British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Office of the Deputy Prime Minister
Creating sustainable communities

DEVON (South)

(comprising Devon, Plymouth, Torbay, Dartmoor National Park and part of Exmoor National Park)

Mineral Resource Information in Support of National, Regional and Local Planning

Mineral Resources

Scale 1:100 000

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For further information see www.minerals.UK.com

BIBLIOGRAPHIC REFERENCE

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SAND & GRAVEL

Superficial deposits

- Sub-alluvial: Inferred resources
- River terrace deposits

Bedrock deposits

- Budleigh Salterton Pebble Bed Formation } Sherwood Sandstone Group } Triassic
- Dawlish Sandstone Formation } Permian
- Aller Gravel Formation and Haldon Gravel Formation } Eocene

CHALK

- Undivided } Cretaceous

LIMESTONE

- Ogwell Limestone, Brixham Limestone, Torquay Limestone, Chercombe Bridge Limestone and Plymouth Limestone formations } Devonian
- Westleigh Limestone Formation and Bampton Limestone Formation } Lower Carboniferous

IGNEOUS & METAMORPHIC ROCKS

- Mafic igneous rocks
- Granite
- Thermal metamorphic aureole (Dartmoor only)

BALL CLAY

- Ball clay-bearing strata within Bovey Formation (see inset map) } Palaeogene

KAOLIN (CHINA CLAY)

- Indicated resources

BRICK CLAY

- Crackington Formation (Carboniferous); Exeter area only; Middle Devonian slate: Plymouth area only

- Approximate 10 km limit of resource

MINERAL PLANNING PERMISSION (as at 31.11.05)

Source: Mineral Planning Authorities

- Surface planning permission (valid and expired)
- Underground planning permission (valid and expired)

MINERAL WORKINGS

- Stoneycombe — Active site
- *Torr* — Inactive (including yet to be worked), worked-out and/or restored site

As	Arsenic	Lst	Limestone
Bal	Ball Clay	Mca	Mica
Ba	Barytes	MSg	Marine sand and gravel
Calc	Calcspar	Och	Ochre
Cc	China Clay	Peat	Peat
Ch	Chalk	San	Sand
Cht	Chert	Sg	Sand and gravel
Cl	Clay and Shale	SiR	Silica Rock
Co	Coal	Sl	Slate
Cu	Copper	Sn	Tin
Fe	Hematite	Sst	Sandstone
Fl	Flint	VMi	Vein Minerals
Ig	Igneous/metamorphic rocks	W	Tungsten/Wolfram

- Active rail aggregate depot
- Active marine aggregate wharf

ENVIRONMENTAL DESIGNATIONS (as at 30/06/03)

- National nature conservation designations (SSSIs and NNRs)
- International nature conservation designations (SACs, SPAs and Ramsar sites)
- Heritage Coast
- UNESCO World Heritage Coast
- National Park: Dartmoor
- Area of Outstanding Natural Beauty (AONB): South Devon, and parts of Tamar Valley and East Devon
- Scheduled Monument

ADMINISTRATIVE AREAS

- Mineral Planning Authority (National Parks are also MPAs)
- District

KAOLIN

China clay or kaolin is a commercial clay composed principally of the hydrated aluminosilicate clay mineral kaolinite. The commercial value of kaolin is based on the mineral's whiteness and its fine, but controllable, particle size which may be optimised during processing. Kaolin is used in a wide range of industrial products where it imparts properties such as opacity, smoothness, strength, resistance to heat, particle shape, which increases opacity at hiding power, its soft and non-abrasive texture, due to the absence of coarser impurities, and its chemical inertness. These key properties distinguish kaolin from the other kaolinitic clays produced in Britain, such as ball clay and fireclay. The kaolinite content of processed kaolin varies, but is generally in the range 75 to 94 per cent.

Kaolin resources in Britain are confined to the granites of South West England. The deposits are world famous for their size and quality. All the main granite intrusions have been worked to a limited extent in the past, but production has historically principally been based on the St Austell Granite and the southwestern margin of the Dartmoor Granite. The St Austell Granite is by far the most important source accounting for about 85 per cent of total sales, which were 1.85 million (tn) tonnes in 2004, valued at nearly £138 million. The industry is of considerable national and regional importance. Of total sales some 88 per cent is exported.

The kaolin deposits are of primary origin and were formed by the in situ alteration of the feldspar component of the granites. The commercial deposits are the product of hydrothermal alteration, which took place along the margins of the granite intrusions soon after the time of their emplacement. The most minerals are largely unchanged by this process. Extraction and processing consists essentially of separating fine-grained kaolinite from coarser, unaltered material, a process that results in large quantities of mineral waste. Kaolin has a range of uses but by far the most important, accounting for about 79 per cent of total sales, is in papermaking. The kaolin performs two quite separate functions, as a paper filler and as a coating pigment. The ceramics industry is the second most important market but kaolin is also used as a filler in paint, rubber and plastics.

In Devon kaolin resources are confined to the extreme southwestern edge of the Dartmoor Granite and on the adjacent, but separate, Crownhill Down Granite. Kaolinisation has been intense and there is a higher proportion of sand and less rock than in the St Austell Granite. The kaolin has lower iron and higher potash contents than in Cornwall and a larger proportion of sales are used in ceramics, paints, plastics and rubber. There is also a significant output of calcined kaolin for which the clays are well suited. Recently dry mining has been introduced in the Devon operations, which allows for more selective extraction and improved yields than traditional hydraulic mining.

The indicated resources shown on the map generally coincide with current production and adjacent areas. Planning permissions for kaolin extraction are more extensive as they also include land allocated for tipping. The projected life of the permitted reserves in Devon exceeds those in Cornwall. However, a critical factor is the availability of tipping space for the large quantities of sand and rock produced as waste. The indicated resources do not include the extensive areas of potentially kaolinised granite in the Dartmoor National Park or there are other smaller areas of kaolinisation in the Dartmoor Granite some of which have been worked in a small way in the past. However, they are not shown on the map, as they are not thought to have any future resource potential.

The kaolinisation is adjacent to and extends into the Dartmoor National Park. In 2001, IMERYS Minerals and WBB Minerals announced that they were to relinquish their permissions in the Park because of the impact that would have on a sensitive area. This has now been carried out.

BUILDING STONE

Currently there are ten quarries producing building stone in Devon; four in Devonian slate, five in Carboniferous sandstone and one quarry in granite.

Historically, Devon has produced a very wide range of stones for building purposes. The oldest rocks of the area are metamorphic schists, slates, limestones, and sandstones of the Devonian. The schists of the Start Complex were locally worked for building stone at Satcombe. The slaty rocks of the succession were worked in the past, both for roofing slate and as a local building stone across much of their outcrop.

The limestones of the Devonian (such as the Chercombe Bridge Limestone Formation) formerly supported an extensive 'marble' (polished limestone) industry, around Plymouth, Ashburton and Torquay. These rocks were also used in these areas as building stone. Tern sandstones occur throughout the Devonian and Carboniferous successions in the county. These have only been worked for local building purposes, but the Upper Devonian sandstones have been worked in a large area. The hard, coarse-grained breccias of the Permian (such as the Heavitree Breccia Formation) also provided local building stone.

In the east of the county, the glauconitic sandstones of the Cretaceous (Upper Greensand) were extensively quarried for building stone in the past, most notably for Exeter Cathedral. Around Blackborough, in east Devon the same succession contains chert nodules which have been used locally for building purposes, as well as supporting a large wheelstone (kaolin) industry in the past.

The Upper Cretaceous (Turonian) hard, chalky, shelly limestones from Beer on the east Devon coast have been mined and quarried since medieval times for building stone (known locally as 'Beer Stone'). This stone was used in Exeter Cathedral and many local churches. Beer Stone was also exported beyond the county boundary.

A wide variety of fine-grained, basaltic rocks from the Permian succession around Exeter and Tavistock have been used for building and are locally known as 'trap'. The best-known quarries were at Pocombe and Poslooe. Stone from these quarries was widely used in and around Exeter. Locally, intrusive dykes were also quarried for building stone.

Slate

Slates from many localities across Devon have been used in the past for building, especially as walling and flooring materials. These were largely worked from Upper Devonian sequences such as the Gurrington Slate Formation and Tavy Formation (formerly known as the Kate Brook Slate Formation) in south Devon and the Ilfracombe Slate, Combe Martin Slate and Morte Slate formations in north Devon.

The only remaining active slate workings are in the Tavy Formation. This consists of hard greenish-grey slates with occasional thin sandstones. The quarries include Mill Hill, Longford and Hennaton (the latter two in Dartmoor National Park) which are in the Tavistock area, west of Dartmoor. The Gurrington Slate Formation produced purple, green and grey roofing slates, but is relatively weak and was restricted to use in the Newton Abbot/Ashburton area. The Morte Slate Formation consists of typically silvery smooth, purplish and greenish-grey slates, locally silty with some siltstone and sandstone.

Granite

Dartmoor granite is Devon's principal building stone resource, widely used in Devon and across the country. The coarser grained, granitic elvan vein at Robonough was important locally as a building stone. The Lundy granite was worked briefly in the past for building stone.

The granite was emplaced as an extensive igneous rock intrusion during the Permian and forms the upland moors and tors of the Dartmoor National Park in south Devon. Mostly the granite is coarsely crystalline, with large phenocrysts or megacrysts of potassium-feldspar, quartz and biotite mica, together with accessory minerals such as tourmaline. Some fine-grained granites do exist within the Dartmoor outcrop, but these have a relatively restricted occurrence.

The suitability of granite for construction varies; much of the granite formerly worked (including that used in Nelson's Column and New Scotland Yard) was coarse-grained and large which helped crystals. Fresh, unaltered granite is ideal for engineering uses, but it is hard and expensive to quarry. Partial alteration of granite by weathering and/or hydrothermal processes (which ultimately leads to the formation of kaolin) makes the granite easier to quarry but limited building stone. Currently, there is only one working quarry in the Dartmoor National Park: Blackingstone Quarry, near Moretonhampstead, on the north-east side of Dartmoor. This quarry have been in operation since at least 1812.

A number of smaller intrusions are associated with the Dartmoor Granite. These include fine-grained felsite known locally as 'elvans'. The felsite intrusion near Chelfham is a very attractive stone. The Hentor Granite is a rare example of a microgranite consisting mainly of quartz, mica and feldspar with minor amounts of topaz and tourmaline. These including the 'Roborough Stone' were worked around Dartmoor for building stone and for roadstone aggregate.

PLANNING PERMISSIONS FOR MINERAL EXTRACTION

The extent of all known extant and former planning permissions for mineral working is shown on the map, irrespective of their current status. Information on planning permissions is provided by the Mineral Planning Authorities: Devon County Council and also digitised by BGS from Folding Sheets and other documents supplied by Plymouth City Council, Torbay Council and Dartmoor National Park. In addition, planning permission information was digitally acquired from Ministry of Housing and Local Government maps for the area and incorporated in the data. This data has been checked against the Mineral Planning Authorities' files. Any queries regarding the extent of sites shown should be directed to these authorities at the addresses shown below. The polygons cover active, former and restored mineral workings and, occasionally, mineral waste deposits.

Planning Permissions represent areas where a commercial decision to work mineral has been made, a successful application has been made with through the provisions of the Town and Country Planning Acts and mineral could be worked but some reserves have been depleted to a greater or lesser extent. Current planning status is not qualified on the map but it is available in the underlying database.

Contact addresses:

Devon County Council, Environment Directorate, Lucombe House, County Hall, Topsham Road, Exeter EX2 4QW, Tel: 01392 382323, Fax: 01392 382135, web address: www.devon.gov.uk

Plymouth City Council, Planning Services Department, Civic Centre, Royal Parade, Plymouth PL1 2EW, Tel: 01752 668000, Fax: 01752 304815, web address: www.plymouth.gov.uk

Torbay Council, Environment Services Department, Roebuck House, Abbey Road, Torbay Road, Torquay TQ2 5JT, Tel: 01803 201201, Fax: 01803 208856, web address: www.torbay.gov.uk

Dartmoor National Park, Planning and Community Department, "Parke", Haytor Road, Bovey Tracey, Newton Abbot TQ13 9JQ, Tel: 01626 832093, Fax: 01626 834684, web address: www.dartmoor-npa.gov.uk

Exmoor National Park, Planning and Community Department, Exmoor House, Dulverton TA22 9HL, Tel: 01398 323665, Fax: 01398 323150, web address: www.exmoor-nationalpark.gov.uk

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Contact address:
English Nature, Northminster House, Northminster, Peterborough, PE1 1UA, Tel: 01733 455000, Fax: 01733 455103, Web page: www.english-nature.org.uk

Positions of Scheduled Monuments at 25th September 2003 as supplied by English Heritage.
The majority of monuments are plotted using a centred NGR symbol. Consequently the actual area and/or length of a monument may extend beyond the symbol. Many of scheduling cannot be represented here. Monuments scheduled since that date are not accounted for. © Copyright English Heritage.
Contact address:
English Heritage, 23 Savile Row, London, W51 2ET, Tel: 020 7973 3132, Web page: www.english-heritage.org.uk

Digital AONB boundaries © Countryside Commission 1986 (now Countryside Agency).
Contact address:
Countryside Agency, John Dower House, Crescent Place, Cheltenham, Gloucestershire, GL50 3RA, Tel: 01242 521381, Fax: 01242 584270, Web page: www.countryside.gov.uk

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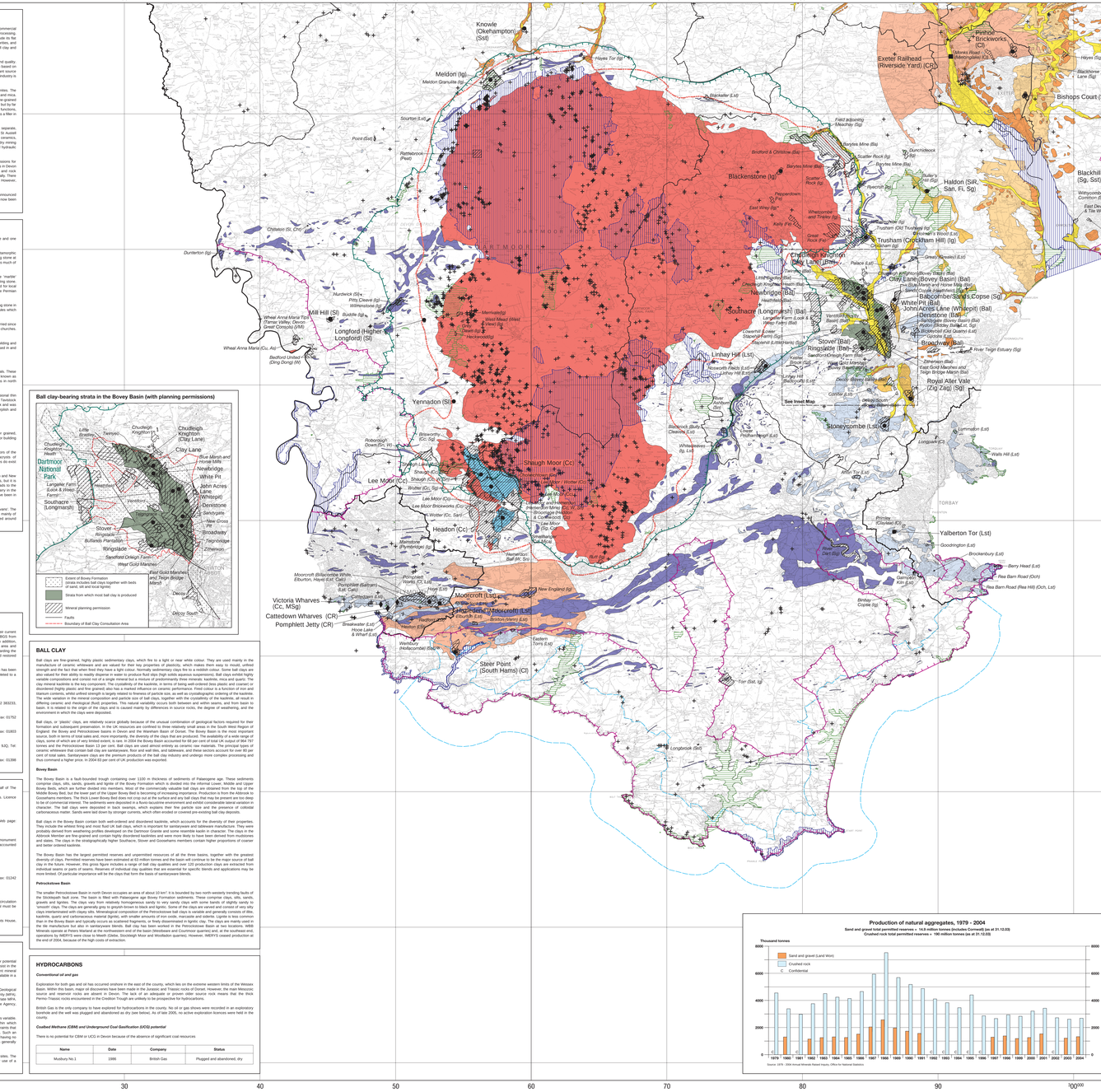
Aims and Limitations

The purpose of the maps in this series is to show the broad distribution of those mineral resources which may be of current or potential economic interest and to relate those to selected nationally-recognised planning designations. The maps are intended to assist in the consideration and preparation of development plan policies in respect of mineral extraction and the protection of important mineral resources against sterilisation. They bring together a wide range of information, much of which is scattered and not always available in a convenient form.

The maps have been produced by the collation and interpretation of mineral resource data principally held by the British Geological Survey and information on planning permissions held by the Mineral Planning Authorities (Devon County Council, Dartmoor National Park Authority, Exmoor National Park Authority). Some of these permissions may have lapsed or expired. The status of individual areas can be ascertained from the appropriate MPA. Location information on national planning designations has been obtained from the appropriate statutory body (Countryside Agency, English Nature and English Heritage). For further information the relevant 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 inferred boundaries shown are, therefore, approximate. Mineral resources defined on the map delineate areas within which potentially workable minerals may occur. These areas are not of uniform potential and also take no account of planning constraints that may limit their working. The economic potential of specific sites can only be proved by a detailed evaluation programme. Such an investigation is an essential precursor to submitting a planning application for mineral working. Extensive areas are shown 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.

The maps are intended for general consideration of mineral issues and not as a source of detailed information on specific sites. The maps should not be used to determine individual planning applications or in taking other decisions on the acquisition or use of a particular piece of land, although they may give useful background information which sets a specific proposal within context.


Knowle (Okehampton) (Sst)
Meldon (Ig)
Okehampton
Exeter Railhead (Riverside Yard) (CR)
Pinhoe Brickworks (Cl)
Monks Road (Meteorologist) (Cl)
Rockbeare (Sg)
Bishops Court (San)
Shawick Grange (Halyrne) (Ch, Slt)
Haldon (Silt, San, Fl, Sg)
Blackhill (Sg, Slt)
Trusham (Crockham Hill) (Ig)
Chudleigh Knighton (Bag Lane) (Bay)
Newbridge (Bal)
Southacre (Longmarsh) (Bal)
Mill Hill (Sl)
Longford (Higher Longford) (Sl)
Hennaton (Sl)
Stover (Bal)
Ringslade (Bal)
Broadway (Bal)
Denstone (Bal)
Royal Albert Vale (Zig Zag) (Sg)
Stoneycombe (Lst)
Yalberton Tor (Lst)
Yennadon (Sl)
Lee Moor (Cc)
Headon (Cc)
Shaugh Moor (Cc)
Moorcroft (Billacombe White, Eburton, Hyed Ore) (Sand)
Victoria Wharves (Cc, MSg)
Cattedown Wharves (CR)
Pomphlett Jetty (CR)
Modbury (Ag)
Steer Point (South Hams) (Cl)
Longbrook (Sst)
Torquay
Paignton
Brixham
Newton Abbot
Bovey Tracey
Ashburton
Tavistock
Okehampton
Kingsbridge
Salcombe
Dartmouth
Totnes
Ivybridge
Plymouth
Tiverton
Cullompton
Honiton
Axminster
Seaton
Sidmouth
Exmouth
Dawlish
Teignmouth
Newton Abbot
Torbay
Dartmoor National Park
Exmoor National Park
Bovey Basin
Bovey Formation
Ball clay-bearing strata in the Bovey Basin (with planning permissions)
Extent of Bovey Formation (strata includes ball clays together with beds of sand, silt and local lignite)
Strata from which most ball clay is produced
Mineral planning permission
Faults
Boundary of Ball Clay Consultation Area
Chudleigh Knighton Heath
Little Bradley
Twinyeo
Chudleigh Knighton Pt 1
Chudleigh Knighton (Clay Lane)
Clay Lane
Blue Marsh and Horse Mills
Newbridge
White Pit
John Acres Lane (Whitepit)
Denstone
Sandygate
Pyes Pit
Broadway
Teignbridge
Colhayne
Great Gold Meadow and Teign Bridge Island
Decoy
Decoy South
Langafer Farm (Lock & Weep Farm)
Langafer Farm
Southacre (Longmarsh)
Heathfield
Heathfield Pit
Stover
Bullands Plantation
Ringslade
Sandford Orleigh Farm
West Gold Meadow
Hennaton
Mill Hill
Longford
Hennaton (Wad) (Wad)
Wheal Anna Maria Tank (Tamar Valley, Devon (Great Consols) (Wf)
Wheal Anna Maria (Cu, Ag)
Bedford United Kingdom (Zing Dong) (W)
Hurdwick (Sl)
Pitts Cleave (Sl)
Wilmestone (Sl)
Buddle (Sl)
Merrivale (Sl)
Yennadon (Sl)
Robonough Down (W)
Lee Moor (Cc)
Lee Moor Brickworks (Cr)
Wotter (Cc, San)
Headon (Cc)
Marldon (Pyrites) (Ig)
Pomphlett Quarry (Ig)
Pomphlett Quarry (Lst, Calc)
Cattedown (Lst)
Breakwater (Lst)
Hoe Lake + Wharf (Lst)
Hoe Gate
Hoe Park
Mount Batten
Radford (Bulk Chalk) (Lst)
Whitestone (Ig, Lst)
Shaugh Moor (Cc)
Hemerdon Mine (Wolfram) (W)
Bronze Pit (Sn)
Cornwood (Lst)
Lee Moor (Ig, Bar)
Lee Moor (Kaolin)
Hemerdon Ball (W, Sn)
Moorcroft (Bill White, Ebu, Hyed Ore) (Sand)
Pomphlett Quarry (Lst, Calc)
Cattedown (Lst)
Hoe Lake + Wharf (Lst)
Hoe Park
Mount Batten
Victoria Wharves (Cc, MSg)
Cattedown Wharves (CR)
Pomphlett Jetty (CR)
Modbury (Ag)
Modbury (Ag) (Sand)
Kingsbridge (Sand)
Bantham (Sand)
Steer Point (South Hams) (Cl)
Steer Point (Sand)
Longbrook (Sst)
Torr (Lst)
Eastern Torrs (Lst)
Torquay (Lst)
Paignton (Lst)
Brixham (Lst)
Goodrington (Lst)
Brockenbury (Lst)
Berry Head (Lst)
Rea Barn Road (Och)
Rea Barn Road (Rea Hill) (Och, Lst)
Galmpton Kiln (Lst)
Binsey Copse (Ig)
Longcross (Lst)
Longford (Sl)
Wheal Anna Maria (Cu, Ag)
Wheal Anna Maria Tank (Tamar Valley, Devon (Great Consols) (Wf)
Bedford United Kingdom (Zing Dong) (W)
Wheal Betsy (Ag)
Wheal Betsy (Ag) (Sand)
Wheal Betsy (Ag) (Sand)
Wheal Betsy (Ag) (Sand