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The Administrator.
N.T. J2-8.

RIO TINTO AUSTRALIAN EXPLORATION PTY. LIMITED

MELBOURNE, AUSTRALIA

PROJECT:— PRP/6/101

REPORT No.:— 8/1956

PRELIMINARY INVESTIGATION

BAUXITE - NORTHERN AUSTRALIA.

OPEN FILE

by

R. A. SEARL

Company rep -

DATE:— 18th Dec., 1956

PROJECT PRP/6/101

PRELIMINARY INVESTIGATION - BAUXITE - NORTHERN AUSTRALIA

By R. A. SEARL

CONTENTS

A. PURPOSE OF SURVEY

The period between 23rd November 1956 and 9th December 1956 was spent making preliminary investigations into the possibilities of locating new deposits of bauxite in the Arnhem Land, Gulf of Carpentaria and Cape York Peninsula areas of Northern Australia. Other than basic research the field investigation was confined to reconnaissance flying of likely areas of interest.

B. KNOWN BAUXITE OCCURRENCES

Bauxite deposits already known occur on the Wessel Islands, in the Cape Arnhem area, and along the northern portion of the east and west coasts of Cape York Peninsula.

Attention was drawn to the possibilities of bauxite in Northern Australia in 1949 when H. B. Owen of the Bureau of Mineral Resources sampled deposits at Mounts Roe and Bedwell on the Coburg Peninsula. H.Y.L. Brown (1908) made the first reference to pisolitic laterites in this area. By the end of 1949, at the request of the Bureau of Mineral Resources, the Northern Territory Coastal Patrol Service had collected specimens of bauxite from Truant and Wessel Islands; these specimens assayed up to 40% available alumina.

Further examination in 1951 by the Bureau of Mineral Resources of the Wessel Islands group decided the Aluminium Commission to proceed with the proving of these deposits. This work commenced in May 1952 and the results have been published in Bureau of Mineral Resources Bulletin No. 24 (Bauxite in Australia" by H. B,Owen 1954. Summarised below is the tonnage proved by this programme.

MARCHINBAR ISLAND - WESSEL ISLAND GROUP - NORTHERN TERRITORY

Deposit	Long Tons	Average Available Al_2O_3
Baker	215,000	47.8
Sphinx Head	1,233,000	43.5
Able	4,627,000	47.1
Dog	1,317,000	47.2
Easy	828,000	45.2
Red Cliff	763,000	43.9
Fox	800,000	42.8
TOTAL:	9,783,000	

The Australian Aluminium Commission have protection over this area (plate 1). Subsequent to the Wessel Islands programme further investigations have been made by New Guinea Resources Prospecting Coy. Ltd. (presumably for British Aluminium Commission) of the Cape Arnhem area in the vicinity of Gove airstrip and Yirrkala mission; this company at present have protection over this area (Plate 1).

In the Cape York Peninsula area, Australian Mining and

Smelting (Zinc Corporation) and Aluminium Laboratories Ltd. (Canadian? interests) hold extensive authorities to prospect for bauxite (Plate 1). Australian Mining and Smelting are carrying out an exploration programme within their areas at the present time: recent Press reports have suggested that large tonnages of bauxite ("many hundreds of million tons") occur within the areas held by A.M.S. A new company, Commonwealth Aluminium Corporation Pty. Ltd. has been formed to develop this area; the British Aluminium Company are associated with A.M.S. in this venture.

C. GEOLOGY OF AREAS UNDER INVESTIGATION.

Knowledge of the detailed geology of the coastal zones under investigation is limited. In Arnhem Land younger (Cretaceous) sandstones and associated sediments and older (Proterozoic) altered sediments and granite crop out along the coastal areas.

In the Cape York area Cretaceous sandstones and associated sediments, together with some Tertiary rocks and older granite crop out in the main areas of interest.

The mature laterites to which the known bauxite deposits in Northern Australia are related, are considered to have formed in the Tertiary period. Within the area investigated laterites have formed over the younger Cretaceous sediments and over older Proterozoic rocks. Some of the lateritic zones inland from Cape Arnhem appear to lie on granite. It is not known whether any particular rock units have been more favourable for the formation of large high grade bauxite deposits. In the Cape York Peninsula the bauxite appears to have formed on Cretaceous sediments while the Marchinbar Island (Wessel Group) deposits lie on quartzites of upper Proterozoic age; the parent rock type at Marchinbar was possibly a quartz-silstone type of Proterozoic age.

D. NATIVE RESERVES AND PERMITS OF ENTRY.

The Arnhem Land deposits and areas of interest all occur in the area of the Arnhem Land Native Reserve. Under the Northern Territory Mining Ordinance, there is no provision for obtaining exclusive rights for prospecting within native reserves; Authorities to Prospect are not available. Permits of entry of two types are available to enter the reserve.

The first type, which was obtained for the purpose of the airborne survey, is reasonably quickly available to bona fide persons by applying to the Department of Native Affairs. This permit is issued for short term visits to Native Reserves but excludes any rights to carry out mining and prospecting activities. As with the second type of permit, separate applications have to be lodged for each person and have to be supported by medical clearances.

The second type of permit of entry is for mining and prospecting activities; it is issued at the discretion of the Administrator of the Northern Territory and takes some time to be granted.

Theoretically, this permit of entry gives no exclusive rights for prospecting. In practice, it may be possible to obtain some form of protection if a strong enough case, outlining proposed programmes etc., can be presented through the Director of Mines to influence the Administrator to exclude other permits of entry while investigations are proceeding. The bauxite deposits of Wessel Island and Cape Arnhem are protected for the Aluminium Commission and New Guinea Resources Prospecting Company in this manner.

Under the Mining Ordinance, mineral leases should be pegged following ground investigation. At present the maximum area of any one lease is 40 acres. Mines Department officials have privately stated that, in view of the possibility of bauxite mining, this may be altered or special leases of larger size may eventually be granted.

In the Cape York Peninsula, native reserves are located along the west coast of the peninsula. There are less restrictions to prospecting activities and Australian Mining and Smelting and Aluminium Laboratories both hold Authorities to Prospect within native reserves.

In the Arnhem Land area, there appears to be a passive resistance generally by mission authorities to the entry of mining groups into the native reserve; this is not as obvious in the Cape York area where A.M.S. have made suitable arrangements to recruit native labour from the mission stations. It is of interest that this labour costs about £14 per man per week; the natives are largely used for pit sinking and hand auger drilling. Two natives average approximately 30 feet per day on a hand auger, i.e. operating cost is about 3/- per foot for this type of work.

A general impression gained from talks with Government officials is that, if mining takes place inArnhem Land Native Reserve, some form of royalty payment may have to be made.

E. RECONNAISSANCE FLYING OPERATIONS.

In the Northern Territory 20.55 hours flying was done using a Muir Aviation Dragon aircraft piloted by Mr. Osgood; hire rates were £17.0.0 per hour. In Queensland 25.45 hours were completed using a Bush Pilots Airways Auster, piloted by Mr. N. Harris; hire rates for this aeroplane were £10 per hour.

Flying was carried out at 50 to 150 feet above the ground. Flying conditions were fair in the Northern Territory but turbulence and thunderstorms made flying in Queensland more hazardous in parts.

The method used in flying was, as far as possible, to sight known deposits from the air and search for similar occurrences elsewhere and, at the same time, noting all lateritic occurrences. Economic bauxite is largely confined to the pisolitic zones of the profile and these are generally high in iron content and have a distinctive red colour. If less distinctly coloured bauxite occurs anywhere in the areas covered it could have been overlooked.

It was found that it is extremely difficult to recognise likely areas of laterite, which could have associated bauxite, when flying over flat undissected terrain and, although a considerable amount of this type of survey was done to avoid "dead" flying when returning to various bases, the major portion of flying was done along the coast line and, as far as possible, along dissected streams. In these zones, exposures in cliff, faces etc. allowed for a better visual estimate from the air.

This type of work is obviously not exhaustive but, in view of the large tract of coastline covered so quickly, it has proved to be the best type of preliminary reconnaissance. The areas chosen by this method are considered, by comparison to known bauxite deposits, to be the best in which to carry out 'follow-up' ground investigations.

F. AREAS SELECTED AND PERMITS OF ENTRY LODGED.

Plate No. 1 shows lateritic areas observed from the air. Of these, four areas have been selected as being the best for initial ground investigations. Applications for permits of entry into these zones have been lodged with the Director of Mines, Northern Territory. Advice on the decision of the Administrator of Northern Territory is now awaited. The total area for which permits have been requested is about 250 square miles.

(i) Area No. 1 :- This area is described as an area of approximately 40 square miles in the Arnhem Bay area, including Mallison Island and that portion of the mainland commencing at Cape Newbald, thence north-east along the coast for a distance of nine miles in a direct line, thence south-east for a distance of approximately eight miles to the north-eastern corner of Arnhem Bay, east of Rhodes Point, thence west along the coast to the point of commencement (Plates 1 & 2.)

Laterite zones are exposed in cliff faces north of Cape Newbald and, in the Rhodes Point area, an exposed cliff section is about 1000 yards long. The laterite appears to contain a pisolitic or ferruginous zone, a mottled or tubular zone with underlying clayey and decomposed rock zones; the total thickness is about 20 feet. By comparison to known bauxite exposures, there is a chance of bauxite occurring in this area.

(ii) Area No. 2 :- Described as an area of approximately 30 square miles in the Arnhem Bay area, including Everett and Hardy Islands, thence commencing on the mainland opposite Everett Island, south along the west coast of Arnhem Bay for five miles, thence west approximately six miles to rejoin the extension of the Arnhem Bay coast south-west of Everett Island, thence north-east along the coast to the point of commencement (Plates 1 & 2.)

In this area, a similar cliff exposure to that near Cape Newbald occurs. It appears that this zone may be a continuation across Arnhem Bay of the zone exposed near Cape Newbald.

(iii) Area No. 3 :- Described as an area of approximately 24 square miles, commencing at the mouth of the Cato River in Arnhem Bay thence three miles at a bearing of 120 degrees, thence approximately three miles to the east coast of Arnhem Bay, thence north along the coast to the point of commencement (Plates 1 & 2).

The exposed lateritic zone on the coast in this area is smaller in length than Areas No. 1 & No. 2, but appears to be of similar type.

(iv) Area No. 4 :- Described as an area of 150 square miles commencing at Coombe Point, four miles south of Volancia Island, in Mount Norris Bay, thence north-north-east along the coast of Mount Norris Bay to De Courcey Head, thence south-east along the coast to Laterite Point, which is approximately ten miles south of Brogden Point, thence approximately 28 miles north-west to the point of commencement (Plates 1 & 2.)

This larger area is a more doubtful one; it was very difficult to discern whether the exposed weathered cliff faces, up to 40 feet high, represent a laterite profile or weathered rock surfaces. A top ferruginous zone is not obvious but some erosion back from the cliffs is apparent and a pisolitic zone could lie under the vegetated surface. This area drains back from the coast into swampy ground.

A small section of bauxite, contained with an Authority to Prospect held by Australian Mining and Smelting, was observed south of Weepa Mission Station and by visual comparison Areas No. 1, No. 2 and No. 3 appear promising. Bauxite on Cape York and the Wessel Islands reaches thicknesses of up to nine feet with very little, if any, overburden. Similar occurrences could be present in Areas No. 1, No. 2 and No. 3.

It is very difficult from aerial observation to make any estimation of possible tonnages which may be available in Areas No. 1, No. 2 and No. 3. A better appreciation will be gained following initial ground investigations. Guessing, if the pisolitic or ferruginous zones contain bauxite, then it seems that a figure of the order of 10,000,000 tons might be available. Reserves of this order would not be significantly high. Therefore, if initial ground work suggests the possibility of a tonnage of this order, then further extension of ground search in North Australia should proceed as soon as possible.

From inspection of Plate 1. it can be seen that known areas of bauxite and other areas of interest all lie north of the 13° parallel. Although somewhat speculative, this tends to suggest that conditions favorable for the formation of bauxite deposits may have existed only north of this parallel. As the Cape York area is already held by other companies, it is considered that further search should be confined to the Arnhem Land zone and should commence initially in areas of interest described below.

G. OTHER AREAS OF PROBABLE INTEREST.

The area shown on Plate 1, in the Cape Arnhem district, as an area of interest may contain bauxite deposits. Lateritic surfaces were noted in this area but with the exception of a small exposed cliff section in Caledon Bay, no profiles were seen. Some of this laterite appears to lie over granite. Part of this area has been briefly described in H, B. Owen's report "Bauxite in Australia", but apparently the zone has not been thoroughly investigated.

Other areas which should be examined if Areas Nos. 1 to 4 prove promising are the Howard Island, Elcho Island areas. The Mines Department, Northern Territory, was unable to give any assurances for permits in this area, as it may be reserved for the Australian Aluminium Commission (Plate 1.)

Goulburn Islands and Croker Island area would also warrant some further investigation. The remainder of the lateritic occurrences shown on Plate 1 are considered to be of lesser interest and appear to be mainly thin ferruginous beds (probably detrital laterites) lying directly on the underlying rocks.

H. NEGATIVE AREAS.

The flying done in the Northern Territory near the Northern Territory- Queensland border was negative in results; the area between Rose River and Robinson River was not flown due to it being out of range of available fuel supplies for the aeroplanes used.

The flying programme in Queensland was also negative. Outside the areas held by Australian Mining and Smelting and Aluminium Laboratories Ltd. no promising zones were observed. It is possible that some bauxite may occur in the "back" country between the Authorities to Prospect held by the above two companies, but recent activity by A.M.S. using winged and helicopter aircraft suggests that these zones would have been searched.

I. FUTURE WORK

(i) Notes on Testing of Bauxite Occurrences.

When investigating bauxitic occurrences the following points, amongst others, should serve as a guide to activities. Most of this information has been extracted from a personal file of R. S. Matheson on "Bauxite Laterites of Western Australia" and "Bauxite in Australia" by H. B. Owen.

(a) Watch for the possibility of better bauxite occurring over or formed from one particular rock type.

(b) Descriptions should be made of laterite profiles; clays are expected under good bauxitic material.

(c) The character of hand specimens in any one area will serve as a guide. For example, in the Darling Range area of Western Australia specimens yielding the highest percentage of acid soluble alumina are generally made up of "nodules about the size of peas scattered through a light yellow matrix. The amount of the matrix should be at least equal to that of the nodules. The freer the matrix is from quartz grains, and from pores, the better. Laterite that is much iron-stained, that is, the matrix of which is coloured by reddish-brown limonite rather than yellow xanthosiderite is usually of poor grade." (G.S.W.A. Annual Rept. 1918 'The Bauxites of the Darling Range - South West Division.)

(d) In descriptions of bauxite it is necessary to give the size of pisolities, nature of the matrix, colour of the matrix, presence or absence of visible free silica, any other minerals present, position and thickness of the best layer, thickness of the bed as a whole.

(e) Describe drainage and other features which may have a bearing on the subject.

(f) Zones of good bauxite may occur above, or below, or in between layers of poorer material.

(g) 'Ignition loss' can be used as a rough field test but this will vary with different areas, i.e. a laboratory control over each area is necessary to make any sort of confident estimate by this method. It would therefore be of limited value in initial ground investigations.

The basis of this test is that the amount of hygroscopic water may be expected to rise with the soluble alumina content, since 'Gibbsite', the soluble aluminium hydrate, which probably forms the bulk of the 'bauxite' contains much more water than any other constituent of the laterite. "A study of the analyses of laterite from the Darling Ranges, made by Geological Survey of Western Australia indicates that if an air dried Darling Range laterite shows, on ignition, a loss of 25% or more, it will yield in the neighborhood of 40% acid soluble alumina, while if its ignition loss be less than 20% its value as an aluminium ore is in grave doubt. If the ignition loss is between 20 and 25% its soluble alumina will usually be over 35% and never much less." (G.S.W.A. Annual Report 1918 - The Bauxites of the Darling Range - South-West Division by E. de C. Clarke).

(h) From the same report as above it is stated that iron oxide content can be as much as 18% but if this is the case silica content must be practically negligible. As iron oxide content decreases, silica content can increase. Total silica content, even if all quartz, must not exceed 15%.

(i) Sampling Procedures - Testing and sampling is carried out using a grid system of bore holes and pits. Sections for sampling should not exceed 5 feet and preferably be less and governed to some extent by changes in the apparent character of the bauxite. Normal sampling methods are by vertical channel sampling in pits and exposed faces and by collection of borings obtained from auger or percussion drilling. Samples from exposed cliff sections may be higher in bauxite values than those from pits and bore holes.

Proving grids should be laid out on a grid of 200 ft. squares with bore holes at each corner; at the corners of each 600 ft. square sample pits replace bore holes.

Averaging of total alumina, total iron, total water, combined alumina and free silica is necessary to get average values for a deposit.

For estimates of quantity, tests on samples will have to be made. Figures vary from 1 ton to 1.6 tons of dry ore per cubic yard. The Marchinbar deposits are of the order of 1.6 tons per cubic yard.

(j) Depth of Test Holes - From information available at present, it appears that good grade bauxite in Northern Australia is confined largely to the pisolitic zones which are up to nine feet in thickness with very little overburden. Therefore, it can be assumed that test pits and bores might average 10 feet in depth.

(ii) <u>Initial Ground Surveys</u>.

Summarising the results of the preliminary reconnaissance work, there are -

(a) Four areas in Arnhem Land of particular interest for which permits of entry have been requested. At present the decision of the Administrator regarding these permits, is awaited.

(b) Other areas of possible interest which would warrant attention following favorable results. of initial ground surveys in Areas No.1 to No. 4.

The aim of the first stage of ground investigations would be to -

(a) geologically investigate and determine the surface extent of possible bauxitic occurrences.

(b) examine and sample exposed cliff sections.

(c) bore and sample on a broad reconnaissance grid (probably $\frac{1}{4}$ - $\frac{1}{2}$ mile spacings) the probable bauxitic areas.

It will be necessary to arrange for assay of samples taken. It would seem impracticable to set up laboratory facilities in the field, at least in the first instance. Aerial photographs covering Areas No. 1, 2, 3 and 4 would facilitate investigations and listed below are the photographs required.

Areas No. 1, 2 & 3.

Arnhem Bay 4 Mile Series D 53-3

Run 1 - 5053 to 5059
2 - 5028 to 5037
3 - 5049 to 5061
4 - 5109 to 5113, 5120 to 5124
5 - 5146 to 5149, 5156 to 5159
6 - 5023 to 5029, 5032 to 5036
7 - 5061 to 5076.

Area No. 4

Coburg Peninsula 4 Mile Series - C 53-13

Run 6 - 5060 to 5065
7 - 5075 to 5081
8 - 5175 to 5182
9 - 5130 to 5137
10 - 5103 to 5111

Initial ground work will require the use of sea craft and/or aircraft; there is little change of getting to the areas by vehicle and it would be impracticable to land vehicles from the sea at this stage as tidal creeks etc. would severely limit their use.

Boat hire could be arranged at Darwin. A 35 ft. boat in Darwin is hired at the rate of £30 per day (approx.) A Hiller helicopter, operated by Trans Australia Airlines, is at present in Darwin for a period of six months, and it may be possible to obtain limited hire of this aircraft; hire rates would probably be of the order of £40-£50 per hour. Dragon aircraft are available for hire at a rate of £17 per hour. The nearest airstrips are about 50 miles direct from the areas of interest and therefore the use of winged aircraft would be limited to supply dropping or to carrying equipment etc. to nearby airstrips for ferrying by helicopter. The range of the helicopter (4 hrs. @ 70 m.p.h. with extra tanks) is sufficient to allow it to be flown to and from Darwin.

It is considered that initial ground investigations will take at least six weeks (ex Darwin, return Darwin) using a party of one geologist and two field assistants; this assumes partial use of a helicopter. Camp equipment and sampling equipment should be kept to a minimum to preserve mobility as most of the areas will be covered on foot. A transceiver radio will be essential for this work.

It is recommended that in order to avoid excessive hire charges for boats and aircraft that, if possible, the investigation be programmed along the following lines. Transport personnel, equipment, fuel and stores by boat to Area No. 1. Carry, on hire, a smaller craft (say 14 ft. motor powered boat) suitable for negotiating tidal creeks. After quick reconnaissance to establish probable existence of bauxite, fresh water supplies etc. allow transport vessel to return to Darwin. Areas No. 2 and No. 3 could be investigated using the light boat. After period of two to three weeks, engage helicopter aircraft for 3 to 4 days. Complete investigations in Areas Nos. 1 to 3 and have transport vessel return with fuel supplies and shift

personnel to Area No. 4. Carry out investigations in Area No. 4 on similar lines making use of a helicopter for a further short period.

Necessary camp equipment, sampling equipment, should be available from existing stocks from -

(a) loan ex Cloncurry store without interfering with that programme.

(b) sampling hand augers (3") and Jones splitter retained from beach sands investigations, Newcastle area.

(iii) Estimate of Costs - Initial Ground Surveys

1.	Seacraft		
	A. 35 foot Transport Vessel with crew 3 weeks at £30 per day	£630	
	B. 14 foot Powered Launch 6 weeks at £25 per week	150	£ 780
2.	Aircraft		
	A. Hiller Helicopter 25 hrs. at £50 per hour	1250	
	B. Dragon Aircraft, 15 hrs. at £17 per hour	255	£1505
3.	Equipment		
	A. Bulk of Equipment on loan from existing stocks - Use, Depreciation and Freight to and from Darwin	300	
	B. Sundry new equipment	100	
	C. Transceiver Radio	250	£ 650
4.	Salaries, Wages		
	A. 1 Geologist £2500 per annum - 6 wks.	300	
	B. 2 Field Assistants - £1000 per annum - 6 wks.	240	£ 540
5.	General Operating Costs		
	A. Field Allowances 3 men for 6 wks @ £20 per month	90	
	B. General - Office, Drafting, Air Fares, Air Photos	300	
	C. Assaying and Mineralogical Investigations.	1000	£1390
	TOTAL -		£4865
			£5000 (say)

(iv) Second Stage - Detailed Exploration

From the estimates quoted above, it seems that approximately £6,000 (approx. £900 spent to date on aerial reconnaissance and associated costs) may be expended before any decision can be made whether to proceed with detailed proving work. At the end of the initial ground surveys the three possibilities will be -

(a) insufficient bauxite is present in the likely areas chosen, to warrant any further work.

(b) a limited tonnage of bauxite is suggested and further ground search in other areas will be necessary to find additional tonnage to warrant proceeding with proving.

(c) initial ground surveys indicate the possibility of sufficient tonnage (say 40,000,000 tons) to proceed immediately with proving.

In view of these alternatives, only the broadest of possibilities and probabilities for any detailed testing programme could be made at this stage. Estimates of costs etc. would be best left until initial ground work is in progress. At that stage a better appreciation of these remote and unknown areas will be gained.

At present Zinc Corporation are actually engaged in proving deposits in the Cape York area. Very little information is known about this programme and if proving of Areas Nos. 1 to 4 proceeds, then a top level approach to Zinc Corporation to obtain precise up-to-date details of methods etc. would be invaluable as a guide to implementation of an exploration and proving programme.

Until such time as areas for proving are determined, it is not possible to make any reliable estimates of footage for bore holes and test pits. Assuming a purely hypothetical 40,000,000 tons to be proved with an average depth of 6 feet at 1.5 tons to the cubic yard, then required bore holes might be of the order of 4,000 and test pits 1,000, i.e. 40,000 ft. of boring and 1,000 test pits to 10 ft. depth.

Major equipment required for a proving programme of this type would be transport and work boats, barges, vehicles, percussion and/or auger drilling equipment, living and office quarters, maintenance units (garages etc.), sampling sections (huts and equipment), servicing facilities either by sea or air- necessitating anchorages and jetties or airstrips. In order to carry out such a programme efficiently and quickly, a considerable labour force other than technical and administrative personnel would be required.

Robert A. Searl
Geologist

Melbourne,
18.12.56

136°

142°

TORRES STRAIT

Melville I

DUNDAS STRAIT

Coboura Peninsula

Croker I

Goulburn Is

Van Diemen Gulf

Wessel Is

Elcho I

Cape Wilberforce

YIRRKALA MISSION (GOVE)

Cape Arnhem

Oenpelli Mission

DARWIN

Caledon Bay

MAINLY PROTEROZOIC

Blue Mud Bay

Groote Eylandt

Pine Creek

Rose River Mission

Katherine

Roper R

Port Roper

GULF OF CARPENTARIA

Sir Edward Pellew Group

Borroloola

Daly Waters

N. T.

Robinson River

Wellesley Is.

Betinck Is

Newcastle Waters

Nicholson R

Burketown

Normanton

Leichhardt R

Norman R

Croydon

Gilbert

Staaten

Galbraith

Esmeralda

Einasleigh R

Wortham Park

Cairns

Cape York

Slate Pt

ALUMINIUM LABORATORIES LTD

AUST. MINING & SMELTING COY

Cullen Pt

Cape Grenville

Temple Bay

Albatross Bay

Cape Direction

ALUM LABS

Archer Bay

Archer

Cape Keer Weer

Holroyd R

Coleman R

Coen

princess Charlotte Bay

Cape Melville

Mitchell Rv. Mission Stn.

Mitchell R

Cooktown

13°

16°

19°

QUATERNARY Q

TERTIARY T

CRETACEOUS
Klr(Q) - Roma Formation
Klb(Q) - Blythesdale Sandstone
Kl (N.T.) - Mullaman Group

PERMIAN P - Port Keats Group

CAMBRIAN
€m - Daly River Group
€b - Edith Creek Volcanics

UNDIFFERENTIATED PALAEOZOIC Pz

PROTEROZOIC P - Buldiva Quartzite

ARCHAEOZOIC? Au - Brocks Creek Group (Probably P)

UNDIFFERENTIATED ROCKS QLD.

GRANITE

Flight lines

Areas held by other companies

A - Aluminium Commission

B - New Guinea Resources Prospecting Coy.

C - Doubtful area - may be reserved for Australian Aluminium Commission

D - Approximate only. Authority to prospect applied for by Enterprise Exploration

Areas for which permits of entry have been requested

Area of probable interest

Lateritic Occurrences observed

CR 56/6.

RIO AUSTRALIAN EXPLORATION PTY. LTD.

PRELIMINARY INVESTIGATIONS – BAUXITE NORTHERN AUSTRALIA

DATE 16-12-1956 SCALE 60 Miles to 1 inch

Geologist R. A. Searle Geophysicist

Draftsman Authority PRP/6/101

PLATE I

RIO AUSTRALIAN EXPLORATION PTY. LTD.

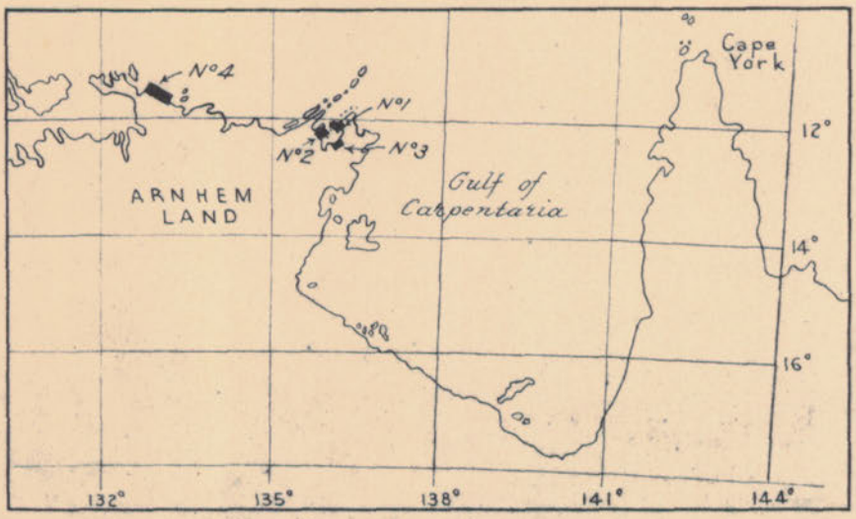
LEASE PLANS AREAS 1-4
ARNHEM LAND AREA N.T. AUST.

DATE 5-12-56 | SCALE

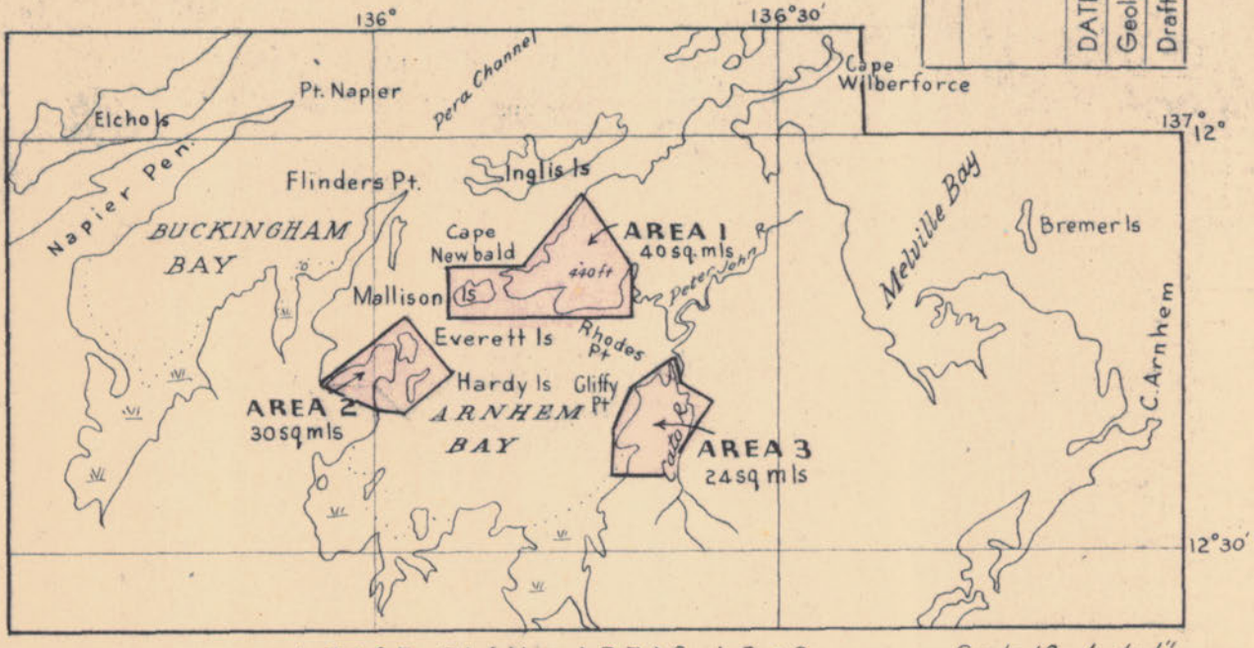
Geologist R.A. SEARL | Geophysicist

Draftsman | Authority

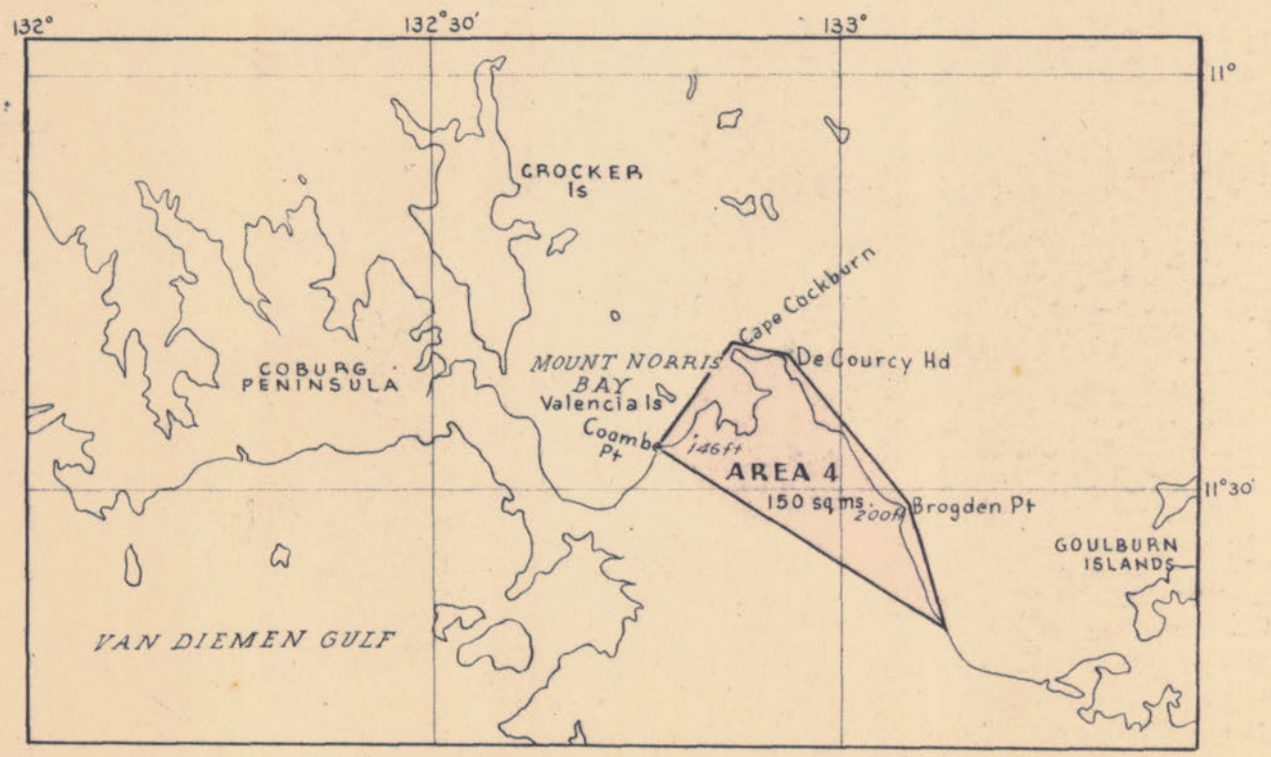
PRP/6/101



LOCALITY PLAN Scale 240 mls. to 1"



LEASE PLAN AREAS 1, 2 & 3 Scale 16 mls. to 1"



LEASE PLAN AREA 4 Scale 16 mls to 1"

PLATE 2

CR56/6.