



NSW DEPARTMENT OF
PRIMARY INDUSTRIES

This document is part of a larger publication and is subject to the disclaimers and copyright of the full version from which it was extracted. Information on purchasing the book, and details of other industrial minerals, as well as updates and copyright and other legal information can be found at:

<http://www.dpi.nsw.gov.au/minerals/geological/industrial-mineral-opportunities>

Potential and Outlook

There is excellent potential in New South Wales for talc, especially from extensive talc–carbonate rocks near Cootamundra (Figure 28). The prospective areas occur at several sites at the northern end of the Coolac Serpentinite Belt (Figure 6), between Coolac and Wallendbeen. The Muttama deposit also occurs in this area. The geology of these prospects and deposits is similar to those that are exploited on a large scale overseas.

There has been a general perception within the industrial minerals industry in Australia that dolomite-associated talc deposits are purer than ultramafic-associated deposits. This perception has undoubtedly contributed to the lack of interest in the past in the ultramafic-associated talc deposits of the state.

However, there are large commercial operations overseas in ultramafic associations that produce high-quality talc (e.g. Vermont, USA) from rocks with as little as 20% talc. It is important to note that the suitability of talc for high-grade industrial applications is independent of the type of deposit (Harben 1999). Nearly all commercial talcs have impurities, usually dolomite or magnesite. Sophisticated processing, including flotation and magnetic separation, is commonly used to increase the purity of the product.

Deposits near Wallendbeen were mined on a small scale between 1910 and 1967. The deposits were worked over a distance of more than 4.5 km, and over 16 000 tonnes of talc were produced (Holmes 1977). Talc sources include talc schist, talc–carbonate, and quartzite near a serpentinite–granite contact. Considerable resources of talc may be present that could be amenable to sophisticated processing. Iron staining of the talc was reported to be a problem in marketing the talc. However, as all the workings were shallow it is unlikely that fresh rock was reached at the depths worked, even in underground workings.

Deposits of talc–carbonate rock associated with serpentinite at Muttama, north of Coolac, were also mined intermittently for many years on a very small scale, for foundry use.

The areas occupied by the talc–carbonate rocks are generally amenable to quarrying, and the main southern railway transects the northern end of the prospective area.

The commercial potential of the broader occurrences of talc–carbonate rock has never been recognised before,

and there has never been any systematic evaluation. Field reconnaissance suggests that the mapped talc–carbonate rocks contain extensive areas of talc-rich rocks, and coarse-grained, light-coloured talc is common, particularly at the margins of the mapped talc–carbonate rocks. In many of the exposures of the talc–carbonate rocks, talc appears to make up a considerable proportion of the rock.

Nature and Occurrence

Talc is a phyllosilicate with the formula $Mg_3Si_4O_{10}(OH)_2$. It is formed by the alteration of magnesium-rich rocks, such as dolomite, siliceous dolomite and ultramafic rocks. The weak links between the layers in the crystal structure of talc cause the mineral's extreme softness (hardness of one on Mohs' scale), and its characteristic greasy, soapy feel. Talc deposits can form in three geological settings:

1. contact metamorphism of dolomite
2. regional metamorphism or metasomatic alteration of ultramafic rocks, such as peridotite or pyroxenite, or mafic rocks such as gabbro
3. hydrothermal alteration in volcanic rocks (rare).

In metamorphic settings, talc forms in both prograde and retrograde processes, depending on specific circumstances, and may occur in shear zones and similar structures. The term 'steatite' is used for any talc-rich rock regardless of origin. 'Steatisation' is the term used for the formation of such rocks.

The most abundant type of talc deposit is that associated with ultramafic rocks, and in such a setting it may occur as large, almost monomineralic masses, or as talc–carbonate rocks.

Deposits associated with dolomitic rocks may be of higher purity and of lower iron content than talc deposits in other settings, but are less common.

Talc is mined in many countries. World talc production in 2004 was about 8 Mt (Table 40) (Virta 2004). The precise amount is hard to specify as talc and pyrophyllite are commonly reported together. The major world talc producers are China, USA, India, France, Brazil, Italy and Australia. Other significant producers include Austria, Republic of Korea, Russia and Spain.

Mined deposits cover the full range of deposit types, but the most common association seems to be with serpentinitic rocks, talc being formed

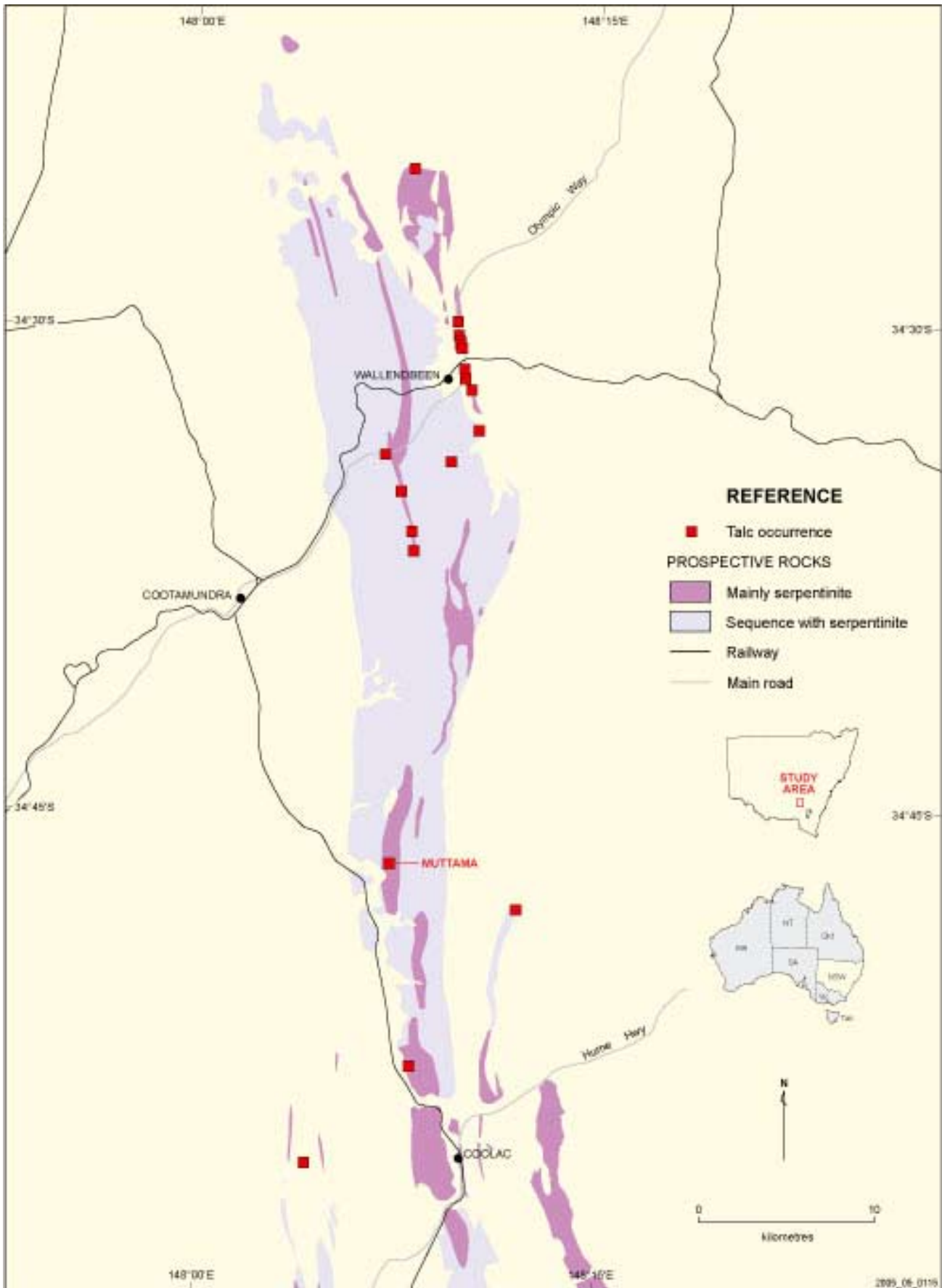


Figure 28. Talc occurrences and prospective rocks in the Cootamundra-Wallendbeen area

by serpentinitisation or by contact metamorphism, commonly associated with carbonatisation and silicification. Major deposits are also associated with dolomitic rocks. These are believed to have formed by contact or regional metamorphism, hydrothermal alteration or magnesium metasomatism. The deposits formed by such processes may be associated with talc schists (steatite or soapstone) or talc-carbonate rocks and magnesite (e.g. in Finland).

Table 40. World talc production 2004

Country	Production (tonnes)*
China	3 000 000
USA	857 000
India	550 000
France	350 000
Brazil	370 000
Australia	173 000
Italy	140 000
Austria	135 000
Other countries	2 745 000
Total	8 320 000

* May include pyrophyllite

Source: Virta (2004)

Main Australian Deposits

Talc has been mined in most Australian states, but the major occurrences are those in Western Australia and South Australia. Western Australia is the source of over 90% of Australian production. The Three Springs talc mine, near Geraldton, in Western Australia is the country's largest producer. In 2004, almost 134 000 tonnes of talc were produced at that operation (Western Australian Department of Industry and Resources 2004). The most common geological setting for Australian deposits is that of contact metamorphism of dolomitic rocks (e.g. Three Springs in Western Australia and Mount Fitton in South Australia). Regional metamorphic settings are also known, and some mined deposits are of uncertain origin (e.g. Gumeracha area, South Australia).

New South Wales Occurrences

There are 52 recorded talc occurrences in New South Wales (Ray et al. 2003). Previous studies of talc in New South Wales were undertaken by Gibbons (1968), Lishmund and Clift (1969) and Holmes (1977). Talc has been mined on a small scale at numerous localities, mainly in the Lachlan Orogen.

Most New South Wales talc deposits are associated with ultramafic rocks, or dolomite, and some are associated with skarns, e.g. in the Goulburn and Crookwell areas, near Taralga, and near Wattle Flat (near Bathurst). Talc has also been mined from small deposits at Havilah, near Mudgee, associated with dolomitic limestone. None of these deposits has been fully assessed. There is also potential for more occurrences of talc associated with ophiolites.

Deposits in New South Wales that have been mined include Muttama and Wallendbeen (ultramafic association) (Figure 28); Cow Flat (near Bathurst, involving regional and contact metamorphism of volcanic and dolomitic rocks); and Havilah (Mudgee area, involving regionally metamorphosed dolomitic rocks). Other deposits have been prospected at Wisemans Creek (Oberon area, origin uncertain but volcanic setting); and Rockley (ultramafic association) (south of Bathurst).

There are instances overseas of deposits being mined and marketed as talc, when the material mined is actually talc-chlorite or other such materials as quartz-sericite rock. There are several areas in New South Wales where deposits of sericite-rich rock occur, notably near Pambula (south coast) and at Botobolar, near Mudgee — in both cases associated with pyrophyllite (discussed in a separate chapter). These deposits may have potential to produce material which could be used as an alternative to talc in some applications, as occurs overseas, but have not been evaluated.

Applications

The properties of talc which make it useful as an industrial mineral are its softness, chemical inertness, its oil-absorptive properties and its flakiness. These properties enable its use as filler material; in ceramics; as an absorbent; in cosmetics; and a wide range of other applications. Depending on the application, the specifications may focus on chemical composition (especially SiO₂, MgO, CaO, Al₂O₃, Fe₂O₃ and TiO₂); colour; odour; brightness; or oil-absorptive capacity.

Numerous other industrial minerals compete with talc in the major applications, but particularly kaolin, calcium carbonate fillers and other clay minerals (such as bentonite). However, higher grade talcs are actively traded internationally.

Economic Factors

It is notable that some of the major world talc deposits are of the ultramafic association, which in Australia has traditionally been regarded as a source of low-grade talc. Sophisticated processing of talc ores is commonplace overseas, including magnetic separation and flotation, which allow ores with as little as 20% talc to be mined. However, it is also common for other associated minerals, such as tremolite, magnesite and dolomite, and even sulphide concentrates, to be extracted from the same ore for commercial use. Some of the associated minerals, such as tremolite, silica and anthophyllite, are considered health hazards in some countries.

Talc has been mined in most developed countries. High-grade talc may be readily marketed internationally, but the lower grades have more restricted markets. The major problems for Australian producers are the comparatively small domestic demand, the distances to overseas markets and competition from other materials, particularly in mineral fillers and ceramics. However, the outlook for high-grade talc is positive.

References

- GIBBONS G.S. 1968. Talc, steatite and pyrophyllite. *Geological Survey of New South Wales, Mineral Industry* 37.
- HARBEN P.W. 1999. *The industrial minerals handybook*. 3rd edition. Industrial Minerals Information Ltd, London.
- HOLMES G.G. 1977. The industrial applications of talc and pyrophyllite, and the economic potential of deposits in New South Wales. Geological Survey of New South Wales, Report GS1977/064 (unpubl.).
- LISHMUND S.R. & CLIFT D.S.L. 1969. Thuddungra talc prospect. Geological Survey of New South Wales, Report GS1969/360 (unpubl.).
- RAY H.N., MACRAE G.P., CAIN L.J. & MALLOCH K.R. 2003. New South Wales Industrial Minerals Database, 2nd edition. Geological Survey of New South Wales, Sydney, CD-ROM.
- VIRTA R.L. 2004. Talc and pyrophyllite. In: United States Geological Survey. compiler. *Minerals Yearbook: Volume 1 — Metals and Minerals 2004*. United States Department of the Interior.
- WESTERN AUSTRALIAN DEPARTMENT OF INDUSTRY AND RESOURCES 2004. *Western Australian Mineral and Petroleum Statistics Digest 2004*. Government of Western Australia.