COMMONWEALTH OF AUSTRALIA.

MINISTRY OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

RECORDS.

1952/70

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BAUXITE AT GOVE, ARNHEM LAND, N.T.

by

H.B. Owen.

CANBERRA.

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BAUXITE AT GOVE, ARNHEM LAND, N.T.

SUMMARY

This report records observations made during two brief visits to the area when reconnaissance was limited to the shores of Melville Harbour and to the immediate vicinity of Gove aerodrome.

Pisolitic bauxite containing upwards of 50 per cent alumina was observed throughout a traverse of 5½ miles easterly from the airstrip. This bauxite, which rests on tubular laterite, may exceed 6 feet in thickness.

The bauxite and associated laterite near Gove are derived from sedimentary beds which overlie coarse garnetiferous granite.

The area is within the Arnhem Land Aboriginal Reserve and is held under lease by the Methodist Mission. Mineral rights are reserved to the Crown, but permission of the Minister for Territories would be necessary before prospecting or mining could be undertaken.

Physical access to the area by sea and air is good.

INTRODUCTION

Towards the end of February, 1952, a specimen of ferruginous pisolitic bauxite was received from Captain F.E. Wells, Darwin, who stated that he had picked it up near the Gove airstrip. Part of this specimen was analysed by R.A. Dunt with the following result:

SiO_2	5.5	per cent.
Al_2O_3	52.6	" "
Fe_2O_3	13.0	" "
TiO_2	3.0	" "
Ign. loss	25.7	" "
	99.8	
SiO_2 as quartz	1.9	" "
Available Al_2O_3	45.3	" "

In reply to further enquiries Captain Wells gave the opinion that the deposit was probably large as he had noted boulders of similar rock for some miles along the road from Gove to Yirkalla Mission.

It was difficult to reconcile this statement with the known presence of siliceous and ferruginous laterite of granitic origin occurring round the shores of Melville Harbour, which was visited by the writer in October, 1951 and further investigation was clearly required. Accordingly a short visit by air was made on 24th August.

Situation and Access

The Gove airstrip (Lat. 12° 17' S; Long. 136° 49' E) in north-eastern Arnhem Land occupies a central position in the area under discussion which is here referred to as Gove Peninsula. The entire area is held under lease by the Methodist Mission authorities (M.L. No. 6) and is known as Yirkalla Mission Lease.

Access by sea is good. The western side of the peninsula is bounded by Melville Harbour with deep and sheltered water. A short jetty, still in a fair state of repair, was built at Drimmie Head by R.A.A.F. during the war and is connected to Gove aerodrome and Yirkalla Mission by metalled, and in part sealed roads. From Gove to the Mission the road is in excellent condition, but the more circuitous road from Drimmie Head to Gove has not been seen by the writer. In any event the flat terrain and unlimited resources of laterite gravel render road construction on the peninsula particularly easy.

The surface is covered with open forest which presents little or no difficulty to movement on foot or by vehicle. The airstrip is in very good condition; it is 6,000 feet long and could take heavy aircraft. Dispersal roads are sealed and provide ready access to approximately 1.9 square miles of laterite- and bauxite-bearing country in the immediate vicinity of the aerodrome.

Distance by road from Drimmie Head jetty to Gove is 19 miles and from Gove to the Mission 7 miles.

Sea and air distances are shown in the following tables -

Distances by sea to Drimmie Head, Melville Harbour from:

Jensen Bay, Marchinbar Island	70	nautical miles
Darwin	430	" "
Thursday Island	560	" "

Air line (direct) distance to Gove from

Darwin	410	statute miles
Thursday Island	400	" "
Cairns	680	" "
Mt. Isa	605	" "

Geology.

The first geological observations made in this region appear to be the notes by Captain Matthew Flinders in 1802-1803, who recorded "pipe-clay" cliffs at the head of Melville Harbour. H.Y.L. Brown (1908) visited the locality in 1907 and refers to coarse garnetiferous granite at Drimmie Head and elsewhere round the shores of the harbour.

Brown missed the significance of the ferruginous laterite which he described by such terms as "cellular clay ironstone" and "ferruginous claystone" and did not attempt any explanation of the almost ubiquitous presence of the laterite mantle.

Near Drimmie Head, and at the head of the harbour, laterite rests directly on granitic rocks from which primary structures may be traced upwards into the laterite thus indicating its granitic origin.

One sample of this laterite developed on medium-grained aplitic rock and taken from an island in Melville Harbour by the writer in October, 1951 was submitted to analysis with the following result:

Insoluble matter	22.8	per cent
Al_2O_3	18.7	" "
Fe_2O_3	44.4	" "
TiO_2	0.5	" "
Ignition loss	11.8	" "
	98.2	" "

Soda-soluble Al_2O_3 14.4 per cent
" " SiO_2 13.9 " "
(Analyst: W.St.C. Manson, Dept. of Mines, Tasmania).

It is well known that economic bauxite cannot be derived from coarse-grained rocks containing abundant quartz, and therefore the presence of bauxite at Gove was accepted as evidence that the granite seen at Drimmie Head might not extend as far eastward as the airstrip or that it might be overlain by a more suitable parent rock. The latter alternative appears to be the case. Granite, as fresh rock, and lateritized, occurs on the eastern shore of the peninsula and presumably this rock underlies the whole area.

At a point about one mile south-west of Yirkalla Mission lateritized sandstone is exposed where a gully reveals a section deep in the laterite profile. The lateritized material here is similar in appearance to the arenaceous beds near the base of the laterite at various points on Marchinbar Island and could not have been derived from an igneous rock. It is apparent therefore that the granite is overlain by sediments which are similar to members of the Wessel Islands sequence.

The granite is intrusive into fine-grained slate of which small pendants or large enclaves occur on the southern shore of Melville Harbour. The relationship between the granite and the overlying lateritized sediments has not been established but it is probable that these beds are younger than the granite.

Laterite, including bauxite, occupies a large proportion of the area (see accompanying sketch map); the occurrence on which Gove airstrip has been constructed has a total area of the order of 25 square miles.

One traverse partly on foot and partly by motor vehicle was made across this area from a point near the edge of the laterite north of the north-western end of the airstrip to Yirkalla Mission. For a distance of 5½ miles the surface consisted of boulders of pisolitic bauxite (A4016) in red soil and outcrops of bauxite in situ. At the western end of the traverse pisolitic bauxite (A4013) 1 to 2 feet thick overlies red tubular laterite (A4014), but at a point ¼ mile south a slit trench now partly collapsed and filled to within 18 inches of the surface with dead leaves and rubbish had been sunk (presumably to a depth of six feet or more) in pisolitic bauxite. A sample (A4015) of this material was taken from the trench. At a point approximately 3 miles west-south-west from Yirkalla near the old R.A.A.F. hospital area, the flat land surface has been dissected by a steep-walled gully which exposes 5 to 6 feet of pisolitic bauxite overlying dark brown tubular laterite. It is reasonable to assume that the thickness of bauxite would be slightly greater at a short distance away from the gully.

DESCRIPTION OF THE BAUXITE

In general the pisolitic bauxite closely resembles that of Marchinbar Island but most specimens seen are rather darker in colour on account of the higher iron content. Some of the ore is only weakly cemented and consequently it breaks down to a mass of loose spherical pisolites on handling. Quartz grains are visible in some specimens.

Chemical composition is shown by the following analyses which are all that have been made to date

No.	(a)	A4016	A4015	A4013	A4014
SiO_2 per cent	5.5	8.9	5.5	10.6	34.9
Al_2O_3 " "	52.6	-	-	-	-
Fe_2O_3 " "	13.0	-	-	-	-
TiO_2 " "	3.0	-	-	-	-
Ign. loss "	25.7	-	-	-	-
	99.8	-	-	-	-
Avail, Al_2O_3	45.3	36.3	42.4	43.6	11.5

(a) Surface boulder near airstrip
A4016 Collection of surface boulders north of airstrip.
A4015 Loose pisolitic bauxite, surface to 1.5 feet, north of airstrip.
A4013 Pisolitic bauxite, base of pisolitic zone, shallow quarry north of airstrip.
A4014 Laterite, floor of same quarry.

MINERAL RIGHTS

As mentioned above the area is held under lease granted by the Administrator to the Methodist Mission but the mineral rights are reserved to the Crown. The area leased remains within the Aboriginal Reserve and the restrictions placed upon entry to such reserves also apply to Mission Leases.

Any attempt to prospect or mine on a Mission Lease will run counter to expressed Ministerial policy.

REFERENCE

Brown, H.Y.L., 1908. Report. Geol. reconnaissance from Van Diemen Gulf to the McArthur River, etc. Adelaide.

CORRIGENDUM: For "Yirkalla" throughout read "Yirrkalla".

Dundas Pt.

Jetty

Drimmie Head

Melville Harbour

Swamp

Swamp

Mt. Saunders

Gulf of Carpentaria

Mt. Dundas

Yirkalla Mission

Shallow Quarry

Gove A/D

Surface ? eroded

Swamp

Latham R.

Approx. Boundary M.L. 6.

Cape Arnhem

Sketch Map of Gove Peninsula showing areas probably occupied by Laterite with or without Bauxite

Approx. Scale 1 mile