MVP Southgate Project

Docket No. CP19-XX-000

Resource Report 11 – Reliability and Safety

November 2018

MVP Southgate Project
Resource Report 11 – Reliability and Safety

Resource Report 11 – Filing Requirements	
Information	**Location in Resource Report**
Minimum Filing Requirements	
1. Describe how the Project facilities would be designed, constructed, operated, and maintained to minimize potential hazard to the public from the failure of project components as well as a result of accidents or natural catastrophes. (§ 380.12(m))	Section 11.2 through 11.4
2. Describe measures proposed to protect the public from failure of the proposed facilities (including coordination with local agencies). (§ 380.12(m)(1))	Section 11.4
3. Discuss hazards, the environmental impact, and service interruptions which could reasonably ensue from failure of the proposed facilities. (§ 380.12(m)(2))	Section 11.2
4. Discuss design and operational measures to avoid or reduce risk. (§ 380.12(m)(3))	Sections 11.3 and 11.4.
5. Discuss contingency plans for maintaining service or reducing downtime. (§ 380.12(m)(4))	Section 11.4
6. Describe measures used to exclude the public from hazardous areas. Discuss measures used to minimize problems arising from malfunctions and accidents (with estimates of probability of occurrence) and identify standard procedures for protecting services and public safety during maintenance and breakdowns. (§ 380.12(m)(5))	Section 11.2
Information Recommended or Often Missing	
7. Identify by milepost and in table form, all U.S. Department of Transportation Class Locations, High Consequence Areas, or areas of concern (as defined in Title 49 Code of Federal Regulations Part 192.903) for the proposed route, alternate routes, and compressor stations and explain the basis for high consequence area identification.	Section 11.2.3
8. Discuss the outcome of the applicant's consultations with local fire departments and emergency response agencies relative to whether additional equipment, training, and support are needed in the project area.	Section 11.4.8

RESOURCE REPORT 11
RELIABILITY AND SAFETY

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LIST OF ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
FERC or Commission	Federal Energy Regulatory Commission
EQM	EQM Midstream Partners, LP
ERP	Emergency Response Plan
ESD	emergency shutdown
HCAs	High Consequence Areas
IMP	Integrity Management Plan
MAOP	maximum allowable operating pressure
MLVs	mainline valves
Mountain Valley	Mountain Valley Pipeline, LLC
NextEra	NextEra Energy Inc.
O&M	Operations & Maintenance
PHMSA	Pipeline and Hazardous Materials Safety Administration
Project or Southgate Project	MVP Southgate Project
U.S.	United States
USDOT	U.S. Department of Transportation

RESOURCE REPORT 11
RELIABILITY AND SAFETY

11.1 INTRODUCTION

Mountain Valley Pipeline, LLC ("Mountain Valley") is seeking a Certificate of Public Convenience and Necessity from the Federal Energy Regulatory Commission ("FERC" or "Commission") pursuant to Section 7(c) of the Natural Gas Act to construct and operate the MVP Southgate Project ("Southgate Project" or "Project"). The Southgate Project facilities will be located in Pittsylvania County, Virginia and Rockingham and Alamance counties, North Carolina. See Resource Report 1 (General Project Description) for additional Project information.

11.1.1 Environmental Resource Report Organization

Resource Report 11 includes descriptions of natural gas pipeline industry safety, corporate risk management, and measures to protect the public during construction and operation of the Project facilities and is prepared and organized according to the Federal Energy Regulatory Commission *Guidance Manual for Environmental Report Preparation* (February 2017). This report is organized into three major sections and a separate section listing the sources used to prepare this report. Section 11.2 includes an overview of natural gas pipeline industry safety. Section 11.3 includes a safety overview. Section 11.4 includes a description of measures to protect the public.

11.2 NATURAL GAS PIPELINE INDUSTRY SAFETY OVERVIEW

Natural gas pipelines present a number of potential safety issues, which are minimized via regulatory standards that have been adopted to prevent accidents, avoid hazards, improve safety, and minimize impacts. This section provides a summary of these hazards, safety standards, high consequence areas, pipeline accident data, and potential impacts on public safety.

11.2.1 Hazards

According to the U.S. Department of Transportation's ("USDOT") Pipeline and Hazardous Materials Safety Administration ("PHMSA"), there are approximately 300,000 miles of natural gas transmission pipelines, and these pipelines are the safest and most cost-efficient way to transport natural gas and hazardous materials (PHMSA, 2018a). Natural gas transmission pipelines are an integral part of the country's infrastructure network necessary to transport a large portion of the country's growing energy needs, and it is imperative that they be safe and reliable. PHMSA has established and enforces industry regulations for transmission pipelines and related facilities that are intended to provide for public safety and reliability and minimize the risk of system failure.

The natural gas transmission industry has an excellent track record of public safety and reliability. Nevertheless, the transportation of natural gas by pipeline involves some incremental risk to the public in the event of an accidental release of natural gas. The predominant hazard is a fire or explosion following a major pipeline failure.

The Southgate Project is designed to transport natural gas. Methane, the primary component of natural gas, is colorless, odorless, tasteless, and will be transported in a gaseous state. It is not toxic, but is classified as an asphyxiant. If breathed in high concentration, oxygen deficiency can result in serious injury or death. Methane is flammable when concentrations are between 5 and 15 percent with an auto ignition temperature

of over 1,100 degrees Fahrenheit. When unconfined, methane is not explosive; however, if confined in a closed space with an ignition source present an explosion may occur. The Project has established a specific tariff to which shippers must adhere to. The tariff limits transportation of only natural gas with components consisting primarily of methane gas, which will be continuously monitored as discussed below. Exceeding the limits set by the tariff may result in the shipper's gas being shut-in with discontinued service.

11.2.2 Safety Standards

The USDOT "Minimum Federal Safety Standards" (49 Code of Federal Regulations ("CFR") Part 192) provide the standards pursuant to which the Southgate Project will be designed, constructed, operated, and maintained. The intent of the USDOT regulations for pipeline facilities is to provide the public with adequate protection from pipeline failures. The USDOT "Minimum Federal Safety Standards" set forth in 49 CFR Part 192 include specifications for material selection and qualification, minimum design and construction requirements, and protection from internal, external, and atmospheric corrosion. The Southgate Project's Operating Partner, EQM Midstream Partners, LP ("EQM"), was created by EQT Corporation in 2012 to own, operate, acquire, and develop midstream assets. These federal safety standards, together with EQM's pipeline integrity management programs and recent advances in pipeline manufacture, construction, and inspection techniques, minimize the potential for pipeline failure. These measures include improved public awareness initiatives, such as the "811" program "Call Before You Dig" and other "One Call" programs that promote public awareness and are intended to reduce third-party damage to underground utilities, including buried high pressure natural gas pipelines.

Class locations are defined in 49 CFR §192.5 and are based on population densities. The definition for "class location unit" is the area that extends 220 yards (660 feet) on either side of the centerline of any continuous one-mile length of pipeline (sliding mile). There are four types of class locations:

- Class 1 – Class location unit with 10 or fewer buildings intended for human occupancy.
- Class 2 – Class location unit with more than 10 but fewer than 46 buildings intended for human occupancy.
- Class 3 – Class location unit with 46 or more buildings intended for human occupancy, or where the pipeline lies within 100 yards of any building, or small, well-defined outside area (such as a playground or recreation area) occupied by 20 or more people on at least five days a week for 10 weeks in any 12-month period (the days and weeks need not be consecutive).
- Class 4 – Class location unit where buildings with four or more stories aboveground are prevalent.

More stringent pipeline design, wall thickness, testing, and operation characteristics are required in more populated areas. Specifically, for a Class 1 location, pipelines must be installed at a minimum depth of 30 inches in normal soil and 18 inches in rock, whereas Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroads, require a minimum cover of 36 inches in normal soil and 24 inches of coverage in consolidated rock (49 CFR §192.327). Design pressures, wall thickness, maximum allowable operating pressures ("MAOP"), hydrostatic test pressures, weld testing and inspection, as well as frequency of leak surveys and patrols of the pipeline, are required to conform to higher standards in areas of greater population density. The Project incorporates these requirements. Table 11.2-1 provides the class locations crossed by the Project.

Table 11.2-1

MVP Southgate Project Pipeline Class Locations

Pipeline / County	Class Location	Beginning Approx. Milepost	Ending Approx. Milepost
H-605 Pipeline			
Pittsylvania	1	0.0	0.4
H-650 Pipeline			
Pittsylvania	1	0.0	0.5
Pittsylvania	2	0.5	0.7
Pittsylvania	1	0.7	0.8
Pittsylvania	2	0.8	1.0
Pittsylvania	1	1.0	1.1
Pittsylvania	2	1.1	1.3
Pittsylvania	1	1.3	2.9
Pittsylvania	2	2.9	3.4
Pittsylvania	1	3.4	3.5
Pittsylvania	2	3.5	4.2
Pittsylvania	3	4.2	4.3
Pittsylvania	2	4.3	4.4
Pittsylvania	1	4.4	6.4
Pittsylvania	2	6.4	6.6
Pittsylvania	1	6.6	7.0
Pittsylvania	2	7.0	7.6
Pittsylvania	1	7.6	7.9
Pittsylvania	2	7.9	9.2
Pittsylvania	1	9.2	10.1
Pittsylvania	2	10.1	10.8
Pittsylvania	1	10.8	13.1
Pittsylvania	2	13.1	13.5
Pittsylvania	1	13.5	15.3
Pittsylvania	2	15.3	15.4
Pittsylvania	1	15.4	15.8
Pittsylvania	2	15.8	16.1
Pittsylvania	1	16.12	16.14
Pittsylvania	2	16.14	16.9
Pittsylvania	1	16.9	16.91
Pittsylvania	2	16.91	17.1
Pittsylvania	1	17.1	18.2
Pittsylvania	2	18.2	18.4
Pittsylvania	1	18.4	18.7
Pittsylvania	2	18.7	18.89
Pittsylvania	1	18.89	18.93

Table 11.2-1

MVP Southgate Project Pipeline Class Locations

Pipeline / County	Class Location	Beginning Approx. Milepost	Ending Approx. Milepost
Pittsylvania	2	18.93	19.4
Pittsylvania	3	19.4	19.5
Pittsylvania	2	19.5	19.9
Pittsylvania	3	19.9	19.97
Pittsylvania	2	19.97	20.41
Pittsylvania, VA, Rockingham, NC	1	20.41	30.4
Rockingham	2	30.4	31.1
Rockingham	1	31.1	31.4
Rockingham	2	31.4	32.1
Rockingham	1	32.1	35.9
Rockingham	2	35.9	36.1
Rockingham	1	36.1	36.2
Rockingham	2	36.2	36.8
Rockingham	1	36.8	37.19
Rockingham	2	37.19	37.22
Rockingham	1	37.22	37.34
Rockingham	2	37.34	37.53
Rockingham	1	37.53	39.49
Rockingham	2	39.49	39.83
Rockingham	3	39.83	39.86
Rockingham	2	39.86	39.94
Rockingham	1	39.94	40.2
Rockingham	2	40.2	40.75
Rockingham	1	40.75	42.1
Rockingham	2	42.1	42.5
Rockingham	1	42.5	43
Rockingham	2	43	43.3
Rockingham	1	43.3	44.2
Rockingham	2	44.2	45.1
Rockingham	1	45.1	48.3
Rockingham	2	48.3	48.7
Rockingham	1	48.7	49
Rockingham	2	49	49.4
Rockingham	1	49.4	52.5
Rockingham	2	52.5	53.6
Alamance	1	53.6	54.9
Alamance	2	54.9	55.6
Alamance	1	55.6	55.7

Table 11.2-1

MVP Southgate Project Pipeline Class Locations

Pipeline / County	Class Location	Beginning Approx. Milepost	Ending Approx. Milepost
Alamance	2	55.7	55.8
Alamance	1	55.8	56.4
Alamance	2	56.4	56.6
Alamance	1	56.6	56.7
Alamance	2	56.7	56.8
Alamance	3	56.6	56.9
Alamance	2	56.9	57.59
Alamance	1	57.59	57.62
Alamance	2	57.62	58.11
Alamance	1	58.11	58.14
Alamance	2	58.1	58.46
Alamance	1	58.46	58.49
Alamance	2	58.49	58.6
Alamance	1	58.6	59.0
Alamance	2	59.0	59.6
Alamance	1	59.6	59.9
Alamance	2	59.9	60.1
Alamance	1	60.1	60.3
Alamance	2	60.3	60.4
Alamance	1	60.4	62.6
Alamance	2	62.6	62.98
Alamance	1	62.98	63.02
Alamance	2	63.02	63.2
Alamance	1	63.2	63.3
Alamance	2	63.3	63.6
Alamance	1	63.6	64.3
Alamance	2	64.3	64.46
Alamance	1	64.46	64.53
Alamance	2	64.53	64.9
Alamance	1	64.9	65.0
Alamance	2	65.0	65.7
Alamance	1	65.7	66.0
Alamance	2	66.0	66.5
Alamance	1	66.5	67.4
Alamance	2	67.4	67.6
Alamance	1	67.6	67.9
Alamance	2	67.9	68.0
Alamance	1	68.0	68.1

Table 11.2-1

MVP Southgate Project Pipeline Class Locations

Pipeline / County	Class Location	Beginning Approx. Milepost	Ending Approx. Milepost
Alamance	2	68.1	68.32
Alamance	1	68.32	68.34
Alamance	3	68.34	68.7
Alamance	1	68.7	69.0
Alamance	3	69.0	70.0
Alamance	1	70.0	71.9
Alamance	2	71.9	72.0
Alamance	1	72.0	72.6
Alamance	2	72.6	72.8
Alamance	3	72.8	72.9
Alamance	2	72.9	73.06
Alamance	1	73.06	73.09
Alamance	2	73.09	73.11

If population densities near the pipeline increase after construction resulting in a change in class location, 49 CFR §192.609 and §192.611 require confirmation or revision to the MAOP to match the new class. If revisions are needed, they may be achieved by reducing the operating pressure, by pressure testing the segment of pipe using the applicable class location multiplier, or by replacing the segment of pipe for the class change, if required, with one that complies with the USDOT minimum PHMSA code for that class location.

During operation, monitoring of the pipeline will include either foot patrol during annual inspection of facilities, crossings, and accessible areas of the right-of-way or the use of high definition aerial photography obtained every year to determine areas that have changed population density. If the population increases enough to require a possible class location change, the Southgate Project will complete an additional class study and change the class of pipeline within 24 months to maintain compliance with 49 CFR 192 requirements.

Additionally, 49 CFR Part 192 provides the minimum standards for operation and maintenance of pipeline facilities, which includes a requirement for a written plan to govern these activities. The pipeline operator must also establish an Emergency Response Plan ("ERP") prior to operation of the pipeline with written procedures to minimize the hazards associated with a natural gas pipeline emergency. The ERP will include:

- Establishing and maintaining communications with applicable fire, police, and public officials;
- Prompt and effective response to a notice of each type of emergency;
- Providing for personnel, equipment, tools, and materials available at the scene of an emergency;
- Protection of people first and then property, and making safe any actual or potential hazards to life or property;

- Emergency shutdown and pressure reduction in any section of the system necessary to minimize hazards to life or property;
- Notifying appropriate fire, police, and other public officials of gas pipeline emergencies and coordinating with them during an emergency; and
- Safely restoring any service outage.

In the unlikely event of an incident during operations, EQM will work with emergency response agencies to maintain access to and from residences and businesses during potential emergency situations. EQM will implement its ERP to bring the incident under control, and work with local responders to maintain access to residences and businesses via existing roads. If a road is damaged by an incident, or access to residences and business is otherwise restricted, EQM will coordinate with the applicable municipalities and responders to provide alternative access to the affected residences and businesses. Additionally, in an emergency situation, EQM could use air lift services to reach affected residences and businesses.

EQM currently has an existing ERP covering the Mountain Valley Pipeline system. Prior to the Project being placed in-service, EQM will modify the current ERP and implement a Project-specific ERP in accordance with the requirements of 49 CFR Part 192 and in coordination with local emergency management. The Southgate Project has initiated discussions with emergency response units in the Project area and will continue those discussions through development of the Project.

11.2.3 High Consequence Areas

A rule for Pipeline Integrity Management in High Consequence Areas ("HCAs") for Gas Transmission was promulgated by the PHMSA and was incorporated into 49 CFR Part 192, Subpart O. This rule requires that an Integrity Management Plan ("IMP") be developed for each facility to provide procedures for monitoring and maintaining pipeline integrity in areas where the pipeline traverses lands or facilities that are considered HCAs as defined in 49 CFR §192.903.

Integrity management is the systematic application of management policies, procedures, resources, and inspection practices to the tasks of analyzing, assessing, and controlling pipeline system integrity to protect employees, the general public, and the environment. Integrity management includes threat identification measures such as:

- Incorporation of formal risk assessment;
- Decision justification record keeping;
- Prescribed baseline and recurring inspection and testing requirements; and
- Management of Program changes.

HCAs may be defined in one of two ways. In the first method, an HCA includes:

- current Class 3 and 4 locations in accordance with 49 CFR §192.5;
- any area in Class 1 or 2 locations where the potential impact radius is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle; or
- any area in Class 1 or 2 locations where the potential impact circle includes an identified site.

An identified site is an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period; a building that is occupied by 20 or more persons on at least 5 days a week

for any 10 weeks in any 12-month period; or a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate. The potential impact radius as defined by 49 CFR §192.903 is determined by the following formula:

$$r = 0.69 \times \sqrt{(p \times d^2)},$$

where:

r = the radius of a circular area surrounding the point of failure (feet)
p = the MAOP in the pipeline segment (pounds per square inch gauge [psig])
d = the nominal diameter of the pipeline (inches)

The 24- and 16-inch-diameter pipeline with a MAOP of 1,440 psig would have a potential impact radius of 628 feet and 419 feet, respectively.

In the second method, an HCA includes any area within a potential impact circle that contains:

- 20 or more buildings intended for human occupancy; or
- an identified site as described above.

Using the second method, the Southgate Project has identified HCAs along the pipeline route (see Table 11.2-2). An additional HCA analysis will be done on each section of pipeline following pipeline construction (as-built analysis), prior to that section of the Project being placed in-service.

Table 11.2-2

Location of High Consequence Areas

Pipeline / County	Beginning Milepost	Ending Milepost	Length (mile)
Virginia			
H-605 Pipeline			
Pittsylvania	NA	NA	NA
H-650 Pipeline			
Pittsylvania	2.93	3.29	0.35
Pittsylvania	4.08	4.47	0.39
Pittsylvania	19.23	19.68	0.45
Pittsylvania	19.71	20.131	0.42
North Carolina			
Rockingham	39.66	40.12	0.36
Rockingham	40.28	40.64	0.36
Rockingham	44.47	44.78	0.31
Alamance	56.65	57.104	0.45
Alamance	69.17	70.04	0.87
Alamance	71.32	71.65	0.33
Alamance	72.51	73.09	0.59
NA = Not Applicable.			

11.2.4 Pipeline Markers

PHMSA also requires pipeline operators to place pipeline markers at frequent intervals along the pipeline rights-of-way, particularly at prominent points along the route, such as where a pipeline intersects a street, highway, railway, waterway, or other significant feature. These markers will display pipeline identifying information and an emergency telephone number that will be manned 24 hours a day, 7 days a week. Pipeline right-of-way markers can help prevent encroachment and third-party excavation-related damage to pipelines. Since the pipeline right-of-way is wider than the pipeline itself and a pipeline can be located anywhere within the right-of-way, state laws require excavators to call their state 811 "One Call" center well in advance of digging to locate underground utilities, and ensure it is safe for the contractor to dig in that location.

11.2.5 Aboveground Facilities

Compressor facilities will be equipped with an emergency shutdown ("ESD") system to protect the public and operating personnel during an emergency such as a fire or failure of station piping. The ESD system will be designed to shut down the compressor units, close the station isolation valves, and vent gas from the station piping to reduce the possibility of gas ignition and fire. The ESD system can be activated automatically by sensors that continuously monitor for the presence of fire and explosive mixtures in the compressor building. They can also be activated manually by station personnel in emergency events or remotely by Gas Control.

11.2.6 Pipeline Accident Data

Since 1984, operators are required to report incidents that involve facility property damage of more than $50,000 (in 1984 dollars), injury requiring in-patient hospitalization, release of gas, or those incidents considered significant by the operator to the USDOT through PHMSA's National Response Center. PHMSA maintains a comprehensive website to make accident data available to the public including data on significant incidents. As shown in Table 11.2-3 below, during the 20-year period on record (1998-2017) there were 1,068 natural gas transmission pipeline incidents meeting these criteria reported on the more than 300,000 total miles of natural gas transmission pipelines nationwide (PHMSA, 2018b). Incident rates during this time period have been relatively flat.

Table 11.2-3

Natural Gas Transmission Dominant Incident Causes, 1998-2017

Incident	Number of Incidents	Percentage
Material/weld/equipment failure	365	34.2
Corrosion	185	17.3
Excavation damage	189	17.7
All other causes	127	11.9
Natural force damage	86	8.1
Other outside force damage	66	6.2
Incorrect operation	50	4.7
Total	**1,068**	**100**

Source: PHMSA, 2018b

The single category accounting for the most frequent cause of all reportable gas transmission incidents is material/weld/equipment failure (approximately 34 percent). Material failure related incidents typically involve pipeline material failure, weld and/or equipment failure or malfunctioning equipment. Corrosion is the cause of approximately 17 percent of the total number of gas transmission incidents since 1998. Pipelines included in Table 11.2-3 vary widely in terms of age, pipe diameter, and level of corrosion control. Each of these variables influences the incident frequency that may be expected for a specific segment of pipeline. The frequency of significant incidents is strongly dependent on pipeline age. For example, older pipelines have a higher frequency of corrosion incidents because corrosion is a time-dependent process, and design standards at the time did not mandate certain corrosion controls, such as advanced coatings and cathodic protection. Since July of 1971, new pipelines are required to use both external coating and cathodic protection systems, which significantly reduce the rate of failure when compared to an unprotected or partially protected pipe. Systems for corrosion control are incorporated into the overall design of the Project. Once the pipeline has been constructed, extensive ongoing corrosion control measures will be implemented to monitor and maintain the pipeline integrity, as defined in 49 CFR Part 192 regulations and EQM's corrosion control operating procedures.

Damage caused by excavation accounts for approximately 18 percent of total reported incidents since 1998. These incidents are typically associated with third-parties and a result of heavy construction equipment, such as bulldozers and excavators, encroaching into pipeline rights-of-way. To minimize these types of incidents, pipeline operators have been required to participate in "one-call" public utility programs to help identify where these buried pipelines are located prior to excavation work.

Other techniques developed in recent years that have contributed to the overall improved safety performance of pipe and pipelines include (American Petroleum Institute, 2001): universal use of non-destructive testing during construction, such as radiography and coating inspection; greater depth of cover; improved backfilling techniques; more effective coatings; and more identifying markers along pipeline rights-of-way.

11.2.7 Impact on Public Safety

Table 11.2-4 provides the number of fatalities annually that were a result of pipeline accidents on natural gas transmission lines from 1998 to 2017 as reported by PHMSA. There was an average of three fatalities annually during this 20 year time period. There were zero fatalities from natural gas transmission pipeline incidents in 2004, 2005, 2008, 2009, 2011, 2012, and 2013.

Information in Table 11.2-4 is summarized from data collected and maintained by PHMSA, which is largely based on required incident reporting. Data collected from the required incident reporting focuses on human impacts and property damage, and does not include analysis of environmental impacts, thus an analysis of environmental impacts from the incidents summarized in Table 11.2-4 is not available.

Table 11.2-4

Annual Natural Gas Transmission System Accident Fatalities

Year	Fatalities
1998	1
1999	2
2000	15
2001	2

Table 11.2-4 Annual Natural Gas Transmission System Accident Fatalities	
Year	**Fatalities**
2002	1
2003	1
2004	0
2005	0
2006	3
2007	2
2008	0
2009	0
2010	10
2011	0
2012	0
2013	0
2014	1
2015	6
2016	3
2017	3
Total	**50**
Annual Average (1998-2017)	3
Source: PHMSA, 2018b. Significant Incidents Summary Statistics, 1998-2017.	

For comparative purposes, Table 11.2-5 provides accident statistics for the number of deaths by type of accident for the single year of 2016. The average of five fatalities annually over a 20-year period is significantly lower than any other fatal accidents for which there is recordable data; therefore, the likelihood that the Project will threaten human life is extremely remote.

Table 11.2-5 National Accidental Death Statistics for 2016	
Types of Accidents	**Number of Fatalities**
All Accidents	161,374
Motor Vehicles	40,327
Public non-work	38,288
Work	1,839
Home	200
Work	4,399
Non-motor-vehicle	2,560
Motor-vehicle	1,839
Home	85,100
Nonmotor-vehicle	84,900
Motor-vehicle	200

Table 11.2-5 National Accidental Death Statistics for 2016	
Types of Accidents	**Number of Fatalities**
Public	33,600
Gas Transmission Pipelines	3
Sources: National Safety Council, Injury Facts 2016 Edition, 2017; PHMSA, 2018b. Significant Incidents Summary Statistics, 1998-2017.	

11.3 SAFETY OVERVIEW

The Southgate Project and EQM are committed to safely operating and maintaining the Project and will instill the existing corporate risk management philosophies of its parent companies to efficiently identify and control or eliminate hazards throughout the life of the pipeline. The Project facilities will fully adhere to USDOT Minimum Federal Safety Standards in 49 CFR Part 192. These safety regulations will be reinforced by the comprehensive and strictly enforced practices of the Project. The effectiveness of the federal and corporate requirements in ensuring reliability and safety is illustrated by the following operating experience profile of the Project companies. The empirical information presented illustrates that the potential for public hazard from accidents associated with the operation of the Project facilities is low.

11.3.1 System Overview

EQM provides natural gas gathering, transmission, and storage services in the Appalachian Basin. EQM owns and operates approximately 2,130 miles of high- and low-pressure gathering lines, 950 miles of FERC-regulated transmission lines, and 18 natural gas storage reservoirs. EQM utilizes design engineering expertise comprised of more than 70 engineers with over 2,000 man-years of experience. The Engineering Department has specific subject matter expertise in areas such as; compression, measurement, and pipeline designs, regulatory, compliance, equipment automation and controls, telecommunications, system planning and hydraulic modeling, civil, mechanical, electrical, operations , and reliability. NextEra Energy Inc. ("NextEra"), a partner in the Southgate Project, owns and operates almost 1,000 miles of oil and gas pipelines across 14 different pipeline systems. NextEra and its affiliates have been providing pipeline services since 1978 for oil pipelines and since 1985 for natural gas pipelines. The Project's remaining partners also have extensive background and history of managing pipeline networks.

11.3.2 Historical Operating Record

Generally, the natural gas transmission industry has an excellent record of public safety. Pipelines and related facilities are designed and maintained with strict adherence to 49 CFR Part 192 standards to ensure public safety, reliability, and to minimize the opportunity for system failure. EQM and NextEra have excellent records of public safety and established records operating pipelines and will continue to employ proper system design, construction, operation, and maintenance practices to ensure this excellent record is maintained.

11.3.3 Safety

Construction

The Southgate Project developed a Fire Prevention and Suppression Plan (see Resource Report 1, Appendix 1-H) designed to protect the public, employees, property, and the environment from the unlikely event of a fire during construction and operation of the Project. A copy of the Fire Prevention and Suppression Plan is included in Appendix 1-H of Resource Report 1.

Karst Terrain

The Southgate Project will implement the following safety measures that exceed the requirements in 49 CFR Part 192: USDOT requirements will be exceeded when preparing pipe specifications in identified karst areas by choosing a wall thickness above the minimum thickness required; construction standards will require 100 percent of welds to be non-destructively examined by an independent radiographic inspection company, regardless of class location; arc burns will be repaired or cut out as required by the Project specifications; pipe will be installed with a minimum of 36 inches of cover, regardless of class location; remote controlled shut off valves will be employed at all main line valve sites. The karst area design parameters, which are more stringent than those required by the USDOT, will result in a longer unsupported span capability, increasing the operating safety should a sinkhole occur beneath the pipe.

Operation

In the event a surface fire was to occur in the vicinity of the pipeline, the presence of the pipeline would not increase fire hazards. Fires on the surface are not a direct threat to underground natural gas pipelines because of the insulating effects of soil cover over the pipeline. Soil is a poor conductor of heat with thermal conductivity values ranging from 0.44 to 1.44 Btu/ft-hr- Fahrenheit. The heat capacity of most soils is 0.20 to 0.25 Btu/lb- Fahrenheit. In one study, soil temperature from intense slash pile burns reached a maximum of only about 50 Celsius (122 Fahrenheit) at a depth of about 24 inches directly under the burn piles (Massman et al. 2008). Based on the proposed burial depth, and the insulating effects of soil cover over the pipeline, forest fires would not affect pipeline integrity. Additional burial depth would not be necessary to protect against damage by surface fires.

In the event that a fire was to occur in forested lands in the vicinity of, or including the pipeline easement, EQM would take an active role in the emergency response coordination with the local fire response personnel. Within forested areas, the local fire personnel would take on fire suppression and control duties similar to conventional forest fire situations. Local fire departments within forested areas are already trained and equipped to fight forest fires using conventional techniques and equipment. EQM would provide personnel knowledgeable with the pipeline to cooperatively work with fire responders to confirm the location of the pipeline easement, depth of ground cover and any precautionary measures to be undertaken if crossing the pipeline with heavy load bearing equipment or vehicles. Therefore, the presence of the pipeline would not interfere with fire suppression efforts, or require the local fire departments to purchase any new or specialized equipment. The presence of the pipeline would not require local fire departments to hire additional personnel.

The Southgate Project and EQM will establish open relationships with local fire, police, and other governmental leaders in order to efficiently respond in a cooperative manner to pipeline emergencies, including emergencies in remote areas crossed by the Project. The Southgate Project and EQM will ensure that appropriate personnel are aware of ESD systems and emergency shutdown protocols and will also

coordinate and financially support periodic emergency response drills and table top exercises to build familiarity with emergency response personnel and response measures to be taken, including drills and exercises for remotes areas crossed by the pipeline where appropriate.

11.4 MEASURES TO PROTECT THE PUBLIC

As a new pipeline, and with the continuing advancements in materials and pipeline operating and maintenance practices, the chances of a failure of the Southgate Project facilities are extremely low. The safety and reliability of the Project will be based on safe design, appropriate equipment selection, code compliance, thorough review, careful construction, post construction testing and competent long-term maintenance and operation. Measures will be incorporated according to approved design practices and standards that have been developed through industry-wide experience of pipeline construction projects.

Measures to protect the public from inadvertent natural gas releases due to accidents or natural disasters can be grouped into three categories: passive protection, active controls, and procedural controls. These measures are described below in Section 11.4.1.

11.4.1 General Protective Measures and Controls

11.4.1.1 Passive Protection

Passive protection minimizes the hazards by incorporating process and equipment design features which will reduce either the frequency or consequence of a hazard without the active functioning of a device. The inherent design of modern pipeline systems affords protection for all but the most severe natural hazard events or inadvertent human actions, such as excavation damage by backhoe. Modern pipelines are made of high strength carbon steel with full penetration welds, resulting in a system with substantial, inherent strength and ductility. Passive protection will include:

- Pipeline design, construction, commissioning, and operation will be conducted in strict accordance with applicable USDOT regulations found in 49 CFR Part 192.
- In accordance with USDOT regulations, the pipeline design factor, wall thickness, location of MLVs, and other parameters will be established according to a classification system based on the number, proximity to the pipeline, and occupation levels of buildings intended for human occupancy located along the right-of-way.
- The Southgate Project and EQM will comply with the applicable sections of the American Society for Mechanical Engineers American National Standards Institute B31.8, Gas Transmission and Distribution Piping Systems, the most widely used industry Code, for the design, operation, maintenance, and repair of its natural gas transmission pipeline.
- The pipeline will be externally coated with a fusion-bonded epoxy and will be cathodically protected against external corrosion.

11.4.1.2 Active Controls

Active (or engineering) controls use instruments, valves, safety interlocks, and emergency shutdown systems to detect and correct process deviations (e.g., over pressure protection). Active controls will include:

- Applicable over pressure protection systems at receipt / delivery interconnect points where MAOPs differ.
- To protect the integrity of the pipeline system, an impressed current cathodic protection system will be installed as a corrosion control measure.
- A Supervisory Control and Data Acquisition system will provide for and enable continuous pipeline monitoring and the control of pressure and flow along the gas pipeline.
- Remote Terminal Units for the Supervisory Control and Data Acquisition system will be located on every receipt / delivery interconnect.
- MLVs will be installed at regular intervals as specified by 49 CFR Part 192, based on class location.
- All of the field girth welds will be tested via x-ray or ultrasonic inspection (non-destructive examination).
- The pipeline and associated facilities will be hydrostatically tested for structural integrity before commencing operation.
- The pipeline will be equipped with facilities to accommodate inline inspection tool (smart pigging) operations for the purpose of locating anomalies in the pipeline wall thickness that may indicate corrosion, and out-of-roundness that may indicate the pipe has been subjected to external forces.
- The pipeline will be inspected with a geometry pig prior to placing in service, to verify the absence of any unacceptable geometric deviations.
- Compressor stations will be equipped with gas detection systems and ESD systems capable of depressurizing all station piping.

11.4.1.3 Procedural Controls

Procedural (or administrative) controls use operating procedures, administrative checks, emergency response, and other management approaches to prevent incidents, or to minimize the effects of an accident (e.g., operating procedures, safe work practices, inspections and testing, and training). The ERP for the Project will be provided to USDOT and will address the following procedural controls:

- Procedures for testing, start-up, operation, purging, and training of operations and maintenance staff on operational procedures.
- Regularly scheduled preventative maintenance programs to meet government regulations for pipeline segments, metering stations, and compressor stations.
- Pipe launchers and receivers capable of accommodating inline inspection tools (smart pigs) will be installed at the beginning of the line, the end of the line and at each of the compressor stations and will be used to inspect the pipeline with smart pigs at intervals per the pipeline safety regulations. As discussed in Section 11.4.12, these inspections are intended to detect corrosion and third-party damage, among other issues.
- The ERP will be developed for reference during a response to hazardous conditions caused by the pipeline. The plan will include measures to ensure an ongoing liaison with the appropriate fire, police, and public officials to coordinate mutual assistance should an emergency occur.

- Procedures for aerial surveillance flights, on-ground inspection surveys, internal pipeline inspection with smart pigging equipment, and cathodic protection system inspection and maintenance.
- An IMP will be developed to provide procedures for monitoring and maintaining pipeline integrity in areas where the pipeline traverses lands or facilities that are considered HCAs as defined in 49 CFR §192.903 (see Section 11.2.3 above). The IMP will include threat identification measures such as, incorporation of formal risk assessment, selection of direct assessment methodologies, and prescribed inspection and testing requirements.
- A Public Awareness Plan will be prepared and implemented to enable customers, the public, government officials, and those engaged in excavation to recognize a natural gas pipeline emergency and report it to appropriate public officials and the company.
- Since April 1982, operators have been required to participate in "One-Call" public utility programs in populated areas to minimize unauthorized excavation activities near pipelines.

11.4.1.4 Continuous Evaluation and Improvement

EQM will continually refine and enhance the integrity management techniques as it implements the IMP on its pipeline system.

11.4.2 Public Safety

The Southgate Project and EQM are committed to safety, protecting the environment, preventing accidents/incidents and maintaining the highest standards for its pipeline operation and maintenance. EQM will accomplish this goal through routine preventative maintenance, pipeline patrols, detailed emergency response plans and a strong pipeline integrity management program. The Project and EQM will establish and maintain strict construction, operation, and maintenance policies and procedures that will be audited periodically by PHMSA and are in compliance with 49 CFR Part 192.

Trained and qualified pipeline personnel will operate and maintain the pipeline in accordance with Subpart N of 49 CFR Part 192. The training program will ensure all personnel possess the knowledge and competency necessary to efficiently operate and maintain the pipeline in a manner that protects the environment, the public and the health and safety of all employees. More specifically, personnel are trained to: execute normal operating and maintenance procedures; recognize abnormal conditions and take appropriate corrective actions; predict consequences of malfunctions or failures; recognize conditions likely to cause emergencies; respond to emergency situations; control accidental releases of gas; and recognize characteristics and hazards of natural gas.

Active pipeline construction can increase safety risks to the public generally in two ways: from an increase of traffic on roadways in the vicinity of the pipeline and from potential exposure to construction activity itself within the construction right-of-way. During periods of active construction, roadways in the vicinity of the pipeline Project could experience an increase in small vehicle traffic from the construction work force, as well as large vehicle traffic transporting construction equipment and materials. Where the pipeline crosses roadways, access to and from the right-of-way by construction vehicles and construction activity itself at the roadway crossing could disrupt traffic and create potential safety hazards to the public. Transportation and traffic mitigation are discussed in Section 5.4.6 or Resource Report 5. In addition, the

Project will obtain necessary permits for public roadway crossings and roadway use and will comply with traffic control and public safety mitigation measures that are conditions of these permits.

During construction, special care will be taken in residential and commercial areas to minimize neighborhood and traffic disruption, to control noise and dust to the extent practicable, and to protect the public at large. Measures to be implemented where the pipeline is near residential areas include, but are not limited to: fencing the construction work area boundary to ensure construction equipment, materials, and spoil remain in the construction right-of-way; ensuring the pipe is installed as quickly as reasonably possible consistent with prudent pipeline construction practices to minimize construction time affecting a neighborhood; installation of temporary pipeline end caps at the end of each work day in residential areas; backfilling the trench as soon as possible after the pipe is laid; covering the open trench of road crossing work areas with temporary steel plates; and completing cleanup and installation of permanent erosion control measures as soon as reasonable, weather conditions permitting. The work will be accomplished to enable emergency vehicles to pass at all times and to limit disruption of access to residential driveways. The Southgate Project has developed site-specific residential construction plans in areas where occupied residential dwellings are within 50 feet of construction (see Resource Report 8, Appendix 8-C).

11.4.3 Emergency Response

Consistent with 49 CFR §192.615, Pipeline contractors will establish an Emergency Response Plan by construction spread that provides written procedures to minimize the hazards from a pipeline emergency. Key features will include:

- Receiving, identifying, verifying, and classifying emergency events – leaks, fires, ruptures, or natural disasters (e.g., hurricanes);
- Managing communications with emergency responders and public officials to establish incident command and coordinate response efforts, including for remote areas crossed by the Southgate Project;
- Emergency evacuation routes, emergency helicopter landing areas, hospital locations, and contact numbers;
- Making personnel, equipment, tools and materials available for emergencies;
- Ensuring that response efforts focus on public safety first; and
- Ensuring emergency shutdown actions are taken in a timely manner.

Should the need arise, EQM will have field service personnel and repair contractors available that are capable of completing emergency repairs and restoration.

11.4.4 Public Awareness Program

The Southgate Project will develop a Public Awareness Program as outlined in 49 CFR §192.616, which will provide outreach measures to the affected public, emergency responders, public officials, and excavation businesses. This program will use multi-media channels (direct mail, e-mail, social networking, public service announcements, print advertisement, public meetings, etc.) to engage these core audiences. The Project's objective is to educate the public on how to recognize the presence of pipelines; understand the potential hazards and safe actions they should take; recognize and report abnormal conditions; and encourage the safe behavior of calling for buried facility location before digging.

11.4.5 One-Call Response

When EQM receives notification from a one-call center that someone intends to dig near its pipeline facilities, personnel will be dispatched to mark the location of the facilities in the vicinity of proposed digging or other earth disturbance activities. If necessary, company employees will be on site when the excavation occurs.

11.4.6 Pipeline Safety Brochures

The Southgate Project and/or EQM will mail information brochures to homeowners, businesses, and public officials along the pipeline system each year to inform them of the presence of the pipeline and instruct them on how to recognize and react to unusual activity in the area. These brochures will provide emergency contact phone numbers available 24 hours a day, 7 days a week, and reinforce the need for excavators to contact the Virginia and North Carolina "811" program "Call Before You Dig." In addition to these outreach efforts, EQM will also provide pipeline location information in the National Pipeline Mapping System to inform the public and others as to the general location of the Project's pipeline facilities.

11.4.7 Interactions with Federal Authorities

The Southgate Project and EQM will maintain frequent contact with PHMSA. PHMSA routinely exercises its oversight authority to ensure that facilities under its jurisdiction are safely designed, constructed, and operated. With regard to its role in public safety for natural gas pipelines:

- PHMSA develops regulations and other approaches to risk management to assure safety in design, construction, testing, operation, maintenance, and emergency response of pipeline facilities; and
- PHMSA administers a national regulatory program to assure the safe transportation of natural gas, petroleum, and other hazardous materials by pipeline. PHMSA will routinely inspect the Project's pipeline facilities and records for compliance with design, construction, testing, operations, maintenance, and integrity regulations.

As described in Section 11.3.3, the Southgate Project's procedures and practices will meet or exceed the pipeline safety regulations and related risk management requirements administered by the PHMSA. For example, the Project will install remote controlled valves, which is not a current PHMSA requirement.

11.4.8 Liaison Procedures with Local Authorities

The Southgate Project and EQM's personnel involved with public awareness will ensure that appropriate liaisons and public education are established and maintained in the communities within which the Project operates. The Project and EQM will establish open relationships with local fire, police, and other governmental leaders in order to efficiently respond in a cooperative manner to pipeline emergencies, including emergencies in remote areas crossed by the Project pipeline. To accomplish this the Project and/or EQM will:

- Hold informational meetings and training with local fire and police departments, and other concerned government agencies at their request;
- Conduct periodic emergency response drills and table top exercises to build familiarity with emergency response personnel and response measures to be taken. These would be in addition to the information meetings and training mentioned in the previous bullet will be conducted upon

request, and where appropriate, will include drills and exercises for remotes areas crossed by the pipeline; and

- Provide literature listing emergency contact phone numbers and other pertinent information.

In addition to maintaining contact with local governmental and emergency response agencies along the pipeline, EQM's liaison efforts will:

- Determine how local officials may be able to assist EQM during an emergency with the determination of jurisdiction and resources that may be involved in responding to an emergency;
- Familiarize local officials with how EQM responds to an emergency on its pipeline system;
- Verify notification preferences for pipeline emergencies; and
- Review with local officials the use of Incident Command System to cooperate and assist with response to an emergency.

Outreach to emergency responders will be conducted on a periodic basis. Focus with these organizations is to review firefighting methods and techniques for natural gas fires and to conduct periodic emergency drills and exercises.

11.4.9 Utility Protection

Prior to construction, existing utility lines and other sensitive resources identified in easement agreements or by federal and state agencies, will be located and marked to prevent accidental damage during pipeline construction. The Southgate Project's contractors will contact the one-call system to verify and mark utilities along the Project workspaces to minimize the potential for damage to other buried facilities in the area. Where there is a question as to the location of utilities (i.e. water, cable, oil, gas, product, and sewer lines), they will be located by field instrumentation and/or test pits.

11.4.10 Equipment Engineering and Design

The Southgate Project's pipeline system will include many equipment features that are designed to increase the overall safety of the system and protect the public from a potential failure of the system due to accidents or natural disasters. Cathodic protection systems will be installed at various points along the pipeline to mitigate external corrosion of the pipeline facilities. The cathodic protection system impresses a low voltage DC current to the pipeline to off-set natural soil and groundwater corrosion potential. The functional capability of cathodic protection systems will be inspected bi-monthly to ensure proper operating conditions for corrosion mitigation.

The Southgate Project's pipeline, including depth of cover, will be installed according to PHMSA 49 CFR Part 192 requirements. Specific site conditions, including karst terrain, were considered in the design of the pipeline.

The Southgate Project's pipeline will be equipped with remote control valves, which will allow the valves to be operated remotely in the event of an emergency that is usually evidenced by a sudden loss of pressure or change of flow on the pipeline. Remotely closing the valve(s) allows a section of pipeline to be isolated from the rest of the pipeline system. Data acquisition systems will be installed at the metering and regulation stations as well as at sectionalizing block valves. If system pressures fall below predetermined ranges, alarms are activated alerting the pipeline operators.

11.4.11 Operations and Maintenance

The pipeline control center for the Project will be located at EQM's Gas Control headquarters in Canonsburg, Pennsylvania and will be staffed continuously by qualified pipeline controllers. The controllers will monitor all aspects of the pipeline including system pressures, temperatures, flows, and valve positions (open or closed). In case of an emergency at the pipeline control center, a secondary pipeline control center will be available at a back-up site located in Jefferson Hills, Pennsylvania.

The pipeline will be continuously monitored for leaks using the data acquisition system. Operators will use pressures, flows and rate of change alarms to monitor for leaks or other abnormal operating conditions. In the unlikely case that a shutdown of the pipeline system is needed, the pipeline system will be equipped with remotely controlled sectionalizing block valves to isolate the affected pipeline segment. In some cases, as a result of an emergency shutdown or operational equipment testing, some minor venting may occur at controlled points at either the compressor stations or MLVs. EQM's Operating Procedures are developed, tested and continuously improved to protect the employees performing the work and the local public from any potential health risks.

PHMSA 49 CFR Part 192 prescribes the baseline standards for operating and maintaining pipeline facilities, including the establishment of a written plan governing these activities. The Southgate Project will develop an Operations & Maintenance ("O&M") Manual for the Project facilities during the construction phase. This O&M Manual will be implemented prior to filling the pipeline system with natural gas. The O&M Manual will include contingency plans for maintaining service or reducing downtime during operation. EQM will have field services crews to perform PHMSA 49 CFR Part 192 required operations, maintenance and inspection tasks along the pipeline. All personnel will have the proper training and qualifications as required by 49 CFR Part 192.

11.4.12 Corrosion Control

The Project will have cathodic protection and will be closely monitored and maintained in compliance with PHMSA 49 CFR Part 192 and NACE International (National Association of Corrosion Engineers) recommended practice SP-0169-2013. Specifically, the health of the cathodic protection system will be monitored through routine rectifier readings and annual surveys. The pipeline will have a high quality fusion-bonded epoxy coating system which will be applied after the pipe has been manufactured. Girth welds will be prepared and coated with a field-applied epoxy coating. Together, the combination of cathodic protection and the epoxy coating system provide excellent corrosion control.

In addition to the other measures, EQM will also inspect the pipeline using devices known in the industry as smart pigs at least once every seven years, as required by 49 CFR Part 192, or more frequently if the baseline integrity assessment requires. These devices run inside the pipe and provide indications of internal and external metal loss, deformation, ovalities, dent detection; valve, fitting and casing locations; pipe repairs; and external metal objects in the vicinity of the pipeline.

11.5 REFERENCES

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