Bureau of Safety and Environmental Enforcement

PANEL REPORT

BSEE PANEL REPORT 2023-004

Investigation of May 15, 2021, Fatality

Lease OCS-G01220

Eugene Island Area Block 158 #14 Platform

Gulf of Mexico Region

Lafayette District

October 31, 2023

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ABBREVIATIONS AND ACRONYMS

API RP – American Petroleum Institute Recommended Practice

BSEE – Bureau of Safety and Environmental Enforcement

DP – Drive Pipe

EI – Eugene Island

EI 158 #14 Platform – Eugene Island Block 158 #14 Platform

EI 158 #14 Platform Well #27 – Well #27

EI 158 C-QRT Platform – Eugene Island Block 158 C-QRT Main Platform

Field-PIC – Field-Person in Charge

FWE – Fieldwood Energy LLC

GOM – Gulf of Mexico

HP – High Pressure

JSA – Job Safety Analysis

MOC – Management of Change

M/V – Motor Vessel

OCS – Outer Continental Shelf

psig – pounds per square inch in gauge

QNE – QuarterNorth Energy LLC

RFI – Request for Further Information

SAR – Search and Rescue

SEMS – Safety and Environmental Management Systems

SCSSV – Surface Controlled Subsurface Safety Valve

SITP – Shut-In Tubing Pressure

SSV – Surface Safety Valve

SWP – Safe Work Practice

DEFINITIONS

Probable Causes are those actions, events, or conditions that:

a) Would have prevented the incident event from occurring, if corrected;
b) Contributed significantly to the incident; and
c) Have the most compelling supporting evidence as to both the existence of the cause and the degree of its contribution to the incident.

Contributing Causes are those actions, events, or conditions that:

a) May have prevented the incident event from occurring, if corrected;
b) Contributed somewhat to the incident; and
c) Have less compelling evidence than the probable causes.

Contributing Factors are those actions, events, or conditions that would not have prevented the incident from occurring but contributed significantly to the occurrence and/or severity of the incident.

EXECUTIVE SUMMARY

On May 15, 2021, an incident resulting in a single fatality occurred on the Fieldwood Energy LLC (FWE) Eugene Island Block 158 Platform 14 (EI 158 #14 Platform). The FWE Field-Person in Charge (Field-PIC) and the Island Operating Company Contract Production A-Operator ("Victim") were conducting a pressure test by applying gas to a shut-in gas well's 16-inch casing when an overpressure event occurred.

On the morning of May 15, 2021, several operator employees and contractors, including the Field-PIC and Victim, attended the daily morning safety meeting held on the Eugene Island Block 158 C-QRT Main Platform (EI 158 C-QRT Platform), where they discussed the existence of sustained casing pressure on the EI 158 #14 Platform Well #27 (Well #27). The FWE Field Foreman tasked the Field-PIC and Victim with performing a casing pressure test on Well #27 using shut-in tubing pressure from adjacent Well #34.

At 0730 hours, the Field-PIC and Victim boarded the EI 158 #14 Platform with temporary test equipment that included a 50-foot High Pressure (HP) hose rated for 2,750 pounds per square inch in gauge (psig), a pressure regulator rated for 4,000 psig, and a digital pressure gauge rated for 5,000 psig. The Field-PIC connected an HP hose to a needle valve on the top of the Well #34 tree without the available pressure regulator and without a pressure safety valve. The Field-PIC was utilizing an existing analog gauge rated for 10,000 psig previously installed at the top of the Well #34 tree to monitor pressure. The Victim then boarded the casing deck and connected the opposite end of the HP hose to a needle valve on the 16-inch casing for Well #27.

The Victim connected a digital pressure gauge rated for 5,000 psig onto the Well #27 16-inch casing valve to monitor and record the pressure of the 16-inch casing. At approximately 0800 hours, the Field-PIC opened the needle valve on the top of Well #34, and the Victim opened the needle valve on the Well #27 16-inch casing to begin the test.

The Victim was monitoring the test pressure when the 16-inch casing of Well 27 exploded in front of him, releasing fluid through a 1½-inch opening between the 36-inch drive pipe and the wellhead base plate. Other operator employees and contractors heard a loud sound, followed by gas escaping, and felt the explosion approximately 1 mile away in the living quarters of the manned EI 158 C-QRT Platform. Witnesses on the EI 158 C-QRT Platform stated they observed black smoke coming from the EI 158 #14 Platform at the time of the explosion, which was discovered to be a black oily film that was released through the 1½- inch opening. Witnesses observed a sheen forming next to the EI 158 #14 platform shortly after the explosion.

The Field-PIC observed the Victim laying down on the casing deck. He found the Victim unresponsive and with lacerations to the head and abdomen. The Victim was flown to Lafayette General Hospital, where he was pronounced dead.

At 1112 hours, an FWE representative notified the Bureau of Safety and Environmental Enforcement (BSEE) Lafayette District Office via its after-hours phone number of a fatality on the EI 158 #14 Platform. The FWE representative stated that an contractor employee was fatally injured during work associated with a casing pressure test in the well bay, and that the person sustained lacerations to the head and abdomen at approximately 0810 hours.

The BSEE Gulf of Mexico Region Director convened a panel ("BSEE Panel") to investigate the cause(s) of the fatality. The BSEE Panel identified the following probable cause, contributing causes, and contributing factors that may have contributed to the totality of the incident:

Probable Cause

- The Field-PIC and Victim conducted a pressure test using temporary test equipment without using a pressure regulator and pressure safety valve, which resulted in the overpressure and subsequent rupture of the Well #27 16-inch casing.

Contributing Causes

- FWE failed to develop or implement an adequate hazards analysis (facility level) and a Job Safety Analysis (operations/task level) for the activities on May 15, 2021, as described within its Safety and Environmental Management Systems (SEMS) Manual.
- FWE failed to follow its Pre-job Planning Safe Work Practice, as described within its SEMS Manual.

Contributing Factors

- Based on the manner in which the gauge could be switched between output modes, the Victim possibly read the digital gauge pressure in units of bars rather than psig.
- FWE failed to conduct a Management of Change, as described within its SEMS Manual.

The BSEE Panel makes the following recommendations to industry as a result of its investigative findings detailed within this report in an effort to further promote safety and prevent a recurrence of the same or similar event, protect the environment, and conserve resources on the U.S. Outer Continental Shelf (OCS):

- Industry should use the hazards analysis to develop procedures to provide to personnel performing the operations, and to enable implementation of all necessary measures of hazard mitigation. All non-routine operations should undergo a hazards analysis by personnel with the appropriate level of expertise.
- Industry should consider implementing processes to assess the risk presented by individual inactive wells and use this assessment to prioritize abandonment. Currently, BSEE analyzes three factors in enforcing well abandonment: lease expiration, idle iron, and casing pressure request denials. There are a significant number of wells on the OCS that are not on expired leases, that do not qualify as idle iron under applicable regulatory guidance, and that are not under casing pressure request denials, but that do have sustained casing pressure indicating some loss of well integrity. If industry assessed these wells for abandonment priority, it could reduce risk to personnel working offshore and to the environment.
- Any time temporary equipment is utilized where the source pressure is greater than any downstream components' pressure rating, a pressure regulating device and a pressure safety valve should be installed.

INTRODUCTION

AUTHORITY

Pursuant to 43 U.S.C. § 1348(d)(2) (Outer Continental Shelf [OCS] Lands Act, as amended) and 30 CFR part 250 (Department of the Interior regulations), the Bureau of Safety and Environmental Enforcement (BSEE) is required to investigate and prepare a public report of this incident. BSEE has authority pursuant to 43 U.S.C. § 1348(f) to summon witnesses and require the production of documents while conducting an investigation pursuant to 43 U.S.C. § 1348(d)(1)-(2).

The BSEE Gulf of Mexico (GOM) Region Director convened an investigation panel ("BSEE Panel") by memorandum dated May 17, 2021, to investigate the incident that occurred on the Fieldwood Energy LLC (FWE) Eugene Island Block 158 #14 Platform (EI 158 #14 Platform) on May 15, 2021. The BSEE Panel included:

- Wade Guillotte – Inspector/Accident Investigator, Production Operations Unit, Lafayette District, GOM OCS Region
- Pierre Lanoix[1] – Senior Incident Investigation Coordinator, Office of Incident Investigations, GOM OCS Region
- Darron Miller – Special Investigator, Safety and Incident Investigations Division, Headquarters
- Glenn Steele – Petroleum Engineer, Production Operations Support Section, GOM OCS Region

BACKGROUND

On May 15, 2021, the FWE Production Foreman assigned a task to the Island Operating Company Contract Production A-Operator ("Victim") and the FWE Field-Person in Charge (Field-PIC) to perform a casing pressure test on EI 158 #14 Platform Well #27 (Well #27).

LEASE & PLATFORM

The lease, OCS-G01220, covers approximately 5,000 acres on the OCS within the GOM off the Louisiana coast (Figure 1). FWE acquired operating rights interests in the lease through assignment in 2014 and took assignment of 100 percent record title interests in 2018. As the lessee and designated operator, FWE was responsible for ensuring all platform operations performed were conducted in compliance with all applicable regulations.

[1] Panel Chair

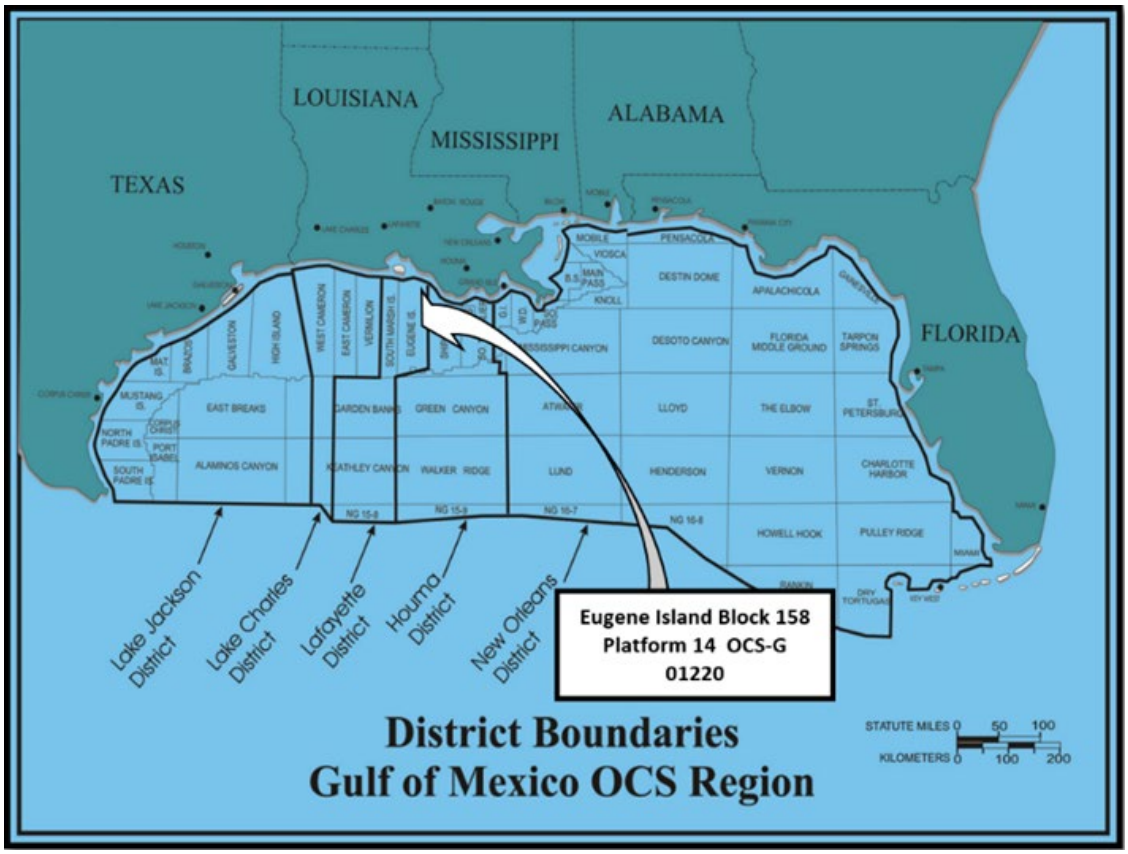

Figure 1 – Location of Eugene Island Block 158 #14 Platform

The EI 158 #14 Platform is a four-pile, fixed steel structure with eight well slots and conductors (Figure 2). Shell Oil Company originally installed the platform in 1969. The water depth at the platform location is approximately 82 feet, and the distance from shore is approximately 40 miles. Apache Corporation was designated the operator as of September 4, 2003. FWE was designated the operator as of December 23, 2013.

As a result of FWE's reorganization plan, confirmed by the Bankruptcy Court for the Southern District of Texas, effective August 27, 2021, FWE underwent a divisive merger that led to the creation of multiple new corporate entities, including QuarterNorth Energy LLC (QNE). Subsequently, QNE was contracted to perform maintenance and monitoring on the lease. Effective July 1, 2022, FWE designated Apache Corporation as operator of all Block 158, Eugene Island Area.

Figure 2 – Eugene Island Block 158 #14 Platform

COMPANIES

FWE was the lessee and designated operator of record at the time of the incident. FWE used Island Operating Company as the primary contractor service provider to perform some of its relevant onsite operations.

PLATFORM OPERATIONS

The EI 158 #14 Platform hosts eight completed wells; however, none were producing at the time of the incident. Field operator employees and contractors visit the satellite platform daily to perform pollution checks, along with routine monitoring and testing as required by regulations. On May 15, 2021, the assigned operator employees and contractors were to pressure test the Well #27 16-inch casing during their visit.

BSEE INVESTIGATION

The BSEE investigation included ordering FWE and its contractors to take all steps necessary to immediately identify, retain, and preserve all potentially relevant information related to the incident. The BSEE Panel conducted multiple site visits for investigative activities. Additionally, the BSEE

Panel interviewed witnesses, along with other various parties who were involved with events that led up to the May 15, 2021, incident. The BSEE Panel requested documents from FWE, QNE, and their contractors. The documents requested included, but were not limited to, Safety and Environmental Management Systems (SEMS), Safe Work Practices (SWPs), company policies, company procedures, casing diagnostic records, inspection records, and training records. The BSEE Panel reviewed the documents it had received and identified key areas of focus for the investigation.

TIMELINE OF EVENTS

The BSEE Panel developed the following timeline from a combination of documentation and witness accounts obtained throughout the course of the investigation.

On March 16, 2021, the field operator employees and contractors performed a monthly monitoring casing pressure check on Well #27. The field operator employees and contractors recorded the pressure on the 10¾-inch casing at 315 pounds per square inch in gauge (psig). Because the personnel observed the pressure on the 10¾-inch casing at higher than 100 psig, FWE needed to conduct a casing diagnostic within 30 days. Per 30 CFR § 250.521(a), a casing diagnostic test must be performed within 30 days after first observing or imposing casing pressure greater than 100 psig on a fixed platform well. FWE noted the casing diagnostic due date as April 15, 2021.

On March 21, 2021, FWE A-Crew operator employees and contractors started a bleed down/build up casing diagnostic test on the 10¾-inch casing of Well #27, but they halted the diagnostic test after 30 minutes due to liquid returns.

On March 30, 2021, FWE B-Crew operator employees and contractors made a second attempt to perform a bleed down/build up casing diagnostic test on the 10¾-inch casing of Well #27. At the time of the diagnostic test, the short string tubing, 7⅝-inch casing, and 10¾-inch casing pressures were all equalized at 360 psig. The B-Crew operator employees and contractors documented 15 barrels of condensate returns, along with the 10¾-inch casing bleeding to 0 psig within 24 hours. During the diagnostic test, the operator employees and contractors observed the tubing pressure, production casing, and surface casing pressures all decreasing at the same time; therefore, they were confident that the well had demonstrated communication between the tubulars, which would require further action.

On April 22, 2021, the FWE Senior Regulatory Specialist submitted a casing pressure request to BSEE, per 30 CFR § 250.526(b).

On April 23, 2021, the responsible BSEE Engineer placed the casing pressure request in review. After the review, the BSEE Engineer returned the submittal with a request for further information (RFI). The RFI included the following: “Perform a 250 psig test on the 16” annulus and attach results. BSEE is requesting this test to ensure there is a competent secondary barrier to prevent fluids from exiting to the atmosphere via the Drive Pipe (DP).” The American Petroleum Institute Recommended Practice (API RP) 90, *Annular Casing Pressure Management for Offshore Wells*, incorporated by reference at 30 CFR § 250.198 and 250.519, defines this type of annulus pressure test in section 5.4.5.7 as a mechanical integrity test. Leak evaluation is one of the reasons listed in API RP 90 for performing this type of pressure test.

On April 27, 2021, an internal email correspondence between FWE Engineers stated, "Since the well is on the decom list it is probably best for the operations team to perform the requested test in case any issues arise."

On April 30, 2021, the FWE Senior Regulatory Specialist emailed the BSEE Engineer asking for clarification on how long the test needed to be and whether a bump test would be sufficient. In return, the BSEE Engineer responded, " Ensure that the pressure does not drop more than 10 percent in 15 minutes."

On April 30, 2021, an FWE Production Engineer emailed the Production Field Foreman on the Eugene Island Block 158 C-QRT Main Platform (EI 158 C-QRT Platform) stating, "We have until 05/23/2020 [*sic*]to complete. I suggest to have someone monitor the drive pipe below deck during the test to ensure no leaks out of the drive pipe."

On May 10, 2021, an FWE Production Engineer emailed the Production Field Foreman on the EI 158 C-QRT Platform asking, "Can you please plan to perform the below casing pressure test with the #34 well SITP [Shut-In Tubing Pressure] gas on chart?" The FWE Production Field Foreman replied, "In order to monitor below deck we will need extensive scaffolding and a standby boat?" The FWE Production Engineer responded by stating: "However you see fit. We need to perform this test either way per BSEE."

On May 15, 2021, the Field-PIC and Victim boarded the EI 158 #14 Platform at 0730 hours. According to the Field-PIC, they arrived on the platform, went upstairs to silence the foghorn, and grabbed a ladder. Next, they set up their temporary test equipment consisting of a 50-foot High Pressure (HP) hose rated for 2,750 psig and a digital pressure gauge rated for 5,000 psig, and started the Well #27 surface casing pressure test.

During the test, the casing ruptured due to overpressure, and highly pressurized fluids came into contact with the Victim. The Field-PIC immediately responded by shutting off the gas flow from Well #34, and the Field-PIC went down to check on the Victim. He observed the Victim unresponsive on the casing deck, laying down on the grating between Well #27 and the handrail.

The Field-PIC immediately contacted the EI 158 C-QRT Platform personnel to inform them of the incident and the Victim's status. The Field-PIC then instructed the Motor Vessel (M/V) stationed below to go pick up personnel from the EI 158 C-QRT Platform. The EI 158 C-QRT Platform PIC contacted a Search and Rescue (SAR) helicopter at 0827 hours, alerting the SAR team that one person had sustained serious injuries at the EI 158 #14 Platform. The medic, along with FWE personnel, loaded equipment and boarded the M/V, then headed over to the EI 158 #14 Platform. When the medic arrived on the scene, the Victim was still unresponsive. The medic attended to the Victim's injuries and attempted to stabilize him while awaiting a SAR helicopter.

The SAR helicopter arrived on scene at 0923 hours and departed at approximately 1040 hours. The Victim arrived at Lafayette General Hospital at 1203 hours.

At 1112 hours, an FWE representative contacted the BSEE Lafayette District Office after-hours phone number to report an explosion that resulted in a fatality on the EI 158 #14 Platform.

On May 15, 2021, FWE issued an email to all of its facilities:

> …This morning, a tragic accident happened at one of our locations that resulted in a fatality. The operation involved Production Operators introducing pressure to a casing string that resulted in a rupture event. In an effort to ensure the safety of our offshore workforce, the action below is to be implemented immediately.
>
> Until it is approved by the Executive Leadership Team, no more casing pressure work/diagnostics are to be done by Production Operations. In certain circumstances, approvals can be granted by Management but should be handled on a case by case basis. Decommissioning or wellwork operations where approved procedures, designed pressure control equipment, and supervisory oversight is in use can continue.
>
> Tomorrow morning, prior to initiating any work, we are to have a Company Wide Gulf of Mexico Safety Stand Down in our morning safety meetings. In this Safety Stand Down, make sure that the email above is clearly understood by all parties. As part of this Safety Stand Down, please stress the inherent risks associated with our offshore operations when dealing with hydrocarbons and pressure and the need to always be extremely vigilant in identifying risk and mitigating those risks. Our JSA process is our tool to ensure that we are always performing this for all of our work activities….

EI 158 #14 Platform Well #27

At the time of the incident, Well #27 was a shut-in gas-lifted oil well on the EI 158 #14 Platform that last produced in February 2013. The Shell Oil Company drilled the well in 1970 and sidetracked the well in 1995. The casing and wellhead design had three annuli that were pressure containing and monitorable: 16-inch x 10¾-inch (C annulus), 10¾-inch x 7⅝-inch (B annulus), and the 7⅝-inch x tubing (A annulus).

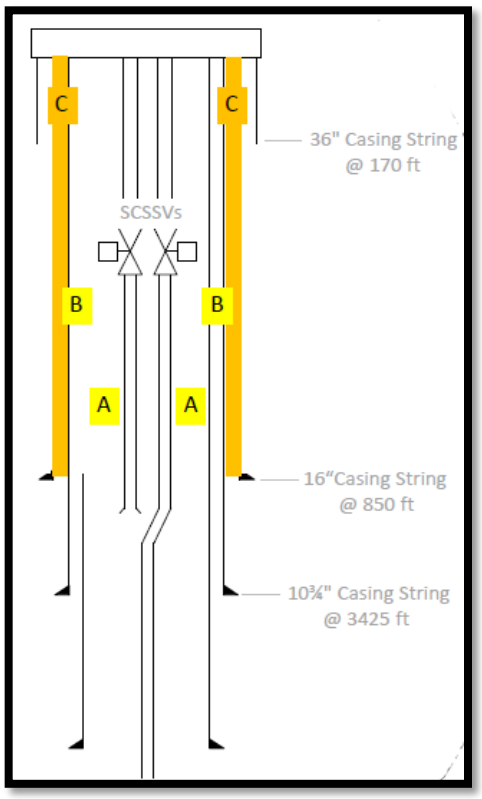

Figure 3 – Well #27 Wellbore Diagram

EI 158 #14 Platform Well #27 - Casing Pressure Diagnostic

According to information FWE provided with its casing pressure request to the BSEE Engineer on April 22, 2021, FWE operator employees and contractors initiated a bleed down/build up diagnostic on the 10¾-inch casing of Well #27 on March 21, 2021, but they halted the diagnostic after 30 minutes due to liquid returns. On March 30, 2021, FWE operator employees and contractors initiated another bleed/down build up diagnostic on the 10¾-inch casing of Well #27. At the time, the short string tubing, 7⅝-inch casing, and 10¾-inch casing pressures were all equalized at 360 psig. The operator employees and contractors performed the diagnostic by bleeding fluid from the 10¾-inch casing via a ½-inch needle valve. It took 24 hours for the 10¾-inch casing pressure to bleed to 0 psig, with 15 barrels of condensate returns taken. The following data from the casing diagnostic performed are indicators of potential communication between tubulars:

- The pre-bleed pressures were equal on the short string tubing, 7⅝-inch casing, and the 10¾-inch casing;
- Pressure declined on the 7⅝-inch casing while the operators bled down the 10¾-inch casing; and
- 15 barrels of condensate returns were taken during the 10¾-inch bleed down.

Based on this information, FWE concluded that Well #27 had a communication path from the short string tubing to the 7⅝-inch casing and a communication path from the 7⅝-inch casing to the 10¾-inch casing. Per 30 CFR § 250.525(c), an operator is required to take action after a casing diagnostic test if the well "has demonstrated tubing/casing, tubing/riser, casing/casing, riser/casing, or riser/riser

communication." Pursuant to 30 CFR § 250.526, FWE had two options for complying with this requirement: (1) submit a notification of corrective action to BSEE (paragraph a), indicating its intention to remediate the sustained casing pressure (e.g., by abandoning the well), or (2) submit a casing pressure request to BSEE (paragraph b), asking to continue to operate the well in its existing condition. FWE chose the latter, and on April 22, 2021, FWE submitted the aforementioned casing pressure request to BSEE.

WELL #27 16-INCH CASING PRESSURE TEST

On April 23, 2021, the BSEE Engineer reviewing the casing pressure request sent an RFI to FWE, with a due date for FWE to respond by May 23, 2021. The RFI included the following instruction: "Perform a 250psi test on the 16" annulus and attach results. BSEE is requesting this test to ensure there is a competent secondary barrier to prevent fluids from exiting to the atmosphere via the DP [drive pipe]." The reason for needing to ensure the competency of the 16-inch casing as a barrier was that the casing pressure on the 16-inch casing historically had been 0 psig. This could have been due either to the absence of any source of sustained casing pressure, or to a loss of integrity in the 16-inch casing that prevented it from acting as a competent barrier to contain fluids and therefore pressure.

The BSEE Engineer's lack of confidence in the 16-inch casing integrity stemmed from the fact that operators often request variances from the requirement to pressure test to confirm isolation of annuli during well abandonment (30 CFR § 250.1715(6)) because holes in casings at the surface caused by corrosion preclude top-down pressure tests. Because Well #27 had known communication from the tubing out to the 10¾-inch casing, the integrity of the 16-inch casing was necessary for there to be two barriers to the environment. Maintaining two barriers to the environment is consistent with BSEE's barrier philosophy. In this case, considering the known frequency of outermost casings in the GOM experiencing a loss of integrity as a result of corrosion, the BSEE Engineer requested the pressure test to ensure with some degree of confidence that two barriers to the environment were in place on Well #27.

API RP 90, incorporated by reference in 30 CFR §§ 250.198 and 250.519, defines this type of annulus pressure test in section 5.4.5.7 as a mechanical integrity test. Leak evaluation is one of the reasons listed in API RP 90 for performing this type of pressure test. The BSEE Engineer specified that FWE perform the test to 250 psig to be consistent with common pressure testing practices used to confirm annular isolation.

The FWE 16-inch pressure test procedure was not submitted to BSEE for review prior to the operator performing the test. FWE did not communicate to BSEE any safety concerns with performing the requested test, or request any extensions to the RFI due date to allow for more time to plan and/or perform the requested operation. Additionally, FWE did not submit a request to the BSEE Lafayette District Manager for approval to utilize process gas via temporary test equipment, as required by 30 CFR § 250.867(c). The only communication between FWE and BSEE, after the 16-inch pressure test was requested via the RFI and prior to the incident, was an email dated April 30, 2021, from FWE to the BSEE Engineer who had requested the test. FWE asked how long the test needed to be and "if a bump test would suffice…." The BSEE Engineer responded that FWE must demonstrate that the " pressure does not drop more than 10 percent in 15 minutes."

TEMPORARY TEST EQUIPMENT

On May 10, 2021, an FWE Production Engineer emailed the Production Field Foreman on the EI 158 C-QRT Platform asking, "Can you please plan to perform the below casing pressure test with the #34 well SITP gas on chart?" During the BSEE Panel interviews, the FWE Production Engineer stated:

> We had a conversation over the phone, don't remember exact date, the PIC, and I discussed the conditions of the platform. No crane in-service, no containment, no produced water, shut in over a year. FWE Production Engineer and Production Foreman agreed if there was gas available from a well or pipeline that would be the best option to perform the test.

During their phone conversation, the FWE Production Engineer suggested they conduct a management of change (MOC). However, the Production Field Foreman felt it was unnecessary since he thought it was a routine operation.

On the morning of May 15, 2021, several operator employees and contractors, including the Field-PIC and Victim, attended the daily safety meeting held on the EI 158 C-QRT Platform. During the safety meeting, the personnel on the facility discussed safety topics, along with the work activities that operator employees and contractors had planned for the day. These discussions included: diesel generator readings, housekeeping, swing rope transfers, pressure, plug checks at the EI 136 #1 Platform, casing diagnostics at the EI 175 #3 Platform, and working on casing valves at the EI 158 JB Platform. The FWE Field Foreman added the EI 158 #14 Platform Well #27 surface casing pressure test to the day's work scope.

The FWE Field Foreman had a brief discussion about the task with the operator employees and contractor and gave them a handwritten note with the maximum pressure of 250 psig to apply to the casing. The Platform-PIC assisted the Field-PIC and Victim in gathering tools and temporary test equipment for the job. Figures 4 and 5 show the temporary test equipment, which consisted of a 50-foot HP hose rated for 2,750 psig, a pressure regulator rated for 4,000 psig, and a digital pressure gauge rated for 5,000 psig. The Field-PIC and Victim then headed down to the boat landing and boarded the M/V at 0715 hours. The Field-PIC and Victim departed the EI 158 C-QRT Platform with the temporary test equipment to start the casing pressure test.

Figure 4– Photograph of Temporary Test Equipment

Figure 5– Photograph of Upper Deck with Pressure Regulator, High Pressure Hose, and Black Case Laying on Deck

The Field-PIC and Victim arrived on the EI 158 #14 Platform to conduct a casing pressure test on the Well #27 16-inch casing. Before they started on the casing pressure test, the Field-PIC contacted the EI 158 C-QRT Platform PIC via handheld radio to confirm the use of Well #34 HP gas to apply 250 psig to the Well #27 16-inch casing for the pressure test. Well #34 was a shut-in HP gas well on the EI 158 #14 Platform that last produced in September 2019.

The Field-PIC connected a low-pressure poly flow tubing from the Well #27 production casing gauge valve to the Well #34 Surface Safety Valve (SSV), bypassing the platform safety system to open the well. Next, the Field-PIC connected the HP hose to the top of the Well #34 gauge valve without any type of pressure regulating device and without a pressure safety valve. Then, the Victim boarded the casing deck and connected the opposite end of the HP hose to the 16-inch casing valve on Well #27. The Victim connected a digital pressure gauge rated for 5,000 psig onto the Well #27 16-inch casing to monitor the pressure.

The Field-PIC opened the SSV in an attempt to conduct the casing pressure test to the 16-inch casing. The Field-PIC opened the needle valve on the top of Well #34, and the Victim opened the needle valve on the Well #27 16-inch casing. According to the Field-PIC, the digital pressure gauge pressure only increased to 51 psig. The target pressure was 250 psig. The Field-PIC closed the needle valve on Well #34 and connected the hydraulic hand pump to the Well #34 Surface Controlled Subsurface Safety Valve (SCSSV) to open the SCSSV. The Field-PIC was using an analog pressure gauge rated for 10,000 psig to read the Well #34 SITP, which at the time was approximately 4,490 psig prior to opening the needle valve once again and sending pressure to the Well #27 16-inch casing (Figure 6).

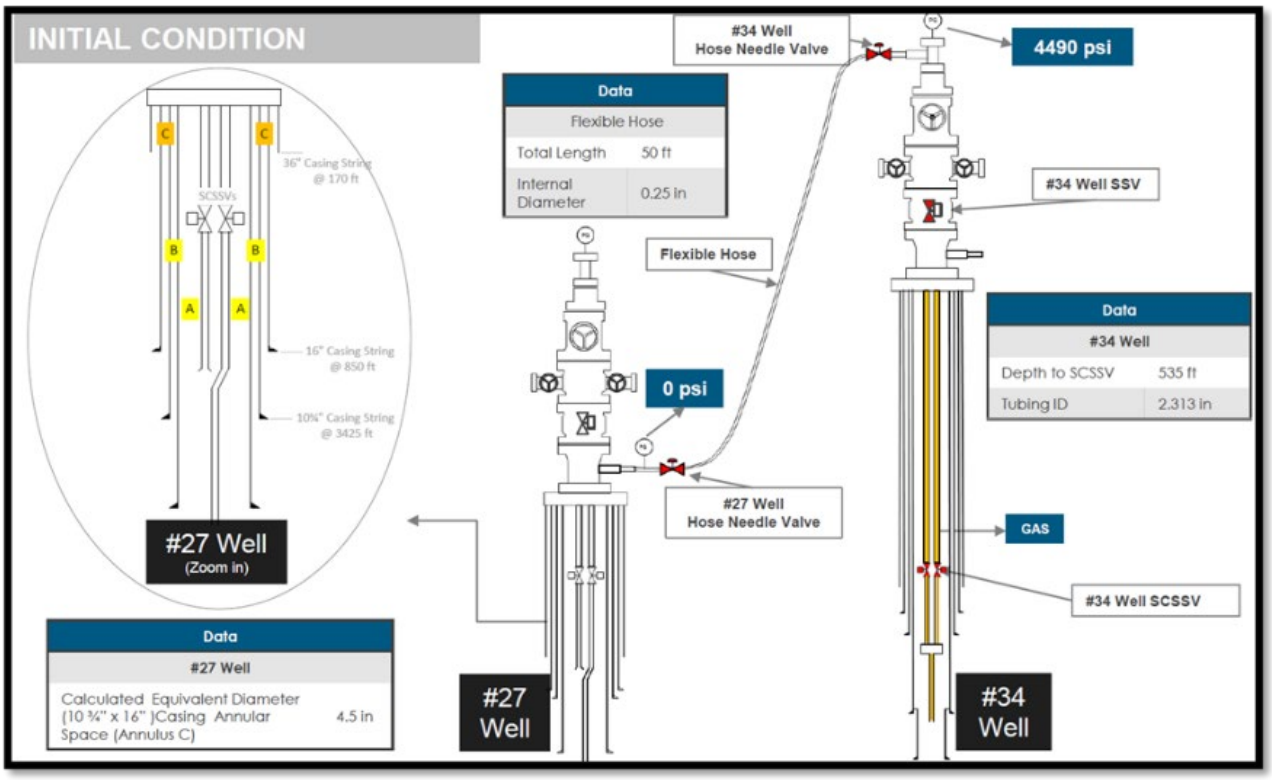

Figure 6 – Initial Condition of Well #27 and Well #34 before Explosion

The Field-PIC cracked open the needle valve to continue pressuring up the Well #27 16-inch casing. The Field-PIC stated he was unaware at the time what the rating was for the 16-inch casing. The rating for the 16-inch casing was 1,640 psig maximum internal yield pressure. According to the Field-PIC, the Victim told the Field-PIC the pressure was at 100 psig. Minutes later, the Victim told the Field-PIC the pressure was at 175 psig on the digital pressure gauge. Seconds after the Victim told the Field-PIC the pressure was 175 psig, an explosion occurred on Well #27 (Figure 7).

The digital pressure gauge used had two measurement modes, one to display pressure in units of psig and the other in units of bars. These measurement modes are alternated on the device by a single button press. One bar is equivalent to approximately 14.5 psig. Noting the conversion of units, the minimum internal yield pressure of the 16-inch casing can also be expressed as approximately 113 bars.

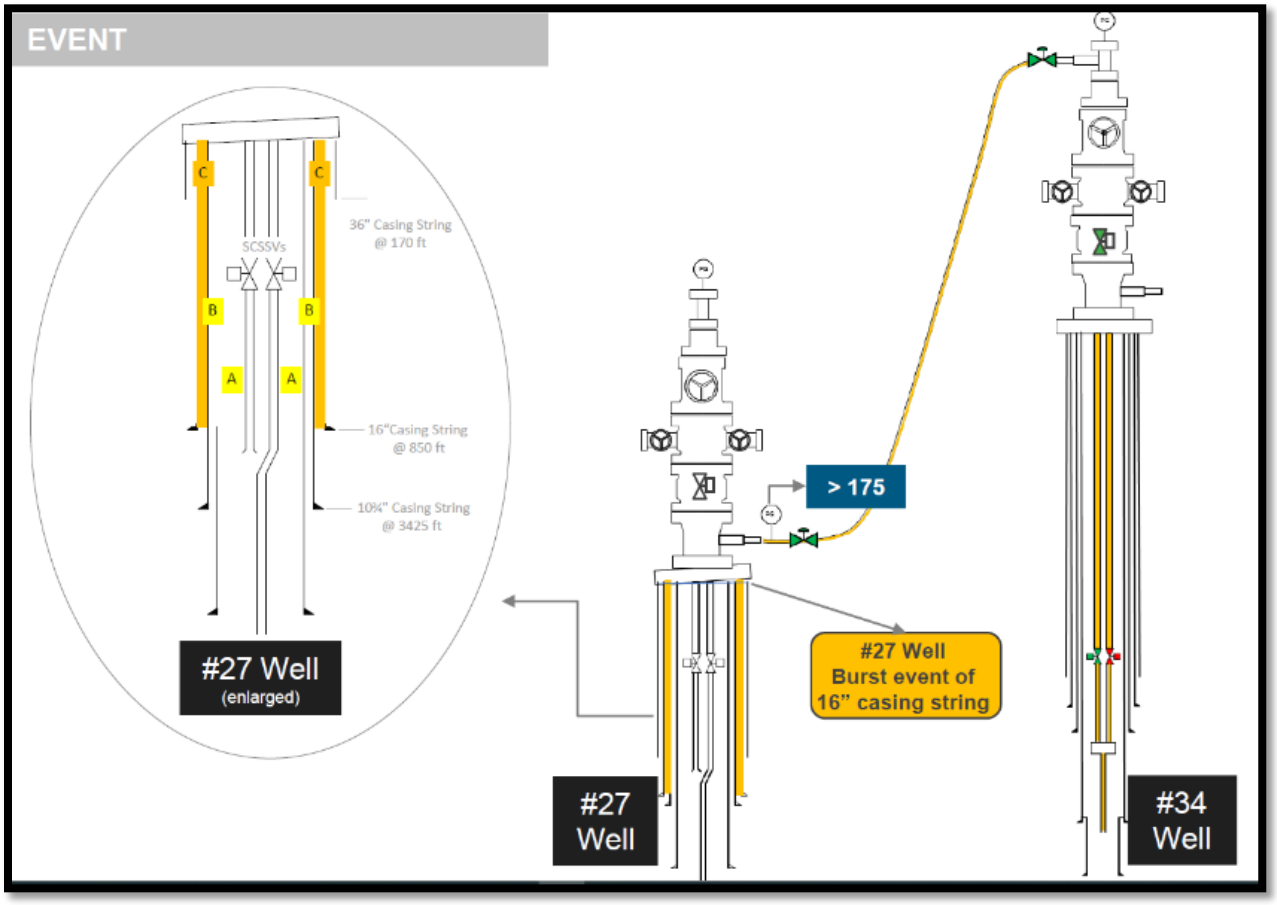

Figure 7 – Condition of Well #27 after Explosion

During the BSEE Panel interviews, the Field-PIC stated that he and the Victim were writing down the steps on a blank Job Safety Analysis (JSA) as they conducted the casing pressure test. Furthermore, the Field-PIC stated that the morning of the incident was the first time he and the Victim had heard of the test; they had no procedures to follow, and due to the limited information provided, they had to figure out how to conduct the test as they performed the job.

BSEE Initial Onsite Investigation, May 16, 2021

On May 16, 2021, the BSEE Lafayette District Inspector/Accident Investigator and Supervisory Inspector ("BSEE Investigators") conducted the initial onsite investigation onboard the EI 158 #14 Platform. The platform was shut-in at the time of the onsite investigation. Upon boarding the platform, the BSEE Investigators observed a black oily film covering the casing deck, the well bay area, and the legs of the structure leading up to the production deck. The BSEE Investigators noticed the handrail in front of Well #27 bent forward, as well as the handrail missing on the west side of Well #27.

The BSEE Investigators observed a hose with one end connected to a needle valve on the Well #27 16-inch casing leading upward through the grating. It appeared a gauge was missing on the needle valve connected to the Well #27 16-inch casing. The BSEE Investigators noticed an opening between the Well #27 wellhead and 36-inch DP with a piece of metal protruding near the opening (Figure 8).

Figure 8 – Photograph of Incident Scene Showing Effect of Explosion

Additionally, the BSEE Investigators observed a piece of grating located above and slightly to the east of Well #27 that had been severely damaged and bent in an upward position due to the explosion. As the BSEE Investigators walked to the well deck area, yellow tape surrounded an open hole due to the damaged grating.

The BSEE Investigators observed the hose that connected to the Well #27 16-inch casing valve leading through the grating connected to a needle valve with a gauge on the top of Well #34. The BSEE Investigators identified a severed piece of ⅜-inch poly flow tubing that initially connected the Well #27 production casing to the Well #34 SSV. The BSEE Investigators took a photo to document the remaining SITP of 2,500 psig on Well #34 (Figure 9).

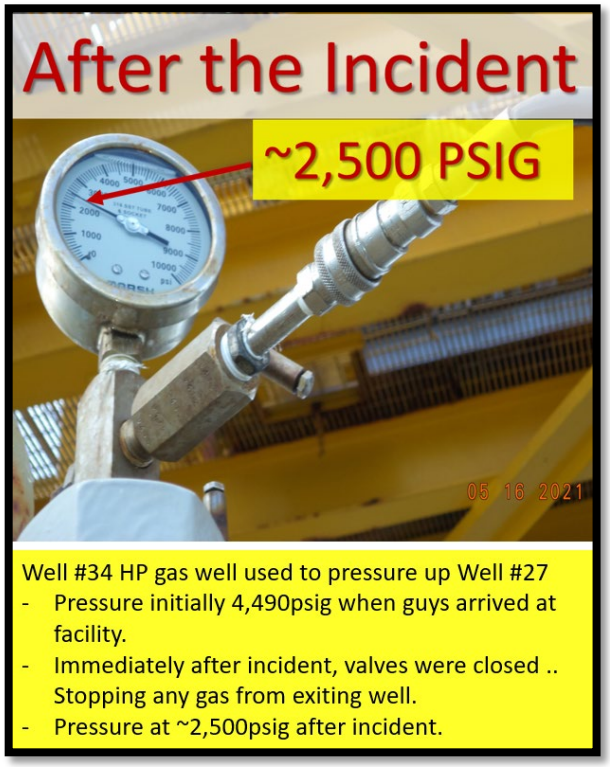

Figure 9 – Post-incident Photograph of Well #34 Shut-In Tubing Pressure

The BSEE Investigators saw a hydraulic hand pump connected to the Well #34 SCSSV. The hydraulic hand pump had been used to apply pressure to open the well SCSSV. The BSEE Investigators observed a spare HP hose and a pressure regulator in the well bay area. However, the Field-PIC and Victim did not utilize this equipment during the pressure test. The BSEE Investigators found a damaged tally book on the EI 158 #14 Platform and brought it back to the EI 158 C-QRT Platform to prevent weather damage. BSEE Investigators took photos of the information located in the tally book. Following a complete initial onsite investigation of the temporary test equipment used to perform the casing pressure test, the BSEE Investigators identified potential hazards that the Field-PIC and Victim encountered during the testing process; however, the BSEE Investigators noted that the Field-PIC and Victim did not use any safety devices to mitigate those hazards.

Following their investigation of the EI 158 #14 Platform, the BSEE Investigators conducted interviews at the EI 158 C-QRT Platform with FWE employees and contract employees that were part of the rescue efforts, as well as with witnesses who saw a cloud from various locations after the explosion occurred.

The FWE Field Foreman told the BSEE Investigators that a digital gauge connected to the 16-inch casing sheared off and fell into the GOM waters due to the explosion. The BSEE Investigators requested that FWE retrieve the digital gauge and attempt to get the latest recorded pressures when the explosion occurred.

ADDITIONAL FINDINGS

On May 17, 2021, FWE hired a diving vessel team to retrieve the digital pressure gauge that was

sheared off the needle valve on the Well #27 16-inch casing from the explosion (Figure 10). During the diving process, the team retrieved the digital pressure gauge from the seafloor.

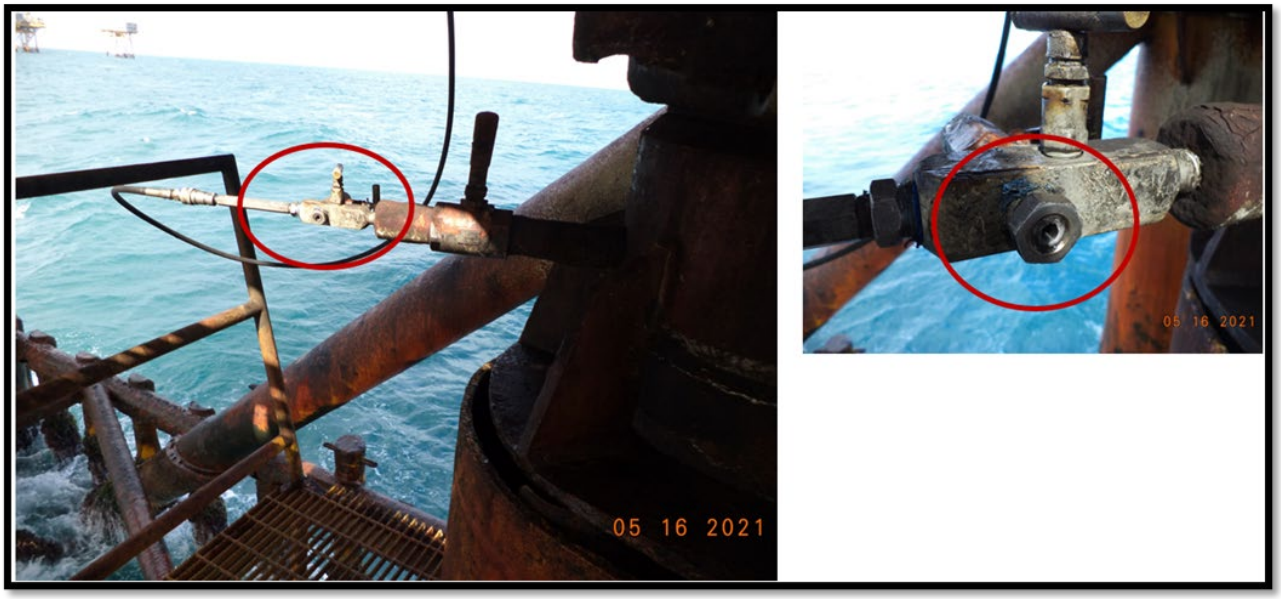

Figure 10 – Digital Gauge Connected to Well #27 16-inch Casing Sheared Off from Explosion

On May 19, 2021, the BSEE Investigators visited the FWE Lafayette office to witness FWE's third-party digital pressure gauge vendor attempt to retrieve the recorded data stored on the digital pressure gauge. After several attempts, the third-party vendor could not retrieve the recorded data, determining that the internal electronic functions of the digital pressure gauge were destroyed due to the explosion and being submerged in saltwater. Additionally, the BSEE Panel contacted the digital pressure gauge manufacturer, and the manufacturer determined that due to the damage, the recorded data could not be retrieved.

On May 27, 2021, members of the BSEE Panel returned to the EI 158 #14 Platform to conduct a damage assessment of the platform and to witness FWE conduct the borescope operation to view the internal damage of the Well #27 16-inch casing (Figure 11). FWE took measurements of the 36-inch DP, tagged the liquid level in the 16-inch casing at 20 inches, pulled samples of the fluids in the Well #27 36-inch DP, and began the borescope procedure. FWE ran the borescope camera inside the 36-inch DP through an opening, taking photos and videos. The BSEE Panel members were able to observe that the 16-inch casing had ruptured, leaving metal parted and visible in the 36-inch DP.

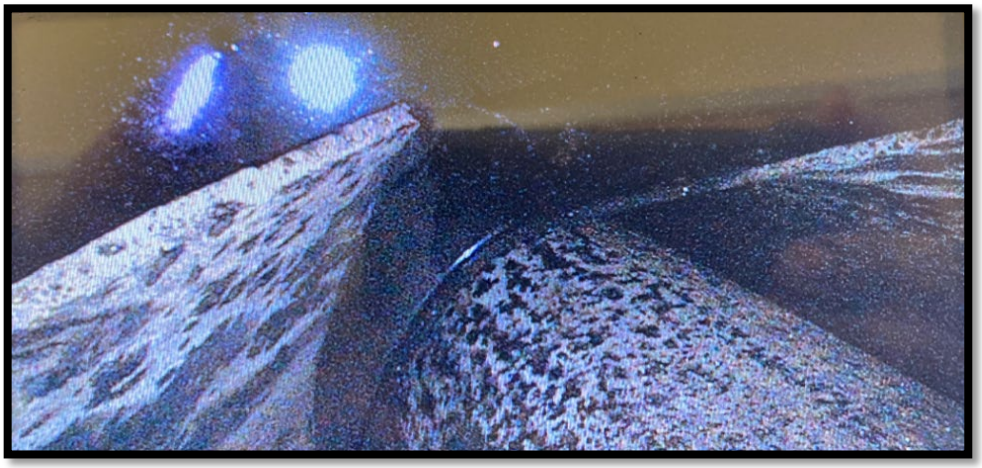

Figure 11 – Photograph of Well #27 Internal Damage of 16-inch Casing

The BSEE Panel also took photos and videos of the platform and wells involved in the incident. In addition, the BSEE Panel took measurements of the damaged grating and the opening in the Well #27 16-inch casing.

The BSEE Panel identified a piece of protruding metal from a 1½-inch opening between the wellhead base plate and the 36-inch DP to be a piece of the 16-inch casing that parted from the explosion (Figure 12).[2] The 16-inch casing parted, causing the pressure to escape through the 1½-inch opening that was in front of the Victim, who was monitoring the pressure on the digital pressure gauge.

Figure 12 – Photographs of Well #27 Well Head Base Plate, 36-inch DP, and Piece of 16-inch Casing after Explosion

The BSEE Panel assessed the damage on the main deck. The section of grating above the casing deck was disfigured and blown upwards from the explosion. Oil residue was observed on handrails, piping, and platform structure beams. The force was so powerful, the surrounding area handrails were disfigured; a section of handrail was blown off the platform and never recovered. The paint on

[2] The 16-inch casing is an H-40 grade of steel.

the surrounding structure beams was blasted down to bare metal. On the casing deck, the force from the explosion created a slight bend upward of the wellhead's 1-inch-thick base plate. The Victim was approximately 1 to 2 feet from the casing when it ruptured. The force of the explosion was sufficient to propel the Victim rearward into the handrail approximately 4 feet away, which bent from the impact. The Victim was wearing a hardhat that was projected approximately 60 to 80 feet upwards, lodging into the piping.

The explosion could be heard and felt approximately 1 mile away on the EI 158 C-QRT Platform. The witnesses from different vantage points described hearing a loud bang followed by a black, brown, and white cloud from the platform at the time of the explosion.

FWE provided the BSEE Panel a third-party engineering report summary authored by Viking Engineering. The report provided pressure modeling of the incident and examined the failure mechanism of the Well #27 16-inch casing. In the Summary section of the report, Viking Engineering concluded the following:

1. "All modeling cases prove that the casing pressure at the #27 Well was much higher than 175 psi."
2. "The physical damage to the casing confirms a pressure event significantly higher than 175 psi."
3. "This means that [the Victim] was not reading pressure based on pounds per square inch (psi)."

Based on its investigation, the BSEE Panel agrees with the number 1 and number 2 findings. While the BSEE Panel was able to conclude that the Victim reading pressure in bars rather than psi was a plausible contributing factor, it was not able to conclude that this was what actually occurred with the same degree of certainty with which Viking Engineering presented finding number 3. Viking Engineering determined this conclusion was the most likely scenario in its thermo-hydraulic models of the incident. In this scenario, the Victim was reading the pressure in units of bars rather than psig; therefore, the pressure on the 16-inch casing prior to the Field-PIC opening the SCSSV on Well #34 would have been 51 bars (approximately 740 psig), rather than 51 psig. This model, however, also determined that the top of the incompressible surface in the 16-inch casing (i.e., the depth to the top of the liquid level in the annulus) would have been 700 feet during the pressure test. There was a significant release of liquids from the ruptured casing when the incident occurred, and FWE measured the liquid level in the 16-inch casing at 20 inches after the incident. These facts are not consistent with the model determination that the liquid level would have been at 700 feet during the pressure test. This presents a potential shortcoming in the accuracy of the model.

The BSEE Panel did conclude that the Victim possibly read the digital gauge in bars rather than psig. The following are pressures relayed to the Field-PIC, converted to psig if the Victim was reading the gauge in bars: 51 bars (739 psig), 100 bars (1,450 psig), and 175 bars (2,538 psig). The last announced reading of 175, if measured in bars (2,538 psig), would have been above the 16-inch casing minimum internal yield pressure (1,640 psig).

On June 10, 2021, FWE sent a notification to all field personnel suspending the use of the digital pressure gauges. Then on June 21, 2021, an FWE third-party vendor reconfigured all the digital pressure gauges, locking them in psig before returning them to service.

SAFETY AND ENVIRONMENTAL MANAGEMENT SYSTEMS

BSEE regulations require that each OCS operator develop, implement, and maintain a SEMS program (30 CFR § 250.1900).

FWE had a written SEMS Manual with eighteen sections/elements. Additionally, FWE had a SEMS Bridging Agreement and Interface Document that defined the interface between the company and its contractors and identified responsibilities related to each SEMS element. The BSEE Panel reviewed the FWE SEMS program documents and interviewed related parties and identified four program elements potentially implicated by the probable and contributing causes and contributing factors for the incident:

Element 1: General – Management Responsibility

The BSEE Panel determined that FWE management was responsible for ensuring proper implementation of the SEMS program pursuant to 30 CFR § 250.1909.

Element 3: Hazards Analysis

The BSEE Panel determined that FWE was required to develop and implement a hazards analysis (facility level) and a JSA (operations/task level) for the facilities and activities associated with the incident. 30 CFR § 250.1911.

During the BSEE Panel interviews, the Field-PIC stated that he and the Victim were hand-writing the JSA as they conducted the job. The BSEE Panel requested that FWE provide it with both the hazards analysis and the JSA for the May 15, 2021, activities. However, FWE failed to provide either of these documents.

Element 4: Management of Change

The BSEE Panel determined that FWE was required to develop and implement MOC procedures pursuant to 30 CFR 250.1912. FWE's SEMS Manual states:

> On occasion, temporary repairs, connections, bypasses or other modifications may be made out of operating necessity. Any of these changes can introduce new hazards or compromise the safeguards built into the original design. Care must be taken to understand the process, facility and personnel safety and environmental implications of any changes.

During its interviews, the BSEE Panel established that although FWE had some verbal discussions about conducting an MOC, FWE did not conduct one. The BSEE Panel determined that, if FWE had followed its MOC process, FWE most likely would have incorporated a pressure regulating device and a pressure safety valve as part of the pressure test, and the explosion, therefore, likely would not have occurred.

Element 6: Safe Work Practices

FWE's SEMS Manual provides: "Fieldwood has established and implemented Safe Work Practices (SWP) designed to provide guidance for minimizing the risks associated with operating, maintenance, modification activities, and the handling of materials or substances that could affect safety or the environment."

Hazard Control Procedures SWP

FWE's SEMS Manual states the following regarding Hazard Control Procedures SWP: "It is the policy of Fieldwood Energy for its Production Foreman, Field Foreman, Person in Charge (PIC) or Consultant to ensure that the Hazard Control Procedures are utilized in a manner which effectively prevents injuries."

The BSEE Panel identified elements within the Hazard Control Procedures SWP – including Pre-job Planning, JSA, Hazards Analysis, and MOC – potentially implicated by the probable and contributing causes and contributing factors for the incident.

Pre-job Planning SWP

On May 15, 2021, during the morning safety meeting, the Field Foreman assigned the Field-PIC and the Victim with an additional work scope of conducting the casing pressure test during the day's activities. This was the first time the Field-PIC and Victim had heard of the test; they had no procedures to follow, and due to limited information provided, had to figure out how to conduct the test as they performed the job.

With respect to Pre-job Planning SWP, the FWE SEMS Manual notes: "…many workplace injuries and accidents are caused by inadequate or inaccurate procedures in carrying out the job task…"

Facility Hazards Analysis SWP

FWE was required to develop and implement a facility level hazards analysis for all of its facilities and activities involved in the incident. 30 CFR 250.1911. With respect to Facility Hazards Analysis SWP, the FWE SEMS Manual notes: "…the facility hazards analysis (HA) is to identify, evaluate and, where unacceptable, reduce the likelihood and/or minimize the consequences of uncontrolled releases and other safety or environmental incidents. Human factors shall be considered in this analysis..."

Job Safety Analysis Procedures SWP

During BSEE Panel interviews, the Field-PIC stated he and the Victim were hand-writing the JSA as they conducted the job. The BSEE Panel concluded that they did not fully complete the JSA prior to beginning their work activities. Additionally, they did not fully identify and mitigate hazards associated with their work activities.

FWE was required to develop and implement an operations/task level JSA for all of the activities involved in the incident. 30 CFR 250.1911. With respect to JSA Procedures SWP, the FWE SEMS Manual notes: "…The JSA is a technique used to identify risks to personnel associated with their job

activities. JSAs are also used to determine the appropriate mitigation measures needed to reduce job risks to personnel…"

Management of Change SWP

FWE was required to develop and implement written MOC procedures for modifications associated with equipment, operating procedures, personnel changes (including contractors), materials, and operating conditions. 30 CFR 250.1912. With respect to MOC SWP, the FWE SEMS Manual states: "…Fieldwood Energy has implemented a management of change (MOC) process to ensure that changes to processes and equipment are adequately evaluated by all appropriate personnel, engineering and management before changes are made..."

CONCLUSIONS

The following conclusions are based upon the totality of the information provided to, and received by, the BSEE Panel during its investigation into the May 15, 2021, fatality.

Based on interviews, statements, multiple site visits, pictures, and third-party analysis, the BSEE Panel determined that an overpressure event had occurred, causing pressurized gas and liquid to escape through a 1½-inch opening between the wellhead base plate and the 36-inch DP. The BSEE Panel concluded that the explosion was a result of introducing a gas supply without the use of a pressure regulator or pressure safety valve, which over-pressured the Well #27 16-inch casing.

The BSEE Panel concluded that the operators did not fully complete Pre-job Planning, MOC, Hazards Analysis, Hazard Recognition/Resolution, and JSA before starting the job task. Furthermore, if FWE had incorporated a pressure regulating device and a pressure safety valve as part of the pressure test, the explosion likely would not have occurred.

PROBABLE CAUSE

- The Field-PIC and Victim conducted a pressure test using temporary test equipment without using a pressure regulator and a pressure safety valve, which resulted in the overpressure and subsequent rupture of the Well #27 16-inch casing.

CONTRIBUTING CAUSES

- FWE failed to develop or implement an adequate hazards analysis (facility level) and a JSA (operations/task level) for the activities on May 15, 2021, as described within its SEMS Manual.
- FWE failed to follow its Pre-job Planning SWP, as described within its SEMS Manual.

CONTRIBUTING FACTORS

- Based on the manner in which the gauge could be switched between output modes, the Victim possibly read the digital gauge pressure in units of bars rather than psig.
- FWE failed to conduct an MOC, as described within its SEMS Manual.

RECOMMENDATIONS

The BSEE Panel makes the following recommendations to industry as a result of its investigative findings detailed within this report in an effort to further promote safety and prevent recurrence of the same or similar event, protect the environment, and conserve resources on the OCS:

- Industry should use the hazards analysis to develop procedures to provide to personnel performing the operations, and to enable implementation of all necessary measures of hazard mitigation. All non-routine operations should undergo a hazards analysis by personnel with the appropriate level of expertise.
- Industry should consider implementing processes to assess the risk presented by individual inactive wells and use this assessment to prioritize abandonment. Currently, BSEE analyzes three factors in enforcing well abandonment: lease expiration, idle iron, and casing pressure request denials. There are a significant number of wells on the OCS that are not on expired leases, that do not qualify as idle iron under applicable regulatory guidance, and that are not under casing pressure request denials, but that do have sustained casing pressure indicating some loss of well integrity. If industry assessed these wells for abandonment priority, it could reduce risk to personnel working offshore and to the environment.
- Any time temporary equipment is utilized where the source pressure is greater than any downstream components' pressure rating, a pressure regulating device and a pressure safety valve should be installed.