

**Investigation of Loss of Well Control
East Cameron Block 23
OCS-G 02853
February 17, 2004**

**Gulf of Mexico
Off the Louisiana Coast**



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

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Frank Pausina – Chairman
Glenn Woltman
Scott Mouton
Michael Hebert

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Investigation and Report

Authority

A loss-of-well-control event (LWC) occurred on Dunhill Resources, Inc.'s Platform Well No. CA-1, East Cameron Block 23, Lease OCS- G 2853, in the Gulf of Mexico, offshore the State of Louisiana, on February 17, 2004, at approximately 0200 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 memoranda dated March 1, 2004, and July 19, 2004, the following personnel were named to the investigative panel:

Frank Pausina, Chairman – Office of Safety Management, GOM OCS Region
Glenn Woltman – Office of Safety Management, GOM OCS Region
Scott Mouton – Lake Charles District, Field Operations, GOM OCS Region
Michael Hebert – Lafayette District, Field Operations, GOM OCS Region

Procedures

On the morning of February 17, 2004, an inspector from the Department of the Interior, Minerals Management Service (MMS) district office in Lake Charles, Louisiana, visited the site of the incident to assess the situation, take photos, and statements.

On February 26, 2004, the investigative panel received a written statement on the sequence of events from Orca Management, LLC (Orca).

On March 5, 2004, panel members met with personnel from Orca.

On March 10, 2004, panel members received the written response to the Incident of Non-Compliance Form MMS-1832 issued by the MMS to Orca in February 2004.

On March 17, 2004, the panel received copies of the wellhead manufacturer's comments on the "cut-out" of the injection port on the wellhead.

In July 2004, panel members held a telecom to review all information received, the status of the investigation, and further informational requests. Additional interviews were deemed necessary.

On July 21, 2004, members of the Investigative Panel traveled to the office of Weatherford International Ltd.'s (Weatherford) legal representation to interview various personnel associated with the repair of the wellhead.

On July 23 and August 5, 2004, members of the panel held interviews with representatives of Orca.

In addition to the interviews, other information was gathered at various times from a variety of sources. This information included the following reports and statements:

- Daily Workover Reports, February 15, 2004 – February 21, 2004;
- Petroleum Professionals International's Report on wellhead, Well No. CA-1;
- Operator's EVACCR Incident/Accident Form, February 17, 2004;
- Form MMS-1832, Notification of Non-Compliance, February 20, 2004;
- Pictures of wellhead.

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

Introduction

Background

Lease OCS-G 2853 covers approximately 4,772 acres and is located in East Cameron Block 23, Gulf of Mexico, off the Louisiana Coast. *For lease location, see Attachment 1.* The lease was issued effective December 1, 1974. Dunhill Resources, Inc. became the Designated Operator of the lease on December 20, 2001.

During December 2001, Dunhill Resources Inc. acquired select properties from Linder, for which the sales and purchase were funded by Aquila Energy Capital. During December 2002, Aquila Energy Capital sold the portfolio of loans to Concert Capital Resources, LP (CCR). In April 2003, CCR filed for foreclosure on the assets of Dunhill Resources, Inc., and during August 2003, Dunhill Resources, Inc., entered Chapter 11 bankruptcy. During October 2003, CCR formed Orca Energy, LP, and Orca Management, LLC, to own and operate the former Dunhill Resources, Inc., assets. During January 2004, Orca Energy, LP, foreclosed on a majority of Dunhill Resources assets. Currently, Dunhill Resources, Inc., remains in bankruptcy. Dunhill Resources, Inc., remains technically as designated operator of the properties, with Orca Management, LLC (Orca), providing all services, support, and financing. For functional purposes, Orca is the operator of the subject lease and will be referred to as such in this report. The Operator-of-Record anticipates that Orca will become principal on the bonds, pending resolution in bankruptcy court and with Minerals Management Service approval.

Brief Description of Incident

During January 2004, contract technicians arrived on the platform to assess the wellhead equipment, repair the actuator, and replace a wing valve. On February 15, 2004, a lift boat arrived on location to begin well work. Coiled tubing equipment, operated by Contractor personnel, was rigged-up and run in hole. Nitrogen was injected down the tubing to wash and clean out the sand to the target depth of 10,391 feet. As the intended target depth was neared, the well started to flow. Wellhead pressure rapidly rose to 2,300 psig after the choke manifold was closed. At approximately 0200 hours on the morning of February 17, nitrogen was observed

leaking from around the wellhead, below the BOP stack. The rig crew started pumping seawater as the kill fluid, and non-essential personnel were evacuated by 1100 hours. Well Control experts arrived by 1430 hours, and the wellhead pressure was reduced to 0 psig by the next day. There were no injuries and no pollution associated with this LWC. The injection fitting port on the wellhead that is used to inject a plastic energizer for the wellhead seal assembly failed. The failed port, together with a missing wellhead seal assembly, allowed for the LWC.

Findings

Brief Well History and Preliminary Activities

The last completion of Well CA-1 was at 10,393 feet with an initial bottomhole pressure (BHP) of 4,676 psi. The last recorded BHP of Well CA-1, taken in April 1991, was 1,487 psi. *For photographs of the well and platform, see Attachments 2 and 3.*

Well CA-1 had been shut-in since February 1993 because of problems associated with water loading.

In June 1993, another operator, in attempting to return the well to production, was unsuccessful in his attempt to pull the well's surface-controlled subsurface safety valve (SCSSV). The well remained shut-in until January 2004.

On January 13, 2004, the SCSSV was successfully retrieved by wire line. At this time, sand was found in the wellbore, and bailing operations commenced. Bailing operations were not successful below a depth of 10,158 feet and problems arose with the wing valve and the surface safety valve (SSV). Bailing operations ceased shortly thereafter. A Weatherford technician was called out to assess the situation and make appropriate repairs. The wing valve was replaced on January 19, 2004, and a kit installed in the SSV actuator on January 23, 2004.

On February 15, 2004, a coiled tubing unit arrived on location and on February 16, 2004, well work began. Nitrogen was injected through the tubing at approximately 2000 hours with a target depth of 10,391 feet. As the target depth was approached, the well began to flow, and the wellhead pressure rapidly rose to 2,300 psi after the choke manifold was closed. Workover reports indicated that the well started to flow and pressure increased rapidly as the sand bridges were removed. At approximately 0200 hours on February 17, 2004, nitrogen was observed leaking from the well area below the BOP stack. *For a photograph of the well area below the BOP and grating, see Attachment 4.* (It was later discovered that the leak occurred through the injection port on the wellhead – to be discussed later.)

Loss of Well Control and Remedial Actions

The crew immediately began to pump seawater as a kill fluid down the tubing and tubing/casing annulus.

Between 0200 and 0600 hours, a cellulose polymer pill was pumped down the annulus, and the wellhead pressure dropped to 600 psig.

Between 0600 and 1015 hours, MMS personnel arrived at the platform. The Operator reported observing a small sheen on the water within 7 hours of the start of the incident. Both O'Brien's Oil Pollution Services and Clean Gulf Associates were notified and a fast response unit was called out during the night. By daylight the next morning, the sheen had disappeared. The Operator did estimate approximately 5 gallons of condensate went into the water.

Between 1015 and 2400 hours, pressure increased on the annulus with sand and gas blowing from the injection port on the wellhead. *For a photograph of the injection port area (where the fitting was prior to the LWC), see Attachment 5. For a photograph for another corroded injection port and fitting on Well CA-1, see Attachment 6.* The injection port welded fitting was absent. All nonessential personnel were evacuated by 1100 hours. Well control specialists (Boots and Coots) arrived on location at 1430 hours.

On February 18, 2004, with well control experts on location, the injector head was removed from the BOP's and well abandonment operations began. Kill mud (12 ppg) was pumped down the annulus, and pressure fell to 0 psig. Attempts were made to set PX tubing plugs by wireline; however, tight hole conditions resulted in the plugs hanging up. Consequently, on February 20, 2004, the wireline was cut and pulled out of the hole. A cement retainer was set at 10,284 feet and heavy cement (16 ppg) was dumped on top of the retainer to a depth of 10,270 feet. On February 21, 2004, a tubing plug was set at 2,858 feet, the tree cap was installed, and the coiled tubing unit and associated equipment were removed from the platform, and the well was temporarily abandoned. In April 2004, the well was permanently plugged and abandoned.

Pre-Coiled Tubing Work and Inspection

Prior to commencement of well work, Orca verbally asked Weatherford to inspect the subject wellhead, but did not specify any inspection work on that section of equipment below the grating (this area would have included the wellhead and casing head) prior to the coiled tubing procedures. Weatherford was also not given any post-verbal written specific inspection instructions. Weatherford found and replaced a wing valve and installed a new kit, consisting of a bladder and O-rings, in the actuator. Interviews with Weatherford personnel indicated that no attempt was made to inspect other equipment on the well.

Well Configuration

Review of Orca's records by the panel revealed that the current completion equipment in the well included an isolation packer that was set at a depth of approximately 10,334 feet. Records did not show any historic evidence of annular casing pressure. However, during the workover activity herein reported, the casing pressure had increased to 1,550 psig just prior to the closing of the choke manifold. Afterwards, the pressure increased to 2,300 psi and the LWC began.

The injection fitting port that failed on the wellhead is designed to contain (trap) pressure around the pack-off assembly. Under normal circumstances, the seal assembly would have isolated the section of the tubing head above the pack-off from tubing/casing annulus pressure below. Once pressure is relieved above the pack-off assembly (as would have happened if the seal assembly and packing failed), the wellbore pressure below or above would be in communication with the injection port. Similarly, if there were no seal assembly installed in the wellhead, well pressure could be exerted on the injection port.

For the type of pressure that was noted on the workover reports to be exerted on the subject port, there had to be a source of pressure or a migration of pressure from the well itself. To have this pressure, either a tubing/casing communication condition or a behind-the-pipe communication had to exist.

Third Party Assessment

After the incident was brought under control and the well secured, Orca commissioned Petroleum Professionals International (PPI), an oil field engineering consulting firm in Houston, Texas, to witness and report observations during the removal of the damaged wellhead. *For a photograph of wellhead and tubing head, see Attachments 7 and 8, respectively.* The PPI report states in part that there was no evidence of any seal assembly and packing in place in the Vetco Gray tubing head and that there was external corrosion of the wellhead and packing injectors. *For a photograph of wellhead showing the corrosion, see Attachment 7. For a diagram of the wellhead, see Attachment 9.*

The seal assembly is designed with a bi-directional Chevron packing set that is energized by plastic packing injected through the packing ports. If the seal assembly had been present and was functional, by design, the pressure could not have been present at the packing injection port. However, with the seal assembly absent or not functional, any pressure from the well could have migrated to the port from above or below the seal assembly. In this incident, casing pressure was noted during the well kill stage of the project.

For the seal assembly to be missing, an opportunity had to exist whereby the wellhead had been removed. Therefore, historic well data were requested by the panel members and were provided to them by Orca. From the information supplied, the wellhead on the subject well was first changed out on March 20, 1980, after the re-completion of the well to the current completion. Four years later, on August 6, 1984, according to information supplied, the wellhead was again changed out because of leaks.

The wellhead was sent to Houston Metallurgical Laboratory (HML) in Houston, Texas, for further viewing or subsequent analysis. Given the data already available, the panel feels that the analysis is not needed for the purposes of this investigation and thus has not requested the findings of that analysis.

During March 2004, post-incident inspection work was performed by Weatherford at the request of Orca. Forty-seven (47) wellheads and trees were inspected, including the subject well. A majority of the components on the wellheads and trees were found to need replacement or

repair. Parts listed for replacement or repair included grease fittings, packing injection fittings, pipe plugs, ring gaskets, bull plugs, studs and nuts, lock screw assemblies for tubing spool, bonnet for annulus valve and bonnet seal ring, as well as blasting and painting requirements on lower wellhead connections. For most of the 47 wells inspected, including the subject well, it was confirmed that most components on the wellheads and casing heads were severely corroded and their functionality was questionable.

Discussions were held by the panel members with ABB Vetco Gray (ABB), the manufacturer of the wellhead equipment. ABB indicated in a written statement to the panel members that this type of leak is extremely rare, and that they have not witnessed this type of failure on their high-pressure wellhead equipment before. ABB indicated that the failure was not due to galvanic corrosion since the tubing head was manufactured from low-alloy (85,000 psig) material, and the fitting was manufactured from carbon steel.

Equipment Maintenance Issues

Observations by the panel members of the PPI and ABB reports, post-incident Weatherford inspections, and MMS on-site assessments led panel members to request a copy of Orca's historic preventative maintenance records on the subject well. No records were provided that pre-dated Orca's scheduled workover date. No records were provided to the panel members during the time frame that this well/lease was operated by previous operators.

Company Management Issues

No written work order with inspection requirements was prepared by Orca and submitted to Weatherford. This resulted in Weatherford only performing an above-deck inspection of equipment, which basically excluded the tubing head and wellhead areas.

A Job Safety Analysis (JSA) was completed neither prior to the wellhead inspection task nor before nor during any subsequent well workover tasks.

Orca neither took a lead role, nor provided support, coverage, and oversight of the work. Written and specific job tasks, which would have identified and assigned individuals to performing services, were not shown.

An employee of Island Operating Company (Island), Orca's contracted lease operator, stated that (1) he was not familiar with the Orca/Island operating agreement, (2) he was not aware of the condition of the subject wellhead, and 3) well work operating decisions did not include Island.

Federal Regulations

Orca is in the process of becoming designated operator of the well and lease, replacing Dunhill Resources, Inc. The paperwork to be submitted for approval to the Minerals Management Service was being processed at the time of the incident. Orca mistakenly assumed that verbal approval had been received from Minerals Management Service to perform work on Well CA-1. As a result, an incident of non-compliance was issued to Orca.

Conclusions

The Accident

After a review of the information obtained during the investigation, it is the conclusion of this panel that, at approximately 0200 hours, while coiled tubing operations were underway, a leak developed through a severely corroded and thus metallurgically weakened plastic injection fitting port in the tubing head section of the wellhead equipment. The LWC resulted in an estimated spill of about 5 gallons of condensate into the Gulf of Mexico.

Cause of Loss of Well Control

This LWC event was a result of the compromised plastic injection fitting port which, when breached, released trapped pressure to the atmosphere. Severe corrosion and metallurgical fatigue from extended service within the harsh “splash zone,” coupled with the absence of historic maintenance, caused the plastic injection port fitting to fail. Increased pressure was momentarily seen on the port as a result of a missing seal assembly and packing in the Gray tubing head.

Down-hole gas flow between the tubing string above the isolation packer and the 7-inch casing migrated “over-the-top” of the 7-inch casing stub over which the tubing head is installed. Physical evidence showed that the failure was exacerbated by the age of the wellhead equipment and the close proximity to sea level within the splash zone. The fitting was severely corroded and metallurgically weakened. Since the well was “dead” prior to the coiled tubing work, little to no pressure was transmitted during that time to the plastic injection port fittings.

Contributing Causes

Orca management’s failure to take a lead role in providing support, coverage, and oversight of work constituted a contributing cause of the accident, as exemplified by the following specific failures:

(a) To inspect and maintain wellhead components, grease and lubricate the valves, and perform routine repair services regularly, as necessary, to ensure structural and functional integrity;

(b) To communicate regularly with the on-site supervision, including contracted operators (Island), to review and assess equipment integrity and compliance with safety policies;

(c) To describe clearly and in writing what was specifically expected of Weatherford in its contracted work, including inspection responsibilities;

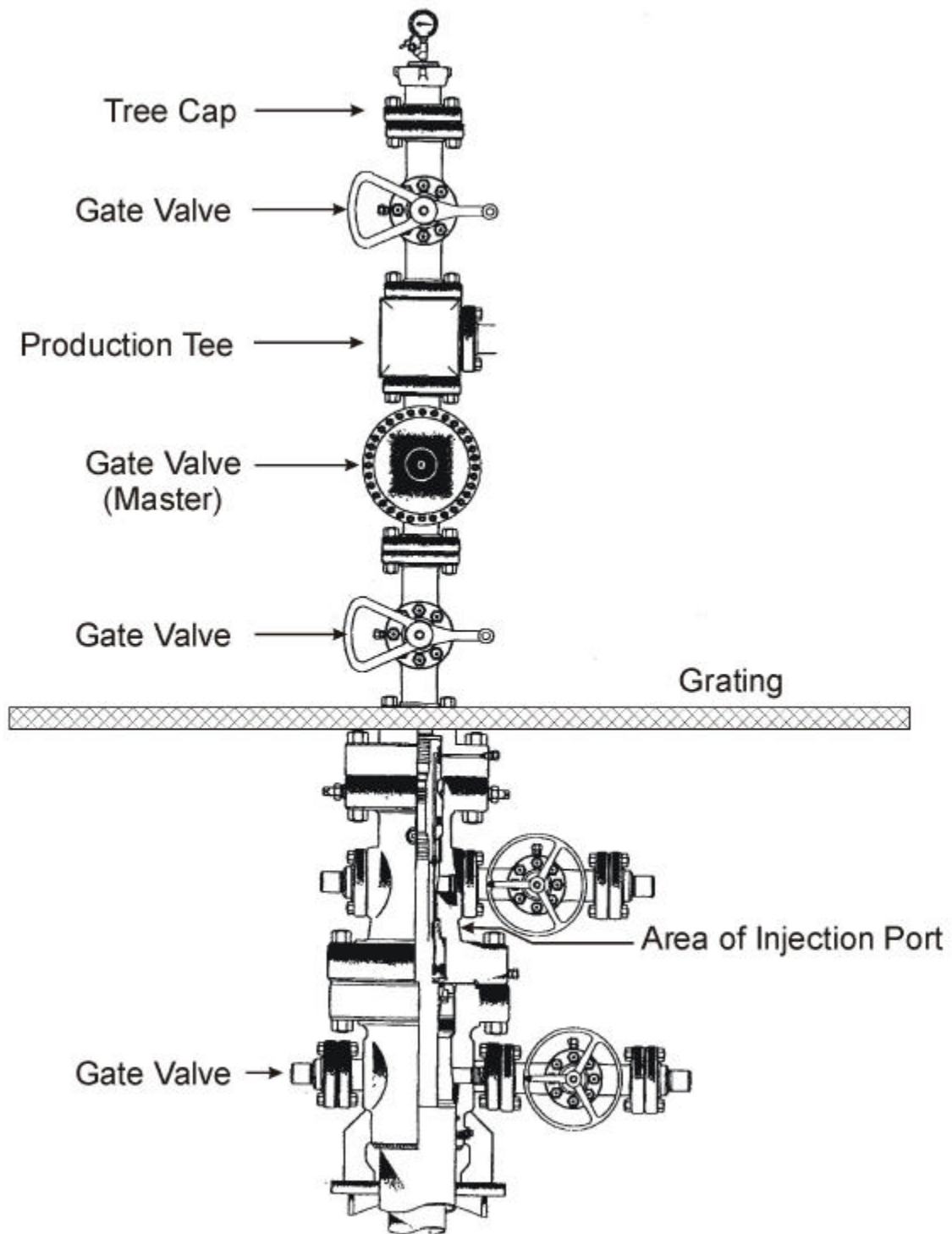
(d) To perform a thorough Job Safety Analysis (JSA) and inspection of all components prior to commencing the well work to ensure all safety issues and work activities had been addressed, and that all personnel were aware of specific duties, possible hazards, and safety policies; and

(e) To have written and specific job tasks identified and assigned to individuals who would be performing services.

Recommendations

The MMS should issue a Safety Alert to all lessees and operators containing the following:

1. A brief description of the accident,
2. A brief summary of the causes, and
3. The following recommendations:
 - a) Lessees and Operators should review their well maintenance policies and activities.
 - b) Lessees and Operators should communicate clearly and in writing what is expected of their field representatives.
 - c) JSA's should be performed for all tasks involving hazards.



Wellhead Diagram

MMS *Securing Ocean Energy & Economic Value for America*



The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

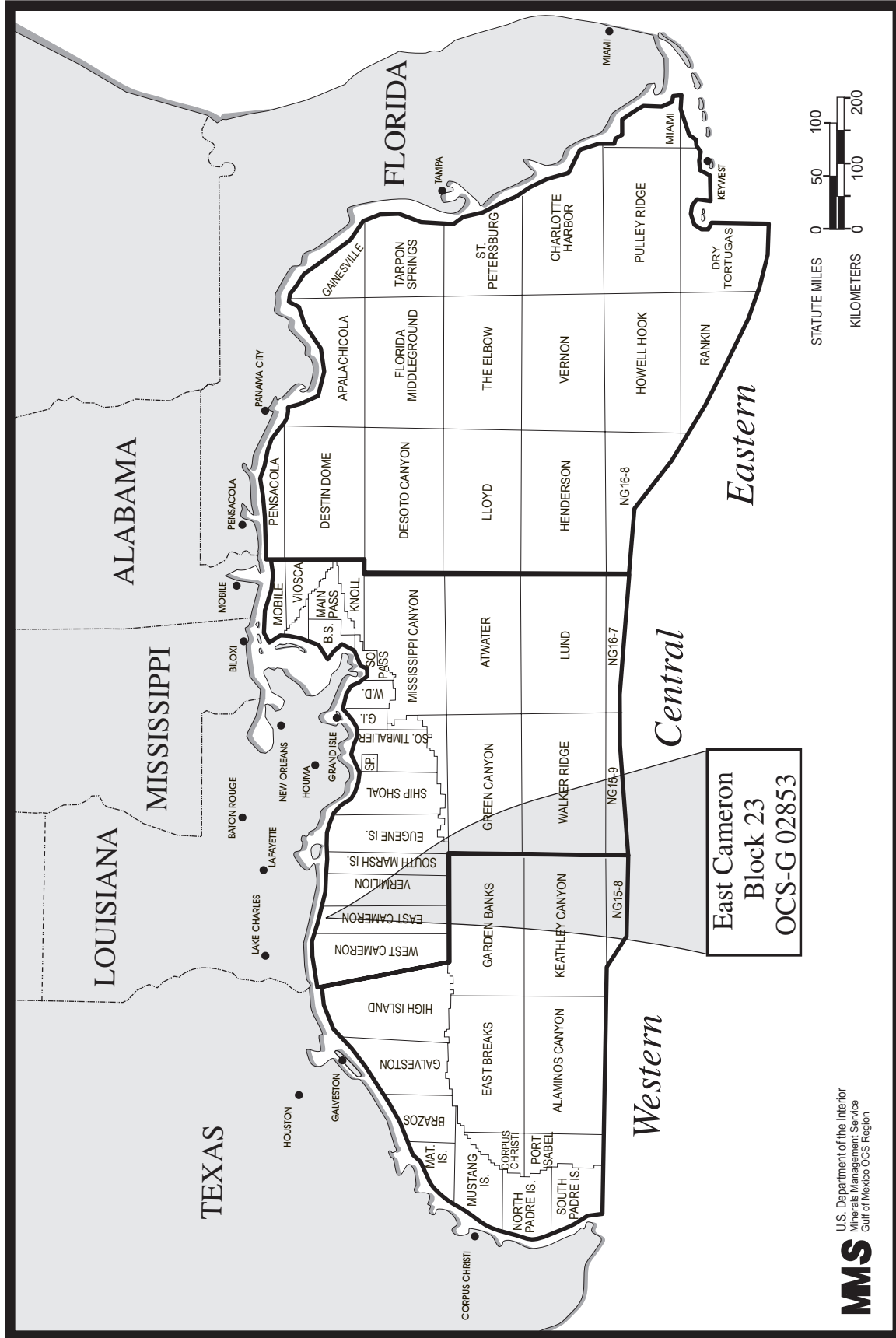


The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.



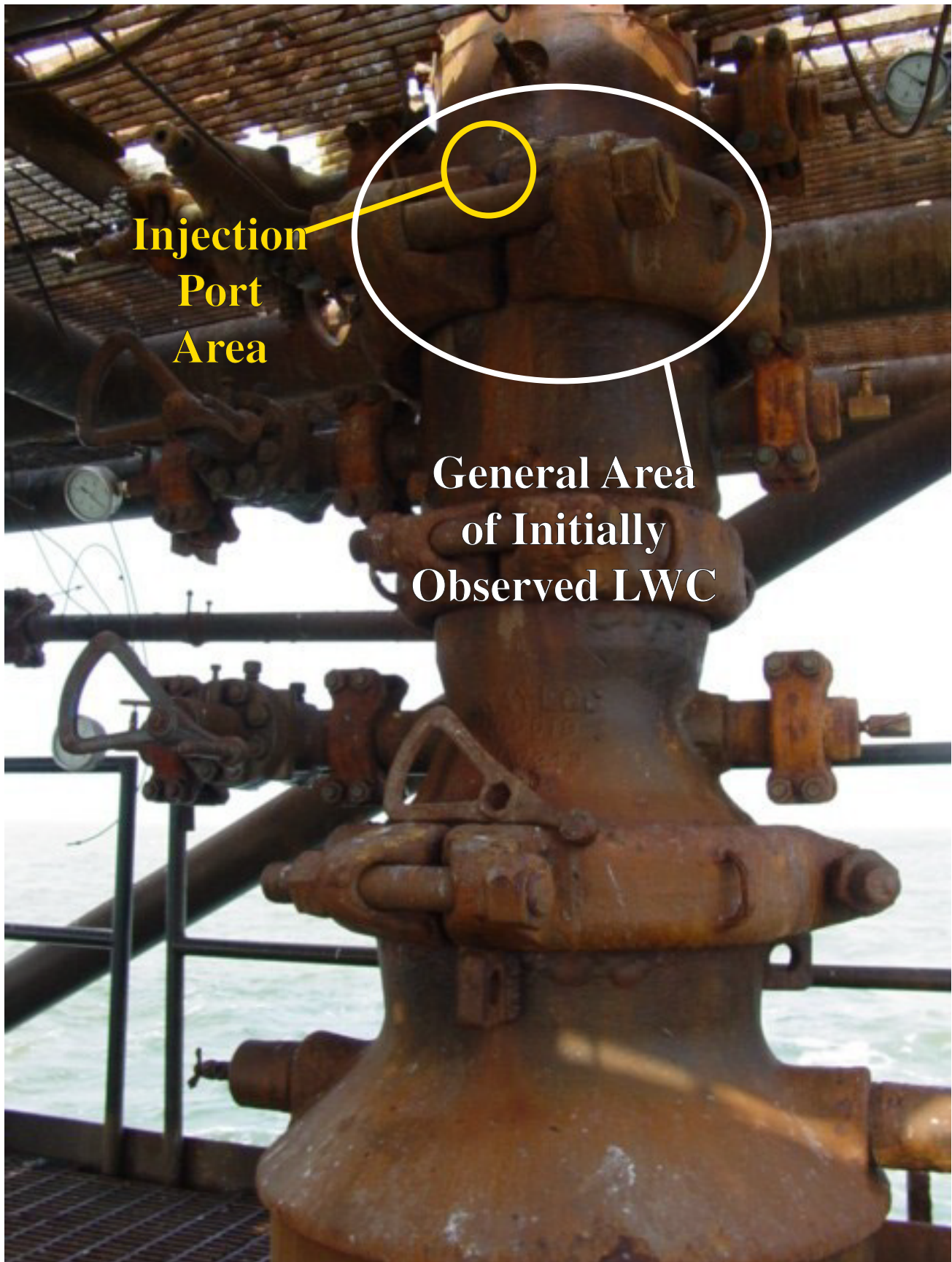
Location of Lease OCS-G02853, East Cameron Block 23



Photograph of Well CA-1



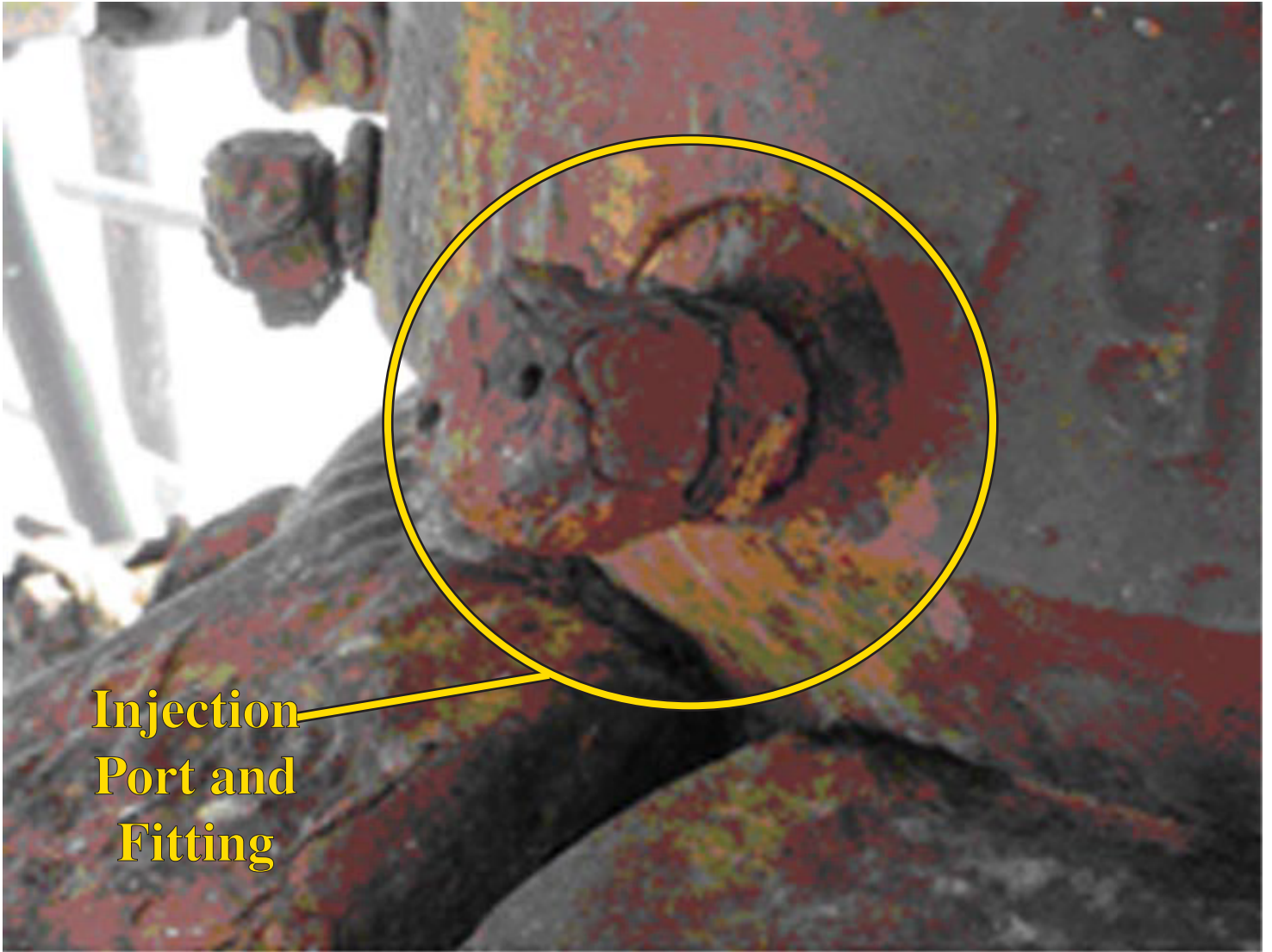
Photograph of Well CA-1 Tree



Photograph of Wellhead Below Workover BOP



Photograph of Injection Port



**Injection
Port and
Fitting**

Photograph of Corroded Injection Port and Fitting



Photograph of Wellhead



Photograph of Tubing Head