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Characteristics of Recent Oil and Gas Discoveries in the Deep Water Portion of the Western Nile Delta, Egypt

Over the past 35 years more than 4.0 BBOE have been discovered in the Nile Delta, primarily as gas and condensate. Figure 1 shows a location map of the area presented in this talk. With the discovery of multi-TCF gas fields in the western Nile Delta, interest in the deepwater Pliocene play has increased significantly in the past few years.

In 2002, Apache Egypt and partners RWE, DEA, and BP completed four discoveries in the deepwater portion of the West Mediterranean in Egypt's Nile Delta. Figure 2 shows a depth structure map on the Top Rosetta (Messinian) deep water portion of Apache's West Mediterranean Concession, Nile Delta, Egypt, with the location of five wells drilled in 2002–2003. The first two wells, Abu Sir-1X and Al Bahig-1X, discovered dry gas from the Upper Lower Pliocene of the Kafr el Sheik Formation. The third well, El Max-1X, recovered gas and gas condensate from the same formation. El

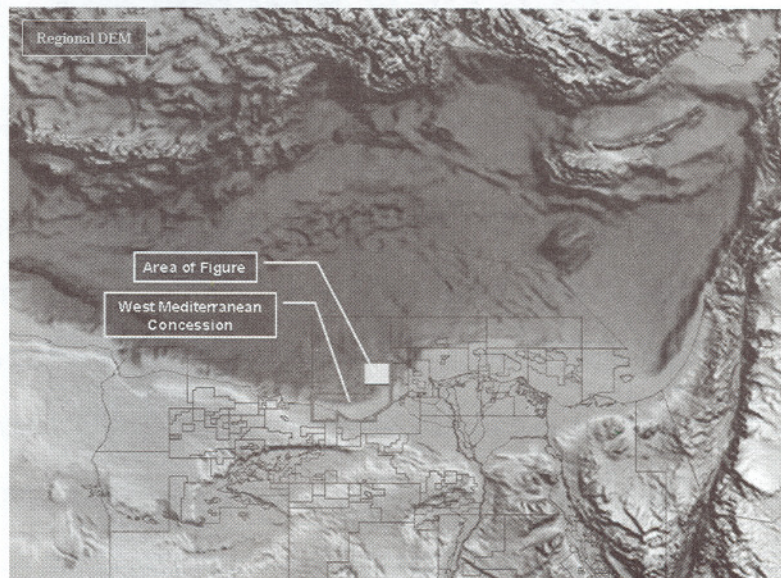


Figure 1 - Location map of the Western Nile Delta region. The exploration area within the West Mediterranean Concession is highlighted as "Area of Figure" and can be seen in Fig. 2. Apache and partners made 4 discoveries on this acreage in 2002.

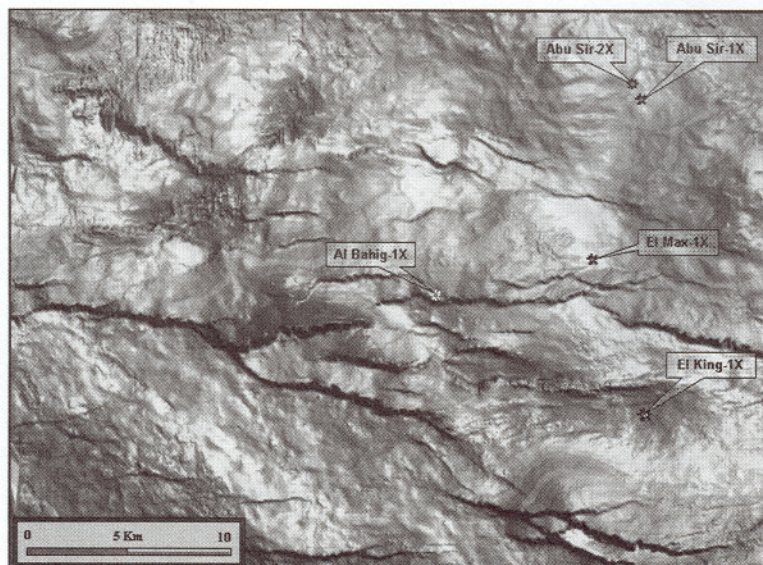


Figure 2 - Depth structure map on the Top Rosetta (Messinian), deep water portion of Apache's West Mediterranean Concession, Nile Delta, Egypt with the location of five wells drilled in 2002-2003.

King-1X, the fourth well, tested 33° API oil, gas and gas condensate from the Messinian Abu Madi Formation and gas and gas, condensate from the Lower Pliocene of the Kafr el Sheik Formation. Oil from El King-1X represents the first oil discovered in the deep water portion of the Egyptian Nile Delta.

The Pliocene gas discoveries consist of northwest-trending deep water levee-channel complexes draped over structures. Abu Sir is a combination structural/stratigraphic trap with closure to the southwest provided by pinchout of the Abu Sir deepwater fan complex. El Max and Al Bahig are both fault-dependent structural traps. El Max is a high-side fault-dependent trap whereas Al Bahig is a low-side fault-dependent trap. All the Pliocene discoveries are >

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characterized by flat spots, phase changes, Class III AVO responses, and structurally conformable amplitude anomalies.

El King is an east-west trending anticlinal structure with hydrocarbons in both the Lower Pliocene and Upper Miocene (Messinian). The Pliocene accumulation is a northwest-trending levee-channel complex draped over the El King anticline. The Messinian reservoirs at El King are interpreted as shallow water deposits and are interbedded with the Rosetta anhydrite. A 16-ft oil leg was encountered in the Messinian at El King.

Geochemistry of the El King-1X oils and condensates from El Max-1X is dissimilar to onshore Cretaceous and Jurassic sources, thus it suggests the possibility of Tertiary source rocks capable of generating both oil and gas in the western portion of the Nile Delta. Preliminary biomarker analyses of the El King-1X show broad similarity with other offshore condensates in the area. Although the condensate in El Max is a different API and has a different gas chromatography trace to the El King oil, both have broadly similar biomarker data. The carbon isotope composition of the dry gas from Abu Sir-1X indicates a thermally mature source for the Abu Sir gas. Carbon isotopes from the dry gas at Al Bahig-1X, on the other hand, indicate that it is predominantly biogenic. ■

Biographical Sketches

JONATHAN BORK received his BS and MS in geology from Michigan State University in 1965 and 1967, respectively, and his PhD in geophysics from Colorado School of Mines in 1973. He has worked in exploration offices in New Orleans, Houston, and London for Amoco but spent more than 20 years at Amoco's Tulsa research center as a research supervisor in interpretation, field acquisition, modeling, AVO, and inversion. Since 1998 he has worked for Apache Corporation in Houston, doing rock



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DAVID PHELPS is currently a senior geological advisor for Apache Egypt, based in Cairo, Egypt. He received a BS in geology from Kent State University, and an MA and PhD in geology from Rice University. He has 22 years of experience in petroleum research, exploration, and production. His areas of expertise include exploration play and prospect development, structural geology, fault seal evaluation, and reserve risk analysis and assessment. Prior to the current assignment in Cairo, Dave completed a three-year assignment with Apache Corporation in Houston. Before joining Apache, Dave worked with Exxon Production and Research for 16 years in a variety of domestic and foreign assignments including Houston, England, Sydney, and Stavanger. He is active with the Geological Society of America and the AAPG. His email is david.phelps@egy.apachecorp.com.



DAVID ALLARD is currently the exploration manager for Apache North Sea, based in Aberdeen. He obtained his BS in geology from Edinboro University of Pennsylvania. David recently completed an exploration assignment in Cairo, Egypt. Previous assignments include a variety of international concerns for Exxon International: Azerbaijan, Russia, Chad, Niger, Venezuela, Guatemala, and others. He has 22 years of petroleum exploration and production experience. Key skills include exploration play and prospect development, fault seals, production enhancement, reserve assessment, risk analysis, petrophysics, well operations, and economics. Domestic USA assignments with Exxon included the Permian Basin and several Rocky Mountain basins. He also explored the Santa Maria Basin of California for Sohio. He is an active member of the HGS and the AAPG. His email is david.allard@gb.apachecorp.com.