

**PROPOSAL FOR A MULTI-CHANNEL
SEISMIC SURVEY OFFSHORE
SOLOMON ISLANDS AND VANUATU**

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TABLE OF CONTENTS

	<i>Page</i>
SUMMARY	5
ACKNOWLEDGEMENTS	4
INTRODUCTION	6
BACKGROUND	6
JUSTIFICATION	7
OBJECTIVES	8
BENEFITS	8
REQUIREMENTS	11
PROPOSED BUDGET	11
REFERENCES	12

LIST OF FIGURES

Figure			
1	Proposed seismic survey program. Solomon Islands		9
2	Proposed seismic survey program, Vanuatu		10

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SUMMARY

This report is a proposal for funding multi-channel seismic surveys in selected offshore areas of Solomon Islands and Vanuatu. The areas proposed for acquisition of new seismic data have been selected on the basis of their good potential for hydrocarbons and relatively shallow water depths,

The proposed survey thus covers the basin margin areas of Iron Bottom Basin and south eastern Russel Basin, Solomon islands; and Big Bay Basin, East Santo Basin and Malekula Basin.

The new data acquired will provide greater knowledge of the petroleum geology of these areas and, when promoted to the oil industry, will increase the awareness of the hydrocarbon potential of Solomon Islands and Vanuatu. Ultimately, this could lead to commercial exploration and drilling.

The total cost of the proposed survey is US\$ 2,789,600.

INTRODUCTION

This work is a contribution to the requirement of the SOPAC 1992 Work Plan Tasks 92.SI.10b, 92.SI.10f and 92.VA.2c: to acquire multi-channel seismic data in Iron Bottom Sound and Vanikoro Basin, Solomon Islands; and in Espiritu Santo and Malekula areas, Vanuatu in order to evaluate the hydrocarbon potential of these areas.

Following the completion of the Tripartite program, the need for further seismic and other geophysical data to be acquired in selected areas of SOPAC member countries, including Solomon Islands and Vanuatu has been described by Exon and Tiffin (1989). Owing to large scale of financial support required for this seismic data acquisition project, a project proposal for funding was drawn up. This proposal is contained in this report.

Areas were selected for the proposed seismic survey on the basis of known petroleum potential and water depth constraints. The petroleum potential of these areas has been most recently reviewed by Coleman (1991), Falvey et al. (1991) and Johnson and Pflueger (1991). Large areas of the intra-arc basins of Solomon Islands and Vanuatu have water depths that are too great to explored for hydrocarbons.

The worldwide maximum water depth for exploration in regions with proven oil reserves is currently 1000m. However, in frontier regions such as Solomon Islands and Vanuatu which have no proven petroleum reserves, a realistic maximum water depth is probably around 600m. Thus the areas selected for the proposed seismic survey are exclusively on the shallow water basin margins. These areas also coincide with the Tertiary basin margin reef play, which is the most prospective exploration play in the region (Coleman 1991, Falvey et al. 1991 and Johnson & Pflueger 1991).

The areas selected for the seismic survey proposal are: Iron Bottom Basin and south east Russel Basin, Solomon Islands; and Big Bay Basin, East Santo Basin and Malekula Basin, Vanuatu.

During 1992, the funding proposal was submitted to several potential international donors, including the Commission of the European Community, for consideration for funding under regional grant aid programs. However, as yet it has not been possible to attract funding for the project.

BACKGROUND

The original seismic data from Solomon Islands and Vanuatu were acquired under the Tripartite programs in 1982 and 1984-87. Interpretation of this, together with other oil industry seismic data, principally by SOPAC, the Australian Geological survey Organisation (AGSO) and the US Geological Survey (USGS), has given encouraging results in certain shallow water areas with respect to hydrocarbon prospectivity.

However, it is not possible to further evaluate prospectivity with these data. This proposal arises from the request of SOPAC member countries, Solomon Islands and Vanuatu, and follows the

recommendations of earlier SOPAC reports (1988 and 1989). These recognise the need to acquire modern multi-channel seismic in order to better define prospectivity and, hopefully, make these areas more attractive to the oil industry.

JUSTIFICATION

Our present knowledge of the offshore subsurface geology of Solomon Islands and Vanuatu comes almost exclusively from data gathered during the Tripartite program. Additional data were provided by oil company seismic surveys (1972-1982) and from the recent ODP (Ocean Drilling Program) drilling in offshore Vanuatu (1990).

The Tripartite cruises were designed to establish the broad framework of sedimentary basins. Thus from these data it has been possible to define the geometry and sediment thicknesses of the basins.

From the point of view of hydrocarbon potential, the results of this work are encouraging. Offshore basins in both Solomon Islands and Vanuatu contain sediment thicknesses which are sufficient to generate oil, if the source rocks are present.

Furthermore, several possible reef structures have been identified beneath Iron Bottom Sound in Solomon Islands. They occur around the basin margin beneath shallow water depths of 600m. If proven, these structures could have the potential to be oil reservoirs.

Because of the marked similarity in geology between the countries, these reefal structures may also be present in Vanuatu. However, this cannot be established from the present seismic data which are of poor quality and do not give sufficient coverage.

The recognition of the possible reefs is an important discovery and a key issue for the oil industry. Once mapped in sufficient detail, they can be used to estimate the size and volume of possible oil reserves and so to help assess the commercial viability of exploration and production in the area.

However, the picture is incomplete at present since there are insufficient seismic data in shallow water areas around the basin margins to indicate the full extent of the possible reefs and other potential hydrocarbon traps. Consequently, in their assessment, oil companies would probably conclude that the chance of finding commercial oil is unacceptably low to warrant exploration in these areas.

A further consideration which makes this an appropriate time for a new seismic acquisition survey is the world oil market. Two factors are important at present. Firstly, following the Iraq-Kuwait conflict, the oil price has again settled at US\$18/barrel, which is the stated OPEC target for the short term. With this oil price, oil companies will begin to look more favourably on investing again in frontier areas such as the Solomon islands and Vanuatu.

Secondly, the Iraq-Kuwait conflict again emphasised the problem that industrialised nations have in relying on a supply of oil from the Arabian Gulf, which is far from secure. This highlights the need to establish guaranteed oil supplies from politically stable countries, and so again encourages oil companies to (re)assess the potential of frontier areas.

OBJECTIVES

The proposed new seismic program will focus specifically on relatively shallow water areas (less than 1 km water depth) which are feasible for present day oil company production technology and economics (Figures 1 and 2).

The aims of the proposed survey are (i) to acquire seismic data of sufficient coverage and quality to assess the extent of the possible subsurface reefs and other potential hydrocarbon traps; and (ii) to map the general trends and geometries of such traps.

To achieve these aims, the optimum grid size for the survey is 5 x 20 km, giving a total of 3,200 km (Figures 1 and 2). Of this it is proposed that 1,700 km be acquired in the SW Russel and Iron Bottom Basins of Solomon Islands; and 1,500 km be acquired in the Big Bay, East Santo and Malakula Basins of Vanuatu.

Following acquisition, the seismic data should be processed to maximise the resolution of the possible reefs and other potential hydrocarbon traps.

BENEFITS

- (1) The proposed seismic survey should enable SOPAC geologists and geophysicists to evaluate the extent of the possible reefs and other potential hydrocarbon traps in the most prospective, shallow water areas of offshore Solomon Islands and Vanuatu.
- (2) With this information, the governments of Solomon Islands and Vanuatu will be in a much better position to assess and manage their hydrocarbon resources.
- (3) At present, because of the lack of seismic data, these areas will be seen by the industry as having a very high risk of no commercial oil reserves and thus as being unattractive. However, once this information is presented to oil companies, they will be in a far better position to assess the hydrocarbon potential and, hopefully, be interested to start exploration in these areas.
- (4) The seismic survey will also be of benefit to nationals of Solomon Islands and Vanuatu who will assist in the interpretation of the seismic data as part of a training exercise.

REQUIREMENTS

The following is not intended to be definitive, rather it provides a brief description of some of the salient points of a seismic survey.

In view of the shallow water depths that will be encountered (less than 20 m, see Figs 1 and 2) it will be necessary to use a shallow-water survey vessel for a significant amount of the survey. A full ocean-going vessel is not suitable for this work.

In order to obtain optimum seismic resolution, cables with 192 or 240 channels should be used with 25 m group and shot spacing. Common depths point stacking should give at least 48-fold multiplicity.

Processing should include state-of-the-art techniques in velocity analysis, multiple suppression, noise reduction in migration. It is essential that processing be done in consultation with the SOPAC geophysicist responsible for the seismic interpretation.

PROPOSED BUDGET

Country	Basin	No of lines	km	Acquisition costs US\$	Processing costs US\$
Solomon Islands	IBB	15	680	544,000	54,400
	RSL	13	1030	824,000	82,400
SubTotals				1,368,000	136,800
Vanuatu	BB	21	1160	928,000	92,800
	ES	4	160	128,000	12,800
	MK	3	140	112,000	11,200
SubTotals				1,168,000	116,800
TOTAL (US\$)				2,536,000	253,600
GRANDTOTAL (US\$)				2,789,600	

IBB: Iron Bottom Basin, RSL: Russel Basin, BB: Big Bay Basin, ES: East Santo Basin, MK: Malakula Basin

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