U.S. DEPARTMENT OF TRANSPORTATION
PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION
Special Permit Analysis and Findings – Usage of Pressure Gradient

Special Permit Information:

Docket Number:	PHMSA-2018-0105
Requested By:	Gulfstream Management & Operating Services, LLC
Operator ID#:	31565
Original Date Requested:	October 26, 2018
Code Section(s):	49 CFR 192.195(a) and 192.619(a)

Purpose:

The Pipeline and Hazardous Materials Safety Administration (PHMSA) Office of Pipeline Safety (OPS)[1] provides this information to describe the facts of the special permit application submitted by the Gulfstream Management & Operating Services, LLC (Gulfstream),[2] to discuss any relevant public comments received with respect to the application, to present the engineering and safety analysis of the special permit application, and to make findings regarding whether the requested special permit should be granted and, if so, under what conditions. Gulfstream requested that PHMSA waive compliance with 49 Code of Federal Regulations (CFR) 192.195(a) and 192.619(a) for segments of the Gulfstream Pipeline.

Pipeline System Affected:

The special permit applies to the Gulfstream request for a waiver with 49 CFR 192.195(a) for overpressure protection and 49 CFR 192.619(a) to allow utilization of a pressure gradient for maximum allowable operating pressure (MAOP) control upstream of a subsea mainline valve

[1] Throughout this special permit the usage of "PHMSA" or "PHMSA OPS" means the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration Office of Pipeline Safety.

[2] Gulfstream Natural Gas System, LLC is an interstate natural gas transmission pipeline system jointly owned by Williams and Enbridge and operated by Gulfstream Management & Operating Services, LLC (Gulfstream). The Gulfstream Pipeline is a portion of the Gulfstream Natural Gas System.

located at Mile Post (MP) 58.7 on the Gulfstream Pipeline. The special permit allows Gulfstream to use pressure gradient to maintain MAOP. The Gulfstream Pipeline includes 427.8-miles of the 36-inch diameter ML 200 Pipeline, Compressor Station 410, Compressor Station 420, mainline valves, metering, flow control, and other components. The Gulfstream Pipeline begins at Compressor Station 410 in Mobile County, Alabama, is routed through the Gulf of Mexico, and then comes onshore in Manatee County, Florida where it ends at Compressor Station 420.

Special Permit Request:

Gulfstream applied to PHMSA on October 26, 2018, for a special permit seeking relief from the Federal pipeline safety regulations in 49 CFR 192.195(a) for overpressure protection and 49 CFR 192.619(a) to allow utilization of a pressure gradient for MAOP control upstream of a subsea mainline valve located at MP 58.7 on the Gulfstream Pipeline.

The Gulfstream Pipeline ***special permit inspection area*** begins at Compressor Station 410 in Mobile County, Alabama, travels through the Gulf of Mexico, and comes onshore at Compressor Station 420 in Manatee County, Florida. The ***special permit inspection area*** includes the ***special permit inspection area A***, ***special permit segment,*** and the ***special permit inspection B,*** which are defined as follows:

- ***Special permit inspection area A*** is from Mile Post (MP) 0.0 through MP 3.9 Mainline Valve 200-1 (MLV 200-1);
- ***Special permit segment*** is from MP 3.9 to MP 58.7 WSSTI; [3,4] and
- ***Special permit inspection area B*** is from the upstream side of MP 58.7 WSSTI to MP 427.8.

[3] Gulfstream Pipeline MP 58.7 and is where the 36-inch "West Subsea Tie In" mainline valves – MLV-200-2A, MLV-200-2B, and MLV-200-2C are located. Gulfstream Pipeline MP 58.7 is in offshore Alabama, Viosca Knoll, Block 82, Gulf of Mexico. The Gulfstream special permit application letter and attachments of October 26, 2019, has rounded MP 58.7 to MP 59.

[4] The Gulfstream Pipeline ***special permit segment*** begins in Mobile County, Alabama approximately 200 feet from the shoreline at approximate Mile Post (MP) 3.9 (Onshore Survey Station (SS) 205+47), enters the Gulf of Mexico in Alabama State waters and continues into Federal waters of the Gulf of Mexico to approximate MP 58.7 (Offshore SS 2892+77 in Viosca Knoll, Block 82, Gulf of Mexico) immediately upstream of the West Subsea Tie In (WSSTI) ("MP 58.7" or "MP 58.7 WSSTI").

This special permit allows Gulfstream to increase the Gulfstream Pipeline operating pressure from the current 2,180 pounds per square inch gauge (psig) MAOP to a new MAOP of 2,296 psig for approximately 55 miles of the 36-inch diameter Gulfstream Pipeline from MP 3.9 to MP 58.7 (***special permit segment***). This special permit allows Gulfstream to not install overpressure control at MP 58.7. Gulfstream Pipeline MP 3.9 is located near the shoreline in Mobile County, Alabama and MP 58.7 is offshore in the Gulf of Mexico in Viosca Knoll, Block 82.

Public Notice:

On November 19, 2019, PHMSA posted a notice of this special permit request in the Federal Register (84 FR 63959) with a closing date of December 19, 2019, with all comments received through March 31, 2020, being considered. The Gulfstream application request letter, Federal Register notice, special permit conditions, environmental assessment, and all other pertinent documents are available for review in Docket No. PHMSA-2018-0105 in the Federal Docket Management System located on the internet at www.regulations.gov.

PHMSA did not receive any comments concerning this special permit request.

Analysis:

Gulfstream requested this special permit is to increase the amount of natural gas supplied to Florida by the Gulfstream Pipeline through a pipeline MAOP increase from Gulfstream Pipeline MP 0.0 to MP 58.7. The special permit allows Gulfstream to increase the Gulfstream Pipeline operating pressure from the current MAOP of 2,180 psig to a new MAOP of 2,296 psig for approximately 58.7 miles of the 36-inch diameter Gulfstream Pipeline from MP 0.0 to MP 58.7. This special permit allows Gulfstream to not install overpressure control at MP 58.7. Gulfstream Pipeline MP 3.9 is located near the shoreline in Mobile County, Alabama and MP 58.7 in the Gulf of Mexico, Viosca Knoll, Block 82. The piping, valves, and fittings from MP 0 to MP 3.9 that are not rated for 2,296 psig will be replaced with materials rated for 2,296 psig by Gulfstream.

The existing Gulfstream Pipeline has the capacity to transport approximately 1.3 billion cubic feet (Bcf) of sales grade natural gas each day from natural gas receipt points in Mississippi and Alabama to power generation and distribution system customers in Florida. The Gulfstream

Pipeline flow volume uprate would enable Gulfstream to respond to the increased gas demand, while also lowering Florida's carbon fuel-based emissions, by supporting local power generation that will use natural gas power generation. This incremental increase in natural gas supply will provide the daily energy needs of approximately 285,000 homes in Florida.

The Gulfstream Pipeline flow volume uprate consists of the installation of a new turbine compressor unit at Gulfstream Pipeline's Compressor Station 410, adding pressure controls at Gulfstream Pipeline's Compressor Station 420, and the replacement of any pipeline materials from MP 0.0 to MP 3.9 that does not meet the uprated 2,296 psig MAOP. This additional piping and equipment, when operational, will increase flow by approximately 78,000 dekatherms per day[5] through the existing 36-inch diameter pipeline, an approximate 6.5% volume increase.

Gulfstream considered and evaluated the following alternatives for meeting the purpose and need in the Final Environmental Assessment and Finding of No Significant Impact document.

- Alternative 1: Selected Alternative (Selected Action, which the special permit is based upon.)
- Alternative 2: No Action Alternative (i.e. permit denial)
    - Alternative 2A: Looping Alternative – add a second pipeline;
    - Alternative 2B: Subsea Isolation Valve Alternative – add a subsea valve for pressure control at MP 58.7;
    - Alternative 2C: Platform Alternative – add a platform with valves for pressure control at MP 58.7; or
    - Alternative 2D: No Change in operations and no increase in gas flow volumes to Florida through the Gulfstream Pipeline.

Operational Integrity Compliance:

PHMSA developed special permit conditions to ensure that Gulfstream maintains the MAOP of the 36-inch subsea mainline valves[6] and the pipeline from the subsea valves at MP 58.7 to MP 427.8. The pressure controls are based upon the usage of flow and pressure models and usage of

[5] 78,000 dekatherms per day is equivalent to 76.4 million standard cubic feet per day with a Heating Value ~1,020 British Thermal Units per standard cubic feet (Btu/ft^3).

[6] The 36-inch subsea mainline valves at MP 58.7 are labeled as MLV-200-2A, MLV-200-2B, and MLV-200-2C. These valves are located offshore Alabama in the Gulf of Mexico, Viosca Knoll, Block 82.

a supervisory control and data acquisition (SCADA) system to maintain the Gulfstream Pipeline MAOP and overpressure protection limits as if it had pressure control valves at MP 58.7 that were on a platform and could be maintained in accordance with 49 CFR Part 192.

To maintain the integrity and safety of the pipeline from MP 58.7 to MP 427.8, PHMSA developed special permit conditions that require Gulfstream to monitor the Gulfstream Pipeline through the usage of pressure and flow models of the pipeline, continuous monitoring of pressures at MP 0.0, MP 58.7, and MP 427.8, recording of maximum pressures, retuning or recalibrating of the pressure model when needed, training, integrity management, certification of compliance by Gulfstream, and annual reports to PHMSA. The special permit conditions are summarized as follows:

1) **Operating Procedures and Documentation**: All procedures, records, and documentation for implementing these special permit conditions for the Gulfstream Pipeline must be included in the Gulfstream Operations and Maintenance (O&M) Procedures to meet 49 CFR 192.605 and 49 CFR 192.603(a) for the life of the special permit.

2) **Maximum Allowable Operating Pressure**: The ***special permit inspection area*** includes the ***special permit inspection area A***, ***special permit segment,*** and the ***special permit inspection B.***

   a) Gulfstream is required to uprate the pipeline MAOP from 2,180 psig to 2,296 psig in ***special permit inspection area A***.

   b) The ***special permit segment*** (MP 3.9 to upstream of the subsea mainline valves at MP 58.7) is rated for a 2,296 psig MAOP.

   c) ***Special permit inspection area B*** (upstream from the subsea mainline valves at MP 58.7 to MP 427.8 in Florida), the Gulfstream Pipeline is rated for an MAOP of 2,180 psig. Pressure gradient will be used to control the MAOP in ***special permit inspection area B***.

3) **Integrity Management Program**: The ***special permit inspection area*** must be included in the Gulfstream Pipeline written integrity management program as a "covered segment" in a high consequence are in accordance with 49 CFR 192.903. Gulfstream

must require in its O&M Procedures the usage of inline inspection (ILI) tools for the inspection and reassessments to meet 49 CFR 192.917 for threats and 49 CFR 192.939 for reassessment intervals for the ***special permit inspection area***.

4) **Flow Model Validation**: Gulfstream must install, monitor, and validate models to monitor pressures at upon real-time pressure and flow readings upstream and downstream of the Gulfstream Pipeline Station 410 and upstream of Station 420. A monthly maximum operating pressure over the 2,180 psig MAOP (based upon the "Active" model calculations) at MP 58.7 or misalignment of the pressures (model versus actual pressures at MP 0.0 and MP 427.8) at MP 0.0, MP 58.7, or MP 427.8 for varying flow rates, where the maximum operating pressure at MP 58.7 can be exceeded, are events that Gulfstream must report to the Director, PHMSA Southern Region and may require Gulfstream to retune and revalidate the "Active" model, if requested by the Director, PHMSA Southern Region.

5) **Operator Training**: Operator training for this special permit must be completed prior to uprating the Gulfstream Pipeline. Operator training must include training on normal operating conditions and upset conditions. All training must be in accordance with 49 CFR 192.631(h).

6) **Pipeline Pressure Control**:
    a) Gulfstream must install an active logic algorithm system for pressure control and a station control panel to monitor pressures at Compressor Station 410 and Compressor Station 420 with real time modeling to ensure the pressure remains at or below 2,180 psig at MP 58.7 WSSTI. Compressor Station 410 must be pressure controlled and monitored to not exceed the uprated 2,296 psig MAOP in ***special permit inspection area A*** and the ***special permit segment***. Attachment E ("Gulfstream Pipeline Hydraulic Flow Modeling and Operator Training") has the requirements that must be followed for the active logic algorithm.
    b) The "Active" model must utilize real-time Gulfstream Pipeline pressures, temperatures, flow rates, and gas composition to provide a detailed picture of current operations. The "Active" model must continuously compute a pressure

for MP 58.7 by reading real-time flow rates and pressures at Compressor Station 410 and Compressor Station 420.

c) If the "Active" model is not online, the discharge pressure at Compressor Station 410 must be maintained at or below 2,180 psig. Gulfstream must maintain documentation of this changed condition.

d) The Gulfstream Pipeline must have an operational supervisory control and data acquisition (SCADA) system, 24-hours per day and 7-days per week, for the ***special permit inspection area*** to be operated over a 2,180 psig MAOP. The SCADA system must be operated in accordance with 49 CFR 192.631 and must receive pressure data from Compressor Station 410, Compressor Station 420, incoming gas receipt pipelines, and outgoing gas delivery pipelines. Should the Gulfstream Pipeline SCADA system become non-operational, Gulfstream must notify the Director, PHMSA Southern Region within 48 hours of the event or the next working day, and must have 24-hour per day operational coverage or communications with Compressor Station 410, Compressor Station 420, gas receipt points, and gas delivery points for pipeline operating pressures.

e) The Gas Control Center for the Gulfstream Pipeline must control pressures entering and leaving the ***special permit inspection area***, so that the 2,180 psig MAOP at MP 58.7 and throughout the ***special permit inspection area B*** will not be exceeded.

f) Should any of the pressure reduction requirements in **Condition 6** need to be modified for up to a seven (7) day interval due to the model or SCADA being out of service, Gulfstream must send a notice letter stating the proposed modification to the Director, PHMSA Southern Region and must receive a letter of "no objection" from the Director, PHMSA Southern Region prior to it being implemented by Gulfstream.

7) **<u>Overpressure Protection</u>**: A minimum of two (2) over-pressure protection (OPP) devices must be installed at Compressor Station 410 for any compressor or pipeline flowing into the Gulfstream Pipeline. Gulfstream must conduct annual flow model validation that ensures the OPP setting at Compressor Station 410 maintains an OPP limit of 2,267 psig or less at MP 58.7. Gulfstream must maintain documentation of the flow model validation for the life of the special permit. Within six (6) months after installation

of the Gulfstream Project to expand flow volumes, Gulfstream must conduct 30 days of pressure monitoring of the Gulfstream Pipeline at MP 58.7 WSSTI to confirm the "Active" flow model for modeling pressure gradients for the Gulfstream Pipeline.

8) **Pipeline Operational Controls**: During any possible upset operational conditions, Gulfstream Pipeline operational controls must be put in place by Gulfstream to temporarily reduce the 2,296 psig Compressor Station 410 discharge pressure to 2,180 psig, by shutting down the new Unit 5 Booster Compressor, during any possible upset operational conditions defined as follows:
    a) ILI or other pigging of the Gulfstream Pipeline.
    b) Compressor Station 410, Compressor Station 420, or any portion of the Gulfstream Pipeline lies between or falls within the 3-day "cone of uncertainty" for a track projection of a named tropical storm or hurricane by the National Hurricane Center. The "cone of uncertainty" represents the range of possibilities for the storm's center and extends up to five days into the future.
    c) Disruption of flow into or out of Compressor Station 420 with any inadvertent or intentional mainline valve closure[7] that may cause upstream pressure increases; or
    d) Extended low flow demand of 337 million cubic feet per day or less in Florida, lasting for 72-hours or more, caused by seasonal or abnormal conditions.
    e) Should any of the pressure reduction requirements in **Condition 8** need to be modified for up to a seven (7) day interval, Gulfstream must send a notice letter stating the proposed modification to the Director, PHMSA Southern Region and must receive a letter of "no objection" from the Director, PHMSA Southern Region prior to it being implemented by Gulfstream.
9) **Pipeline Patrols and Surveys**: Gulfstream must perform aerial patrols from the Gulfstream Pipeline MP 0 to MP 58.7 in Alabama and from MP 406 (Egmont Key -

[7] Examples of inadvertent or intentional mainline valve closures that would disrupt flow and cause mainline pressures to increase would be the closure of the 36-inch mainline valves, where the Gulfstream Pipeline reaches the Florida coast and would include the 36-inch diameter mainline valve MLV-200-10 located near the Florida Sunshine Skyway Bridge, the 36-inch diameter mainline valve MLV-200-11 located where the pipeline comes onshore in Florida, and 36-inch diameter mainline valve GF-200-S1 located at the inlet of Compressor Station 420 near the incoming pig receiver.

Offshore SS 21438 +16) to MP 427.8 in Florida on a quarterly basis, not to exceed 75 days, in accordance with 49 CFR 192.705.

10) **Annual Offshore Leakage Survey**: Gulfstream must perform an offshore leakage survey by aircraft from Gulfstream Pipeline MP 3.9 to MP 427.8 on an annual basis, not to exceed 15 months, in accordance with 49 CFR 192.706.

11) **Shallow Water Surveys**: Gulfstream must develop procedures for performing shallow water depth of cover surveys and remediation based upon survey findings for the Gulfstream Pipeline. The procedures must require shallow water depth of cover surveys a minimum of every five (5) years, not to exceed 66 months, in accordance with 49 CFR 192.612.

12) **Annual Report to PHMSA**: Gulfstream must submit an annual report to PHMSA on integrity threats, maximum operating pressure reached at MP 0.0, MP 58.7, and MP 427.8 for each month, reportable incidents, on-going damage prevention initiatives, and change of ownership.

13) **Certification**: Gulfstream must certify that the Gulfstream Pipeline ***special permit inspection area*** including the ***special permit inspection area A***, the ***special permit segment,*** and the ***special permit inspection B*** meets the conditions described in this special permit, special permit conditions are in the O&M Procedures, and all special permit conditions have been implemented within 60 days after installation.

Pipeline Design and Pressure Testing:

The Gulfstream Pipeline was hydrostatically pressure tested after construction for eight (8) hours at a minimum of 2,879 psig in accordance with 49 CFR 192, subpart J. The MP 58.7 WSSTI subsea mainline valves were manufactured in accordance with API 5D – Specification for Pipeline Valves with a ASME/ANSI 900 pressure rating of 2,180 psig. The subsea mainline valves and fabrications were shop tested to a minimum pressure of 3,350 psig for eight (8) hours. The maximum pressure that the subsea valve at MP 58.7 could have in an OPP event is 2,267 psig or less, which is 1.04 times the MAOP of 2,180 psig (2,267 psig). Section 192.201(a)(i) allows a maximum hoop stress of 75 percent of specified minimum yield strength (SMYS) which is 1.04 times MAOP for a 72 percent SMYS pipeline design in a Class 1 location. A 2,180 psig pressure rating for the subsea mainline valves times 1.04 would be a 2,267 psig OPP limit.

Below is a review of how OPP must be set-up by Gulfstream based upon the special permit conditions.

1) The Gulfstream Pipeline must have compressor pressure controls at Compressor Station 410 (MP 0.0) and to limit the discharge pressure into the pipeline to the 2,296 psig MAOP. Any pipelines flowing into the Gulfstream Pipeline must have pressure controls to limit pressures flowing into the Gulfstream Pipeline to the MAOP.
2) OPP at Compressor Station 410 or pipelines flowing into the Gulfstream Pipeline must be set at 2,341 psig or less (2,296 psig times 1.02).
3) Gulfstream must use flow models to show that a 2,341 psig OPP at Compressor Station 410 will not overpressure MP 58.7 WSSTI mainline valves beyond 2,267 psig.

The Gulfstream Pipeline has 36-inch mainline pipe that is a minimum of 0.820-inch, Grade API 5L X-70, double submerged arc welded pipe seam pipe, which using a Class 1 location design factor of 0.72 has a design pressure of 2,296 psig. The 36-inch pipe design pressure of 2,296 psig is the same pressure as the 2,296 MAOP.

Pressure loss on the Gulfstream Pipeline will be between 2.4 to 2.6 psig loss per mile at normal gas flow volumes between MP 0.0 to MP 58.7. A discharge pressure at Compressor Station 410 (MP 0.0) at 2,296 psig would result in a pressure of between 2,142 to 2,154 psig at MP 58.7. Gulfstream has modeled the Gulfstream Pipeline and has confirmed that it would take up to 15 hours of minimum gas delivery volumes in Florida with maximum gas input volumes in Alabama at Compressor Station 410 for MP 58.7 to reach 2,180 psig.

Past Enforcement History – January 1, 2010 through April 20, 2020:

Gulfstream Pipeline's Operator Identification Number (OPID#) is 31565. A review of Gulfstream's 49 CFR Part 192 compliance history reveals one (1) non-compliance order (four (4) 49 CFR Part 192 violations) on the Gulfstream Pipeline from January 1, 2010, through April 20, 2020. The Gulfstream Pipeline non-compliance order was opened by PHMSA on January 23, 2020 and closed on April 9, 2020. The non-compliance order contained a penalty of $209,002 for atmospheric corrosion, poor coating and pitting, on a ¾-inch ball valve and fitting assembly for a 36-inch valve (MLV 60-1). The atmospheric corrosion led to leakage of natural gas from the ¾-inch ball valve and fitting assembly. There were three (3) other violations in the non-compliance order that led to warnings for immediate notice of incident events (49 CFR

191.5(a), (b), and (c)) and for a procedural manual (49 CFR 192.605) warning for a "gas detection system functional test" where the audio and visual indications at Compressor Station 420 not working properly.

Based upon Gulfstream's past enforcement history indicating one (1) non-compliance order comprised of four (4) violations with 49 CFR Part 192 within the past 10 years, PHMSA concludes that a special permit allowing the usage of pressure gradient to control the MAOP from MP 58.7 to MP 427.8 on the Gulfstream Pipeline would not be inconsistent with pipeline safety.

Findings:

Based on the information submitted by Gulfstream and PHMSA's analysis of the technical, operational, and safety issues, and the special permit conditions that will be implemented by Gulfstream to maintain MAOP pressures of 2,180 psig or less in ***special permit inspection area B*** and MAOP pressures of 2,296 psig or less in the ***special permit inspection area A*** and the ***special permit segment***, PHMSA finds that granting this special permit to Gulfstream allowing the usage of a pressure gradient to control the MAOP on the Gulfstream Pipeline would not be inconsistent with pipeline safety. Accordingly, the Gulfstream special permit application is granted.

Completed in Washington DC on: May 19, 2020
Prepared by: PHMSA OPS - Engineering and Research Division