

RARE EARTHS & MINERALS PTY LTD
&
PILBARA CHEMICAL CORPORATION NL

FIRST ANNUAL REPORT

EL 10102

HYLAND BAY SALT PROJECT
PORT KEATS, NORTHERN TERRITORY

BY

DOUGLAS MITCHELL, BA [Hons], MA [Econ][Distn]

October 2002

CONTENTS

	Page Number
1. SUMMARY	3
2. INTRODUCTION	3
3. TENURE	4
4. PREVIOUS EXPLORATION	4
5. WORK UNDERTAKEN 2002 – 2002	6
5.1 Literature Review	6
5.2 Preliminary Geological Assessment	7
5.3 Other Project Development Activities	7
6. CONCLUSIONS AND RECOMMENDATIONS	8
7. FIGURES	
Figure One, Tenement Location Map	
Figure Two, Hyland Marine Seismic Survey, Location and Seismic Lines	
Figure Three, Port Keats Seismic Line H31-B	
Figure Four, Port Keats Time Structure Map, Top Tanmurra	

1. SUMMARY

Historical data and previous work by others has inferred that a diapiric structure is present at Tree Point adjacent to Hyland Bay on the west coast of the Northern Territory. The structure is inferred to be about ten kilometres in diameter and is within about three hundred and fifty metres from surface.

In order to validate this exploration target and determine whether the structure contains salt of suitable composition and extraction cost to warrant the development of the project a wide variety of risks need to be defined and mitigated.

Sufficient independent geological data has been identified to validate the location of the structure and determine potential drill targets if the commercial environment is encouraging.

In turn, to achieve a positive commercial environment it is necessary to identify a specific market for product from the project, to determine the indicative costs of further project development and implementation, to evaluate the potential competitiveness of the Hyland Bay project in relation to other existing solar salt projects and potential locations for a new salt mining project in the event that the resource is proven and, lastly, to secure the required additional funding for full-scale project implementation.

2. INTRODUCTION

On 20 March 1998 Rare Earths & Minerals Pty Ltd and Pilbara Chemical Corporation NL applied for an Exploration Licence extending from the low water mark and seaward over an area adjacent to Hyland Bay and Dorcherty Island near Port Keats on the West coast of the Northern Territory.

Previous interpretation of old seismic data by others inferred the presence of a diapiric salt structure of considerable areal extent, located relatively close to surface and extending under land at Tree point adjacent to Hyland Bay.

Based on this interpretation and other geological reviews the inferred structure at Hyland Bay was considered to be the nearest known potential source of salt in the event that a basic chemical project, for which salt is an essential feedstock, could be established at Darwin.

In the event that a basic chemical project was not viable for any reason, it was also considered that if a resource of salt could be proven at Hyland Bay then salt exported to Asian markets from this location could enjoy significant transport cost and other economic advantages in comparison with existing Australian solar salt fields.

Initial discussions with one international group to supply the required gas and ethylene for a basic chemical project were inconclusive.

Subsequently, in 2000 Rare Earths and Minerals Pty Ltd and Pilbara Chemical Corporation NL were approached by and entered into discussion with another proponent of a basic chemical project at Darwin. These subsequent discussions were also inconclusive, in part because of the continuing lack of a supply of economically priced gas at Darwin.

Following the grant of EL 10102 Rare Earths & Minerals Pty Ltd and Pilbara Chemical Corporation NL have continued to review a wide range of matters involved in evaluating the potential of the Hyland Bay tenement, with increasing emphasis on the potential of the project as a stand alone salt mining operation, or not.

3. TENURE

EL 10102 was granted on 3 July 2001 for a period of six years. The tenement comprises 57 full or part graticular blocks extending from the low water mark and is located on the Port Keats 1:250,000 Geological Map Sheet. The geographic location of the tenement is shown in Figure One.

4. PREVIOUS EXPLORATION

In October – November 1967 Western Geophysical Company of America undertook the Hyland Marine Seismic Survey for Australian Aquitaine Petroleum Pty Ltd [Final Report, Bonaparte Gulf, Northern Coast of Australia O.P. 2 and O.P.83, Hyland Marine Seismic Survey, Australian Aquitaine Petroleum Pty Ltd, 1967]. The survey location and seismic lines are shown in Figure Two.

The geology of the area was subsequently reviewed by C.M. Morgan for the Bureau of Mineral Resources, Geology and Geophysics [Port Keats, Northern Territory, 1:250,000 Geological Map and Explanatory Notes, Australian Government Publishing Service 1972]. Morgan did not refer to any salt potential in the Port Keats area.

More recently, Salt Exporters (Aust) Pty Ltd ['SEA'] undertook a review of then existing data, including the Hyland Marine Seismic Survey and the Port Keats 1:250,000 Geological Map and Explanatory Notes.

Using data from Australian Aquitaine Petroleum Pty Ltd's Hyland Marine Seismic Survey SEA interpreted two lines of seismic from this survey, H31-B and H-14, as both having "very strong structural features which are attributed to salt diaper intrusion".

As can be seen from Figure Two, both H31-B and H-14 lie within both the SEA tenement and the now EL 10102, adjacent to Tree Point.

SEA concluded that "although there are no wells within the [then] lease ...the two seismic lines which traverse the tenement indicates the presence of salt. Seismic line H31-B...shows strong salt effects indicative of a large intrusion. Elsewhere in the region there are numerous salt diapers and major swells"

An interpretation of seismic line H31-B, which SEA considered to have “very strong structural features which are attributed to salt diaper intrusion”, is shown at Figure Three. The areal extent of the interpreted diaper and other diapirs and major swells in the region are shown at Figure Four, Port Keats Time Structure Map, Top Tanmurra.

Advisers to SEA estimated that the “salt diaper has a diameter of approximately 10 kilometres and is within 350 metres of the surface. The diaper extends onshore along the western side of Hyland Bay where a cavern field would easily be established”.

SEA concluded, in summary, that “the available seismic indicates a salt diaper, of considerable areal extent, is present at shallow depth” [**Australian Salt Export projects: Project Review**, pp.92 – 93].

In turn SEA recommended further project evaluation activities as follows:

acquisition of onshore acreage and negotiation with the Traditional Owners;
compilation of all geophysical and regional drill hole data; and
modelling of available seismic to better define drill targets.

To date we have been unable to determine whether any of this recommended work was undertaken.

In 1994, the Australian Geological Survey Organisation undertook an airborne geophysical survey of 67,250 line kilometres over the western two thirds of the Port Keats 1:250,000 geological map sheet and the entire Medusa banks 1:250,000 map sheet area. The survey was flown along east-west flight lines spaced 500 metres apart, at a nominal terrain clearance of 100 metres.

A preliminary report arising from this work was published the following year [Gunn, P.J., Brodie, R.C., and Mackey, T., 1995] and a more comprehensive report became available five years later [**The Joseph Bonaparte Gulf. W.A./N.T., Medusa Banks and Port Keats, Airborne Geophysical Survey, 1994, Operations Report, Australian Geological Survey, Record 1999/09**, R.C. Brodie].

Information available from this survey includes total magnetic intensity, gamma ray spectrometric and digital elevation model data at both 1:250,000 and 1:100,000 scales which has been processed in both digital and map form, as well as colour and greyscale pixel image maps.

In the context of the present Hyland Bay Salt Project, the significance of the 1994 AGSO survey is that it generated additional data not then available to SEA. When this data is reviewed it should enable the validation of location aspects of the SEA interpreted diapiric structure and, secondly, assist the definition of drilling targets to test the interpreted structure and determine its content.

5. WORK UNDERTAKEN 2001 – 2002

5.1 Literature Review

During 2001 – 2002 Rare Earths & Minerals Pty Ltd and Pilbara Chemical Corporation NL carried out a literature review of technical information and located past reports relevant to the EL10102 Hyland Bay salt project area including the following:

Australian Aquitaine Petroleum Pty Ltd, **Final Report, Bonaparte Gulf, Northern Coast of Australia O.P. 2 and O.P.83, Hyland Marine Seismic Survey, 1967**].

Brodie, R.C., **The Joseph Bonaparte Gulf, W.A./N.T., Medusa Banks and Port Keats, Airborne Geophysical Survey, 1994, Operations Report, Record 1999/09**.

Edgerley, D.W. and Crist, R.P., 'Salt and Diapiric Anomalies in the Southeast Bonaparte Gulf Basin', **The APEA Journal**, 1974.

McLennan Magasanik Associates Pty Ltd, **Chloralkali Study**, February 1993.

Morgan, C.M., **Port Keats, Northern Territory 1:250,000 Geological Map and Explanatory Notes**, Bureau of Mineral Resources, Geology and Geophysics, Australian Government publishing Service, Canberra 1972.

Salt Exporters (Aust) Pty Ltd, **Australian Salt Export Projects: Project Review**, no date [199?].

Wells, A.T., **Evaporites in Australia**, Bureau of Mineral Resources, Bulletin 198, AGPS, Canberra, 1980.

Additional data identified but not yet located or reviewed includes the following:

Australian Aquitaine Petroleum, 'Hyland Seismic Survey OP2-OP84, N.T. Interpretation Report', Bureau of mineral Resources, Australia, Petroleum Search Subsidy Acts File 67/11181 [unpublished].

Gunn, P.J., Brodie, R.C., and Mackey, T., **Interpretation of aeromagnetic data over the Southern Joseph Bonaparte Gulf in the context of petroleum prospectivity, Australian Geological Survey Organisation, Record 1995/40**.

5.2 Preliminary geological Assessment

From outcrop and drill hole data from the region SEA and its advisers concluded that their then tenement covered Bonaparte Basin sediments of Carboniferous to Permian age.

Secondly, SEA noted that [unnamed] regional gravity undertaken by the Bureau of Mineral Resources showed that the tenement “lies over a conspicuous and regionally extensive north trending gravity low”.

Thirdly, SEA noted that the then tenement was located about 25 kilometres west of the Moyle Fault, which effectively defined the eastern margin of the Joseph Bonaparte Basin. SEA considered that the Moyle Fault “may be an important feature localising the intrusion of salt diapers...Such a relationship is evident elsewhere [unspecified] in the offshore Bonaparte Basin”.

An alternative interpretation suggested to us is that the principal significance of the Hyland Bay Seismic Survey was to demonstrate that the sedimentary basin was in deeper water and not close to shore [Technical Outsourcing, personal communication, October 2002].

However we have also noted the interpretation of Morgan who considered that detailed gravity work by Aquitaine located “the centre of the Bonaparte Gulf Basin *near Port Keats Mission*” [emphasis added]. Morgan also noted that aeromagnetic, seismic and gravity data “show a major discontinuity at the position of the Moyle River Fault indicating a downthrow to the west of at least 3,000m” [Morgan 1975, pp. 14 - 15].

Diapiric structures containing salt [or shale] would, in fact, tend to be located in the deeper parts of the basin. In the offshore Joseph Bonaparte Gulf one well, Kinmore 1, intersected a substantial section of salt at a depth of approximately 3,000 metres and was interpreted by SEA as a salt diaper.

Two previous onshore wells, Kulshill 1 and Kulshill 2, located about fifteen kilometres south west of the then tenement were drilled in 1966. Although drilled in the vicinity of a very large interpreted salt diaper, neither well intersected salt.

Further work is required in order to resolve these differing interpretations, to validate the location of the interpreted diapiric structure and to determine drill hole locations if the commercial outlook is encouraging.

5.3 Other Project Development Activities

In addition to the above literature review and preliminary geological assessment, the proponents have undertaken initial evaluation and discussions of a wide variety of issues affecting the project including: gas availability and pricing in the event that the development scenario included a basic chemical project and, secondly, to provide energy to a stand-alone salt mine and associated infrastructure; mine development options; infrastructure requirements; market, transport and other matters; and potential joint venture participation by others.

6. CONCLUSIONS AND RECOMMENDATIONS

Previous preliminary work by others suggests that a substantial diapiric salt structure of some ten kilometres in diameter and about 350 metres from surface may be present within EL 10102.

However, this interpretation may be questioned on the basis that diapiric structures containing salt, as distinct from shale, are likely to be in deeper waters of the offshore sedimentary basin, rather than on the margin of the Joseph Bonaparte Basin west of the Moyle Fault line.

Nevertheless, further work is recommended to better determine the range of project evaluation and development risks involved, including comparisons with other potential salt project locations elsewhere in Australia. The outcome of this further risk analysis will enable a more informed decision about whether further geological evaluation and ultimately drill testing of the inferred structure is warranted.