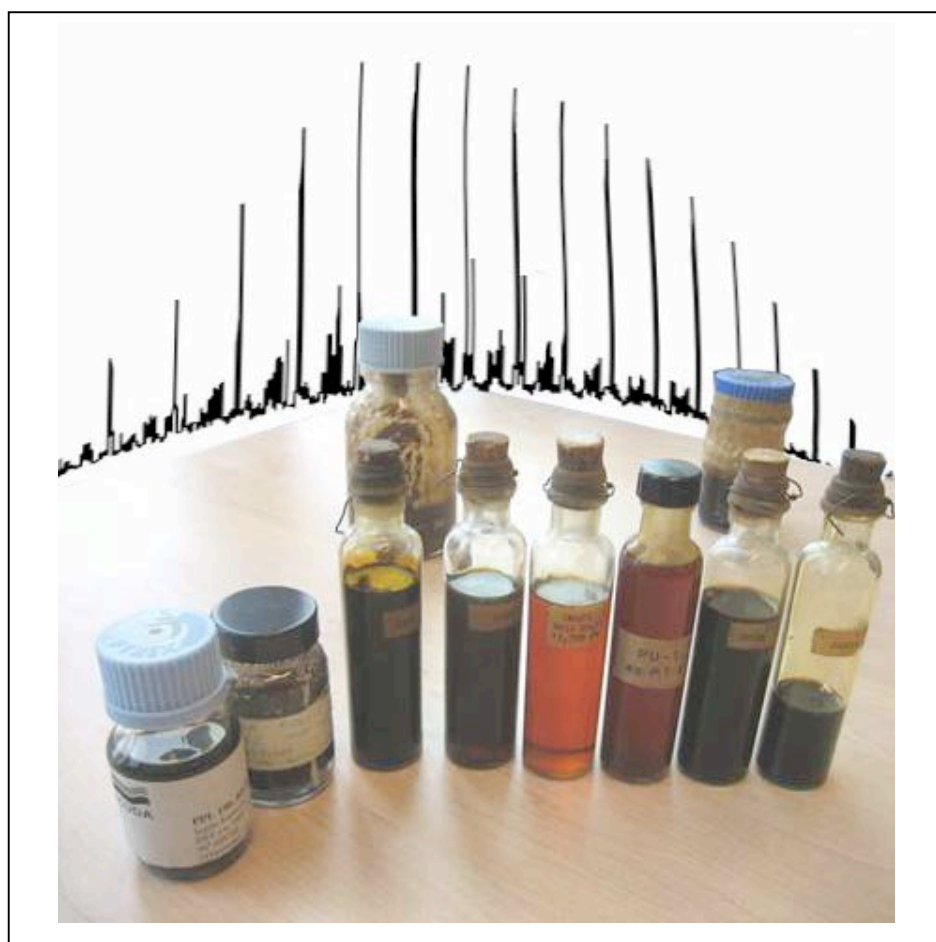




**STEPHEN WOOD
MASTERS THESIS**

**OIL POTENTIAL OF THE
UPPER TURAMA RIVER AND
FLY RIVER DELTA AREAS,
PAPUA NEW GUINEA
FORELAND**

JULY 2010



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ABSTRACT

The Papuan Foreland is a structurally simple region and is generally under-explored relative to the Papuan Foldbelt where significant oil and gas fields have been discovered. Despite several gas discoveries in the Foreland, well results suggest an oil based petroleum system exists. This study aimed to define the origin of these oils, explain both the charge and migration history and use the results to define areas for future oil exploration.

The study focused on two areas of the Foreland: The Turama River (north) and Fly River Delta (south). The organic geochemistry of thirty-five oils were described from ten wells and two seeps in the study area. These were divided into five oil families, consisting of; Family L (lacustrine), Family MC (marine carbonate), Family LJ (Late Jurassic sourced), Family O (Cretaceous-Tertiary sourced), Family C (coal sourced). A sixth family, Family X represented mixed oil families.

Oil to source correlations were performed for the oil families. Biomarker and isotopic data demonstrated that oils from Family L appear to be sourced from Late Triassic mudstones which were drilled at Kanau 1 deposited in a synrift environment. Family MC oils may also be sourced from this synrift based on biomarker evidence but the correlation is less certain with respect to isotopic data. Oil to source correlations appear simple for Families LJ and C since low oil maturity suggests in-situ generation for most of the oils from these families. Lack of data and probable deep erosion of the Late Cretaceous means that the source for Family O oils is uncertain.

Source rock evaluation data was investigated for the greater study area which showed that using Total Organic Carbon and Hydrogen Index cut offs, oil prone source rock typically of poor to fair quality is developed in the Magobu, Barikewa and Lower Imburu Formations. Source potential for the Triassic is fair to good. Coals within the Magobu are also shown to be oil prone. Assessment of algal rich units in the Barikewa to Lower Ieru section at Kimu 1 were also assessed for oil source potential but appear gas prone.

Using knowledge of the source rocks and stratigraphy from wells and seismic, Basin Mod 1D models were created to evaluate the charge history; one model was based in the Darai Plateau at Kanau 1, with two pseudo-wells used to model the Omati Trough. Basin history indicates two charge events: 1) a Late Cretaceous event recorded by biodegraded Family L oil on footwall highs or in fluid inclusions. 2) A Miocene to Present Day charge which likely contributed Family MC and/or L oils either as seeps or as fresh oil 'overprints' upon previously biodegraded oils. Biodegradation of Late Cretaceous oil is believed to be a likely origin of biogenic gases such as at Kimu 1 and Koko 1.

A play fairway map was created for the study area, indicating the Turama River and Fly River Trough areas have oil potential. Basin modelling suggests late oil charge is possibly limited in volume in the Turama River area.

STATEMENT OF CONFIDENTIALITY

Due to a confidentiality agreement between Oil Search Limited and the Australian School of Petroleum, this thesis is not available for public inspection or borrowing until 31 July 2012.

STATEMENT BY THE AUTHOR

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution. To the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference has been made in the text.

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Stephen Wood

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