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GEOLOGICAL REPORT ON THE JERVIS BAY FIREBRICK CLAY DEPOSIT AND JERVIS BAY AERODROME

by

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AND JERVIS BAY AERODROME.

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I. SUMMARY AND RECOMMENDATIONS.

Firebrick Clay. (See Plan ACT.18a/1). The firebrick clay lies on the south-west side of Jervis Bay Aerodrome, underlying an area of about 18 acres within the aerodrome boundary fence and about 35 acres outside the fence. It is surrounded by and underlain by sandstone and has a generally sandy cover which averages about 4 feet thick. The deposit has steep edges on the north-west and south-east margins and has a thickness of up to 15 feet 4 inches. Near the margin there are a number of discoloured and gritty bands in the clay, particularly near the southern end. These appear to be of local character only.

The total quantity of clay is probably in excess of 1,200,000 tons of which 800,000 tons lie outside the aerodrome boundary, and only about 170,000 tons lie outside the funnel of a proposed 45 degree runway.

Present Leases. The position of Block 29, the lease at present held by Newbold General Refractories Limited, appears to have been calculated from an incorrect plot of the proposed 45 degree runway. It contains only about 18,000 tons of clay to a depth of 10 feet and probably would not exceed 30,000 tons to its full depth, whereas a block of about 9 acres bounded by the runway funnel and the aerodrome fence would contain more than 100,000 tons of clay.

A new lease applied for by Newbold General Refractories Limited has been marked by only two lease pegs, one of which is well within the funnel of the proposed runway.

Proposed Runway. To date, the area available for mining appears to have been limited mainly by the funnel of a proposed 45 degree runway. This project appears to have been abandoned and the R.A.N., who are at present taking over the aerodrome, may be willing to permit an extension of mining operations.

Aerodrome. (See plan ACT.18a/2). The aerodrome has two runways whose bearings are 95 degrees and 164 degrees. Of these, the 164 degree runway appears to be the better. It is underlain by sandstone, sand and grit and has a reasonably firm even surface. However, its south-west edge has recently been filled with material stripped from the firebrick clay deposit. This contains a large quantity of white clay which may cause an uneven surface in time.

The 95 degree runway has sandstone at each end and is underlain by sand from the centre to its western end. However, there is a thin band of white sandy clay underlying the eastern portion of the runway where, after rain, the tarred surface becomes cracked and blistered and some patches are very soft.

Recommendations for Future Mining Operations. It is suggested that, on present knowledge, it would be advisable to continue mining from the existing quarry along the aerodrome boundary towards the centre of the deposit where good clay 15 feet 4 inches thick has been encountered in Bore No. 43. If possible,

the present lease, Block 29, should be extended to the edge of the proposed runway funnel and another attempt made to obtain permission to mine within the funnel.

The presence of discoloured and gritty bands in some areas of the clay suggests that, if it becomes necessary to open a new quarry, a programme of deep boring should be undertaken to determine the best quarry location and the depth to which it should be worked.

II. INTRODUCTION.

Situation. The Jervis Bay Aerodrome is situated on high ground about one mile south-south-west of the former Naval College. The firebrick clay underlies a triangular area of about 52 acres on the south-west side of the aerodrome and lies partly within and partly outside the aerodrome boundary fence.

Prospecting and Mapping. A plane table survey of the area south-west of the aerodrome was made between 10/2/48 and 25/2/48 and a number of test bores sunk to determine the margin of the clay. Plan No. ACT.18a/1 has been prepared from this survey. A reconnaissance of the aerodrome itself was made and a geological sketch plan (Plan No. ACT.18a/2) has been prepared.

History and Production. It was stated locally that the firebrick clay was first discovered by an aboriginal from Wreck Bay. However, it was noted that the clay had been exposed prior to 1914 in the old brick-pits (see Plan No. ACT.18a/1). On 4/11/41 Newbold General Refractories Limited first made application for a lease to mine the clay. It was decided not to grant a lease within the aerodrome boundary or within the limits of the funnel of a proposed 45 degree runway, but the Company was eventually granted a licence to mine the clay as from 1/12/46 in a block of about 8 acres known as Block 29. Since that date, the Company has applied for a further lease on the opposite side of the funnel of the proposed runway.

The reported production to 30/11/47 was 2,310 tons 6 cwt. 3 qrs. and measurements of the quarry on 10/2/48 indicate that total production to that date was approximately 2,500 cubic yards or 3,800 tons, assuming a density of 1.5 tons per cubic yard. This would include clay which has been dumped near the quarry to allow work to continue while the quarry is under water in wet weather.

III. GEOLOGY AND TOPOGRAPHY OF AERODROME.

General: The whole Jervis Bay area consists of Upper Marine sandstone with localised shallow cover of sand, gravel and clay. The topography is a mixture of rough scrubby sandstone country with swampy areas, lakes and old sand dunes covered by heavy timber.

The aerodrome is situated on high, relatively flat ground about one mile south-south-west of the Naval College, the intersection of the two runways being 195 feet above sea-level. Beyond the aerodrome from north-west through north to south-east is rough sandstone country which falls sharply to Lake Windermere in the north-west and to ~~the bay~~ in the north-east, while to the south-east the country rises ~~towards the~~ cliffs near Steamer Beach. To the south, swampy watercourses with few sandstone outcrops fall gently to Mary Beach where there are low sandstone cliffs. Beyond a swampy area to the south-west of the aerodrome are old sand dunes covered by heavy timber.

Aerodrome. Sandstone outcrops from the north-eastern side of aerodrome round to the southern end of the 164 degree runway

(See Plan No. ACT.18a/2) where it has a strike of 17 degrees and a dip of 6 degrees to the west. At the western end of the 95 degree runway are numerous sandstone outcrops, to the west of which is a swampy area of thin sandy cover underlain by sandstone with a few low outcrops. In the south-west angle between the two runways is an area of heavy timber traversed by a swampy water-course. Between this and the runways is an area of low sandstone outcrops which are hidden by bracken and grass.

Three areas of clay were found within the aerodrome boundary. The firebrick clay lies west of the swampy water-course in the south-west angle of the runways and extends outside the aerodrome boundary (see Plan No. ACT.18a/1). It has a shallow cover of sand and sandy clay and is generally covered by heavy timber except for one small area, the site of Newbold General Refractories Limited present quarry. On the south side of the 95 degree runway, towards the west, is an exposure of white sandy clay in a drain. A bore on the edge of the timber nearly 1,000 feet east of this encountered slightly sandy white clay at 4 feet 6 inches, but bores further east were bottomed in hard rock, probably sandstone, without encountering clay. It is not known whether this clay area is an extension of the firebrick clay, but it is considered more likely to be a separate occurrence. The third clay deposit lies in the south-east angle of the runways and extends under the 95 degree runway towards the Jervis Bay road. The clay is white to grey and slightly sandy, except for one small area where it closely resembles the firebrick clay, and it is generally less than 2 feet thick. It is underlain by sandstone and has a shallow cover of variegated sands and grits. A test bore on the edge of the 95 degree runway encountered white sandy clay from 2 feet 3 inches to 4 feet and in this area, the tarred surface of the runway becomes cracked and blistered after rain. Some patches are so soft that they have a marked braking effect on a car. The presence of rounded sand grains and a few diatoms in the clays indicates that they are of sedimentary origin, probably of Pliocene or Pleistocene age.

To the west and south-west of the firebrick clay is an area of old sand dunes which are aligned roughly north-south and covered by heavy timber. On the north side of the 95 degree runway are two sand ridges, possibly old dunes, in which sand pits have been worked.

The south-west edge of the 164 degree runway has recently been filled with material stripped from the firebrick clay. This contains a large proportion of white clay, but test bores indicate that it is underlain by sandstone with a shallow sandy and gravelly cover.

IV. INVESTIGATION OF FIREBRICK CLAY.

Surveying. The vicinity of the clay deposit was surveyed by means of a plane table and telescopic alidade fitted with a Beaman Arc. The survey was oriented from the existing runways and levels were calculated from the height of the intersection of the runways as shown on a plan being used by the Department of Works and Housing. All traverses closed accurately for level so that the reduced levels of bores Nos. 1 to 43 (which were surveyed) should be reliable. The contours should be reasonably accurate in the vicinity of the clay deposit, but in some other areas, particularly within the timber to the east of the clay, insufficient points were obtained to allow accurate contouring. All sandstone outcrops shown with a solid line were accurately surveyed, the position of the remainder having been interpolated.

Boring Programme. The retiring local manager for Newbold General Refractories Limited stated that some boring had been carried out by him, using a 3-inch auger, to determine the extent of the clay. However, no record of these bores had been kept and their positions had not been marked, so a boring programme was undertaken together with the plan table survey. The bores were put down using a 4-inch posthole borer with extension rods, a 3-inch auger and a 6-foot crowbar.

In most cases the posthole borer was more effective than the auger, although the auger was useful for penetrating hard or gravelly bands, and the crowbar was invaluable for work in compacted sediments. It was found that the posthole borer was rapidly blunted in sharp sand and the blades became bent in coarse gravelly material, so that, as the work progressed, boring became more difficult.

Due to limited time, only three deep bores were put down, the remainder being shallow bores to determine the position of the clay margin. In several cases very hard bands were encountered above the clay, but, boring was continued where it was possible to make any progress no matter how slow. In most cases, where clay was not encountered, the holes were bottomed in hard rock. Generally the bottom could not be sampled, especially in holes more than 6 feet deep, but in some cases sandstone fragments were obtained. For the purpose of outlining the clay it has been assumed that all these bores encountered sandstone, so it is possible that the clay has a greater extent than has been indicated.

V. RESULTS OF INVESTIGATION.

General. The results of all test bores (see Appendix I) have been plotted on Plan No. ACT.18a/1 together with the estimated boundary of the clay. The occurrence is roughly triangular with a sharp apex to the south and has an area of about 52 acres. Except for the north-east corner and the southern apex, the surface of the clay is very flat with an even dip of about ½ degree to the west. Section A, through bores Nos. 5, 43 and 36 indicates that the thickness of the clay on this line is very constant at about 15 feet, although the exact thickness in Bore No. 36 was not determined. It will be noted that the sandstone margin is very steep, as is also revealed in the quarry which has been worked to a depth of 10 feet of clay very close to a massive sandstone outcrop. In the southern apex of the occurrence the clay has a steeper surface and thins out, being only 16 inches thick in Bore 21. This may be due to erosion after the clay deposit was formed. In the north-east corner the clay surface appears to rise considerably as shown in Bores Nos. 41 and 42, suggesting either an uneven surface of the clay or the presence of another clay deposit stratigraphically higher than the main occurrence. The number of bores on the north-east corner was insufficient to determine exactly the position of the clay margin and it is possible that the clay extends towards that found in Bore No. 44.

The cover, which varies in thickness from 1 foot 10 inches to 8 feet 6 inches, consists generally of sand and brown sandy clay, with local variations such as gravelly bands. The average thickness is probably about 4 feet.

Quality of Clay. In the quarry, the clay has been exposed to a depth of 10 feet. The quality appears to be quite consistent, the clay being clean and white, with numerous rootlets as the only visible "impurity". However, in Bore No. 5, about 500 feet south of the quarry, the clay contains brown and yellow

gravelly bands from 3 feet 6 inches to 10 feet. Below this the clay may be of higher quality but samples were contaminated by brownish gravelly water which came in at 10 feet. In Bore No. 36, on the opposite side of the deposit, the clay is of good quality from 6 feet 6 inches to 11 feet. Below 11 feet bands with red and yellow discolouration were encountered and below 17 feet the clay is consistently yellow in colour. Bores Nos. 18 to 22 in the southern apex of the deposit encountered clay which contains a large proportion of red and yellow sandy, gritty and gravelly bands. All these discoloured and gritty bands in the clay appear to be of limited extent and locally variable. In all other bores including No. 43, the deep bore in the centre, the clay appears to be of good quality.

The retiring local manager for Newbold General Refractories Limited stated that the clay at present being quarried is valued chiefly for its high alumina content. Its water content is high so that, due to irregular shrinkage, it cannot be made directly into firebricks. It is, therefore, calcined, crushed and mixed with other clays of lower alumina content to produce a firebrick with at least 40 per cent alumina. The following was stated to be a typical analysis of a calcined sample from the quarry.

SiO_2	51.6
Al_2O_3	46.0
TiO_2	1.6
Fe_2O_3	0.8
CaO	Trace
	100.0

Origin and Age of Clay. A microscopic examination of a number of clay samples revealed the presence of rounded grains of quartz and chalcedony with rarely fragments of siliceous sponge spicules and very rarely diatoms throughout the deposit. The diatoms have been identified by Miss I. Cresyin as the freshwater types Navicula, Diatoma and cf. Cyclotella. The clay is, therefore, a freshwater sedimentary deposit of age - Pliocene to Recent. The fact that the clay has a dip of ½ degree suggests that it is older than Recent and that its age may be Pliocene to Pleistocene.

Four clay samples from Bore No. 43 are described in detail in Appendix II.

Reserves. The lack of deep bores and the fact that most bores are located near the margin allows only a very rough estimation of the quantity of clay. As Section "A" shows a depth of 15 feet of clay and the clay in the quarry has been worked to 10 feet, an over-all depth of 10 feet has been assumed for the purpose of calculation. The areas calculated are those contained by the estimated clay margin as shown on Plan No. ACT.18a/1, except that the area of poor quality clay, south of Bore No. 18 has been omitted. The clay density has been assumed as 1.5 tons per cubic yard. For convenience, the deposit has been divided into six portions bounded by the aerodrome fence and the boundaries of the funnel of the proposed 45 degree runway.

Portion	Area in acres	Quantity cubic yards	Quantity tons
North-west of funnel within fence	3.8	60,000	90,000
Within funnel and fence	9.9	160,000	240,000
South-east of funnel within fence	3.9	65,000	95,000
Total within fence	17.6	280,000	420,000
North-west of funnel outside fence	4.7	75,000	115,000
Within funnel outside fence	27.8	450,000	675,000
South-east of funnel outside fence	2.2	35,000	55,000
Total outside fence	34.7	560,000	840,000
Whole clay deposit	52.3	840,000	1,270,000

From this it will be seen that the total quantity of clay is probably in excess of 1,200,000 tons, of which little more than one eighth lies outside the aerodrome boundary and the funnel of the proposed 45 degree runway.

Present Leases. The area pegged as Block 29, the lease at present held by Newbold General Refractories Limited, consists mainly of sandstone under shallow cover. The firebrick clay is confined to an area of 0.9 acres in the eastern corner of the lease and lies wholly within the fenced area (see Plan No. ACT. 18a/1). Assuming a depth of 10 feet of clay, the depth at present being worked, the total clay available is about 18,000 tons. However, if worked to its full depth, a further 10,000 tons may be obtained.

The position of Block 29 appears to have been calculated from an incorrect plot of the proposed 45 degree runway, thereby greatly reducing the amount of clay available for mining. If the position of the 45 degree runway shown on Plan No. ACT. 18a/1 is correct (see below) then a block of about 9 acres bounded by the aerodrome boundary fence and the runway funnel would contain more than 100,000 tons of clay.

The new lease applied for by Newbold General Refractories Limited has been marked by only two lease pegs near the aerodrome boundary fence. As shown on Plan No. ACT.18a/1, this proposed lease lies almost entirely within the runway funnel.

Proposed 45 Degree Runway. The proposed runway as plotted on Plan No. ACT.18a/1 has been plotted from Department of the Interior Neg. No. 3034 N.E.W., allowing an over-all width of 400 feet and an over-run of 500 feet, from which the edges of the funnel diverge at 15 degrees from the line of the runway.

The Department of Civil Aviation controls the aerodrome at present and, when interviewed in Melbourne on 23/3/48, the engineers concerned had no knowledge of the proposed runway. They stated that, as far as their department is concerned, any such project has been abandoned, and there would be no objection to mining operations outside the south-west boundary of the aerodrome.

The aerodrome is at present being handed over to the R.A.N. and an informal discussion with the officers concerned suggested that, after further deliberation, the R.A.N. may be willing to permit such mining operations.

APPENDIX I.

BORE LOGS.

Bore No.	R.L. in ft.	Depth of cover	Firebrick Clay From	Firebrick Clay To	Bottom	Ground water level	Remarks
1	184	6'		Nil	Sandstone	Not reached	
2	185	2'		Nil	"	"	
3	189	3'		Nil	"	"	
4	190	3' 6"		Nil	"	"	
5	190	3' 6"	3'6"	19'6"	"	10'	Brown gravelly bands in clay to 10', sand and sandstone fragments in clay from 19' to 19'6". Sampled at 4'6", 9'6", 14'6" and 19'6".
6	188	4' 6"		Nil	Hard rock	Not reached	Bottom sandy, probably sandstone.
7	189	5'		Nil	"	"	"
8	190	5'	5'	6'	Not reached	"	Bore abandoned in clean white clay. Sampled at 6'.
9	189	4' 6"		Nil	Hard rock	"	Bottom sandy, probably sandstone.
10	191	3' 8"		Nil	"	"	"
11	190	3' 3"	3'3"	3'4"	Not reached	"	Bore abandoned in clean white clay. Sampled at 3'4".
12	205	14'		Nil	"	14'	Bore in dune sand abandoned at 14', owing to water.
13	188	4'		Nil	Hard rock	Not reached	Bottom sandy, probably sandstone.
14	188	5'		Nil	"	"	"
15	188	5'		Nil	"	"	"
16	190	5'		Nil	"	"	"

Appendix I continued.

Bore No.	R.L. in ft.	Depth of cover	Firebrick Clay From	Firebrick Clay To	Bottom	Ground water level	Remarks
17	192	4'	4'	5'	Not reached	3'9"	Clay sandy to 4'8". Bore abandoned in clean white clay.
18	192	6'	6'	9'3"	"	8'	Numerous reddish gravelly bands in clay. Bore abandoned in wet clay with ironstone grit.
19	189	4'4"	4'4"	7'6"	"	2'	Clay contains yellow sandy bands to 5'6" then red clay bands to 7'6" where bore was abandoned.
20	187	4'	4'	5'3"	"	2'4"	Top 4" of clay sandy. Bore abandoned in clean white clay.
21	184	1'10"	1'10"	3'	1' clayey sand over sandstone	Not reached	Top 10" of clay contains yellow sandy bands.
22	184	3'10"	3'10"	4'6"	Not reached	1'	Top 5" of clay sandy. Bore abandoned in clean white clay.
23	194	6'	Nil		"	Not reached	Bore abandoned in dune sand.
24	187	4'	Nil		Sandstone	"	
25	184	4'6"	Nil		Hard rock	"	Bottom sandy, probably sandstone.
26	186	4'4"	Nil		Not reached	4'2"	Hole abandoned in sand owing to water.
27	182	2'3"	Nil		Sandstone	Not reached	
28	185	3'10"	Nil		"	"	
29	186	2'6"	Nil		"	"	
30	188	3'9"	Nil		"	"	
31	189	5'	5'	5'9"	Not reached	3'6"	Bore abandoned in clean white clay.
32	200	18	Nil		Sandstone	Not reached	

Appendix I continued.

Bore No.	R.L. in ft.	Depth of cover	Firebrick Clay From	To	Bottom	Ground water level	Remarks
33	195	4'	4'	7'	Not reached	Not reached	Top 6" of clay sandy. Sampled at 7'. Bore abandoned in clean white clay.
34	204	2'6"	Nil		Hard rock	"	Possibly sandstone.
35	205	4'4"	Nil		"	"	Bottom sandy, probably sandstone.
36	204	8'6"	8'6"	18'	Not reached	"	Clean white clay to 11'. Red and yellow bands in clay from 11' to 17'. Yellow clay from 17' to 18'. Bore abandoned in yellow clay. Sampled at 9'6", 14'6" and 17'6".
37	208	5'	Nil		Hard clayey sandstone gravel	"	No progress made. Blades possibly striking sandstone.
38	207	7'	7'	8'	Not reached	"	Bore abandoned in clean white clay.
39	204	2'6"	2'6"	3'	"	"	" "
40	200	4'	4'	5'	"	"	" "
41	207	5'6"	5'6"	6'	"	"	" "
42	205	6'6"	6'6"	7'	"	"	" "
43	197	4'3"	4'3"	19'7"	3" yellow sand and 2" grey clay over sandstone.	"	All clean white clay. Sampled at 4'6", 9'6", 14'6" and 19'6".
44	189	3'2"	3'2"	4'2"	Not reached	1'	Clay slightly sandy. Bore abandoned owing to water.
45	195	60"	Nil		"	4'6"	Abandoned due to water.
46	197	3'6"	Nil		Sandstone	Not reached	
47	199	4'	Nil		Hard rock	"	Bottom sandy probably sandstone.
48	203	2'	Nil		Sandstone	"	

Appendix I continued.

Bore No.	R.L. in ft.	Depth of cover	Firebrick Clay. From	To	Bottom	Ground water level	Remarks
49	196	3'10"		Nil	Hard rock	Not reached	Bottom sandy probably sandstone.
50	202	6'		Nil	Clayey sandy grit	"	No progress made, blades possibly striking sandstone.
51	-	4'		Nil	Hard rock	"	Bottom sandy, probably sandstone.
52	-	3'		Nil	Sandstone fragments in clay.	6"	
53	-	2'3"	2'3"	4'	Hard rock	4'6"	Bottom sandy, probably sandstone. Clay light grey and sandy.

APPENDIX II.

DESCRIPTION OF CLAY SAMPLES.

The four samples from Bore No. 43 appear to be typical of the whole clay deposit except where gritty or discoloured bands occur. The following description of the samples is the result of a preliminary examination, but, as no suitable apparatus was available, the clay minerals could not be positively identified.

Sample A was taken from a depth of 4 ft. 6 inches, Sample B from 9 ft. 6 inches, Sample C from 14 ft. 6inches and Sample D from 19 ft. 6 inches.

All four samples are very similar in appearance and behaviour. When dry, they are nearly pure white in colour except Sample C which has some patches of very pale greenish grey colour and a few spots of reddish brown and dark grey. When wet, Sample D remains nearly white, Samples A and B become very pale greenish grey with streaks and lenses of white and a few streaks of brown and Sample C becomes mottled greenish grey and very pale brown with a few spots of reddish brown and dark grey. The dry samples are all friable and stick to the tongue and when wet the clay is slightly plastic and has a greasy feel. In water it breaks up with a crackling noise giving finely divided material and a residue of flakes up to 5 mm. long. Heated before the blowpipe the clay decrepitates but is infusible. Thin rods of clay which were moulded and dried then heated in the flame of a Barthel burner, which easily melts copper (M.P.1080°C), shrank and cracked, but did not soften.

Under the microscope, thin sections of Sample A are seen to consist essentially of three minerals. One is an aggregate of very fine colourless transparent grains which have low relief and an R.I. greater than that of Balsam. It has no orientation and shows very little double refraction, so may be primary halloysite which would explain the excessive water content of the clay. It is traversed by fine irregular veins of similar material with the same R.I, but which is oriented and shows low interference colours. This may be secondary kaolinite and may be the material which remains as flakes when the clay breaks up in water. Throughout the aggregate material, but more commonly in or near the material in the veins are irregularly distributed and irregularly oriented laths of a transparent colourless mineral with a higher R.I. and higher double refraction than the material in the veins. The laths are commonly curved, in one case forming a complete circle, and have one good cleavage parallel to their length and a cross parting. Tests with roughly calibrated refractive index liquids indicated that its birefringence is greater than that of kaolinite and that its R.I. is near that of gibbsite. The high alumina content of the clay suggests that this mineral may be a hydrated aluminium oxide, but it is length fast whereas gibbsite is length slow. Therefore, it may be boehmite, a recently identified mineral of which little information is available in Canberra. Dana states that the R.I. of boehmite is slightly higher than that of gibbsite, and its chemical composition is the same as that of diasporo which is length fast. In hydrothermal synthesis, "kaolinite forms by the reaction of alumina and silica in neutral alkali-free solutions, or in acidic alkali-containing solutions, below 400°C. Excess alumina crystallises to boehmite; excess silica remains amorphous" (Morey and Ingerson, 1937). Thus, boehmite is a mineral which could have been

formed at the same time as the secondary kaolinite by the action of ground and surface waters.

The following percentages of minerals in the samples are rough estimates made by agitating about 50 gms. of each sample with water, decanting the clay in fractions and preparing slides from each fraction.

Sample A

44% Primary halloysite.
20% Secondary kaolinite.
30% Boehmite ? as crystals averaging 0.1 mm. long, one incomplete crystal being 2.54mm x 0.39 mm.
6% Accessory minerals comprising:
- 50% Leucoxine as rounded grains up to 0.16mm in diameter.
- 40% Chalcedony as rounded grains from 0.05mm to 0.45mm in diameter with inclusions of leucoxine.
- 10% Quartz as subangular to rounded grains from 0.05mm to 2.0 mm in diameter.

Sample B

30% Primary halloysite.
66% Secondary kaolinite.
1% Boehmite ?.
6% Accessory minerals comprising:
- 45% Leucoxene as rounded grains up to 0.25mm in diameter.
- 30% Quartz as subangular to rounded grains from 0.08mm to 0.70mm in diameter.
- 24% Chalcedony as rounded grains from 0.10mm to 0.23mm in diameter with inclusions of leucoxene.
- 1% Ilmenite as large subangular grains up to 0.51mm in diameter.
- A few grains of limonite up to 0.25mm in diameter .
- One prism of zircon 0.24mm long.
- One crystal similar to zircon, but possibly cassiterite, 0.10mm in diameter.

Sample C

20% Primary halloysite.
68% Secondary kaolinite.
A few laths of boehmite ?.
12% Accessory minerals comprising:
- 65% Leucoxene as rounded grains up to 0.14mm in diameter.
- 15% Limonite as subangular to rounded grains from 0.08mm. to 0.70mm in diameter.
- 15% Quartz as subangular to rounded grains from 0.07mm to 0.39mm in diameter.
- 5% Chalcedony as rounded grains from 0.08mm to 0.50mm in diameter with a few inclusions of leucoxene.
- A few rounded grains of ilmenite about 0.1mm in diameter.

Sample D

7% Primary halloysite.
85% Secondary kaolinite.
2% Boehmite ?
6% Accessory minerals comprising:
- 50% Leucoxene as subangular to rounded grains up to 0.34mm in diameter.
- 45% Quartz as subangular to rounded grains from 0.09mm to 0.85mm in diameter.
- 5% Chalcedony as subangular to rounded grains from 0.10mm to 0.16mm in diameter with inclusions of leucoxene.

A few grains of limonite from 0.10mm to 0.85mm in diameter.
A few grains of ilmenite up to 0.42mm in diameter.

CONCLUSIONS.

The preliminary examination suggests that the following may be the history of the formation of the firebrick clay.

The clay was originally laid down as a sediment consisting of halloysite with or without finely divided kaolinite in a small swamp or lake which contained very little organic matter. Following the deposition of the halloysite, ground water and surface water have leached out some of the halloysite and removed some of its silica content, causing the deposition of secondary kaolinite in the fractures and the formation of boehmite crystals. Thus, the boehmite is most common at the top of the clay where the leaching of silica would be greatest and decreases rapidly with depth; and the secondary kaolinite formed by the transportation of the halloysite increases with depth. It will be noted that the amount of boehmite increases slightly at the bottom of the deposit, probably due to the action of ground water in the sandstone immediately under the clay leaching out some of the silica.

REFERENCE.

Morey, G.W. and Ingerson, E. : The Pneumatolytic and Hydrothermal Alteration and Synthesis of Silicates. Econ. Geol. 32-746.

JERVIS BAY A. C. T.

PLAN OF

FIREBRICK CLAY DEPOSIT

SCALE 1 in. = 200 ft

ft 100 0 100 200 300 400 500 ft

Plane table survey by W. C. Smith, D. J. Belford, W. L. Hawthorne and A. V. Robertson 10 Feb. 1948

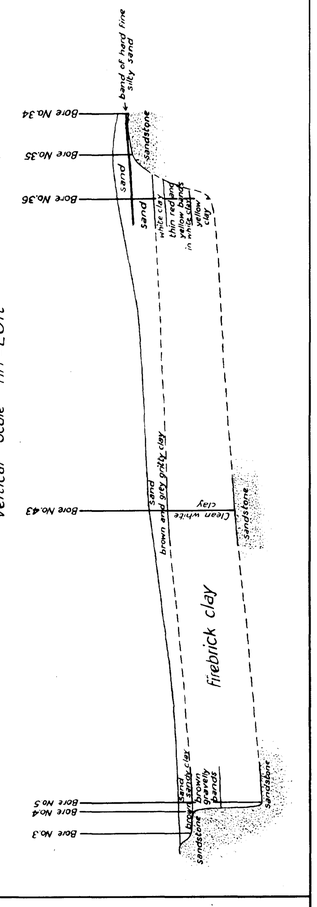
LEGEND

- Estimated boundary of clay
- Clay pit
- Lease peg
- Boundary of proposed runway and funnel
- Test bore in white clay
- Test bore bottomed in hard rock (probably sandstone) without encountering white clay
- Test bore abandoned without result
- Contours (Contour interval 5 Ft)
- Fence
- Sandstone outcrop
- Clay dump
- Edge of timber

A. C. T. 18a/1

SECTION "A"

Horizontal Scale 1 in = 200 ft
Vertical Scale 1 in = 20 ft



JERVIS BAY A. C. T.

GEOLOGICAL SKETCH PLAN OF AERODROME

SCALE 1in=400ft

Ft 100 0 200 400 600 800 1000 ft

Geology by W. C. Smith 24 Feb. 1948

LEGEND

- Exposure of white clay
- Area of numerous sandstone outcrops
- Estimated area underlain by clay
- Sand ridge and quarry
- 51● Test bore bottomed in hard rock (probably sandstone)
- 44⊕ Test bore in clay

True N

Mag N

Semi-consolidated variegated sands

Old sand ridges partly removed

Outline of Plan No A.C.T. 18a/1

95° RUNWAY

164° RUNWAY

Sand more than 6ft deep

White sandy clay

White sandy clay over grey clay

White clay and sandy clay

Grey clay

Firebrick clay

Clay filling from Block 29

Semi-consolidated variegated sands, grits and sandy clay

53

49

50

51

52

A. C. T. 18a/2