July 2016
Louisiana Department of Natural Resources (LDNR) – Office of Coastal Management	Coastal Use Permit (CUP), a Joint Permit Application with USACE (R.S. 49:214.25)	Terminal & Pipelines	Permit	Anticipated submittal of CUP Application: May 2015 Anticipated receipt of CUP: August 2016
Louisiana Department of Wildlife and Fisheries	Threatened and Endangered Species Consultation (16 USC 460 *et seq*)	Terminal & Pipelines	Clearance	Anticipated receipt of Listed Species Clearance (assuming no significant impacts): February 2015
Louisiana Department of Culture, Recreation and Tourism, Division of Archaeology	National Historic Preservation Act (NHPA) Section 106 Consultation (36 CFR Part 800) and Review	Terminal & Pipelines	Clearance	Anticipated receipt of Cultural Resources Clearance (if no significant finds): February 2015
Louisiana Public Service Commission	Certificate of Convenience and Necessity	Electric Lines	Authorization	Permitting Schedule: *To be Determined*
Louisiana Department of Transportation and Development	Road and Utility Crossing Permit (if required)	Terminal & Pipelines	Authorization	Permitting Schedule: *To be Determined*
LOCAL				
Cameron Parish Police Jury	Development Permit	Terminal & Pipelines	Permit	Permitting Schedule: *To be Determined*
NATIVE AMERICAN TRIBES				
Alabama-Coushatta Nation of Texas	Consultation	Terminal & Pipelines	Project Notification and Comments	Anticipated comments: February 2015
Chitimacha Tribe of Louisiana	Consultation	Terminal & Pipelines	Project Notification and Comments	Anticipated comments: February 2015
Jena Band of Choctaw Indians	Consultation	Terminal & Pipelines	Project Notification and Comments	Anticipated comments: February 2015

TABLE 1.9-1

Calcasieu Pass Project
Permits, Approvals, and Clearances

Agency	Permit/Approval - Regulatory Scope	Project / Facility Applicability	Authorization/ Interaction Required	Authorization/ Communication Timeline
Coushatta Tribe of Louisiana	Consultation	Terminal & Pipelines	Project Notification and Comments	Anticipated comments: February 2015
Tunica-Biloxi Indians of Louisiana	Consultation	Terminal & Pipelines	Project Notification and Comments	Anticipated comments: February 2015

1.10 Agency, Public, and Other Stakeholder Communications

Venture Global Calcasieu Pass has initiated a comprehensive public outreach and consultation plan with stakeholders to discuss the proposed Calcasieu Pass Project and to identify issues of concern. As part of this plan, Venture Global Calcasieu Pass has undertaken and will continue written and verbal communication (including meetings) with the following groups: agencies (federal, state, and local); landowners; elected officials (federal, state, parish, and local); tribes; community leaders; agricultural, business, and civic groups; and non-governmental organizations. An introductory letter announcing the Calcasieu Pass Project was sent to stakeholders (including potential affected landowners) on October 24, 2014. Consultation to date has enabled Venture Global Calcasieu Pass to engage in an ongoing dialogue with stakeholders, providing project information and a means for stakeholder input into project plans.

In addition, Venture Global Calcasieu Pass is offering several other communication opportunities for stakeholders to learn more about the proposed Project and provide input. These include a public open house to be held on December 11, 2014 in Cameron, Louisiana, informational materials (e.g., slide presentations and fact sheets), a project website (www.ventureglobalLNG.com), and one-on-one communication pathways (e.g., e-mail [info@ventureglobalLNG.com] and a toll-free telephone number [1-800-514-0833]).

In accordance with 18 CFR Section 157.6(d)(2), Venture Global Calcasieu Pass will send formal written notification to all landowners within 0.5 mile of the Terminal Site and to affected landowners on the Pipeline System within three business days following the date the Commission issues a Notice of Application (see Appendix 1-B for current landowner lists). Additionally, copies of Venture Global Calcasieu Pass Application will be placed in local public libraries.

1.11 References

Federal Energy Regulatory Commission (FERC). 2007. Draft Seismic Design Guidelines and Data Submittal Requirements for LNG Facilities. Issued January 23, 2007. Available online at www.ferc.gov/industries/gas/indus-act/lng/lng-seis-guide.pdf; accessed November 2014.