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Stratigraphy and Depositional Environment of the Upper Zubair Sandstone (“Main Pay”), West Qurna 1 Field, Iraq

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SUMMARY

ExxonMobil and South Oil Company entered into an agreement to develop oil reserves in the “Main Pay” reservoir at West Qurna 1 field in 2010. Two cored wells, WQ1_0002 and RN_0083, were released to ExxonMobil in 2011 by SOC for core description and sampling. Various authors have interpreted the Zubair sandstones in the region to have been deposited in deltaic, estuarine and fluvial environments, but prior to reviewing these core data the dominant environments of deposition at West Qurna field were not well defined.

A biostratigraphic study of the “Main Pay” reservoir indicates that most samples contain a mix of marine and terrestrial fauna. Examples of marine fauna include: benthic forams, dinocysts, echinoid plates/spines, bivalves, gastropods, calcispheres and trace fossils. Terrestrial material includes organic matter, spores, pollen, phytocuticles, amber and thin coal intervals. Abundant marine faunas occur in lower energy, deeper marine conditions whereas reduced marine fauna that is admixed with terrestrial material, occurs in higher energy, shallower water conditions.

Rock types observed in core in the lower portion of the “Main Pay” include coarsening upward black claystones at the base overlain by bioturbated very fine grained sandstones which in turn are overlain by fine-grained, trough cross-bedded sandstones. Cross-bedded sandstones are sometimes capped by thin coals or lignites. Above the coarsening upward succession is a shale interval that is 10m thick with abundant marine fauna. Overlying the shale member is the middle sandstone unit. This unit is composed of interbedded thin claystone- siltstone intervals and thin to thick bedded very fine to fine grained sandstones. Bioturbation by marine organisms is common throughout this unit.

Biostratigraphic and rock description show the reservoir sandstones of the Zubair “Main Pay” at the West Qurna 1 area were deposited predominantly in shallow water marine setting. Presence of thin coals, phytocuticles, roots and other terrestrial material indicate the area was periodically occupied by land plants.

Well log correlations and MDT pressure data demonstrate that the “Main Pay” sandstones have good lateral connectivity. This high degree of lateral continuity together with paleoecologic and lithologic indicators of alternating marine and terrestrial deposition suggest the Zubair “Main Pay” reservoir at West Qurna 1 was deposited close to the paleo-shoreline, and most likely in a deltaic environment.

