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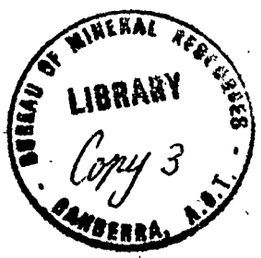

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

RECORDS:

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EXAMINATION OF SUPPOSED BAUXITE BEARING AREAON COBOURG PENINSULA, NORTHERN TERRITORY OF AUSTRALIA.

by

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EXAMINATION OF A SUPPOSED BAUXITE BEARING AREA ON COBOURG PENINSULA, N.T.

1. INTRODUCTION

The presence of laterite described as high-silica bauxite at Mt. Roe on Cobourg Peninsula had been reported early in this century by H.Y.L. Brown (1) Government Geologist of South Australia, who submitted a specimen to analysis with the following results:-

Silica	(SiO_2)	21.0 %
Alumina	(Al_2O_3)	47.3 "
Ferric oxide	(Fe_2O_3)	9.7 "
Ignition Loss		22.3 "

In the absence of information about the mineralogical composition of the rock the chemical analysis alone affords a very incomplete description of the material. It was considered that the rock might be somewhat similar to the commercially valuable high-silica bauxite which occurs in the Netherlands East Indies and Malaya.

Two typical analyses of unwashed bauxite as it occurs at Telok Mas, Malacca are given here to show the general similarity of chemical composition existing between two laterites which subsequently proved to be markedly dissimilar in other respects.

ANALYSIS OF CHANNEL SAMPLES FROM BAUXITE QUARRIES AT TELOK MAS, MALACCA (2)

Silica	(SiO_2)	12.8	10.1
Alumina	(Al_2O_3)	41.5	45.3
Ferric Oxide	(Fe_2O_3)	21.8	17.6
Ignition Loss		21.9	26.5

At the request of the Australian Aluminium Production Commission the writer was instructed to examine the area in the vicinity of Mounts Roe and Bedwell, and to sample and report on any accessible bodies of apparently aluminous laterite.

Cobourg Peninsula is uninhabited (except by the crew of Cape Don Lighthouse) and not connected with Darwin by road, consequently the only approach is by sea. Through the courtesy of His Honour the Administrator the patrol vessel "Kuru" was made available to transport the writer between Darwin and Cobourg Peninsula. The Mt. Roe locality was visited on 22nd - 23rd June and again on 27th and 28th. The interruption being due to the receipt of orders from Darwin for the ship to proceed to Mount Norris Bay.

II LOCALITY & ACCESS

(Refer to Australian Chart 049 and Military Map 0457 4 mile series. See also map accompanying this report)

Mounts Roe and Bedwell form two prominent landmarks on the southern shore of Cobourg Peninsula 120 miles east-north-east from Darwin. The peninsula is almost severed from the mainland, and being uninhabited (with the exception mentioned above) has no roads or connection by road with the mainland. A landing ground for light aircraft is available at Cape Don.

The deeply indented northern coast of the peninsula affords reasonably convenient access by sea, and no point on the peninsula lies more than six miles from the coast. This latter statement does not necessarily imply that good anchorages and suitable landing beaches exist at all points. Much of the shore-line, particularly the southern coast, is fringed with mangrove swamps and coral reefs.

During the visit on 22nd - 23rd June threatening south-easterly weather prevented a direct approach to Mt. Roe from Van Diemen Gulf and a landing was made in Port Essington.

III TOPOGRAPHY

Cobourg Peninsula forms an arm of land, with a maximum width from north to south of 25 miles, stretching 60 miles westerly from the north-western extremity of Arnhem Land, and forming the northern shore of Van Diemen Gulf. As mentioned already the northern coast line of the peninsula is very irregular and deeply embayed.

Mounts Roe (526 feet) and Bedwell (480 feet) form the principal features of topographic relief on the peninsula. The surface is mainly one of low relief with a few rounded hills rising to about 300 feet.

The land surface rises more or less abruptly from sea-level along the shores of Van Diemen Gulf and slopes gently to the north, with the consequent result that the divide between south-flowing and north-flowing streams is approximately parallel to and within 2 to 4 miles of the southern shore.

IV GENERAL GEOLOGY

Only Cretaceous rocks of the Mullaman group, capped with remnants of Tertiary laterite occur in addition to recent sand, estuarine deposits and recemented laterite.

The Cretaceous formation consists of alternating beds of sandstone and shale, the latter arenaceous in part. The shales are exposed only in coastal cliffs (with minor exceptions mentioned below) and the sandstones alone outcrop inland. The greater part of the peninsula is covered with sand, lateritic soil and saline swamps, and consequently exposures of the bed rock are poor and mainly confined to the steeper slopes of the hills.

An idealized vertical section through Mt. Bedwell where exposures are rather better than elsewhere is here given. All thicknesses stated are very approximate.

	Approx height above sea-level
Laterite (ferruginous zone)	488' - 470'
Leached shale (mottled or pallid zone)	470' - 460'
Sandstone-brown	460' - 350'
Shale (strongly silicified)	350' - 300'
Sandstone, ferruginous, black and dark brown	300' - 100'
Arenaceous Shale	100' - 0'
Sandstone ? (exposed at low water)	0' - ?

The Cretaceous beds are apparently horizontal but may possess a slight dip to the north.

The laterite is exposed at the summit of Mts. Roe and Bedwell with a maximum thickness of about 40 ft., at Mt. Kuru (372 ft.), which bears a thin capping of lateritised sandstone, and at the top of the coastal cliff at Victoria (about 50 ft. above sea level).

Only few remnants of the old laterite surface now remain as small areas elevated above the general level. It is noteworthy that the laterite deposits lie on a surface with a gentle fall to the north at about the rate of 50 feet or less per mile.

The deeply embayed northern coast of the peninsula contrasts with the more regular southern short line, and it is reasonable to suggest that there has been a downward warping to the north resulting in the drowned valleys of Port Essington, Port Bremer and Raffles Bay. This suggestion gains some support from the observed northerly dip of the laterite, although it is conceded that laterite could form on a gently sloping or undulating surface.

V THE LATERITE OCCURRENCES

A. MOUNT ROE. Mt. Roe is capped with laterite ranging from about 10 feet to a minimum of 15 feet in thickness. The opening of verticle joints under weathering has caused the laterite to fall away in large prismatic blocks leaving vertical cliffs surrounding the plane and nearly level top of the mount. At the foot of the cliff, and immediately below, the steep slopes are covered with fallen blocks of laterite and at only two places on the periphery of the laterite body could the underlying parent rock be seen and sampled.

The laterite itself bears a thin capping (2 feet to 4.5 feet thick) of pisolitic material consisting of light red pisolites mostly from 4 to 6 millimetres diameter, embedded in an apparently textureless matrix of similar color. The pisolites, which show a typical concentric structure when broken, form about 75% of the rock.

Massive tubular laterite underlies the pisolitic zone. This also is light red in colour and dull and dirty to the eye. It contains small rounded nodules of little altered shale, and, very rarely grains of milky quartz. Some whitish patches which were observed are probably halloysite. The solution channels which give the rock its tubular character are vertical and range in diameter from about 65 millimetres to 5 millimetres and less.

The tubular laterite passes with little gradation into a mottled zone consisting of pink and white earth containing thin horizontal plates of ferruginous matter and rounded fragments of soft bleached shale. Below this a zone of fine red earth overlies horizontally bedded bleached shale.

Analysis of six samples representing a complete section are given:-

Depth (Ft.) From	To	Description	SiO_2	Al_2O_3	Fe_2O_3	TiO_2	Ignition Loss %
0	2	* Pisolitic laterite	28.7	36.9	13.8	2.7	17.3
2	7	Tubular laterite	34.4	27.7	24.1	1.5	12.0
7	12	do	30.3	25.3	31.1	1.6	11.5
12	17	do	32.0	25.6	28.7	1.85	11.6
17	19	Mottled zone	40.4	30.2	14.7	2.2	12.2
19	20.5	" Red Earth	41.5	27.1	17.7	2.1	11.3
0.5	24	Obscured	-	-	-	-	-
24	?	White Shale	Not sampled				

* Contained 17.3% Available Al_2O_3, i.e. Al_2O_3 present as trihydrate. All other samples contained less that 1% available Al_2O_3.

It is estimated that the laterite deposit forming the summit of Mount Roe measures about 520,000 cubic yards, equivalent to about 750,000 long tons.

B. MT. BEDWELL

Mt. Bedwell lies 2½ miles north-west from Mt. Roe to which it is connected by a ridge of horizontally bedded ferruginous sandstone rising to 200 feet above sea level.

The hill is very similar to Mt. Roe being flat-topped and capped by massive light-red laterite. The pisolitic capping in evidence on Mt. Roe is almost completely missing from Mt. Bedwell having been stripped by erosion to a small remnant 2 feet thick on the southern side of the summit and scattered boulders elsewhere. Detrital laterite masks the base of the laterite and the thickness could not be measured, it was observed however to exceed 15 feet. The description of tubular laterite on Mt. Roe applies equally well to the material capping Mt. Bedwell. Sampling of an exposed section yielded the following results:

Depth (Ft.) From	To	Description	SiO_2 %	Al_2O_3 %	Fe_2O_3 %	TiO_2 %	Ignition Loss %
0	1	Pisolitic laterite (1)	31.6	39.1	9.6	2.5	16.8
1	4	Tubular laterite (2)	39.8	32.7	12.4	1.8	12.8
4	8	do	37.8	31.2	15.9	1.8	13.1
8	10	do	35.2	29.9	20.8	1.6	12.4
10	14.5	do	35.6	28.2	22.4	1.5	11.9
-	- (3)	do	36.5	30.6	18.6	1.5	12.4

(1) contains 12.8% available Al_2O_3 (2) contains 2.4% available Al_2O_3 all other samples contain less that 2% available Al_2O_3. (3) Chip sample from middle of large freshly broken boulder.

The laterite crest on Mount Bedwell is considerably smaller than that on Mount Roe and contains about 90,000 cubic yards or roughly 130,000 tons of laterite.

C. MT KURU

Mt. Kuru lies 4 miles North from Mt. Roe and rises to 372 feet above sea level.

The top of this small mount, which, is flat and slopes gently to the north consists of laterite derived from ferruginous sandstone, or more correctly, consists of partly lateritised sandstone.

One sample was analysed with the following results:-

SiO_2	-	56.2 per cent
Al_2O_3	-	13.6 per cent
Fe_2O_3	-	21.7 per cent
TiO_2	-	0.86 per cent
Ignition Loss		7.3 per cent

D. VICTORIA. Red laterite overlies arenacious shale forming the sea cliff below the site of the old settlement of Victoria. The material in situ was not examined at close quarters, but boulders at the foot of the cliff were observed to be highly siliceous. Immediately inland above the cliff lateritized sandstone is exposed in a gully and had been used for building purposes by the garrison at Victoria.

It is evident that the flat ground which was chosen for the site of the settlement is a remnant of the old laterite surface. It lies at about 60-70 feet above sea level.

E. MINERALOGICAL CHARACTER OF THE LATERITE. Examination of one thin section of tubular laterite from Mount Roe showed the rock to be composed wholly of isotropic minerals except for a single minute grain of quartz. A large part of the section consisted of white translucent mineral probably halloysite, and the remainder of the slide was opaque to brown sub-translucent material ranging from hematite to ironstained clay or halloysite. No gibbsite was recognised but it is possible that a small amount of eliachite is present but is indistinguishable from ironstained halloysite.
The lateritizing process has been sufficiently complete to destroy the texture of the parent rock and to form pisolitic and tubular laterite of perfectly normal megascopic appearance, yet the apparently thorough alteration which the rock has undergone has effected comparatively little removal of silica, which is the sine qua non of the lateritic process. The high silica, but may be ascribed to the siliceous nature of the parent rock and to the sluggish movement of groundwater during lateritization preventing a more complete removal of silica. It is noteworthy from the analysis of the tubular laterite that the ratio of silica to alumina is about that which normally exists in clay minerals. Apparently any pre-existing large excess of silica over the requirements of alumina to form a clay mineral has been removed.

VI CONCLUSION

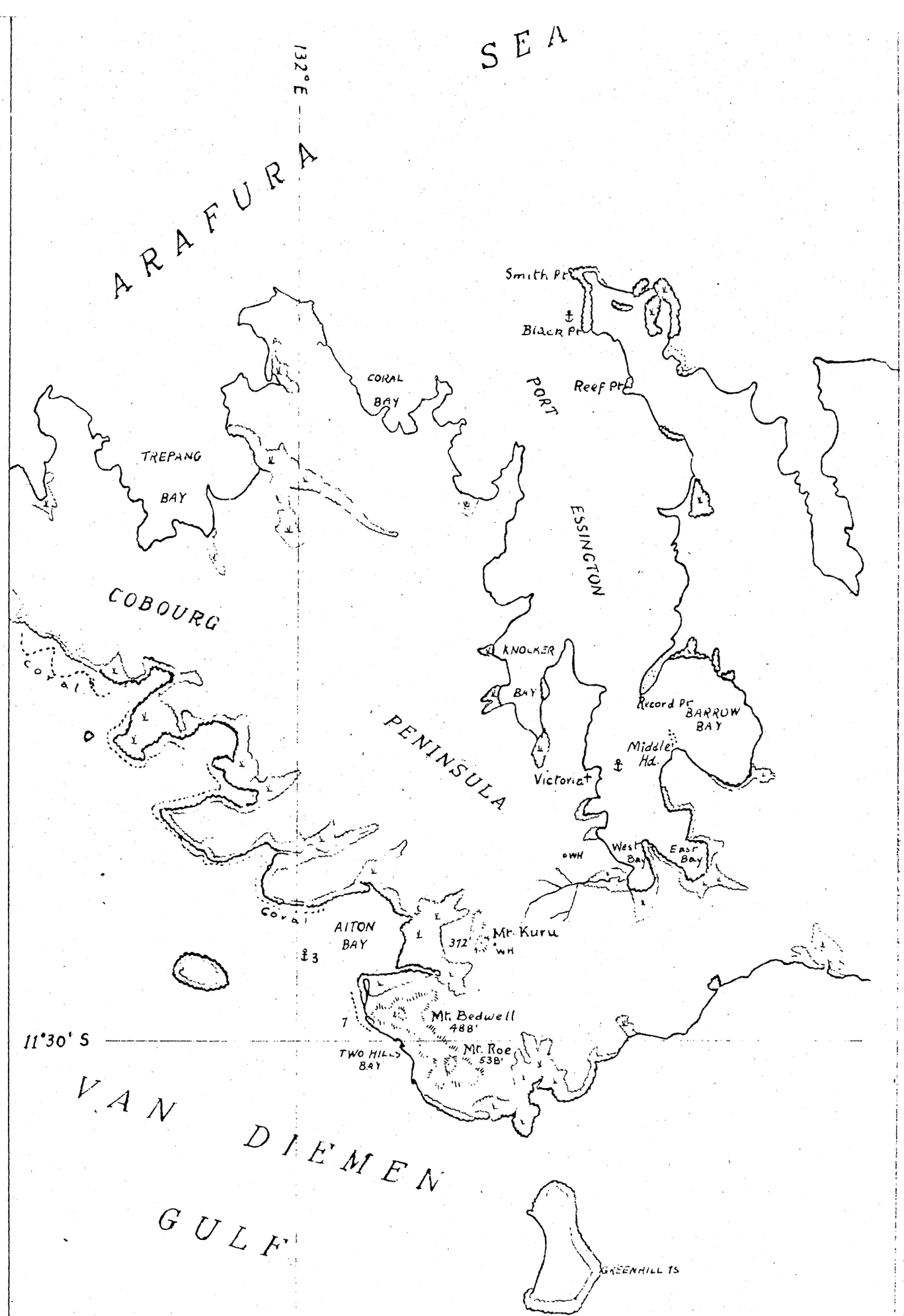
The laterite occurring on Cobourg Peninsula is derived from siliceous rocks, mainly shale, of Lower Cretaceous age. This laterite, and presumably any other which is similarly derived, is of no commercial value as a source of aluminium.

VII REFERENCES AND ACKNOWLEDGEMENT

(1) Brown H.Y.L. Geological Reconnaissance from Van Diemen Gulf to McArthur River Etc. Adelaide 1908.
(2) Owen H.B. Bauxite Deposits near Malacca in the Federation of Malaya, Report No. 55 - Australian Aluminium Production Commission, 1948.

All chemical analyses in this report, except the first and third in Section 1 are by R.A. Dunt, Chief Chemist, Australian Aluminium Production Commission.

H.B. Owen
18th August 1949



MAP OF PART OF COBOURG PENINSULA. N.T.

3 2 1 0 2 4 miles