

**AV The Somewhat Accidental Discovery of the Mobile Bay Gas Field:
A Story of Perseverance and Good Fortune**

Weldon G. Frost¹

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*Adapted from oral presentation at forum, History of Petroleum Geology, at AAPG Annual Convention and Exhibition, New Orleans, April 11, 2010

¹Retired Mobil, Longboat Key, FL (weldonfrost@verizon.net).

Abstract

In 1979, NASA's SkyLab was still in orbit; Jimmy Carter was President; the US was suffering from the Second OPEC Oil Crisis; the Sony Walkman was introduced; and Terry Bradshaw's Pittsburgh Steelers took Super Bowl XIII from the Dallas Cowboys. I was Exploration Manager for Mobil in New Orleans, and the Mobile Bay Field was discovered.

Today, Jimmy Carter has been a former President for over 30 years; the Walkman is an antique; and Terry Bradshaw is a 61-year old actor and sports commentator. However, Mobile Bay is still producing gas and will continue to do so for at least another thirty years.

An oil or gas discovery often comes from a combination of luck, sound technical and management decisions, overcoming legal, environmental, and operational difficulties - and perseverance at critical times. This story of the discovery of gas at 20,450 feet in the Mobile Bay #76-1 well in 1979 includes all of the above. Located in the very heart of a major Gulf Coast recreational and historical area - an offshore Civil War Battlefield no less - Mobile Bay #76-1 presented a unique set of technical and environmental challenges. This presentation describes the technical aspects of how this discovery came about, but unlike most such papers, the passage of time allows the author an opportunity to provide a new generation of geologists a glimpse of how the industry and the technical story has evolved. The real story here is one from a personal and human perspective and how the character and experience of some of the individuals involved had such a great impact on the successful and surprising outcome.





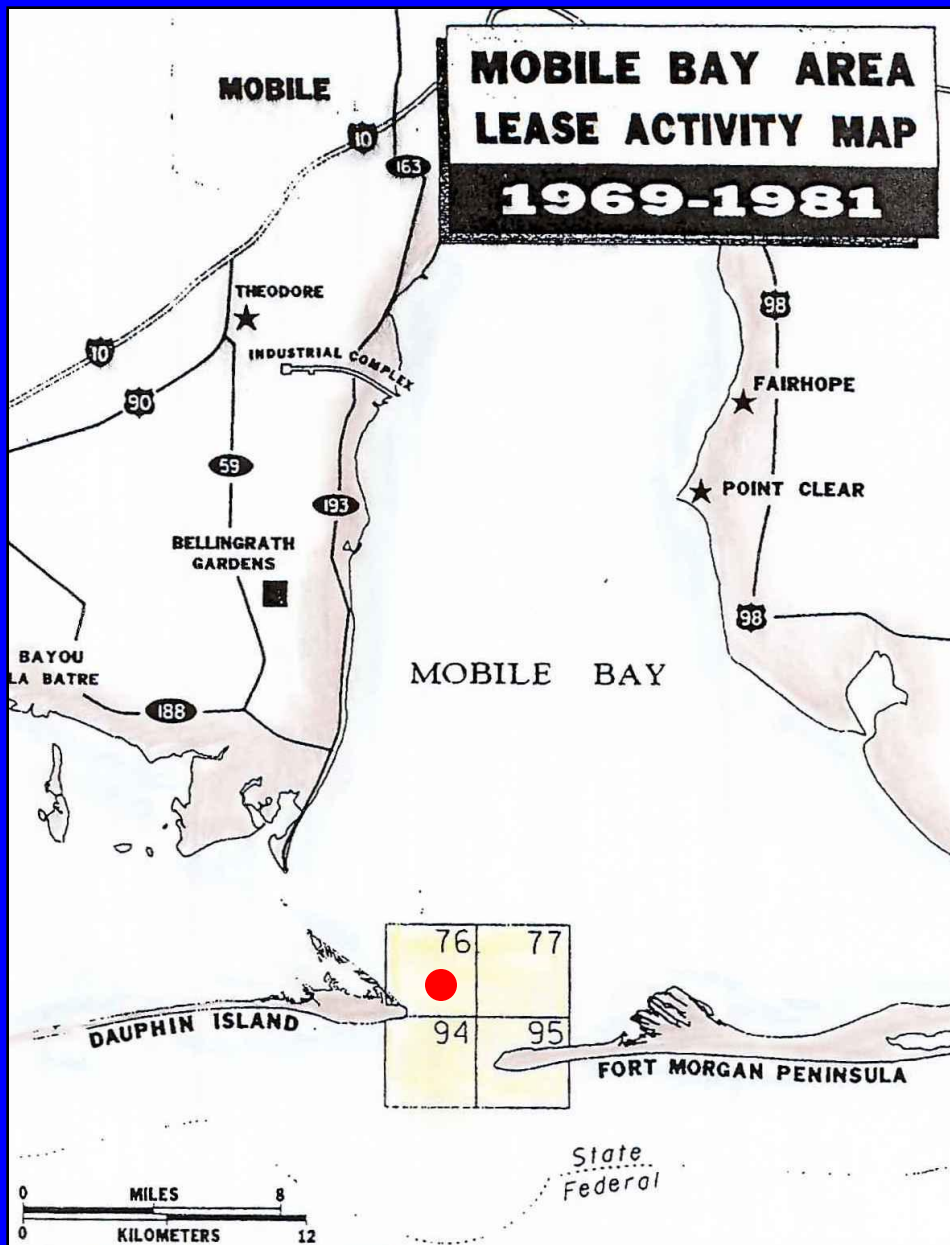
The Somewhat Accidental Discovery of the Mobile Bay Gas Field:

A Story of Perseverance and Good Fortune

Weldon G. Frost

STORY ELEMENTS

- * Getting the LEASES and PERMITS to DRILL
- * The PROSPECT
- * DRILLING Operations
- * TESTING the Well
- * What was FOUND
- * AFTERTHOUGHTS



Acquiring Leases and Permits

Challenges

- The Attorney General for the State of Alabama Opposed Mobil's Application
- The Oil and Gas Board Had to Delay Action on the Applications While Rules for Offshore Drilling Were Formulated
- Mobil successfully filed a suit in Federal Court to stop the clock on the lease expirations
- A State appeal of that decision was unsuccessful so the clock remained stopped
- Hearings were held with the Corps of Engineers, the Oil and Gas Board and the Alabama Water Improvement Commission
- Certification was eventually denied by the Alabama Water Improvement Commission
- Another suit was filed in Federal Court by Mobil, was deferred to a State Court then removed to the Circuit Court in Montgomery County – all without resolution

Principal Parties and Groups Involved

Alabama Water
Improvement
Commission

Ken Keller
General
Manager, Mobil
New Orleans

U.S. Corps of
Engineers

Myrt Jones
President, Mobile
Bay Audubon
Society

Alabama Oil and
Gas Division

Tom Joiner,
State Geologist
Oil and Gas
Division State of
Alabama

Pre-conditions for approval of the Mobile Bay Audubon Society

- * Mobil was to provide a \$55MM BOND against potential damages that might occur as a result of drilling
- * A —NO DUMP POLICY” — the first of its kind in industry
 - Mobil would collect all mud, cuttings, sewage and even rainwater that fell on the rig
 - All water / cuttings would be directed into a special barge and disposed of onshore in an approved landfill
- * Special Containment EQUIPMENT around the rig
- * Continuous MONITORING of water quality in the Bay :
Pre-, During-, and Post-drill

U.S. NAVY



"Damn the torpedoes,
Go ahead!"

FARRAGUT AT MOBILE BAY, AUG. 5, 1864

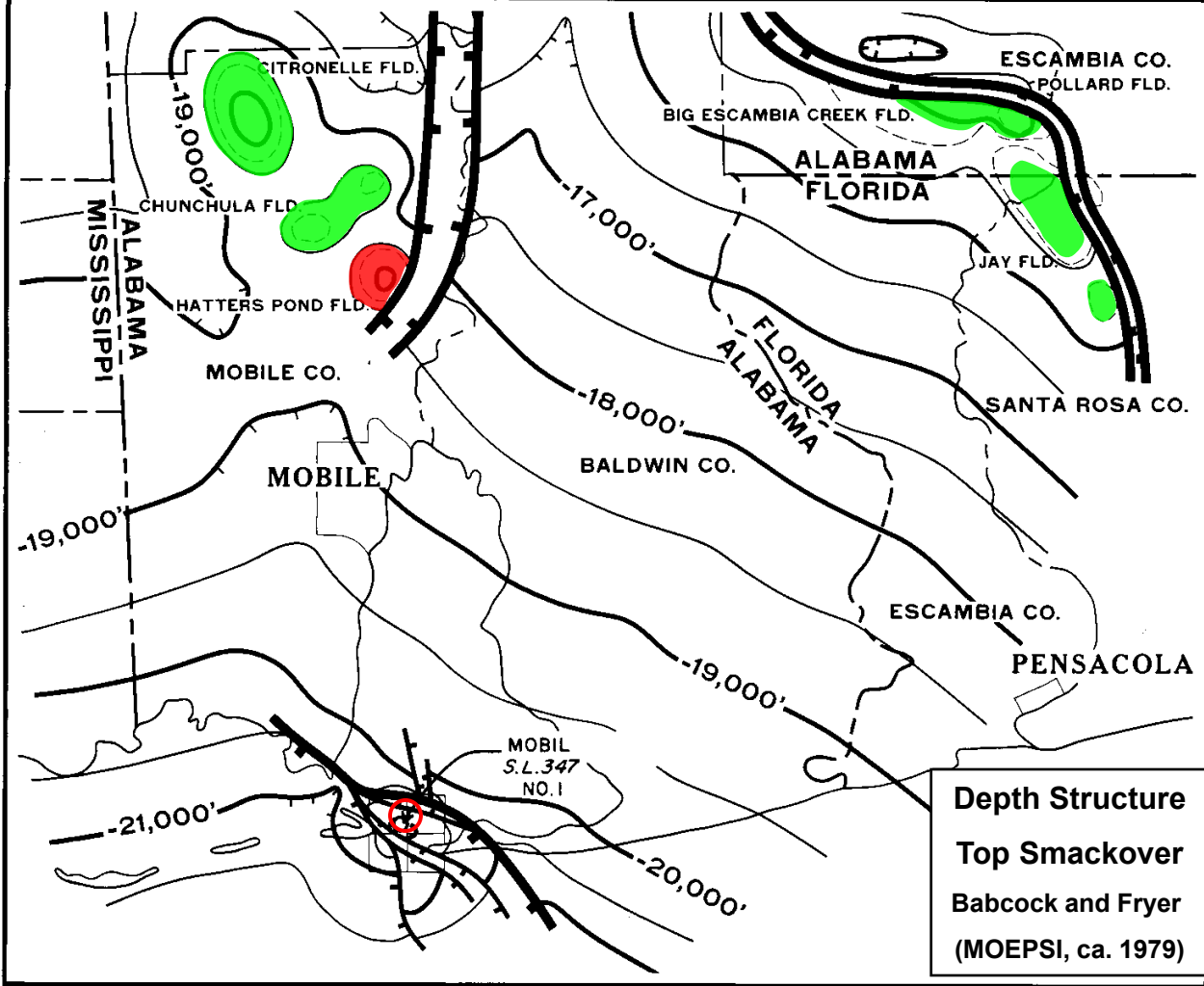
FROM ILLUSTRATION BY
H. H. H. H.

**HELP YOUR COUNTRY
ENLIST IN THE NAVY**

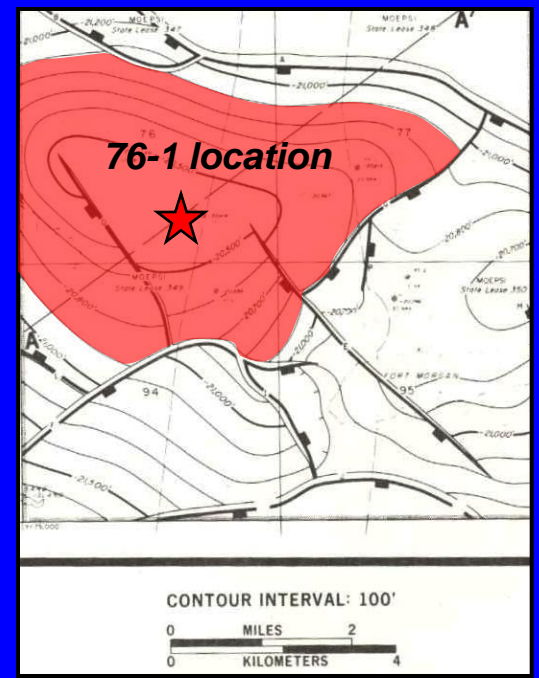
History

August 5, 1864

The Prospect



REGIONAL SMACKOVER STRUCTURE
MOBILE & BALDWIN COUNTIES, ALABAMA
CONTOUR INTERVAL 500 FT.



Depth Structure, Top Norphlet
Crandall et. al
(MOEPSI, ca. 1987, Prior to 3D acquisition)

**Mobil 76-1 =
State Lease 347 No. 1**

MOBIL E&P SERVICES INC.
 EXPLORATION SERVICES CENTER
 DALLAS, TEXAS
 LINE NO.
KG-4

**12 FOLD CDP STACK
 RESIDUAL STATICS**

LOCATION INFORMATION
 AREA: MOBILE BAY ALABAMA
 SHOTPOINT: 238 TO 4
 STATE: ALABAMA COUNTRY: USA
 GURD: UNK

RECORDING INFORMATION

RECORDED BY: OSI PARTY 324
 DATE RECORDED: 6-16-74
 INSTRUMENT TYPE: OFS
 FOLD: 15 TRACES/RECORD: 24
 RECORD LENGTH: 6000S SAMPLE RATE: 4MS
 FIELD FILTER: LOWCUT 8HZ 48 DB/OCT
 GROUP INTERVAL: 230FT HIGHCUT: 62HZ
 ENERGY SOURCE: AIR GUNS
 ENERGY SOURCE SPACING: 330FT

CPREAD CONFIGURATION
 * 560 FT * TR24
 * 7530 FT * TR24
 SP TR1 TR24
 170-186 SHOOTING THROUGH CABLE, CABLE BEING PU
 SP TR1 TR1
 170-156 SHOOTING THROUGH CABLE, CABLE BEING PU
 SP TR24 TR1
 154-1

DIRECTION OF SHOOTING: NORTHEAST

PROCESSING SEQUENCE

TRACE MUTE
 MEAN REMOVAL 12 FOLD
 CDP GATHER 1800 MS GATE
 GAP DECONVOLUTION 400 --2.400 SEC 180 MS
 GAP = 12 MS
 2.400 - 4.200 SEC 180 MS
 GAP = 12 MS

N. W. O. VELOCITY ANALYSIS - CVESTK
 TRACE MUTE
 TRACE SELECTION
 FREQUENCY FILTER 6/ 8 - 38/ 40 HZ

RESIDUAL STATICS
 TRACE SELECTION
 MEAN STACK 12 FOLD
 FREQUENCY FILTER

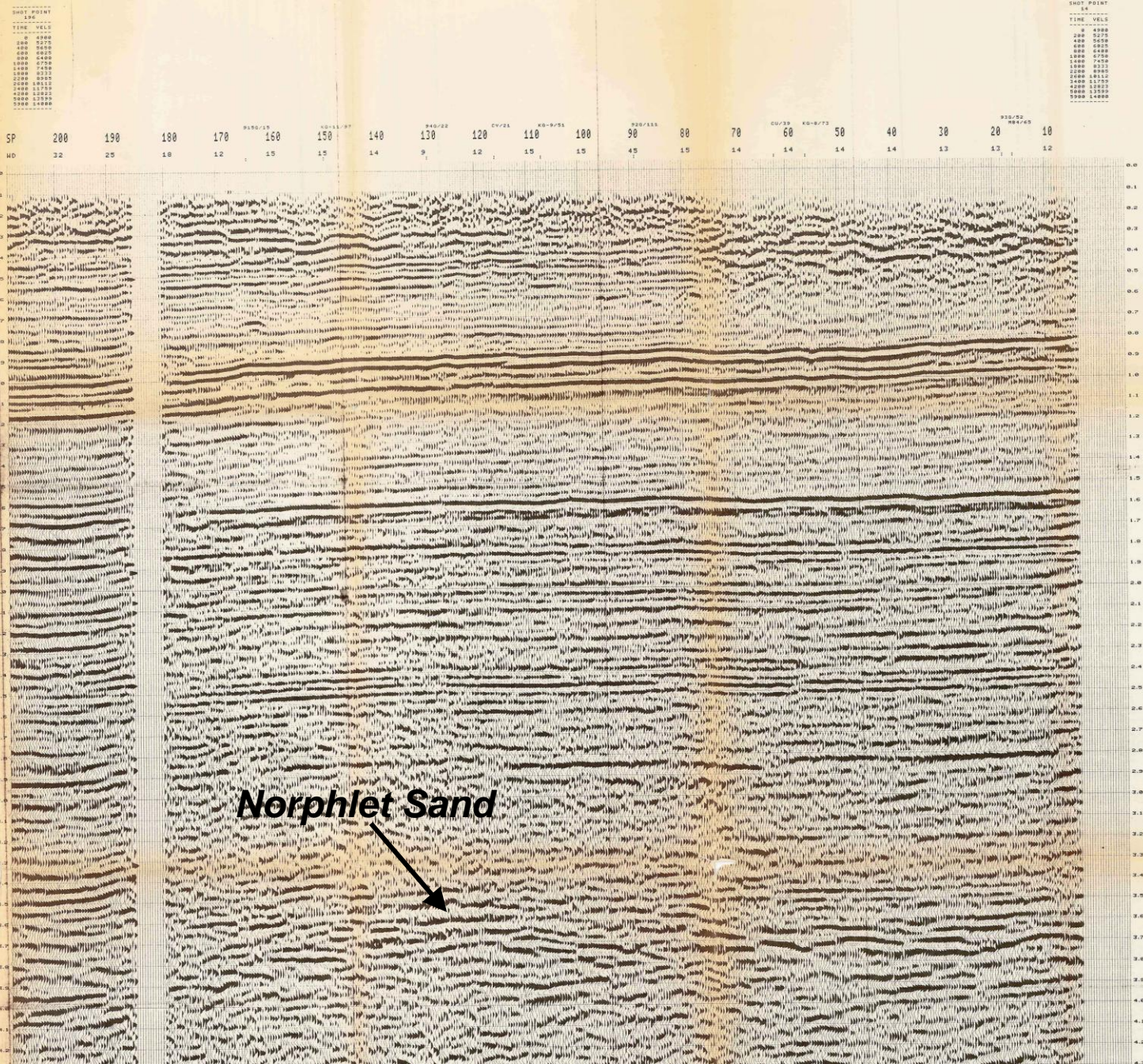
TIME BANDPASS
 500 SEC 10/ 12 - 38/ 40 HZ
 1.600 SEC 6/ 8 - 30/ 32 HZ
 2.800 SEC 6/ 8 - 26/ 28 HZ
 AGC 1000 MS GATE

DISPLAY INFORMATION

PRESENTATION 4WA 16 TR/IN
 VERTICAL SCALE 5.00 IN/SEC
 POLARITY NORMAL
 MIX 20 PCT
 PLAYBACK GAIN 2**5 +18 DB
 PLAYBACK DATE 03/12/80

SERIAL NO: 8002762

PRELIMINARY
 PROCESSING



Norphlet Sand



Serving The South Since 1813

THE MOBILE REGISTER

Final



PARTLY CLOUDY

Temperature 50s-70s
Rain Probability None
Winds easterly, 8-14 mph

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Tuesday, November 14, 1978

4 Sections—42 Pages—10 Cents

Mobil rig delivered for bay drilling

Diplomats try to save peace talks

Permits sought for more wells

By The Associated Press

By telephone and in meetings on two continents, President Carter and his diplomats sought to head off a breakdown in the Egyptian-Israeli peace talks Monday.

Egypt's Anwar Sadat reportedly considered, but then dropped the idea of calling his negotiators home from Washington.

Egyptian Prime Minister Mustapha Khalil said the talks were going "not badly."

Israeli Prime Minister Menachem Begin arrived in Jerusalem from a U.S.-Canadian tour and said his government would be reviewing American and Egyptian proposals for resolving the central dispute in the negotiations — whether and how to link an Egyptian-Israeli treaty to a solution of the Palestinian issue.

Begin is to convene his Cabinet on Thursday for a full-scale review of the talks and Foreign Minister Moshe Dayan, one of Israel's two top negotiators in Washington, will fly back to Jerusalem to report. It was announced that Israel's other ranking delegate, Defense Minister Ezer Weizman, will remain in Washington.

State Department spokesman George Sherman said Egypt's acting foreign minister, Boutros Ghali, would go to Cairo "for brief consultations" while Defense Minister Kamal Hassan Ali, who heads the Egyptian negotiators, stays in Washington.

Carter, in a televised interview on the Public Broadcasting Service, spoke of the talks being "bogged down" in legalisms and language with

By RHEE ODOM

Register Staff Reporter

DAUPHIN ISLAND, Ala. — A huge oil and gas drilling rig is expected to be locked into place one mile east of here in Mobile Bay Tuesday for start of Mobil Oil Corp.'s multi-million-dollar exploration of this area's proposed energy reserves.

And while workmen ready equipment at this particular site, a spokesman for the corporation said late Monday that Mobil has filed applications with the Mobile District office of the U.S. Army Corps of Engineers for permission to drill four additional test wells in the bay if findings at the primary location prove successful. If approved by the Corps, three will be located west of the Mobile ship channel and one north of Fort Morgan.

The barge rig for Tuesday's drilling date arrived at Dauphin Island Sunday from Galveston, Texas, after a delay of several weeks due to bad weather. The derrick portion on the barge has been raised and crewmen expect to begin actual drilling operations late Tuesday or early Wednesday.

The Mobil corporation has fought opponents of the exploration work for more than eight years to obtain permission to drill a test well. Environmentalists argued strongly that it would endanger the environmental and esthetic values of the bay.

In rebuttal, Mobil posted a \$55 million contingency bond with the Alabama Water Improvement Commission in the event of environmental problems with the drilling.

The settlement worked out by the oil

and proof of oil and gas reserves. It will take about six months to drill the well to its scheduled 21,500-foot level. Site of the drilling is in 14 feet of water.

Company officials after acquiring detailed seismic data over the bay area are convinced the site is potentially another Citronelle or its equivalent. The present field in northern Mobile County has produced over the years some 124.6 million barrels of oil and some 11.3 million cubic feet of gas.

Wastes from the Mobile Bay drilling operation will be barged to DuLac, La., where they will be used as fill for a construction site.

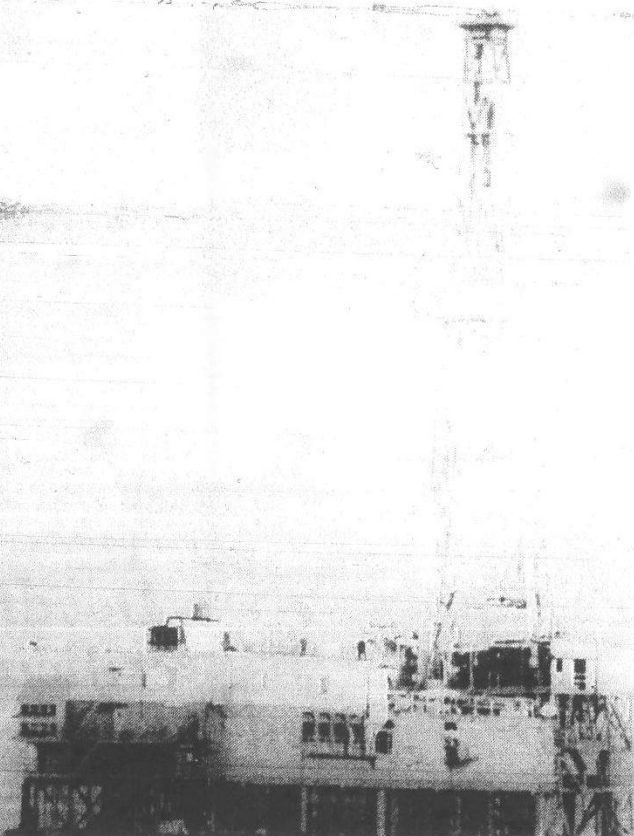
Tuesday's drilling culminates what one state official called "arbitration unprecedented in the history of offshore projects."

Disaster satellite system announced

WASHINGTON (AP) — The federal government announced plans Monday for a satellite communications system designed to keep communications operating during major disasters.

Under the plan, private industry would develop the system and then lease it to the government at a cost of \$20 million for the first five years. Bardsyl R. Tirana, director of the Defense Civil Preparedness Agency, said the government expects to award a contract next March and hopes to have the system operating by 1981.

Tirana said such a system is needed



DRILLING PROBLEMS

- Stuck the surface casing and had to re-drill
- The pad of oyster shells placed under the barge rig washed away and had to be replaced and protected by sheet piling
- Lost a 13 ¾ inch bit at 5,950 feet and milled on it
- Twisted off twice
- Lost a turbo drill at 14,750 feet, fished and sidetracked, losing six weeks
- Numerous logging difficulties due to the high temperature and pressure, as well as vendor organizational problems
- Lost both coiled tubing and wire line while testing the well which required lengthy fishing operations

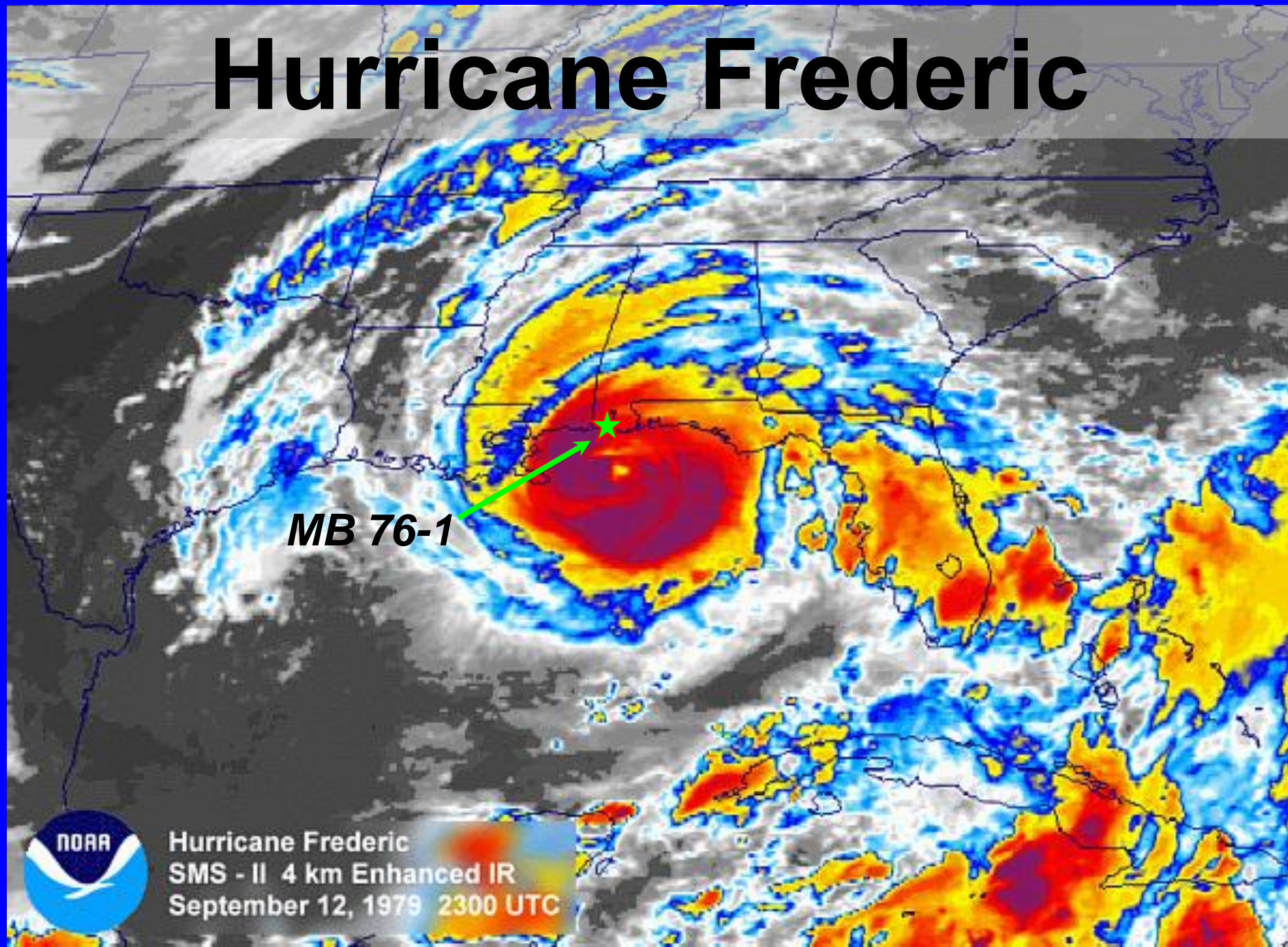
Hurricane Frederic

MB 76-1

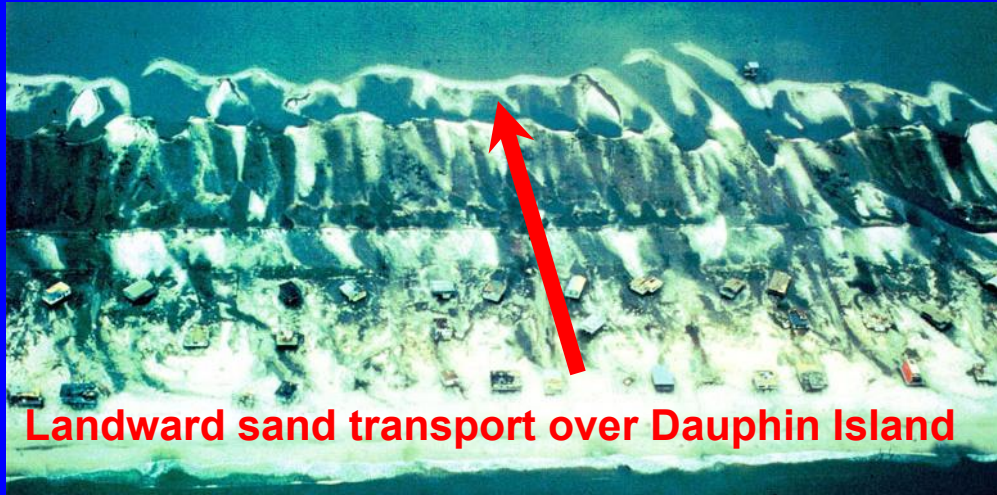


Hurricane Frederic
SMS - II 4 km Infrared
September 12, 1979 2300 UTC

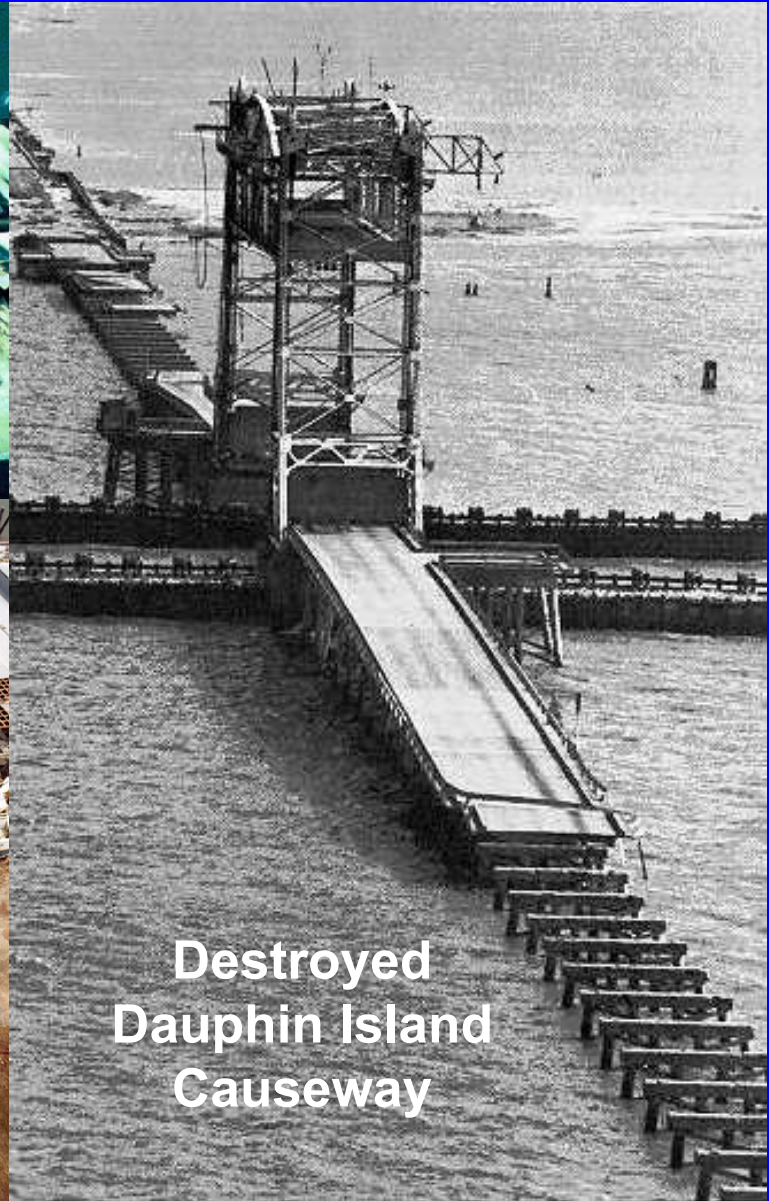
Hurricane Frederic



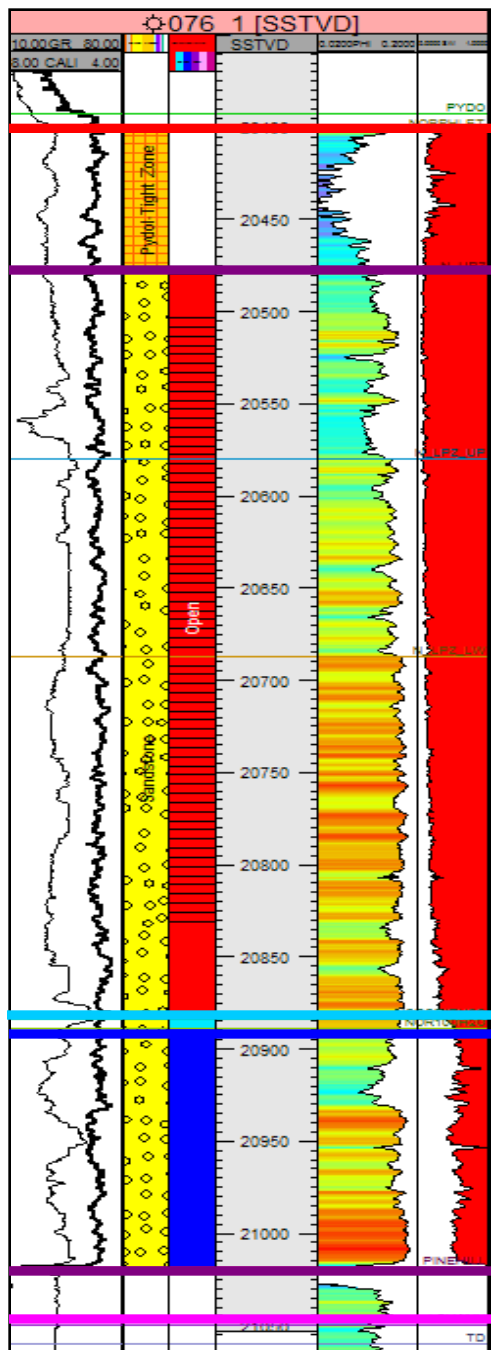
Hurricane Frederic



Landward sand transport over Dauphin Island



Destroyed
Dauphin Island
Causeway



**Top
Norphlet**

Tight Zone - <7% porosity

**Top
Porous
Norphlet**

Porous Norphlet
7-15% porosity
Eolian Sandstone

**Critical Water
100% Water
(-20,899')**

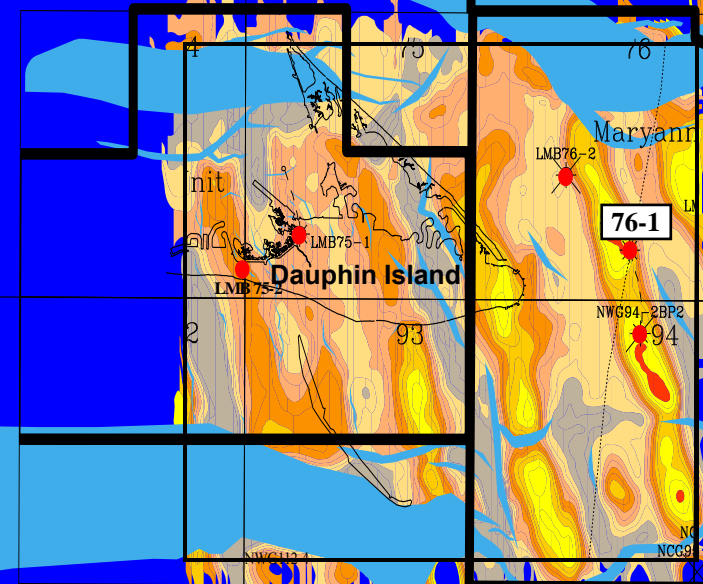
Pine Hill

LouAnn Salt

Mobil 76-1

Tight Zone Isochore: 74'
Porous HC Column: 412'
Net Gas 362'
Gross Norph. Isochore: 542'

Porosity avg 11.1%
Permeability avg 7.7 md
SW avg 14.6%



Testing the Well

<i>Remarks / Depth</i>	<i>Time</i>	<i>Duration (Minutes)</i>	<i>Coil Tubing Depth (Feet)</i>	<i>Coil Tubing (PSI)</i>	<i>Annulus (PSI)</i>
7,000'. Pumping N2	12:30	88	7000	1400	0
7000' of 3-1/2" blown dry. N2 returns to surface. Monitored for no feed-in. Begin GIH to 8000'	13:58	24	7000	1400	0
At 8000'. Pumping N2. Running low on N2 supply. Well showing no indication of feed-in. GIH to 10,000' while pumping N2.	14:22	28	8000	1400	0
At 10,000'. Pumping N2 . Increase in injection pressure equal to increase in hydrostatic head (1400 to 3000 psi).	14:50	40	10000	3000	0
At 10,000'. Injection Pressure had built from 3000 to 3600 psi. Began picking up coil tbq. to 9700'. Pressure stabilized at 3600.	15:30	37	10000	3600	0
Getting anticipated returns; however, returns seemed stronger than usual. Start POOH w/coil tbq. Annulus pressure starting to build. Well is coming-in.	16:07	53	9200	3400	500
Gas hit at surface	17:00		6021	6100	4700

The Big Lesson:

Perseverance

Mobil 76-1

Final Test Results

12.6 MMCF/D, 28/64 ths Choke, 12 hrs
9% H₂S, 5% CO₂

Trace C₃

Calculated AOF: 37.3 MMCF/D

At 20,729':

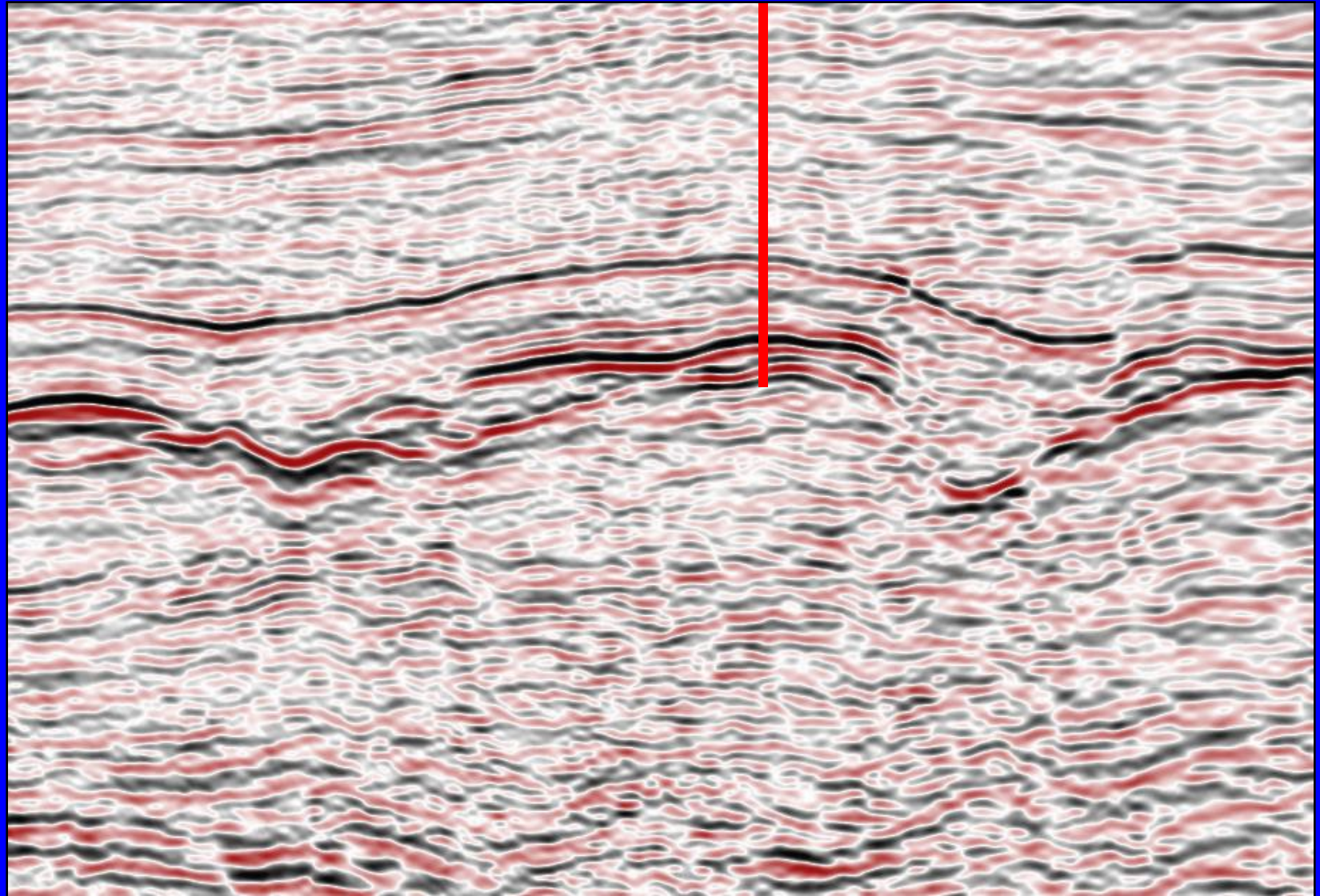
BHT 414 Deg. F

BHP 11,240 psi (0.542 psi/ft)

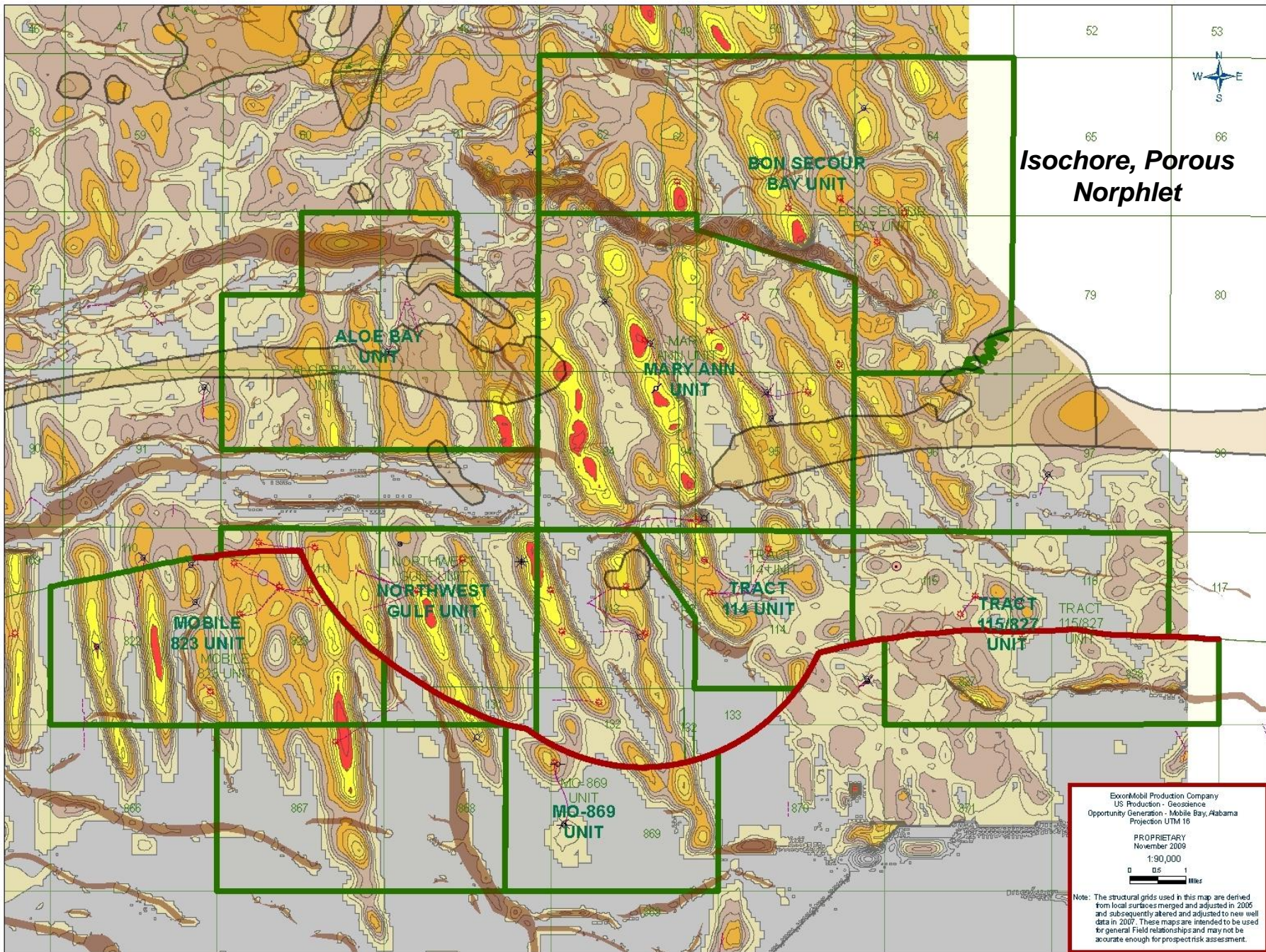
SW

Mobil 76-1

NE



Multisurvey Merge / Reprocessing, 2/2010



52 53
65 66
79 80
97 98
117

ExxonMobil Production Company
US Production - Geoscience
Opportunity Generation - Mobile Bay, Alabama
Projection UTM 16

PROPRIETARY
November 2009

1:90,000

0 0.5 1
Miles

Note: The structural grids used in this map are derived from local surveys merged and adjusted in 2005 and subsequently altered and adjusted to new well data in 2007. These maps are intended to be used for general field relationships and may not be accurate enough for prospect risk assessment.

INDUSTRY ACTIVITY

20+ Platforms Active

320 MMCFG/D Current Production

4.5 TCF Produced to Date

20 Years To Fruition

Mobile Bay Success Was Worth The Wait

By KATHY SHIRLEY
EXPLORER Staff Writer

It took Mobil Oil Corp. more than two decades to finally drill its prospect in Alabama's Mobile Bay, but the results were certainly worth the wait.

The firm completed its first discovery east of Dauphin Island in Mobile Bay in December 1979 — more than 20 years after Mobil explorationists first suspected there was a structural trap in the region, said Roy Roadifer, chief geologist for Mobil.

But the discovery well, 76-1, made all the hard work and frustration worthwhile when it hit pay and was tested at 12.2 million cubic feet of gas per day at a total depth of 21,113 feet.

Today, there may be a bright future for an area that has only yielded one dry hole, that just 10 years ago had no offshore oil or gas discoveries, and that 20 years ago gave only the smallest hint of the potential that lay beneath the shallow waters of Mobile Bay.

The story started in the late 1950s, when Mobil explorationists studying the area concluded that there could be a structural trap beneath the bay in Cretaceous objectives. Those early conclusions were based primarily on a gravity survey and one well on the Fort Morgan Peninsula that indicated a structure in the bay, Roadifer said.

Mobil at that time had not thought in terms of production deeper than the Cretaceous, because at that time deeper seismic data could not be obtained. There was no way of mapping what lay deeper.

'Mobile Bay' Paper Slated For Atlanta

Roy Roadifer, chief geologist with Mobil will present a special paper "The Mobile Bay, Alabama, Exploration Play," at the AAPG annual convention in Atlanta.

The special session will be held at 5 p.m. Tuesday, June 17.

Mobil spent the next 10 years in the frustrating process of attempting to obtain the leases in Alabama's state waters in Mobile Bay. This leasing problem was complicated by the fact that the leases that now cover the Mary Ann Field are in the shipping channel between Fort Gaines and Fort Morgan. Ultimately, Mobil was the successful bidder, and in 1969 leased four blocks of about 5,000 acres each for approximately \$80,000, with a 1/6 royalty.

But Mobil's troubles weren't over. For the following nine years the company fought for the appropriate federal and state permits allowing it to drill in the bay.

A drilling permit finally was issued in 1978. Mobil wasted no time in spudding its first well.

Hitting The Norphlet

During the 20 years Mobil landmen and attorneys were battling for leases

See '**Mobile Bay**,' page 12



Photo Courtesy of Mobil Oil Corp.

Development of Mobile's Mary Ann Field offshore Alabama is underway. The Rowan Rig 4, pictured here, drilled the discovery well in the field as well as one of the delineation wells.

A Win-Win Outcome: Benefits to the citizens of Alabama

1982: ALABAMA HERITAGE TRUST FUND

\$449 Million - Lease Bonuses, Sale No. 1, Alabama State Waters

1985: ALABAMA TRUST FUND

Bonuses, Rents, and Royalties from offshore gas industry

2001: ALABAMA TRUST FUND

(Combined both Trusts : Permanent and Irrevocable)

\$3.4 Billion (Year 2009) Total Assets

+/- \$300 Million Annual Income

THANKS

The author wishes to thank his co-author, R. Scott Hubbard, and ExxonMobil, for preparation of the graphics.

Tom Joiner, Ellis Babcock, Joe Fryer, Bill Sinclair, Jack Wilson and Ted Lumley assured the authenticity of the story.

The End

(For now)