ROEBUCK RESOURCES N.L.
E.L. 5335
CURTIN SPRINGS
NORTHERN TERRITORY

FINAL REPORT
10TH JULY 1987 TO
13TH NOVEMBER, 1987

Prepared by

S.B. Warne
for
Roebuck Resources N.L.

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1. **INTRODUCTION**

The exploration licence was secured to cover portion of a chain of alkali playa lakes between Eldunda and Curtin Springs.

Interest in the area was aroused following a report of glauberite being identified from a lake adjacent to the Ayres Rock highway near Spring Lake.

Commercial sodium sulphate deposits all result from the evaporation of surface waters in closed basins and are often associated with near surface mirabilite (Glauber Salt) beds and surface deposits of gypsum and halite. If sodium sulphate minerals could be identified in the area it was considered search for economic saturated brines was warranted.
2. **CONCLUSIONS**

1. No sodium sulphate crystals were identified in the bed of the salt lake east of Spring Lake.

2. Analyses of lake brines indicated contents of potassium salts comparable to brines in other commercial and potentially commercial deposits.

3. The lake chain between Spring lake and Erldunda, from the limited data presently available, appears to carry brines enriched in Na, K, B. The source for these elements may be:
   a) salt deposits beneath present lake surfaces formed by evaporation in the restricted eastern end of the Amadeus depression during a more arid climate period, possibly aided by a west to east prevailing wind direction or west to east lake floor slope.
   
   b) saline spring (e.g. Spring Well) waters which derive salts from ancient subsurface deposits.
   
   c) subsurface migration of concentrated brines from the larger Lake Amadeus system in the northwest. A subsurface flow could be achieved, through sandy horizons of lake deposits, instigated by a high evaporation rate in the more restricted depression of the Erldunda section.
   
   d) a combination of a), b) and c).

4. More data is required on a regional scale to select a best area to assess the potential of brines in the Erldunda lake chain area.
3. GEOLOGY

The area covers salt lakes continuing from lake Amadeus in the northwest and trending easterly toward Erldunda. These lakes are edged by wind blown gypsum deposits and separated by sand dunes. The sand cover appears to relate to a recent period of aridity which allowed dunes to encroach into a continuous saline depression to produce the present series of disconnected lakes.

Tertiary limestone is exposed south of Spring Lake where it occurs as jagged, irregular travertine surfaces in the vicinity of salt lakes.

Spring lake and the salt lake to the east are both fed by saline drainages from the south. Spring Creek drainage derives water from a spring (Spring Well) which flows during overcast weather.

Lakes in the area are dominantly gypsiferous but a small circular lake northwest of Spring Lake and the larger lake to the east exhibit halite crusts. Wells et. al. (1966) reported odd lots of salt were mined near Curtin Springs and sold in Alice Springs. An old camp on the edge of the lake east of Spring Lake may have been related to salt gathering.

Further eastward in the lake chain, near Pulcara Well, Wells et. al. (1966) report a salt crust sample gave the following assay results:

- Insoluble material (quartz sand, clay, limonite) 50.41% (wt)
- Soluble in HCl (anhydrite) 1.46% (wt)
- Soluble in water (sodium sulphate, halite) 48.12% (wt)
- Sodium sulphate (thenardite) comprised 90% of the water soluble component.
In the vicinity of EL 5335 the dominant calcium sulphate character of the Amadeus Lake depression appears to alter to incorporate a sodium sulphate-sodium chloride precipitation in surface salt crusts from saturated brines.

4. **EXPLORATION**

4.1 **Lake Bed Sampling**: (see Plan 2)

Sampling was confined to the lake bed east of Spring Lake. This lake is a typical playa lake, ellipsoidal in shape, located in a depression ringed by recent aeolian red sand dunes. On the western side red sand is actively encroaching on the present lake edge and this sand covers older gypsum dune material derived from Spring Lake. It is likely the playa was formerly a part of Spring Lake. A low relief samphire zone, irregularly developed along the west margin of the playa, represents a thin layer of sand and flour gypsum covering a more westerly extending former lake bed.

A saline drainage channel at present discharges rain water, and possibly subsurface saline flow, into the southern portion of the lake. Older gypsum dunes are well developed in the south and cut by the drainage channel. On the east side of the lake, as well as the northern and northeast sectors gypsum dunes are well developed but are variously covered by recent red sand; the gypsum extends into the lake bed in these areas as seed gypsum (east side) and crystal mushes (north end).

At the time of sampling a thin sheet of 'water' from recent rain covered the SE sector of the lake. Halite was precipitating as tabular masses and coalescing to form a crust, in places to 2 cm thick.
The following notes describe various sites sampled. Holes were hand dug into the lake bed. Water samples were collected in plastic containers which previously held distilled water and were assayed within four days of collection.

**Site 1**

150m from lake edge. Sand cover, then at 25 cm dark blue-grey mud with grey gypsum crystals and entry of brine into hole. Sample mud, brine, salt crust.

**Site 2**

Adj. lake edge in re-entrant section. Fluffy gypsum surface overlying buff coloured seed gypsum. Sample of seed gypsum 20 cm carries clear, thin, tabular crystals/plates (submitted for identification - probably gypsum).

**Site 3**

Halite crust over grey mud (2-3 cm) formed on firm, fine, white, water washed sand. At about 20 cm red-brown clay with abundant coarse gypsum crystals in pocket +10 cm thick. Sample: crystals + clay; brine.

**Site 4**

200m from lake edge. White tabular halite crusts on veneer of green-grey mud then laminated sandy mud to 12 cm. At 12 cm coarse light brown/honey coloured gypsum crystals in reddish sandy mud. Crystals continue to 30 cm. At 33 cm water entered hole with copious, large gas bubbles released. Sample 12-25 cm. Crystals occur in reddish zone above pale laminated sands. The crystals occur in pockets within the zone rather than a distinct layer. Reddish, 1 cm wide, solution conduits extend from crystal pockets to surface - these may relate to polygonal contraction cracks on the lake surface when dry. Water sample.
Site 5
1 cm salt crust (+ possible deliquescent mineral) on veneer of grey-green mud.
0-12 pale pinkish sand.
At 13 cm distinct thin lenses of coarse reddish gypsum crystals 5 cm thick.
At 45 cm in wet greenish mud, a second layer of white, clear gypsum crystals.

Site 6
Hard surface of lake. 5 cm crust red clay loam then grey and red loam with gypsum pockets and at 15-22 cm large pocket crystals.
22-25 cm : laminated white sand
25-40 cm : red clay merging into firm, green montmorillonite clay.

Site 7
Wet surface. 5 cm layer or less of clay loam then 10 cm mush of gypsum crystals over laminated white sands (lamination marked by very thin dark layers - a seasonal effect?).

Site 8
Surface damp, soft. 5 cm surface layer of windblown red sand loam overlying 25 cm mush of large gypsum crystals resting on red clay (?old lake surface).
Water sample.

Site 9
5 cm dark sandy loam on surface then mush of crystals (in clay) to 40 cm overlying red clay.

Site 10
Grey gypsum crystals beneath 6 cm sandy silt. This zone 12 cm thick and overlies mush of white gypsum crystals resting on red clay 35-40 cm.

Site 11
6 cm dark, sandy loam/clay.
6-15 cm : grey gypsum crystals
15-40 cm : pink gypsum crystals above and then in red clay/loam.
Site 12 650m from lake edge.
Complete mush of crystals to 40 cm (hole collapsed). From lake edge decrease in sand/loam and increase in volume of crystals as effect of wind blown material lessens and 'wetness' of lake increases.

Water samples from sites 5 and 8 were submitted for potassium and boron determinations and crystal samples from all sites identified by microscopy with an X-ray diffraction check of material from site 2.

4.2 Sampling Results

Crystal Samples: All samples carried gypsum mostly occurring in simple flattened forms and 'swallow-tail' twins. Sample 2 was confirmed as seed gypsum by XRD.

A careful search through all samples failed to indicate any sodium or potassium sulphate minerals.

Water Samples: The following results were received from Comlabs Services Pty. Ltd. for the two water samples (expressed in milligrams per litre)

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<th>Sample No.</th>
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<th>Boron (B)</th>
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<tr>
<td>5</td>
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<tr>
<td>8</td>
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5. EXPENDITURE

EXPLORATION EXPENDITURE
EXPLORATION LICENCE 5335
CURTIN SPRINGS
JULY TO NOVEMBER, 1987

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<td><strong>TOTAL:</strong></td>
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6. REFERENCES


EL 5335
28 BLOCKS
90 sq km

Location EL 5335 and
LOCATION OF AREA COVERED BY
PLAN 3

PLAN 1

Scale 1:250000