

Investigation into the January 30, 2014 Loss of Well Control
Lease OCS-G 17921, Vermilion Block 356, Well A-007

Gulf of Mexico Region
Off the Louisiana Coast



U.S. Department of the Interior
Bureau of Safety and Environmental Enforcement

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Executive Summary

On January 30, 2014, at approximately 8:30 a.m., the Rowan Louisiana crew, drilling for Energy Ventures, LLC, had 13-3/8 inch conductor casing set at 1,217' measured depth (MD) and 1,200' true vertical depth (TVD) and had drilled the well to 2,217' MD/1,935' TVD. The crew started a method known as a "short trip" where the drill pipe is moved in and out of the wellbore in order to gauge whether a hole is clean and/or the mud weight is sufficient. When pulling the bottom hole assembly (BHA) into the casing shoe, the driller noticed a 30,000 (30K) pound over-pull followed by a 10 barrel (bbl) increase in the rig's trip tank. The crew stopped the short trip, checked for flow (static), made up the top drive to the drill string, and began circulating fluid when the well started to flow resulting in a loss of well control. The driller responded by closing the rig's diverter annular which automatically opened the diverter valve allowing water and gas out of both diverter lines and away from the rig. The Offshore Installation Manager (OIM), in consultation with the company representative, ordered the adjacent platform shut in and all personnel evacuated from the rig. The well flowed from the port side diverter line for approximately 36 hours until the flow was killed using a "dynamic kill procedure".

The Bureau of Safety and Environmental Enforcement Gulf of Mexico Regional Director appointed an Investigation Panel for the purpose of determining the possible cause(s) of the Loss of Well Control, determining regulatory findings (if any), and to make recommendations (if appropriate) on how to strengthen implementation of existing Safety and Environmental Management Systems (SEMS). The Panel reviewed requested documents, conducted interviews, and met several times to discuss all facts relevant to the incident.

The BSEE Investigation Panel determined that, during the short trip, the BHA was being pulled up through the 13-3/8 inch casing. As the first stabilizer was pulled into the shoe, it got caught up in a clay build-up within the formation, or "Gumbo", which caused a 30K pound over-pull and reduction in wellbore pressure due to a "swabbing effect". The driller tried to circulate the fluids but the reduced wellbore pressure allowed gas and water to flow up through the casing string to the surface. The Driller, following the pre-approved procedures, closed the diverter annular and opened the overboard diverter lines.

Introduction

On Thursday, January 30, 2014, the Rowan Louisiana rig crew experienced a loss of well control incident while engaged in directional drilling operations on Energy Venture's (EnVen) Lease OCS-G 17921, Vermilion Block 356 (VR 356), Well A-007 located in the Gulf of Mexico, approximately 80 miles off the coast of the State of Louisiana.

Pursuant to 43 U.S.C. 1348(d)(1) and (2) and (f) [Outer Continental Shelf (OCS) Lands Act, as amended] and Department of the Interior regulations 30 CFR 250, the Bureau of Safety and Environmental Enforcement (BSEE) is required to investigate and prepare a public report of this incident. By memorandum dated February 4, 2014, from the Regional Director, Gulf of Mexico Region, and pursuant to the BSEE Manual, Part 640, Chapter 3, Incident Investigation and Information Management, the following personnel were named to the Investigation Panel:

Charles Arnold¹—Special Investigator, Investigations and Review Unit, Office of the Director

Frederick Brink— Chief, District Operations Support, District Field Operations, GOM OCS Region

Royce Buford- Chief, Well Operations Section, Lake Charles District, GOM OCS Region

Stephen Kovacs— Petroleum Engineer, Office of Safety Management, Regional Field Operations, GOM OCS Region

¹ Designated Panel Chair

Lease Information

Lease OCS-G 17921 covers approximately 4093 acres encompassing all of VR 356, Gulf of Mexico, off the coast of the State of Louisiana. (See Figure-1) The block was leased in 1997 by OEDC Exploration & Production, acquired in 1999 by Coastal Oil & Gas USA, L.P., and acquired by Pisces Energy LLC effective November 1, 2007. Pisces Energy LLC changed its name to Energy Ventures, LLC (EnVen) effective June 14, 2013. EnVen remains the sole owner/operator of the lease. The EnVen VR 356 complex sits in 262 feet of water, approximately 80 statute miles from shore at latitude 28.1502 and longitude -92.1809.

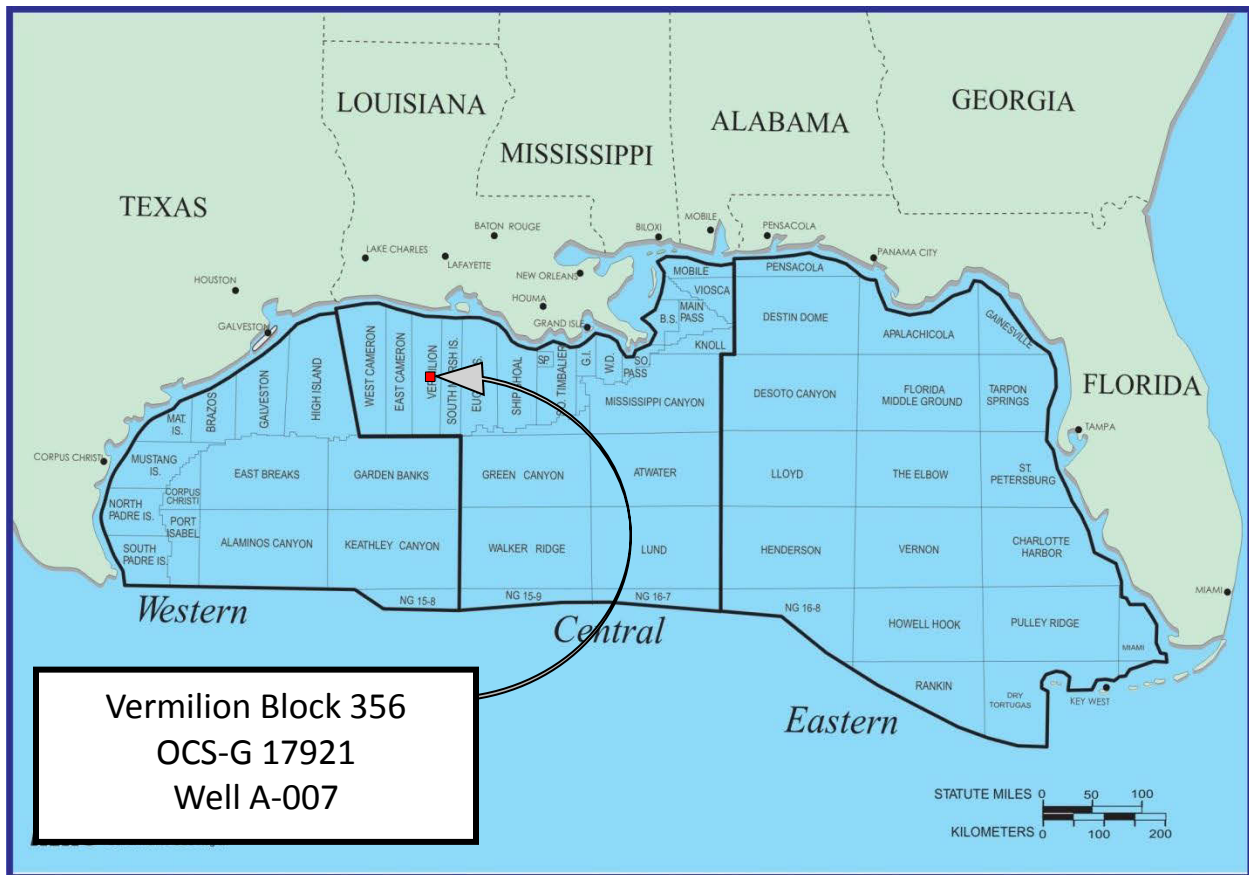


Figure 1: Location of Lease OCS-G 17921, Vermilion Area Block 356, Well A-007

The BSEE Investigation

The BSEE Investigation into this incident included a thorough review of EnVen's well application, permits, Well Activity Reports, and documents produced by Rowan Companies and EnVen. The Panel members also conducted interviews with some of the Rowan Louisiana crew and EnVen company representatives, and met several times to go over investigative findings. Inspectors/Incident Investigators were unable to board the rig for several weeks after the incident due to weather conditions, so the Panel members relied on daily situational reports, documents, and photos requested from both EnVen and Rowan Companies. After completing the above steps, the BSEE Investigation Panel reports the following;

Preparations for Drilling

While proceeding through the permit process for drilling operations on VR 356 A-007 well, both the BSEE and Enven's Engineers were aware of a previous loss of well control incident that occurred on April 10, 2013 when the Rowan Louisiana crews were conducting directional drilling operations on VR-356 A-006 well. While drilling the A-006 well, the 24" drive pipe was driven to 597' MD/TVD and a 17- 1/2" hole was drilled to 1,485' MD/1,405' TVD, when a quick burst of mud was blown up through the rotary. The diverter was closed and the upwind diverter line was isolated. After about an hour into the event, the rig pumps went down and the returns slowed and then stopped completely. The drill pipe was severed at 1,282' MD and a balanced cement plug was placed in the hole and dressed off to 873' MD in preparation for operations to the original hole. The new hole was successfully drilled and the 13-3/8" conductor casing set and cemented at 1,213' MD.

EnVen's VR 356 A-007 well design included setting the 13-3/8" casing above a shallow gas zone at 1,309' TVD that was found while drilling the A-006 well. It was thought that by cementing the 13-3/8" casing shoe at a shallower depth in the A-007 well, it would provide adequate shoe pressure in the case of a loss of well control incident. EnVen was fully aware of the possible shallow gas when drilling the A-007 well and had prepared by incorporating the new setting depth of its 13-3/8" casing. The BSEE followed up with a caution in the approval

comments of EnVen's Application for Permit to Drill a New Well. The comment reads, "Caution should be used while drilling the conductor and surface hole. The geologic review indicates that shallow gas may be encountered at 1,309 ft and 2,069 ft TVD". EnVen's objective was to penetrate the sands at 9,905 ft. measured depth (MD), 10,490 ft. MD, and 11,156 ft. MD.

EnVen received approval on November 27, 2013 to drill the A-007 well (API No. 17-706-40976-00). The well was directionally drilled from EnVen's "A" platform located in VR- 356 (Lease OCS-G 17921) with intentions of reaching total depth in South Marsh Island Block 166 (Lease OCS-G 33088). The January 30, 2014, Loss of Well Control incident occurred prior to reaching the lease line; therefore, the wellbore is entirely within VR 356 (Lease OCS-G 17921).

The panel found, through interviews, that the OIM and Company Representative knew there was an area of shallow gas and both had said that the information was relayed to crew members. However, after interviewing other crew members, the panel found that this information may not have been relayed clearly to the drilling crew.

Drilling Activities, Loss of Well Control

The Rowan Louisiana arrived at VR 356 on January 17, 2014, and began drilling or "spud" the A-007 well on January 25, 2014. From January 25, 2014 through January 30, 2014, they ran 13-3/8" conductor casing into the hole and set it at 1,217' MD and 1,200' TVD and had drilled the well to a depth of 2,217' MD / 1,935' TVD. The Driller stated in interviews that they had been experiencing "gumbo" buildup during the drilling operations. So, while drilling this hole section, he would move the drill pipe in and out of the wellbore every 1000 feet to gauge if it was clean. After reaching 2,217' MD / 1,935' TVD the Driller began to clean the hole or "circulate bottoms up". Then he stopped circulating and started a "short trip" which consisted of pulling the drill pipe and the BHA into the casing. The short trip operation was working fine and the hole was taking proper fluid, per stand, until the BHA reached the shoe.

When the first BHA stand with the first stabilizer came into the shoe, the driller noticed a 30K pound over-pull on his weight indicator and a 1 bbl gain in the trip tanks. This 30K over-pull was

within the Driller's "margin of over-pull" which is the amount of additional tension that can be applied to the drill string before it yields. The Driller then stopped moving the pipe, conducted a flow check, and noticed the well was not flowing or was "static". He slacked back down 25-30 feet, in an attempt to displace mud out of the hole, and then continued with the short trip by pulling the rest of the BHA into the shoe. When the drill bit was pulled into the shoe, the driller noticed another 30K pound over-pull on his weight indicator and a 10 bbl gain in the trip tanks. He again stopped moving the pipe and checked for flow and noticed the well was still static. This process started a suction or "swabbing effect" which allowed bottomhole pressure to decrease causing the well to go underbalanced and allowing formation fluid to enter the well.

The company representative, identifying the early detection of "swabbing", decided to have the Driller rig up and connect the Top-Drive System (TDS) to the drill pipe and begin circulating. The Driller made the connection, slacked back down 20-30 feet, and began circulating mud by pumping approximately 15 strokes a minute with 300-400 psi pressure. After pumping approximately 400 strokes, or 15 minutes, the well came in shooting mud "about 8 feet above the rotary". The Driller closed the annular and placed the rig on diverter directing the unexpected flow through the port and starboard diverter lines then overboard. Once wind direction was determined, the starboard diverter line was closed subsequently diverting the entire flow overboard through the port line. (Figure 2)

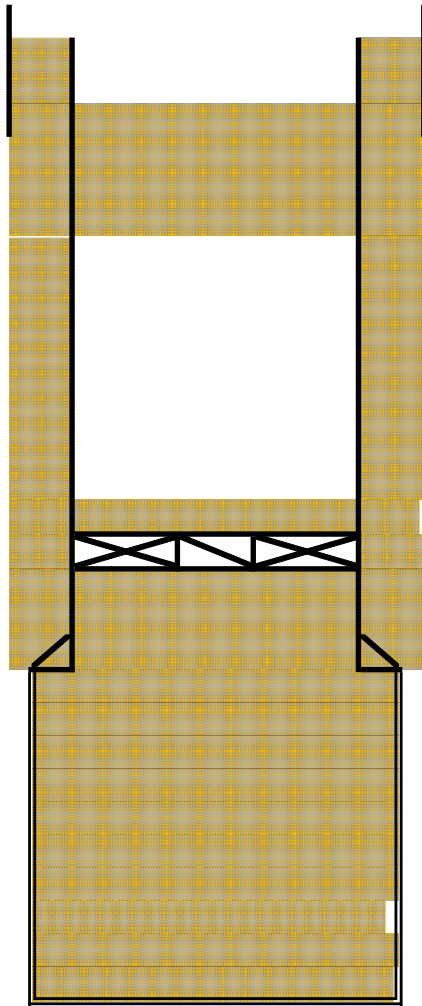


Figure 2: Picture of active port diverter line during the January 30, 2014 Incident

The Response

The OIM responded to the rig floor and observed the well on diverter. He consulted with the company representative and ordered another 100 pounds per square inch (psi) of pressure to be added to the diverter bag which put more pressure around the drill pipe preventing fluid from coming through the annular. The rig had three pumps, but only two pumping at one time. The rig pumped approximately 300 bbls of 14.2 pounds per gallon (ppg) kill mud back into the well without stopping the flow of gas and sand from the formation. After pumping all the kill mud onboard, the rig began pumping seawater. The OIM also ordered any extra engine cooling water diverted to the mud pits, instead of going overboard, so that they could have more volume at a faster rate. The operators immediately activated the VR 356 “A” platform’s Emergency Shut Down (ESD) system shutting in all the wells. All platform personnel were evacuated to the rig and later both rig and production non-essential personnel were evacuated to the Motor Vessel (M/V) Kristi and M/V Margaret Lab. A well control consultant was then brought on location as well as a resupply of kill weight mud. The well control crew used a process that is commonly referred as a “Dynamic Kill Procedure” by fluctuating kill weight mud and pumping sea water into the wellbore at high rates and various pressures in order to stop the flow. The well subsequently stopped after flowing on diverter for approximately 36 hours. The wellbore was then secured using a cement retainer, and by squeezing cement below and placing cement above the cement retainer. (Figure 3)

Mudline at 384'



24" cut & pulled at 457' (73' Below Mud Line)

13-3/8" cut & pulled at 467' (83' BML)

24" x 3/4" wall at 612' (228' BML)

Surface cement plug set at 540' - 725'
(168 cu ft.) Weight tested surface
plug to 20,000#

Pressure tested surface plug to 1000 psi

Casing tested to 1000 psi

TOC at 930' - weight tested to 20,000#

13-3/8" cement retainer at 1050'

"Retainer pressure tested to 1000psi"

13-3/8", 68ppf, HCN-80 BUTT at 1217' MD
(1200' TVD)

Squeezed 954 cu ft. cement below retainer
Sufficient to fill open hole

Figure 3: Final VR 356 Well A-007 wellbore schematic

Conclusions

Cause of Loss of Well Control

The Investigation Panel has concluded that the immediate direct cause of the loss of well control was due to the the following events:

- I. Drilling into a shallow gas, “high risk”, environment. Pursuant to geologic review as a part of the Application for Permit to Drill a New Well, there were indications of the existence of shallow gas at 1,309 feet and 2,069 feet TVD.

- II. While conducting a short trip operation within the “high risk” zone, the BHA was pulled into the shoe casing where it is believed a combination of clay and drilling mud had built up to form a “Gumbo Ball,” which is supported by the 30K pounds of overpull during the two attempts to pull out of hole with positive mud returns. This resulted in the lowering of bottom hole pressure below that of the formation pore pressure to a point where the well was capable of flowing, created by the “swabbing effect”.

Possible Contributing Cause of Loss of Well Control

In addition to the immediate cause, this Investigation Panel has identified the following possible contributing causes to the loss of well control incident:

- 1) A Morning Report for the Rowan Louisiana recorded that on January 30, 2014 between 0630-hours to 0830-hours, the rig crew connected to the TDS and began Pumping at 500 gallons per minute after twice attempting to pull the BHA through the casing shoe with 30K pounds of overpull, and receiving returns totalling 11 bbls. It is the conclusion of the Investigation Panel that a possible contributing cause may have been the failure to have the TDS made up and circulation started prior to, and during the “short trip” operation.

Recommendations

The Investigation Panel submits the following recommendations for EnVen and Rowan Companies:

- When conducting “short trip” operations with the knowledge of shallow gas zones, if and when the BHA is required to be pulled through the casing shoe, make up the TDS and start pumping prior to pulling into the shoe to eliminate the risk of swabbing. Also, consideration should be given to “pumping out” when pulling the BHA out of the hole.
- Improve communications to ensure all relevant crewmembers are made aware of shallow gas hazards and any guidance to mitigate the hazards.
- Limit drilling penetration rates, ROP, while drilling into zones with potential shallow gas to reduce build-up of cuttings and drilling mud, “Gumbo.”

Recommendations for BSEE

- When reviewing Applications for Permit to Drill, the BSEE may consider requesting more detailed shallow hazard mitigation procedures for those applications that involve drilling into an area with previously known shallow hazard incidents.
- The Investigation Panel recommends the BSEE Lake Charles District Office review the Panel Report in detail and considers any appropriate regulatory violation(s). If regulatory violation(s) are found, the District Office should issue an Incident of Non-Compliance(s) to EnVen or Rowan Company Inc. with any authorities supported by specific findings and bullet the individual items accordingly.

Safety and Environmental Management Systems

The Investigation Panel recommends EnVen and Rowan Companies consider the following relevant to their SEMS Program:

- *Hazard Analysis*

Review and strengthen the levels of hazards analysis, hazard mitigation and JSAs that are developed and implemented for the specific drilling environment, shallow gas, operations with the existing or potential safety, health and environmental hazards associated with each step; and the recommended action(s) and/or procedure(s) that will eliminate or reduce these hazards, the risk of a workplace injury or illness, or environmental impacts.

- *Operating Procedure*

Review and improve written drilling operation procedures that provide instructions for conducting safe and environmentally sound activities and work practices for identified hazards during operations and the degree of hazard present.

- *Safe Work Practices*

Improve communications to ensure all relevant personnel involved in the specific drilling operations are made aware of any known potential hazards, such as the potential for drilling into shallow gas zones, and any guidance to mitigate the hazards.