

## **REGULATORY ISSUES AND DEEPWATER PRODUCTION**

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### **Background**

The Minerals Management Service (MMS) is the Federal Agency that manages and regulates the Nation's natural gas, oil, and other mineral resources on the Outer Continental Shelf (OCS), and collects, accounts for, and disburses about \$4 billion yearly in revenues from offshore Federal mineral leases and from onshore mineral leases on Federal and Indian lands. The OCS Lands Act, as amended, gives the MMS the authority to regulate offshore pipeline operations to ensure that they are conducted in a manner that protects life, property, and the marine, coastal, and human environment, and minimizes conflicts with the other uses of the OCS. The Department of Transportation (DOT) also has responsibility for offshore pipeline operations. A revised Memorandum of Understanding (MOU) was signed on December 10, 1996, and is in the process of being implemented; it defines the respective areas of responsibility to minimize duplication of effort. However, the MMS reviews and approves all OCS pipeline applications.

In the Gulf of Mexico (GOM) the MMS has a Regional office in New Orleans and four District and two Subdistrict offices located along coastal Louisiana and Texas. The Regional Office is responsible for reviewing pipeline applications, including those for installation, modification, and abandonment, whereas the District offices are responsible for conducting onsite pipeline inspections. At present, the MMS in the GOM has 53 inspectors and 14 helicopters at its disposal to conduct all inspections, including pipelines. The MMS inspects all aspects of pipeline operations including installations, safety equipment, repairs and abandonment's. Recently, the area

of responsibility for the GOM Regional office was extended to include the Atlantic Region (Figure 1).



Figure 1. Gulf of Mexico and Atlantic OCS Planning Areas

## **INTRODUCTION**

Twenty-five years ago the edge of the OCS, at 200 meters or 656 feet, was considered deepwater. Few rigs had the capability to drill beyond that depth and there was little certainty of finding hydrocarbons on the continental slope. At the present time and for the purpose of this discussion, deepwater refers to water depths greater than or equal to 1,000 feet, or 305 meters. Other depths such as 200 meters (656 feet) and 800 meters (2,625 feet) are used for various regulatory purposes.

Favorable economics, the development of three-dimensional (3D) and subsalt geophysical technologies, the announcement of several deepwater discoveries, the development of new deepwater drilling and development technologies, the passage of the Deep Water Royalty Relief Act, and the opportunity to lease new prospects have all contributed to the revitalization of exploration and development in the GOM. After the recent implementation of deepwater royalty relief measures, specifically designed to support the development and production of deepwater tracts, the MMS received record bids in the 1996 and 1997 lease sales in the Central and Western GOM Planning Areas. In 1994 and 1995, there were 210 blocks leased in 900 meters (approximately 3,000 feet) or greater water depth; in the 1996 and 1997 sales, there were 1,822 blocks leased in that water depth.

Deepwater operations are significantly different from conventional operations in shallower waters of the shelf. Deepwater operations are significantly farther from shore, encounter different environmental conditions, are technologically more sophisticated, may produce at much higher rates, and are subject to different economic determinants. These differences will significantly impact the MMS Gulf Region's workload and present many technical and regulatory challenges.

The number and complexity of Exploration Plans, Development Operations Coordination Documents, pipeline applications, Applications for Permits to Drill, and requests for regulatory alternative compliance/departures will continue to increase. In addition, the MMS has established requirements for the submittal of Deepwater Operations Plans and Conservation Information in support of proposed deepwater operations. New and evolving technologies, larger and more complex facilities, modifications of procedures, and additional environmental protection issues are all anticipated for deepwater activities. The MMS technical, safety, and environmental reviews of these proposed deepwater activities will take longer and require new expertise. The MMS is working diligently to keep pace with the evolving deepwater issues and technical expertise, and has developed the regulatory framework required to be an effective manager and regulator of these deepwater areas.

### **Major Deepwater Projects**

Industry is rapidly advancing operations into deepwater (Appendix 1). In May 1997, Shell Deepwater Production Inc. (Shell) installed a tension leg platform (TLP) in 3,214 feet of water at its Ram-Powell prospect (Viosca Knoll Block 956), surpassing the 1996 record set by Shell's Mars TLP in 2,860-foot waters. Texaco's Gemini prospect in 3,393 feet of water is projected for production startup in 2000. In even deeper water, production is planned for Shell's Ursa prospect at 3,916 feet, Texaco's Fuji prospect at 4,243 feet, Exxon's Diana at 4,500 to 4,800 feet, and Amoco's Kings Peak prospect at 6,530 feet. In 1996, the BAHA well was drilled by Shell in approximately 7,600 feet of water. Shell began natural gas production at a world record water depth of 5,300 feet from its Mensa subsea project (Mississippi Canyon Block 687) in June 1997. Although Mensa still holds as a GOM record water depth production record, the world record has since been set by Petrobras in the Campos Basin off Brazil in approximately 5,600 feet of water, using a subsea well completion.

In the future, even greater water depths will be tackled by industry. By the early 2000's, exploration wells may be drilled at 10,000-foot depths, at the very limits of the Exclusive Economic Zone, and production systems will be designed for depths of 6,000 feet and greater. The product pipeline networks for gas and oil will have been extended well off the continental shelf and down the continental slope. Large reservoirs will be serviced by tension leg platforms or SPAR platform derivatives with extended capability to handle distant subsea completions. These facilities will likely be operated by consortia of major oil companies. Smaller deepwater reservoirs will be produced by independent oil companies utilizing small moored floating platforms, many of which will be capable of reuse in other locations. The business climate will demand innovative platform configurations, reductions in the weight and cost of drilling/production risers and mooring systems, and solutions to the pipeline flow problems.

### **Gulf of Mexico Production**

Discovery of OCS deepwater fields in the Gulf of Mexico began accelerating in 1994 . The vast majority of these discoveries have been in the Central Gulf offshore Louisiana and Mississippi (Figure 2). Though Shell has been the pioneer in the deepwater Gulf, other companies have

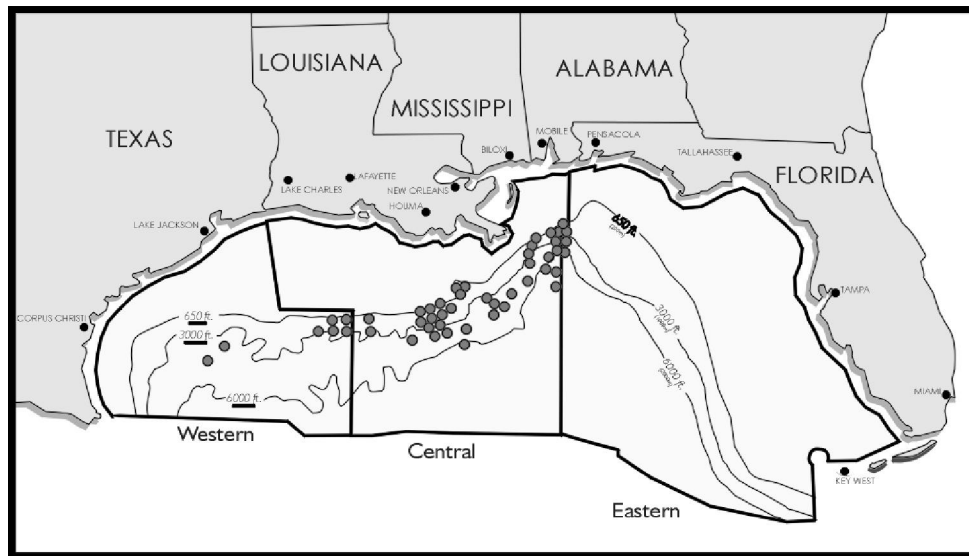


Figure 2. Deepwater Discoveries

been quick to recognize the potential of this province as Shell began to show that there were indeed sizable fields to be found. Shell's announcements of large discoveries in the Tahoe (1984), Bullwinkle (1985), Auger (1987), and Mars (1989) fields have heightened interest in this region. During the past two years, industry has announced plans to develop many of the recent deepwater discoveries (Appendix 2).

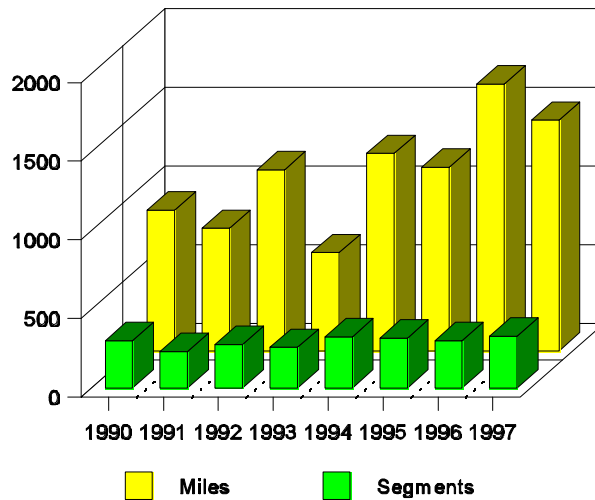
For the period January through July 1997, deepwater production from the Gulf accounted for approximately 53.9 million barrels of oil and 174.5 billion cubic feet of natural gas (24% and 6%, respectively, of total Gulf OCS production). For the same period January through July 1996, there were 37.6 million barrels of oil and 147.8 billion cubic feet of natural gas (18% and 5%, respectively, of total Gulf OCS production). While the total production figures for later months are not yet available, the total production in 1997 is surely higher as large production projects like Mensa and Troika came online later in the calendar year. A continuing increase in Gulf deepwater production is expected; examples of 1997 prospects that came online are British Petroleum's Troika, which set a new daily flow-rate record for oil production from a single well, and Shell Offshore's Mensa, which is one of the Gulf's highest producing natural gas wells with approximately 100 million cubic feet per day of natural gas. In Fiscal Year 1996 (October 1995 through September 1996), the OCS contributed approximately 27 percent of the United States' total gas production, and approximately 18 percent of its total oil production.

Projections for Gulf of Mexico oil and gas production through 2002 range widely, depending on which assumptions are used. The MMS Gulf of Mexico Region projects an increase in oil production from 0.9 MMBOPD in 1995 to as much as 1.6-1.9 MMBOPD in 2002 and projects that gas production will remain fairly steady or increase from 13 Bcfpd to as much as 17.5 Bcfpd. A large portion of this additional production will be derived from new deepwater fields. Less dramatic, but still sizable, contributions will be obtained from the development of the newly

discovered subsalt plays. There are several factors that influence production rates including the availability of pipelines and processing facilities to handle production. The MMS publication *Gulf of Mexico Outer Continental Shelf Daily Oil and Gas Production Rate Projections From 1996 Through 2000* has just been updated and is now available.

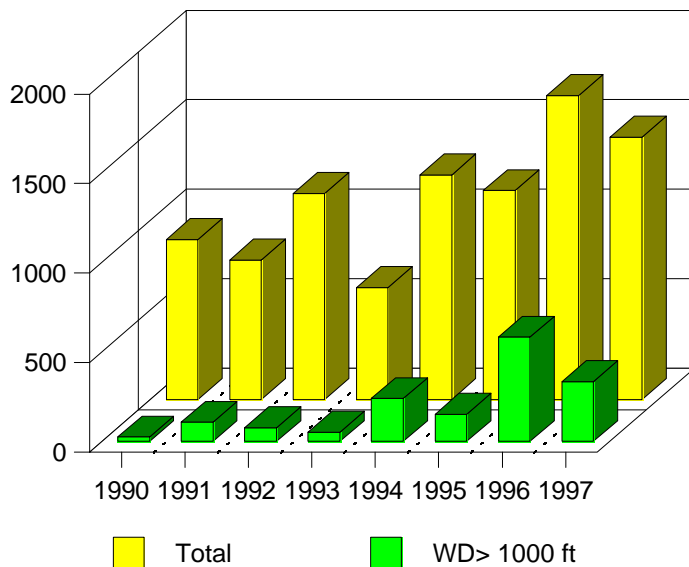
### **Pipeline Infrastructure**

There are, at present, 26,646 total miles of pipelines approved in the Gulf of Mexico OCS. Installation applications have increased in number as well as complexity. Additional production from more active leases and the fact that the pipeline infrastructure in many areas of the Gulf is at or near capacity will require expansion of the pipeline system. In some cases, transmission companies will request approval for increased pipeline maximum allowable operating pressure to facilitate the flow of additional production. The MMS in 1996 approved 1,698 miles of pipelines (Figure 3), the highest number of miles approved in a calendar year.



**Figure 3 - Approved Pipelines, by Calendar Year**

Many of the deepwater fields are located in areas where there is no existing pipeline infrastructure, so development will require new pipelines to the shallow-water infrastructure and, in some cases, to shore. Since 1990, the number of miles approved in the GOM is 9,041, of which 1,571 miles or 17 percent are in water depths greater than 1,000 feet (Figure 4).



**Figure 4 - Deepwater Pipeline Miles Approved, by Calendar Year**

Since 1994, when the deepwater activity began accelerating, there have been 20 major lines approved from the OCS to state waters and/or to shore (Appendix 3). Out of these lines, 6 have gas/condensate service, 6 gas, 7 oil, and 1 gasH (gas with H<sub>2</sub>S). All of these lines have been or will be installed offshore Louisiana and Mississippi/Alabama (Figure 5). So far in 1998, another gas system was approved in February for a 24-inch line from Main Pass Block 261 to Mobile Block 822 Junction Platform, and from this platform a 30-inch line to shore in Mobile County,



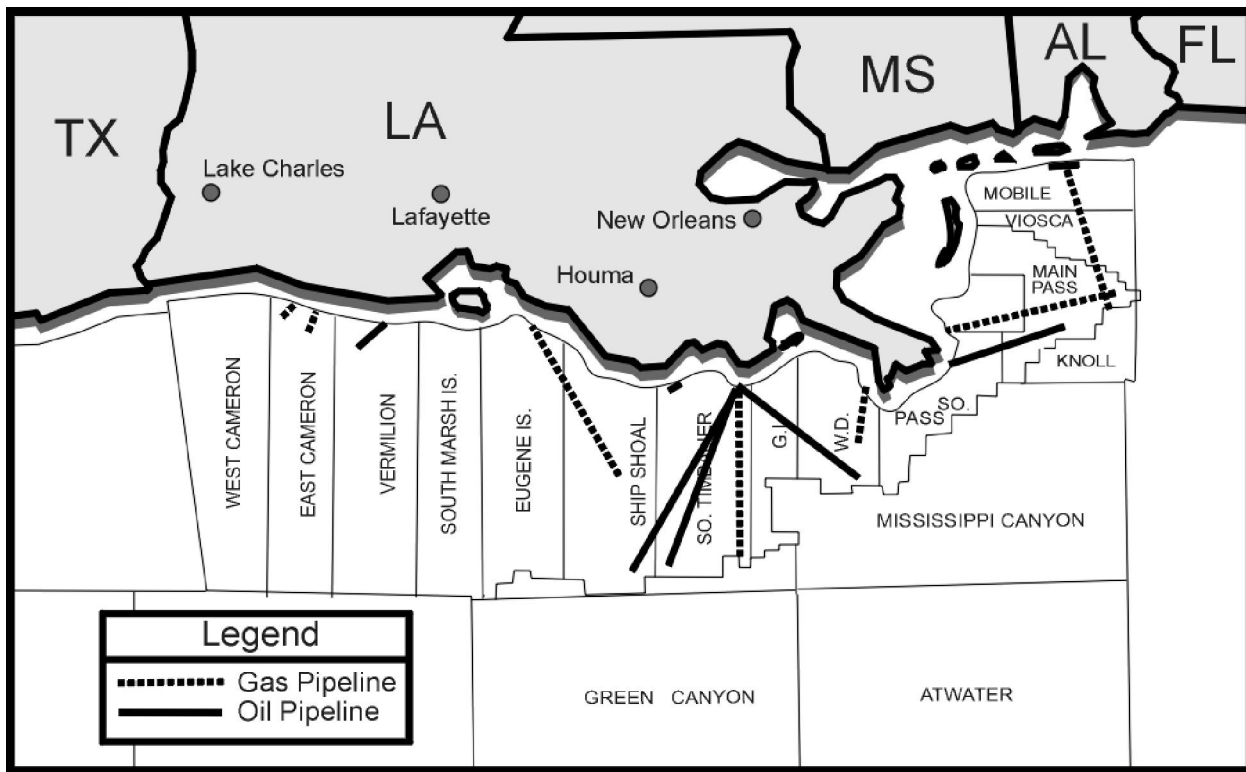


Figure 5. Major pipelines to state waters and/or to shore, approved 1994 to 1997

Alabama. This system was approved for Transcontinental Gas Pipeline Corporation and is 369,600 ft. (70 miles) long. As for future lines to shore, Exxon is planning an oil line to handle its production for the Diana project. The line will make landfall near Galveston, Texas. In addition, if the oil and gas characteristics of new fields are incompatible with the oil and gas in the existing pipeline systems or with separation/treatment facilities, new pipeline systems to shore will have to be installed. These longer pipelines have a greater potential of impacting environmental resources (e.g., prehistoric and historic archaeological resources, chemosynthetic communities, and topographic features). Longer pipelines may encounter more geologic hazards or ordnance disposal areas, which may require special pre- and postpipeline installation seafloor surveys as well as design considerations. The formation of hydrates and paraffins will be of greater concern because of the colder temperatures encountered at the seafloor in deepwater, and may create the need for review and approval of additional injection systems or for insulated or heated pipelines.

The GOM pipeline infrastructure information is maintained on a database available in the Internet at <http://www.gomr.mms.gov> . In addition to this database, which lists specific information for the 26,646 miles of pipelines in the GOM, the MMS has recently digitized the pipeline maps and has also made available the database with the proposed and as-built points in the same website.

### **Pipeline Regulatory Issues**

Rapidly evolving and developing technical capabilities have enabled operations to move into deeper water. A number of technical considerations and concerns have been raised regarding deepwater development projects. For the MMS to be effective in its review and evaluation of deepwater operations, frequent meetings with operators, service vendors, and research entities are necessary to understand the technological developments.

Because operations and equipment used in deepwater are different from those used in shallower waters, the existing regulations, originally written for conventional, shallow-water operations, cannot be directly applied to proposed deepwater operations in many cases. For example, current regulations do not address the extended testing period that is often requested for deepwater wells. Safety device location, operation, and testing are fundamentally different for subsea completions that will be used in deepwater areas. Abandonment and site clearance procedures are expected to be significantly different for deepwater structures. Further, there is currently no review and approval process for transporting production by means other than by pipeline. As a result, the MMS has been granting variances from regulations, as well as requiring adherence to new mitigation and safety measures unique to deepwater operations.

Requiring the submittal of a Deepwater Operations Plan (DWOP) (Notice to Lessees [NTL] 96-4N) was established to address the different functional requirements of equipment in deepwater, particularly the safety system requirements associated with subsea development

systems, and the complexities and unique types of fixed and floating production facilities. The DWOP allows the MMS and industry to identify very early in the plan review process any potential issues specific to deepwater operations. The plans provide a mechanism for the coordination of permitting responsibilities within the MMS and also provide a mechanism for the consistent application of policies and regulations. Another reason for the DWOP is that deepwater technology is evolving faster than MMS's ability to revise OCS operating regulations. The NTL process is flexible enough to keep pace with the expanding activities and technology. Deepwater pipelines will be longer and may require new design methods and technology for pipelaying and for transportation of the well production. In some cases, new technologies will require review for alternative compliance with OCS regulations.

Currently, thirty-three existing regulations have been identified by the MMS and industry as requiring alternative compliance approval to permit development operations to proceed, of which 10 are pipeline related (see Table 1). For the MMS to grant alternative compliance approvals, the operator must demonstrate an equivalent or improved degree of safety. Requests for alternative compliance are occurring more often as operations move into even deeper waters, and the use of new technologies, methods, and procedures other than those prescribed by the regulations are proposed.

**Table 1. Typical Alternative Compliance for Deepwater Pipeline Projects**

<b>250.152(a)</b>	Modified pipeline internal design pressure formula (e.g., use external and internal pressures)
<b>250.152(a)</b>	Use of alternate design formula (Is the present formula overly conservative for high pressure design?)
<b>250.152(b)</b>	Pipeline valves, flanges, and fitting requirements (e.g., cold temperature effects)
<b>250.152(d)</b>	Use of High Integrity Pipeline Protection System (HIPPS) for over-pressure protection for subsea completion lines designed for less than shut-in tubing pressure
<b>250.153(a)(3)</b>	Pipeline crossing: 18-inch separation crossing requirement
<b>250.153(b)(1)</b>	Hydrostatic testing requirements due to significant difference in elevation
<b>250.153(b)(1)</b>	Hydrostatic testing requirements for the use of a test medium other than water
<b>250.154(b)(6)</b>	Subsea tie-in FSV requirements
<b>250.156(a)(1)</b>	Abandonment requirements for DOI pipelines
<b>250.154(b)(3)</b>	Pipeline PSH setting

Some of these alternative compliance methods have been addressed at the DWOP stage and others at the pipeline application stage. However, in order to prevent delays in the pipeline application permitting and save company time and resources, it is highly recommended that any request for alternative compliance be addressed and submitted as soon as possible in the Conceptual or Preliminary DWOP before any funds are invested on a design, method, or procedure that may not be approved.

Another pipeline regulatory issue is, as previously mentioned, the greater concerns for deepwater pipelines becoming plugged either by the accumulation of paraffin or by the formation of hydrates. Therefore, under the guidelines outlined in NTL 96-4N for DWOP's, all companies must address the need to mitigate such plugs which, when formed, in some cases may require the replacement of a pipeline and lead to the premature abandonment of a producing well(s) due to the high pipeline replacement cost.

### **Other Issues**

Increasing OCS activities require increasing coordination with Federal, State, and local agencies. The MMS Gulf Region is actively involved in several cooperative efforts with other Federal agencies. The MMS is cooperating with the Environmental Protection Agency in monitoring compliance with more restrictive water pollution controls, and MMS inspectors have assumed new duties in collecting water samples from offshore platforms and performing more visual inspections for discharged effluents. The Federal Energy Regulatory Commission (FERC) will use MMS's environmental assessments for pipelines that fall under FERC jurisdiction. The MMS and the Department of Transportation (DOT) have entered into a Memorandum of Understanding (MOU) that, when implemented, will place all producer-operated pipelines under MMS jurisdiction and all transporter-operated pipelines under DOT's jurisdiction. The main provisions of this new MOU are as follows:

- It provides for an easier determination of jurisdiction.
- It provides for the MMS to inspect DOT pipelines.
- It provides for a regulatory review to achieve regulatory compatibility for offshore pipelines.

Both MMS and DOT are working on amending their respective regulations, and the new MOU should be implemented by April or May of this year. When implemented, the MMS pipeline database will undergo a global change to show MMS jurisdiction for all lease term permitted pipelines. For right-of-way (ROW) permitted lines, the MMS will assume that the ROW holder is the operator of the line unless it notifies the MMS within 60 days from the effective date of the regulation implementing the MOU. At the same time, those transporter-operated lines that are assigned MMS jurisdiction at present will have to be changed to DOT jurisdiction. As for regulatory compatibility, the MMS and DOT will begin the process of identifying and discussing the differences in regulatory requirements between the two agencies with the objective of making these regulations as compatible as possible. It is imperative that we have similar requirements for marine pipelines, as there will be pipelines connecting with each other under the jurisdiction of both agencies. The compatibility review process needs to be done in a manner that will maximize human safety and environmental protection. Most of the total GOM production is transported via pipelines, and we need to keep the system as safe as we can.

Finally, I would like to mention briefly another MOU that is in the process of being revised, and that is the one between the MMS and the U.S. Coast Guard. An original agreement was signed in August 1989, and has recently been revised to redefine the agencies' responsibilities associated with offshore facilities, and at the same time minimize duplication of effort and effect better use of resources. Even though the present definition of facilities does not include pipelines, the revised MOU does impact pipelines, especially during pipeline leak/pollution incidents. The revised MOU was published in the *Federal Register* on January 5, 1998. We encourage every one affected by this MOU to review it and to provide comments to the respective agencies. The closing date to submit comments is March 6, 1998; however, any comments submitted within the next few days may be given full consideration.

## Summary

As a result of technological advances that have proven successful in field application, new discoveries, and the recent passage of the Deep Water Royalty Relief Act, there is renewed industry interest in Gulf of Mexico deepwater leasing. The challenges of effectively managing and regulating exploration and development activities in the frontier deepwater areas are in addition to ever-increasing demands of the OCS Program in the shallower water areas of the Gulf. The impacts on the workload and demands on the Minerals Management Service, particularly the Gulf of Mexico OCS Regional Office, as a result of deepwater activities are just beginning. Although some specific impacts are emerging and others can be anticipated, the full magnitude of the impacts is not yet known. Deepwater development will impact all aspects of the MMS Gulf Region's Program including the maintenance and expansion of the pipeline infrastructure.

## References

Cranswick, Deborah; Regg, James — *Deepwater in the Gulf of Mexico: America's New Frontier*, OCS Report MMS 97-0004, updated by OCS Report MMS 98-0003, *Deepwater in the Gulf of Mexico: An Update on America's New Frontier*.

Melancon, J. Michael, et al.— *Gulf of Mexico Outer Continental Shelf Daily Oil and Gas Production Rate Projections From 1996 Through 2000*, OCS Report MMS 97-0006, updated by OCS Report MMS 98-0013, *Gulf of Mexico Outer Continental Shelf Daily Oil and Gas Production Rate Projections From 1998 Through 2002*.

## Appendix 1. Discoveries Announced in 1997

Operator	Prospect	Area/Block	Water Depth (feet)
Marathon	Arnold	EW 963	1,760
Reading & Bates	East Boomvang	EB 688	3,800
Exxon	Hoover	AC 25	4,795
Vastar	King	MC 764	3,250
Conoco	King Kong	GC 472, 473, 517	3,817
Santa Fe	Knight	GB 372	1,740
EEX Corp.	Llano	GB 386	1,526
Texaco	Lady Bug	GB 409	1,355
Amoco/Shell	Nakika	MC 429, 522, 383	5,000
Reading & Bates	North Boomvang	EB 643	3,688
Amerada Hess	Penn State	GB 216	1,450
Marathon/Shell	Stellaria	GC 112/113	2,045
Elf	Virgo	VK 823	1,132
Texaco	Narcissus	MC 638	4,250
Union Pacific	Gomez	MC 755	3,000
British Borneo	no name	GC 37	2,024



## Appendix 2: Production Startups

Year (1998-2000 Projected)	Company	Prospect	Area/Block	Water Depth (feet)
1997	Oryx/ CNG	Neptune	VK 826	1,930
	Shell	Mensa	MC 687	5,300
	Shell	Ram-Powell	VK 956	3,214
	BP Exploration	Troika	GC 244	2,684
1998	Marathon	Arnold	EW 963	1,752
	Amerada Hess	Baldpate	GB 259, 260	1,619
	British Borneo	Morpeth	EW 965	1,673
	Marathon	Oyster	EW 917	1,200
	Tatham Offshore	Sunday Silence	EW 958	1,450
	Walter Oil	EW 1006	EW 1006	1,882
1999	British Borneo	Allegheny	GC 254	3,186
	Shell	Europa	MC 935	3,870
	Chevron	Genesis	GC 200	2,599
	Vastar	King	MC 764	3,250
	Shell	Macaroni	GB 602	3,690
	Texaco	Petronius	VK 786	1,754
	Shell	Ursa	MC 810	3,916
	Elf	Virgo	VK 823	1,132
	Walter Oil		MC 443	
	Walter Oil		MC 837	
	Walter Oil		MC 533	
2000	Reading & Bates	Bequia	EB 690	3,800
	Shell	Betelguese	MC 584, 585	3,000
	Union Pacific	Blue Throat		2,862
	Shell	Coulomb	MC 657	7,520
	Exxon	Diana	EB 945	4,500-4,800
	Shell	Flathead	MC 899	4,430

	Texaco	Fuji	GC 506	4,243
	Texaco	Gemini	MC 292	3,393
	Shell	Glider	GC 248	3,300
	Exxon	Hoover	AC 25, 26	4,785
	Santa Fe	Hudson	GB 302	3,000
	Shell	Jalapeno	GB 370	1,530
	Conoco	King Kong	GC 472	3,817
	Amoco	King's Peak	DC 133	6,530
	Amoco	Marlin	VK 914	3,238
	Texaco	Mazama	GC 509	4,380
	Vastar	Mirage	MC 941	3,862
	Amoco/Shell	Nakika	MC 429, 522, 383	5,000-6,800
	Enserch/Mobil	Sheba	GC 294-297	3,300
	Shell	Toro	GC 69	1,500
	Shell	Venus	MC 853	3,600
	Marathon	West Merced	GC 172, 173	3,000

**APPENDIX 3 - PIPELINES TO STATE WATERS AND/OR TO SHORE - APPROVED 1994 TO 1997**

Segment No.	Segment Length (Feet)	Federal + State Length (Feet)	Company	Origin	Destination	Approval Date	Status	Pipeline Size (Inches)	Service
10094	4,914	27,828	Dauphine Island Gathering Partner	MO 822	F/S MO 822	03/09/94	ACT	12	G/C
10098	5,002	27,749	Dauphine Island Gathering Partner	MO 822	F/S MO 822	03/09/94	ACT	12	G/C
10268	14,256	23,293	Arco Pipe Line Company	SP 60	F/S SP 6	05/20/94	PROP	10	Oil
10553	264,750	282,390	Shell Pipe Line Corporation	WD 143	F/S BM 3	03/24/95	ACT	24	Oil
10631	353,414	375,414	Shell Pipe Line Corporation	ST 301	F/S BM 4	08/14/95	ACT	24	Oil
10698	13,259	45,464	Chevron Pipe Line Company	MO 864	F/S MO 821	08/04/95	ACT	12	GASH
10727	38,798	63,567	Unocal Pipeline Company	VR 38	F/S VR 16	09/20/95	ACT	06	OIL
10731	1,699	47,945	Tenneco Offshore Gathering Company	PL 2	F/S PL 2	09/18/95	ACT	08	G/C
10793	59,870	84,381	Venice Energy Services Company	WD 79	F/S WD 26	09/08/95	ACT	20-22	GAS
10799	178,436	189,633	Shell Gas Pipeline Company	WD 143	F/S WD 26	01/26/96	ACT	30	GAS
10903	361,424	416,243	Poseidon Oil Pipeline Company, LLC	SS 332	F/S ST 11	06/10/96	PROP	24	OIL
10942	33,422	85,008	Tennessee Gas Pipeline Company	EC 33	F/S EC 17	01/25/96	ACT	12	GAS
11015	317,988	324,881	Amoco Pipeline Company	MP 225	F/S MP 69	07/12/96	ACT	18	OIL
11161	345,515	551,115	Texaco Exploration and Production	EW 873	F/S BM 4	01/15/97	PROP	30	C/C
11177	47,839	68,063	Chevron USA Inc.	MO 864	F/S MO 823	02/07/97	ACT	10	G/C
11217	358,603	440,023	Marathon Pipe Line Company	SS 207	F/S EI 19	03/03/97	ACT	30	GAS
11273	325,835	398,792	Destin Pipeline Company Inc.	MP 260	F/S MO 819	01/26/97	PROP	36	GAS
11355	323,059	342,059	Dauphine Island Gathering Partner	MP 225	F/S MO 821	07/03/97	PROP	24	G/C
11372	14,925	44,925	Warren Energy Inc.	EC 10	F/S EC 9	04/30/97	PROP	16	GAS
11379	190,202	204,227	Shell Oil Company	MP 289	F/S MP 70	08/27/97	PROP	20	OIL