

Pacific Oil & Gas Pty Limited

INTERPRETATION OF

THE ELSEY SEISMIC SURVEY DATA

McARTHUR BASIN - EP19

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Report No. 304318

PR91/062E

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## 1. SUMMARY

In 1990, one seismic line was shot and a stratigraphic hole, Sever 1, was drilled in EP19.

The present interpretation ties the stratigraphic hole and the seismic line. It defines the northeastern limit of the Daly sub-Basin under the base Cambrian unconformity. As well as the structural profiles of the key horizons, a possible extent of the dolerite was mapped along the seismic line.

## 2. INTRODUCTION

The exploration permit EP19 is situated in north central in Northern Territory. The permit was initially awarded to Pardi Pty. Ltd., in 1988. In 1990, Pacific Oil & Gas Pty. Limited shot a 60 kilometre seismic line (EL90-201) in addition to the farm-in obligation of one well (Sever 1, Plan PetNTcw4362).

The area is in the west of the McArthur Basin, informally called the Daly sub-Basin, defined by an extensive gravity low. The exploration program in 1990 consisted of one stratigraphic drill hole, Sever 1 (1259.86 metres TD), and the seismic line mentioned above. Its purpose was to investigate the extent of any prospective stratigraphy, its lateral distribution and structure along the seismic line.

## 3. BASIC DATA

Apart from the regional gravity data (BMR, 1975), there is little geological or geophysical data. The surface is largely covered with alluvium, and the nearest Roper Group outcrop is some 20 kilometres to the northeast of the permit.

The seismic line EL90-201 is oriented northeast-southwest in the permit. Acquisition was by Geosystems using the Geocor IV recording system (O'Sullivan et.al., 1991) and the quality of the seismic data is poor to fair.

The stratigraphic hole Sever 1 was drilled in September 1990 to a total depth of 1259.86 metres and was plugged and abandoned in Corcoran Formation (Lanigan & Torkington, 1991). The hole did not intersect any live hydrocarbons. The source unit of the middle Velkerri Formation was intruded by dolerite and was over-mature for oil generation.

A synthetic seismogram was constructed from sonic and density logs and well velocity survey data, (Plan PetNTcw4341). A small linear shift was applied to achieve a better tie to the seismic section.

4. TIE BETWEEN Sever 1 AND EL90-201

A synthetic seismogram was constructed for Sever 1 (Plan PetNTcw4341), and horizons were tied as in Table 1 below.

HORIZON	DEPTH (mGL)	TWO-WAY TIME (msec)
Base Cambrian Unconformity	152	109
?Bukalorkmi Sst	Not intersected	-
?Top Kyalla Member	Not intersected	-
Velkerri Formation	331	220
Mid-Velkerri Dolerite	757	444
Bessie Creek Sandstone	1167	625
Corcoran Formation	1228	663
"46" marker	Below TD	
(?Nathan Group)	(1980 est)	(965)
"43" marker	Below TD	
(?McArthur Group)	(2850 est)	(1265)
"22" marker	Below TD	
(? Tawallah Group)	(4100 est)	(1680)

The horizons are described in Section 5.

5. SEISMIC HORIZONS

- 5.1 Base Cambrian Unconformity (PetNTcw4346) - an angular unconformity is observed at 109 millisecond TWT at Sever 1. The erosional nature of the unconformity is best seen between vibrator points (VP) 1000 and 1600. At Sever 1, the lithology directly above the unconformity is basalt of the Nutwood Downs Volcanics which is in turn, overlain by Tindall Limestone. The lithology immediately below the unconformity is shale of the Kyalla Member, the stratigraphic top of which is missing.
- 5.2 Bukalorkmi Sandstone (PetNTcw4347) - The Bukalorkmi Sandstone is not present in Sever 1. A strong reflector which is truncated by the Base Cambrian Unconformity at VP1340, is interpreted as the top of the Bukalorkmi Sandstone.
- 5.3 Kyalla Member (PetNTcw4348) - At Sever 1, the stratigraphic top of the Kyalla Member is missing. A reflector which is truncated by the Base Cambrian Unconformity at VP1650 is interpreted as the top of the Kyalla Member. It is not well defined, and reliability is low.
- 5.4 Velkerri Formation - The seismic character at the top of Velkerri Formation is not well defined, and reliability is low. This horizon is not mapped as it is largely conformable with the horizons below.

- 5.5 Dolerite Unit (PetNTcw4349)- A strong reflector is tied with the dolerite. It seems conformable to the strata over the seismic line.
- 5.6 Bessie Creek Ss (PetNTcw4350) - Bessie Creek Sandstone at Sever 1 is well silicified and its porosity is low (3% on average). A weak reflector is recognised and correlated with the Bessie Creek Sandstone.
- 5.7 Corcoran Formation (PetNTcw4351) - The top of the Corcoran Formation is tied at Sever 1 with a consistent continuous reflector. In places some truncations are observed below this reflector. The character suggests an unconformity or disconformity at the top of Corcoran Formation.

The next three horizons are not intersected at Sever 1 as they are below the total depth. The correlations are interpreted from regional geological knowledge in the Basin.

- 5.8 "46" Marker (PetNTcw4352) - A strong continuous reflector at 965 milliseconds at Sever 1. This is thought to represent the bounding between the Roper and the underlying Nathan Group.
- 5.9 "42" Marker (PetNTcw4353) - An erosional unconformity surface about 300 milliseconds below the "46" marker. The seismic character above this horizon indicates rather small internal reflectivity while the formation below shows a well stratified series of sediments. This sequence is considered to be equivalent to the McArthur Group.
- 5.10 "22" Marker (PetNTcw4354) - At this point below the base of the well the stratified series of reflectors are underlain by chaotic seismic character. The "22" marker is defined as the boundary between the stratified and chaotic characters. The chaotic signal could represent lower Proterozoic Tawallah Group or the granitic basement.

## 6. STRUCTURE

The entire seismic line is covered with Cambrian to recent cover. The Base Cambrian Unconformity is the first major feature in the area.

In the northeast of Line EL90-201, a large fault is observed which defines the limit of the upper Proterozoic sedimentary basin. It is truncated by the Base Cambrian Unconformity at VP 2685.

To the northeast of this point, the section below the Base Cambrian Unconformity has similar character to (?)McArthur Group to the southwest. That section is totally truncated by the unconformity at VP 2920. Below the "22" marker, there is hardly a coherent reflector to the northeast. This could be Tawallah Group meta-sediments or granitic basement.

Southwards from the basin margin fault, the basin is gently dipping to the southwest until some faults occur around VP 500. It is difficult to determine the nature of the fault system from the scarcity and the quality of the data. It is inferred from the regional trend that the tectonic environment was compressional, possibly associated with some wrenching movement.

The structural events in the area were minimal during deposition of the Upper Proterozoic sequence. The only significant thickness variation is observed in the Kyalla Member thickening to the northeast against the regional dip. This suggests at least two phases of dip reversal in the late Proterozoic period: first dip to the northeast at the time of deposition of the Kyalla Member and then dip reversal to the southwest perhaps associated with the faulting. Erosion prior to deposition of the Cambrian sandstone "planed" off the Proterozoic to a very flat surface.

As the structure dips uniformly to the southwest there is little chance to form a trapping geometry. At the southwestern end of the line, where faults are observed, small structural closures may be possible in the vicinity of, or on the top of the fault system.

The Bessie Creek Sandstone is truncated before the eastern edge of the basin, so there is little chance of a basin-margin fault play to be developed.

#### 8. CONCLUSION

The seismic line EP90-201 shows the northeastern limit of the Daly sub-Basin. The structure of the basin along the seismic line is monotonously dipping to the southwest with a possible wrench fault system in the south. There is little potential for trapping geometry.

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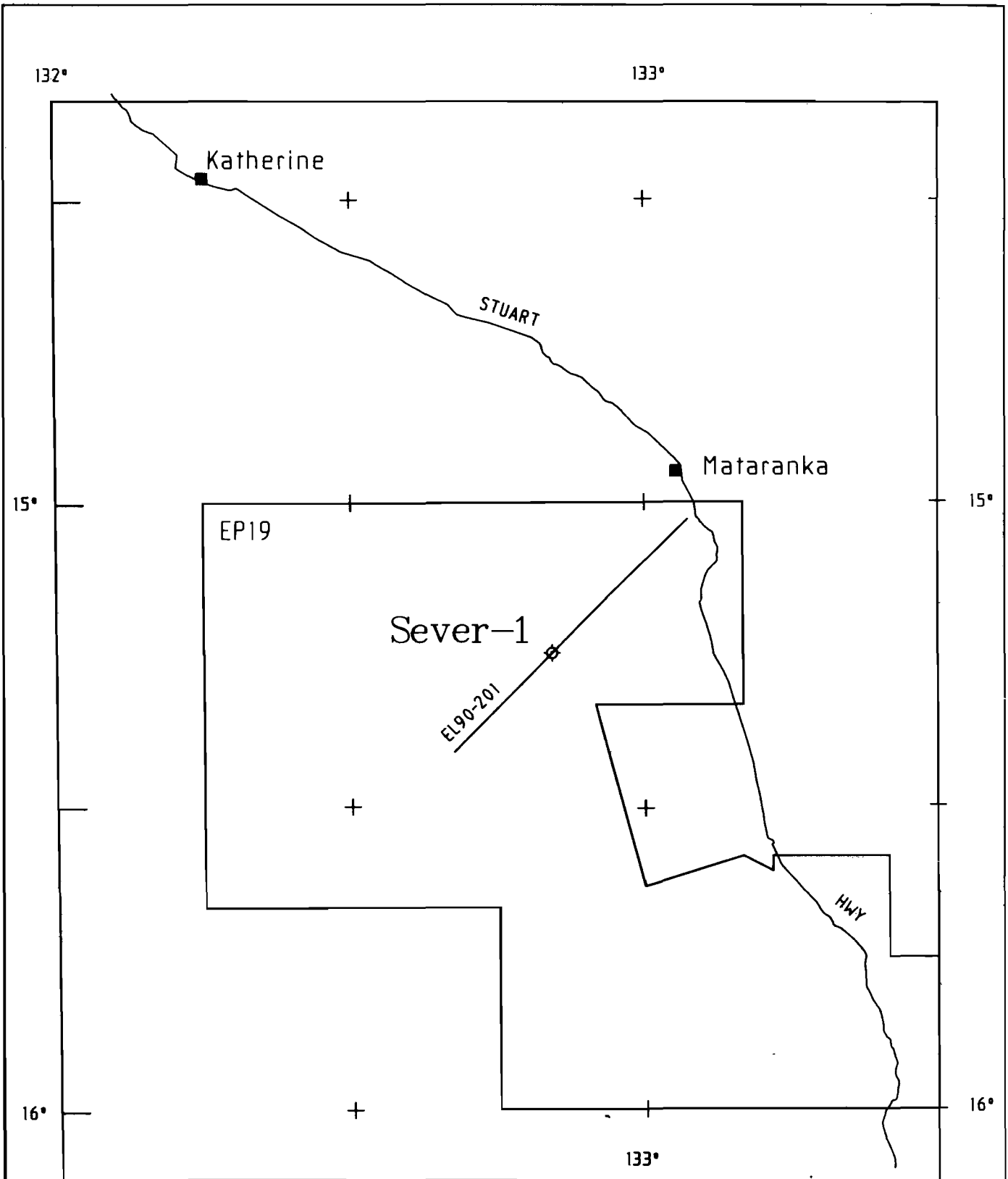
KEYWORDS

Geophys-seismic, onshore, vibroseis, McArthur Basin, Daly sub-Basin,  
petroleum exploration, Proterozoic, Precambrian.

MAPSHEET

Larrimah SD53-13 1:250,000





**CRA** Pacific Oil & Gas Pty Limited

**McARTHUR BASIN FARMIN PROJECT**

**EP 19  
LOCATION PLAN**

REF.	SD 53-13	DRAFTING	J.B.
SCALE	1:1000 000	REPORT	304318
AUTHOR	I.M.C.	PLAN No.	PetNTcw4362
DATE	JULY 91		