Paulsson, Bjorn N. P., Martin Karrenbach, Alan Hardin, Karen E. Blake
(Paulsson Geophysical Services, Inc, Brea, CA)

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.