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3D MASSIVE VSP AT WILMINGTON OIL FIELD, LONG BEACH UNIT

New high-resolution seismic imaging technology has been used to image part of the Wilmington Oil Field, which is the third largest oil field in the continental United States. The field is located on a thirteen-mile long and three-mile wide anticline that extends from onshore San Pedro to offshore Seal Beach. Vertical faults divide the field and production stems mainly from five major turbidite sandstone intervals ranging from 2,000 feet to 11,000 feet in depth.

The Long Beach Unit (LBU) of the Wilmington field produces from four islands constructed in the harbor area. Since 1965, LBU produced 800 million barrels of oil with an estimated one billion recoverable barrels is still in place. Recovery efforts include water flooding, fracturing and horizontal drilling.

In February 2002, Paulsson/Geophysical Services, Inc. completed a high-resolution 3D Massive VSP seismic survey of the producing reservoirs and deeper exploration prospects. An 80 level three-component borehole array was used to acquire 30,000 shots from Freeman and Chaffey Islands. Five wells (two vertical and three deviated) were instrumented. An initial velocity model was constructed and refined using direct arrival and reflection tomographic methods. Finally, the processed up-going wave field was pre-stack depth migrated providing images of the LBU directly in depth. Converting the 3D VSP image back into the time domain shows frequencies up to 120 Hz, which is a great improvement in resolution over traditional surface seismic data in that area.