OCS Report
MMS 96-0038

Investigation of Hydrocarbon Spill, West Cameron Block 198, Gulf of Mexico, Off the Louisiana Coast

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

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Milford Cole
Cliff Delouche

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New Orleans
July 1996

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Investigation and Report

Authority

A liquid hydrocarbon spill occurred on Chevron U.S.A.'s Platform A, West Cameron Block 198, Lease OCS-G 3265 in the Gulf of Mexico (GOM), offshore the State of Louisiana, on December 14 and 15, 1995. Pursuant to Section 208, Subsections 22 (d), (e), and (f), of the Outer Continental Shelf (OCS) Lands Act, as amended in 1978, and the Department of the Interior Regulations 30 CFR Part 250, the Minerals Management Service (MMS) is required to investigate and prepare a public report of this accident. By memorandum dated January 19, 1996, the following MMS personnel were named to the investigative panel:

Frank Pausina, New Orleans, Louisiana (Chairman)

Milford Cole, Lake Charles, Louisiana

Cliff Delouche, Lafayette, Louisiana

Procedures

On December 18, 1995, panel member Milford Cole visited the scene of the accident. The accident investigation panel members met with Chevron U.S.A. personnel at the MMS Gulf of Mexico OCS District Office in Lafayette, Louisiana, on January 18, 1996. At the meeting, information regarding the spill was presented to the panel members. After reviewing the data the panel decided that additional information was required in order to continue the investigation. Consequently, another meeting was held between panel members and Chevron U.S.A. personnel at Chevron U.S.A. offices in Lafayette, Louisiana, on March 25, 1996, during and subsequent to which, additional information was submitted to the panel.

Introduction

Background

Lease OCS-G 3265 covers approximately 5,000 acres and is located in West Cameron Area (WC) Block 198, GOM, off the Louisiana coast. (For lease location, see Attachment 1.) The lease was issued to Gulf Oil Corporation, effective September 1, 1975, for a cash bonus of $6,750,000. At the time of the accident, Chevron U.S.A. Inc. was the lessee and designated operator of Lease OCS-G 3265.

At the time of the accident, the wells whose production was being processed on Platform A, an unmanned platform, were Well No.1 (produced from WC Block 197 Platform A), Well C-1 (produced from WC Block 198 Platform C), and Wells A-2 and A-3 (produced from WC Block 198 Platform A). Wells No. 1, A-2, and A-3 produce Lease OCS-G 3264, WC Block 197. Well C-1 produces Lease OCS-G 3265, WC Block 198.

Description of Accident

On December 14, 1995, a high-pressure separator on WC Block 198 Platform A was cleaned in an effort to reopen the separator's clogged water leg. Upon returning to the platform on December 15, 1995, the platform operators observed a spill and reported it to the MMS and the National Response Center (NRC) as 6 gallons. It was observed that liquid hydrocarbons were spilling from the platform's sump tank and that a ball valve on the drain line from the separator to the sump tank was not holding. The valve, which had been opened and closed during the previous day's cleaning of the separator, was removed, and the line was blind flanged. Meter readings and well tests were reviewed, and the spill volume was upgraded and reported as 740 barrels.

Findings

Brief Summary of Platform Processing

On Platform A at the time of the accident, all wells flowed to one of two separators. Wells A-3 and C-1 flowed to the high-pressure separator and Wells No. 1 and A-2 flowed to the low-pressure separator. Separated gas flows to a glycol dehydrator and is then measured for sales. Separated condensate is measured by allocation meters and is then recombined with the separated gas prior to entering a 30-inch Texas Eastern Transmission Company pipeline (MMS Operations System No. 9) for transportation to shore. The drain valve from the high-pressure separator to the sump tank is controlled by a manual 2-inch ball valve. The high-pressure separator is equipped with a level safety low (LSL) in the water bucket, an LSL in the condensate bucket, and a level safety high (LSH) for the entire vessel. The sump tank was equipped with an LSH. (For a simplified flow schematic of the platform, see Attachment 2.)

Preliminary Activities

On December 12, 1995, Chevron operators discovered that the water leg of the high-pressure separator on Platform A was plugged, reducing the separator from a three-phase to a two-phase. At 0700 hours on the morning of December 14, 1995, a decision was made to wash out the separator in an attempt to reopen the water leg. At 1000 hours, Platform A was shut in as was Well No. 1. At 1045 hours, Well C-1 was shut in.

Shortly after all the wells had been shut in, a 2-inch ball valve on the drain line from the separator to the sump tank was opened in preparation for the cleaning of the separator. Apparently there was no drainage through the line. Cleanout caps on the inlet, bottom, and water side of the separator were then opened, releasing mud, water, and approximately 5 gallons of condensate into the skid pan. The contents of skid pans are piped to the sump tank. The separator was then flushed with water. Concurrently, the sump tank pump suction line, which was plugged with trash, was being cleaned. After the separator was cleaned, the cleanout caps and ball valve were closed.

Between 1400 and 1630 hours, the separator was purged, all wells were brought back on line, all safety devices were placed back in service, and no problems were observed. At 1630 hours the Chevron operators departed Platform A.

Discovery of Spill

At 0730 hours on December 15, 1995, Chevron operators arrived on Platform A, observed the spill, and shut in the platform. All valves on lines from all pressured vessels to the sump tank were closed. By feeling the lines for heat, the operators then determined that the 2-inch valve on the drain line from the high-pressure separator to the sump tank was leaking. Liquid hydrocarbons and water were flowing out of the water leg of the sump tank, and a mist of liquid hydrocarbons and flash gas was spraying from the thief hatch of the sump tank. The sump tank pump, which pumps to the skimmer tank, was observed to be operating, and the sump tank LSH had not been activated. At 0830 hours Chevron reported a 6-gallon spill both to MMS and the NRC. This amount was based on a visual sighting with poor visibility of a relatively small sheen near the platform. A helicopter overflight was conducted soon thereafter; however, due to inclement weather, including continued poor visibility, nothing was detected in the water. At 0900 hours the leaking valve was removed and replaced with a blind flange. By 1400 hours, Wells No. 1, A-3, and C-1 were back on line. At 2100 hours, after reviewing the allocation meter readings between December 14 and 15, recent average allocation meter readings, and well test data, Chevron upgraded their spill report to both MMS and the NRC as 740 barrels.

Sump Tank

The sump tank has a capacity of approximately 20 barrels. The actuation of the sump tank LSH results in the shutting-in of the wells produced on the platform and the shutting-in of the pipelines boarding the platform.

The LSH at the time of the accident was configured in such a manner that a fluid level that would normally be expected to actuate the LSH would fail to do so if a critical volume of condensate in the tank were exceeded. (For a simplified schematic of the sump tank, see Attachment 3.) The external tubing leading to the LSH, if initially containing water, will not reflect the true contents of the tank as condensate begins to enter the tank. The tubing will contain water while the tank will contain condensate and water. The difference in the composite specific gravity of the water and condensate in the tank and the specific gravity of the water in the tubing will result in the column of fluid in the tank exerting less force on the tube inlet than the column of fluid in the tubing. Therefore, if there were enough condensate in the tank, the difference in the aforementioned specific gravities would be great enough such that the water level in the tubing would not reach and not actuate the LSH even if the level in the tank were to exceed the height of the LSH. On December 15, after the platform was shut-in, the LSH was tested with water and did actuate.

The LSH, within one week of the accident, was reconfigured so that the specific gravities of the contents of the tubing and the tank remain relatively equal, thereby allowing for the proper actuation of the LSH. (For a simplified schematic and picture of the reconfigured sump tank LSH, see Attachments 4 and 5, respectively.) The reconfiguration consisted of lowering the LSH an additional 3 inches and connecting the tubing with the tank at point 23 inches below the top of the tank. Also, the drain line from the separator to the tank was blind-flanged at both ends. Additionally, all drain lines from pressured vessels to the sump tank were removed as of January 14, 1995.

Drain Line Valve

Through an analysis of the drain line valve, it was determined that the ball and body of the valve were cut out and that the valve is not completely closed when the valve handle is perpendicular to the valve body. (For a picture of the position of the valve bore when the valve handle is perpendicular to the valve body, see Attachment 6.) The handle must be turned an additional 10 to 20 degrees past perpendicular to completely close the valve. (For a picture of the position of the valve stem and the valve handle when the valve is closed, see Attachment 7.) It was also discovered that the valve stem is twisted. (For a picture of the twisted valve stem, see Attachment 8.)

Volume Data

Well test data for the four previously mentioned wells are as follows:

Well	Test date	Oil (barrels/day)	Gravity (API)
No.1	11/07/95	22	55.4
C-1	12/09/95	1,582	43.5
A-2	11/06/95	6	53.5
A-3	12/12/95	245	40.8

Prior to the spill, Well C-1 had recently been producing 100 percent water for a 2- to 4-hour period upon being brought back on line from a shut-in status. After the spill, the period of 100 percent water production extended beyond 4 hours.

The liquid allocation meters measured 259 barrels between 0700 hours on December 14, 1995, and 0700 hours on December 15, 1995. For the period beginning at 0700 hours on December 13, 1995, and ending at 0700 hours on December 19, 1995, excluding December 15, the average volume of condensate measured by the liquid allocation meter was approximately 1,400 barrels.

On November 26, 1995, an analysis of the composite condensate production from WC 198 reported a shrinkage factor of approximately 13 percent.

Spill Fate and Response

At 0700 hours on December 16, 1995, the first overflight of the spill was conducted by the United States Coast Guard. The flight confirmed a 5-nautical mile (nmi) by 5-nmi slick 35 nmi southeast of Sabine Pass, Texas, with approximately 100 to 200 barrels (bbls) on the surface. By 1000 hours a Clean Gulf Associates ready-response skimmer was on the scene. At approximately 1550 hours on December 16, 1995, dispersants were applied to the spill. By 0730 hours on December 17, 1995, the slick had separated into two areas, with approximately 20 to 40 bbls spread over 11,500 acres. Two skimmers were operating in one area and one skimmer in the other. The skimmers collected 22 bbls of oil. The last reported location of the slick was latitude 29° 25' 00" N / longitude 93° 34' 00" W at 1600 hours on December 17, 1995. At 1330 hours on December 18, 1995, two helicopter flights with good visibility were unable to find any trace of the spill.

Conclusions

Cause of Spill

The cause of the spill was the overflow of liquid hydrocarbon production from the thief hatch and water leg of the platform's sump tank.

Contributing Causes

The contributing causes of the spill are as follows:

1. Deformed valve stem — The twisted valve stem allowed the high-pressure separator drain line valve to remain slightly open when the valve handle was perpendicular to the valve body, the position in which the valve is normally closed. The complete closing of the valve required the turning of the valve handle through an additional 10 to 15 degrees past perpendicular. Once production was restored, gas, water, and condensate from the high-pressure separator began to cut out the valve ball and body and allowed an increasing flow of production to the sump tank.

2. Ineffective LSH configuration — As production entered the sump tank, water already existing in the tank was forced up the tube leading to the LSH. The amount of condensate in the tank reduced the specific gravity of the contents of the tank, even when full, to such an extent that the pressure exerted on the LSH tube inlet, located at the bottom of the tank, could not force the water in the tube high enough to actuate the LSH, located at a level near the top of the tank. Therefore, after the tank filled, condensate production began to spill from both the water leg and thief hatch of the tank without the actuation of the LSH.

Estimated Volume *of Spill*

The uncertainty involved in the determination of the volume of condensate spilled is the result of the absence of usable slick size observations, given the delayed time of the first sighting and the subsequent deterioration of the slick, and the uncertainty of the volume of condensate that flowed though the drain line of the high-pressure separator during the incident.

The use of recent well test data and an average of the volume measured by the liquid allocation meters over a recent time period are the two available methods utilized in approximating this volume. In both cases, it is assumed that the spill began at 1630 hours on December 14 and ended at 0730 hours on December 15, 1995. Therefore, in both methods, any measured volumes over a period of time and any daily production rates that are utilized will be prorated as necessary to reflect the assumed spill period. The utilization of the two available methods results in a range of probable volumes spilled.

In one method, the prorated average allocation meter volume is assumed to be the total volume that flowed from the high-pressure separator during the spill period. In the other method, the sum of the prorated well test volumes is assumed to be that volume. In each method the volume of condensate measured though the allocation meter from 0700 hours on December 14 to 0700 hours on December 15 is subtracted from the volume estimated to have flowed from the high-pressure separator from 1630 hours on December 14 to 0730 hours on December 15. This difference is the volume of oil that flowed through the drain line to the sump tank and eventually overboard. The apparent discrepancy of the two time periods is insignificant since the allocation meter did not measure any production from Wells A-3 and C-1 from 0700 to approximately 1630 hours on December 14.

In both methods, the initial water production of Well C-1, the largest producing well, is taken into consideration by adjusting the proration of the volumes flowing from the high-pressure separator. Also, in both methods, the flashing of gas, as indicated by the shrinkage factor, is taken into consideration by reducing the spill volumes by 13 percent.

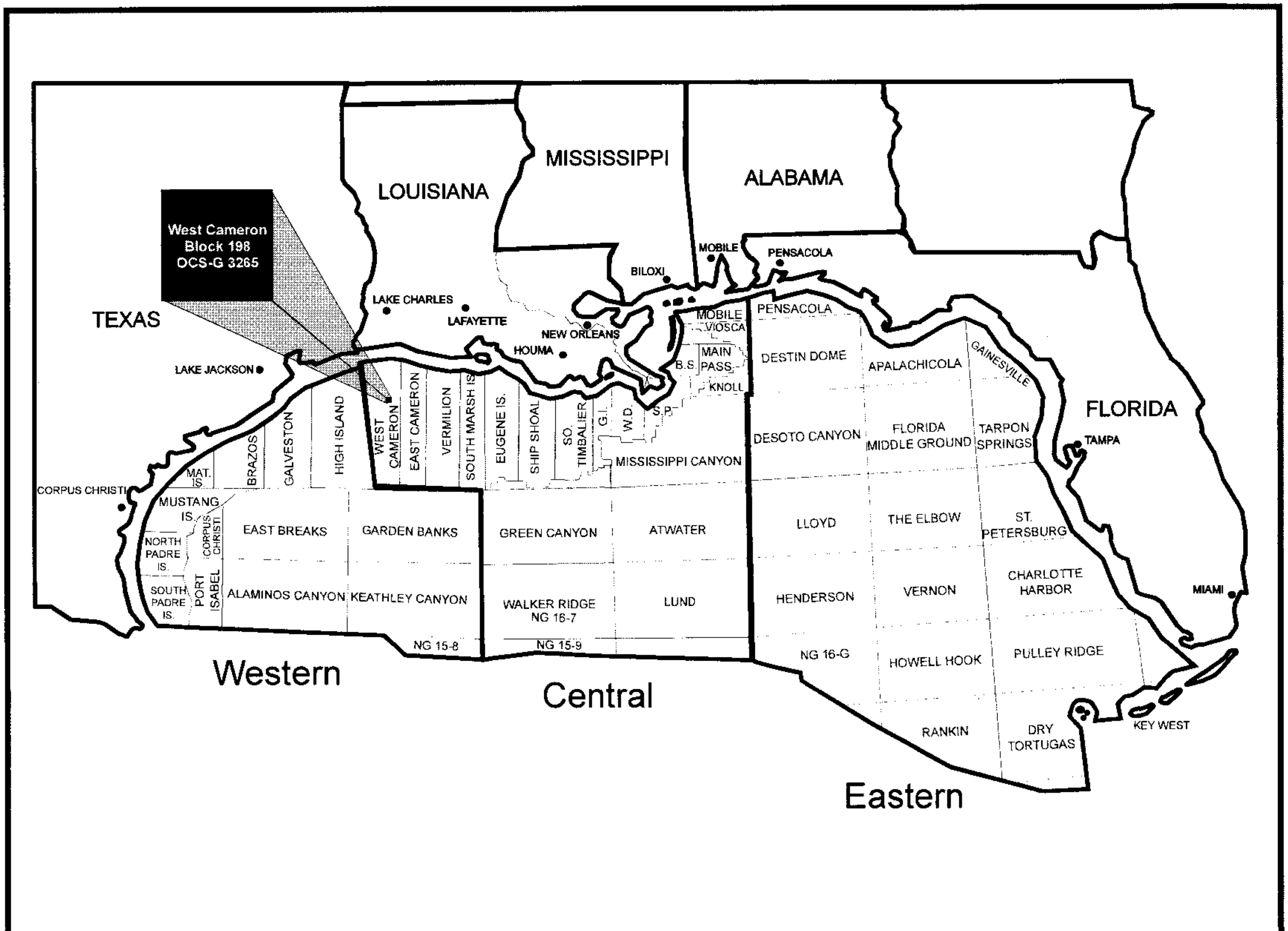
Using the above methodology, the probable volume of liquid hydrocarbon spilled is between 435 and 650 barrels. However, due to the greater reliability of the average allocation meter volume method, which resulted in a conclusion of 435 barrels spilled, the distinct possibility that Well C-1 flowed 100 percent water for a period greater than four hours, and that the transition of 100 percent water production to the normal percent of water production occurred gradually, the actual volume spilled is probably much closer to 435 barrels.

Recommendations

1. The MMS should issue a Safety Alert to notify all lessees of the possible danger associated with the type of LSH configuration appearing in this accident and the remedial action that can be taken to substantially lessen that danger.

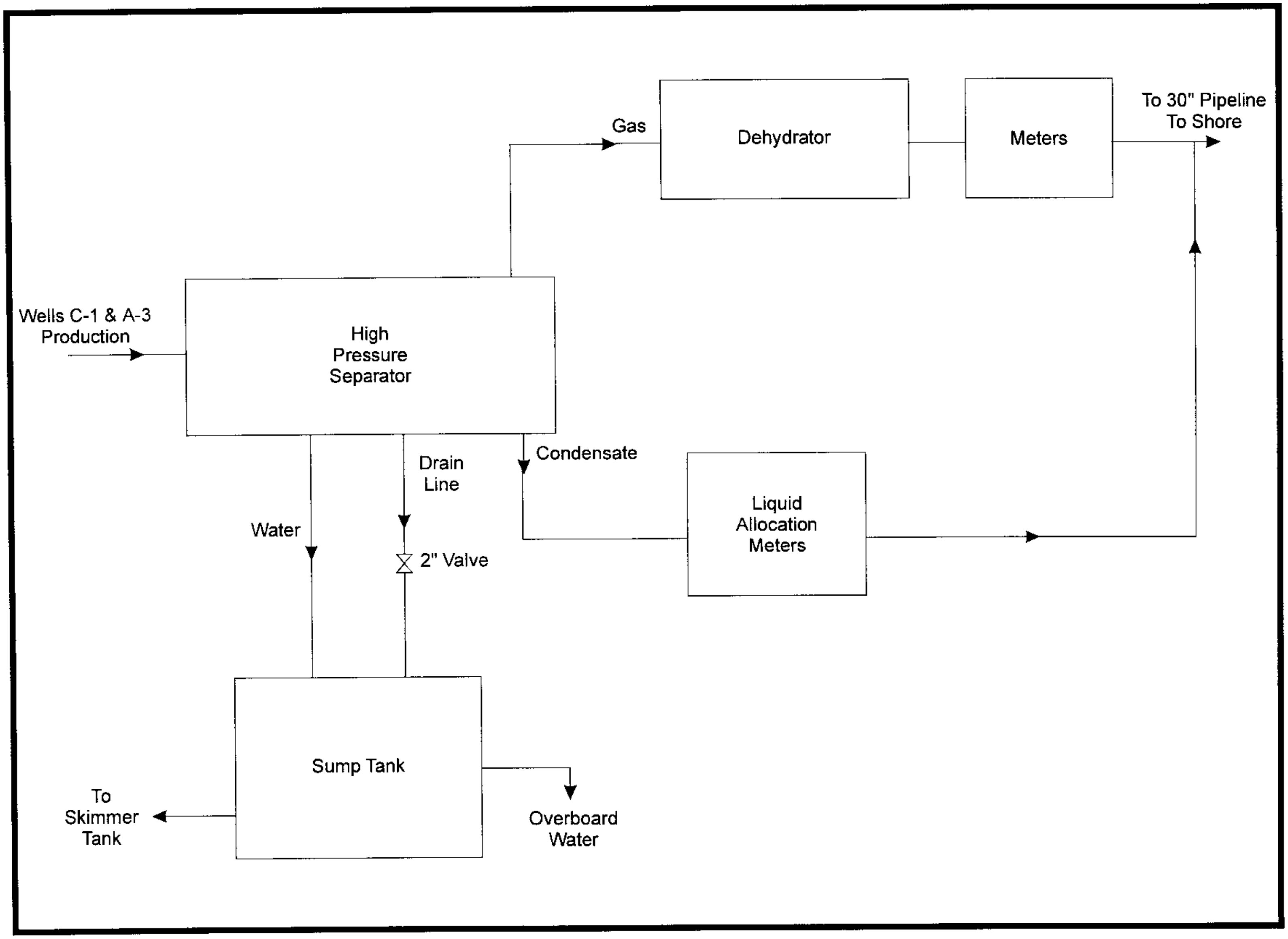
2. The MMS should issue a Safety Alert to recommend to all lessees that all manual valves be checked periodically for holding capabilities.

Attachment 1



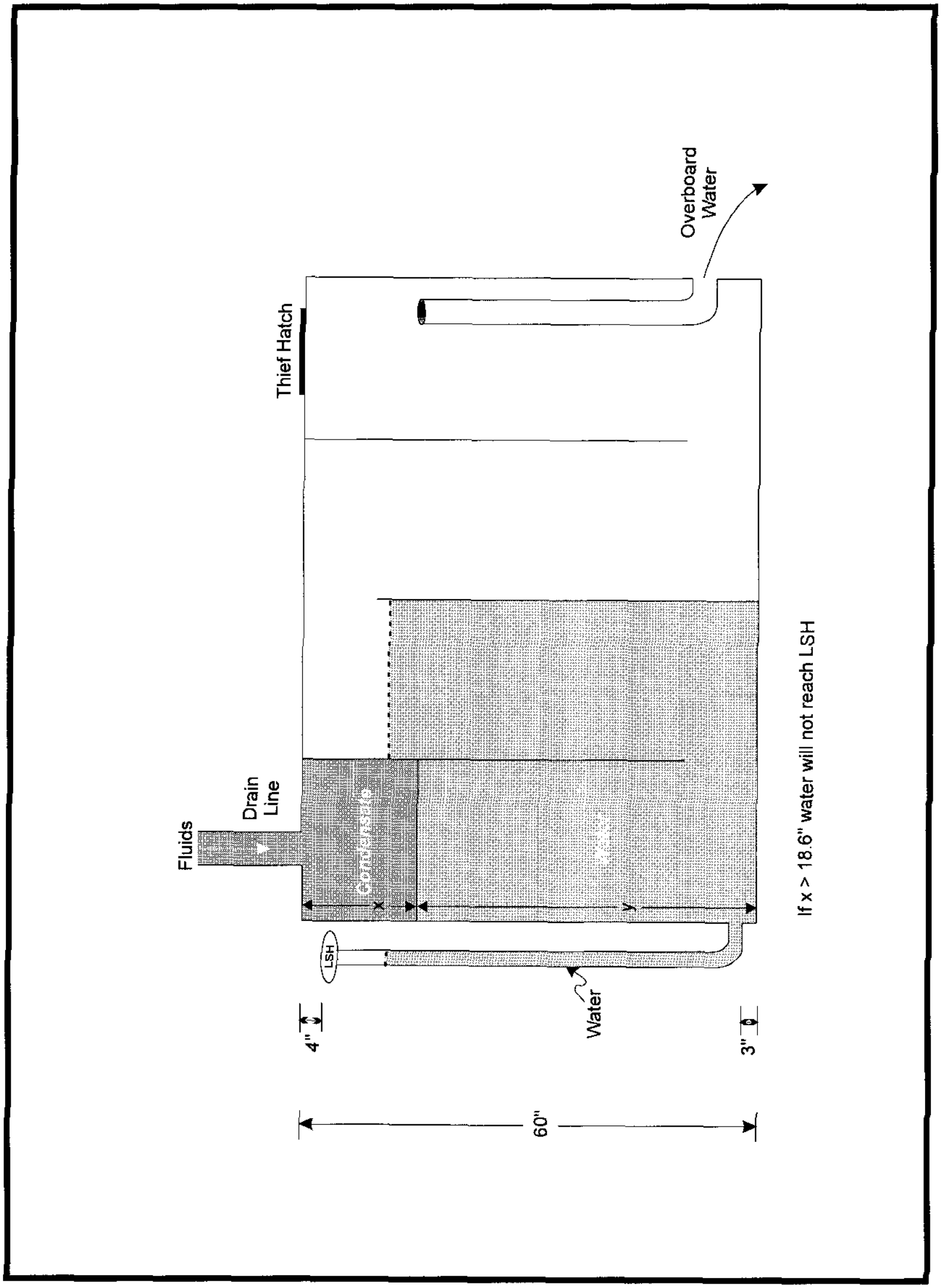
Location of Lease OCS-G 3265, West Cameron Block 198

Attachment 2



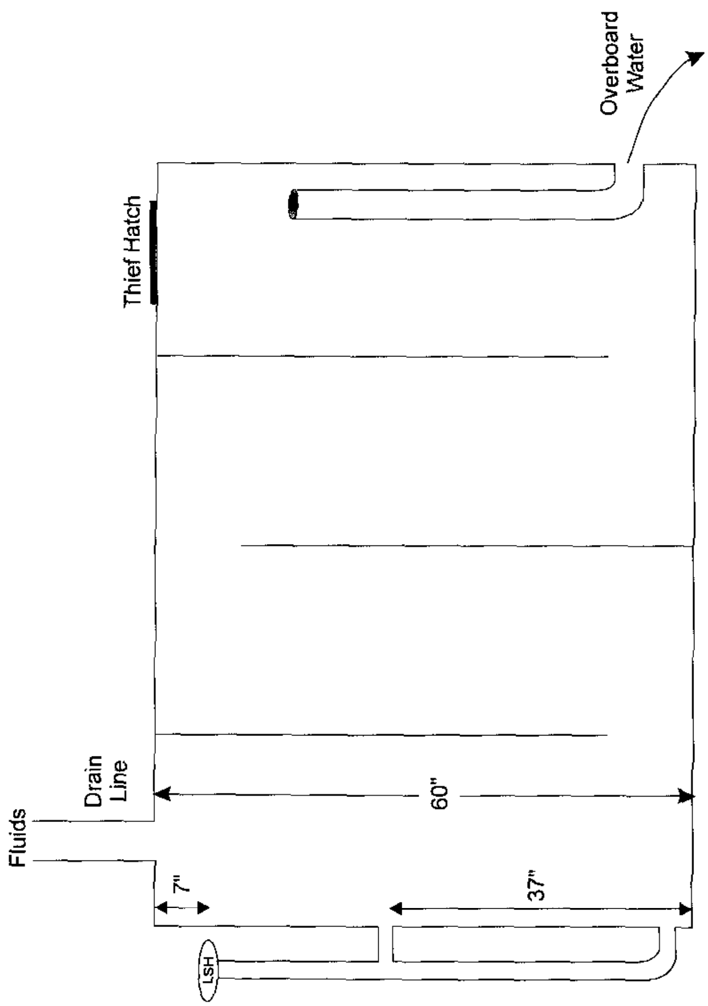
Flow schematic West Cameron Block 198 Platform A

Attachment 3



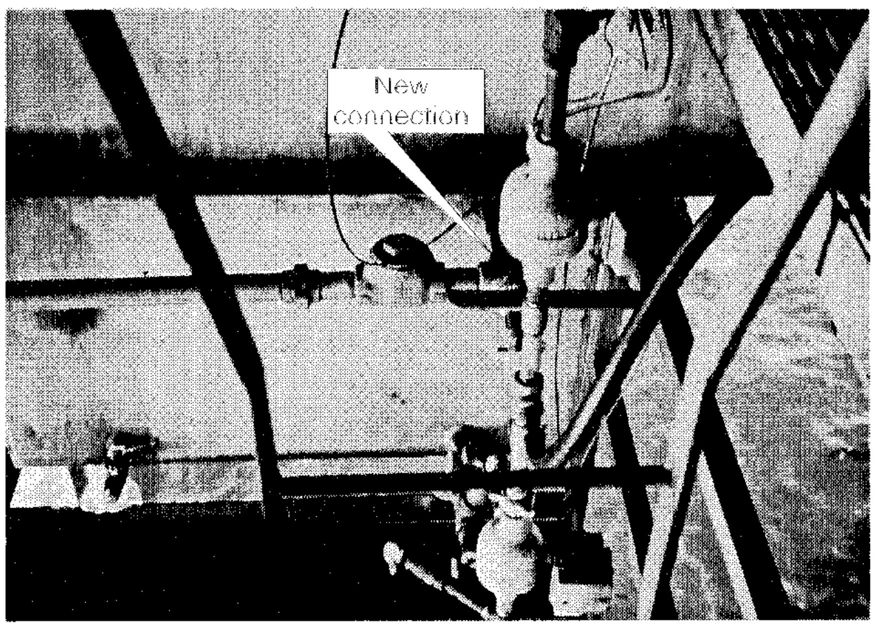
Sump tank schematic

Attachment 4

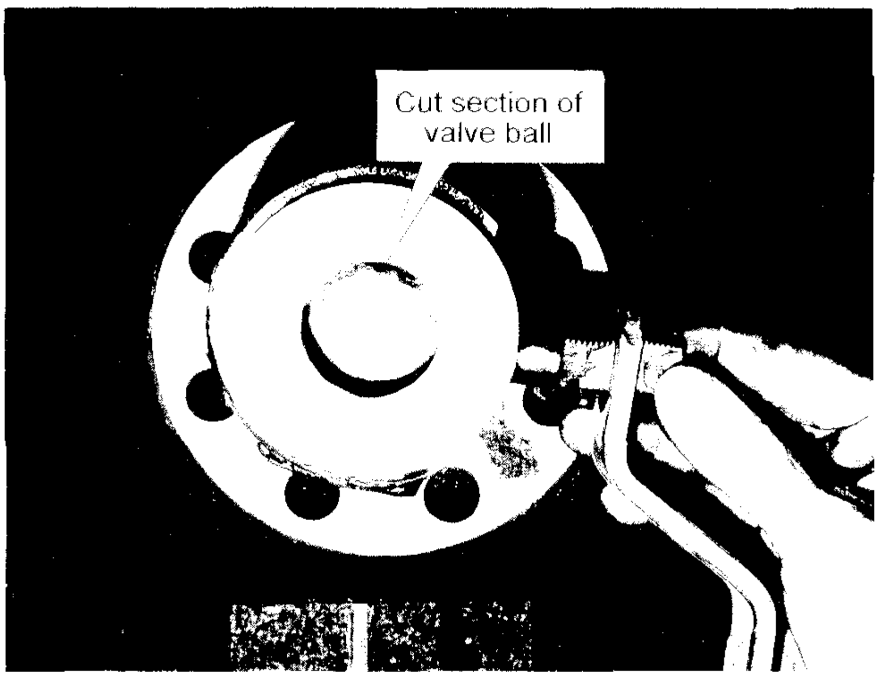


Reconfigured sump tank schematic

Attachment 5

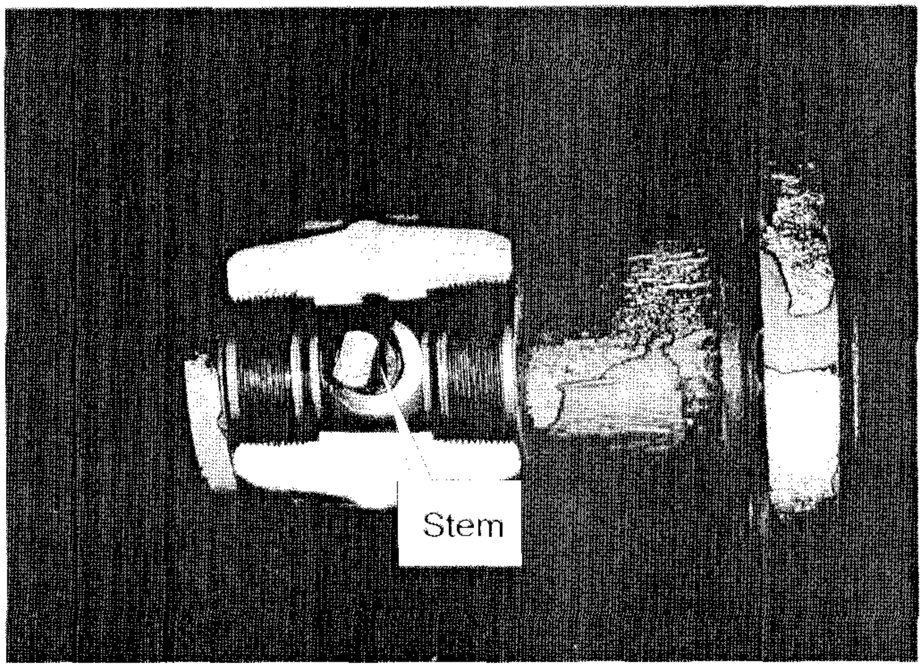


Reconfigured sump tank LSH

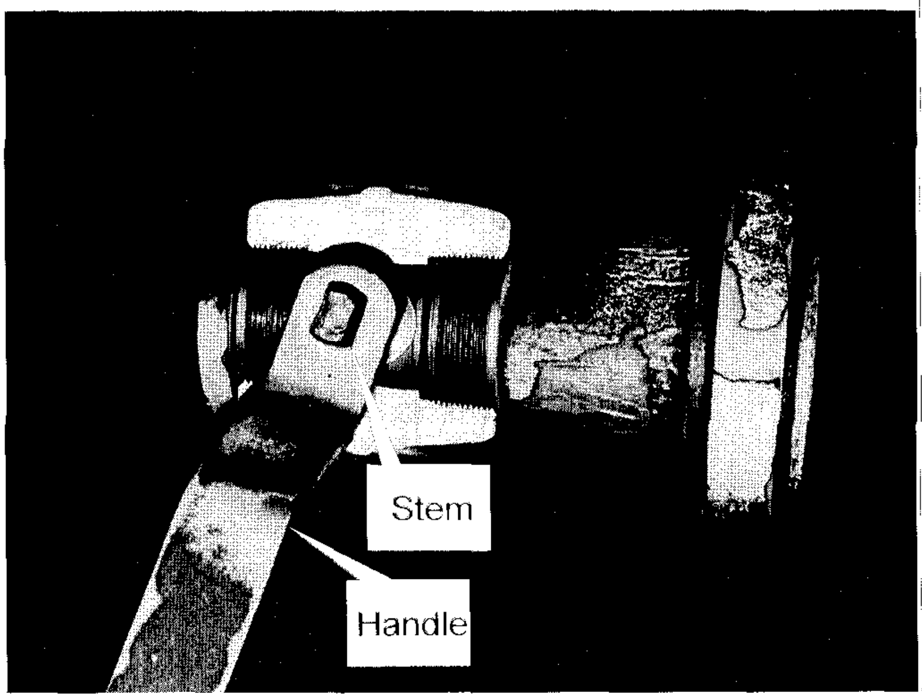


Valve handle perpendicular to valve body / ball bore visible through valve bore.

Attachment 7

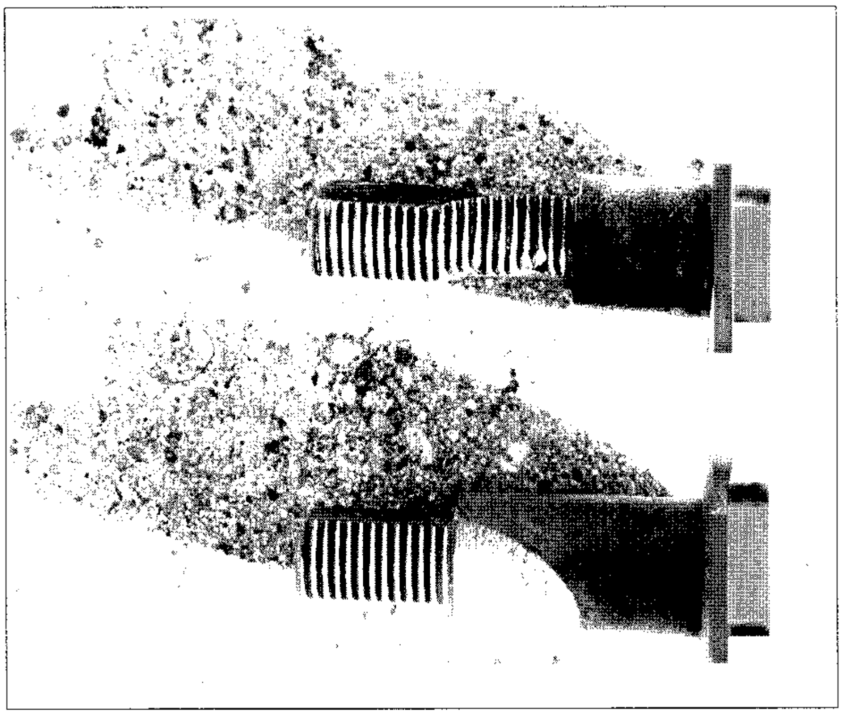


Stem position with valve closed.



Stem and handle position with valve closed.

Attachment 8



Twisted stem of subject valve compared to new stem.

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 **Royalty Management Program** 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.