OCS Report
MMS 2008-054

Investigation of Loss of Well Control
South Pelto Block 10, Well No. 10
OCS-G 02925
14 February 2008

Gulf of Mexico
Off the Louisiana Coast

U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Regional Office

New Orleans
November 2008

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Jason Mathews– Chairman
Kelly Bouzigard
Bradley Hunter

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Contents

Glossary of Acronyms

ANSI – American National Standards Institute

API – American Petroleum Institute

BOPD – Barrels of Oil Per Day

BWPD – Barrels of Water Per Day

GOM – Gulf of Mexico

HCL – Hydrochloric Acid

JSA – Job Safety Analysis

MCFD – Thousand Cubic Feet of Gas Per Day

MMS – Minerals Management Service

OCS – Outer Continental Shelf

PSI – Pound Per Square Inch

SCSSV – Surface-Controlled Subsurface Safety Valve

Executive Summary

On February 13, 2008, Production Wireline, LLC (Production), contracted by Apache Corporation (Apache), was performing routine scaling operations on Well No. 10 (Well), South Pelto Block 10, Lease OCS-G 02925, in an attempt to repair a leaking surface controlled subsurface safety valve (SCSSV). The operator decided to perform an acid job to reduce the amount of scale around the SCSSV after several attempts to remove the scale with a wireline unit were not successful. Production pumped approximately 100 gallons of 1 percent hydrochloric acid (HCL) into the Well and allowed it to soak overnight. The day after the acid job Production re-entered the Well to perform more scraping. At approximately 1740 hours on February 14, 2008, a seal ring on the bottom flange below the master valve began to leak and dry gas was released into the atmosphere. Since the SCSSV was not operable and the leak was below the master valve, Apache was not able to prevent the escape of natural gas. The South Pelto No. 10 platform was evacuated shortly after the loss of well control without injury. The Well was secured on February 17, 2008.

The incident was caused by a leaking SCSSV, severely corroded ring gasket, and the performance of an acid job possibly accelerating the failure of the ring gasket. Recommendations made by the panel include: (1) a Safety Alert to Lessees and Operators to address those items; and (2) a reminder to operators to become familiar with the platform specific abandonment plans.

Introduction

Authority

An incident that resulted in a loss of well control occurred on Apache Corporation's Well No. 10 on Lease OCS-G 02925, South Pelto Block 10, in the Gulf of Mexico, offshore the State of Louisiana, on February 14, 2008, at approximately 1740 hours. Pursuant to Section 208, Subsection 22 (d), (e), and (f), of the Outer Continental Shelf (OCS) Lands Act, as amended in 1978, and Department of the Interior Regulations 30 CFR 250, Minerals Management Service (MMS) is required to investigate and prepare a public report of this accident. By memorandum dated February 29, 2008, the following personnel were named to the investigative panel:

Jason Mathews, Chairman – Accident Investigation Branch, MMS Headquarters Herndon
Kelly Bouzigard – Houma District, Field Operations, GOM OCS Region
Bradley Hunter – Houma District, Field Operations, GOM OCS Region

Background

Lease OCS-G 02925 covers approximately 5,000 acres and is located in South Pelto Block 10, Gulf of Mexico, off the Louisiana Coast. (*For lease location, see Attachment 1.)* The lease was issued effective December 1, 1974, and Apache became designated operator of the lease on January 1, 2003.

Lease OCS-G 02925, Well No. 10 was successfully completed in July 1980. BP American Production Company recompleted the Well in May 1999, and at that time installed a Wood Group refurbished tree in accordance with ANSI/API Specification 6A. Well No. 10, which had been off production since June 2006, was brought back on production on January 7, 2008.

On January 29, 2008, Apache notified MMS of 1,950 pounds per square inch (psi) of casing pressure on the production string of the Well. At the time of this notification, production on this Well was reported to be 82 barrels of oil per day (BOPD), 375 barrels of water per day (BWPD), and 1,200 cubic feet of gas per day (MCFPD).

Procedures

Two MMS representatives, including a member of the panel, performed an overflight of the incident scene on February 15, 2008. (*For a depiction of the incident scene during the overflight see Attachments 2 through 4.)* Once it was safe to land on the facility, the overflight was followed up by an onsite investigation by the same representatives on March 6, 2008.

On March 5, 2008, the panel forwarded a letter, with a deadline of response by April 7, 2008, to an Apache regulatory representative requesting various documents from Apache pertinent to the investigation.

Once the Well was safely plugged, Apache sent the tree to Cameron Surface Systems' (Cameron) yard for a post-mortem investigation. Cameron pressure tested the tree and determined the leak point. On March 7 and 13, 2008, at Cameron's facility in Patterson, Louisiana, panel members inspected the tree associated with the incident. (*For post-mortem photographs of the tree and components, see Attachments 5 through 11.)*

On April 5, 2008, MMS received an official response from Apache in regard to the letter requesting additional information dated March 5, 2008.

Following a review of Apache's response, the panel held a telecom with Lafayette and Houston Apache representatives on April 16, 2008, to discuss the investigation to date.

On June 25, 2008, Apache forwarded their findings on the metallurgic properties of the ring gaskets associated with the well to the MMS.

Various documents from Apache pertinent to the investigation were collected by the panel.

The panel met numerous times throughout the investigation and, after having considered all of the information available, produced this report.

Findings

The Accident

On Tuesday, February 12, 2008, the parties involved in the incident began repairs on South Pelto Area Block 10, Well No. 10. The operator was removing and replacing a ring gasket, not associated with the incident, between the crown and block valve. Prior to any operations being performed on the subject Well, Apache and the contractors held a safety meeting and a Job Safety Analysis (JSA). During these meetings there was a discussion concerning bleeding down the downhole valve, operations involved in dissembling the tree, replacing the ring gasket, and reassembling the tree. The recommendations made within this meeting for a safe job performance were to contain all fluids and bleed slowly, lift properly to reduce back strain, watch hand and foot placement to avoid pinch points, maintain good communication with the crane operator, and inform all JSA participants they have stop work authority. After the repair was made to the tree, the SCSSV would not close. The operator attempted to stroke the SCSSV; however, it would still not hold. At 1430 hours, the Well was shut in. Due to inclement weather that evening, the wireline and field crew shut down operations. The previous successful SCSSV test took place on January 7, 2008. Prior to the January 2008 test, the SCSSV had no historical leakage issues reported to MMS.

The following morning, February 13, 2008, an additional JSA was held to discuss the wireline rigging up operations and the chemical injection procedures set for the day to remove scale build-up which was preventing the SCSSV to close properly. Every participant was informed of the proper personal protective equipment required for this job and of their stop work authority. During the JSA, Apache informed all representatives involved in this specific operation the location of a shower in case of contact with the acid, and it was decided to have a fresh water hose at the Well in case of emergency.

At 1100 hours on Wednesday, February 13, 2008, wireline was beginning to be rigged up and pressure was tested by Production. A restriction in the tubing was preventing them from working past 25 feet. After pulling the tool from the Well, Production reported scraping marks all around the edge of the 2-inch impression block. An undersized scratcher was then run into the hole and worked the jars. With the scratcher not being successful, Production pulled out of the hole, laid down the lubricator, and began to inject 100-gallons of 15 percent HCL into the Well overnight. The night tower monitored the chemical pump associated with the operation. Prior to this acid treatment, Apache was not aware of any other previous acid jobs under its operation of the Well.

At 0600 hours, Thursday, February 14, 2008, following a JSA and safety meeting, the day tower resumed operations and began to rig up the wireline lubricator. Prior to running back into the hole, the day tower successfully rigged up and tested the lubricator by 0800 hours. A 1.75-inch broach, which is an outer diameter tool that allows for subsequent passage of tools and equipment of a prescribed diameter, was run into the hole by Production to approximately 300 feet without any restrictions. The 1.75-inch broach was followed with a 2.1-inch to 2.25-inch tapered broach. However, Production was unable to get past the initial restriction in the tubing.

Shortly after the restriction prevented further depth into the hole, Production ran into the hole with a 2.25-inch impression block and sat down at the location of the impression and jarred it one time. When the 2.25-inch impression block was pulled out of the hole, it was determined that there was evidence of build-up on the tubing walls.

After pulling out of the hole with the impression block, Production proceeded to run into the hole with an undersized, barbed scratcher. They were able to work it to approximately 15 feet before the tool had to be pulled out of the hole and cut down the scratcher. Production was able to cut heavy scale to approximately 300 feet, and ran up and down the tubing several times with the tool. Following the commencement of the initial scraping operation, Production ran back into the hole with a 1.85-inch paraffin knife and chipped the scale down to 300 feet. They then pulled out of the hole and began to run a 2.1-inch tapered broach. The broach was not able to get past 15 feet. It was then decided to rig up the acid pump equipment and inject additional acid into the Well to reduce the scaling.

At 1740 hours, the Well began leaking natural gas between the master valve and the adapter.

Post-Accident

Following the blowout, approximately 35 people were evacuated to either South Pelto Block 2, Platform JA; Ship Shoal Block 91, Platform B; or a dedicated lift boat in the field. There were no reported injuries during this platform abandonment. Prior to departing to safe harbor, the field was shut in, all shut down valves were closed, and the platform had its emergency shut down system activated.

There was a dedicated field boat keeping observation on the Well following the incident, and an oil spill response organization was dispatched in the event any liquids were to begin discharging from the Well. Apache established a Unified Command Center with the United States Coast

Guard on the evening of February 14, 2008, and contacted the MMS Houma District Office with all updates.

Apache and Wild Well Control developed a plan of action to control the Well by February 15, 2008. On February 17, 2008, the Well had been killed and secured. A back pressure valve was installed in the tree and the ring gasket was replaced. The J-3 zone, which was located at 9,963 feet – 9,978 feet true vertical depth, was squeezed with cement and successfully pressure tested. A test run on February 27, 2008, indicated the pressure on both the casing and tubing strings bled to 0 psi and had no subsequent build up. The platform returned to service.

The subject tree was sent to Cameron for investigation and was received on February 22, 2008. (*For post-mortem photographs of the tree and components at the Cameron yard, see Attachments 2 through 8.)*

After the incident, Apache conducted a formal investigation of the loss of well control. Apache identified the causal factors as the leaking SCSSV, the leaking ring gasket, and the acid job procedure. Their findings were submitted to MMS on April 5, 2008.

Further, Apache is developing an operational procedure to ensure that pressure tests are conducted on wells prior to acid treatment operation to lower the possibility or prevent this type of incident from occurring in the future. The purpose of this pressure test will be to verify the mechanical integrity of the ring gasket and other critical wellhead components before acid is circulated into the well system.

Apache Integrity Management

In accordance with Apache's *In-Service Mechanical Integrity Evaluation Plan for Offshore Oil and Gas Production Piping and Equipment* document dated August 6, 2002, Apache established requirements and guidelines for the scheduling, inspection, evaluation, and documentation of in-service piping, pressure vessels, production equipment, and personnel safeguards. Further, Apache ensures that their employees receive appropriate training and experience necessary to perform the intended tasks set forth within this document.

The mechanical integrity of the ring gasket which failed in this incident would not have been identified via any inspection processes set forth in this document. Also, there is no known non-destructive inspection process which could have identified the loss of the ring gasket's mechanical integrity.

The visual inspection was performed to determine the condition of the exterior surfaces of piping, vessels, insulating systems, painting/coating systems, etc. Apache also performed ultrasonic thickness measurement inspections and profile radiography inspections on process piping.

Records supplied to the panel from Apache indicate the Well was visually inspected once a week in accordance with Apache's Platform Weekly Checklist. The inspections during the month of the incident occurred on February 1, February 8, February 14, and February 22. The components of this checklist are made available in Apache's *Offshore Safety Operations Procedures (OSOP)*, Section B, Chapter 3, Part A. It shall be noted that the frequency of well/tree inspections is not captured in the Apache Integrity Management document.

Apache Safety Management

With respect to Apache's *OSOP*, Apache required all of their employees to continually use and reference the document as a reference for all projects and day-to-day offshore operations. The policies and procedures set forth in this document were designed to be used as a tool to prevent injuries, environmental impacts, and property damage. All Apache employees are required to acknowledge that they have viewed the Apache *Safety Orientation Video*, they have received, read, and understand the contents of the *Offshore Safety Orientation Handbook* which serves as a guide and reference for some of the minimum rules and standards established for Apache Corporation offshore facilities. All records indicate all parties involved with this incident were familiar with this document.

The *OSOP* also covers emergency preparedness and emergency drill procedures. In accordance with this document, Apache requires all of their platforms to perform weekly drills in regard to man overboard, fire, or abandon platform drills.

According to Apache's *OSOP* document, the purpose of conducting abandonment drills is to prepare personnel to abandon the platform in the event of an emergency and to demonstrate that personnel can perform their assigned duties in this situation. The abandonment drill procedure presented within this document is as follows:

1. The drill should be pre-planned and should emphasize some key learning points.

2. The drill will be held on various days and at various times, and occasionally without prior notice to personnel as to day or time.

3. The designated alarm sounds for abandoning platform is posted on the station bill. An announcement should be made that this is a drill. The designated alarm is a continuous ringing of the general alarm.

4. All personnel will report promptly to his station bill assignment unless excused to continue operations. (Excuses should be rare occurrences and require prior approval of the supervisor.)

5. Platform communication equipment and procedures should be tested by notifying the designated shore base and standby boat, if available, that an “abandon platform drill” is in progress.

6. All personnel will carry appropriate survival gear to the drill. Appropriate clothing to abandon the platform should be worn to the drill.

7. Trained and competent personnel must be assigned to operate each lifeboat. These personnel will be referred to as lifeboat commanders. If more than one lifeboat man is required, one will be pre-designated as lifeboat commander and will be visibly identifiable by some appropriate device.

8. The lifeboat men will prepare the lifeboat for boarding.

9. Personnel will enter the lifeboat following instructions by the lifeboat commander and then fasten their seat belts.

10. The lifeboat commander will explain the operation and lowering procedures.

11. All engines will be started and operated for several minutes.

12. A roll call, by name, will be taken by the lifeboat commander. Each person, as called, will state his duties and sign a roster indicating he attended the drill.

13. Each drill will be recorded on the appropriate form, including a brief description of what items were stressed.

14. The lifeboat commander should conduct a verbal critique with his crew upon completing the drill. Discussion should include deficiencies observed and alternate abandonment procedures.

15. The person in charge should critique the drill with the lifeboat commanders.

All records indicate four weekly platform drills were performed in accordance with Apache's *OSOP* document during the month of the incident. Apache also performed platform abandonment drills on January 7, 2008, and also on January 13, 2008.

Secondly, all JSA's, safety meetings, incident reporting, and procedures were also performed in accordance with Apache's *OSOP* document.

Sustained Casing Pressure

Following the initial notification of 1,950 psi of casing pressure on the production casing, Apache performed diagnostics on the February 8, 2008, and February 22, 2008. The diagnostics on February 8, 2008, indicated that the pressure would not bleed down to 0 psi within 24 hours, and the MMS issued a denial on March 14, 2008, requiring Apache to respond to the MMS District Office with a plan to eliminate the sustained casinghead pressure within 30 days. However, on February 22, 2008, Apache performed and additional test which specified the pressure bled to zero and was granted a "self approved" departure from the MMS on March 17, 2008.

Conclusions

The Accident

It is concluded by the panel, that as routine scraping and acid operations were occurring on OCS-G 02925, Well No. 10, to repair a leaking SCSSV, the ring gasket in between the master valve and its adapter failed and caused the release of natural gas into the atmosphere.

Causes

Mechanical/Actions:

1. The exact condition in which the gasket was in prior to the incident is not known; however, it is known that a ring gasket downstream was replaced two days prior due to a possible corrosion failure. Pictures taken during a post-mortem inspection of the tree indicate the gasket involved in the incident was heavily corroded prior to the incident. **Therefore, the amount of corrosion on the ring gasket which lead to the loss of mechanical integrity is concluded to be a cause of the incident.**

2. It is the conclusion of the panel that the performance of an acid job to reduce scale likely accelerated the loss of mechanical integrity of the ring gasket. **Therefore, the performance of an acid job is concluded to be a contributing factor of the incident.**

3. It is the conclusion of the panel that, if the tubing retrievable SCSSV was able to close properly, it could have prevented the loss of well control. **Therefore, a leaking SCSSV is concluded to be a contributing factor to the duration of the incident.**

4. It is the conclusion of the panel that it is also possible that as the scraping operations were taking place in the Well near the ring gasket, the scratchers could have contacted the ring gasket. The manner in which that occurred could have influenced the amount of integrity loss of the ring gasket prior to the loss of well control. While it has been concluded as a very reasonable possibility, any conclusion as to the probability of such contact is made difficult by no solid data indicating this happened. The panel made this assumption due to an anomaly in a post-mortem picture. (*For a depiction of anomaly, see Attachment 6.)* **Therefore, the contact of the scratchers with the ring gasket is concluded to be a possible contributing factor of the incident.**

Training:

It is the conclusion of the panel that Apache's training does adequately train employees to abandon a platform if necessary. Apache relied heavily on its emergency drill training to prepare their employees to abandon the platform in the event of an emergency. **The existence of formal training and emergency drills was instrumental in the prevention or cause of any other incidents or accidents during the platform evacuation.**

Management:

It is the conclusion of the panel that Apache's safety management was clearly documented in their *OSOP* document and implemented within the field. Also, it is concluded that the responsibilities of their representatives on the platform were performed and documented in accordance with the policies set forth within the document. **It is, therefore, the conclusion of the panel that there were no failures in Apache's safety management system that contributed to this accident**.

Sustained Casing Pressure:

It is the conclusion of the panel that, if the sustained casing pressure had no effect on the loss of well control. **Therefore, the sustained casing pressure on the production casing is concluded not to be a contributing factor to the occurrence or duration of the incident.**

Recommendations

Minerals Management Service should issue a Safety Alert to all lessees and operators containing the following:

1. A brief description of the accident;

2. A summary of the causes; and

3. The following recommendations:

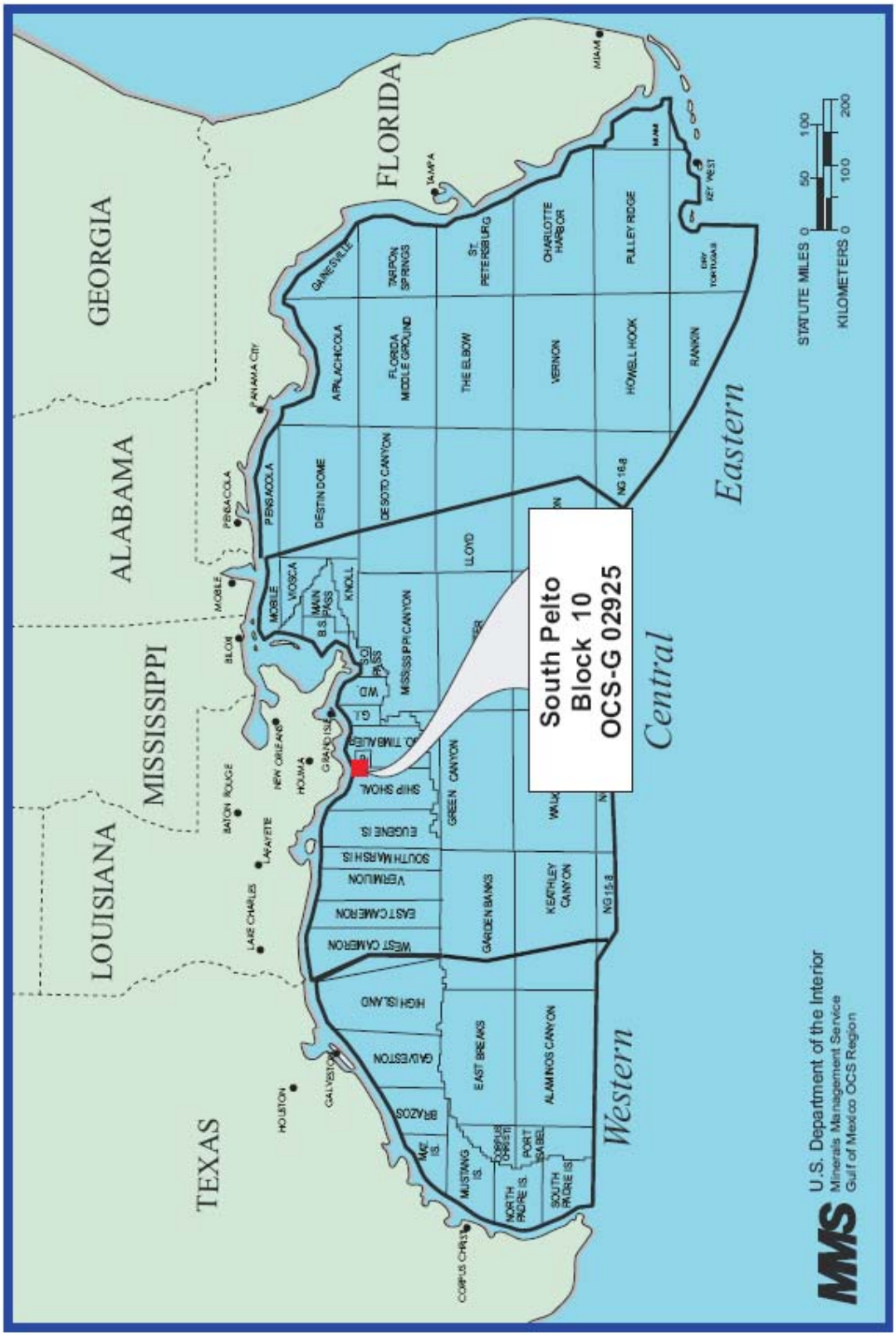
   a) Lessees and operators should review their policies regarding the performing of acid operations especially if an SCSSV is not functioning properly.

   b) Lessees and operators should review their platform specific emergency plans to reduce further injuries or accidents when an incident occurs.

   c) Lessees and operators should be able to trace the history of ring gaskets in the field regardless of previous ownership, and/or determine the condition of said ring gaskets prior to the performance of future operations.

Minerals Management Service should meet with tree providers and determine if there is any non-destructive procedure to test the structural integrity of ring gaskets inside of trees.

Attachment 1



Location of Lease OCS-G 02925, South Pelto Block 10

Attachment 2

Photo of Ring Gasket

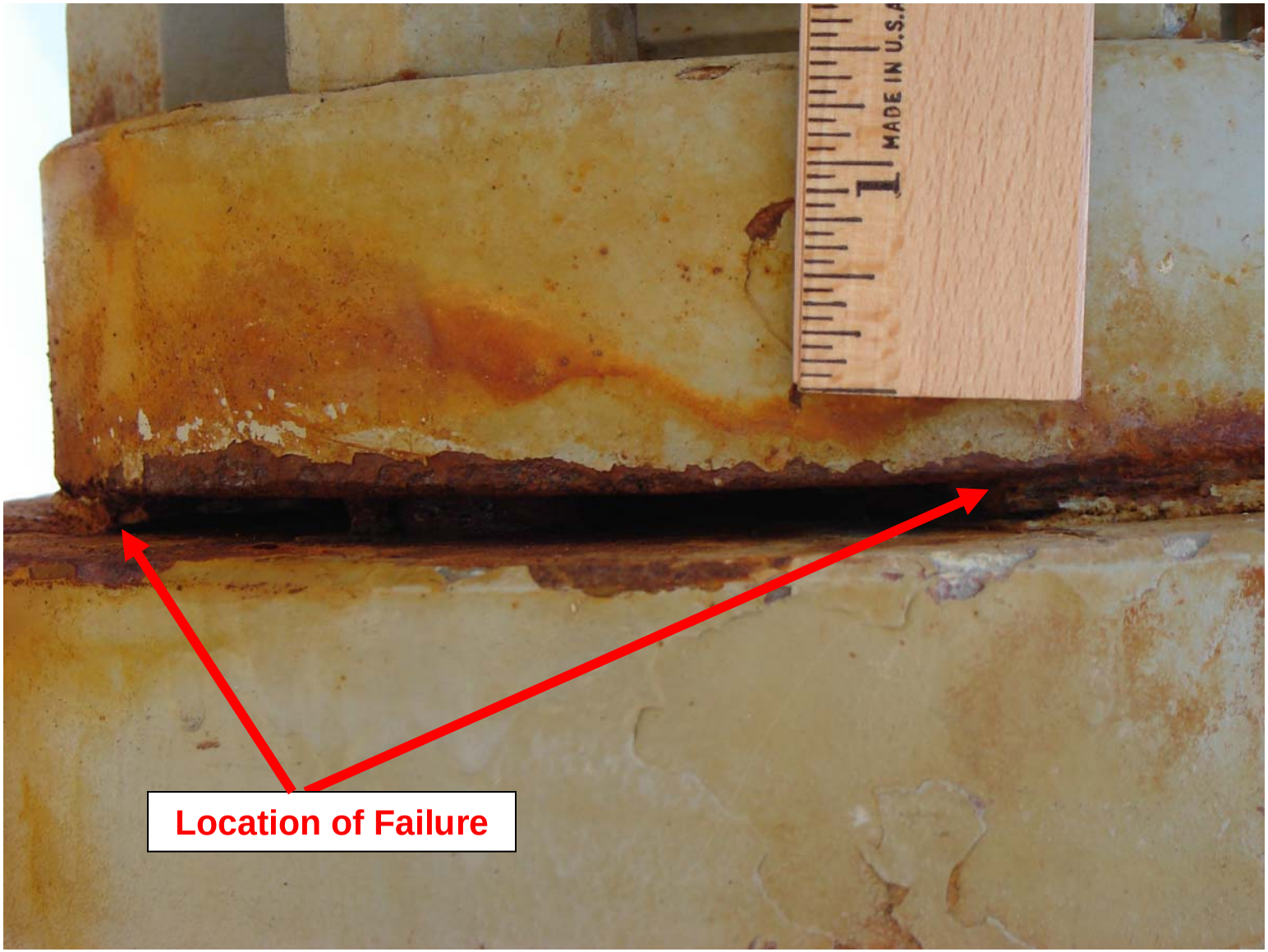


Photo of Connection Between Master Valve and Adapter Flange (Location of Ring Gasket Failure)

Attachment 3

Attachment 4

Photo of Connection Between Master Valve and Adapter Flange

Attachment 5

Photo of Adapter Ring Groove and Corrosion

Attachment 6

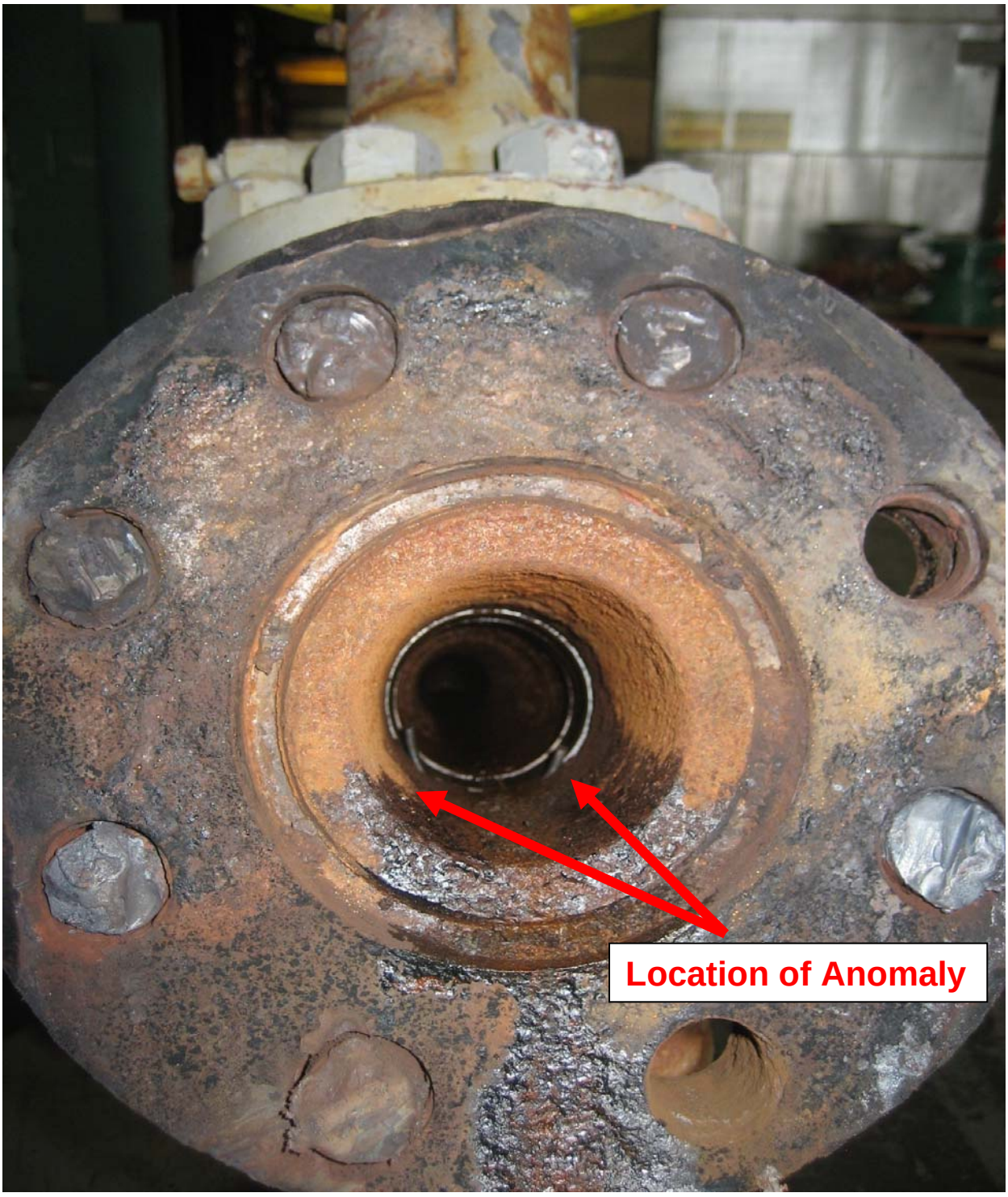


Photo of Master Valve Ring Groove and Corrosion

Attachment 7

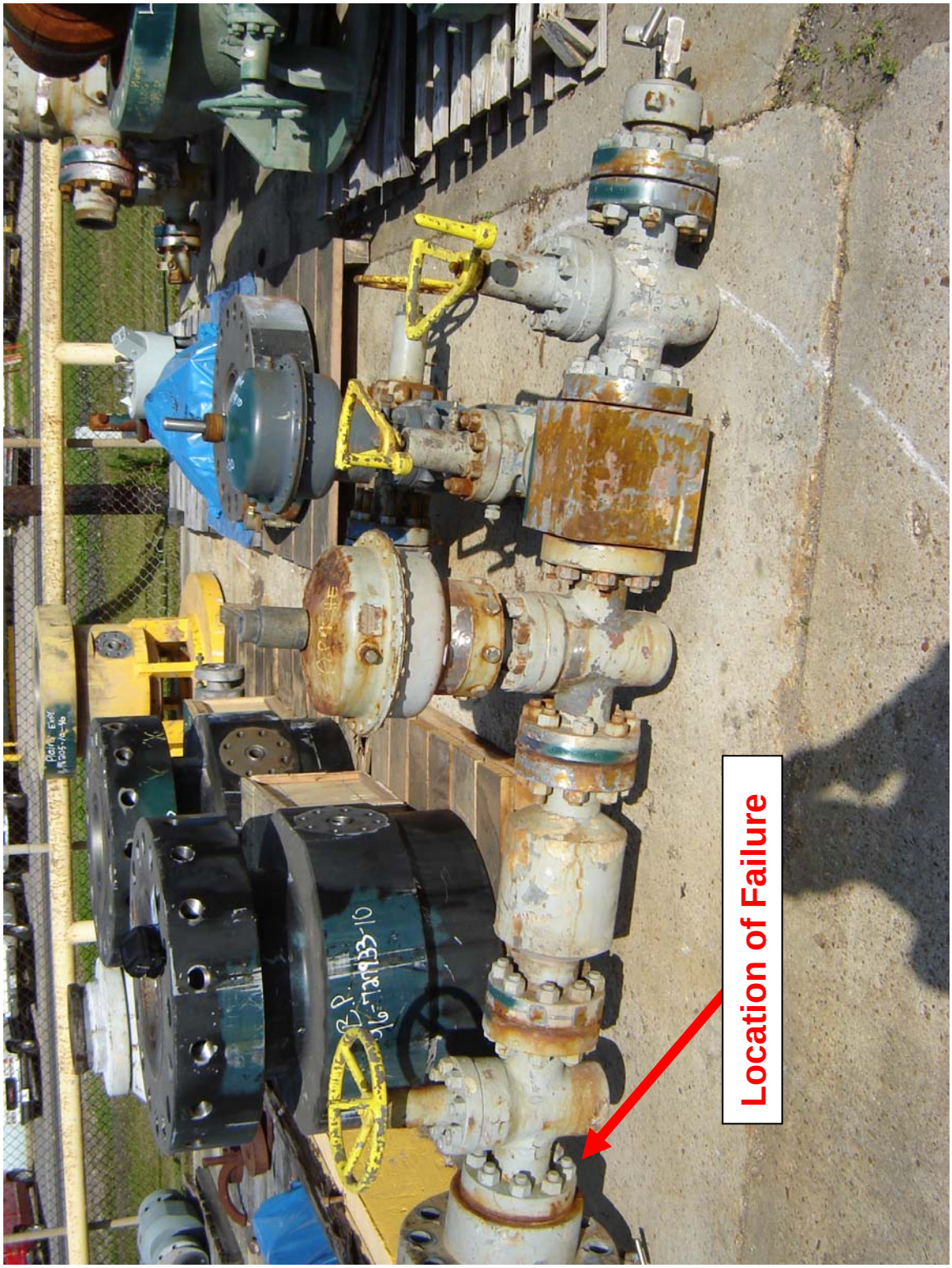


Photo of Tree in the Cameron Yard Post-Mortem

Attachment 8

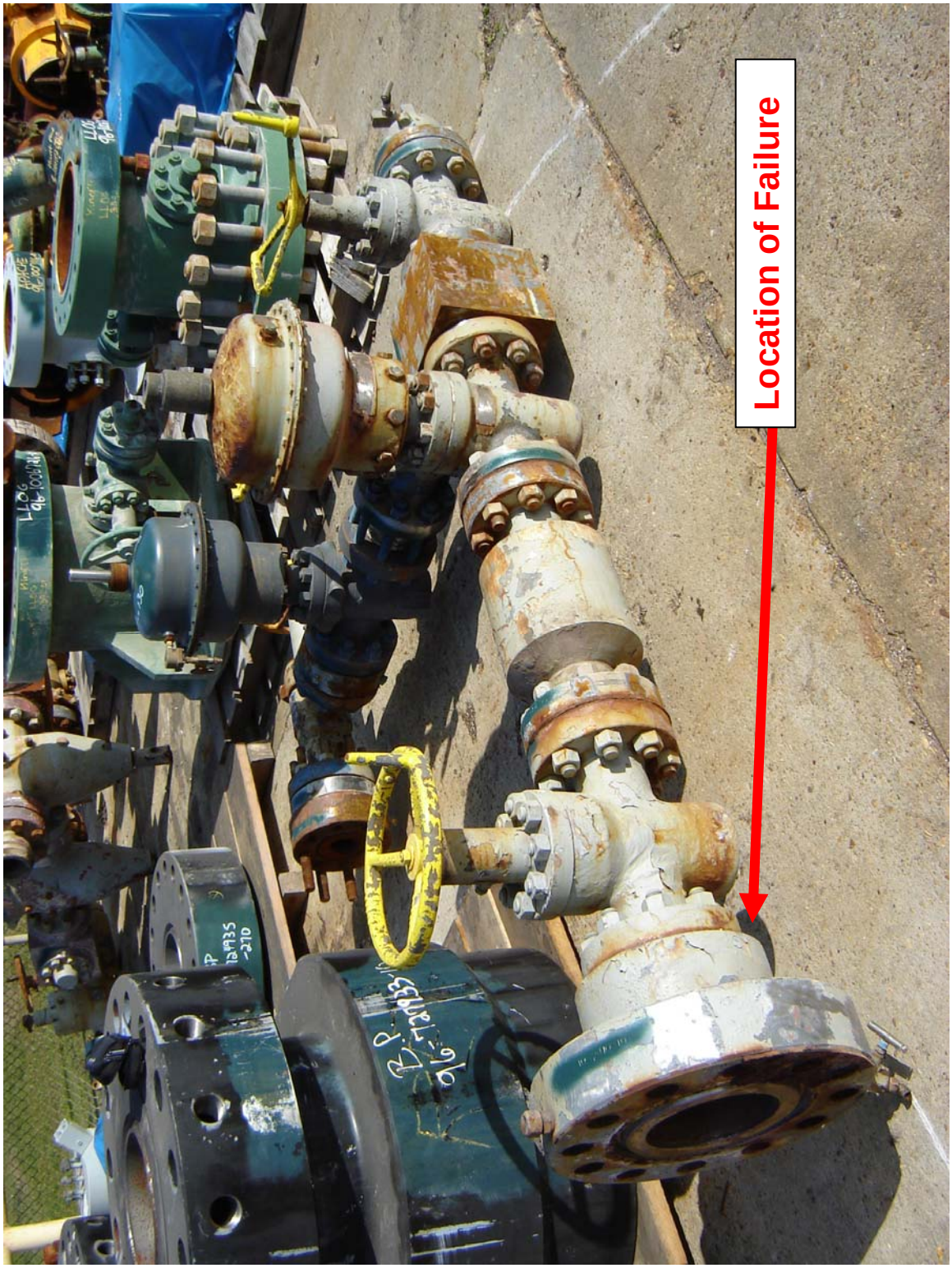


Photo of Tree in the Cameron Yard Post-Mortem

Attachment 9

Photo of Well No. 10 During Loss of Well Control

Attachment 10

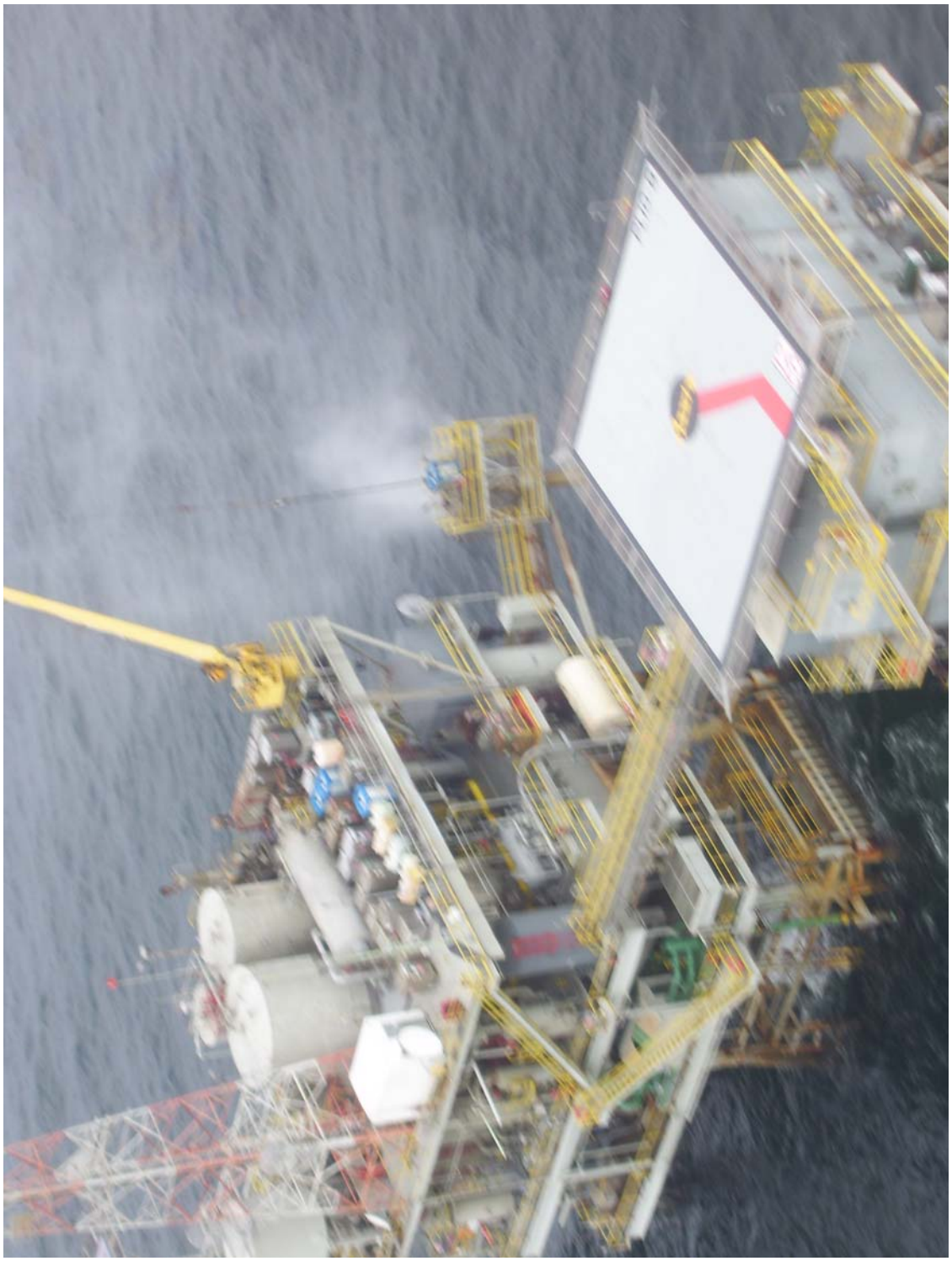


Photo of PL 10 During Loss of Well Control

Attachment 11

Photo of PL 10 During Loss of Well Control