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# CLAY AT SURGES BAY

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## SUMMARY

A near-outcrop of syenite porphyry at Surges Bay has been weathered to a clay, some of which was of sufficient smoothness and brightness to find a use as a filler in paper making.

The syenite intrudes sandstones and siltstones of Permian age. A recent boring campaign has indicated that the economic limits of the clay have now been reached.


## INTRODUCTION

For the past fifteen years, a local syndicate, Non-Metallic Minerals Syndicate N.L., has been quarrying clay from an area adjacent to the shoreline at Surges Bay. Most of this clay has been supplied to Australian Pulp and Paper Mills at Burnie for use as a paper filler. Its grade and brightness therefore must necessarily be of the first order. Recently the quality of the clay in the quarry face began to deteriorate and the depth of overburden to increase, so a boring campaign was laid out to ascertain if further reserves of this clay existed.

## LOCATION AND ACCESS

Surges Bay is a small bay on the western bank and near the mouth of the Huon River. It is five miles south of Geeveston and forty miles from Hobart and is reached by a sealed road. The clay deposit extends almost to the water's edge and a jetty, now out of repair, was once used by small ships.

## GEOLOGY

Permian rocks outcrop sparsely in this region but along the shore line are well exposed in beds generally having a dip of 5° to the north. Cores from the bores also give additional information about these rocks. The top beds behind the clay pit consist of white siltstones which become easily weathered to a soft clay. These may be correlated with the Ferntree Mudstone of the Hobart area. Less than 50 feet of these beds remain and they are underlain by about ten feet of grits and sandstones which are correlated with the Risdon Sandstone. These beds can be examined along the shore line and in the bores. They are generally extremely hard but vary greatly in grainsize from place to place, from a fine grained sandstone to a sandy matrix with large pebbles.

No. 6 bore which is lower in elevation than the remainder penetrates through the Risdon Sandstone into a black soft siltstone containing numerous pebbles. Perhaps this is equivalent to the Woodbridge Glacial Formation.

Into these Permian strata intrudes a small mass of syenite porphyry. This rock is a member of the alkali syenite suite, described by Edwards (1947) and others and outcropping principally in the vicinity of the town of Cygnet. The age of this suite is post Jurassic, probably early Tertiary. The intrusion at Surges Bay is dyke-like in form having a width of 400 feet and a length in a north-westerly

direction of about 1500 feet. Erosion has reached the top of the intrusion near the shore line. Exact limits of length can not be determined but there is no outcrop of the syenite at or near sea-level on the northern side of Surges Bay or in the creek to the south of the clay pits.

## THE CLAY

It is a fortunate coincidence that a member of the alkali syenite suite of such a composition should be intruded into sedimentary rocks in such a position that present day erosion has almost reached the top of the intrusion. This intrusive rock is mainly composed of feldspar, both as phenocrysts and in the groundmass, and this feldspar in favourable horizons has weathered to kaolin.

It would appear that the most favourable weathering conditions occur where there are from ten to twenty feet of Permian overburden to protect the intrusive material. The top few feet of this latter is not suitable as a commercial product as it is brown in colour, due to leaching of iron from the syenite. Below this where the iron is leached and the feldspars are weathered to kaolin is the required product. This commercial clay varies in thickness from one to twelve feet and then the feldspars become gritty (as they are not wholly weathered) and the groundmass grey in colour. At greater depths, the intrusion becomes less and less weathered.

A complication in this area is that the Permian siltstone weathers to a soft white clay, which although quite different in composition and useless to the paper makers may, to the uninitiated, be confused with the clay formed by the weathering of the syenite.

A section of the quarry face shows from the top:—

Surface Soil;
White clay (from weathered Permian rocks);
White Siltstone;
Hard white Sandstone-Conglomerate;
Yellow-Brown Clay;
Good White Clay;
Weathered Syenite Porphyry.

## THE BORING CAMPAIGN

Six bores averaging 54 feet in depth were put down. The results of these are:—

**No. 1 Bore** was put down 60 feet in advance of the quarry face at its northern end and about 10 feet above the top of the quarry. The overburden had increased to 52 feet and very little of the weathered syenite (less than one foot) would have been suitable for Australian Pulp and Paper Mills. The iron stained zone was wider than in the quarry face and just below this the phenocrysts of feldspar were gritty and the matrix grey.

Details are as follows:—

| *Footage.* | *Core.* | *Strata.* |
|---|---|---|
| 0′ — 7′ 6″ | Broken Pieces | Soft white fine siltstone. |
| 7′ 6″— 9′ | Broken Pieces | ditto |
| 9′ — 13′ | 1′ 6″ | White siltstone—six inches of hard grey quartzite at 13 feet. |
| 13′ — 17′ | Broken Pieces | Soft white siltstone. |
| 17′ — 20′ | 2′ | Harder white siltstone. |
| 20′ — 24′ | 3′ | ditto |
| 24′ — 28′ | 1′ 6″ | ditto |
| 28′ — 31′ | 1′ 6″ | ditto |
| 31′ — 34′ | 2′ | Fine white sandstone. |
| 34′ — 39′ | 1′ | ditto |
| 39′ — 41′ | 1′ | White sandstone. |
| 41′ — 44′ | 1′ | ditto |
| 44′ — 47′ | 1′ 6″ | Coarse grey sandstone. |
| 47′ — 49′ | 1′ 3″ | ditto |
| 49′ — 52′ 6″ | 1′ | Coarse grey hard sandstone. |
| | | *End of Permian.* |
| 52′ 6″— 54′ 2″ | 9″ | Weathered Syenite Porphyry: Yellow clay—no grit. |
| 52′ 2″— 57′ | 2′ 9″ | Yellow red clay—no grit. |
| 57′ — 59′ 4″ | 2′ 4″ | Yellow grey clay—no grit. |
| 59′ 4″— 62′ | 2′ 8″ | Greyish clay—little grit. |
| 62′ — 64′ | 2′ | Grey to white clay—little grit. |
| 64′ — 67′10″ | 2′ 6″ | White clay becoming gritty. |
| 67′10″— 69′ 6″ | 1′ | Greyish clay—gritty. |
| 69′ 6″— 72′ | 6′ | Grey clay—some feldspar, hard. |
| 72′ — 74′ | 3″ | ditto. |

**No. 2 Bore** was sited 100 feet north of the northern corner of the quarry face and about eight feet lower in elevation than the top of the quarry. The bore reached a depth of 39 feet without encountering weathered syenite.

| *Footage.* | *Core.* | *Strata.* |
|---|---|---|
| 0′ — 12′ | No Core | — |
| 12′ — 22′ 3″ | 6′ | Hard grey coarse sandstone. |
| 22′ 3″— 28′ 6″ | 5′ | ditto |
| 28′ 6″— 30′ | 1′ | Soft white siltstone. |
| 30′ — 33′ | 1′ | Soft white fine sandstone. |
| 33′ — 36′ | 6″ | White fine siltstone. |
| 36′ — 39′ | 6″ | Soft yellow fine sandstone. |

**No. 3 Bore** was sited 125 feet farther from the quarry face than No. 1. It was not expected that the overburden would lessen or the quality of the clay improve but the bore was put down in case the roof of the intrusion took an upward trend. The elevation of the bore and the amount of overburden was much the same as in No. 1, but the quality was even poorer.

| *Footage.* | *Core.* | *Strata.* |
|---|---|---|
| 0′ — 12′ | 3′ of broken pieces | Yellowish siltstone. |
| 12′ — 15′ | 2′ of broken pieces | White siltstone. |
| 15′ — 20′ | 1′ of broken pieces | Yellow-white fine-grained sandstone. |
| 20′ — 25′ | 1′ 3″ | White sandstone. |
| 25′ — 30′ | 6′ | ditto. |
| 30′ — 44′ | 5′ | Grey sandstone. |
| | | *End of Permian.* |
| 44′ — 46′ | 1′ | Yellow clay—no grit. |
| 46′ — 48′ 6″ | 2′ 6″ | ditto. |
| 48′ 6″— 53′ | 3′ 6″ | Yellow-grey clay—no grit. |
| 53′ — 56′ 6″ | 3′ | Reddish clay. |
| 56′ 6″— 58′ 6″ | 2′ | Yellowish clay becoming gritty. |
| 58′ 6″— 62′ | 3′ | Six-inch yellow clay then white, gritty. |
| 62′ — 64′ | 2′ | Weathered syenite—hard feldspars. |
| 64′ — 66′ | 1′ | ditto. |

**No. 4 Bore** was sited 125 feet back from the centre of the quarry at a higher elevation than bores 1 and 3. The bore was stopped at 66 feet before the intrusion, the roof of which must dip here, was encountered.

| *Footage.* | *Core.* | *Strata.* |
|---|---|---|
| 0′ — 10′ | 1′ 6″ | White sandstone. |
| 10′ — 19′ | 3′ | Coarser white sandstone. |
| 19′ — 28′ | 2′ | First half white siltstone. Second half white gritty sandstone. |
| 28′ — 35′ | 1′ | Fine white sandstone. |
| 35′ — 40′ | 2′ 6″ | ditto. |
| 40′ — 45′ | 6″ | White sandstone. |
| 45′ — 36′ | 1′ | Hard coarse yellow sandstone. |
| 56′ — 66′ | Broken Pieces | White sandstone. |

**No. 5 Bore** was sited at a much lower elevation, 125 feet back from the southern corner of the quarry. The weathered syenite was encountered at about the expected depth but like the material nearest it in the quarry was unsuitable for paper making.

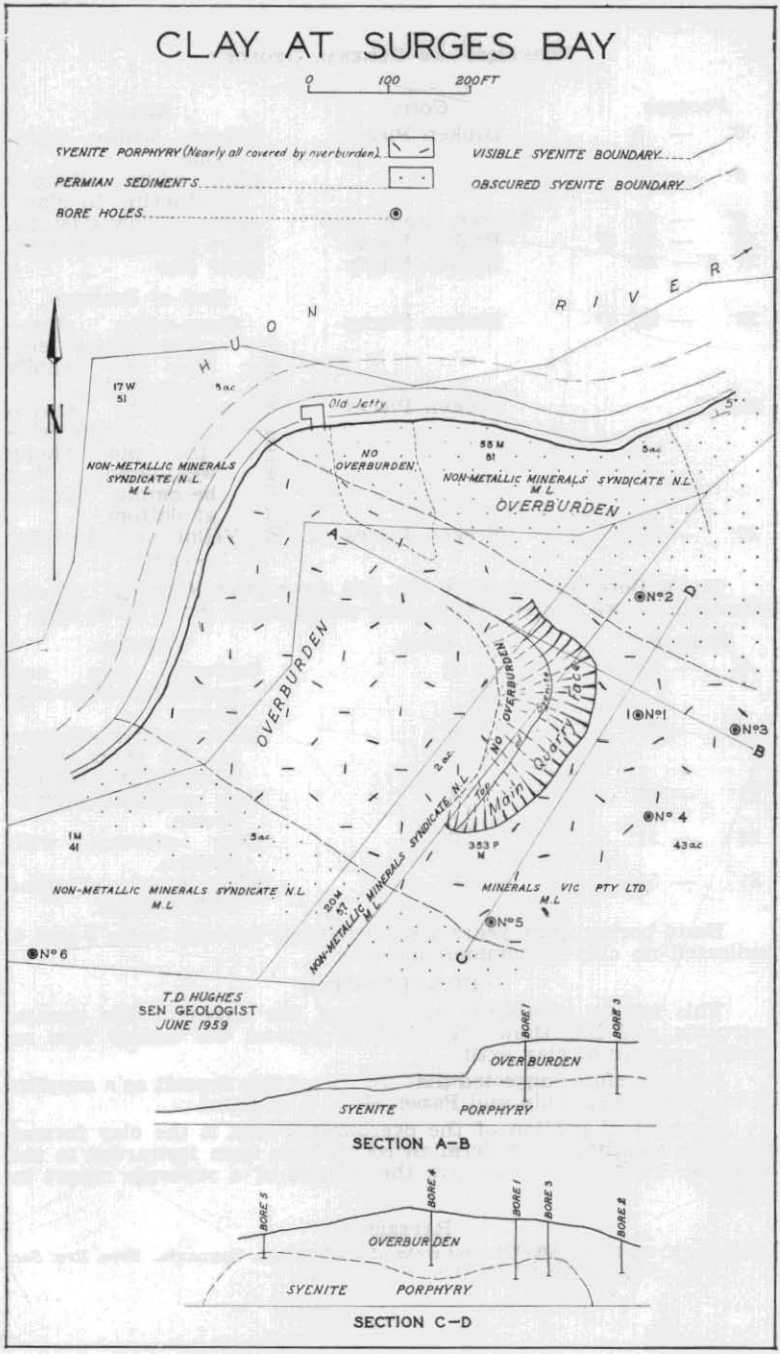


FIGURE 12.

5 cm

| *Footage.* | *Core.* | *Strata.* |
|---|---|---|
| 0′ — 5′ | Broken Pieces | Coarse white sandstone. |
| 5′ — 6′ | 1′ | Fine white siltstone weathering to clay. |
| 6′ — 13′ | Broken sandy clay | Coarse yellow siltstone. |
| 13′ — 21′ 6″ | Broken Pieces | Hard yellow sandstone. |
| 21′ 6″— 22′ | Broken Pieces | Grey clay. |
| | | *End of Permian.* |
| 22′ — 23′ 6″ | Broken Pieces | Weathered Syenite: Grey-white clay—gritty—some feldspar not wholly weathered. |
| 23′ 6″ | Broken Pieces | Weathered Syenite: Grey-white clay—gritty—some feldspar not wholly weathered but becoming yellow at bottom. |
| 27′ — 28′ | Broken Pieces | Weathered Syenite: Yellow and grey clay —gritty. |

**No. 6 Bore** was sited on the old Recreation Ground. As was expected, no weathered syenite was encountered down to 50 feet.

| *Footage.* | *Core.* | *Strata.* |
|---|---|---|
| 0′ — 12′ | 3′ | Surface, clay and weathered white siltstone. |
| 12′ —23′ | 9′ | White to grey siltstone to 20′ then sandstone—iron stained. |
| 23′ — 28′ | 4′ | Fine sandstone grey to brown. |
| 28′ — 31′ | 3′ | Grey siltstone with pebbles. |
| 31′ — 51′ | 18′ | Black to grey siltstone with pebbles. |

Hand boring some years ago in the area between bores 5 and 6, indicated no clay of commercial value.

## CONCLUSIONS

This boring campaign has limited the edges of the syenite intrusion and has shown that inland beyond the quarry face no useful supplies of clay exist.

It is therefore suggested that the life of this deposit as a supplier to the Australian Pulp and Paper Mills, is finished.

Samples of portion of the overburden, that is the clay formed from the weathering of Permian rocks, have been forwarded to the Ceramic Technologist and are the subject of a separate report by him.

## REFERENCE.

EDWARDS, A. B., 1947.—Alkali hybrid rocks of Port Cygnet, Tasmania. *Proc. Roy. Soc. Vict.*, 58 (N.S.), 81-115.