

**CORNWALL**

A Summary of Mineral Resource Information for Development Plans: Phase One

**Mineral Resources**

Scale 1:100 000

Compiled by R.C. Scrivener, D.E. Highley, D.G. Cameron and K.A. Linley  
Project Leader: D.E. Highley  
Planning Consultants: J.F. Cowley, Mineral & Resource Planning Associates.  
Digital cartography by C. Simpson, British Geological Survey, Keyworth.

Production of this map was commissioned and funded by the Department of the Environment, Transport and the Regions (Contract MP0624).

Topography based on the Ordnance Survey 1:100 000 scale County maps. © Crown Copyright 1985  
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Locations of Scheduled Monuments at 31st March 1994 as supplied by English Heritage. The majority of monuments are plotted using a centred NGR system. Consequently the actual area and/or length of a monument protected by the legal constraints of scheduling cannot be represented here. Monuments scheduled or descheduled since that date are not accounted for.  
Digital AONB boundaries © Countryside Commission 1999  
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**MAJOR LIMITATIONS**  
The purpose of this map and associated reports in this series is to show the broad distribution of those mineral resources which may be of current or potential economic interest and to assist in assessing relative mineral resource potential. The map is not intended to assist in the consideration and preparation of development plans in respect of mineral extraction and the production of important mineral resources. They bring together a wide range of information, much of which is outdated and not always available in a convenient form.

The map has been produced by collection and interpretation of mineral resource data assembled by the British Geological Survey. Information on mineral planning permissions has been obtained from the relevant Mineral Planning Authorities. Some of these permissions may have expired. The areas of individual areas can be ascertained from the appropriate MPA. Location information on national planning designations has been obtained from the appropriate bodies (Countryside Commission, English Nature and English Heritage). For further information, the appropriate body should be contacted.

The mineral resource data presented are based on the best available information, but are not comprehensive and their quality is variable. The mineral boundaries shown are, therefore, approximate. Extensive areas are identified as having no mineral resource potential, but some isolated mineral workings may occur in these areas. The presence of these operations generally reflect very local or specific situations which are referred to in the accompanying report.

The map is intended for general consideration of mineral issues in relation to other planning constraints, and not as a source of detailed information on specific sites. The map should not be used to assist individual planning applications or to bring other decisions on acquisition or use of a particular piece of land. Although the map would be available for use as a specific product without cost.

**CHINA CLAY (Kaolin)**  
Measured and indicated resources  
Inferred resources  
Miscellaneous residue dams containing variable amounts and qualities of recoverable china clay

**IGNEOUS AND METAMORPHIC ROCKS**  
Granite  
Basic igneous rocks  
Intrusive (dolerite, gabbro) and extrusive (basalt, spilitic and volcanic ash)  
Ultrabasic igneous rocks  
Serpentinite / Picroite  
Metamorphic rocks  
Metamorphic (undifferentiated)

**SANDSTONE**  
Interbedded sandstone and shale / slate  
Sand  
Silica sand and clay  
Blown sand

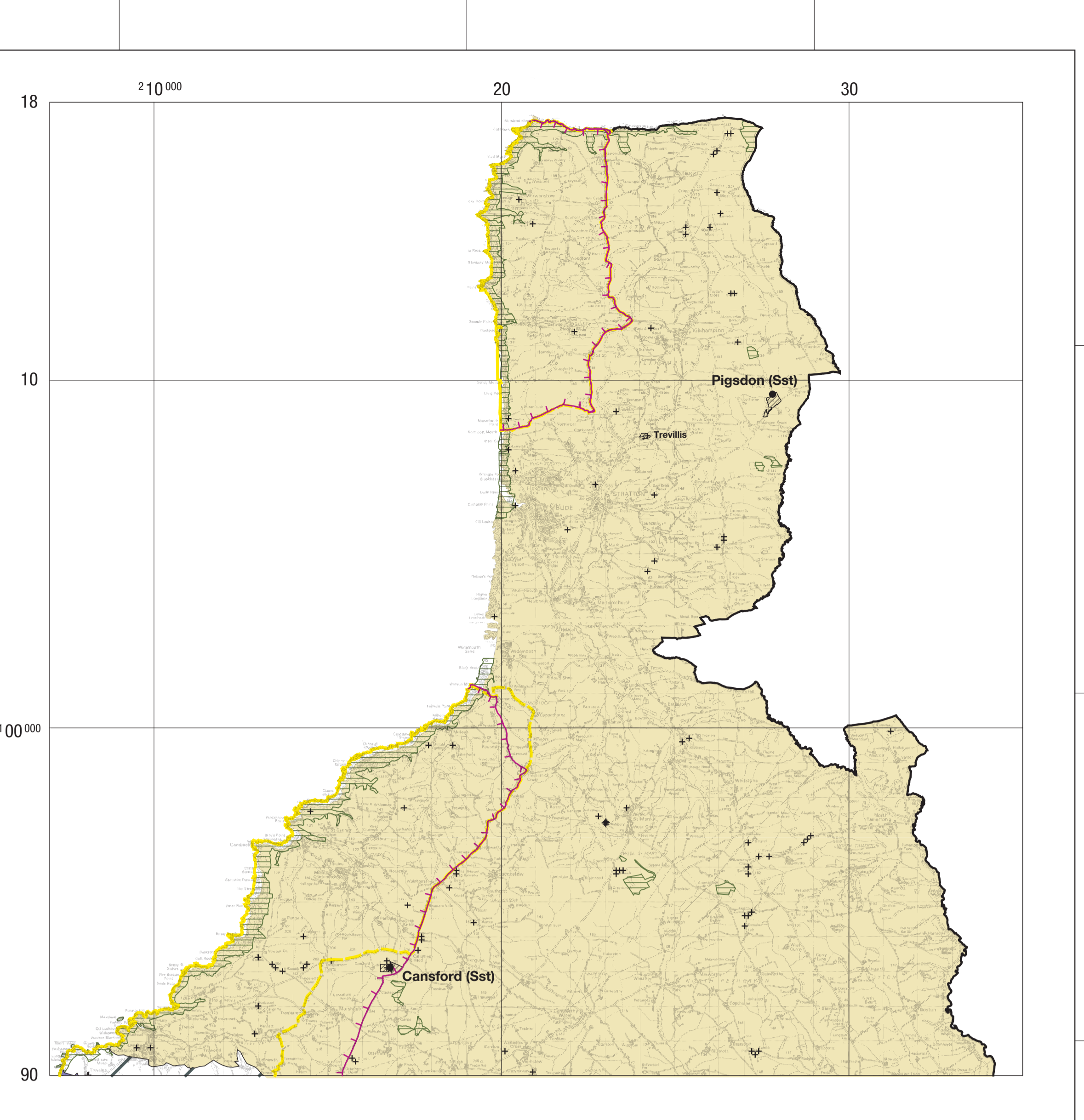
**SLATE**  
Slate resources  
Mineral workings  
Surface mineral working  
Underground mineral working

**Mineral Commodity**  
Cc China clay Cs Construction sand  
Ig Igneous rock Sn Tin  
Sst/Sh Sandstone / Shale Sl Slate  
Si Silica sand Cl Clay

**MINERAL PLANNING PERMISSIONS (as at 1.10.1996)**  
Source: Cornwall County Council  
Surface permission  
Underground permission

**ENVIRONMENTAL DESIGNATIONS**  
Area of Outstanding Natural Beauty  
Heritage Coast  
Heritage Coast (Inland boundary)  
Site of Special Scientific Interest  
National Nature Reserve  
Scheduled Monuments

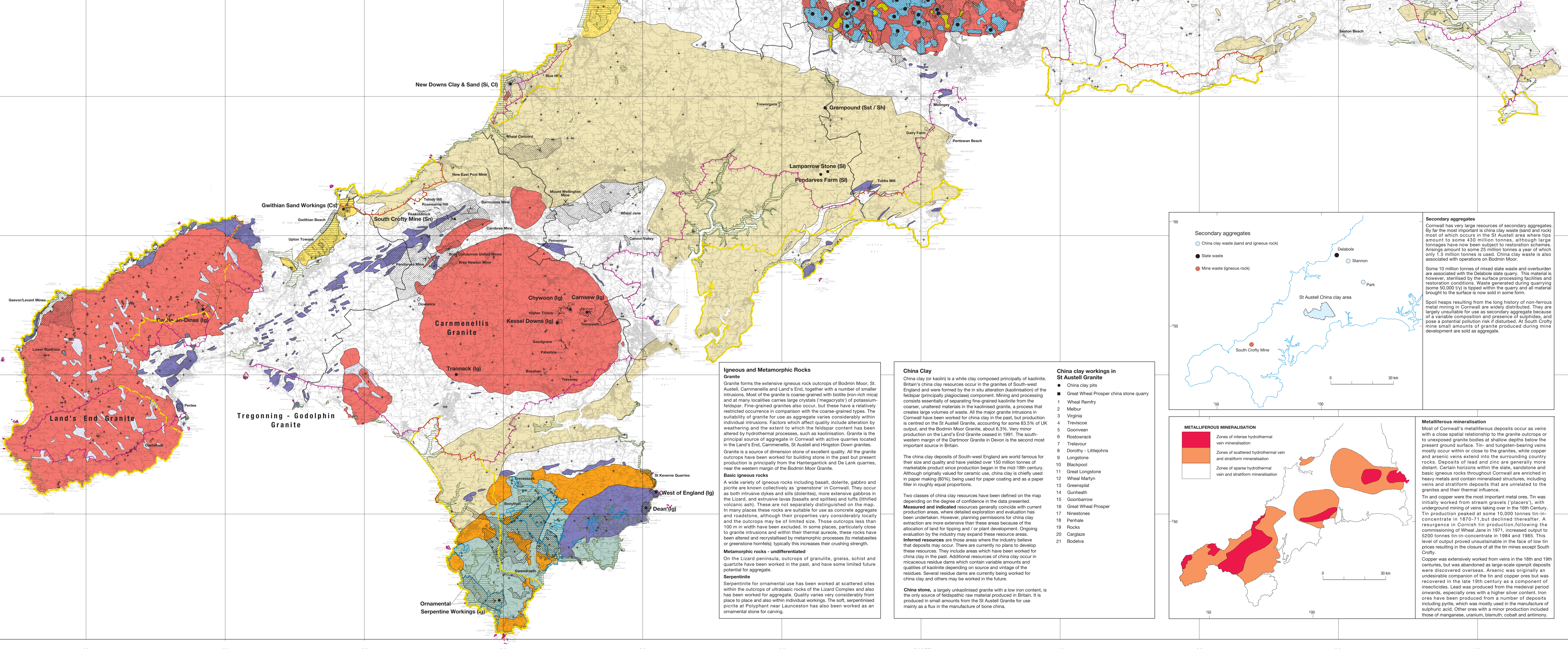
**ADMINISTRATIVE AREAS**  
County  
District



**Other minerals**  
**Slate**  
Cleaved or flaggy siltstone has been worked for building purposes, including walling and floor materials, from many localities in Cornwall. Areas which have yielded slate with a well-developed cleavage are much more restricted, these are shown on the map. Within these areas, good quality slate and particularly slate of roofing quality is of patchy occurrence. The largest slate working is at Dalabole in north Cornwall in beds of Upper Devonian age. Other smaller workings exist in this area, and also in Devonian slates immediately to the south of Bodmin Moor Granite.

**Sandstone**  
Sandstone resources occur within a number of the Devonian and Carboniferous formations of the Cornish peninsula. Sandstone may account for less than 50 percent of the outcrop, with the balance comprising shale, slate and siltstone interbedded with sandstone. Individual sandstone deposits vary in thickness, lateral persistence, hardness, grain size and weathering state, all of which affect their aggregate potential. The principal sandstone resources occur in the Bude and Crackington formations (Upper Carboniferous) of north Cornwall and in the Staddon Gilt (Lower Devonian) and Gramscote Beds (Upper Devonian) of east and central Cornwall, respectively. Some sandstones exhibit good aggregate properties and moderately high PSVs, but the presence of interbedded shales significantly reduces their potential. Sandstones have mainly been worked for aggregate and walling stone.

**Sand and clay**  
Other than beach deposits and coastal dunes (and china clay 'sand'), inland outcrops of sand are very restricted. Blown sand is worked near Hayle for construction use.  
Silica sand with interbedded beds of clay occur at St Agnes Beach. These deposits are worked in a very small way for pottery clay and sand for industrial use.



**Igneous and Metamorphic Rocks**  
**Granite**  
Granite forms the extensive igneous rock outcrops of Bodmin Moor, St Austell, Carnmenellis and Land's End, together with a number of smaller intrusions. Most of the granite is coarse-grained with biotite (iron-rich mica) and at many localities carries large crystals (megacrysts) of potassium feldspar. Fine-grained granites also occur, but these have a relatively restricted occurrence in comparison with the coarse-grained types. The suitability of granite for use as aggregate varies considerably within individual intrusions. Factors which affect quality include alteration by weathering and the extent to which the feldspar content has been altered by hydrothermal processes, such as kaolinisation. Granite is the principal source of aggregates in Cornwall with active quarries located in the Land's End, Carnmenellis, St Austell and Hingston Down granites. Granite is a source of dimension stone of excellent quality. All the granite outcrops have been worked for building stone in the past but present production is principally from the Hantertantick and De Lank quarries, near the western margin of the Bodmin Moor Granite.

**Basic igneous rocks**  
A wide variety of igneous rocks including basalt, dolerite, gabbro and picrite are known collectively as 'granitoids' in Cornwall. They occur as both intrusive dykes and sills (dolerites), more extensive gabbros in the Lizard, and extrusive lavas (basalts and spilitic) and tuffs (thinned volcanic ash). These are not separately distinguished on the map. In many places these rocks are suitable for use as concrete aggregate and roadstone, although their properties vary considerably locally and the outcrops may be of limited size. Those outcrops less than 100 m in width have been excluded. In some places, particularly close to granite intrusions and within their thermal aureoles, these rocks have been altered and recrystallised by metamorphic processes to metabasalts or greenschist horizons; typically this increases their crushing strength.

**Metamorphic rocks - undifferentiated**  
On the Lizard peninsula, outcrops of granulite, gneiss, schist and quartzite have been worked in the past, and have some limited future potential for aggregate.

**Serpentinite**  
Serpentinite for ornamental use has been worked at scattered sites within the outcrops of ultrabasic rocks of the Lizard Complex and also has been worked for aggregate. Quality varies very considerably from place to place and also within individual workings. The soft, speckled picrite at Polphar near Launceston has also been worked as an ornamental stone for carving.

**China Clay**  
China clay (or kaolin) is a white clay composed principally of kaolinite. Britain's china clay resources occur in the granites of South-west England and were formed by the *in situ* alteration (kaolinisation) of the feldspar (principally plagioclase) component. Mining and processing commenced especially of separating fine-grained kaolinite from the coarser, unaltered materials in the kaolinised granite, a process that creates large volumes of waste. All the major granite intrusions in Cornwall have been worked for china clay in the past, but production is centred on the St Austell Granite, accounting for some 85.5% of UK output, and the Bodmin Moor Granite, about 8.3%. Very minor production on the Land's End Granite ceased in 1991. The south-western margin of the Dartmoor Granite in Devon is the second most important source in Britain.

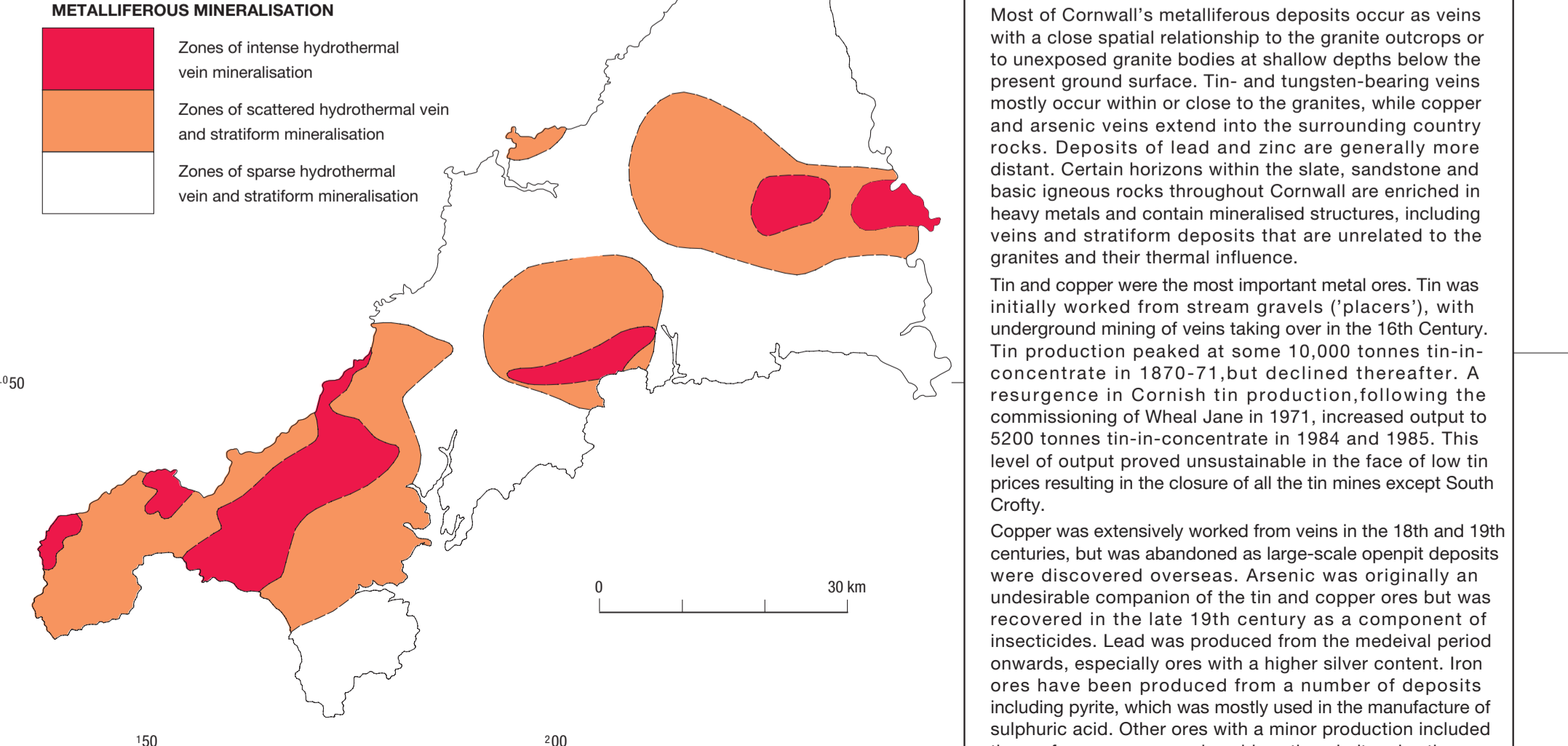
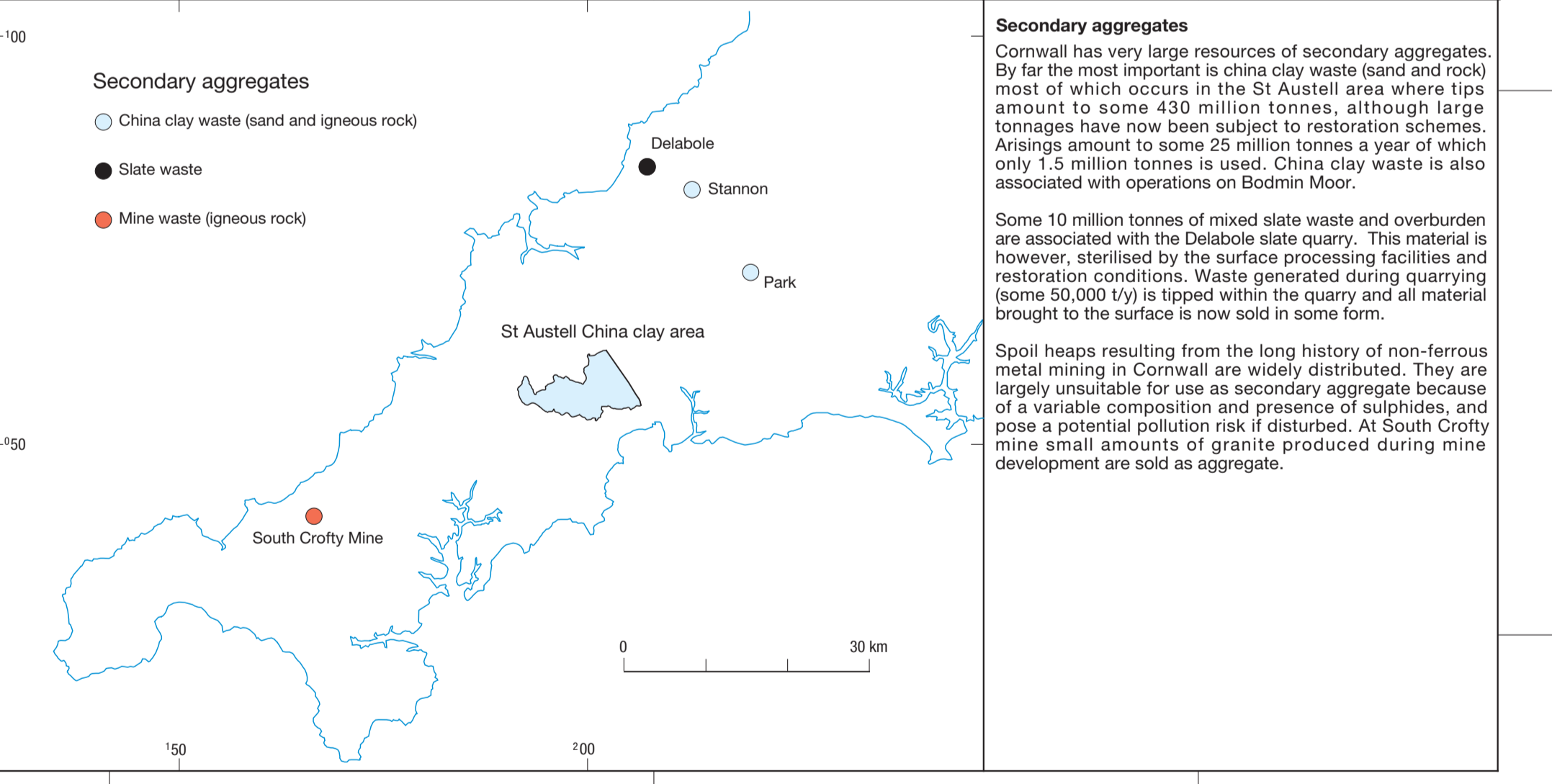
The china clay deposits of South-west England are world famous for their size and quality and have yielded over 150 million tonnes of material product since production began in the mid-18th century. Although originally valued for ceramic use, china clay is chiefly used in paper making (80%), being used for paper coating and as a paper filler in roughly equal proportions.

Two classes of china clay resources have been defined on the map depending on the degree of confidence in the data presented. Measured and indicated resources generally coincide with current production areas, where detailed exploration and evaluation has been undertaken. However, planning permissions for china clay extraction are more extensive than these areas because of the allocation of land for tipping and / or plant development. Ongoing evaluation by the industry may expand these resource areas. Inferred resources are those areas where the industry believe that deposits may occur. There are currently no plans to develop these resources. They include areas which have been worked for china clay in the past. Additional resources of china clay occur in micaceous residue dams which contain variable amounts and qualities of kaolinite depending on source and vintage of the residue. Several residue dams are currently being worked for china clay and others may be worked in the future.

**China stone**, a largely unkaolinised granite with a low iron content, is the only source of felspathic raw material produced in Britain. It is produced in small amounts from the St Austell Granite for use mainly as a flux in the manufacture of bone china.

**China clay workings in St Austell Granite**

- 1 Wheel Remyly
- 2 Mabur
- 3 Virginia
- 4 Trevelick
- 5 Goonwan
- 6 Rootowack
- 7 Treleour
- 8 Daverty - Litleyghns
- 9 Longstone
- 10 Blackpool
- 11 Great Longstone
- 12 Wheel Maryn
- 13 Greensplat
- 14 Gunheath
- 15 Goonbarrow
- 16 Great Wheel Prosper
- 17 Ninestones
- 18 Parhale
- 19 Rocks
- 20 Carlyze
- 21 Boobeva



**Secondary aggregates**  
Cornwall has very large resources of secondary aggregates. By far the most important is china clay waste (band and rock) most of which occurs in the St Austell area where tips amount to some 430 million tonnes, although large tonnages have now been subject to restoration schemes. Arsenic amount to some 25 million tonnes a year of which only 1.5 million tonnes is used. China clay waste is also associated with operations on Bodmin Moor.

Some 10 million tonnes of mixed slate waste and overburden are associated with the Dalabole slate quarry. This material is however, stabilised by the surface processing facilities and restoration conditions. Waste generated during quarrying (some 50,000 t/y) is tipped within the quarry and all material brought to the surface is now sold in some form.

Spill heaps resulting from the long history of non-ferrous metal mining in Cornwall are widely distributed. They are largely unsuitable for use as secondary aggregate because of a variable composition and presence of sulphides, and pose a potential pollution risk if disturbed. At South Crofty mine small amounts of granite produced during mine development are sold as aggregate.

**Metaliferous mineralisation**  
Most of Cornwall's metaliferous deposits occur as veins with a close spatial relationship to the granite outcrops or to unexposed margins of granite intrusions. They are largely unexploited, but some have been worked in the past. Tin and tungsten-bearing veins mostly occur within or close to the granites, while copper and arsenic veins extend into the surrounding country rocks. Deposits of lead and zinc are generally more discrete. Certain horizons within the slate, sandstone and basic igneous rocks throughout Cornwall are enriched in heavy metals and contain mineralised structures, including veins and stratum deposits that are unrelated to the granites and their thermal influence.

Tin and copper were the most important metal ores. Tin was initially worked from stream gravels ('placers'), with underground mining of veins taking over in the 16th Century. Tin production peaked at some 10,000 tonnes tin concentrate in 1870-71, but declined thereafter. A resurgence in Cornish tin production following the commissioning of Wheal Jane in 1971, increased output to 5200 tonnes tin-in-concentrate in 1984 and 1985. This level of output proved unsustainable in the face of low tin prices resulting in the closure of all the tin mines except South Crofty.

Copper was extensively worked from veins in the 18th and 19th centuries, but was abandoned as large-scale open-pit deposits were discovered overseas. Arsenic was originally an undesirable component of the tin and copper ores but was recovered in the late 19th century as a component of insecticides. Lead was produced from the medieval period onwards, especially ores with a higher silver content. Iron ores have been produced from a number of deposits including pyrite, which was mostly used in the manufacture of sulphuric acid. Other ores with a minor production included those of manganese, uranium, bismuth, cobalt and antimony.