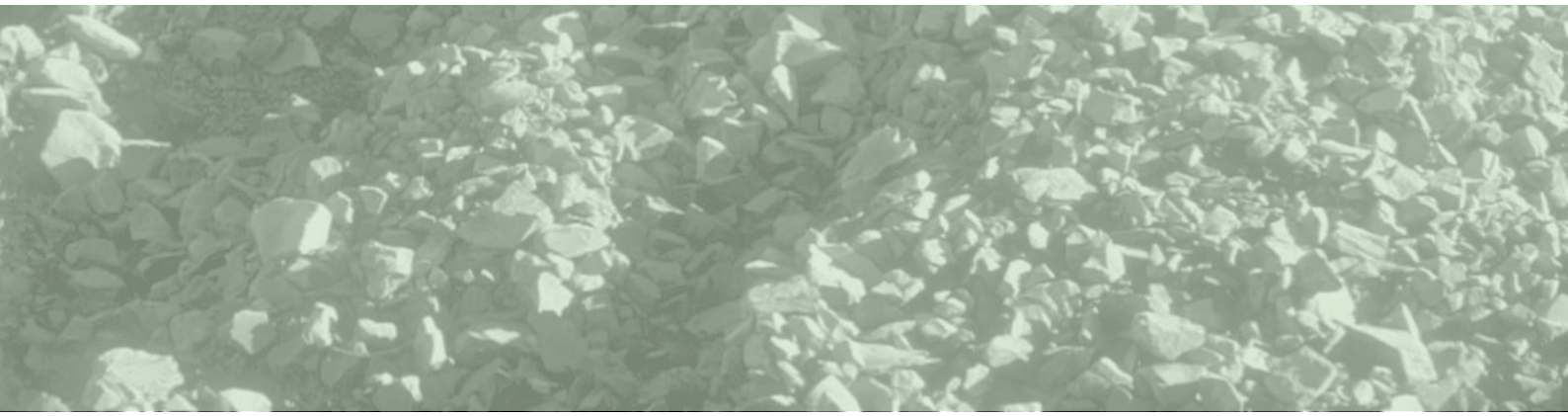
THE INDUSTRIAL MINERAL DEPOSITS OF TASMANIA



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THE INDUSTRIAL MINERAL DEPOSITS OF TASMANIA

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Overview

This publication contains a summary of Tasmanian industrial minerals (including construction materials and coal): their distribution, recent production statistics, existing and past operations, and opportunities for development. Locality maps are provided for most of the commodities, and for many of them the distribution of prospective rock types is also shown.

There is no universally accepted definition for industrial minerals, but they generally include the non-metallic minerals and most of those minerals that are not chemically refined from their ores, but are used 'as mined', in bulk. For the purpose of this summary, construction materials and coal are included as industrial minerals.

Industrial minerals contribute substantially to the construction and manufacturing sectors of the Tasmanian economy. Of the 635 Mining Leases in existence at the end of June 2007, some 546 were held for construction materials or industrial minerals.

A large range of materials used in building roads, bridges, houses, factories and shopping centres came from these leases. These products include road base and surfacing materials of varying specifications, sand for making concrete, bedding sand for laying pipes and pavers, joint filling sand, foundry or moulding sand, glass sand, top dressing or garden sand. Clay is quarried to produce bricks and tiles, for use in making cement, capping waste dumps and for use in revegetation projects.

Silica flour is used to produce high quality lens glass, LCD screens, optical fibre, silicon chips and lead crystal. Lump silica is used to make metallurgical products. Quartzite is used to produce road construction materials, building sand, concrete and road making aggregates, hot-mix sealants and concrete blocks.

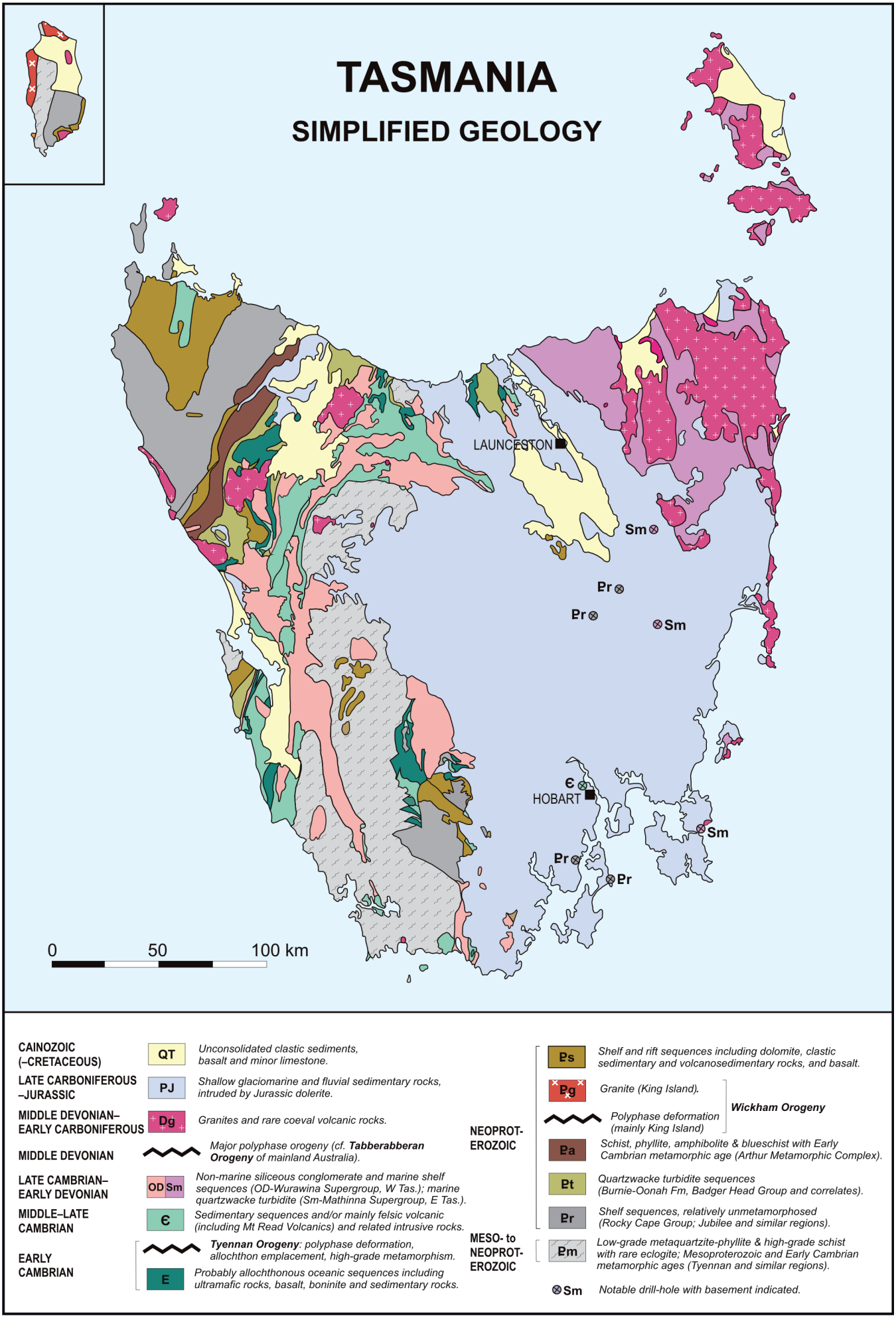
Limestone is used as a raw ingredient in cement manufacture and for agricultural use. Dolomite is used for metallurgical and agricultural purposes. Sandstone is quarried and cut into blocks and used for construction purposes, either in a load-bearing or decorative capacity. Slate is mined for use as flooring and facing stone has been produced periodically from a variety of rock types.

Tasmanian coal is used mainly in the manufacture of cement and paper products.

The total annual value of production of the commodities outlined in this report is approximately $101 million (2006/2007 figures).

Substantial, but as yet undeveloped deposits of magnesite, magnetite, fluorite, wollastonite and ochre occur in Tasmania.

Some of the commodities included above have yet to be produced in Tasmania, although potential exists. More information is available in the references cited, and via the online Mineral Deposits and Document Search databases maintained by Mineral Resources Tasmania (www.mrt.tas.gov.au).


TASMANIA
SIMPLIFIED GEOLOGY
LAUNCESTON
HOBART
Sm
Pr
Pr
Sm
Є
HOBART
Sm
Pr
Pr
0
50
100 km
CAINOZOIC (–CRETACEOUS)
QT
Unconsolidated clastic sediments, basalt and minor limestone.
LATE CARBONIFEROUS –JURASSIC
PJ
Shallow glaciomarine and fluvial sedimentary rocks, intruded by Jurassic dolerite.
MIDDLE DEVONIAN–EARLY CARBONIFEROUS
Dg
Granites and rare coeval volcanic rocks.
MIDDLE DEVONIAN
Major polyphase orogeny (cf. Tabberabberan Orogeny of mainland Australia).
LATE CAMBRIAN–EARLY DEVONIAN
OD Sm
Non-marine siliceous conglomerate and marine shelf sequences (OD-Wurawina Supergroup, W Tas.); marine quartzwacke turbidite (Sm-Mathinna Supergroup, E Tas.).
MIDDLE–LATE CAMBRIAN
Є
Sedimentary sequences and/or mainly felsic volcanic (including Mt Read Volcanics) and related intrusive rocks.
EARLY CAMBRIAN
Tyennan Orogeny: polyphase deformation, allochthon emplacement, high-grade metamorphism.
E
Probably allochthonous oceanic sequences including ultramafic rocks, basalt, boninite and sedimentary rocks.
NEOPROT-EROZOIC
Ps
Shelf and rift sequences including dolomite, clastic sedimentary and volcanosedimentary rocks, and basalt.
Pg
Granite (King Island).
Polyphase deformation (mainly King Island)
Wickham Orogeny
Pa
Schist, phyllite, amphibolite & blueschist with Early Cambrian metamorphic age (Arthur Metamorphic Complex).
Pt
Quartzwacke turbidite sequences (Burnie-Oonah Fm, Badger Head Group and correlates).
Pr
Shelf sequences, relatively unmetamorphosed (Rocky Cape Group; Jubilee and similar regions).
MESO- to NEOPROT-EROZOIC
Pm
Low-grade metaquartzite-phyllite & high-grade schist with rare eclogite; Mesoproterozoic and Early Cambrian metamorphic ages (Tyennan and similar regions).
Sm
Notable drill-hole with basement indicated.

Hard Rock

Dolerite, Basalt, Quartzite

Rock materials excellent for most construction purposes, notably dolerite and basalt, are widespread in Tasmania and are found close to all major population centres. These materials are mostly used in road construction, structural fill and concrete aggregate. Current annual total production is approximately 5.9 million tonnes. (Natural gravel and sand, and dimension stone are considered separately).

OCCURRENCES/GEOLOGICAL SETTING

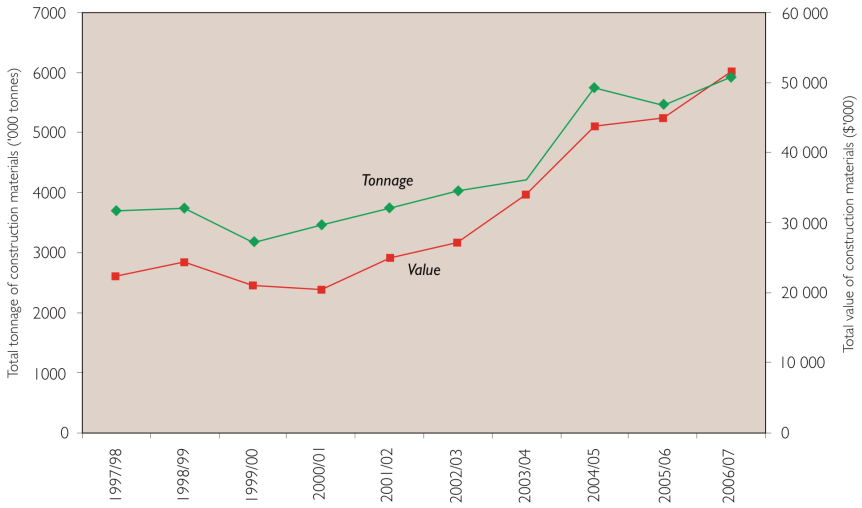
Jurassic dolerite is the most abundant rock type in eastern and central Tasmania, occurring as sills up to 600 metres thick intruding older rocks. Tertiary basalt flows are widespread, particularly in northern Tasmania. A number of other rock types are quarried for construction use, notably Cambrian siliceous conglomerate, quartzite and chert, Ordovician limestone, and Precambrian quartzite. Locations of major quarries tend to be determined as much by proximity to markets and competing land uses as by geological factors

EXISTING OPERATIONS

COMPANY	LOCALITY	ROCK TYPE	ANNUAL PRODUCTION (tonnes) 2006/2007
Boral Resources (Tasmania) Ltd	Launceston	dolerite	1 000 000
Boral Resources (Tasmania) Ltd	Nook	basalt	
Boral Resources (Tasmania) Ltd	Bridgewater	basalt	
BIS Industrial Logistics	Western Junction	basalt	647 000
BIS Industrial Logistics	Ridgley	basalt	
BIS Industrial Logistics	Birralee	quartzite	
BIS Industrial Logistics	Talisker	dolerite	
Duggans Pty Ltd	Cradoc	dolerite	110 000
Circular Head Council	–	quartzite	–
Gunns Forest Products	45 quarries, widespread	various	120 000
Hanson Construction Materials Pty Ltd	Flagstaff Gully, Hobart	dolerite	280 000
HBMI Pty Ltd	Leslie Vale	dolerite	590 000
Lloyds North	Kindred	basalt	92 000
Norske Skog	18 quarries, widespread	various	32 000
Stornoway Quarries Pty Ltd	Frankford	sandstone	200 000
Stornoway Quarries Pty Ltd	Raeburn (Breadalbane)	basalt	–
Treloar Transport	Shackley Hill	chert	–

PRODUCTION

Total tonnage and total value of production, hard-rock construction materials 1998–2007.



GRADE

Numerous engineering tests have been conducted on aggregates for various purposes (compressive and tensile strength, density, impermeability, abrasion resistance, and surface texture). The physical and chemical properties of Tasmanian Jurassic dolerite makes it highly suitable for a variety of purposes. Compressive strength is typically >250 MPa, with modulus of rupture of 35 to 50 MPa (Sloane, 1991; Leaman, 2002).

EXPLORATION AND HISTORICAL OPERATIONS

Jurassic dolerite in the Bell Bay area has been investigated as a potential source of large volumes of aggregate for export (Harrington, 1991, 1992).

The potential of gabbro near Beaconsfield as a decorative crushed gravel has been assessed by Reed (2006).

Abandoned and currently operating quarries for construction materials in Tasmanian are catalogued by MRT in the Mineral Deposits database (see www.mrt.tas.gov.au).

OPPORTUNITIES

Most regions in Tasmania have adequate supplies of gravel. Most municipal councils source gravel from the larger operators. Apart from the larger suppliers listed above there are numerous smaller operators. There are currently 570 mining leases for Category 3 Minerals, defined as rock, stone, gravel, sand and clay used in construction, bricks and ceramics.

About 100 quarries are used as a source of road construction materials on land administered by Forestry Tasmania.

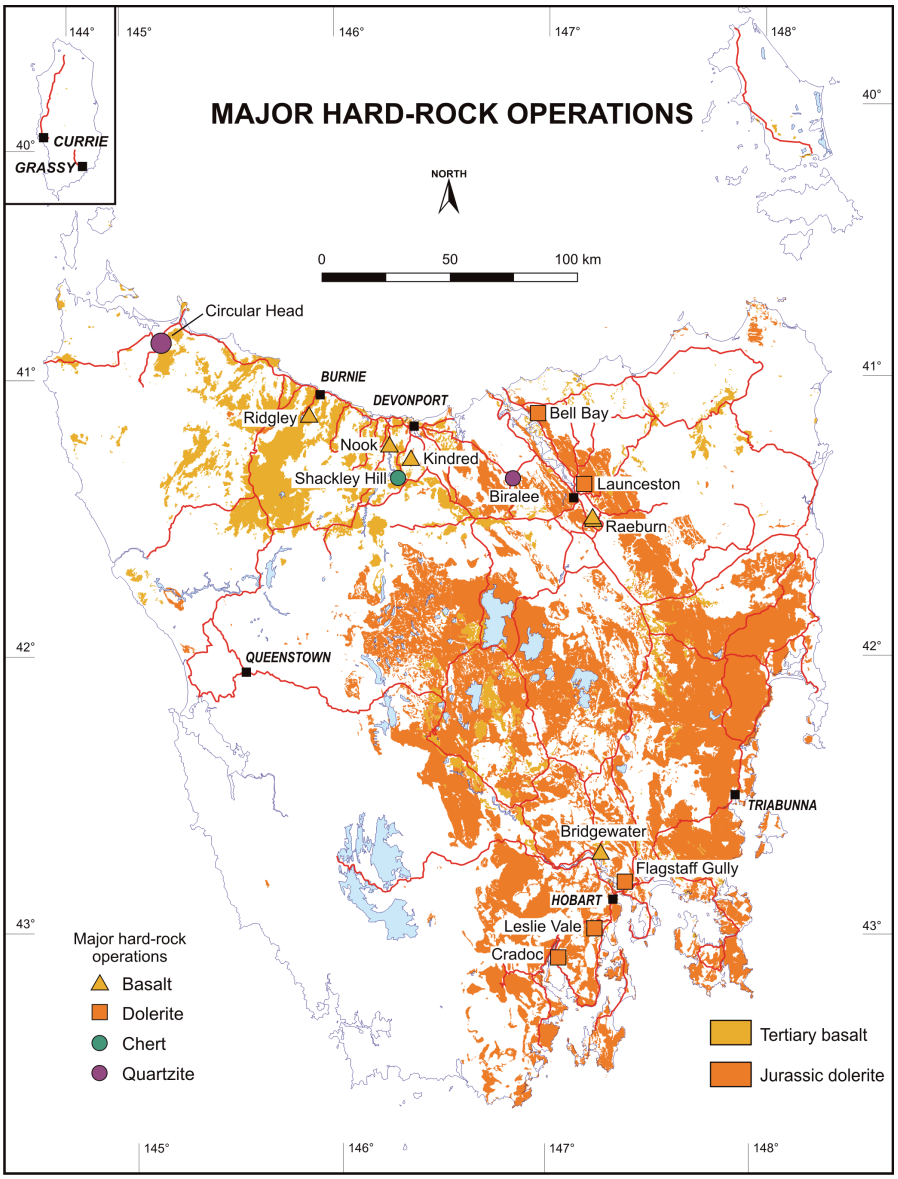
In most areas the market for supply of hard-rock construction materials is highly competitive, although availability and quality of gravel is a concern in the Break O'Day municipality (Anon., 2007).

Southern Tasmania has considerable gravel resources in the form of weathered dolerite.

There may be opportunities for specialist applications. Tasmanian basalts are compositionally varied and some may be suitable for rockwool manufacture. Crushed quartzite gravel from western Tasmania has superior durability and skid resistance as a road sealing aggregate, relative to dolerite and basalt.

Because of the low unit value and wide availability of construction materials, there is no significant interstate trade, although rising demand and decreased local availability in Pacific Rim metropolitan centres may make export of hard-rock construction materials from Tasmania economic (Harrington, 1991, 1992). Areas of dolerite close to Bell Bay are held under retention lease by B3 (Bell Bay Bluestone) Pty Ltd with this scenario in mind (see also Turner, 1993).

Distribution of Jurassic dolerite and Tertiary basalt and major hard-rock construction material operations.



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Sand & Gravel
(natural aggregate)

Sand is essential for the manufacture of concrete and other pavement materials used in the building and construction industry.

Sharp sand is free from clay and other contaminants and is primarily used in the manufacture of concrete.

Fat sand contains some clay and is primarily used for mortar and loam. Fat sand can be washed to produce sand suitable for concrete production, although this adds to the cost.

Other uses of sand include bedding sand, foundry or moulding sand, glass sand, and top dressing or garden sand. Foundry sand requires the SiO_2 content to be over 99.6%. Glass-making sand generally requires an SiO_2 content of over 99%.

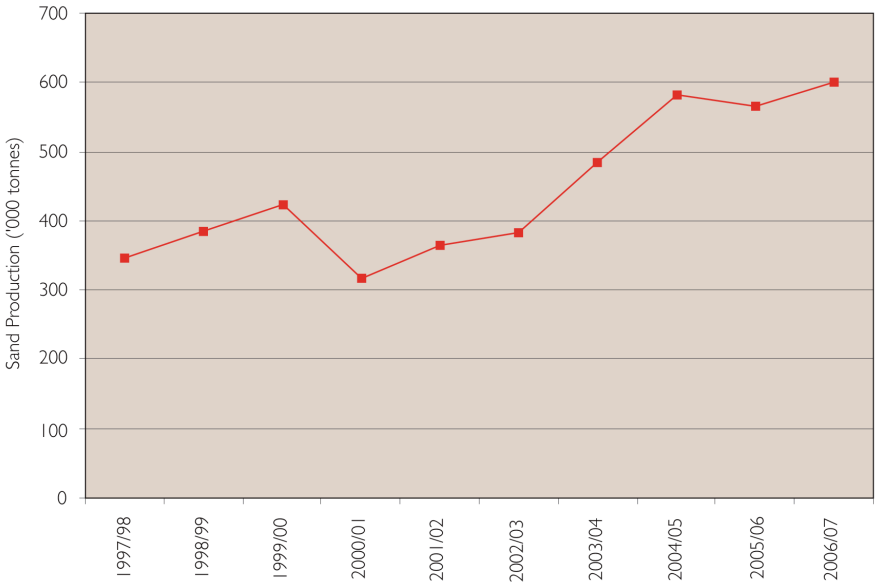
'Gravel' in this section refers to a construction material that requires minimum processing before sale, i.e. excavation, screening and blending, excluding crushed rock products. Typical use is in structural fill, road construction and road maintenance.

OCCURRENCES/GEOLOGICAL SETTING

Widespread deposits of Quaternary fluvial gravel and sand occupy river valleys throughout Tasmania. Coastal dune sands are locally the most economical source of building sand but environmental and competing land use factors severely limit their availability. Tertiary siliceous fluvial gravel and sand are used in the north, notably in the Calder and Scottsdale areas. Residual siliceous sand deposits are locally found on Triassic and Ordovician quartz sandstones. Residual gravel, derived from the in situ weathering of Jurassic dolerite and Devonian granite, are important in many areas.

PRODUCTION

Production of sand in Tasmania, 1998–2007



EXISTING OPERATIONS

COMPANY	LOCALITY	ROCK TYPE	ANNUAL PRODUCTION (tonnes) 2006/2007
Caroline Quarries	Railton	Siliceous gravel, sand	12 400
Dennis Fieldwick Pty Ltd	various	Aggregate, gravel, sand	221 000
Lloyds North Pty Ltd	Ulverstone	Siliceous gravel, sand	112 000
Hanson Construction Materials Pty Ltd	Calder	Sand	75 000
Island Resources Pty Ltd	Scottsdale	Sand & gravel	125 600
Males Sand / RNB Trading Pty Ltd	South Arm	Sand	127 000
Boral Resources (Tasmania) Ltds	South Arm	Sand	150 000
RNB Trading Pty Ltd	George Town	Sand	19 000
Stornoway Hewitt Pty Ltd	Beauty Point	Sand	–

EXPLORATION AND HISTORICAL OPERATIONS

Excessive overburden and other factors caused production at Clarke's sand pit at Huonville to cease in 2001.

Exploration for coarse quartz pebble gravel in the Pipers River area of northeast Tasmania was undertaken in 1986. Test pitting and bulk sampling delineated a resource of 74 000 tonnes (Wright, 1985).

A large resource of sand has been identified on the spit at Seven Mile Beach (Llanherne).

Sizing and compositional analysis of residual quartz sand in the Dip Range area is given in Threader (1994).

The sizing and compositional analysis of silica sand in the Scottsdale area has also been examined (Anon., 1995, 1998). As a result of test pitting a reserve of 750 000 tonnes of coarse quartz sand near Scottsdale has been delineated (Gregory, 1999).

A large (2 to 3 million tonne) low-iron silica sand resource at Grassy, on King Island, has been reported (Stephenson, 1991).

OPPORTUNITIES

Much of the sand resource in southern Tasmania is no longer available, with areas underlain by sand being occupied by residential and other developments.

Sharp sand is mined in the Hobart region from dune deposits at South Arm and Llanherne, and from river deposits at Penna. The fine dune sands need to be blended with coarse crusher dust to make them suitable for concrete manufacture.

The large sand spit at Llanherne is estimated to contain 7 to 13 million tonnes of sand (Grun, 2006). Sand for use in the manufacture of concrete is currently being extracted from this deposit by Sanbar Pty Ltd.

Outlying, widespread smaller fluvial and residual sand bodies may become economic in southern Tasmania as prices rise. Significant potential additional resources of sand in southern Tasmania are found at Brown Mountain Road, Carlton Plains and Sand River (Buckland) (Duncan, 1999). There are abundant resources of coarse sharp sand in northern Tasmania.

Natural gravel can be produced at a considerably lower cost than a crushed hard-rock product. Such sources generally have a cost advantage in areas away from major population centres where the large hard-rock operations supply most of the demand.

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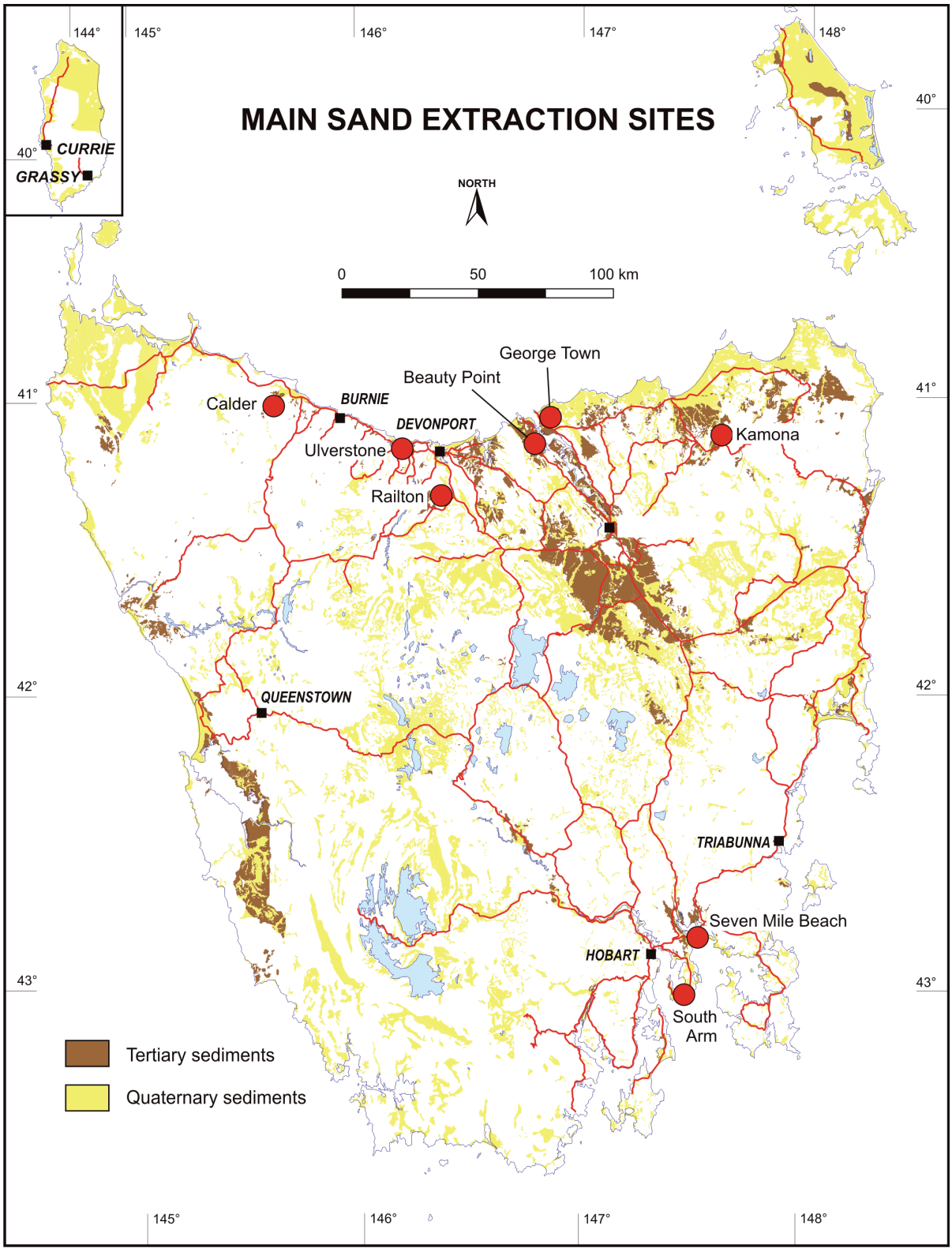
Quaternary and Tertiary sediments and main current sand operations



Clay

Tasmanian clay deposits include ball clay, fire clay, bentonite, Fuller's earth and brick clay, cement clay, and china clay or kaolin (considered separately).

Ball clay (pipe clay) is an impure kaolinite-rich clay, commonly organic-rich, which usually fires off-white, and is sedimentary in origin. It is used for bonding white ware.

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

Bentonite is composed mostly of montmorillonite, and is used as a bonding agent in foundry sands, for sealing porous materials in civil engineering, drilling, etc., water purification and many other uses.

Fuller's earth consists of non-swelling montmorillonite. Halloysite, attapulgite (palygorskite) and diatomite may also be used as Fuller's earth. These are all principally used for bleaching, degreasing and absorption (similar to zeolite).

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

Cement clay is a non-specific type of clay used in cement manufacture.

Clay is also used to cap municipal waste dumps and has been used in rehabilitation of land disturbed by mining, usually to cap dumps of acid producing waste rock.

OCCURRENCES/GEOLOGICAL SETTING

Ball clays are abundant in the Tertiary lacustrine sediments of the Launceston basin and in the St Helens/Georges Bay area.

Fire clays are found with Tertiary alluvial and residual tin gravel in the northeast (e.g. South Mt Cameron), in the Launceston basin, interbedded with Permo-Triassic coal measures, and in Precambrian clayey siltstone at Mawbanna.

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).

Brick clays 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 such as those at Cooee.

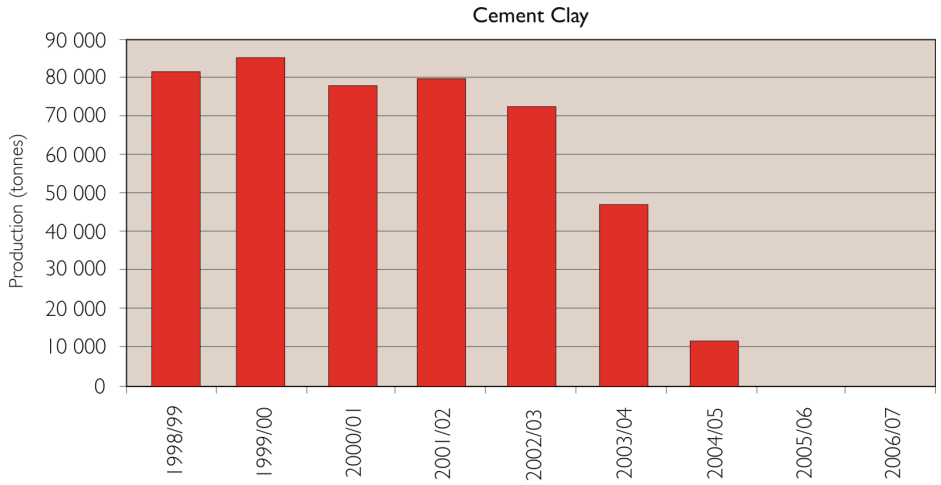
Overburden of fluvial clay and deeply weathered dolerite boulder beds is used as cement clay at the Railton limestone quarry operated by Cement Australia Holdings Pty Ltd.

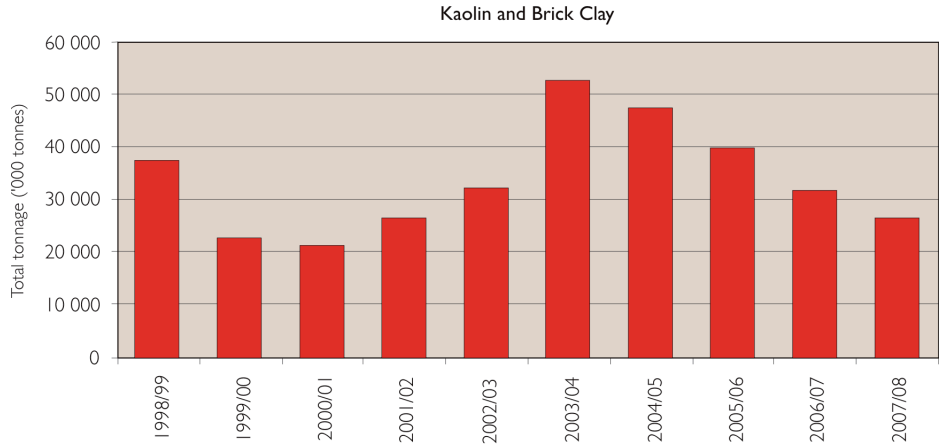
PRODUCTION

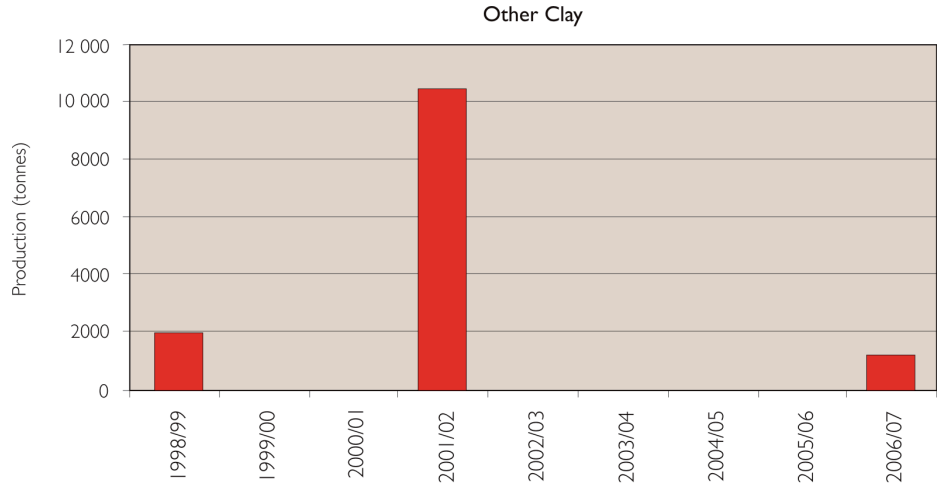
About 25 000 tonnes of brick clay is produced annually, mostly from various sites in the Hobart and Launceston areas.

Up to 80 000 tonnes/annum of cement clay has been produced at Railton by Cement Australia Holdings Pty Ltd, although no production has been recorded for the past two years.

Production of cement clay, brick clay, kaolin and other clays, 1998–2007







EXISTING OPERATIONS

COMPANY	LOCALITY	PRODUCT
Clifton Brick (Tasmania) Pty Ltd	Wyena	Brick clay
Clifton Brick (Tasmania) Pty Ltd	Longford	Brick clay
Kemp and Denning Ltd	Cygnet	Brick clay
Gossage BA & CM	Carrick	Clay fill
Cement Australia Holdings Pty Ltd.	Railton	Cement clay

EXPLORATION AND HISTORICAL OPERATIONS

Clay has been mined from many localities across Tasmania, with clay pits being usually opened close to where building materials were needed. The remains of clay pits, puddling machines and sometimes small brick kilns can be seen in many places, including Port Arthur where convicts were forced to make bricks during the early days of European settlement.

In the Hobart area clay has been mined from Knocklofty and at New Town, the latter to supply The Hobart Brick Company Pty Ltd. When this pit was exhausted clay was mined from Margate and from Grierson's pit at Dodges Ferry to supply the brickworks.

At Granton, a brick kiln was operated near Chevertons siding for many years, in close proximity to the Humes Ltd's factory where earthenware pipes were manufactured.

Pipes and pots were produced by Agripipe Pottery Pty Ltd at Relbia.

These ventures closed when plastic became the preferred material for use in plumbing works.

Bricks were produced by Zolati and Son Pty Ltd in a kiln fuelled by firewood near Dulverton.

Several brickworks have existed in the Launceston area, including Machens Bricks Pty Ltd at Kings Meadows and Huttons Bricks Pty Ltd.

Bricks were produced using Quaternary-aged clay by the Wynyard Brick Company Pty Ltd at Wynyard.

There are currently only two brick manufacturers in Tasmania, K&D Bricks and Pavers in Hobart and Nubrick Pty Ltd in Launceston. Tasmanian bricks have been exported to New Zealand in recent times.

A deposit of montmorillonite 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).

Mineral Holdings Australia Pty Ltd investigated a clay deposit at Aberfoyle Hill from 1999 to 2003. Shallow drilling outlined an indicated resource of 200 000 cubic metres of smectite clays and an inferred resource of 1.5 million cubic metres of mixed clays (Duncan, 2003).

Reed (2007) investigated the potential of halloysite in the Adamsfield area but found negligible resources.

The clay resources of the Hobart and Launceston areas have been subject to examination and analysis by staff of the Department of Mines (Threader 1969a, b).

OPPORTUNITIES

Clay materials are relatively common, although sources close to settlements are harder to develop due to conflicting land uses.

There are many prospective areas in which clays of varying types can be found including the Tamar region, northeast Tasmania and areas of weathered Triassic and Permian sedimentary rocks.

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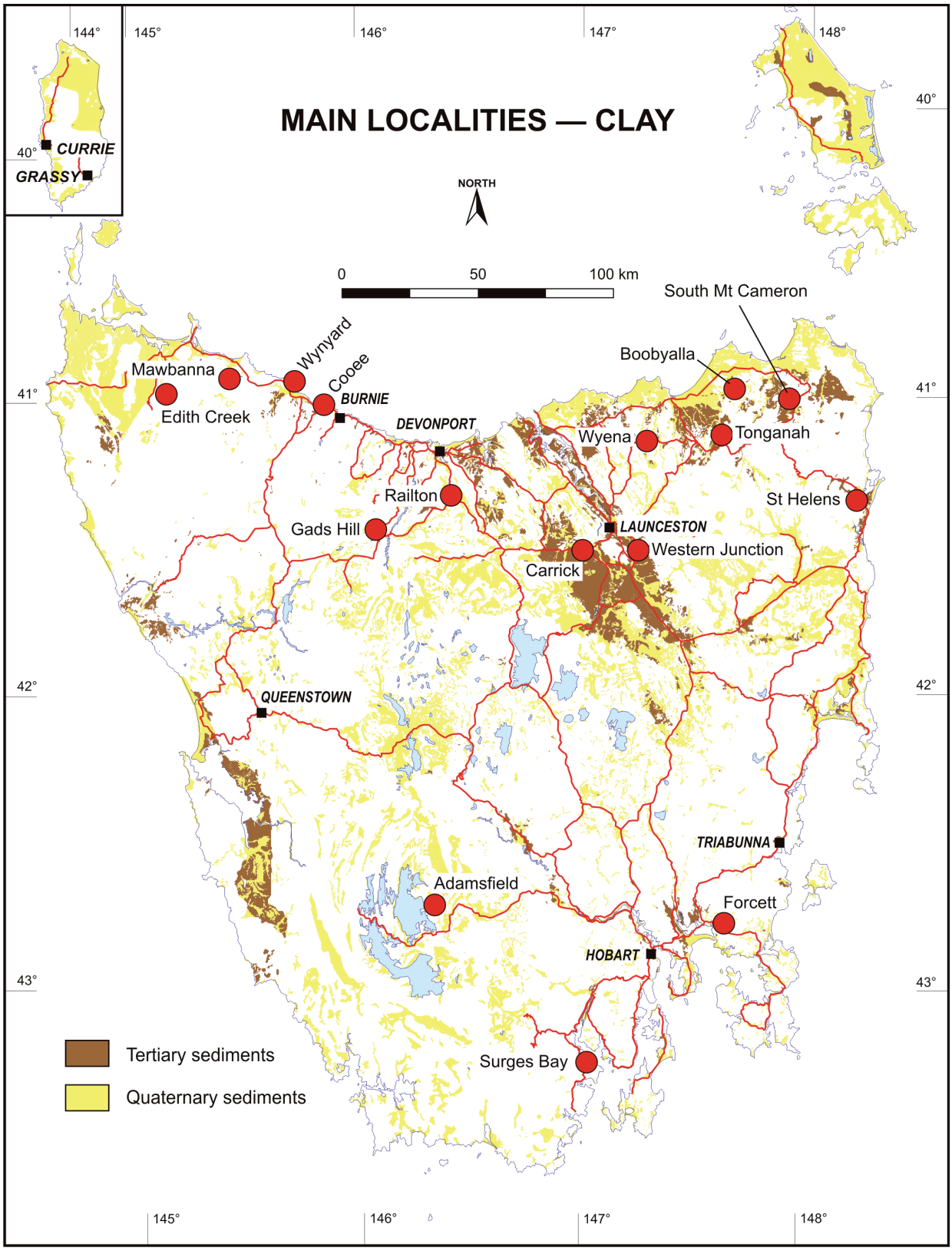
Distribution of Quaternary and Tertiary sediments, and current clay operations and other sites



Kaolin

China clay (kaolin) is relatively pure kaolinite which fires white with low shrinkage and low plasticity. Kaolin is usually formed by hydrothermal alteration or weathering of felspathic rocks. Kaolin has been mined in Tasmania for use as a paper filler.

OCCURRENCES/GEOLOGICAL SETTING

China clay occurs in Tertiary alluvial deposits overlying tin-bearing gravels in northeast Tasmania (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). While some reserves remain no kaolin is currently mined for this purpose.

PRODUCTION

Tasmanian kaolin has been used as filler in paper but was not of good enough quality to use as a coating clay. It is adequate for brick manufacture.

EXISTING OPERATIONS

None.

EXPLORATION AND HISTORICAL OPERATIONS

Kaolin and similar materials have been extracted in a number of places for use as a paper filler, although this use for kaolin has largely been superseded. Kaolin was extracted at Tonganah from 1976 to 1999 and used in the manufacture of paper at Burnie. This kaolin was possibly produced by hydrothermal alteration rather than weathering.

A weathered Precambrian clayey siltstone was mined near Mawbanna. This material is more accurately described as a fire clay, being comprised of kaolin and quartz. The use of this material was discontinued because the quartz content was deleterious to the paper making machinery. Some 9541 cubic metres was mined from 1940 to 1956.

Mining of the Surges Bay deposit, also used in paper manufacture, ceased when the deposit was exhausted. A total of 28 000 tonnes was mined between 1944 and 1959.

Kaolin was mined in conjunction with alluvial tin at the Endurance mine at South Mt Cameron. A total of 53 000 tonnes was mined from 1945 to 1962.

Clay, reported as kaolin, has been extracted by Nubrick Pty Ltd at Cressy since 1981 for use in the manufacture of bricks.

OPPORTUNITIES

The pre-mining reserves at Tonganah were estimated at over seven million tonnes, although the best areas have been worked out and a tourist development is planned within close proximity to the remainder of the deposit.

Kaolin lenses are common within the Tertiary alluvial deposits in the northeast.

References
BACON, C. A. 1992. Industrial minerals in Tasmania – kaolin. *Report Department of Mines Tasmania* 1992/07.
BOTTRILL, R. S. 1995. The clay resources of Tasmania. *Record Tasmanian Geological Survey* 1995/02.

Silica

Silica occurs throughout Tasmania as flour, sand and quartzite rock. The silica flour is exported to produce high quality lens glass, LCD screens, optical fibre, silicon chips and lead crystal. Coarse crushed quartzite is used to make metallurgical products. Quartzite is also used to produce road construction materials, building sand, concrete and road making aggregates, hot-mix sealants and concrete blocks.

OCCURRENCES/GEOLOGICAL SETTING

Quartzite deposits are found in the Precambrian rocks of the west and northwest (Rocky Cape Group and Forth Metamorphics), and the Cambrian sequences around Smithton. Younger quartzite from the Ordovician Cabbage Tree Formation and the derived scree slopes are mined near Beaconsfield. Extensive Quaternary deposits of coastal and alluvial silica sand are used statewide in the construction industry. The silica flour deposits of the northwest are residual weathering products of Proterozoic carbonate rocks under Tertiary gravel.

GRADE

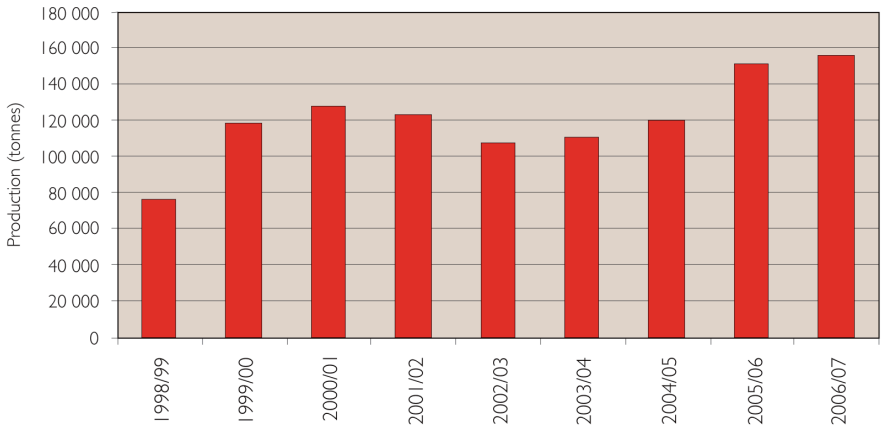
Corinna silica flour:
grades over 99.9% SiO_2

Precambrian silica:
usually 85% to 99% SiO_2

Silica sand and gravel:
range from 80% to 99% SiO_2

PRODUCTION

Silica production (combined silica flour and metallurgical silica), 1998–2007



EXISTING OPERATIONS

Silica is currently quarried at a number of locations:

Corinna	high quality silica flour
Beacom Hills	road construction materials
Flowerdale/ Calder	road construction materials/concrete blocks/sand
Port Sorell	road construction materials and sand
Beaconsfield	crushed quartzite for metallurgical use and construction materials
Scottsdale	a range of specialised sand and gravel products including foundry sand
South Arm and Llanherne	building sand

EXPLORATION AND HISTORICAL OPERATIONS

Exploration has focussed on securing sand and gravel for the construction industry, supplies for metallurgical operations, and silica flour for the super high quality optical market.

In the period from 1973 to 1985 extensive exploration for coherent lump silica was undertaken at various localities within Tasmania with the aim of locating material suitable for the production of silicon metal and silica metal alloys. Some of the areas explored were Cape Sorell south of Strahan, Marrawah and Hunter Island in the northwest, Beacom Hills near Smithton and the Hastings area and Glovers Bluff south of Hobart. A number of bulk samples were taken and reserves varying from two million tonnes to 150 million tonnes were estimated. Silicon metal was produced at Electrona by Pioneer Silicon Industries Pty Ltd until the closure of the plant in 1991.

A deposit of lump silica and silica flour has been extensively explored immediately to the south of Maydena by a number of operators. The most recent work has been undertaken by JJ McDonald and Sons Mining Pty Ltd and Maydena Sands Pty Ltd. A combined resource of approximately six million tonnes of good quality silica lump and flour has been reported.

The Tasmanian Electro Metallurgical Company Pty Ltd (TEMCO) produces ferro alloys, ferromanganese and silicomanganese at Bell Bay. In 2006/2007 TEMCO produced 109 200 tonnes of silicomanganese using lump silica from Beaconsfield.

Hugh Nolan discovered the Corinna silica flour deposits in the early 1980s and with his company, Cominex Pty Ltd, has subsequently developed them into a source of super high quality silica used for the manufacture of optical quality glass and in the production of flat screens for the TV and computer industries. The deposits were probably formed from silicification of dolomite by magmatic fluids with later disaggregation of the silicified dolomite under a protective blanket of Tertiary sediments. The deposits are of mainly silt to sand grade with some lump and are usually 99.9% pure SiO_2. With the current high demand for pure silica a new treatment plant has been constructed at Wynyard by Tasmanian Advanced Minerals Pty Ltd (a private joint venture company with Cominex Pty Ltd and Sumitomo Australia Ltd as the major shareholders). Production is likely to be maintained at 80 000 tonnes per year.

Sand from South Arm was once used in the manufacture of glass jars and bottles but this industry has now ceased.

OPPORTUNITIES

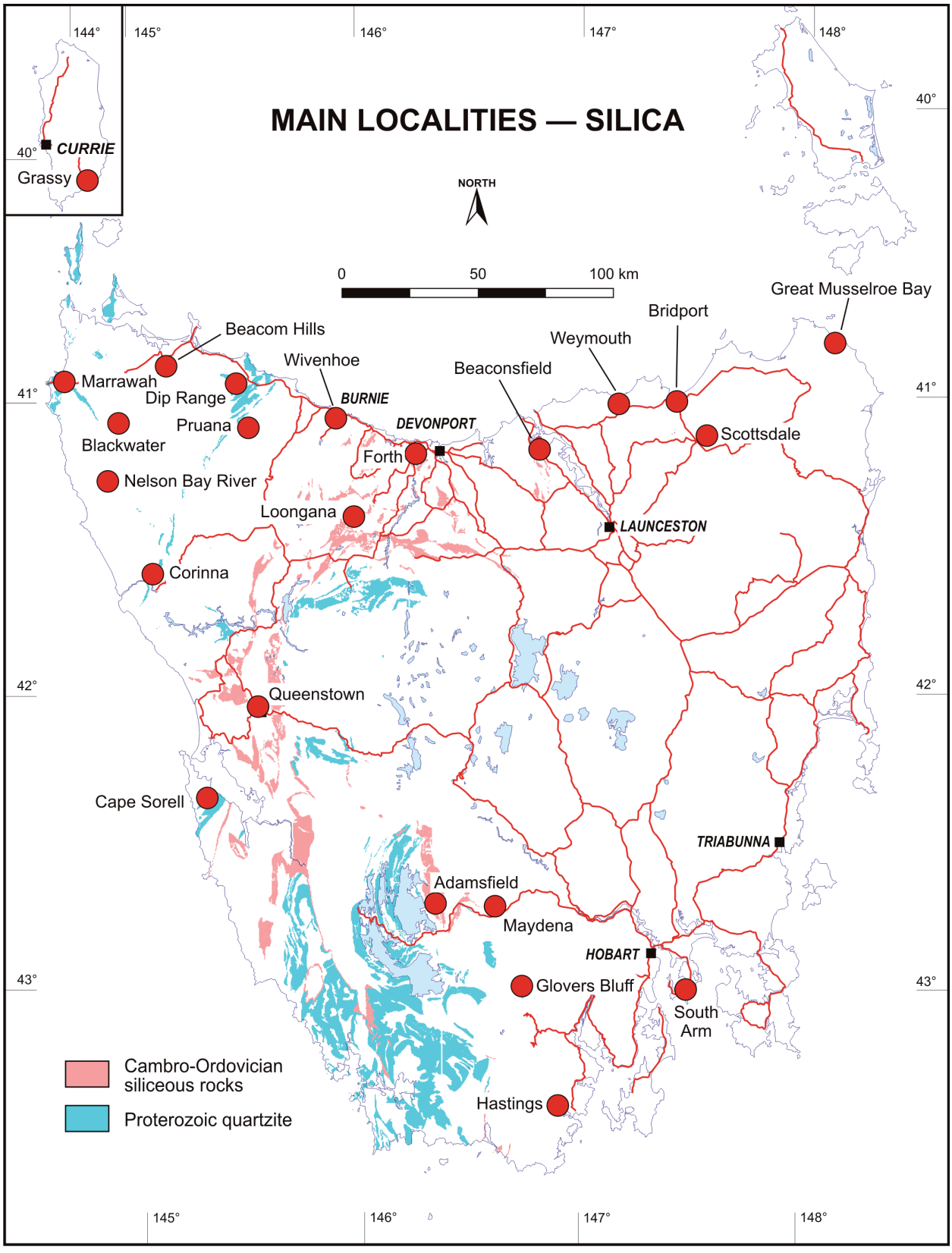
Exploration for super high quality silica flour deposits has been undertaken in a methodical manner over the last twenty years, with the most recent developments being at Blackwater (1.6 million tonnes) and at Maydena in the south. The potential to discover similar deposits exists in the more remote areas of the West Coast.

The extensive deposits of Precambrian quartzite in the far northwest are accessible and prospective, but those to the south of Macquarie Harbour are difficult to access.

References

BACON, C. A.; PEMBERTON, J. 1995. Silica in Tasmania. *Record Tasmanian Geological Survey* 1995/03.

Distribution of main prospective siliceous rock types, and main silica localities



Coal

Coal has been used since ancient times as a fuel. In Tasmania black coal is mined from seams of Triassic age and used in the manufacture of cement and as a boiler fuel for steam raising by two paper mills and a number of secondary industries.

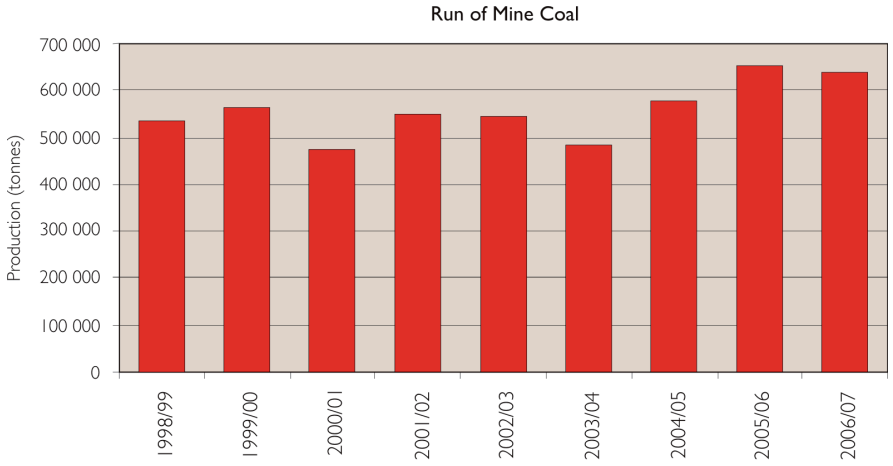
OCCURRENCES/GEOLOGICAL SETTING

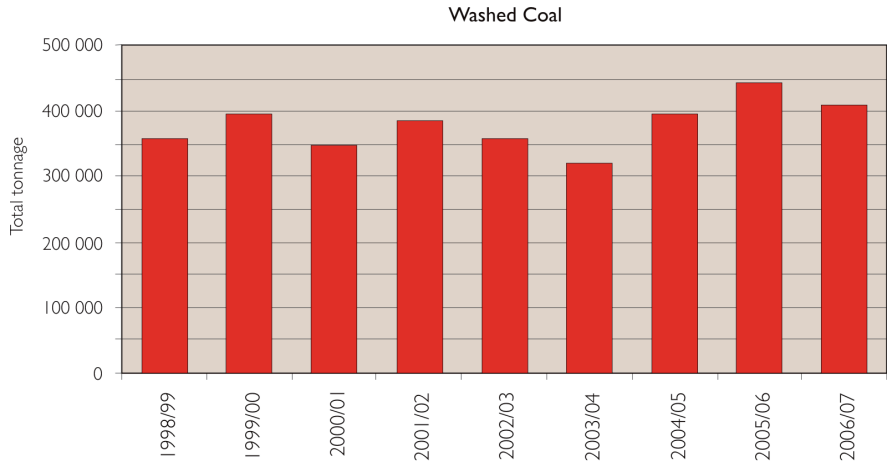
Although coal has been found at three stratigraphic intervals within the Tasmania Basin, all the economically important coal reserves are hosted in the Late Triassic coal measures. These comprise a lithic sandstone sequence with interbedded mudstone, claystone, coal and minor tuff. The sequence was intruded by dolerite during the mid Jurassic; the East Coast coalfields are now overlain by an eroded dolerite sheet 100 to 300 metres thick. The coal seams are typically thin, the majority being less than one metre thick but there are some more than 1.5 metres thick and a few up to three metres thick, such as the seams mined by the Cornwall Coal Company Pty Ltd on Mt Nicholas and the Duncan seam on Fingal Tier.

Two smaller intervals of coal-bearing strata are of Early Permian and Late Permian age. A significant deposit of Tertiary brown coal occurs at Rosevale near Launceston.

PRODUCTION

The Cornwall Coal Company Pty Ltd is the only producer of coal in Tasmania, with operations in the Fingal Valley and near Hamilton. In 2006/2007 some 407 000 tonnes of saleable coal was produced from 635 000 tonnes of raw coal. Production levels have remained steady for some years.





GRADE

The Late Triassic coals are typically banded with mudstone and claystone, have an ash content of 25–30%, a low sulphur content (0.5%) and a specific energy value of 22 to 24 MJ/kg.

EXISTING OPERATIONS

Coal is mined by the Cornwall Coal Company Pty Ltd from the Duncan and Blackwood collieries and the Cullenswood open cut mine in the Fingal Valley. The Blackwood and Duncan collieries are adit entries into steep hillsides. Periodically coal is mined from the company's open cut at Kimbolton, near Hamilton. The coal is treated at a washing plant near Fingal.

EXPLORATION AND HISTORICAL OPERATIONS

Coal has been mined in many places in Tasmania, although most mines were short lived and of a small scale. The mines have nearly all been underground operations with just five deposits being open cut.

The coal mining industry has not been bigger partly for geological reasons. Most of the seams are too thin and the coal is not of high enough quality for export in the face of competition from mines in NSW and Queensland.

Coal mining has had significant effects on only two Tasmanian communities. The discovery of coal in the Don and Mersey valleys attracted many people to the area in the 1850s and 1860s but the prevalence of faults and thinness of the seams precluded later significant developments. The opening of the railway to serve the Fingal Valley in 1886 allowed the coal fields in the Avoca–Fingal–St Marys area to be developed. Coal mining has had a significant impact on the economy of this region. (For a comprehensive review of the history of coal mining and exploration in Tasmania see Bacon and Banks, 1989).

In 1981/1982, exploration by CSR Ltd and AAR Ltd at Rosevale outlined combined (measured and indicated) reserves of 118 million tonnes of lignite.

OPPORTUNITIES

The most attractive coal-bearing areas in Tasmania, the Fingal, Mt Nicholas and Dalmayne coalfields, are held under mining leases and retention licences by the Cornwall Coal Company Pty Ltd.

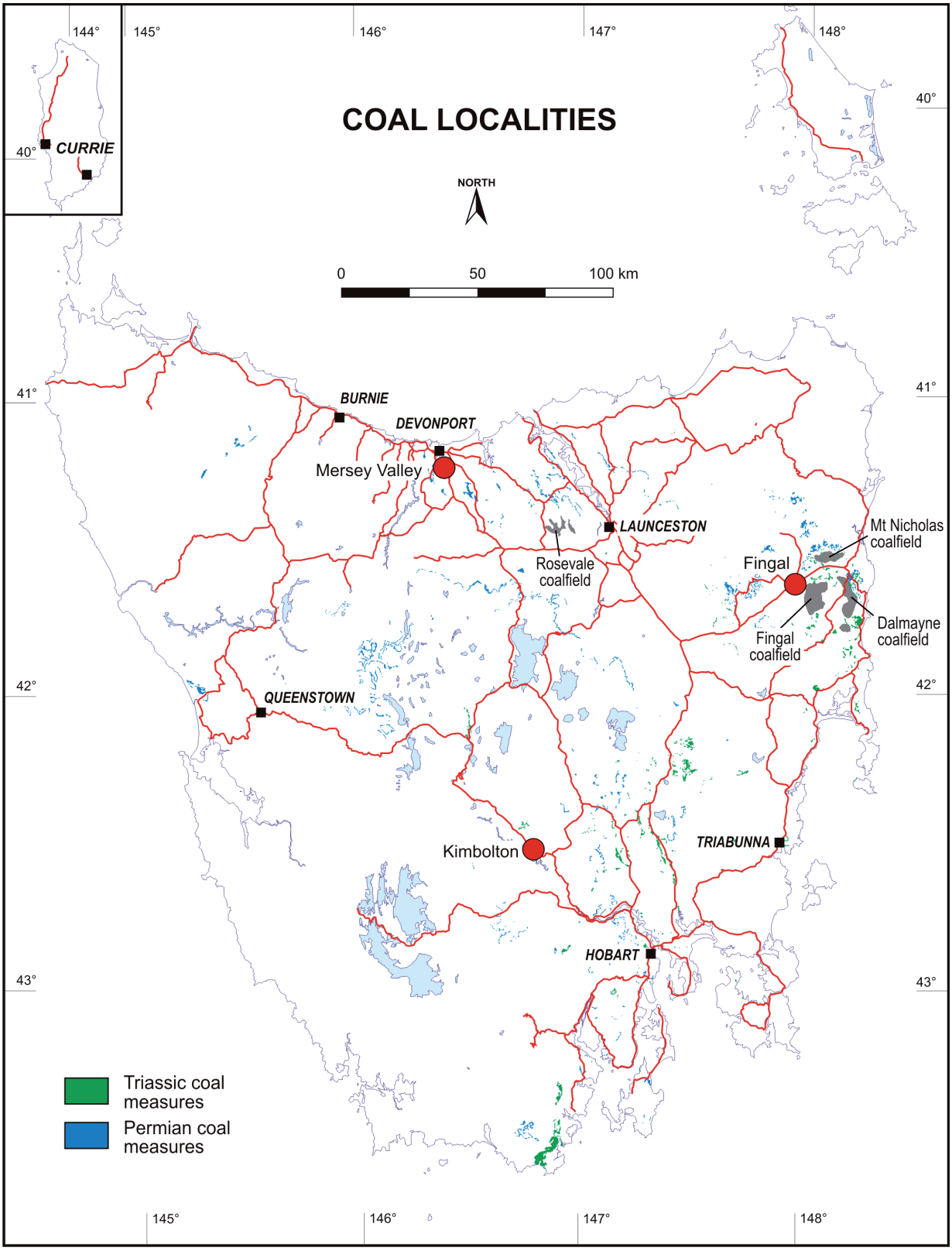
The Rosevale deposit is held under exploration licence by New Hope Exploration Proprietary Limited.

References

BACON, C.A. 1986. The coal resources of Tasmania. *Bulletin Geological Survey Tasmania* 64.

BACON, C. A.; BANKS, M. R. 1989. A history of discovery, study and exploitation of coal in Tasmania. *Papers and Proceedings Royal Society of Tasmania* 123:137–189.

Distribution of Triassic and Permian coal measures, major coalfields and other localities.



Limestone

Limestone, a sedimentary rock composed mainly of the mineral calcite ($CaCO_3$), is probably used in greater quantities and for a broader range of applications than any other industrial mineral. In Australia, about 75% of mined limestone goes to the manufacture of cement clinker and lime. Limestone is also used as a metallurgical flux, in agriculture to control soil pH, and as a filler in a wide range of products.

In Tasmania, industrial limestone is currently produced at Railton, Mole Creek and Flowery Gully. The Railton operation fulfills the requirements of Cement Australia Holdings Pty Ltd, while the quarries at Mole Creek and Flowery Gully produce limestone mainly for agricultural purposes

OCCURRENCES/GEOLOGICAL SETTING

Limestone of Proterozoic, Ordovician, Permian and Cenozoic age is of economic interest in Tasmania.

The Proterozoic Smithton Dolomite, occurring in northwest Tasmania, locally contains significant intercalations (c. 100 m thick) of high-grade limestone (c. 98% $CaCO_3$) and dolomitic limestone low in non-carbonate impurities. The unit is folded, with moderate to steep dips, and occurs in flat-floored valleys with abundant surficial gravel cover.

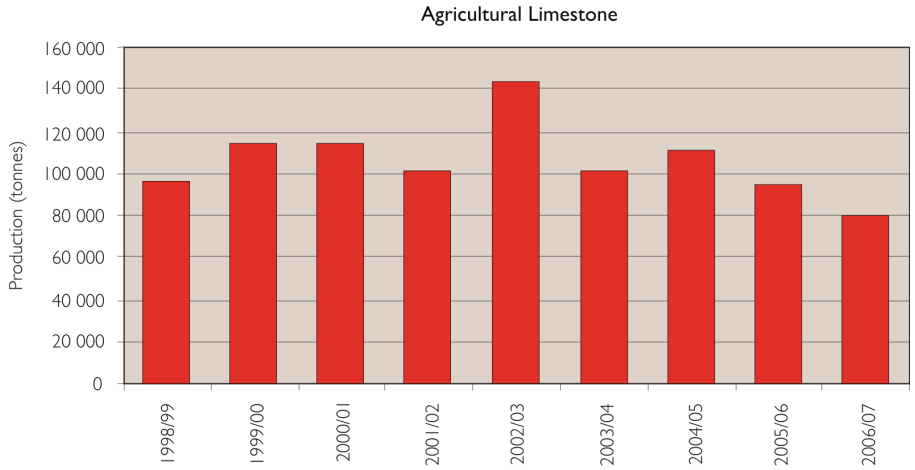
A widespread, thick (up to 2 km) succession of Ordovician limestone comprises the 'Gordon Limestone' or Gordon Group and is divided into a number of formations. This unit is currently the source of almost all of Tasmania's industrial and agricultural limestone. The group is composed of a sequence of carbonate rocks with minor siliciclastic rocks. They are mainly shallow marine deposits but deeper water deposits occur at Surprise Bay in southern Tasmania and Beaconsfield in northern Tasmania (Burrett and Martin, 1989). The Gordon Group is moderately folded, and is found in numerous synclinal or faulted outliers across the western two-thirds of Tasmania. The large deposits of Ordovician limestone average around 87–90% $CaCO_3$, but the succession is heterogeneous and higher values are locally obtainable. Recent work near Maydena revealed a resource of 5.5 million tonnes at 93% $CaCO_3$ and 0.6% Mg, with very large reserves of lower grade limestone occurring in the nearby Florentine Valley.

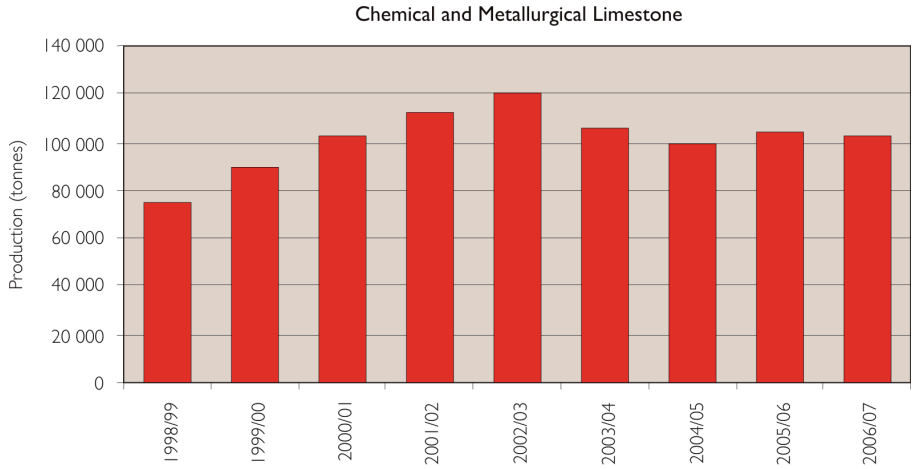
Limestone of Permian age (Berriedale Limestone, Darlington Limestone and correlates) is found in a flat-lying succession of marine and glaciomarine sedimentary rocks, the Lower Parmeener Supergroup. The limestone is limited to the Hobart area and other parts of southeast Tasmania, Maria Island and the St Marys district in the northeast. It tends to be relatively impure (50–80% $CaCO_3$), but has been exploited on a small scale for agricultural use and cement manufacture.

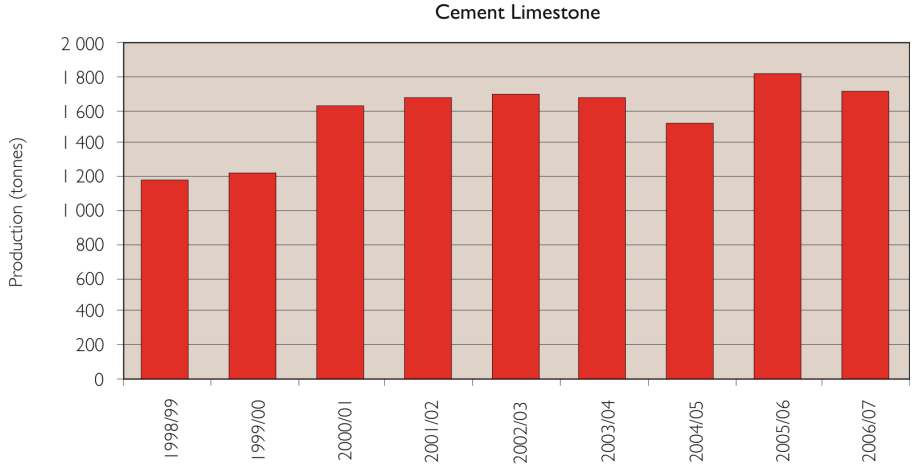
Thin Tertiary marine limestone has been explored in northwest Tasmania. A Quaternary travertine deposit (the Pulbeena Limestone) has been worked near Smithton.

PRODUCTION

Production of agricultural limestone, chemical-metallurgical limestone, and cement limestone, 1998–2007.







EXISTING OPERATIONS

COMPANY	LOCALITY	PRODUCTION
Beams Brothers Pty Ltd	Flowery Gully	138 500 tonnes including 56 500 tonnes of metallurgical limestone and dolomite
Unimin Australia Ltd	Mole Creek	139 000 tonnes of limestone
Cement Australia Holdings Pty Ltd	Railton	1.06 million tonnes cement clinker

EXPLORATION AND HISTORICAL OPERATIONS

A large limestone quarry was operated by Broken Hill Pty Ltd at Melrose, southwest of Devonport, from 1930 to 1947. Up to 300 000 tpa was exported to Newcastle for use in steelmaking. The screenings were crushed further at the Melrose agricultural lime works.

Benders Quarry at Lune River was closed by the Australian Government in 1992. Because of the proximity of the quarry to the Exit Cave system, there were concerns that the continuation of quarry operations may affect the cave system. Up to 55 000 tpa was mined for use in the Electrona carbide works, and later the Risdon zinc smelter, as a flux.

A number of small quarries operated in the vicinity of Maydena from 1950 to 1970 to supply the Boyer paper mill.

Two quarries operated at Queenstown to supply the Mt Lyell smelters with flux.

All these operations were in limestone from the Gordon Group.

Exploration has not been exhaustive as the Gordon Group limestone is well mapped. Drilling at Maydena by the Division of Mines and Mineral Resources between 1990 and 1992 defined a resource of 5.5 million tonnes at 93% $CaCO_3$ and 0.6% Mg.

Mineral Holdings Australia Pty Ltd has been exploring the Proterozoic carbonate rocks of the Smithton area for many years and has identified a number of sites with lenses of high-grade limestone.

OPPORTUNITIES

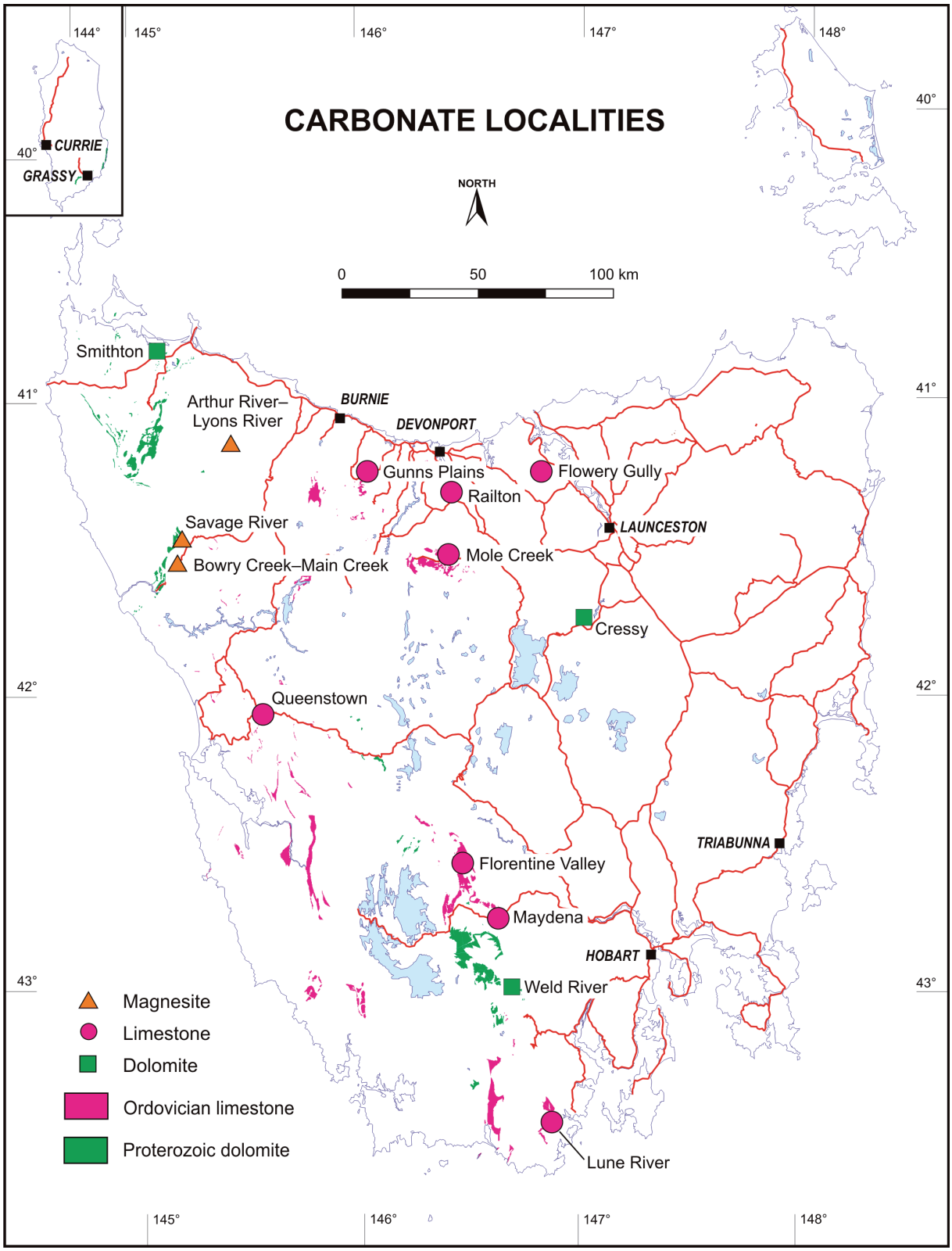
Large deposits of Ordovician limestone, close to transport infrastructure, are present in several parts of Tasmania, notably Gunns Plains, Mole Creek and the Florentine Valley. Reserves have not been estimated, but would be of the order of tens of millions of tonnes in each of these areas.

The resource at Maydena (Wrigley, 1993) remains undeveloped.

Mineral Holdings Australia Ltd continues to seek a joint venture partner for the development of the Proterozoic dolomite and limestone resources in northwest Tasmania. The company wishes to develop an export industry based on chemical, industrial and agricultural carbonate products.

References
BURRETT, C. F.; MARTIN, E. L. (ed.). 1989. Geology and Mineral Resources of Tasmania. *Special Publication Geological Society of Australia* 15.
HUGHES, T. D. 1957. Limestones in Tasmania. *Mineral Resources Geological Survey Tasmania* 10.
WRIGLEY, P. K. 1993. Evaluation of the limestone resource at Roberts Hill, Maydena. *Report Division of Mines Tasmania* 1993/03.

Distribution of Proterozoic dolomite, Ordovician limestone and major carbonate (limestone, dolomite, magnesite) industrial mineral localities



Dolomite

Dolomite, a magnesium-calcium carbonate, is used as a refractory raw material, for manufacturing glass, and in agricultural applications as a fertiliser, soil conditioner and stockfeed supplement.

OCCURRENCES/GEOLOGICAL SETTING

Thick successions of Late Proterozoic dolomite occur in a number of places in northwest, central and southern Tasmania.

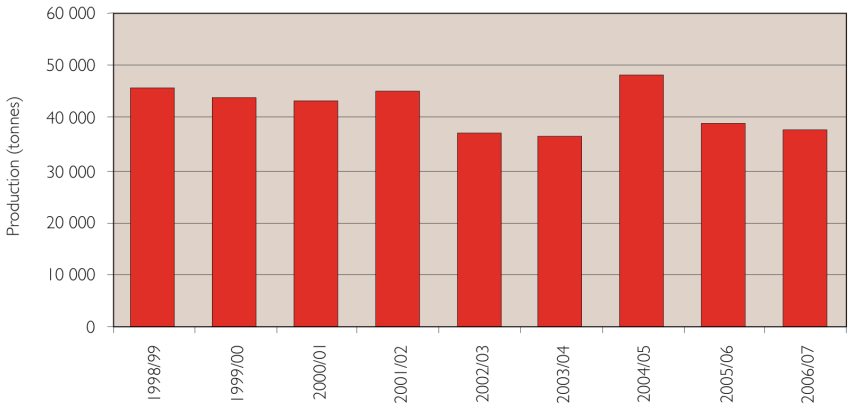
Two dolomite formations (Black River Dolomite and Smithton Dolomite) are found in the upper Proterozoic Togari Group in northwest Tasmania. The Smithton Dolomite is generally of higher grade (typically 98% $CaMg(CO_3)_2$) while the Black River Dolomite tends to be higher in silica (2–10% SiO_2). The succession is folded and dips are moderate to steep. The dolomites generally crop out poorly in flat-floored valleys and have an extensive surficial cover of gravel and sand.

Probable correlates of the Togari Group dolomite are found in the Savage River–Corinna district (Ahrberg Group), in central Tasmania (Jane Dolomite), northern Tasmania (dolomite at Cressy), and southern Tasmania (Weld River Group). Sparse analytical data suggest generally similar characteristics to the Togari Group dolomite. Some of these areas may be unavailable for mineral exploration.

Dolomitic limestone and dolomite are also locally found in the Ordovician Gordon Group.

PRODUCTION

Production of agricultural dolomite, 1998–2007



EXISTING OPERATIONS

Dolomite is currently quarried at Cressy by Beams Brothers Pty Ltd for use by the Tasmanian Electro Metallurgical Company Pty Ltd (TEMCO) as a flux in the smelter at Bell Bay. TEMCO produces ferro alloys, ferromanganese and silicomanganese.

The Circular Head Dolomite and Trading Co. Pty Ltd produces dolomite powder for agricultural use and dolomite screenings for use in road construction materials and concrete manufacture. Material has been supplied in the past for metallurgical use.

EXPLORATION AND HISTORICAL OPERATIONS

Large areas underlain by potentially high-grade industrial dolomite remain available for exploration in northwest Tasmania.

Proterozoic dolomite continues to be the focus for exploration in the Smithton area, with Mineral Holdings Australia Ltd currently holding the bulk of the prospective area either as exploration or retention licences.

In the southeast the Weld River valley is prospective for smaller deposits and Kallista Hill, west of Maydena, has a small known resource of 355 000 tonnes.

The dolomite at Cressy occurs as an inlier in basal Permian-aged tillite and there does not appear to be much potential for further discoveries in this area.

OPPORTUNITIES

Some areas underlain by potentially high-grade industrial dolomite in the Smithton area remain available for exploration.

Smaller areas, with grades largely untested, are also available in southern Tasmania, particularly in the Weld River valley.

Mineral Holdings Australia Ltd continues to seek a joint venture partner for the development of the Proterozoic dolomite and limestone resources in northwest Tasmania. The company wishes to develop an export industry based on chemical, industrial and agricultural carbonate products.

References
BURRETT, C. F.; MARTIN, E. L. (ed.). 1989. Geology and Mineral Resources of Tasmania. *Special Publication Geological Society of Australia* 15.
HUGHES, T. D. 1957. Limestones in Tasmania. *Mineral Resources Geological Survey Tasmania* 10.

Magnesite

Magnesite (magnesium carbonate, $MgCO_3$) is used in the manufacture of high temperature refractory products and as a source of magnesium metal.

Large, high-grade deposits exist in Tasmania but have yet to be developed.

OCCURRENCES/GEOLOGICAL SETTING

Very large deposits of high-grade magnesite are found in the Arthur Metamorphic Complex in northwest Tasmania.

The magnesite is found as a number of discontinuous, steeply-dipping lenses, up to 400 metres thick, dispersed along a belt of deformed Proterozoic rocks known as the Arthur Metamorphic Complex. Most of the magnesite occurrences can be assigned to the Bowry Formation, which also includes the Savage River iron ore body.

The magnesite deposits are thought to have resulted from metasomatism of dolomite, rather than deposition as a sediment, although this remains uncertain. Six main magnesite lenses are known, three in the south (Bowry Creek, Main Creek and Savage River), and three in the north (Lyons River, Keith–Arthur River and Central Creek). Each is up to 400 metres thick, and contains minor interlayered dolomite and chloritic and talcose schist.

PRODUCTION

None.

EXISTING OPERATIONS

None.

EXPLORATION AND HISTORICAL OPERATIONS

Major drilling programs were undertaken in the 1990s in the Main Creek and Arthur River areas.

The magnesite deposits in the Savage River district (Main Creek and Bowry Creek deposits) occur as stratiform lenses within muscovite-chlorite schist and phyllitic rocks of the Precambrian Bowry Formation. This area was explored by Savage Resources Limited and Industrial and Mining Investigations Pty Ltd from 1972 to 1983, and Golden Triangle Resources NL in 1998 and 1999.

An inferred resource of 47.4 million tonnes at 43.36% MgO and 2.66% SiO2 at the Main Creek deposit was announced by Golden Triangle Resources NL in 1999.

The Arthur River–Lyons River deposits are stratiform lenses within a less metamorphosed equivalent of the Bowry Formation. Mineral Holdings Australia Pty Ltd explored the deposits from 1970 to 1984. Tasmania Magnesite NL conducted an intensive program of drilling on the Arthur River deposit in 1997.

The Arthur River deposit contains 29 million tonnes at 42.8% MgO, 5.3% SiO2, while the Lyons River deposit contains 30 million tonnes at 40% MgO, 5.53% SiO2.

The Cann Creek deposit is approximately ten kilometres north of the Arthur River deposit. It was explored by Mineral Holdings Australia Pty Ltd and CRA Exploration Pty Ltd. A resource of 285 000 tonnes at 44.2% MgO was reported.

OPPORTUNITIES

The Arthur Metamorphic Complex is highly prospective for further large, high-grade magnesite deposits similar to those already known.

No development of these deposits has yet taken place. Tasmania Magnesite NL is the holder of retention licences over the magnesite deposits at Arthur River and Lyons River, and is currently endeavouring to develop the deposits.

The Main Creek and Bowry Creek deposits are currently held under exploration licences by Australian Bulk Minerals which is exploring for magnetite in the immediate vicinity.

Thick upper Neoproterozoic dolomitic successions are present in several parts of Tasmania, and have some potential for magnesite deposits, being similar in age to the sedimentary magnesites of South Australia.

References

CALVER, C. R. 1999. Tasmanian magnesite resources: a summary. *Record Tasmanian Geological Survey* 1999/07.

WYATT, J. D. 1997. *Summary report on the Arthur/Lyons River magnesite resource northwestern Tasmania*. Geological Investigations Pty Ltd [TCR 99-4309].

DICKSON, T. W. 1990. Arthur River and Lyons River magnesite deposits, *in*: HUGHES, F. E. (ed.). Geology of the mineral deposits of Australia and Papua New Guinea. *Monograph Serial Australasian Institute of Mining and Metallurgy* 14:1181–1183.

FROST, M. T. 1982. The magnesite deposit at Main Creek, Savage River, Tasmania. *Economic Geology* 77:1901–1911.

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Dimension Stone
(including Building Stone)

The term 'dimension stone' refers to natural stone that has been cut to a predetermined size or dimension, usually polished if the rock is crystalline, and used as a facing stone. The term also includes 'building stone', which is stone cut into blocks and used for construction purposes, either in a load-bearing or decorative capacity, slate (whether for roofing or cladding floors), and monumental stone.

Dimension stone is categorised by rock type. The most common types are granite (including other coarse, crystalline rock types which are not strictly granites in a petrological sense), marble (including limestone and serpentinite), sandstone and slate.

OCCURRENCES/GEOLOGICAL SETTING

Granites are widespread in northeast and western Tasmania, and are petrologically varied, with red, red-brown and grey varieties that are used as dimension stone.

Sandstone of Permian to Triassic age is also widespread and supplied most of the material for Tasmania's historic buildings, with production and export continuing to the present day.

Slate continues to be extracted from Ordovician deposits in the northeast. Extensive Ordovician limestone and Precambrian dolomite and magnesite deposits are prospective for marble, particularly where the rocks are locally contact metamorphosed in proximity to Devonian or Jurassic intrusions.

Tertiary basalt and Jurassic dolerite are also prospective, the latter locally as 'black granite'.

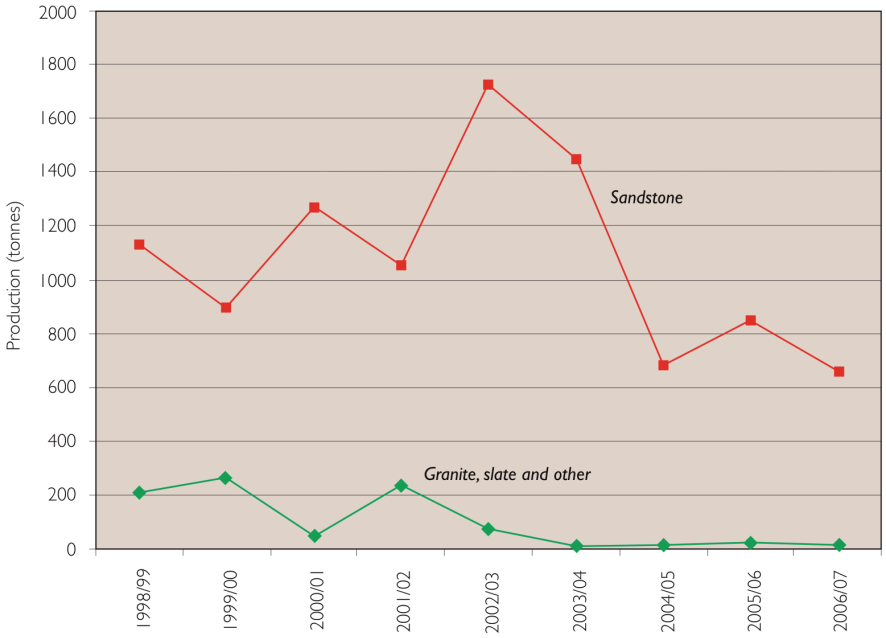
GRADE

Durability, frequency of jointing and aesthetics are the prime criteria in the evaluation of dimension stone. Some relevant data on Tasmanian sandstones are reported by Sharples (1990). Samples from eleven quarries have effective porosities of 9 to 16%, and an Air-dried Point Load Strength Index of 0.8 to 3.4 MPa. The presence of expanding clay (smectite) may be locally deleterious to sandstone durability.

West and Spry (1985) reported data on the Coles Bay red granite; bulk density is 2.60, compressive strength is 129 MPa, and modulus of rupture 8.9 MPa.

PRODUCTION

Production of sandstone and other building stone, 1999–2007



EXISTING OPERATIONS

COMPANY	LOCALITY	ROCK TYPE
Dunn Monumental Masons Pty Ltd	Nunamara	Sandstone
Kulinski LG	Mike Howes Marsh	Sandstone
Krulow RJ & SJ	Oatlands	Sandstone
Dunn JA	Melton Mowbray	Sandstone
Tasmanian Sandstone Quarries Pty Ltd	Buckland	Sandstone
Hookway T	Back Creek	Slate
Dunn JG	Ben Nevis	Granite
Nargun Pty Ltd	Natone	Granite

EXPLORATION AND HISTORICAL OPERATIONS

Granites at Trial Harbour (western Tasmania) and Coles Bay, Memory Road, Diddleum and Blessington (eastern Tasmania) were formerly quarried for dimension stone. The deep red stone from Coles Bay ('Nelson Red') was used extensively in Tasmania and also exported to the mainland, but the quarry was undesirably close to the Freycinet National Park and conditions were eventually placed on the operation making it uneconomic. Tertiary basalt was briefly quarried at Miena and marketed as 'black granite'.

Sandstone has been widely used in Tasmania since the early days of European settlement. Numerous quarries, mostly no longer operating, were opened up near major towns, such as Hobart, Oatlands, Port Arthur and Launceston.

Most of Tasmania's nineteenth century heritage buildings are constructed of sandstone, which was also exported to the mainland at that time.

In the more recent past, sandstone extraction has taken place at Pontville, Cobbs Hill, Elderslie, Bryn Estyn and Molesworth (Sharples, 1990). Current operations are listed above.

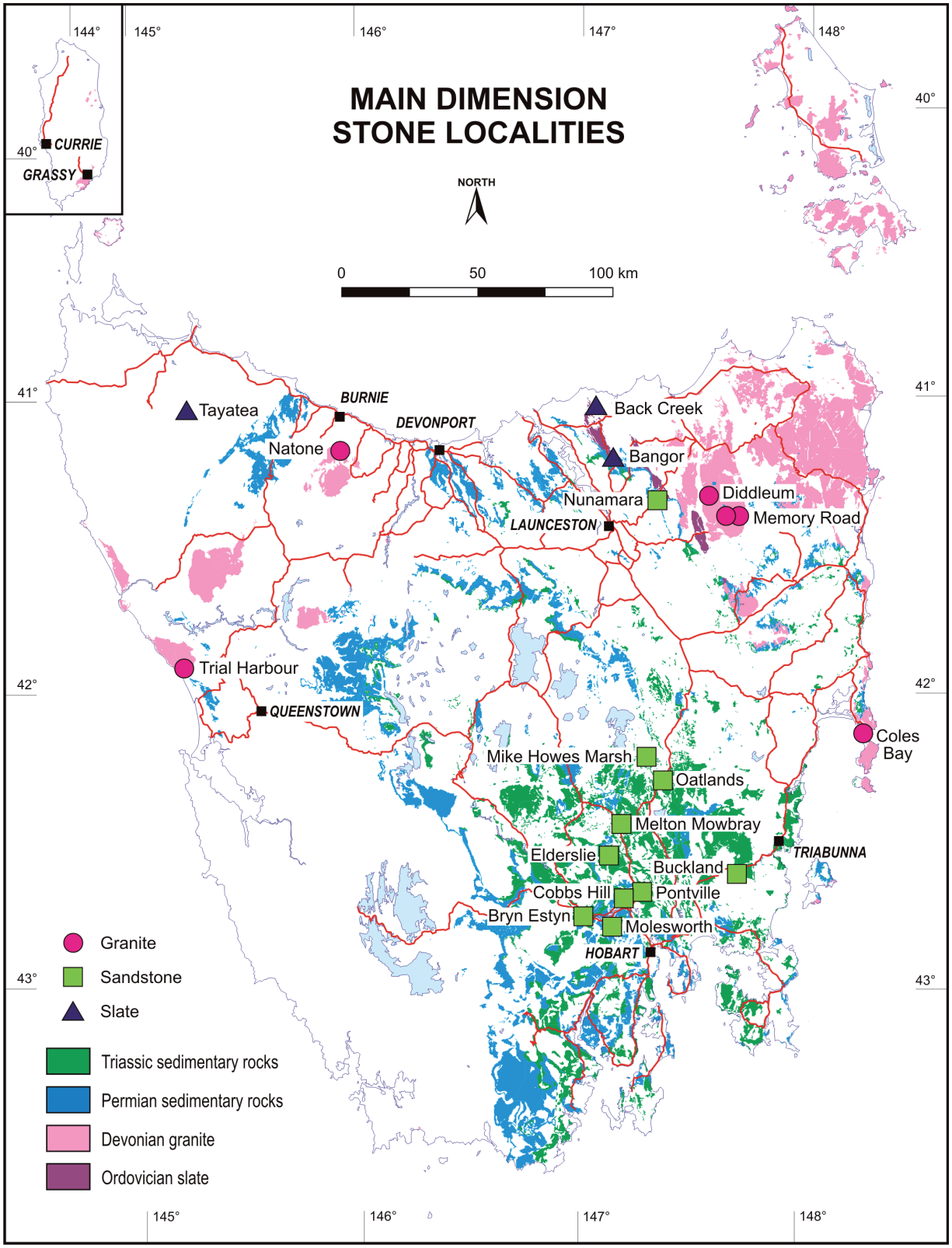
Slate was quarried at Bangor (Ordovician Mathinna beds, northeast Tasmania) in the nineteenth century and in the recent past. The Precambrian Cowrie Siltstone has been quarried for slate (Tayatea Quarry) and locally used in northwest Tasmania.

OPPORTUNITIES

Recent developments have included the export of sandstone to the mainland and attempts to find an export market for red granite. There are large reserves of prospective red and grey stone on the West Coast. Extensive occurrences of dolerite and basalt may also be prospective for use as dimension stone. Tasmania has large areas of dolomite and magnesite that may be suitable for dimension stone development, while the extensive deposits of limestone are prospective for dimension stone where they have been contact metamorphosed by the intrusion of granite.

References
BACON, C. A. 1987. Industrial minerals in Tasmania — slate. *Unpublished Report Department of Mines Tasmania* 1987/15.
BACON, C. A. 1989. Industrial minerals in Tasmania — granite and marble. *Unpublished Report Department of Mines Tasmania* 1989/11.
SHARPLES, C. E. 1990: The building and ornamental stone resources of Tasmania. *Report Division of Mines and Mineral Resources Tasmania* 1990/31.
WEST, D.; SPRY, A. 1985. Coles Bay Granite: Nelson Red. *AMDEL Report C6029, for Northern Tasmania Quarries Pty Ltd, August 1985.*

Distribution of main prospective geological units (Ordovician slate, Devonian granite, Permo-Triassic sedimentary rocks) and current and recently active dimension stone operations



Mineral Sands

Heavy minerals, mainly zircon, ilmenite and rutile, commonly make up approximately 1 to 5% of mineralised sand dunes. Ilmenite and rutile are treated to produce titanium dioxide which is widely used as a pigment in paints, plastics and sunscreens. Zircon has a high heat tolerance and is used in ceramics, engines and electronics.

OCCURRENCES/GEOLOGICAL SETTING

Heavy mineral occurrences are known from most of the Cenozoic sand-rich areas around the coast of mainland Tasmania and the offshore islands. Similar offshore deposits are found at Naracoopa, on King Island, and in Ringarooma Bay off northeast Tasmania. The deep lead tin deposits of northeast Tasmania are associated with a suite of heavy minerals and gemstones.

PRODUCTION

Mineral sands were mined at Naracoopa on King Island from 1969 to 1977. Production totalled 39 715 tonnes of rutile and 38 753 tonnes of zircon, with 20 000 tonnes of ilmenite still stockpiled on site.

EXISTING OPERATIONS

There are currently no operating heavy mineral sand mines in Tasmania. Tasmanian Titanium Pty Ltd, which held a mining lease over the deposit at Naracoopa, has recently sold its interests to Dr Allan J Bond and Associates Pty Ltd.

EXPLORATION AND HISTORICAL OPERATIONS

All major coastal sand deposits around Tasmania have been explored for heavy minerals.

Tasmanian Titanium Pty Ltd reported a resource of 25 million tonnes grading 3% to 5% heavy minerals for the southern and northern Naracoopa deposits. Reserves were estimated at 120 000 tonnes of rutile, 130 000 tonnes of zircon and 600 000 tonnes of ilmenite (see Tasmanian Titanium Pty Ltd, King Island Sand Mine, Development Proposal and Environmental Management Plan, 1999).

Ocean Beach, near Strahan, has a deposit on the active beach which has been extensively sampled over the last thirty years. Aztec Mining Company Ltd reported a resource of 2.1 million tonnes of 9% heavy minerals for the beach deposit and 75 million tonnes inland at 1% (Woods, 1990). It was recognised by this company that mining the active beach would not be environmentally acceptable and the ground was relinquished.

Ann Bay, at Marrawah in far northwest Tasmania, was explored in the 1960s and 1970s and has a recognised deposit of 3.5 million tonnes at 3.6% heavy minerals (MacDonald, 1971). As this area has a relatively high density of residential and tourist accommodation, and is actively farmed, a recent mining proposal was not acceptable to the local community and was not supported by the Tasmanian Government. The area has been excluded from the *Mineral Resources Development Act 1995*.

OPPORTUNITIES

The environmental, recreational and tourism values of coastal access have now precluded extractive activity for mining heavy minerals at Ocean Beach and Ann Bay.

The relatively high rate of coastal development and reservation in Tasmania has restricted the exploration opportunities for this style of deposit.

Exploration licences are currently held over Flinders Island, King Island, offshore King Island and Ocean Beach.

References

MACDONALD, E. H. 1971. *Preliminary evaluation programme, beach sands at Strahan and Ann Bay, Tasmania.* Electrolytic Zinc Company of Australasia Limited [TCR 71-802].

WOODS, P. J. 1990. *Final report, Ocean Beach, Strahan, Tasmania. EL1/86. 1.4.1989 to 15.12.1989*. Aztec Mining Company Limited [TCR 90-3083].

Barite

The high specific gravity (4.5) of barite (barium sulphate, $BaSO_4$) and chemical inertness make it valuable as a weighting agent in drilling mud, its major use.

OCCURRENCES/GEOLOGICAL SETTING

Known barite deposits in Tasmania are associated with rocks of Cambrian age, as replacement deposits, veins and a gangue mineral in metallic sulphide ores.

At Howard Plains, near Queenstown, the ore zone is about 600 metres long with individual lenses up to 60 metres long and 3.6 metres wide, and occurs in a fissured keratophyre.

At Lower Beulah several steeply-dipping lenticular bodies with a maximum width of 1.2 metres and of variable grade occur in greywacke.

A lode 518 metres long and from 0.3 to 2.5 metres wide occurs on Intercolonial Spur in the Jukes–Darwin mineral field, which is the southern extension of the host rocks of the Mt Lyell copper mineralisation.

At Alma, south of Forth, a lens of barite from 0.6 to 3.0 metres wide occurs in slate and quartzite.

In the foothills of Mt Roland, a lode 1.3 to 1.8 metres wide containing bands 0.3 metres thick of high grade barite has been the subject of recent exploration.

PRODUCTION

There has been no production since 1959. Total recorded production in Tasmania is 2240 tonnes.

GRADE

LOCATION	$BaSO_4$	SiO_2	$Fe_2O_3+Al_2O_3$	LOI
Howard Plains	99.4	0.40	0.04	0.50
Lower Beulah	98.2	1.10	0.20	0.38
Riana (Kaines prospect)	95.9	1.90	1.06	0.50
Alma	96.4	0.90	1.10	0.90
Penguin (Sullocks Hill)	96.4	0.46	0.50	0.60

EXISTING OPERATIONS

None.

EXPLORATION AND HISTORICAL OPERATIONS

Some exploration was undertaken over the occurrence at Howard Plains during the 1980s.

OPPORTUNITIES

Opportunities are limited, with the known occurrences being probably too small to be economic.

References
THREADER, V. M. 1976. Barite – Tasmania, in: KNIGHT, C. L. (ed.). Economic Geology of Australia and Papua New Guinea. 4. Industrial minerals. *Monograph Serial Australasian Institute of Mining and Metallurgy* 8:26–27.

Fluorite

Fluorite or fluorspar (CaF_2) is the most common source of fluorine and fluorine chemicals.

OCCURRENCES/GEOLOGICAL SETTING

At Moina, in the central north, a fluorite-rich skarn deposit formed when the Dalcoath granite of Devonian age intruded into the Mt Read Volcanics and the overlying mantle of Ordovician Moina Sandstone and Gordon Limestone.

Comalco Aluminium (Bell Bay) Ltd drilled a number of holes into the skarn and reported an estimate of 26.5 million tonnes at 18% fluorite, 0.1% tungsten and 0.1% tin (Askins, 1979).

Fluorite was recorded in 1902 from the North Black mine in the North Dundas mining district and has been noted in the Mt Bischoff tin field.

PRODUCTION

None.

GRADE

Estimate of 26.5 million tonnes at 18% fluorite at Moina.

EXISTING OPERATIONS

None.

EXPLORATION AND HISTORICAL OPERATIONS

The Moina skarn has been explored by Comalco Aluminium (Bell Bay) Ltd and CRA Exploration Pty Ltd and is currently being assessed by Minemakers Ltd. The skarn is polymetallic and contains potentially recoverable grades of tungsten, tin, zinc, magnetite, molybdenum, bismuth and gold. It is regarded as the largest known fluorspar deposit in Australia but its development has not progressed because of the fine-grained style of mineralisation known as 'wrigglite'.

Extensive metallurgical testing in the past, and that recently commissioned by Minemakers Ltd, suggests it would be possible to recover fluorspar, tin and tungsten using a mix of flotation and gravity treatment.

OPPORTUNITIES

The resource at Moina is currently held under Retention Licence RL10/88 by Geotech International Pty Ltd which has an agreement with Minemakers Ltd to further the development of this deposit.

References

THREADER, V. M. 1976. Barite – Tasmania, in: KNIGHT, C. L. (ed.). Economic Geology of Australia and Papua New Guinea. 4. Industrial minerals. *Monograph Serial Australasian Institute of Mining and Metallurgy* 8:26–27.

ASKINS, P. W.; WESTE, G. *EL7/74 – Moina, areas covered by Moina Sheets 1, 2, 3, 1979 update; and Moina Sheet A, report on all investigations to August, 1979.* Commonwealth Aluminium Corporation Limited [TCR 79-1389].

Magnetite

Magnetite is an iron oxide (Fe_3O_4). Its main use as an industrial mineral is in coal washing.

Magnetite deposits are mined on the West Coast at Savage River and in the northwest at Kara. The Savage River deposits are fine ground on site and pumped as a slurry to Port Latta, where the magnetite is pelletised for export for use in steel making. At Kara magnetite is a by-product of scheelite mining and is exported to mainland Australia for use in coal washing.

OCCURRENCES/GEOLOGICAL SETTING

The Savage River magnetite deposits occur as large lenses in Proterozoic sequences of metamorphic rocks. A number of lenses have been mined, with an estimated pre-mining resource of 300 to 500 million tonnes at about 32% Fe.

After a comprehensive study of the Savage River mineralisation and associated rock types, Bottrill and Taheri (2007) concluded that "the mineralisation, setting and alteration are highly indicative of iron-copper-gold styles of mineralisation, particularly the Kiruna and Iron-skarn subtypes, but the genesis is under more detailed investigation".

Devonian granite-related skarn deposits have been exploited for tin and tungsten with magnetite as a by-product. The Kara deposit is a skarn replacement of the transition beds from the Ordovician Moina Sandstone to the Gordon Limestone, while the Mt Lindsay deposit, to the southeast of Savage River, is a replacement of Cambrian-aged carbonate rocks.

A number of other magnetite-rich bodies are known in the Temma area on the West Coast. The Nelson Bay River deposit is the largest of these bodies and occurs as a cross-cutting dyke-like body in Mesoproterozoic sedimentary rocks.

At Iron Creek, in the Cape Sorell area, a magnetite-hematite body of similar dimensions to the Nelson Bay River deposit occurs on a fault in Cambrian-aged rocks or at the contact with Precambrian sequences.

PRODUCTION

Mining commenced at Savage River in 1967 with pellet production of up to 2.5 million tonnes per year. Pellet production in 2006/2007 totalled 1.838 million tonnes.

The Kara mine produced 77 000 tonnes of magnetite concentrate for coal washing in 2006/2007.

GRADE

Savage River 2006/2007 (MRT Annual Review, 2006/2007)

Measured, indicated and inferred: 323 790 000 tonnes @ 50.9% Davis Tube Recovery (a measure of the percentage of magnetite that will be recovered into concentrate from ore).

Kara mine 2006/2007 (MRT Annual Review 2006/2007)

Proven and probable: 3 076 800 tonnes @ >30% Fe and 0.55% WO_3.

Nelson Bay River 2008 (Gujarat NRE Resources NL website)

Inferred: 6.9 million tonnes @ 38.2% magnetite

EXISTING OPERATIONS

Savage River mine (Australian Bulk Minerals)

Kara mine (Tasmania Mines NL)

EXPLORATION AND HISTORICAL OPERATIONS

The Savage River area has a long history of exploration, starting with the initial discovery in 1877 by the State Government surveyor C. P. Sprent. Numerous prospectors and exploration companies sampled, sunk shafts and dug trenches in the

hope of discovering base or precious metals. Air and ground magnetic surveys were flown by the Australian Government in 1956 followed by drilling. Savage River Mines Ltd was formed in 1962 and production started in 1967. Goldamere Pty Ltd is currently exploring the southern lens at Long Plains with the intention of developing this deposit in the near future.

Turner (1992) summarised the potential for shallow open-cuttable magnetite skarns in the Kara–Hampshire area. An estimate of 11 to 14 million tonnes of measured, indicated and inferred magnetite skarn is reported. These skarns are currently being explored for their magnetite potential by Iron Mountain Mining Ltd.

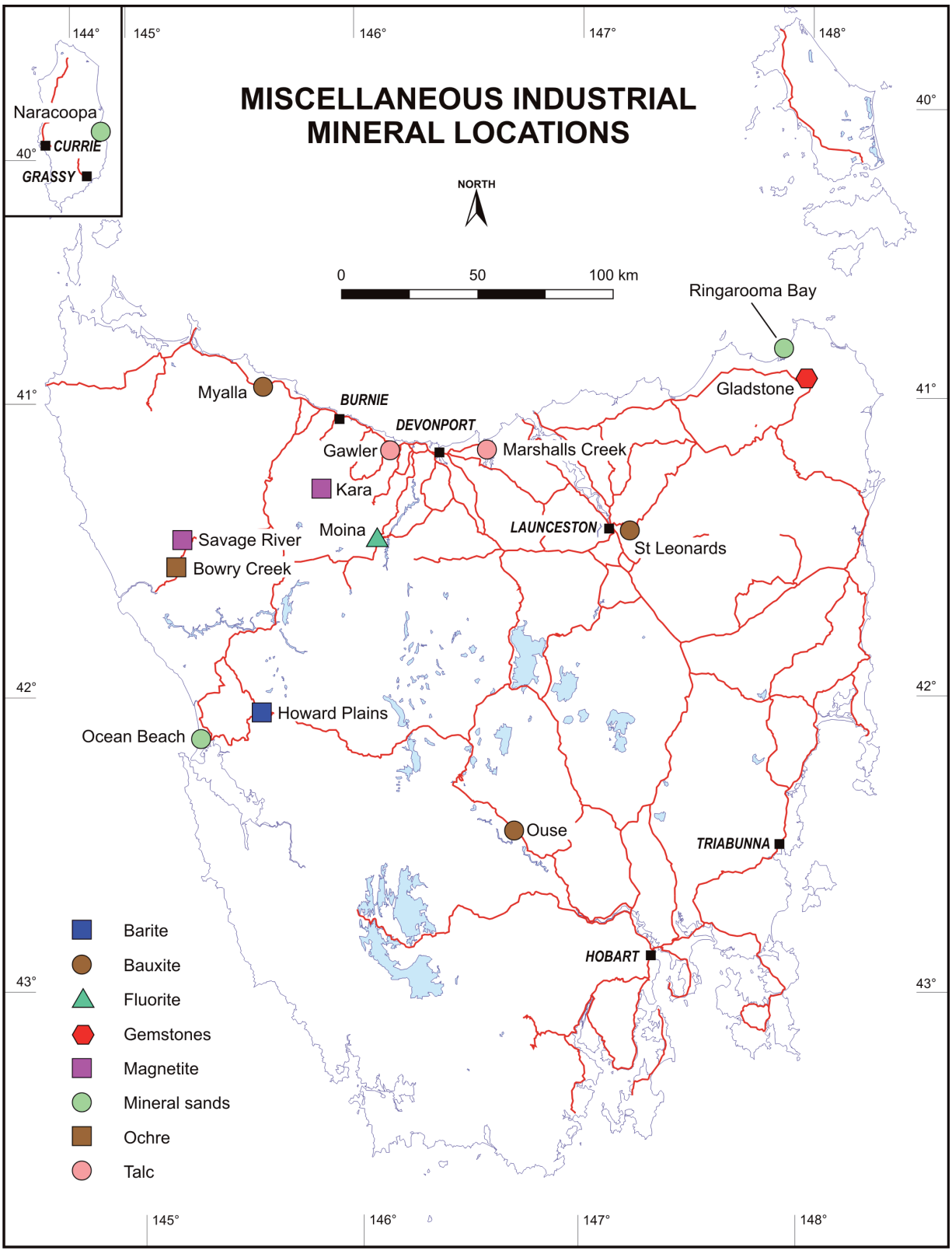
The Nelson Bay River deposit was initially explored by Pickands Mather and Company International (Savage River Mines) in 1966. Geopeko Ltd, in joint venture with CRA Exploration Pty Ltd, explored the deposit in the mid 1980s and Pacific-Nevada Mining Pty Ltd drilled two holes in 2000. The area has recently been explored by Gujarat NRE Resources NL.

Venture Minerals Ltd has recently explored the Mt Lindsay skarn with the intention of proving up a magnetite resource. A report to the stock exchange of 18 March 2008 outlines positive results from eighteen drill holes and highlights intersections such as 46 metres at 36.9% Fe.

OPPORTUNITIES

All the known magnetite deposits are currently held under some form of mining tenement and are being actively explored.

References
BOTTRILL, R. S.; TAHERI, J. 2007. Petrology of the host rocks, including mineralisation and adjacent rock sequences, from the Savage River mine. *Record Tasmanian Geological Survey* 2007/05.
TURNER, N. J. 1992. Kara and other nearby magnetite resources. *Report Department of Mines Tasmania* 1992/12.
Gujarat NRE Resources NL web site (www.gujaratnre.com.au).


MISCELLANEOUS INDUSTRIAL MINERAL LOCATIONS
NORTH
0
50
100 km
144°
145°
146°
147°
148°
40°
41°
42°
43°
Naracoopa
CURRIE
GRASSY
Ringarooma Bay
Myalla
BURNIE
DEVONPORT
Gawler
Marshalls Creek
Gladstone
Kara
Moina
LAUNCESTON
St Leonards
Savage River
Bowry Creek
Howard Plains
Ocean Beach
Ouse
TRIABUNNA
HOBART
Barite
Bauxite
Fluorite
Gemstones
Magnetite
Mineral sands
Ochre
Talc

Ochre

Ochre is usually defined as being composed of iron oxide, although clays heavily stained with iron oxides are also called ochres. It is used as a colouring agent in paint, plastics, rubber, concrete and pharmaceutical applications.

OCCURRENCES/GEOLOGICAL SETTING

Ochre is known to occur in many places in Tasmania although the individual deposits are very small.

The largest deposits are found to the south of Savage River (Bowry Creek) on the West Coast. These are iron oxide based and occur as residual and transported material in superficial deposits up to tens of metres thick, and are derived from the weathering of the underlying magnesite of the Precambrian-aged Bowry Formation.

A report by Annett (1995) discussed the two styles of deposit found at Bowry Creek. The Ochre site (yellow pigment) was calculated to have a reserve of proved and probable ore totalling 46 990 tonnes. Reserves at the Umber site (brown pigment) were estimated at around 20 000 tonnes. Extensive market and weathering testing was completed and showed that the product met all international standards.

Ochre is known from spring deposits near Smithton, weathered basalt, hematite and dolerite. Chrome-bearing oxides derived from serpentinite occur at Beaconsfield.

PRODUCTION

Small quantities have been mined for use in the manufacture of paint (2498 tonnes up to 1966) although none is mined today.

GRADE

The Savage River deposits conform to the American and British standards for 'iron oxide pigments'.

EXISTING OPERATIONS

None.

EXPLORATION AND HISTORICAL OPERATIONS

Ochre was mined from spring deposits near Smithton in the 1940s and sold for paint manufacture. Small quantities of red ochre, derived from weathered basalt, were mined intermittently last century at Spalford. Ochre and iron ore have been mined near Penguin and the chrome-bearing iron oxides near Beaconsfield were used for paint production from 1890 to 1928. Red and yellow ochres, derived from weathered dolerite, have been mined at Mowbray.

The iron oxide deposits at Bowry Creek were extensively explored in the 1990s and plans were made by Savage Resources Ltd for the mining of these deposits but this did not eventuate.

OPPORTUNITIES

The deposits at Bowry Creek, near Savage River, provide the best opportunity for the production of ochre in Tasmania. The reserves have been estimated at 350 000 tonnes of refined pigment consisting of yellow (ochre), brown (umber) and red (sienna) colours.

References

ANNETT, R. W. 1995. *Annual report for Retention Licence 8802 and Consolidated Mining Lease* 46M/90 at Main Creek, Savage River, Tasmania, for the period 24 May 1994 to 23 May 1995. Savage Resources Limited [TCR 95-3745].
BACON, C. A. 1987. Industrial Minerals in Tasmania – ochre. *Unpublished Report Department of Mines Tasmania* 1987/09.
SAVAGE RESOURCES LTD, 1993. *Development Proposal and Environmental Management Plan to operate a mine and beneficiation plants for the production of pigment at Savage River and on the North-West Coast*. Savage Resources Ltd [TCR 93-3516].

Talc

Talc is a soft whitish, greenish or greyish monoclinic mineral with a characteristic soapy or greasy feel, and is usually derived from the hydration of non-aluminous magnesium silicates. Talc has been used as a dusting agent, filler coating, pigment, a constituent of rubber, as a lubricant and in talcum powder.

OCCURRENCES/GEOLOGICAL SETTING

Talc is known to occur in many places in Tasmania in association with serpentinised ultrabasic rocks or as an alteration product of dolomite. Two lenses, one 27 × 1.8 metres, the other 18 × 1.5 metres wide occur near Gawler in northern Tasmania, hosted in quartz mica schist of Precambrian age.

A deposit of around three million tonnes occurs at Marshalls Creek, east of Port Sorell. The talc body is estimated to be 500 metres long, 50 metres wide and 40 metres thick. The talc forms part of a Cambrian-aged sequence of greywacke and siltstone with interbedded chert and dolomite.

Talc replacement of dolomite is known at Mt Bischoff, the largest body being 35 × 15 metres.

PRODUCTION

Production of talc in Tasmania totalled 338 tonnes between 1928 and 1948.

GRADE

	GAWLER	MARSHALLS CREEK
SiO_2	61.6	66.2
MgO	30.76	28.3
Al_2O_3	1.91	0.64
Fe_2O_3	0.57	0.24
CaO	–	0.03
LOI	5.22	4.9

EXISTING OPERATIONS

None.

EXPLORATION AND HISTORICAL OPERATIONS

Blue, white and an inferior iron-stained product were produced from pits at Gawler.

OPPORTUNITIES

The Marshalls Creek deposit is the largest occurrence in Tasmania.

Reference
BACON, C. A. 1987. Industrial minerals in Tasmania – talc. *Unpublished Report Department of Mines Tasmania* 1987/25.

Precious and semi-precious stones

A wide variety of semi-precious stones are found in Tasmania. While of interest to fossickers and lapidarists, only a few gemstones of high quality have been recorded.

OCCURRENCES/GEOLOGICAL SETTING

Sapphires have been found in the northeast alluvial tin fields. The majority of these specimens are small but specimens ranging up to 264 carats have been recorded from the Weld River. Small fractured specimens of ruby have also been noted from the tin fields. The alluvial sapphires, zircons and spinel originated as upper mantle xenocrysts in the Tertiary alkali basalts of northeast Tasmania.

Sapphires have also been found at Blythe River, Stanley and Boat Harbour.

Various forms of crystalline quartz have been found including amethyst, citrine, rose quartz and cairngorm. Cryptocrystalline silica varieties reported include agate, jasper, chert, flint, hornstone and prase. Amorphous silica in the form of common opal and wood opal (silicified wood) is known to occur at various localities. Almandine, andradite and grossular garnet have been found, as has topaz and zircon. The topaz crystals from Killiecrankie Bay on Flinders Island are known as 'Killiecrankie diamonds'.

PRODUCTION

Largely collection by amateur fossickers, quantities unknown.

GRADE

Gem quality sapphires occur in the northeast tin fields.

EXISTING OPERATIONS

Van Dieman Mines plc has recently begun mining near Gladstone in northeast Tasmania and intends to produce cassiterite and sapphire.

EXPLORATION AND HISTORICAL OPERATIONS

Sapphires were mined as a by-product during alluvial tin mining operations in northeast Tasmania, most of which ceased in the 1970s.

Fossickers have had a long interest in seeking out Tasmania's semi precious stones. A number of lapidary clubs exist for this purpose.

OPPORTUNITIES

The northeast alluvial tin deposits represent the most promising opportunities.

References
THREADER, V. M. 1976. Sapphire and ruby — Tasmania, in: KNIGHT, C. L. (ed.). Economic Geology of Australia and Papua New Guinea. 4. Industrial minerals. *Monograph Serial Australasian Institute of Mining and Metallurgy* 8:316.
THREADER, V. M. 1976. Semi Precious stones in Tasmania, in: KNIGHT, C. L. (ed.). Economic Geology of Australia and Papua New Guinea. 4. Industrial minerals. *Monograph Serial Australasian Institute of Mining and Metallurgy* 8:351–352.

Bauxite

Bauxite is an impure hydrated aluminium oxide, and the principal ore of aluminium. Appreciable quantities are also used as an industrial mineral, either calcined or processed to chemical-grade alumina for use in a wide variety of ceramic, abrasive, refractory, chemical and other applications.

OCCURRENCES/GEOLOGICAL SETTING

Small areas of bauxite occur on dolerite and basalt, and represent remnants of more widespread development due to deep weathering in the late Tertiary. The greatest concentration of bauxite remaining is in the Ouse area, where seventeen separate lenticular bodies of bauxite have been located. The maximum thickness of the bauxite is 7.6 metres, with an average thickness of 2.4 metres. The bauxite lenses, which dip from 6° to 12°, are overlain by a 15 metre thick layer of interbedded clay, sandy clay and lignite. Three zones have been identified:

1. an upper zone with pisolitic or nodular texture;

2. a zone with massive structureless bauxite;

3. a lower horizon of massive bauxite, often finely porous with a texture suggesting weathered dolerite.

Several separate dolerite-derived bauxite areas occur near St Leonards but this area is now well established as an outer suburb of Launceston. These lenses vary from 1.5 to two metres in thickness and are locally overlain by Tertiary sediments.

Two small deposits have been recorded north of Swansea, where the bauxite has developed on dolerite.

Bauxite forms a capping on some of the hills underlain by basalt at Myalla.

PRODUCTION

A small quantity has been produced at Myalla and used to purify transformer oil.

GRADE

	Al_2O_3	SiO_2	Fe_2O_3	TiO_2
Ouse	40.4		28.0	2.2
St Leonards	41.5		25.7	2.2
Swansea (1)	34.3	3.8		
Swansea (2)	35.0	8.1	33.0	

EXISTING OPERATIONS

None.

EXPLORATION AND HISTORICAL OPERATIONS

The bauxite deposits in Tasmania were examined by the (then) Department of Mines and the (then) Commonwealth Bureau of Mineral Resources in the 1940s.

OPPORTUNITIES

The Tasmanian deposits are small by Australian standards.

Reserves have been estimated as:

Ouse — 700 000 tonnes

Myalla — 180 000 tonnes

St Leonards — 145 000 tonnes

Swansea (6 km north) — 95 500 tonnes

Swansea (11 km north) — 31 500 tonnes

Reference
MATTHEWS, W. L. 1975. Bauxite in Tasmania in: KNIGHT, C. L. (ed.). Economic Geology of Australia and Papua New Guinea. 1. Metals. *Monograph Serial Australasian Institute of Mining and Metallurgy* 5:992–993.

Graphite

Graphite, a form of carbon, is used in refractory products, lubricants, brake linings, battery electrodes, and many other uses.

Graphite has been found as a minor component in quartz-mica schist in Tasmania. Minor quantities have been mined. There is no current production.

OCCURRENCES/GEOLOGICAL SETTING

Graphite has been found in Precambrian metamorphic rocks near Forth, Ulverstone and Rocky Cape; in carbonaceous shale at Balfour; and in Silurian-aged slate on Cape Barren Island. Minor occurrences have been noted in Triassic sedimentary rocks in the Wayatinah district and with ores in the Zeehan and Dundas districts.

PRODUCTION

Around 22 tonnes was mined from the River Leven deposit intermittently from 1940 to 1949.

GRADE

Paloona Bridge — 5% carbon;

River Leven schist — 0.6% carbon.

EXISTING OPERATIONS

None.

EXPLORATION AND HISTORICAL OPERATIONS

Two leases were held on Cape Barren Island in 1898, with a small tonnage being mined from three shafts. There has been minor production from an adit near the River Leven.

OPPORTUNITIES

The Balfour Shale contains carbonaceous lenses that may be composed of up to 40% graphite.

References

BACON, C. A. 1987. Industrial minerals in Tasmania — graphite. *Unpublished Report Department of Mines Tasmania* 1987/14.
HUGHES, T. D. 1951. Commercial graphite in Tasmania. *Unpublished Report Department of Mines Tasmania* 1951:33–34.

Wollastonite

Wollastonite (calcium silicate, $CaSiO_3$) is used in ceramics, as a substitute for asbestos, and as a filler in paper and paints. In Tasmania it is mostly found in skarns related to Devonian granites. The largest deposit is near the Kara (tungsten/magnetite) mine in northern Tasmania and is suitable for beneficiation.

OCCURRENCES/GEOLOGICAL SETTING

Wollastonite has been recorded from Moina, Kara and Mt Lindsay where siliceous limestone has been intruded and contact metamorphosed by Devonian granite. A large deposit occurs in Wollastonite Creek near the Kara mine in a calcite-wollastonite-diopside-feldspar skarn. Wollastonite is found with pyroxenes at Highwood Hill, and has been reported in skarn from the former Shepherd and Murphy Sn-W-Bi-Au mine at Moina. It also occurs in siliceous limestone at the base of the Ordovician Gordon group near Moina.

Many other minor occurrences are known, including occurrences where brachiopods in impure Permian limestone have been replaced with wollastonite as a result of contact metamorphism with Jurassic dolerite.

PRODUCTION

None to date.

GRADE

Samples from the Kara mine contain between 20 and 50% wollastonite. Beneficiation tests in 1997 showed that a sample containing 20% wollastonite could be used to produce a concentrate containing 96% wollastonite after grinding and flotation. Fibres with a length/width ratio greater than 3:1 comprised about 70% of the concentrate. Earlier work by the Department of Mines laboratories produced a concentrate of 94% wollastonite by a combination of magnetic separation and flotation.

Moina skarns contain up to 80% wollastonite.

EXISTING OPERATIONS

None.

EXPLORATION AND HISTORICAL OPERATIONS

The wollastonite in the vicinity of the Kara mine has been examined periodically. None of the other occurrences have received much attention and consequently the reserves and grades are unknown.

OPPORTUNITIES

The major deposit is at Wollastonite Creek near the Kara mine, where reserves have been estimated at one million tonnes. The limestone beds in which the wollastonite occurs are thin and banded with chert.

The calcic skarn at Moina has some potential.

The Mt Lindsay skarns have not been well studied but as the wollastonite content is low the potential is limited.

References
BACON, C. A.; BOTTRILL, R. S. 1988. Industrial minerals in Tasmania – wollastonite. *Unpublished Report Department of Mines Tasmania* 1988/29.
BOTTRILL, R. S. 2001. Wollastonite in Tasmania: an update. *Record Tasmanian Geological Survey* 2001/02

Phosphates

Phosphate minerals are found in sedimentary, igneous and metamorphic rocks, but sedimentary rocks are the most important as commercial sources of phosphorus, whether for fertilisers or industrial chemicals. The main phosphate mineral is apatite $Ca_5(PO_4,CO_3)_3(F,OH,Cl)$.

By far the main use of phosphate rock is for manufacturing fertiliser. Phosphates are also processed to a wide range of phosphorus-containing chemicals, including elemental phosphorus, for use in a wide variety of industrial processes and products such as detergents.

OCCURRENCES/GEOLOGICAL SETTING

Phosphatic nodules comprise up to 5% of some Permian units in southern and eastern Tasmania, notably the Berriedale Limestone, Malbina Formation, Darlington Limestone and Fonthill Sandstone Member.

In northwest Tasmania, the Smithton Dolomite is thought to be of Ediacaran to possibly Early Cambrian (c. 570–530 Ma) age. This was a time of generation of large phosphorite deposits in many parts of the world (e.g. northern Australia, India, China). The Smithton Dolomite is the right age and palaeo-environment (shallow-marine carbonate) to be prospective for phosphorite, but the unit is poorly exposed and needs to be tested by drilling.

PRODUCTION

None.

EXISTING OPERATIONS

None.

EXPLORATION

Special Exploration Licence 40/2005 was taken out to search for phosphate and other industrial minerals in northwest Tasmania, and was recently relinquished.

OPPORTUNITIES

Potential in the Neoproterozoic–Cambrian Smithton Basin remains largely untested.

Zeolite

Zeolites are a diverse 'supergroup' of minerals, all being crystalline hydrated aluminosilicates of the alkali and alkaline earth metals, particularly Ca, Na and K. Some 94 species are known, some of the more important including clinoptilolite, chabazite, mordenite, phillipsite, laumontite, stilbite, heulandite, analcime, natrolite and thomsonite. The zeolites have some unusual and important characteristics including capacity for ion-exchange and molecular sieving which make many varieties of considerable economic significance. Uses include adsorption (e.g. removal of ammonia, heavy metals, radio isotopes, etc.), purification (particularly waste water, sewage, hydrocarbons, air and gases), drying, kidney dialysis, hydrogen production (from water), detergent production, animal feeds, fertilisers, aquaculture, hydrocarbon conversion (e.g. conversion of methane to petroleum), isomerisation, redox reactions, hydrogenation and dehydrogenation, organic catalysis (e.g. shape-selective reforming), solar energy storage, and many more.

OCCURRENCES/GEOLOGICAL SETTINGS

Naturally occurring members of the zeolite group are widespread in Tasmania, particularly as secondary minerals in Jurassic dolerite and Tertiary basalt. They have also been reported from Devonian mineralised systems, Permian hornfels, Upper Triassic volcaniclastic lithic sandstone, Cretaceous alkaline rocks and Tertiary conglomerate. Nineteen different species have been recorded. Styles include veins, replacement, pore-filling, breccia fill and vesicle fill.

PRODUCTION.

None known.

GRADE

At Gads Hill zeolites (mostly chabazite) reach concentrations of approximately 25% over a thickness of about 20 metres.

EXISTING OPERATIONS

None

EXPLORATION

The Commonwealth Aluminium Corporation Limited (Comalco) explored for zeolites in the Sheffield area, mostly in Tertiary basalt and agglomerate at Gads Hill, which were tested by diamond drilling, geological mapping and metallurgical beneficiation. This work indicated that the zeolites (mostly chabazite) reach concentrations of ~25% over a thickness of about 20 m, and can be upgraded by gravity concentration and magnetic separation to purities of up to 98%. Comalco also explored the Redpa–Marrawah area for zeolites, which occur in Tertiary basalt and agglomerate.

OPPORTUNITIES

Economic deposits are not known in Tasmania at present, but there are numerous small occurrences, some of which are relatively rich and of moderate size, giving indications of some potential for economic mineralisation.

Deposits in post-Carboniferous rocks appear to have the highest economic potential for zeolites in Tasmania. Disseminated zeolites occur in significant amounts in Permo-Triassic volcaniclastic lithic sandstone near Wayatinah and York Plains, but the grade and size potential is uncertain. Abundant zeolite cement is common in Tertiary deposits of dolerite conglomerate and sandstone in the Tamar area and in some nearby sub-basalt Tertiary sandstone, and could have economic potential. Deposits in basalt at Gads Hill and Marrawah have sub-economic grades and potential and there are probably many more deposits of this type in Tasmania.

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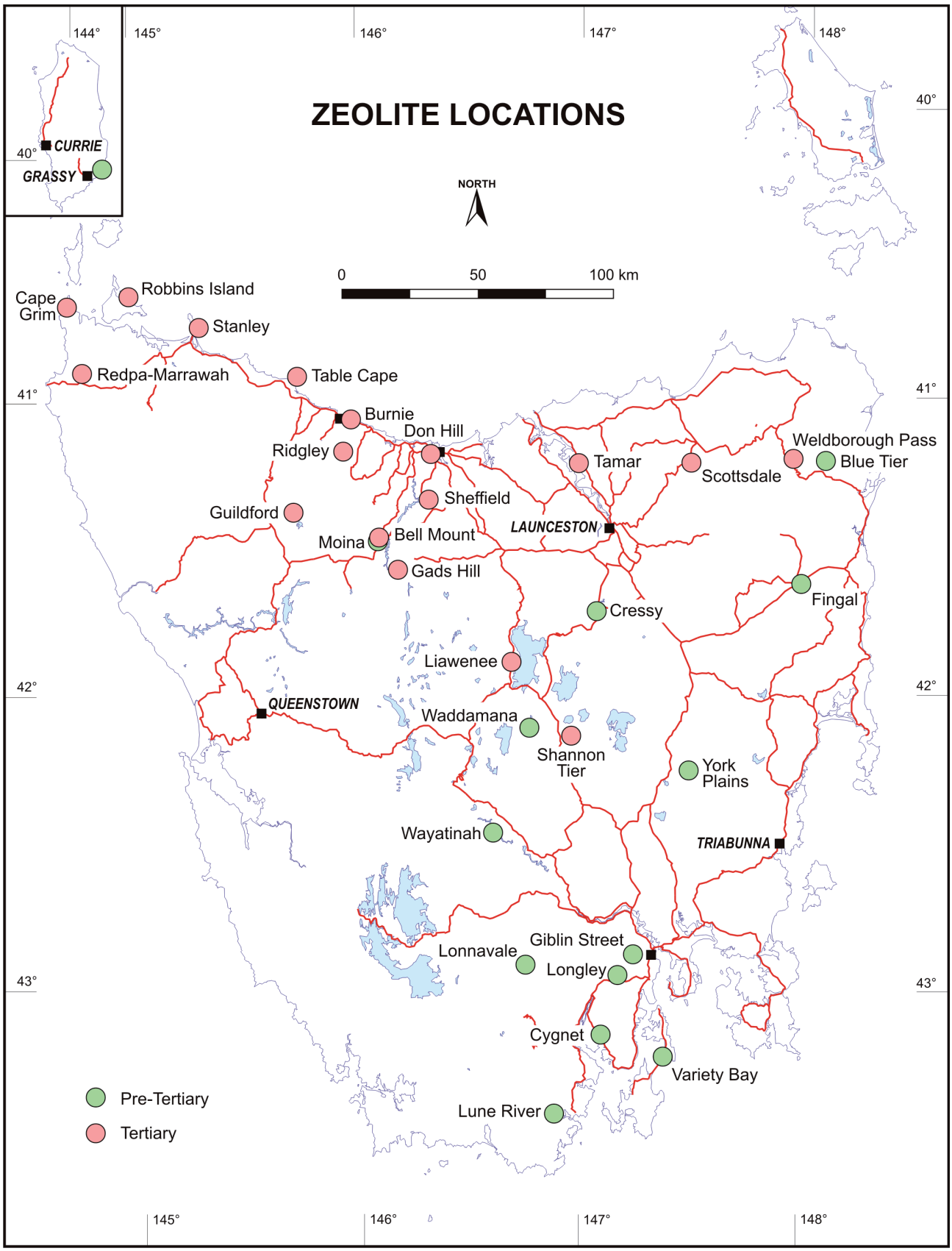
Reference
BOTTRILL, R. S.; EVERARD, J. L. 1997. Zeolites in Tasmania. *Record Tasmanian Geological Survey* 1997/07


ZEOLITE LOCATIONS
NORTH
0
50
100 km
144°
145°
146°
147°
148°
40°
41°
42°
43°
CURRIE
GRASSY
Cape Grim
Robbins Island
Stanley
Redpa-Marrawah
Table Cape
Burnie
Don Hill
Ridgley
Tamar
Scottsdale
Weldborough Pass
Blue Tier
Sheffield
Guildford
Moina
Bell Mount
LAUNCESTON
Gads Hill
Fingal
Cressy
Liawenee
QUEENSTOWN
Waddamana
Shannon Tier
York Plains
Wayatinah
TRIABUNNA
Giblin Street
Lonnavale
Longley
Cygnet
Variety Bay
Lune River
Pre-Tertiary
Tertiary

Sulphur

Sulphur is used mainly in the form of sulphuric acid, the main uses of which are the manufacture of phosphatic fertilisers and the leaching of copper ores, particularly oxidised ores. Comparatively minor amounts of elemental sulphur are used in agriculture, as insecticide and fungicide, in the paper and rubber industries, and in some detergents and pharmaceutical products.

No elemental sulphur is known in Tasmania but there is abundant pyrite (FeS_2) which, when calcined, liberates sulphur dioxide (SO_2), which may then be converted to sulphuric acid.

OCCURRENCES/GEOLOGICAL SETTING

The ore bodies at Mt Lyell (copper) and Rosebery (lead-zinc) contain pyrite and have yielded much sulphur from the treatment of sulphide ores. The pyrrhotite-pyrite-tin lodes at Renison Bell contain sulphur. Pyritic shale occurs at Branchs Creek east of Port Sorell.

EXISTING OPERATIONS

Sulphuric acid is produced at the Nyrstar zinc refinery at Hobart, although the raw material for this refinery is only partly sourced from the Rosebery mine in western Tasmania.

EXPLORATION

Pyrite for the manufacture of sulphuric acid has been mined near Zeehan and at Mt Chester. A by-product from the Mt Lyell mine has been exported for acid production.

A plant to make sulphuric acid at Burnie used raw material from the west coast mines, but this is now closed.

OPPORTUNITIES

The largest quantities of sulphur ore are within the Mt Lyell and Rosebery ore bodies which are currently being mined.

References
KNIGHT, C. L. 1976. Sulphur — Tasmania, in: KNIGHT, C. L. (ed.). Economic Geology of Australia and Papua New Guinea. 4. Industrial minerals. *Monograph Serial Australasian Institute of Mining and Metallurgy* 8:384.

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