684001

ANNUAL REPORT
EXPLORATION LICENCE 36/86
PIPERS RIVER, TASMANIA

for the period
15th November, 1988 to 31st December, 1988

C.H.C.SHANNON

10-1-1989

SAVAGE RESOURCES LIMITED

Incorporated in Tasmania

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Plate 1: borehole sections and correlation back pocket

Plate 2: plan of drilling area back pocket

Introduction

The drilling project was at last undertaken in the period 6-8 December 1988. Five auger holes were drilled of the six planned for, one being dropped from the program because of anticipated problems with hard basalt cover.

The samples have been sent to the Savage Minerals/Marafield Ltd. laboratory in Ballarat where they are to be examined in the hope that a white firing pottery clay may exist. No results have been received as yet.

The drillholes and rough geological boundaries in the drilling area have been located on a surface survey by compass/pacing/tape traverses plotted by computer and related to the local 1:25,000 contour map. The fit is quite good so points are probably located to within 20m of their claimed horizontal co-ordinates and 5m of the vertical.

The holes (except possibly hole 4) do not encounter bedrock. Correlation of borehole sections is attempted by assuming that coarse facies intervals match up. The clays include intervals in which excessive iron content is expressed by yellow/orange limonite pigment but it may be the case that all the clays contain too much iron for a white firing clay.

Geology

The target formation is at the base of the Tertiary sediments and is capped by basalt which covers summits on the ridgeline. Basement is slate of the Mathinna beds. It appears that the sequence is gently folded; dips are observable in the quarry exposure in R.W. Carter's lease. The main cliff looks to be horizontal but in the pseudokarst cave at the quarry/lease corner the dip is 3 degrees to 325 degrees AMG; low on the quarry floor there is an area with 16 degree dip to 45 degrees.

There is some 11m of the section exposed in the quarry. The previous sampling which demonstrated good firing properties except for colour comes from 5-9m up from the lower limit of exposure. Potentially about 10m more clay may exist down to basement. There appears to be only a rudimentary basal breccia consisting of a lag deposit of vein quartz (scattered clasts to 20cm, south of the drilling area).

Above the quarry there is a poorly exposed interval of 13m up to the basalt contact. It was this interval that was the main target of the investigation. Some very white clay, some sand and a distinctive gravel with discoidal pebbles have some exposures here. There is a collapsed adit south of the existing quarry in this zone. The white clay from this source is supposed to have been exported to Britain at some time about the turn of the century (R.W. Carter pers. comm.).

The deposit is considered to be lacustrine because of the well developed lamination in the clays and the disc pebbles (characteristic of a beach) in some gravels or sandy gravels.

The structure is thought to be a syncline with a steeper limb on the NE. The exposure is not good enough to tell if the narrowing of the clay belt may be due to an original high on the basement surface.

The basalt seems to have flowed directlyinto the lake since there is no indication of a soil, and there appears to be a load cast in hole 3 where a detached 2m of basalt was encountered below the first clay.

Facies in the sediments.

The clays make up the bulk of the sediments. Coarser material is mainly in the top 15m and varies from disc pebble gravels through grit to medium and then fine sand, often with clay binder; the variation is compatible with a beach swash zone and offshore fining shore complex. Some sand units coarsen upwards.

The clays can be classed as compact or plastic physical types. The plastic type appears to be an alteration of the compact type which occurs adjacent to sands or other permeable zones and more commonly away from the basalt capping. The alteration process would appear to start with secondary hydration and proceed to oxidation and perhaps introduction of iron. Excessive iron content of the plastic clays is expressed by a yellow to orange colour phase. The plastic clays normally have a bleached colour phase, either alone or mixed with the yellow in a large scale mottling pattern.

The compact clays appear to contain less iron but this may mean only that the iron is present as Fe^{++} compounds that are inconspicuous. Concretions of limonite may be present in either physical type but may be removable in processing. In the compact clay samples these produce an orange fleck in the ground sample.

The natural colour phases of the compact clays are as follows:

1) very pale grey, commen near the top in all holes drilled though altered to plastic clay in some cases. It occurs blow a yellow to white plastic clay unit.

2) pale bluish grey clay, usually with some yellow bands.

3) light bluish grey clay, encountered only in the lower part of hole 3 but also exposed in the quarry section?

4) chocolate brown clay, encountered only in hole 5 at depth. Possibly equivalent to (3). The color is obviously organic(peat, lignite) and some plant fossil material is present.

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The colours may all reflect increasing organic content.

Bibliography

Shannon, C.H.C.;1988: Annual report exploration licence 36/86 Pipers River, Tasmania for the period 1st January 1988 to 15th November 1988. Savage resources Ltd. unpub. report, November 1988.

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Appendix 1

Samples for laboratory examination.

The following 31 samples from the 5 holes drilled have higher priority since they are clays without evidence of more than trace amounts of iron staining.

Samples

1/3-4,6,14-15,17-18.

2/6-7,14-15.

3/7-9,13-14,22-27.

4/7-8.

5/4,11,15-19.

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Appendix 2

Drilling log, Pipers River program, 6-8th December 1988.

Drillhole 1

Sample	depth	description
PR1/1	0.0 -0.5	red soil with basalt stones.
	0.5 -0.8	yellow clay.
	0.8 -1.0	white clay (not sampled, contaminated).
PR1/2	1.0 -1.2	white clay.
	1.2 -1.4	yellow clay.
	1.4 -2.0	white clay.
PR1/3	2.0 -3.0	greyish white to pale yellow clay.

Note: a pin was lost, the top 1m of the hole had to be dug out; the next few samples were contaminated with soil.

Sample	depth	description
PR1/4	3.0 -4.0	greyish white clay; trace limonite stain, contaminated.
PR1/5	4.0 -4.8	greyish white and buff clay, contaminated.
	4.8 -5.0	yellow clay.
PR1/6	5.0 -6.0	greyish white clay, with sparse slate chips.
PR1/7	6.0 -7.0	buff and greyish white clay with minor grit; buff colour organic? some limonite stain.
PR1/8	7.0 -8.0	very pale bluish grey and buff clay.
PR1/9	8.0 -8.9	pale bluish grey and yellow clay with limonite pisolites.
	8.9 -9.0	pale yellow sandy clay.
PR1/10	9.0-10.0	pale yellowish grey sand.
PR1/11	10.0-11.0	fine sand with clay binder, pale grey grading to buff clay at base.
PR1/12	11.0-12.0	buff clay (pale pinkish orange) 7YR7/3 approx on the Munsell colour chart.
PR1/13	12.0-12.6	buff clay.
	12.6-12.8	yellow clay.
	12.8-13.0	pale grey and buff clay.
PR1/14	13.0-13.9	buff and pale grey clay, trace yellow clay.
	13.9-14.0	buff clay.

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PR1/15	14.0-15.0	buff clay, yellow at base.
PR1/16	15.0-16.0	buff clay, some yellow at base.
PR1/17	16.0-17.0	mainly pale grey clay, some buff.
PR1/18	17.0-18.0	pale grey clay.
PR1/19	18.0-18.9	pale grey clay.
	18.9-19.0	yellow clay.
PR1/20	19.0-19.5	yellow clay.

End hole.

Drillhole 2

Sample	depth	description
	0.0 -3.7	basalt.
PR2/4	3.7 -4.5	white clay with minor yellow and dark brown organic clay, fine sand at base.
PR2/5	4.5 -5.0	pale grey, buff, yellow and chocolate brown organic clay.
PR2/6	5.0 -6.0	pale bluish grey clay, minor brown organic clay.
PR2/7	6.0 -7.0	pale bluish grey and brownish grey organic clay with minor quartz clasts.
	7.0 -7.2	gravel, coarse with clay matrix, (not sampled).
PR2/8	7.2 -7.6	pale grey clay.
	7.6 -8.0	pale grey with minor yellow clay and fine gravel.
PR2/9	8.0 -8.8	pale grey clay.
	8.8 -9.0	grey clay with pebbles, some coated with limonite.
PR2/10	9.0 -10.0	pale grey clay, minor yellow stain and organic stain.
PR2/11	10.0-11.0	sample yellowish grey silty clay with isolated disc pebbles: interpreted as ground up disc-pebble gravel.

Note: rods changed to the smaller size owing to bent hole problems caused by basalt boulders. The following samples are smaller and tend to be contaminated.

	11.0-11.6	not sampled, (too much containation).
PR2/12	11.6 12.0	pale grey to buff clay, contaminated.
PR2/13	12.0-13.0	pale grey and some buff clay.
PR2/14	13.0-14.0	pale grey and light brown clay, hard band at 14.5m.
PR2/15	14.0-15.0	pale grey and organic light to medium brown clay. Interbedded in 1-3mm beds.
PR2/16	15.0-16.0	poor sample initially, then pale grey and cream clay, trace yellow clay.
PR2/17	16.0-17.0	poor sample: brown clay, some pale grey, isolated pebbles. (A sand that fell off the auger is likely).

End hole. Hole stopped owing to poor recovery.

Drillhole 3

Sample	depth	description
	0.0 -1.1	soil and weathered basalt; (no sample).
PR3/2	1.1 -2.5	greyish white clay and buff clay.
	2.5 -4.5	basalt! (a load cast structure would account for this).
PR3/5	4.5 -5.0	greyish white plastic clay flecked with orange limonite stain.
PR3/6	5.0 -6.0	pale grey fine sand, minor clay binder.
PR3/7	6.0 -7.0	pale bluish grey silty clay grading to clay towards base.
PR3/8	7.0 -8.0	pale bluish grey clay.
PR3/9	8.0 -9.0	pale bluish grey clay.
PR3/10	9.0 -10.0	pale bluish grey clay, very minor orange fleck near top.
PR3/11	10.0-11.0	pale bluish grey clay,minor orange fleck throughout (limonite).
PR3/12	11.0-11.1	pale grey? clay with grit.

11.1-11.2 pale grey clay with orange limonite fleck.
11.2-12.0 pale bluish grey clay with very minor orange fleck in places.

PR3/13 12.0-13.0 pale bluish grey clay with very minor orange fleck in places.

PR3/14 13.0-14.0 pale bluish grey clay.

PR3/15 14.0-14.1 pale bluish grey clay.
14.1-14.6 yellow clayey sand (Fe stain).
14.6-15.0 bluish grey silty clay; minor Fe stain orange fleck.

PR3/16 15.0-15.1 bluish grey silty clay.
15.1-15.6 yellow, clayey, fine sand.
15.6-16.0 bluish grey, and yellow silty clay.

PR3/17 16.0-17.0 pale bluish grey and greyish yellow silty clay; less Fe stain towards base.

PR3/18 17.0-18.0 pale bluish grey clay and minor yellowish grey clay.

PR3/19 18.0-19.0 pale bluish grey clay, very minor yellow fleck in places.

Note: the hole was then extended using supplementary standard rods (i.e. non auger type) since the hole was straight and stable.

PR3/20 19.0-19.7 pale bluish grey clay with very minor yellow clay.
19.7-19.9 yellow and pale grey clay.
19.9-20.0 pale bluish grey clay.

PR3/21 20.0-20.1 pale bluish grey clay.
20.1-20.3 pale bluish grey clay with minor yellow clay.
20.3-21.0 pale bluish grey clay.

PR3/22 21.0-22.0 pale grey clay.

PR3/23 22.0-23.0 light grey clay (darker than above).

PR3/24 23.0-24.0 light grey clay.

PR3/25 24.0-25.0 light grey clay.

PR3/26 25.0-26.0 light grey clay.

PR3/27 26.0-27.0 light grey clay.

PR3/28 27.0-27.5 light grey clay.

End hole.

Drillhole 4.

Sample	depth	description
	0.0 -0.5	brown clay soil.
PR4/1	0.5 -1.0	pale grey clay, minor yellow Fe stained clay.
PR4/2	1.0 -1.3	pale grey clay.
	1.3 -2.0	orange clay.
PR4/3	2.0 -2.5	pale grey and yellowish orange clay.
	2.5 -3.0	yellowish orange clay.
PR4/4	3.0 -3.9	greyish yellow fine sand with clay binder.
PR4/5	3.9 -4.6	orange gravelly sand; some clay at base.
PR4/6	4.6 -5.0	white and pale yellow plastic clay.
	5.0 -6.0	pale grey clay with very minor orange limonite fleck.
PR4/7	6.0 -7.0	pale grey clay with very minor orange fleck.
PR4/8	7.0 -7.9	pale grey clay, silty towards base.
PR4/9	7.9 -8.0	orange and pale grey mottled silty clay.
	8.0 -8.1	orange and pale grey clayey sand.
	8.1 -8.8	pale grey clayey fine sand.
	8.8 -8.9	pale grey and orange clayey sand.
PR4/10	8.9 -9.1	orange medium sand.
	9.1 -9.9	pale greyish yellow medium sand.
	9.9 -10.0	pale greyish orange medium sand.
PR4/11	10.0-10.1	pale greyish orange medium sand.
	10.1-10.6	orange? claybound grit (30% v.coarse sand in plastic clayey matrix).
	10.6-11.0	grey and yellow mottled, Fe stained plastic clay with some relict organic brown stain.
PR4/12	11.0-11.4	pale grey and orange mottled plastic clay.
	11.4-11.8	pale grey clay with orange flecks.
	11.8-11.9	pale grey and orange mottled plastic clay.
	11.9-12.0	pale greyish yellow silt (c.f. below).
PR4/13	12.0-13.0	pale greyish yellow silt with small chips of pale grey slate or clay; harder drilling. Bedrock? Disc pebble gravel?

End hole.

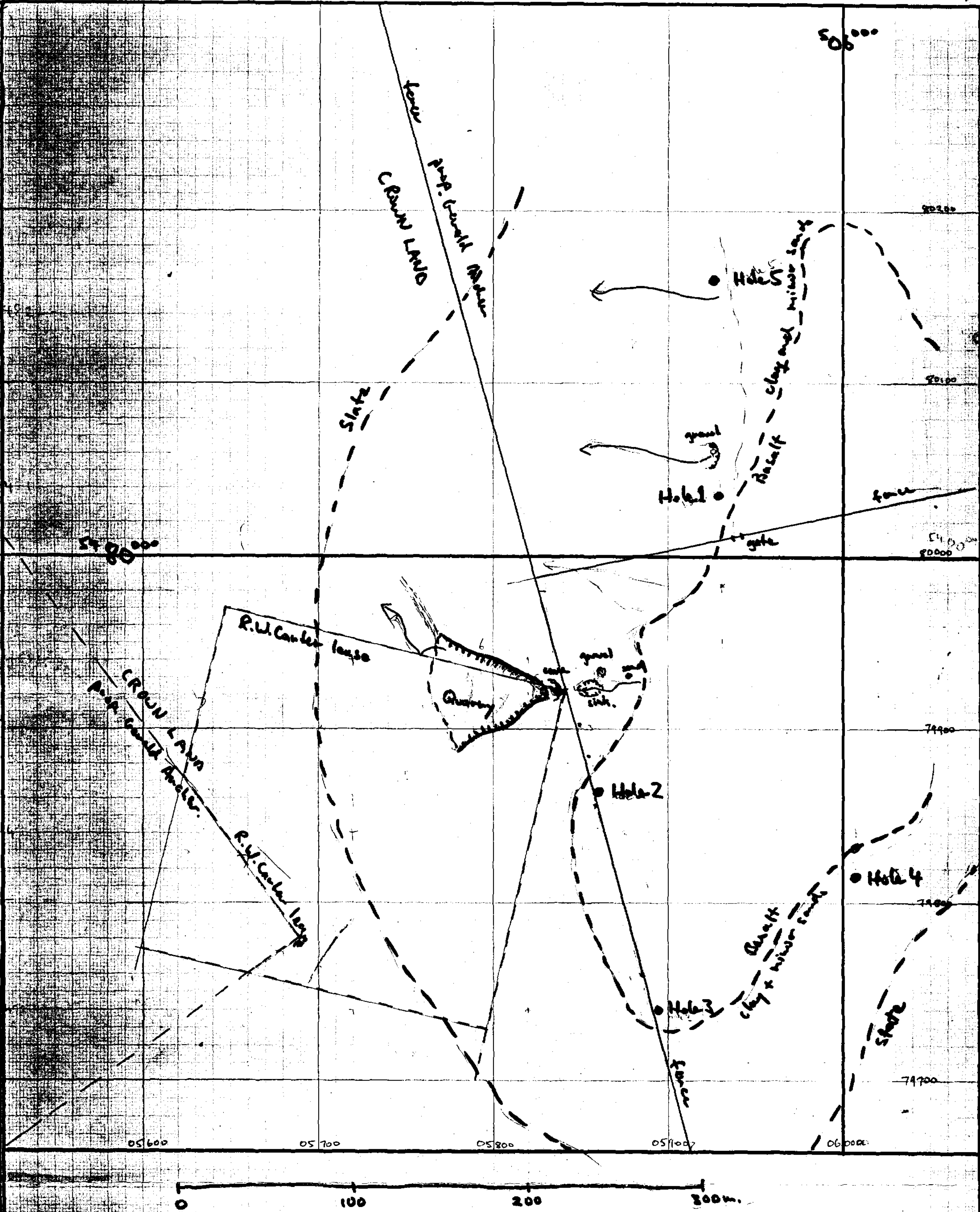
Note: The hole was stopped because this silty material was considered to be bedrock on the grounds that no rounded surfaces could be found on the slate chips, but it now seems more likely that it was a disc pebble gravel with more clay likely to exist below it. A clear example of a disc pebble gravel was penetrated in hole 5.

Drillhole 5.

Sample	depth	description
	0.0 -0.2	brown crumbly clay soil(basalt wash).
	0.2 -1.0	pale yellow to pale grey plastic clay, (contaminated sample).
PR5/2	1.0 -2.0	pale grey plastic clay, with Feox. concretions.
PR5/3	2.0 -3.0	pale grey plastic clay, Fe ox. concretions commen near top.
PR5/4	3.0 -4.0	pale grey plastic clay.
PR5/5	4.0 -4.1	yellow sand.
	4.1 -5.1	orange to yellow with minor pale grey mottled plastic clay
PR5/6	5.1 -5.4	greyish yellow pebbly clay (disc pebble gravel).
	5.4 -6.0	greyish yellow silty clay with slate chips; some definately fragments of disc pebbles (ground up disc pebble gravel).
PR5/7	6.0 -7.0	yellowish grey silty clay with slate chips, as above; (ground up disc pebble gravel).
PR5/8	7.0 -8.0	pale grey and brownish orange (Fe stained), mottled plastic clay.
PR5/9	8.0 -9.0	yellow and some pale grey mottled plastic clay.
PR5/10	9.0 -9.5	yellow and some pale grey mottled plastic clay.
	9.5 -9.6	grey fine sand.
	9.6 -10.5	yellow plastic clay with reddish brown Fe ox. stains/soft concretions.
PR5/11	10.5-11.0	pale grey plastic clay with minor reddish brown stains, as above.
PR5/12	11.0-12.0	yellow and pale grey plastic clay.
PR5/13	12.0-13.0	yellow and pale grey plastic clay.

PR5/14	13.0-14.0	yellow plastic clay grading to pinkish brown/grey organic, plastic clay.
PR5/15	14.0-15.0	pinkish brown/grey organic plastic clay.
PR5/16	15.0-16.0	chocolate brown organic plastic clay.
PR5/17	16.0-16.9	dark chocolate brown organic plastic clay.
	16.9-17.0	dark chocolate brown organic crumbly clay.
PR5/18	17.0-18.0	chocolate brown plastic and non-plastic clay.
PR5/19	18.0-19.4	chocolate brown plastic and non-plastic clay.
PR5/20	19.4-19.5	dark yellowish brown clayey peat cemented fine sand and minor grit.

End hole.



grid N.

PIPERS RIVER DRILLING.

BOREHOLE LOCATIONS.

5 cm

PLATE 2.

1:2000

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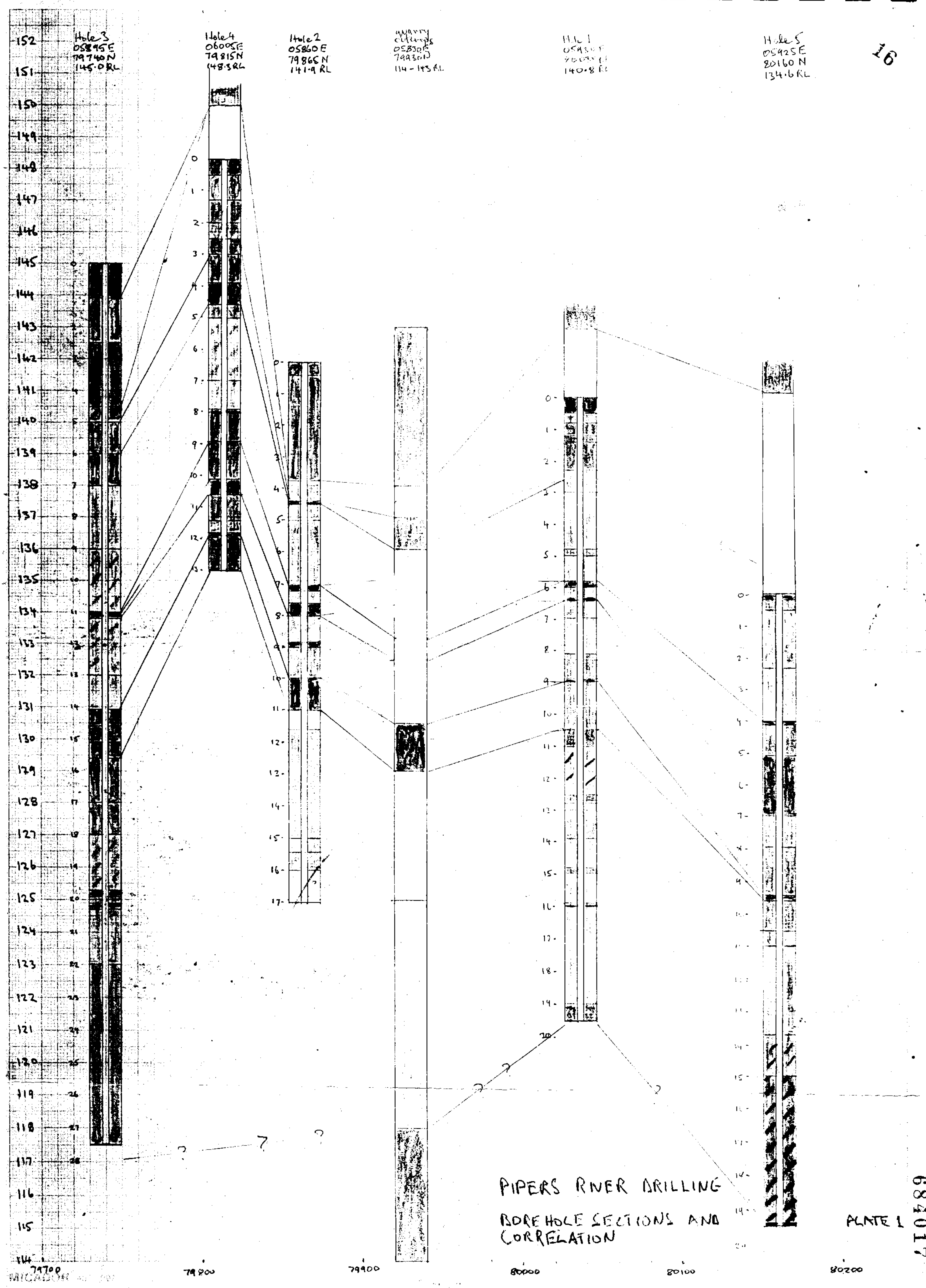
MICADOR A3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79740N
145·0 RL
Hole 4
06005E
79815N
148·3 RL
Hole 2
05860E
79865N
141·9 RL
quarry outcrops
05830E
79930N
114 - 143 RL
Hole 1
140·8 RL
Hole 5
05925E
80160N
134·6 RL
79700
79800
79900
80000
80100
80200
PIPERS RIVER DRILLING
BOREHOLE SECTIONS AND CORRELATION
PLATE 1

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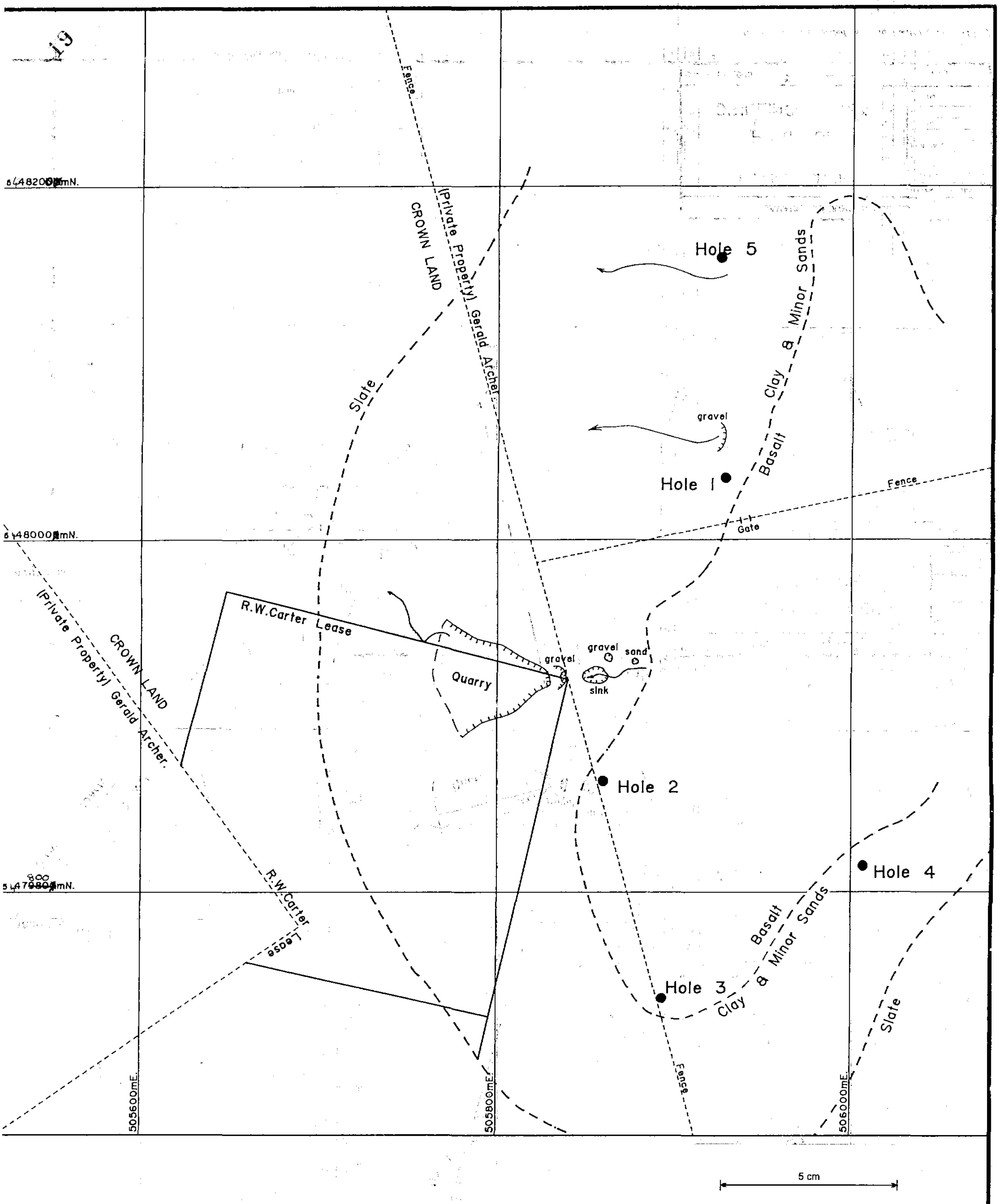

SAVAGE RESOURCES LIMITED

PIPERS RIVER

PLAN OF DRILLING AREA

DRAWN BY : H.S.
DRAFTSMAN : T.O.D.S.
DATE : March'89
REVISIONS :
FILE No.
FIG.

SCALE 1 : 2,000

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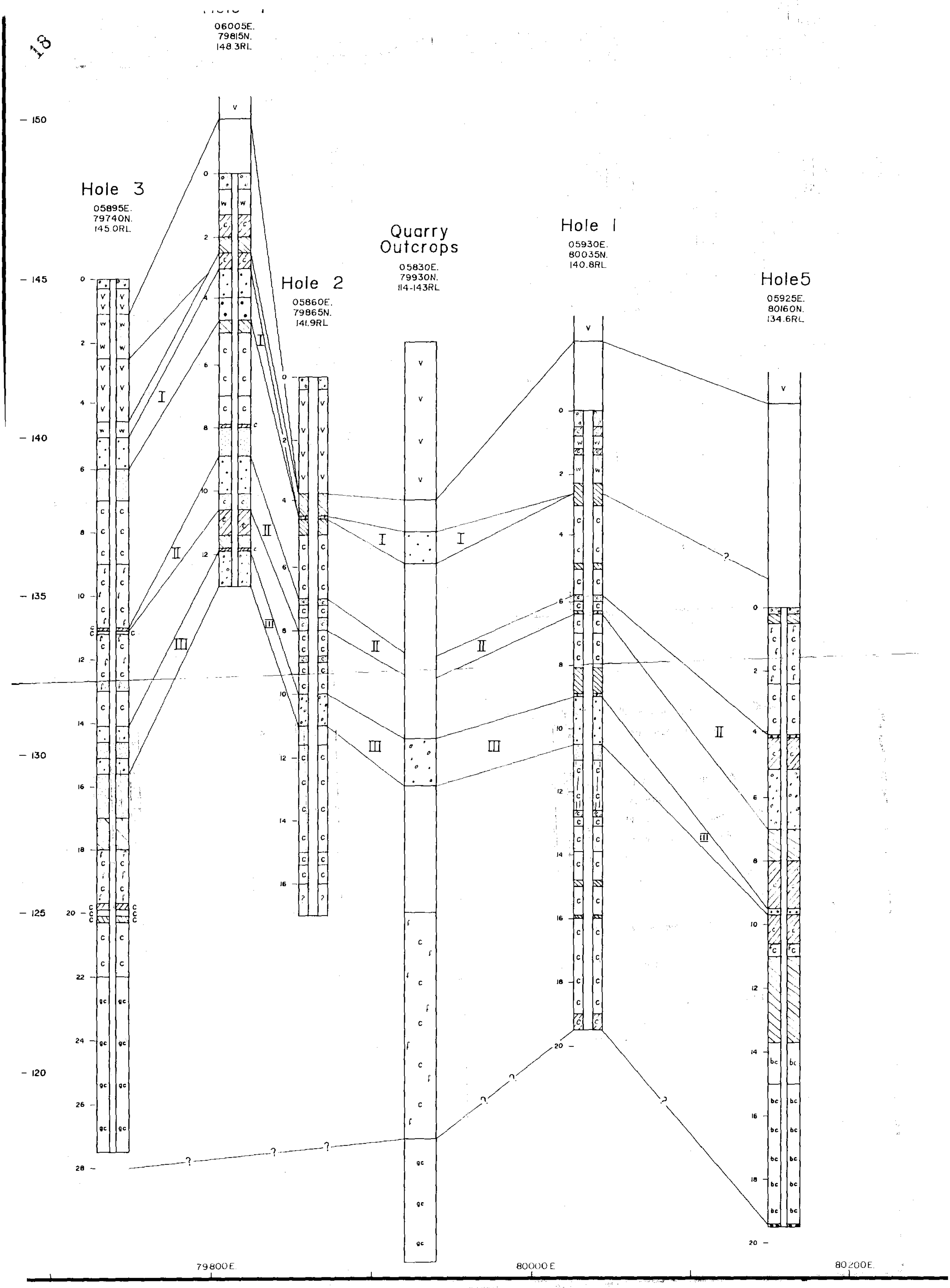
N. W. Computer Aided Drafting Centre (004 354315)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148.3RL
Hole 3
05895E.
79740N.
145.0RL
Hole 2
05860E.
79865N.
141.9RL
Quarry Outcrops
05830E.
79930N.
114-143RL
Hole 1
05930E.
80035N.
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134.6RL
I
II
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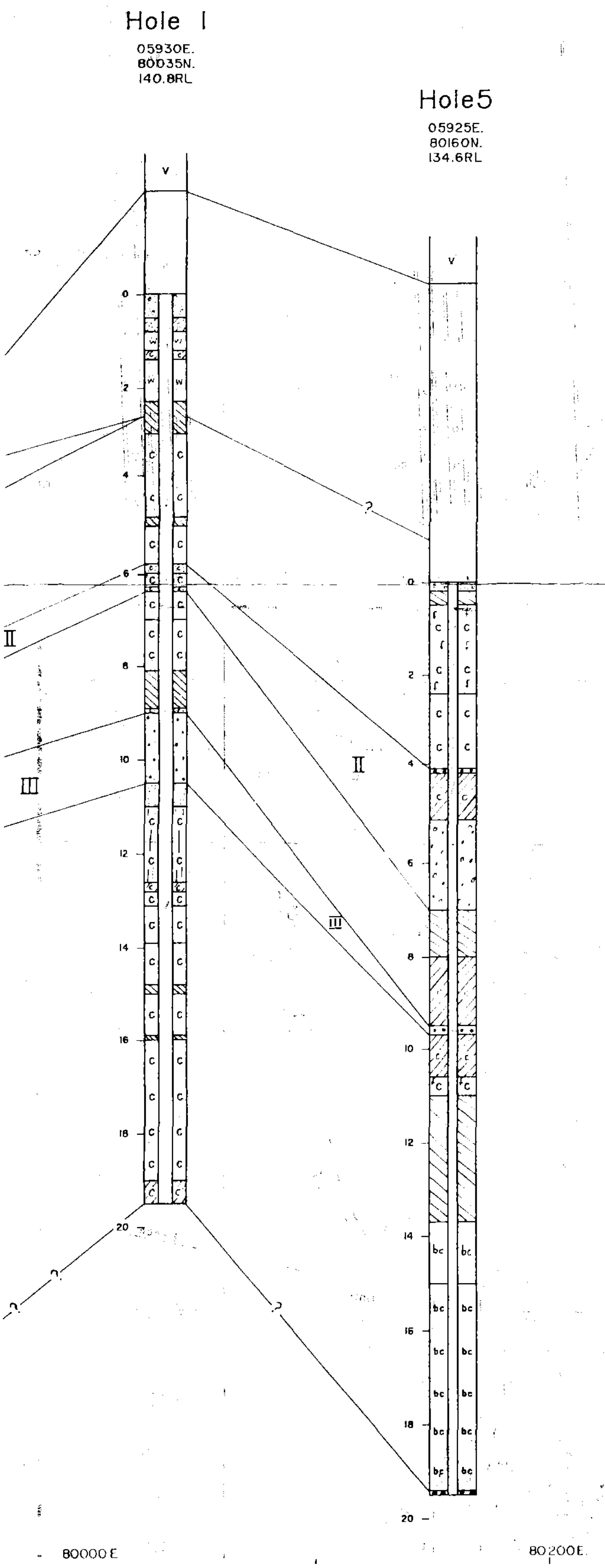
80000E
80200E

684019



LEGEND

- Soil, residual or transported with basalt clasts.
- V — Basalt.
- W — White plastic clay.
- C — Pale bluish grey copact or plastic clay.
  - (1) Without obvious Fe contamination.
  - (2) With traces of Fe contamination.
  - (3) With minor yellow clay admixture.
  - (4) With major yellow or organic clay.
  - (5) With chocolate brown organic lamination.
- gc — Light grey clay.
  - (1) Without obvious Fe contamination.
  - (2) With traces of Fe contamination.
- bc — Chocolate brown organic clay.
- Silty clay with fine sand
- Medium sand.
- Coarse sand.
- Gravel with disc pebbles.
- c — Grit set in clay.
- I = Sandy interval.

5 cm

PIPERS RIVER DRILLING

PROJECTED SECTION OF BORE HOLES AND CORRELATION

LOOKING WEST

VERTICAL SCALE 1:100
HORIZONTAL SCALE 1:2000

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OPEN FILE

PIPERS RIVER CLAYS

Preliminary Investigation

7th February 1989

89-2912 Appx 3 (copy 1)

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INTRODUCTION

The Pipers River clays have been drilled by Savage Resources Ltd. under the supervision of Henry Shannon.

The samples, in excess of one hundred, were transferred to Marafield Pty Ltd for evaluation as a profitably marketable material.

The approach here has not been to carry out an exhaustive academic study of the samples, but rather to take a commercial approach having one eye always on the potential markets.

THE APPROACH

Out of the numerous samples the field geologist selected six which were thought to represent the various clay types available, and which would allow an early elimination of the deposit should it prove not to be of economic interest. These samples have been examined in the light of the following market realities :-

1] The only significant kaolin consuming industries in Tasmania are the paper making, and paper coating facilities of A.P.P.M. at Burnie and Wesley Vale. A.P.P.M. import their coating clays from the United States as this source is cheaper than mainland Australia and of better quality. The attempts made by A.P.P.M. to establish their own clay facility at Scotsdale was only partially successful in that it failed to produce a viable coating grade and has been used as a filler. Any competing kaolin would have to make a coating grade of comparable quality to the American material, or have some exceptional filling properties.

2] There exists no significant ceramic industry in Tasmania. Although the recently established Bamix operation is interesting, its weekly consumption is unlikely to reach double figures and as such would in no measure support a local clay source. If this clay is to find a mainland or export market as a ceramic material it will have to fit one of two roles.

a) As an ultra low titania white firing, porcelain clay of the New Zealand China Clay type.

OR

b) As a strong, low grit ball clay of the English type, requiring no processing.

3] The freight costs to the mainland will preclude its use in the less onerous areas of the market such as paper filling, paint filling, sanitary ware, wall tiles etc.

TESTING PROCEDURE

The six clays were sampled in duplicate, one for the determination of moisture and raw fired colour, and the second for the determination of refining recovery, particle size, raw colour and bleached colour. In the general handling of these clays we would also expect to make a number of subjective observations as to some other parameters. Although far from exhaustive, the above tests would all have to be satisfactory to give the clay any chance of being commercial.

A sample of each clay (1Kg wet) was blunged with water and a polyacrilate dispersant to produce a slurry of about 10% solids. This slurry was then screened though a 100 um sieve and the oversize dried and weighed.

The remaining slurry was then diluted in a container to achieve a depth of 200 mm, the slurry was agitated and then allowed to settle for 20 mins.

This settling time is equivalent to the time taken for a 15 um particle to settle the full depth of the slurry. Thus 100% of 15 um particles are removed. It can also be shown that 50% of 10 um particles and 25% of 7.5um particles are removed and that the weight of the remaining suspended particles approximates to the weight of less than 7.5 um particles in the sample.

The slurry was then decanted and the settled residue dried and weighed. The decanted slurry was again diluted to achieve a depth of 200 mm and allowed to settle for 3 hours.

This settling time is equivalent to the time taken for a 5 um particle to settle the full depth of the slurry. Thus 100% of 5 um particles are removed. It can also be shown that 50% of 3.5 um particles and 25% of 2.5um particles are removed and that the weight of the remaining suspended particles approximates to the weight of less than 2.5 um particles in the sample.

Again the slurry was decanted and the residue dried and weighed. The suspended slurry was aggregated by raising the pH, allowed to settle and a portion filtered through a Buckman filter. The resultant cake was dried and the powder brightness measured. The remaining slurry was then subjected to an oxidising bleach followed by a reduction bleach in order to reduce both organic and inorganic staining. A further portion was filtered, dried and brightness measured.

The above procedure was only applied to the visibly whiter clays of hole 1.

The duplicate clay sample was dried and reweighed to determine moisture content and was then fired to a temperature of 1080 C. The colour of the fired powder was measured.

RESULTS

a) Appearance and subjective comments

None of the clays examined had an exceptionally white appearance and at least one exhibited extremely dark organic staining. The immediate first impression was of a collection of secondary clays, which, given certain physical characteristics, might be described as "ball clays".

SAMPLE	DESCRIPTION
PR 1/8	A pale grey clay, well sorted with low grit
PR 1/18	A pale grey clay as above but with higher moisture content
PR 2/6	A pale grey clay with a high level of mica present.
PR 3/9	A pale grey clay, slightly more gritty than those of hole 1.
PR 3/23	A dark grey clay otherwise similar to hole 1 samples.
PR 5/26	A chocolate brown clay, very smooth and plastic with high moisture content.

b) Moisture and Particle Size

SAMPLE	Moisture	> 100 um	> 15 um	> 5um	< 5 um
PR 1/8	9,0	0.8	29.2	41.2	28.7
PR 1/18	21.0	0.9	28.1	41.1	29.9
PR 2/6	9.0	6.3	34.4	38.5	20.8
PR 3/9	11.0	4.4	28.2	40.4	27.0
PR 3/23	10.0	1.0	31.2	34.4	33.3
PR 5/26	25.0	0.8	29.5	38.7	31.1

c) Fired Colour

The raw clay was fired at 1080 C. and the colour measure on the international L a b scale. On this scale, porcelain type clays would be expected to yield "L" figures of between 95 and 99. The "b" figure should be less than 2.0.

SAMPLE	L	a	b
PR 1/8	81.03	1.64	16.62
PR 1/18	85.23	-0.28	14.71
PR 2/6	77.94	3.62	19.67
PR 3/9	81.48	2.33	20.29
PR 3/23	82.10	0.80	16.32
PR 5/26	82.14	2.07	19.23

d) Raw and Bleached Colour <5 um Fraction

	Unbleached			Bleached		
SAMPLE	"L"	a	b	L	a	b
PR 1/8	88.09	-0.82	6.81	87.91	-0.28	4.9
PR 1/18	84.84	-0.44	6.27	84.77	-0.53	4.88

Bleaching was only carried out on the two most promising samples. In view of the results, no further samples were tested.

CONCLUSIONS

The raw and bleached colour is such that they would also be unsuitable for paper coating or filling. As is common with organically stained clays, bleaching actually reduces the reflectivity, although the yellowness is somewhat reduced.

The clays tested are relatively fine and plastic ball clays. The fired colour is such that they would only be suitable for relatively low value markets, which do not exist locally.

The very low grit level of most of the samples would make the clay eminently suitable for whiteware applications. During filtration it was noticed that the clays were apparently very strong and should the modulus of rupture be quite exceptionally high, there could be some application as a ball clay additive to sanitary ware bodies.

On the whole we believe that any further investigation of these clays is likely to be of academic interest only unless or until a major ceramic industry is established in the area.