TASMANIA
DEVELOPMENT
AND RESOURCES

Tasmanian Geological Survey
Record 1995/02

The clay resources of Tasmania

by Ralph S. Bottrill

INTRODUCTION

The clay deposits of Tasmania fall under five different industrial classifications: china clay, ball clay, fire clay, bentonite, Fuller's earth and brick clay. Much of the following is summarised from Barrie (1965*a*, 1965*b*), Berkman (1976) and van Moort (1978).

CLASSIFICATION

China clay (or kaolin) is relatively pure kaolinite (hydrous aluminium silicate) that fires white with low shrinkage and low plasticity. This clay has a high demand in pottery, paper, refractory and rubber production. It is typically formed by hydrothermal alteration or weathering of feldspathic rocks (e.g. granites).

Ball clay (pipe clay) is similar but is impure and plastic, with high shrinkage, is commonly organic-rich, usually fires off-white, and is sedimentary in origin. It is used for bonding white ware.

Fire clay is any clay able to withstand a high degree of heat without fusion. It is usually highly aluminous and/or siliceous with low percentages of fluxing oxides (iron, magnesium, calcium, potassium and sodium) and comprises mostly kaolinite and quartz. It is used in refractory ceramic products.

Bentonite is composed mostly of montmorillonite, as is most *Fuller's earth* (bleaching clays); most swelling montmorillonite is classified as bentonite and non-swelling montmorillonite as Fuller's earth. Halloysite, attapulgite (palygorskite) and diatomite may also be used as Fuller's earths. Bentonite is used as a bonding agent in foundry sands, for sealing porous materials in civil engineering, drilling, etc., water purification and many other uses. Fullers earths are principally used for bleaching, degreasing and absorption (similar to zeolites).

Brick clays are usually illite and quartz-rich clays, low in calcium, magnesium and organic matter, but are typically iron rich. Weathered shale, slate and mudstone are typical sources. These clays are used in brick, tile and pipe manufacture.

DEPOSITS

The most important Tasmanian deposits and occurrences are shown on Figure 1 and are discussed below. A MIRLOCH listing is included as Appendix 1.

China clays

These occur in Tasmania in Tertiary alluvial deposits overlying tin-bearing gravels in the northeast (e.g. South Mt Cameron); kaolinised Devonian granite in the northeast (e.g. Tonganah); and weathered Cretaceous syenite in the southeast (e.g. Surges Bay; Hughes, 1959). Production for paper filler has been recorded from Tonganah, South Mt Cameron and Surges Bay. More details on kaolin are included as Appendix 2 (Bacon, 1992). The Adamsfield 'kaolin' (Bacon, 1992) contains no kaolinite and is more like a ball clay than true kaolin in nature (containing halloysite, quartz and illite), but needs testing.

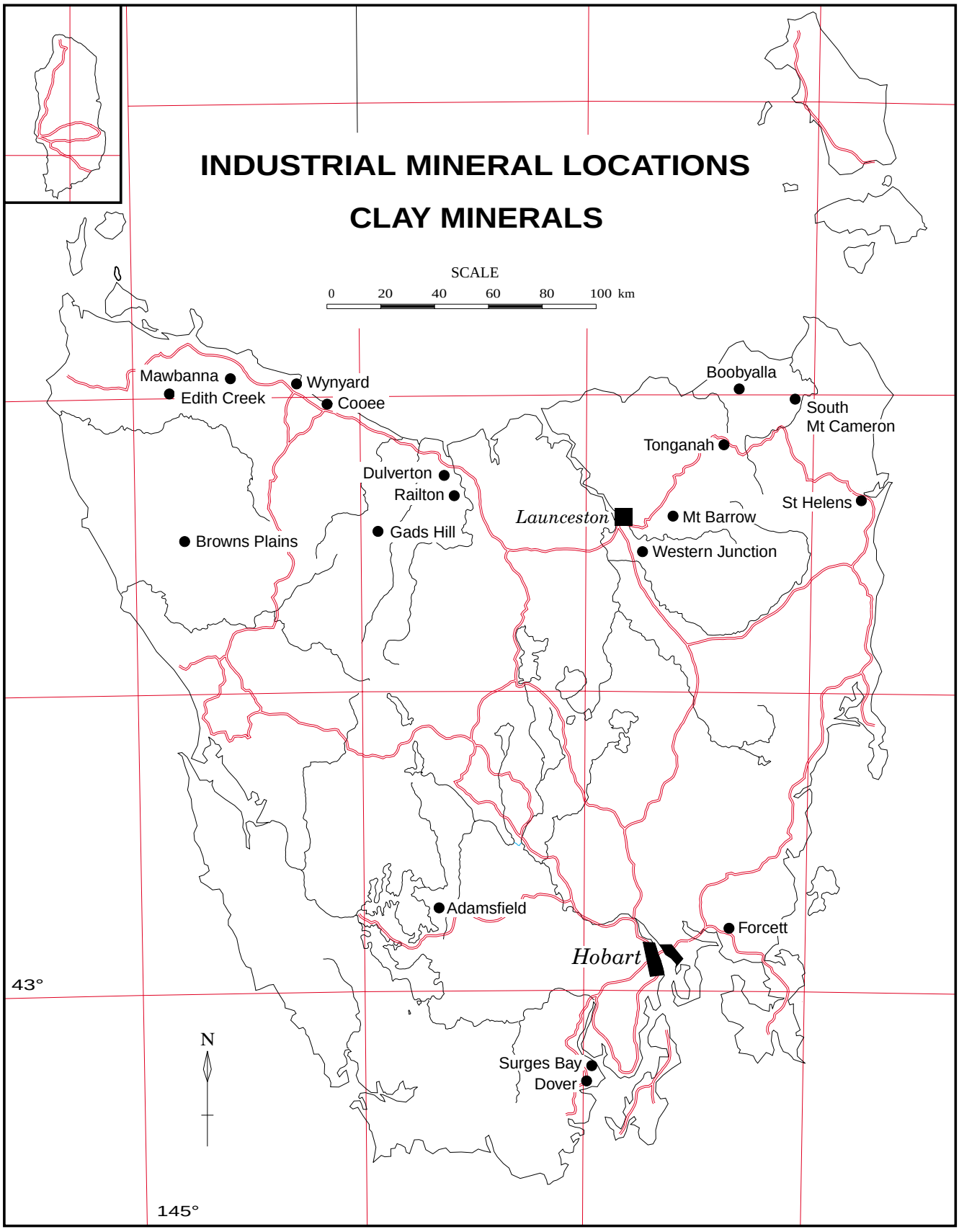
The Tonganah deposits (near Scottsdale) are the only kaolin deposits currently mined in Tasmania, and these produce about 22 000 t of washed kaolin annually for paper manufacture at the Amcor plant in Burnie (Higgins and Solomon, 1986; Bacon, 1992). The material is used only as paper filler, not coating, due to halloysite and other impurities. A pre-mining resource of 7.25 million tonnes was defined in 1977 (Dickinson, 1971). It is possible that the Tonganah kaolin is related to hydrothermal alteration rather than weathering (Higgins and Solomon, 1986).

Ball clays

These are present in Tertiary river and lake deposits in the Launceston basin (e.g. Western Junction; van Moort, 1978); Browns Plains (Shannon, 1994); and the St Helens/Georges Bay area. Production for paper filler has been recorded from St Helens (Bacon, 1992) but no deposits are worked at present on a large scale, although some small cottage industries exist for local potters, etc.

Fire clays

These occur with Tertiary alluvial and residual tin gravels in the northeast (e.g. South Mt Cameron); in detrital deposits in the Tertiary Launceston basin (e.g. Western Junction; van Moort, 1978); interbedded with Permo-Triassic coal measures (e.g. Dulverton; van


INDUSTRIAL MINERAL LOCATIONS
CLAY MINERALS
SCALE
0 20 40 60 80 100 km
Mawbanna
Edith Creek
Wynyard
Cooee
Boobyalla
South
Mt Cameron
Tonganah
Dulverton
Railton
Gads Hill
Browns Plains
Launceston
Mt Barrow
St Helens
Western Junction
Adamsfield
Forcett
Hobart
Surges Bay
Dover
43°
145°
N

Moort, 1978); and Precambrian clayey siltstone at Mawbanna. Production for paper filler has been recorded from Mawbanna (Bacon, 1992) but there is little or no exploitation anywhere in Tasmania at present.

Bentonite and Fuller's Earth

Bentonite and Fuller's earth deposits in Tasmania are poorly known and have not been exploited, although the major constituent, montmorillonite, is common in weathered and altered Tertiary basalt, Jurassic dolerite and other rock types throughout much of Tasmania (Anon., 1970). One deposit was assessed in the Boobyalla area (Telakowska, 1984), and another at Gads Hill (Askins, 1980). Palygorskite (attapulgite), a Fuller's earth mineral, occurs in minor amounts at Edith Creek (Bottrill,1989) and Mt Barrow (Bottrill, unpublished data).

Brick clays

These are widespread in Tasmania, and include Tertiary detrital deposits in the Launceston basin (Cole and Carthew, 1953); residual deposits derived from Triassic mudstone in the Hobart area; weathered Permian mudstone at Launceston, Wynyard, Dover, Forcett and Dulverton; and older Palaeozoic and Precambrian deposits (e.g. Cooee). About 60 000 t is produced annually, mostly from various sites in the Hobart and Launceston areas.

Cement clay

This is a miscellaneous form of clay used for cement manufacture. About 25 000 t /annum is produced at Railton by the Goliath Portland Cement Company.

REFERENCES

ANON. 1970. Catalogue of the Minerals of Tasmania. *Record Geological Survey Tasmania* 9.

ASKINS, P. W. 1980. EL 7/74 Tasmania, Report on Investigations, zeolites, Gads Hill area. Comalco Limited [TCR 80-1441].

BACON, C. A. 1992. Industrial minerals in Tasmania — Kaolin. *Report Department of Mines Tasmania* 1992/07.

BARRIE, J. 1965*a*. Bentonite and Fullers Earth, *in:* MCLEOD, I. R. (ed.). Australian Mineral Industry: The mineral deposits. *Bulletin Bureau Mineral Resources Geology and Geophysics Australia* 72:73–82.

BARRIE, J. 1965b. Clays, *in:* MCLEOD, I. R. (ed.). Australian Mineral Industry: The mineral deposits. *Bulletin Bureau Mineral Resources Geology and Geophysics Australia* 72:113-126

BERKMAN, D. A. 1976. Field Geologists Manual, *Monograph Serial Australasian Institute of Mining and Metallurgy* 9:72–73.

BOTTRILL, R. S. 1989. Palygorskite from Edith Creek. *Report Department of Mines Tasmania* 1989/16.

COLE, W. F.; CARTHEW, A. R. 1953. The mineralogical composition of some Tasmanian clays. *Papers and Proceedings Royal Society of Tasmania*. 87:1–12.

DICKINSON, D. R. 1971. *Kaolin in the Scottsdale District*. Unpublished Report to Australian Pulp and Paper Manufacturers [TCR 77-1195].

HIGGINS, N. C.; SOLOMON, M. 1986. Genesis of the clay deposits of N.E. Tasmania: a product of low temperature hydrothermal alteration? *Genesis of Tin-Tungsten Deposits and their associated granitoids: Conference Proceedings*. 30–33. Bureau of Mineral Resources, Canberra, Australia

HUGHES, T. D. 1959. Clay at Surges Bay. *Technical Report Department of Mines Tasmania* 4:51–56.

SHANNON, C. H. C. 1989. *Documentation on Browns Plains clay deposit*. Corinna Clays Partnership. [TCR 94-3542].

TELAKOWSKA, Z. 1984. *Preliminary assessment of EL 1/83 Ringarooma, Tasmania*. ACA Howe Australia Pty Ltd [TCR 84-2209].

THREADER, V. M. 1976*a*. Kaolinitic clay — Tasmania, *in:* KNIGHT, C. L. (ed.). Economic Geology of Australia and Papua New Guinea. 4. Industrial Minerals and rocks. *Monograph Serial Australasian Institute of Mining and Metallurgy* 8:57.

THREADER, V. M. 1976b. Structural clay — Tasmania, in: KNIGHT, C. L. (ed.). Economic Geology of Australia and Papua New Guinea. 4. Industrial Minerals and rocks. *Monograph Serial Australasian Institute of Mining and Metallurgy* 8:56.

VAN MOORT, J. C. 1978. The mineralogy and chemistry of Tasmanian clay deposits. *Journal of the Australian Ceramic Society* 14:13–19.

[4 January 1994]

APPENDIX 1

MIRLOCH listing

STATUS

OPM	Operating mine
NOR	Non-operating mine — reserves known
NOX	Non-operating mine — reserves unknown
AMR	Abandoned mine — reserves known
AMX	Abandoned mine — reserves unknown
AMO	Abandoned — mined out
PEX	Prospect — explored
PUN	Prospect — unexplored
MAR	Mineralised area
MOC	Mineral occurrence

SIZE OF DEPOSIT

ND	Not determined
VS	Very small: <100 tonnes (or cubic metres)
SM	Small: 100 t – 10 000 t
ME	Medium: 10 000 t – 1 000 000 t
LA	Large: 1 000 000 t – 10 000 000 t
VL	Very large: > 10 000 000 t

HOST ROCK

PCS	Precambrian sequences
CSS	Cambrian sedimentary sequences
CIG	Cambrian igneous sequences
MRV	Mount Read Volcanics and correlates
OMS	Owen Conglomerate/Moina Sandstone and correlates
GLE	Gordon Limestone/Eldon Group and correlates
MAT	Mathinna Beds
DGN	Devonian granitoid
PSG	Parmeener Supergroup
JCS	Jurassic–Cainozoic sequences

AGE OF MINERALISATION

ND	Not determined
PC	Precambrian
EC	Eocambrian–Early Cambrian
MC	Middle–Late Cambrian
OD	Ordovician–Early Devonian
LD	Late Devonian (granite associated)
PT	Permo–Triassic
JC	Jurassic–Cretaceous
TT	Tertiary
QT	Quaternary

FORM OF DEPOSIT

VMS	Volcanic massive sulphide
STFM	Stratiform
VEIN	Vein (single, sheet, saddle)
STWK	Stockwork
DISS	Disseminated
REPL	Replacement
PIPE	Pipe
PLAC	Placer
RESD	Residual
OTHR	Other (noted in refs)

EXPLORATION OF DEPOSIT

NO	Nil or no known exploration
PS	Prospecting
GM	Geological mapping
GC	Geochemical surveys
GP	Geophysical surveys
DR	Drilling

Reference No.	Mine/Deposit Name	Commodity Major	Minor	AMG Reference mE	mN	Error	Sheet	Status	Size	Host rocks	Age	Form	STK	Exploration
24076	Echo Reference: TCR 84-2209	Bent	Cf	578500	5468700	<100	84162	PEX		JCS	TT	RESD	-99	PS
24077	Boomerang Reference: TCR 84-2209	Bent	Cf	579100	5468300	<100	84162	PEX		JCS	TT	RESD	-99	PS
24072	Yz Wkgs; Ah Kaw Ck Reference: TCR 79-1322	Sn, Ck	Clay	583300	5464000	<100	84162	AMX		JCS	TT		-99	PS
24073	Hardwickes Lagoon (N) Reference: TCR 79-2209	Ck	Clay	578400	5469800	<100	84162	PEX		JCS	TT		-99	PS
24074	Hardwickes Lagoon (S) Reference: TCR 79-2209	Ck	Clay	578500	5468600	<100	84162	PEX		JCS	TT		-99	PS
32263	Clifton Creek Reference: TCR 79-1322	Ck	Clay	580000	5459000	<500	84151	PEX		JCS	TT		-99	PS
37167	Railton Reference: ML Plan	Clay		451000	5424000	<500	81152	OPM					-99	
41070	St Helens Clay Reference: UR1992/07; TW (1904) OS	Ck	Clay	607800	5424000	<100	85152	AMO		JCS	TT	STFM	-99	
43172	Browns Plains Clay Reference: TCR 88-2776	Ck	Clay	347900	5391700	<100	79144	PEX		CSS	TT	STFM	-99	GM, GC, DR
45030	Gads Hill Reference: TCR 80-1441	Ze, Cf	Bent	431800	5397700	<500	81144	PEX		JCS	TT	REPL	-99	GM, DR
21016	Mawbanna Reference: Min Map 2	Clay		358900	5473200	<500	79162	PEX		JCS	QT	RESD	-99	
21017	APPM Reference: Min Map 2	Clay		365600	5470700	<500	79162	PEX		JCS	QT	RESD	-99	
22005	Wynyard Reference: ER22	Clay		391000	5461000	>1000	80163	OPM		JCS	QT	RESD	-99	PS
28023	Un-named Reference: Min Map 5	Clay		400500	5438500	<1000	80151	PEX		JCS	TT	RESD	-99	PS
28024	Un-named Reference: Map 28	Clay		392100	5456700	<100	80154	PEX		JCS	TT	RESD	-99	PS
28033	Un-named Reference: Min Map 5	Clay		408600	5444500	<500	80151	PEX		JCS	TT	RESD	-99	PS
29086	Un-named Reference: Map 29, Min Map 6, ER 29	Clay		429100	5440700	<100	81154	PEX		JCS	QT	RESD	-99	PS

Reference No.	Mine/Deposit Name	Commodity Major	Minor	AMG Reference mE	mN	Error	Sheet	Status	Size	Host rocks	Age	Form	STK	Exploration
29088	Un-named Reference: Map 29, Min Map 6, ER 29	Clay		427600	5443200	<100	81154	PEX		JCS	QT	RESD	-99	PS
29101	Un-named Reference: Min Map 6	Clay		432000	5440700	<500	81154	PEX		JCS	QT	RESD	-99	PS
29111	Un-named Reference: Map 29, Min Map 6, ER 29	Clay		427500	5443800	<100	81154	PEX		JCS	QT	RESD	-99	PS
32141	? Reference: Sheet 32	Clay		550300	5443100	<100	84154	PEX		JCS	TT	RESD	-99	PS
32142	? Reference: Sheet 32	Clay		550000	5442500	<100	84154	NOR		JCS	TT	RESD	-99	PS
32143	Tonganah Reference: Sheet 32	Clay		549700	5442000	<100	84154	OPM	LA	JCS	TT	RESD	-99	PS
32144	Un-named Reference: Sheet 32	Clay		549800	5439900	<100	84154	NOR		JCS	TT	RESD	-99	PS
32145	? Reference: Sheet 32	Clay		550300	5439900	<100	84154	NOR		JCS	TT	RESD	-99	PS
32146	? Reference: Sheet 32	Clay		550700	5440000	<100	84154	NOR		JCS	TT	RESD	-99	PS
32147	? Reference: Sheet 32	Clay		551050	5440600	<100	84154	NOR		JCS	TT	RESD	-99	PS
32152	? Reference: TDM plan 1207	Clay		581600	5459900	<500	85151	PEX		JCS	TT	PLAC	-99	PS
32153	? Reference: TDM plan 1207	Clay		581100	5459700	<500	85151	PEX		JCS	TT	PLAC	-99	PS
32154	? Reference: TDM plan 1207	Clay		580100	5455900	<500	85151	PEX		JCS	TT	PLAC	-99	PS
37147	 Reference: Min Map 6	Clay		445500	5417800	<500	81152	PEX		JCS	TT	STFM	-99	PS
37148	Un-named Reference: Min Map 6	Clay		451700	5424700	<500	81152	PEX		JCS		STFM	-99	PS
82024	New Town Reference: Blake (1960) TR4	Clay		524000	5254000	>1000	83122	MOC		PSG	TT	STFM	-99	PS
82025	Austins Ferry–10 Mile Hill Reference: Hughes (1960) TR1	Clay		520500	5264500	<1000	83122	AMX		PSG	TT	STFM	-99	PS

Reference No.	Mine/Deposit Name	Commodity Major	Minor	AMG Reference mE	mN	Error	Sheet	Status	Size	Host rocks	Age	Form	STK	Exploration
82026	Mt Rumney-1	Clay		534500	5255000	<500	83122	PEX		PSG	TT	STFM	-99	PS
	Reference: Hughes and Blake (1959) TR3													
82027	Collinsvale Road	Clay		518000	5260000	>1000	83123	PEX		PSG	TT	STFM	-99	PS
	Reference: Threader (1971) TR14													
82028	Claremont	Clay		518700	5262800	<500	83123	AMX		PSG	TT	STFM	-99	PS
	Reference: Blake (1961) TR5													
82029	Knocklofty (Crisp & Gunn)	Clay		524000	5253000	>1000	83122	AMX		PSG	TT	STFM	-99	PS
	Reference: Threader (1971) TR14													
82030	Mt Rumney-2	Clay		535000	5253700	<500	83122	PEX		PSG	TT	STFM	-99	PS
	Reference: Hughes and Blake (1959) TR3													
82031	Granton	Clay		519000	5267000	>1000	83123	AMX		PSG	TT	STFM	-99	PS
	Reference: Hughes and Blake (1959) TR3													
82032	Chigwell	Clay		520000	5260000	>1000	83123	PEX		PSG	TT	STFM	-99	PS
	Reference: Hughes and Blake (1959) TR3													
83006	Lewisham; Forcett	Clay		551000	5258000	<1000	84123	OPM		JCS	TT		-99	
	Reference: Green et al. (1988) Min. Map; ML Plans													
83007	Plunkett Pt	Clay		558000	5240000	<1000	84123	AMX					-99	
	Reference: Brill and Hale (1954) PPRST 88													
88031	Kingston–Spring Farm	Clay		523500	5241000	<1000	83122	OPM		PSG	TT	STFM	-99	PS
	Reference: Threader (1971) TR14													
89010		Clay		568700	5222300	<100	84111	NOX		PSG	PT	STFM	-99	PS
	Reference: Forsyth and Bacon UR1987/10													

Search options are:
Either major or minor commoditiesBENT/MONT/CK/KAOL/CLAY/

STATUS

OPM	Operating mine
NOR	Non-operating mine — reserves known
NOX	Non-operating mine — reserves unknown
AMR	Abandoned mine — reserves known
AMX	Abandoned mine — reserves unknown
AMO	Abandoned — mined out
PEX	Prospect — explored
PUN	Prospect — unexplored
MAR	Mineralised area
MOC	Mineral occurrence

COMMODITIES

Ck	Kaolinite
Cf	Fullers earth
Bent	Bentonite
Ze	Zeolites
Sn	Tin

APPENDIX 2

Tasmania Department of Mines — Report 1992/07

Industrial minerals in Tasmania — Kaolin

by C. A. Bacon

INTRODUCTION

Kaolin suitable for use as a paper filler has been extracted from several places in Tasmania. At the present time kaolin is produced at Tonganah, near Scottsdale. No clay suited to coating paper has been located within the State; all coating clay is imported.

SURGES BAY

Kaolin was mined at Surges Bay from 1944 to 1959. The source was a weathered alkaline intrusive rock. The clay was of sufficient quality to be used as a paper filler, and mining only ceased due to the exhaustion of the deposit.

The kaolin was formed from the weathering of feldspars in the alkaline intrusive rock, part of the alkali syenite suite cropping out in the Cygnet area, which have been described by Edwards (1947). The weathered Cretaceous intrusive rock is overlain by a band of Fern Tree Mudstone (of Permian age) and this has protected the clay from erosion. The mudstone itself has weathered to a white, gritty clay and the contact between the two is not clear to the untrained eye.

When mined, the top two metres or so of "gritty clay" was discarded. The underlying clay contained pieces, chunks even, of only partially weathered feldspars which were mined along with the clay. No separation was made at the mine of weathered/unweathered material.

Extraction of the clay began in 1944 on ML 1M/41 of 5 acres by the Nonmetallic Minerals Syndicate NL. Extraction was initially 30 tonnes or so a week, and the work employed five men (Hughes, 1948). After fifteen years, the "pod" of kaolin was showing signs of being exhausted. Six holes were drilled; these showed that the limits of the weathered porphyry had been reached, and the operation closed in 1959 (Hughes, 1960). Altogether some 28 000 tonnes of clay were mined, and all was used by APPM as a paper filler.

The reserves of this deposit have been exhausted.

MAWBANNA

A weathered Precambrian clayey siltstone was mined near Mawbanna between 1940 and 1956 for use as a paper filler. The total production from the pit was 9451 m^3. Use of the material ceased due to replacement with more pure clay from the northeast, the presence of very fine-grained silica in the Mawbanna clay being deleterious to the paper making machinery (Threader, 1976).

SOUTH MT CAMERON

Clay was mined in conjunction with tin at the Endurance mine at South Mt Cameron from 1945 to 1962, and was used exclusively by the paper industry as a "filler" clay.

The clay at South Mt Cameron forms "drifts" in granite-derived Tertiary sediments of sand and gravel, certain horizons of which are tin bearing. The clay was mined in conjunction with the tin. Extensive laboratory tests were made in 1962 by the Department of Mines, and from these experiments a pilot plant was designed to separate the clay from the associated quartz grit (Manson *et al.*, 1962). This process was quite successful, and clay derived from this source was used satisfactorily for some time. Around 53 000 t of clay was produced. The operation ceased because the reserves at this location were largely exhausted.

There would still be some remaining reserves of kaolinite clays associated with both alluvial and eluvial (weathered granite) tin workings in the northeastern part of the State. No quantifiable estimates of such reserves can be made on the available information.

ST HELENS

From 1950 to 1954 clay was mined by a Mr M. Kirwan and four employees from a deposit near St Helens. The exact location of this deposit is not known. Altogether some 15 200 t of kaolin was produced. Presumably mining ceased due to exhaustion of the deposit.

TONGANAH

Kaolin is mined by the Ballarat Clay Company at Tonganah, to the east of Scottsdale in the State's northeast. The clay is used as a paper filler at the APPM plants at Burnie and Wesley Vale. The area of the mine and treatment plant is held under ML 38M/76.

The kaolin is derived from decayed feldspars in weathered *in situ* granite. The crumbling granite is scooped up by hydraulic excavator after the overburden of soil and vegetation has been removed. From the weathered granite, the kaolin fraction is removed at the nearby treatment plant by cycloning and screening. The reject material is returned to the mined-out pits, which are recontoured when filled, and sown with pasture.

Production for the 1988/89 financial year was 30 000 tonnes of kaolin product. This mine is at present the only one producing kaolin in the State. The clay is suitable only for "filler" clay, and imported clay is still used as a "coating" clay for the paper produced. To date around 300 000 t of filler clay has been produced.

ADAMSFIELD

Thick lenses of white clay occur interbedded with alluvial gravels in the valley of the Adam River at Adamsfield. The material is partly derived from the ultramafic rocks in the surrounding higher country. Osmiridium was extracted from the alluvial wash earlier this century.

No detailed investigation has been made of the clay. A spot sample was analysed as:

Illite	40%
Quartz	35%
Halloysite*	25%

[* a clay mineral having the same chemical composition as kaolinite, but a different crystal structure and consequently different physical properties. Apparently halloysite can be converted to kaolinite by heating.]

The clay is a clean white colour and is worthy of further studies to determine if the clay can produce a product suitable for paper manufacture.

REFERENCES

EDWARDS, A. B. 1947. Alkali hybrid rocks of Port Cygnet, Tasmania. *Proc. R. Soc. Vict.* 58:81–115.

HUGHES, T. D. 1948. Clay deposit at Surges Bay. *Unpubl. Rep. Dep. Mines Tasm.* 1948:44.

HUGHES, T. D. 1959. Clay at Surges Bay. *Tech. Rep. Dep. Mines Tasm.* 4:51–56.

MANSON, W. St. C.; LIDDY, J.; JAMES, P. L. 1962. Clay — South Mount Cameron. *Tech. Rep. Dep. Mines Tasm.* 6:99–160.

THREADER, V. M. 1976. Kaolinitic clay — Tasmania, *in*: KNIGHT, C. L. (ed.). Economic geology of Australia and Papua New Guinea. 4. Industrial minerals and rocks. *Monogr. Ser. australas. Inst. Min. Metall.* 5:57.

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