



2 Justification for Inscription

Richard Trevithick (1771-1833).
Portrait in oil by J Linnell, 1816.
Courtesy of The Science Museum.

2. Justification for Inscription

2a Statement of Significance

The Significance of the Cornwall and West Devon Mining Landscape

Introduction

The Cornwall and West Devon Mining Landscape is an embodiment of the profoundly important process of non-ferrous metal mining, its industrialisation, and its social and economic consequences. This transformed the landscape between 1700 and 1914 and contributed substantially to the development of the Industrial Revolution in the rest of Britain. Cornwall pioneered the transfer of the British industrial revolution overseas and thus played a key role in the growth of a global capitalist economy.

Not only did the region dominate the world's output of copper, tin and arsenic, but the overall technological, social and economic contribution made by Cornish mining was crucial to the development of modern industrial society. The Cornish mining industry also played a leading role in the diffusion of both metal mining and steam technology around the globe.

The rapid industrialisation of the Cornish mining landscape required unprecedented levels of technological innovation in the use of power, transport and processing techniques, and in major social changes too, including a massive population increase. As the rich lodes were exploited in innovative ways, much of the landscape was re-written to create thriving and prosperous settlements scattered throughout Cornwall and West Devon. The substantial remains of this early industrial landscape are an extraordinary testimony to the manner in which every level of society helped to pioneer new methods of harnessing mineral wealth.

Why were these industrial metals needed?

Tin was used in pewter ware and solder, and to make the tin plate on which the canning industry was built. It was alloyed with copper to make bronze for industrial applications, including machine bearings and ship's propellers.

Copper was used to sheath the hulls of British ships and to provide coinage. The sugar and dyeing industries used it to make hollow-ware boilers, vats and piping. It is also the principal constituent of brass and so provided crucial fittings for steam engines, gun cartridges and brass trading goods. Cornish copper formed the basis of the Bristol and then of the Birmingham brass industries. These were the largest producers in the world at that time.

Arsenic was used extensively in the nineteenth century, for example in the dyes and pigments of the Lancashire cotton industry. Demand grew during the last quarter of the century when it became a popular insecticide. It helped to control Colorado Beetle which had devastated potato, tobacco and other crops across America.

Productivity - one of the world's most important non-ferrous mining regions

Cornwall and Devon contained Europe's principal tin deposits and satisfied substantial demand over four millennia. The region's ancient mining industry was founded on the expertise gained in the working of tin and other metal ores by the Celtic Britons and the organisation of the medieval Stannaries. During the nineteenth century, half of Cornwall's output came from the Camborne and Redruth Mining District and until the late 1870s Cornwall and West Devon produced more tin than any country in the world.

Larger-scale tin smelting began during the early eighteenth century following the introduction of reverberatory furnace technology. (Ultimately this replaced the blowing houses that had been in operation since the medieval period). Virtually all the ore from Cornwall and Devon was smelted within the region until the twentieth century.

Copper production from West Cornwall during the first three decades of the nineteenth century amounted to two-thirds of the world's supply. During the 1850s, Devon Great Consols in West Devon became the largest single producer in Western Europe.

Copper smelting ceased within the nominated Site in 1819. Swansea in South Wales then became the global centre for the trade, much of it under the control of Cornish entrepreneurs. During the second half of the nineteenth century copper became the essential metal of the electrical and communications industries.

Arsenic production in Britain began as a by-product of tin and copper mining in West Cornwall during the early nineteenth century. In the 1870s Devon Great Consols, and a few other mines in West Devon and East Cornwall, produced half the world's supply.

All arsenic ores from within the nominated Site were refined in the region.

Technical aspects of ore-processing ('dressing') were pioneered within the nominated Site and imported techniques were improved. They enabled ores to be mined which had previously been considered unworkable. The diffusion of such technology to mines overseas proved to be of international significance.

The impact of mining on the Cornwall and West Devon landscape during the period 1700-1914 was large-scale and the speed at which the industry was abandoned resulted in an unparalleled relict primary mining landscape. It features more than 3,000 shafts, numerous waste tips and over 200 engine houses, together with the widespread remains of tin and arsenic processing.

Industrial infrastructure

Transport was crucial. Supplies had to be brought in and minerals - particularly copper ore - had to be moved out from the mines to the new purpose-built mineral ports. A high-capacity transport network developed during the early nineteenth century to meet this demand.

Remains of this network occur right across the nominated Site. There is an internationally significant group of late eighteenth- and early nineteenth-century industrial ports, together with the tramways, railways and canals which connected them to the mines.

Ancillary industries developed in the towns and ports to service the mines. Tin smelting became highly capitalised and in the nineteenth century foundries and engineering works produced the steam engines, rock drills and other mining equipment (particularly steam-driven machinery) which pushed out the technological barriers, enabling mines to be dug deeper, made larger and process their ore efficiently. The impact of these developments was felt throughout the mining world.

There are substantial remains of these ancillary industries within the nominated Site. Important concentrations occur in the new industrial towns of Hayle, Charlestown and Camborne, in Tavistock, Redruth and in the Kennall Valley on the edge of the Gwennap Mining District.

Innovation and export

The Cornish mining industry was characterised by prolific innovation, sustained by an influx of capital, attracted to what had become a crucible of industrial development. The near-vertical metalliferous vein deposits could be exploited only by deep-shaft mining. Local pioneers invented the Newcomen atmospheric steam engine and first applied it to a metal mine, probably between 1710 and 1714, in West Cornwall. The expense of shipping coal to the Cornish mining region from Bristol and South Wales stimulated the need for energy efficiency. Newcomen's engines were vastly improved by Cornish engineers during the second half of the eighteenth century.

During the last quarter of the eighteenth century, large-scale copper mining attracted Boulton & Watt to Cornwall; a region that became their principal market. Their patent expired in 1800 and Cornish engineers went on to develop high-pressure steam pumping technology which resulted in the Cornish beam engine and boiler, the most efficient equipment of its kind at that time anywhere in the world. It also led to the development of steam as a method of motive power by pioneers elsewhere whose experiments eventually resulted in the mass movement of goods and people.

Cornish mining expertise and products began to be exported throughout the world during the second decade of the nineteenth century, wherever mining operators sought the latest technology and working practices. (Often these mines were developed with the help of British capital too). The core of the export trade consisted of steam engines, the engineers needed to install and operate them, mining equipment and the miners needed to superintend mining operations.

One globally successful export was the Cornish safety fuse which was used for blasting. This too was pioneered on the Site. It made a significant technological contribution to the industry as well as saving countless miners' lives. The Cornish mining industry as a whole made a very specific contribution to metal mining throughout the world, particularly during the nineteenth century.

Cornish engine houses, which are among the most distinctive industrial buildings in the world, survive in Spain, Mexico, South Africa and Australia. They are striking evidence of this world-wide impact. As to the Cornish engine houses on the nominated Site, they are not only iconic, they represent the largest concentration of such technological monuments anywhere in the world.

Industrial society

Cornwall was one of Europe's earliest industrial regions, with a complex and dispersed industrial society. It was unusual in that it never developed a dominant large town or city containing the political, economic and institutional elite, around which the county might have cohered. Instead, ownership and control was spread among the small towns throughout the Cornish countryside. Landowners and merchants diversified their portfolios across mining, banking and smelting enterprises. So capital was dispersed, with no direct social control.

The owning class exercised their power through agents and stewards. Mine agents, more usually known in Cornwall as 'captains', imposed workplace discipline and social leadership. This was often reinforced by their position as lay preachers in the Methodist chapels which dominated the Cornish religious landscape after the Revivals of 1799 and 1814.

This social structure enabled mining communities to be relatively independent. In addition, the practice of leasing out smallholdings on unenclosed land in the mining districts enabled a proportion of miners to build their cottages, rear pigs and grow vegetables. This decreased their dependence on both market and mine and helped to maintain the economic role of the family unit. It also led to more egalitarian relations between men and women within the household. Yet despite the scattered and independent nature of small mining communities in the eighteenth century, they tended to be grouped geographically in quite dense concentrations according to the location of particular mineral resources.

The copper industry was exceptional in that its growth rate exceeded every other major national industrial sector. Eighteenth-century copper mining was principally confined to a small area between Hayle and Gwennap. This became Cornwall's core industrial district, bounded by the towns of Truro, Penzance and Falmouth. In cultural terms, this small area was extraordinarily dynamic and innovative. Two newspapers were established in Truro within a decade: the *Royal Cornwall Gazette* in 1800 and the *West Briton* (which still exists under the same name) in 1810.

Shortly afterwards a number of literary institutes were established. The most significant were the Royal Geological Society in Penzance (1814), the Royal Institution of Cornwall in Truro (1818) and the Royal Cornwall Polytechnic Society in Falmouth (1833); all three continue to contribute to Cornwall's rich cultural life. Mineralogy and geology, and their practical application to the mining and mineral processing industries, were studied extensively throughout the nominated Site. The ferment of engineering and scientific endeavour associated with the development, by deep mining, of one of the world's most mineralogically diverse orefields stimulated the ground-breaking efforts of Cornish scientists whose contributions helped to lay the foundations of geological, chemical and physical science.

The cultural identity of Cornwall and West Devon was transformed by mining and its infrastructure during the course of the nineteenth century, aided by the extension of copper mining to the St Austell district in the 1810s, to east Cornwall in the 1830s and renewed activity across the Tamar to Tavistock in the 1840s. By the time of the 1861 census more than 38,000 men, women and children were employed directly in Cornwall's mining industry, almost a quarter of the entire workforce. At its peak around half of all families in Cornwall were dependent on the extractive industries while even more were affected by the rise and fall of the mining economy.

Global migration

Cornwall was locked into the global economy at an early stage. As a leader in mining expertise its miners were in demand in other, newer mining regions. By the 1820s Cornish miners were being recruited for mines in Latin America. Within a generation a flourishing culture of emigration had been created and links with North America and Australia forged. During the fall in world copper prices in the late 1860s and the crisis decade of the 1870s, when tin prices were also in recession, the Cornish had a ready-made option. They left. Indeed, Cornwall became one of Europe's major emigration regions with perhaps over 200,000 people leaving in the century after 1830. Although not all emigrants were miners, it was to mining communities overseas that Cornish traditions were most obviously transferred, replicating their familiar Cornish mining landscapes. This gave the Cornish Mining industrial region a global significance, exporting its culture, as well as its mining expertise and its copper and tin, world-wide.

Outstanding Universal Value

The Cornwall and West Devon Mining Landscape was transformed during the period 1700-1914 by early industrial development that made a key contribution to the evolution of an industrialised economy and society in the United Kingdom, and throughout the world.

Its outstanding survival, in a coherent series of highly distinctive cultural landscapes, is testimony to this achievement.



South Caradon Mine (A9). This mine produced 217,820 tons of copper-ore between 1838 and 1885 (its output ranked seventh in the region) and was one of the last of the big Cornish copper producers to survive. Its waste tips, chimneys and engine houses have created distinctive landforms and landmarks that are a typical outward manifestation of Cornish copper mines.



'From Under the Sea'. Botallack Mine by James Clarke Hook (1819-1907). In 1863, the iron hoisting-chain broke and nine miners were killed as the wheeled skip plunged down the shaft. Accidents were an accepted part of everyday life for mining families. Courtesy Manchester City Art Galleries.

2b) Comparative analysis (including survival of similar sites)

The World Heritage Committee has acknowledged thematic imbalances in the World Heritage Site List and recognises the significance of the Industrial Revolution for all humankind.

Industrial and Cultural Landscapes on the World Heritage Site List

In 1992, industrial heritage and cultural landscapes were identified as being under-represented categories on the World Heritage Site List. Industrial sites currently account for less than 5% of the List. Of the 788 inscribed so far (July 2004), 36 were nominated, either wholly or in part, for their industrial significance. Of these, only nine have non-ferrous mining associations and all represent different historical, technological and cultural traditions.

The Cornwall and West Devon Mining Landscape

The nominated Site was a large-scale eighteenth and nineteenth century example of industrialisation which was highly capitalised by private and local individuals, usually associated in what were known as cost book companies. The use of private capital underlies much of the success and distinctiveness of Cornish mining. The Stannary system (see section 3b) of bounding encouraged enterprise, multi-ownership and partnerships, and Cornish mining was stimulated by entrepreneurial working practices intended to produce the greatest profit in the shortest time; for the ultimate benefit of the mine owners and mineral lords. This ran counter to the system of government control that was characteristic of European mining regions which were managed to produce a regulated supply of metals together with a steady source of employment for their people, subject to as little fluctuation as possible.

The nominated Site includes the mines themselves, the remains of the early infrastructure which was developed to facilitate industrialisation and innovation, and the tangible and intangible surviving evidence of its social and economic consequences, including a wide-ranging manifestation of distinctive settlement patterns.

This is the first cultural landscape nomination for inclusion on the World Heritage List that is concerned with the mining and ore-processing of tin and arsenic as well as copper and other industrial metals. It is also the first mining landscape nomination to be dominated by steam-powered deep shaft mining. This is exemplified by the distinctive architectural form of the Cornish engine house, a feature of mining fields throughout the world, wherever they were influenced by the Cornish cultural and mining diaspora. There is extensive evidence of the export of this distinctive technological and cultural ensemble to other countries, both within the United Kingdom and overseas.

The region dominated much of the world's output of copper, tin and arsenic during the eighteenth and nineteenth centuries and Cornish mining culture made an outstanding contribution to the evolution of metal mining and steam technology, influencing its diffusion across the globe. Today there are distinctive Cornish mining landscapes in Australia, Mexico, Spain and South Africa. These sites made considerable contributions to the industrial, social and economic development of these countries and are derived directly from the nominated cultural landscape.



Holmbush Mine (A10). Engine houses and burrows (waste tips) exemplify the distinctiveness of the Cornish Mining landscape.

United Kingdom World Heritage Sites linked to the industrial revolution with comparisons to the nominated Site.

	Type	Pre 18 th Century	18 th century	19 th century	20 th century	Landscape	Settlement	Tin Mining	Copper Mining	Arsenic Mining	Silver Mining	Gold Mining	Coal/Iron Mining
Cornwall & West Devon Mining Nomin.	Mining landscape												
Blaenavon	Coal & iron												
Ironbridge	Industrial landscape												
Derwent Mills	Cotton factory system												
New Lanark	Cotton Mills												
Saltire	Industrial town												

Table 4. United Kingdom comparative table.

Of the 24 United Kingdom World Heritage Sites, five represent key sites linked to the industrial revolution.

None however is associated with the early industrialisation of non-ferrous metal mining and its cultural diffusion across the world.



Figure 14. The five key World Heritage Sites linked to the industrial revolution in the United Kingdom.

Saltaire (West Yorkshire)

Saltaire was the creation of a single owner who managed and controlled both the industrial activity and provided the social infrastructure of this new town.

Principal differences:

- Type of industry
- Ownership and organisation
- Settlement pattern

Ironbridge Gorge (Shropshire)

Ironbridge exemplifies pioneering iron-making during the industrial revolution and is inscribed as an eighteenth- century industrial area.

Principal differences:

- Primary resources
- Mining and processing technologies

Derwent Valley Mills (Derbyshire)

This site is inscribed for its eighteenth- and nineteenth- century cotton mills set in an industrial landscape linked to the cotton spinning technology of Richard Arkwright and his factory system.

Principal differences:

- Type of industry
- Ownership and organisation

New Lanark (South Lanarkshire, Scotland)

New Lanark is associated with Richard Arkwright's factory system for textile production and was operated by a single owner who managed and controlled all activity including the social infrastructure of this new town. The village contains impressive cotton mills and the model industrial built community moulded by Robert Owen in the early nineteenth century.

Principal differences:

- Type of industry
- Ownership and organisation

Blaenavon Industrial Landscape (Wales)

Blaenavon is inscribed for its outstanding and remarkably complete late eighteenth- and early nineteenth-century landscape created by coal mining, iron and steelmaking integrated under a single ownership.

Principal differences:

- Primary natural resources
- Mining and processing technologies
- Ownership and organisation

International World Heritage Sites (linked to non-ferrous metal mining) with comparisons to the nominated Site.

	Type	Pre 18th century	18th century	19th century	20th century	Landscape	Settlement	Tin Mining	Copper Mining	Arsenic Mining	Silver Mining	Gold Mining	Water Power	Stream Power
Cornish Mining Nominated Site	Mining landscape													
Falun	Mining landscape	17												
Rammelsberg	Town/mines	15-20												
Guanajuato	Town/mines	16-18												
Zacatecas	Town/mines	16-18												
Potosi	Mining city	16												
Ouro Preto	Mining town													
Las Medulas	Gold mine	1/2												
Stiavnica	Mining town	16												
Roros	Mining town	17/18												

There are no tin or arsenic mining World Heritage Sites, nor any mining landscape dominated by steam power technology.

Table 5. World comparative table.



Figure 15. Location of international World Heritage Sites linked to non-ferrous metal mining.

Mining Area of the Great Copper Mountain in Falun (Sweden).

The Stora Kopparberget copper mine was at its peak during the seventeenth century when it produced 70% of the world's copper.

The Site also contains the associated seventeenth century planned town of Falun, with its original housing, together with a number of industrial and domestic settlements within the Dalarna region.

Principal differences:

- Main exploitation phase
- Primary natural resources
- Principal extractive method is opencast compared to shaft mining
- Water power
- Processing technologies

Mines of Rammelsberg and the Historic Town of Goslar (Germany)

The Rammelsberg mines (lead, zinc and copper) are closely associated with the medieval city of Goslar that contains some 1,500 half-timbered houses dating from the fifteenth to the nineteenth century.

It is a mining region that strongly influenced early post-medieval Cornish mining practice, particularly within the realms of water power.

Principal differences:

- Water power
- Primary natural resources
- Processing technologies
- Ownership and organisation
- Settlement pattern

Historic Town of Guanajuato and its Silver Mines (Mexico)

Guanajuato is inscribed for its significance as the world's leading centre of silver extraction during the eighteenth century. There are exceptional silver-processing sites within the limits of the colonial city founded during the sixteenth-century.

Principal differences:

- Main exploitation phase
- Primary natural resources
- Processing technologies
- Power
- Settlement pattern

Historic Centre of Zacatecas (Mexico)

Zacatecas was founded during the sixteenth, seventeenth and eighteenth centuries upon the prosperity derived from the exploitation of rich silver deposits. It is inscribed for its outstanding architecture.

Principal differences:

- Main exploitation phase
- Primary natural resources
- Processing technologies
- Power
- Settlement pattern

City of Potosi (Bolivia)

Potosi is recognised as one of the world's largest industrial complexes of the sixteenth century and is based upon silver mining. The town developed during this highly prosperous mining phase and is notable for its religious architecture and workers' housing.

Principal differences:

- Main exploitation phase
- Primary natural resources
- Processing technologies
- Water power
- Settlement pattern

Historic Town of Ouro Preto (Brazil)

Ouro Preto developed primarily as a result of Brazil's gold rush which began in the late seventeenth century and predominated during the eighteenth century. Churches, bridges and fountains are testimony to past prosperity.

Principal differences:

- Primary natural resources
- Processing technologies
- Water power
- Settlement pattern

Las Medulas (Spain)

Las Medulas is a Roman gold mining area, whose landscape was fashioned during the first two centuries AD, which has survived due to there having been no subsequent industrial activity.

Principal differences:

- Main exploitation phase
- Primary natural resources
- Mining methods were principally opencast
- Water power
- Processing technologies

Banská Stiavnica (Slovak Republic)

Banská Stiavnica is a medieval mining centre, its prosperity derived from nearby gold and silver deposits. It developed into a town with Renaissance palaces and sixteenth century churches.

Principal differences:

- Main exploitation phase
- Primary natural resources
- Water power
- Processing technologies
- Settlement pattern

Røros (Norway)

Røros developed in response to the discovery of rich copper deposits in the seventeenth century. Developments from this period survive, including those of the smelting process. The original historic settlement core however, comprises medieval wooden houses grouped around courtyards.

Principal differences:

- Main exploitation phase
- Primary natural resources
- Water power
- Processing technologies
- Settlement pattern

Other non-ferrous mining sites within Cornwall and Devon (same geo-cultural region)

The selected areas within the nominated Site were chosen to express its outstanding universal value. There are however other mining cultural landscapes in the region which can be regarded as important within the setting of the proposed World Heritage Site. Examples include: the Mary Tavy/Peter Tavy mining district north of Tavistock (A10ii) which is historically significant in terms of the development of Tavistock and its canal; the Trencrom area near St Ives and the Polgooth mining district near St Austell (which has both historical and survival significance). There are also extensive areas of medieval tin-streaming on Dartmoor, Bodmin Moor and St Austell Moor in particular. Such areas contain individual sites and monuments of archaeological importance both to local communities, and as part of the setting of the nominated Site.

Principal differences in comparison with the nominated Site:

- Too geographically remote from nominated bid areas;
- insufficient survival of coherent mining landscape;
- range of components not large enough to be proposed as additional elements of the nominated Site.

Non-ferrous mining sites outside the nominated Site



Figure 17. United Kingdom non-ferrous mining sites outside the nominated Site.

Copper mining sites in the United Kingdom

Copper mining was relatively widespread in the United Kingdom but only Parys Mountain in Anglesey (Wales) seriously challenged Cornish production; indeed it exceeded it for a period during the second half of the eighteenth century. The copper was principally extracted by opencast methods which created a spectacular mining landscape. The nearby copper-ore harbour of Amlwch and its associated smelting and industrial complex is an exceptional late eighteenth century survival.

The Great Orme at Llandudno in Wales is an important prehistoric mining site. Alderley Edge in Cheshire is notable for its Roman associations. At Coniston in the Lake District of Cumbria, copper mines were developed in the seventeenth century and worked on a large scale during the eighteenth and nineteenth centuries, powered principally by water. There are Welsh copper mining sites in Cardiganshire and Snowdonia. They too were water-powered.

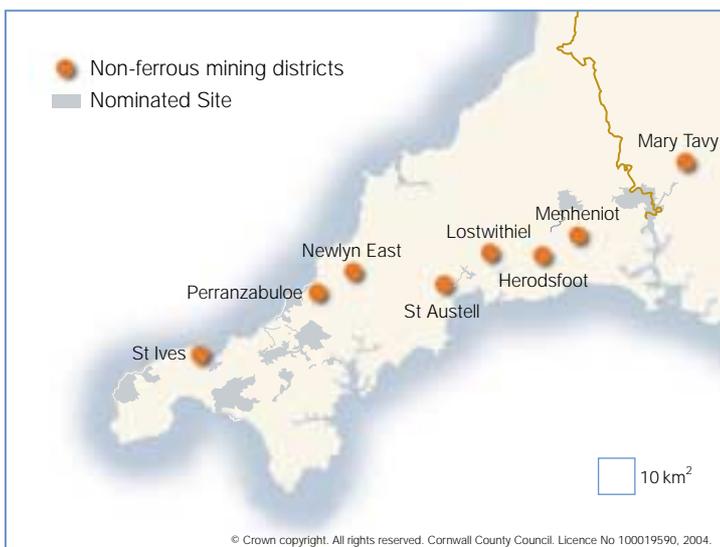


Figure 16. The places shown above represent former mining districts whose locations fall outside nominated bid areas in Cornwall and West Devon.

Copper-mining sites in Eire

Southern Ireland (Eire) is notable for nineteenth-century copper mining and as a classic example of a Cornish-derived steam-powered mining landscape. The most important mines, around Berehaven and West Carbery in County Cork, Knockmahon in Waterford and Avoca in Wicklow, were all directly associated with Cornish mining. Cornish engine houses remain and the man-engine house at Mountain Mine on the Atlantic coast at Allihies in Cork is particularly notable. The significance of these mining landscapes is recognised and preservation schemes are progressing under the direction of the Mining Heritage Society of Ireland.

Lead- and zinc-mining sites in the United Kingdom

Lead- and zinc-mining in the United Kingdom shared a number of technologies with Cornish mining, particularly water-power for pumping, ore-processing technologies and, though on a much smaller scale, steam-pumping.

England (lead-zinc)

Lead and zinc was mined extensively in northern England: in the east and west Pennines; the Peak District of Derbyshire, where at least three Cornish engine houses survive; in the Yorkshire Dales at Grassington, and in Lancashire. In central England it was mined in Shropshire, notably at Snailbeach and Tankerville where there are Cornish engine houses. In the south west, outside Devon and Cornwall, lead was mined principally in the Mendip Hills, Somerset, where evidence of Roman mining exists.

Wales (lead-zinc)

Lead was mined in all the Welsh counties. Water-power predominates but steam-power was adopted, using Cornish engines, particularly in the Flintshire/ Denbighshire mines. Several engine houses survive in addition to one at Frongoch.

Other United Kingdom (lead-zinc)

Wanlockhead in Scotland and Laxey on the Isle of Man were also significant sources of lead and zinc.

Other non-ferrous United Kingdom mining

This includes gold such as at Dolaucothi in Wales where a Roman mine is preserved together with eighteenth- and nineteenth-century technologies.

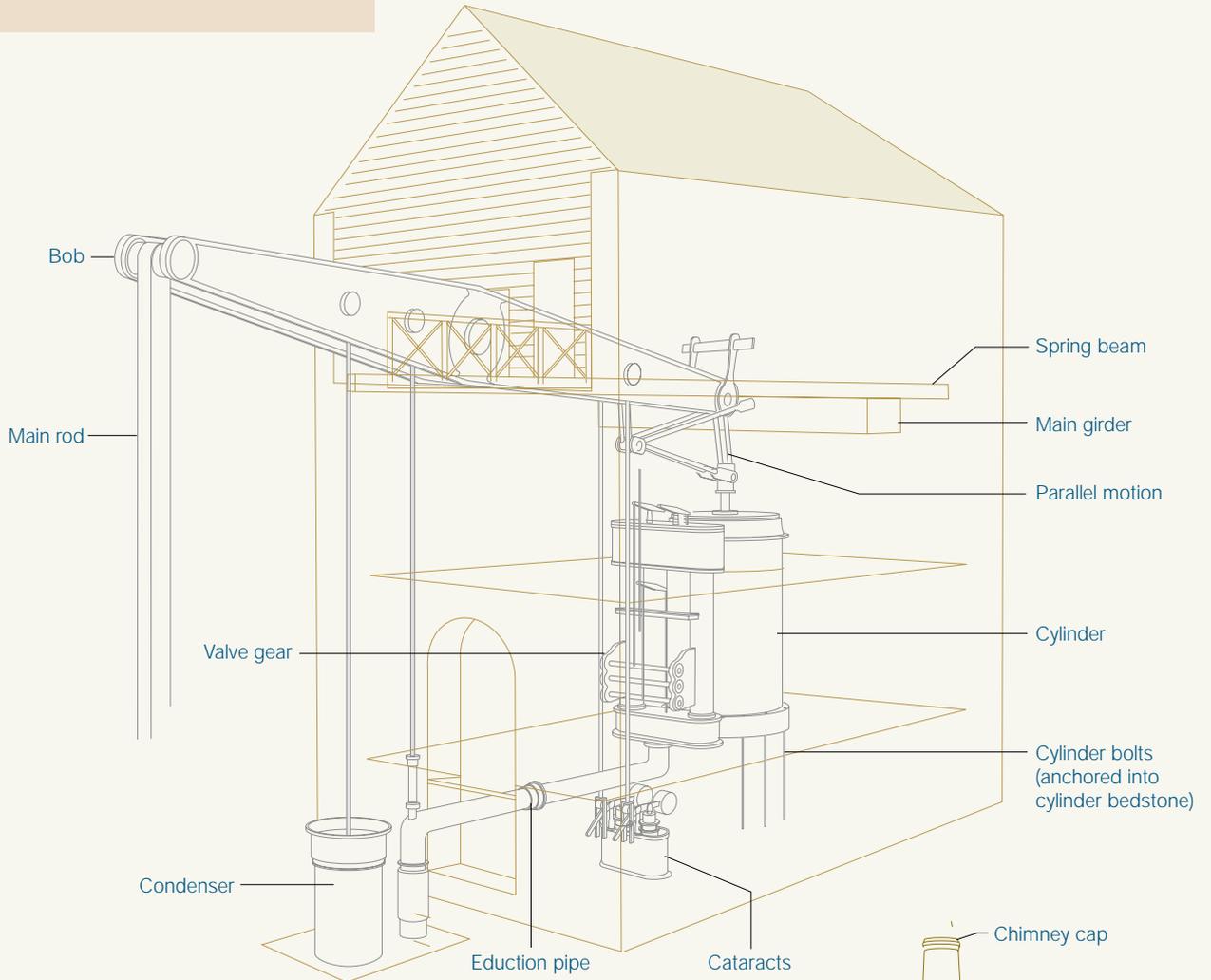
Steam Technology - Beam engines

Of the thousands of beam engines erected only a small number have survived and those still on their original sites are fewer still. It must be noted that the relocation of beam engines from one mine to another was very common practice. An engine may have been moved three or four times during its lifetime and therefore may have had several different but entirely authentic locations.

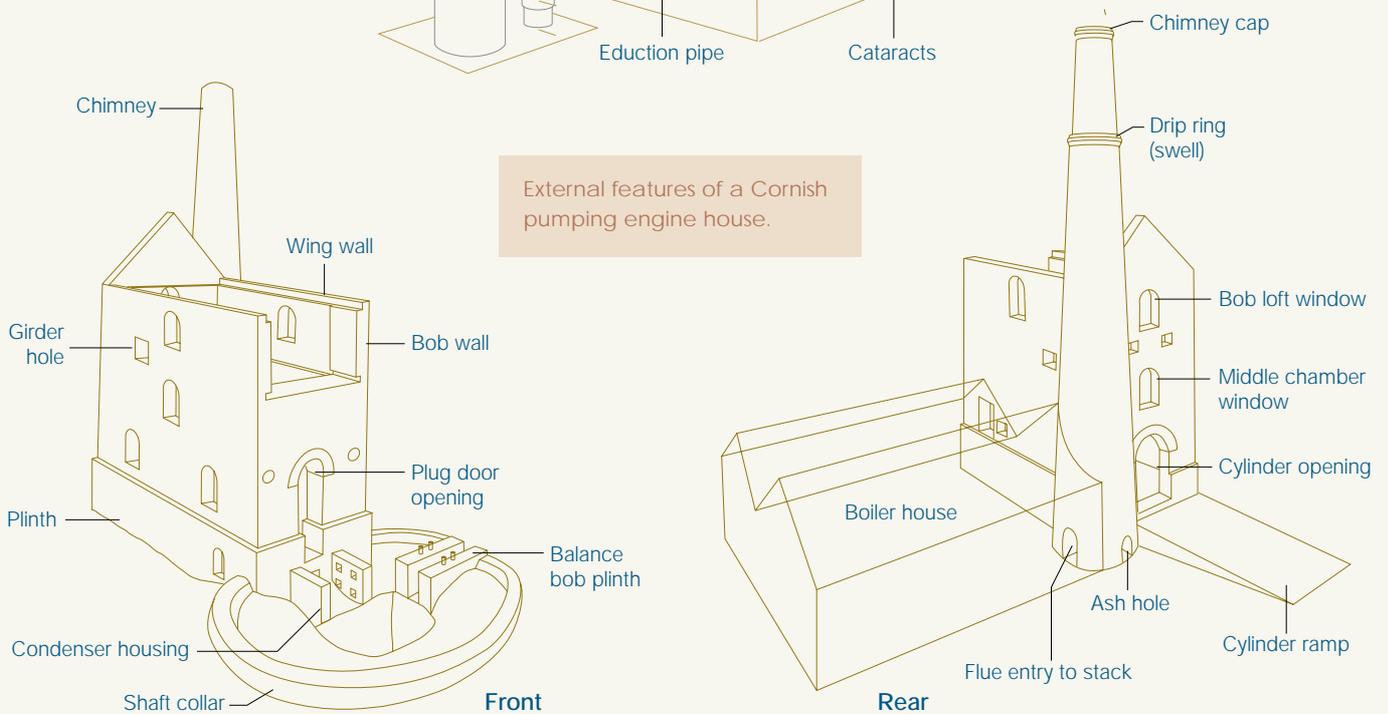


East Pool Mine (A5, 1887, Listed Grade II*). The North Whim at Mitchell's Shaft was designed by Francis Michell of Redruth and made by Holman Brothers of Camborne in 1887. It was the last traditional Cornish beam whim to be built and is now preserved by the National Trust.

Simplified layout of a Cornish pumping engine house showing the position of principal components.



External features of a Cornish pumping engine house.

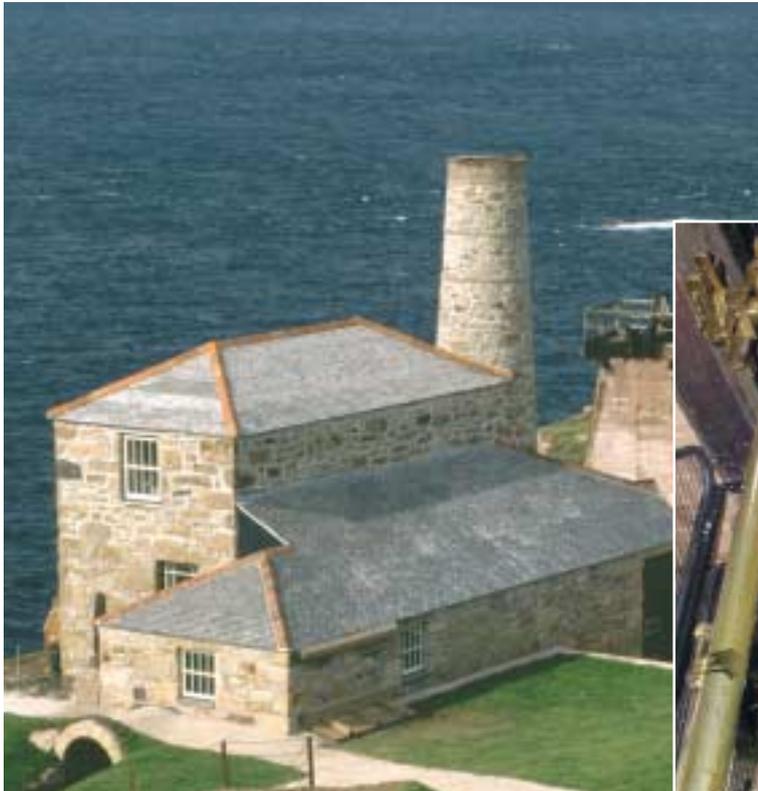


Local stone was used to build engine houses. This was sourced from quarries (commonly opened up near the site to provide the rubble walling), sometimes from mine waste and often from existing derelict engine houses on the same or adjoining mines that were pulled down to re-use the stone, particularly cut granite that was always favoured for the cylinder bedstone, the bob wall and coigns. Gable roofs were covered with Cornish slate and bricks were brought in to construct the topmost section of the chimney stacks and to form arch/window details. The necessary massive construction of these engine houses is the principal reason for their survival.

Figure 18.

Beam engines, Cornwall:

Within the nominated Site there are four beam engines still in situ on their original metal mines:



Levant Mine (A1, 1840, Listed Grade II). The restored engine house contains an all-indoor beam whim that was designed by Francis Michell and made by Harvey & Co., Hayle, in 1840. It worked until 1930 and was the first engine to be preserved by the Cornish Engines Preservation Committee, formed in 1935. It is now under the care of the National Trust.



Levant Mine. Interior view showing part of the engine, restored to working (steaming) order, but powered by modern oil-fired plant for practical reasons.

There is an indoor winding engine at Levant Mine (A1); There are two at East Pool & Agar Mine - Taylor's pump and Michell's whim - and the Robinson's pumping engine at South Crofty Mine (A5).

Many beam engines were moved from mines to the St Austell china clay district. These include engines at Rostowrack and Parkandillick, the Goonvean engine and the Greensplat engine which has been re-erected at Poldark Mine (A4). The china-clay industry's adoption of beam engines has contributed to their present-day survival.



East Pool & Agar Mine (A5, engine house 1924, Listed Grade II*). The 90-inch pumping engine at Taylor's Shaft was designed by Nicholas Trestrail and manufactured by Harvey & Co., Hayle, in 1892. It was purchased second-hand in 1923 from the nearby Carn Brea & Tincroft Mines and was the last Cornish beam pumping engine to be erected in Cornwall. It was also one of the last to work, being replaced by electric pumps in 1954.

Beam engines, other United Kingdom:

The Newcomen engine at the Elsecar Colliery in Yorkshire is on its original site. Others are to be found in the Science Museum, London, and in Dartmouth, the Devon birthplace of Thomas Newcomen. Later mine engines are to be found in situ at Hodbarrow Iron Mine, Cumbria (built by the Perran Foundry), Dorothea Slate Quarry, Caernarvon (built by Holman Brothers of Camborne) and Prestongrange Colliery. Kew Steam Museum, near London, was a pumping station that pumped water for public utilities. It contains important Cornish engines. Similar sites such as Crofton (where water was pumped to upper levels of the Kennet and Avon Canal) have other examples of beam engines, some of which were made in Cornish foundries. Beamish and Blist's Hill at Ironbridge (Shropshire) and the Science Museum in London have important examples of ex situ beam engines.

Other world locations with known surviving Cornish engine houses and beam engines:

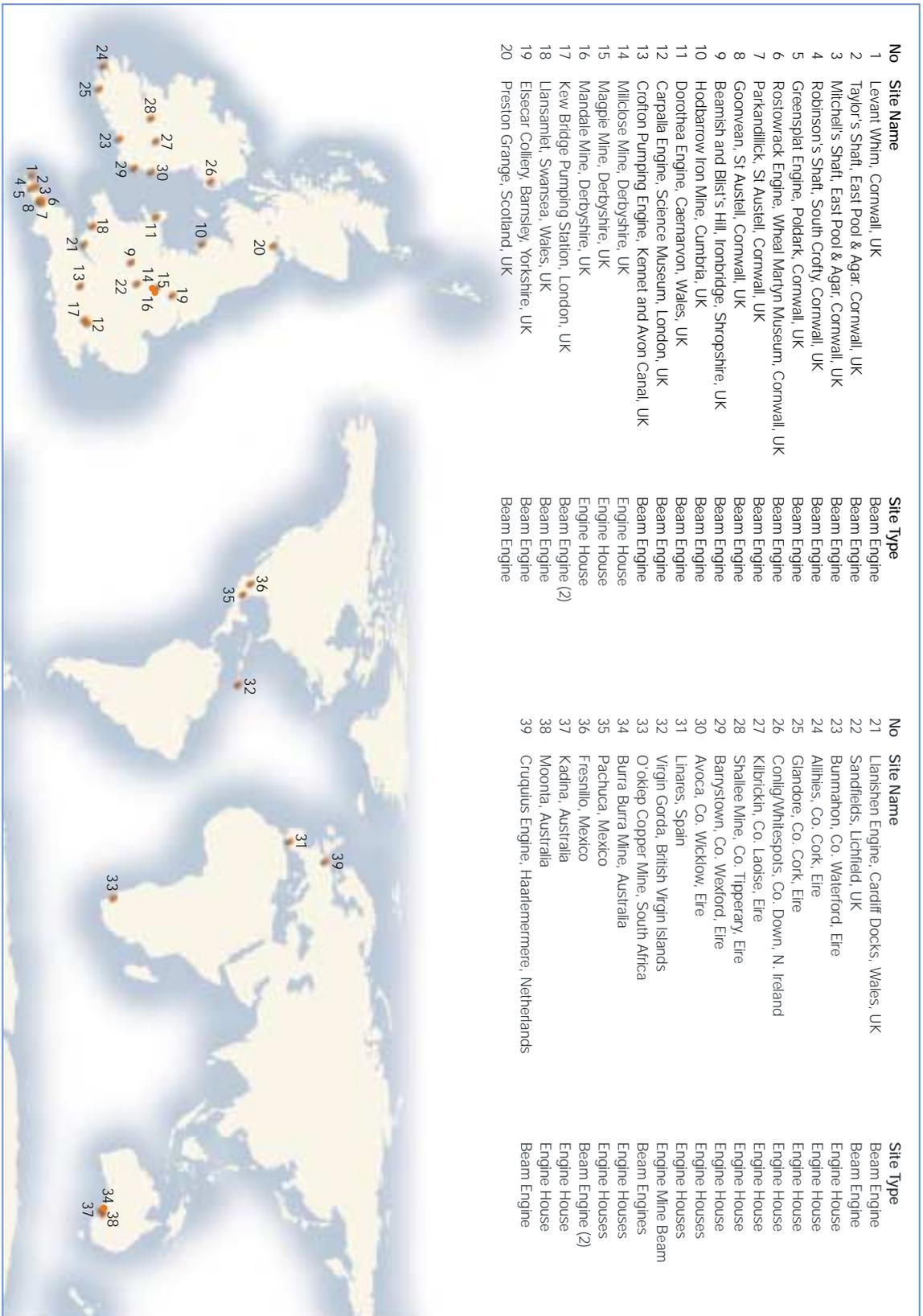
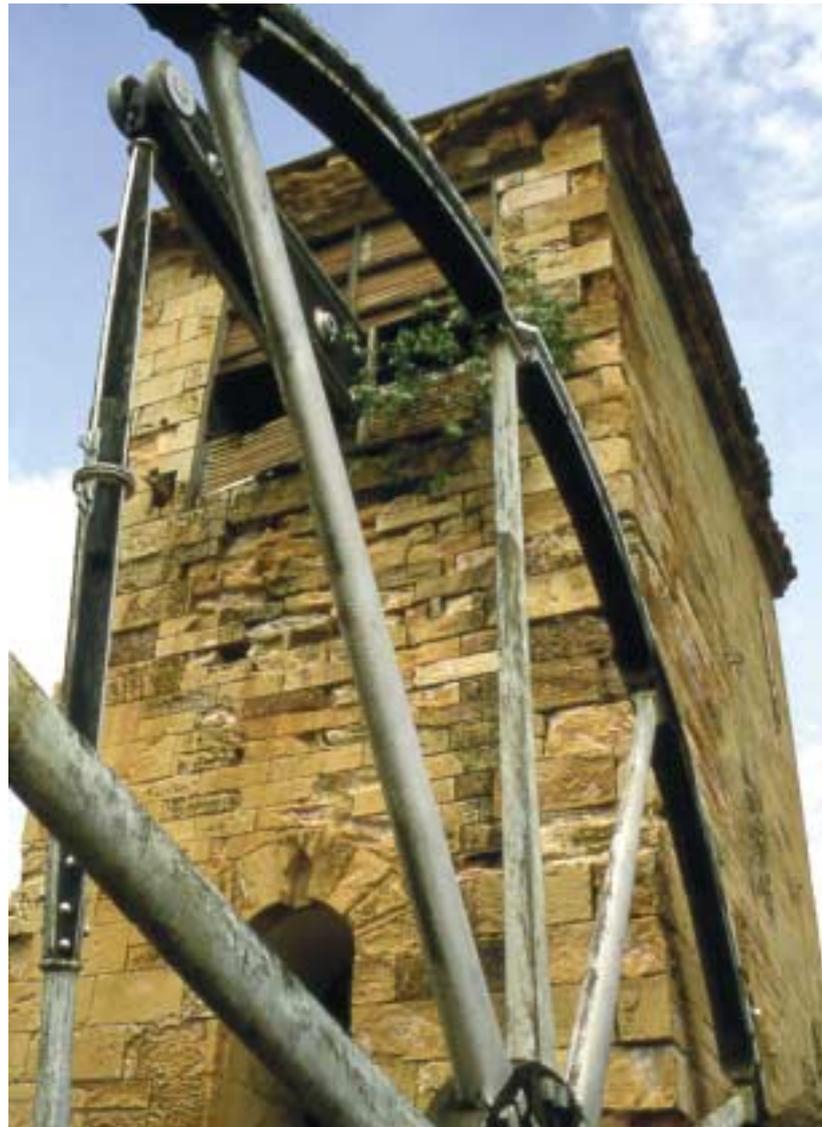


Figure 19. Map of United Kingdom and world Cornish engine house and beam engine sites.

Cornish beam engines overseas



The D F Wouda Steam Pumping Station, Lemmer, Holland (inscribed as a World Heritage Site in 1998). Three Cornish engines were ordered by the Dutch Government in the mid-1840s for the purpose of draining the Haarlem Mere. Two were supplied by Harvey & Co., Hayle, and the other by Perran Foundry, Perran-ar-worthal. The cylinder cover of the Cruquius engine is pictured: with an outer cylinder diameter of 144 inches (3.66m), it is the largest steam engine ever built.



Fresnillo Mine, Zacatecas, Mexico. Harvey's of Hayle exported beam engines to this rich silver mine in the 1830s, 40s and 50s. Two such engines, used to power crushing machinery, are preserved in their roofed houses not far from the Zacatecas World Heritage Site.

O'okiep Mine, South Africa (National Monument). The beam pumping engine, manufactured by Harvey's of Hayle, is the only such engine to survive in situ in the southern hemisphere.



Cornish engine houses (United Kingdom)

In the United Kingdom (outside of Cornwall and West Devon), extant mine engine houses are to be found in Wales (at least six, including the house for a Boulton & Watt engine at Llansamlet), at least three in Derbyshire and three in Shropshire.

There are eight Cornish engine houses in Ireland.



Mountain Mine, Allihies, Eire.
The Cornish Man-Engine House (1862).



Mina San Pedro la Ravia, Pachuca, Mexico.
This pumping engine house is one of eight Cornish engine houses to survive in the Pachuca-Real del Monte silver mining district, in the Sierra Madre north-east of Mexico City. The engine houses, in particular, are now under the care of The Historic Archive and Museum of Mining in Pachuca.

Cornish engine houses (overseas)



Burra Burra Mine, South Australia. Morphett's pumping engine house (erected in 1858, and reconstructed in 1986) with the whim engine house (1861) behind.

Burra was once the largest metal mine in Australia and the majority of its miners came from Cornwall; the surface and underground methods were all Cornish. Apart from the engine houses and cottages that form part of the Burra Mine Open Air Museum there is a Methodist chapel that is preserved in the nearby village of Redruth.

Cornish engine houses signify 'Cornish' mining landscapes across the world. Their setting varies from desert landscapes to a tropical island.



Moonta Mine, South Australia. Hughes engine house (erected 1864) housed one of a number of Cornish engines that were sent to Australian mines around the mid-nineteenth century. There are seven Cornish engine houses surviving in South Australia.

Virgin Gorda Copper Mine, British Virgin Islands. In 1835 a party of 31 men and five women migrated from St Austell (mid-Cornwall) to work the mine and were joined by 140 islanders. A Cornish engine house, the remains of the crusher house (for Cornish Rolls), part of a Cornish boiler and the flue and chimney survive. On the beach below there are two halves of a cast iron engine beam (together with other engine parts) in shallow water. One half still bears the name of Perran Foundry and the date 1836.



Linares, southern Spain. Mining plant in this rich lead mining district was entirely imported, principally from Cornwall. Harvey's of Hayle shipped one of the first engines to Linares in 1844. However a new trade of engine-dealing for export emerged in west Cornwall in the 1860s when many copper mines closed following the great copper crash. Spain was one of the principal destinations of these Cornish engines until the mid-1870s. The surviving landscape of Cornish engine houses in this region is exceptional.





Pozo Ancho, Linares, southern Spain.

Conclusion to the comparative analysis.

In comparison with other industrial heritage and cultural landscapes in the World Heritage Site List, the nominated Site stands out as being of international significance for:

- The early industrialisation of non-ferrous metal mining, its widespread social and economic consequences, and its contribution to the development of modern industrial society.
- The large-scale exploitation of industrial metals within the nominated Site (particularly tin, copper and arsenic) and the world significance of this output.
- The type of exploitation, which was dominated by steam-powered deep shaft mining, and the high level of technological innovation associated with it.
- The leading role played in the diffusion of both metal mining technology and steam pumping technology, across the world.
- The outstanding survival of landscapes transformed by metal mining during the period 1700 -1914, particularly those associated with steam engineering, the ore-processing of tin and arsenic, the industrial infrastructure and the type of settlement.
- The high level of conservation applied to the Cornish Mining landscape and the high level of protection afforded to key structures and areas.
- The development of a distinctive cultural tradition and the evidence for its diffusion world-wide.
- World-wide evidence of metal mining landscapes that are derived from the original Cornish example.
- The large size and scope of the property which, covering a substantial part of Cornwall and West Devon, offers opportunities to harness heritage as a deliverer of social and economic benefit and to link cultural heritage to a sense of identity and well-being.

"This district (Cornwall and West Devon) has clearly been one of the internationally most important regions of mining non-ferrous metals in history. None of the World Heritage Sites listed up to now includes a district of tin and arsenic production. Thus an inscription of the Cornwall and West Devon mining district could fill a gap on the international list of World Heritage Sites."

2c) Authenticity

The Cornwall and West Devon Mining Landscape fulfils all the criteria for authenticity in relation to World Heritage Sites set out in the declaration of the conference organised by UNESCO, ICCROM and ICOMOS at Nara, Japan in 1994.

The Areas that make up the nominated Site collectively represent one aspect of an important stage in human development, namely the industrialisation process of the eighteenth and the nineteenth centuries with their associated technical, scientific, cultural and landscape changes.

It is a landscape which continues to evolve. It contains exceptional and varied evidence of past activities as well as the interaction of people with the natural world, in particular with the metalliferous resources of the Cornubian Orefield (see 3a).

Efforts to conserve elements within the site began more than seventy years ago. A Preservation Committee first emerged in 1935. From this evolved the Cornish Engines Preservation Society which, in 1943, formally advocated the preservation of a number of Cornish beam engines as monuments to Britain's heritage in power and technology. This organisation is now the Trevithick Society which works closely with the National Trust on engine restoration. The success of this partnership was demonstrated recently by the successful re-steaming of the Levant Mine winding engine. These beam engines were not designed to be portable but were traditionally moved to new sites as part of their ongoing working life. The survival in situ of four mine engines is entirely authentic in this respect.

As far as the mining landscape is concerned, a major effort has been directed towards the conservation of the built mining heritage during the past fifteen years. A further programme of work is planned for the next five years. A high priority is placed on retaining the authenticity of the structures. Best practices have been adhered to when conserving engine houses and their associated mineshafts which have often survived relatively unaltered. Reconstruction has been limited to the minimum required to achieve structural integrity and public safety. Not one of the key features of the Cornish Mining Landscape is a replica.

The nominated Site includes Camborne-Redruth that has, at times, when viewed as a single urban centre, contained one of the largest populations in Cornwall.



Levant Mine (A1, 1901). The recently consolidated compressor house remains (left) formerly contained an air-compressor made in 1901 by Holman's of Camborne. It was described by *The Mining Journal* as "the biggest piece of machinery of its kind ever erected in the County."

The overall pattern and structure of this historic 'new town' survives remarkably well. Some of the smaller-scale authentic elements have been damaged as most buildings have been refurbished.

Much of this is retrievable, however, and will constitute an issue within the Management Plan. Some of the nearby mining landscapes have experienced new development. Many buildings have been adapted for new uses and remain in occupation.

The nominated Site is exceptionally well documented. It has the longest and most continuous recorded history of any metal mining region. It is the subject of diverse research, extensive publication of Scientific and Learned Society Proceedings and Transactions, aerial mapping, measured survey, photography, written and oral records. A very extensive and still growing reference literature is based around the mines of the Cornubian Orefield. This high level of information and knowledge provides a database that has allowed the landscape to be tested for authenticity and integrity and to be monitored effectively so as to inform conservation strategies.

Integrity

The Serial Nomination known as the Cornwall and West Devon Mining Landscape is an example of dispersed industrialisation. The ten areas are necessary to ensure that the geographical coverage and the overall size is sufficiently large to provide a complete representation of all the significant elements which together express outstanding universal value.

Table 6 shows the components C1-C7 (see page 50 et seq. for a description) which are essential to the distinctive character of the Cornish Mining landscape. Areas A1-A10 are the best examples of surviving mining cultural landscapes which also remain free from the adverse effects of development. They also represent the most significant areas in terms of industrial history. Though the evidence of industrialisation was dispersed across a wide area, the components were not evenly spread. An examination of Table 6 shows that each area possesses a different mix of components. It is the *sum* of the Areas rather than any individual Area which demonstrates the full relationship between the components and leads to an holistic understanding of the Cornish mining landscape.

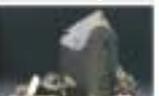
Components	 C1 Mines	 C2 Transport	 C3 Ancillary	 C4 Settlement	 C5 Smallholdings	 C6 Houses and Estates	 C7 Mineralogical and Ecological
Areas							
A1 St Just							
A2 Hayle							
A3 Tregonning							
A4 Wendron							
A5 Camborne-Redruth							
A6 Gwennap							
A7 St Agnes							
A8 Luxulyan-Charlestown							
A9 Caradon							
A10 Tamar-Tavistock							

Table 6. Area/component table.

"Today the effects of mining on our land are mellowed but they still influence our way of life. They will continue to provide everyone who studies them with an incomparable source of our history and industrial heritage."

Bryan Earl
President, The Trevithick Society

2d) Criteria under which the inscription is proposed and the justification for the inscription under these criteria

The Cornwall and West Devon Mining Landscape is nominated as a cultural landscape under the criteria for cultural properties set out in the Operational Guidelines for the Implementation of the World Heritage Convention. Under the second category defined in 39(ii): *the organically evolved landscape*, and within its first sub-category: *a relict landscape*, it is further proposed that this be taken to demonstrate *the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal.*

The nominated site meets three criteria: (ii), (iii) and (iv).

Criterion (a) (ii): Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design.



The Central Mining District c1890 with Carn Brea on the right (south). This view includes a group of mines that were, during the second half of the nineteenth century, the most productive in the world. The entire landscape was devoted to metal mining.

Cornwall was an early and advanced eighteenth-century industrial region. During the nineteenth century the region played a strategic role in the world-wide spread of hard-rock mining skills, and of steam-engine technology. Cornwall pioneered the transfer of the British industrial revolution overseas.

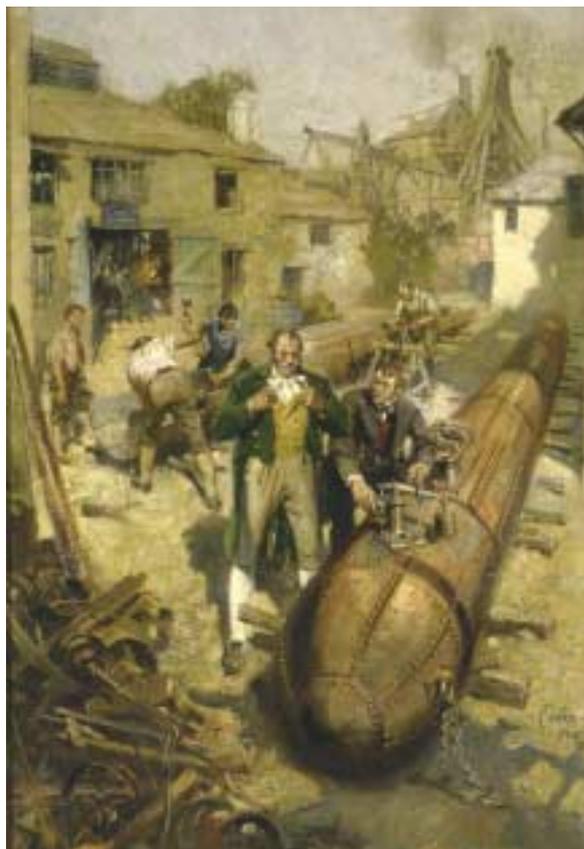
As a result, the nominated Site played a key role in the growth of a global capitalist economy.

From 1700, the key interchange that characterised Cornish mining was the diffusion of technology. Cornwall and Devon both played a leading role in the development of the steam engine because this was the technology that was increasingly used to pump the deep wet mines of the region, to draw the ore to the surface and, later, to crush it.



A £2 coin issued in 2004 by the Royal Mint to commemorate the first steam engine to run effectively on metal rails. The high-pressure steam-powered locomotive – named Penydarren – was designed by Richard Trevithick in 1804. It allowed the engine to haul six to seven times its own weight.

Steam power was first adopted by a metal mine during the second decade of the eighteenth century. This was probably at Wheal Vor (A3) between 1710 and 1714. The engine was a Newcomen atmospheric steam engine, patented by Thomas Newcomen and Thomas Savery from Devon. Despite this early beginning, it took time for the technology to be adopted, primarily because of the cost of the coal that had to be shipped from the coalfields of Bristol and South Wales.



Richard Trevithick in the yard of the Holman Boiler Works (Pool, A5) during the early nineteenth century. Boiler development was integral to the success of high-pressure steam. Painting by Terence Cuneo for Holman Brothers, Camborne (1950s).

When the patent expired in 1733, engineers such as the Hornblowers began to improve the Newcomen-Savery design. John Smeaton, who was brought in by Cornish mines adventurers during the early 1770s, almost doubled the power of the Newcomen engine. This power output was effectively doubled yet again by Boulton & Watt who began to supply for their own engines to Cornwall from 1777. They also made highly significant fuel savings. By the time their monopoly came to an end in 1800, Cornish engineers such as Trevithick and Woolf were beginning to develop the high-pressure steam engine. Once again this was to double the 'duty' reached by the best of Watt's engines. So by 1838, the average 'duty' of Cornish engines was almost two-and-a-half times more than that of the best Watt engines.

It was at the foundries and mines in areas A2, A3, A5 and A6 that much of the development was carried out which was to propel the steam engine to previously unimagined levels of efficiency.

A whole society was involved in this diffusion of knowledge and expertise, a society steeped in a vigorous and receptive industrial culture. It was a powerhouse of invention and innovation, importing new ideas from elsewhere, exporting new techniques in turn. It was a culture that gave rise to a local engineering industry dedicated to servicing the growing needs both of mining and processing the ore ('ore-dressing'). Local foundries manufactured innovations such as 'Cornish rolls' which crushed copper ore, and the 'Cornish boiler' which was used to produce high-pressure steam.

A Cornish mining scene. Heaps of copper ore are being sampled and weighed within a traditional walled mine yard. By 1861 there were 340 Cornish mines which directly employed more than 38,000 men, women and children. In addition, there were countless numbers of supporting businesses and their employees. (English School, nineteenth century).



A number of internationally significant innovations originated in the nominated Site. For example in 1792 William Murdoch was the first person to use gas for lighting. The house he lit still stands in the centre of Redruth (A5).



William Murdoch (1754-1839)

Richard Trevithick experimented with steam-powered road vehicles in Camborne and his railway engine of 1802 helped to lay the foundations for the railway system that revolutionised the

world economy. Sir Humphry Davy invented the coal miners' safety lamp in 1816. And William Bickford developed the miners' safety fuse in 1831. Bickford's factory complex at Tuckingmill became the global centre of fuse manufacturing. Parts of it still survive.

Some of Britain's earliest printed 'scientific' works on mining and mineralogy were produced in Cornwall. They included *Mineralogia Cornubiensis* by William Pryce, a Redruth mine surgeon, which was published in 1778. Another intellectual characteristic of the nominated Site was the founding of miners' and mechanics' institutes such as the one at St Agnes (A7), and mining schools such as the one at Redruth (A5). Some mining schools were later incorporated into the Camborne School of Mines. In the nearby towns of Penzance, Truro and Falmouth, an interest in geology and science was encouraged by literary institutions and museums. The Royal Geological Society of Cornwall (1814), the Royal Institution of Cornwall (1818), and the Royal Cornwall Polytechnic Society (1833) were founded with the aim of increasing knowledge and improving skills within the industry. They still exist and retain their importance as part of the Cornish cultural heritage.

Cornwall's mining industry had a profound impact on the landscape. New ports and quays were built at places such as Hayle (A2), Portreath (A5), Devoran (A6), Charlestown (A8) and Morwellham (A10). New tramways and railways were laid down, for example the Poldice Plateway (A5), the Redruth & Chasewater Railway (A6), the Liskeard & Caradon Railway (A9) and the East Cornwall Mineral Railway (A10). In addition there were the hundreds of distinctive engine houses with their associated 'burrows' and shafts, together with waste tips which sprawled across the landscape. New settlements such as Camborne (A5), Carharrack (A6) and Minions (A9) sprang up, each one containing rows of terraced miners' cottages and the ubiquitous Methodist chapels.

As emigration became central to the cultural life of nineteenth-century Cornwall, this characteristic mining landscape together with numerous aspects of the mining community's social ethos went overseas with the emigrants. Cornish engine houses and Cornish chapels can still be found in countries as far apart as Australia and Mexico.



Mina Corteza, Pachuca, Mexico, 1899. Cornish miners and engineers first brought steam engines to the silver mines of Pachuca-Real del Monte in the 1820s.



Hayle - a new town created by the mining industry.

The Cornish landscape had a special meaning for its people in medieval times. The evidence for this claim is the propensity to adopt surnames based on place names. This link between people and places continued throughout the industrial period though developments in the nineteenth century meant it was no longer confined to geographical Cornwall. For example, Cornish surnames such as Menadue, Chynoweth or Nankivell, all derived from the Cornish language via place names, are now far more common in Australia than in Cornwall. So even Cornish names now have an international aspect. This illustrates the process of cultural interchange that has followed the changing fortunes of Cornish mining.



Bal-maidens - women and girls - 'dressing' tin. Water-coloured sketch by James Henderson who published *On the Dressing of Tin and Copper Ores in Cornwall*, 1858.

Criterion (a) (iii): Bear a unique or at least exceptional testimony to a cultural tradition or to a civilisation which is living or which has disappeared.

Cornish mining transformed both the region's landscape and its society over a period of four millennia. It also helped to create a distinctive culture.

The industrialisation of Cornish mining in particular had profound social and cultural consequences.

By the mid-nineteenth century, Cornwall had spawned a proud and assertive regional identity, associated most closely with the mining districts. (This identity took on a wider global significance in the wake of mass migration overseas). Eventually this cultural tradition fused with other aspects of Cornwall's heritage and developed into the contemporary perception of the Cornish - by the Cornish - as 'industrial Celts'.

Cornwall's mining landscape bears the imprint of much of this distinctive and changing cultural heritage.

Most medieval European mining regions were closely controlled by the state. Cornish mining was different. It had developed under conditions which gave both miners and investors considerable freedom. Mining practice in Cornwall was based on Stannary law, a codified version of customary mining traditions which included such practices as the adventurers' right to 'bound' land, in other words to stake a claim to a piece of land for mining purposes without regard for the constraints of normal landed property rights. The Stannary Courts and Convocation existed in association with the Duchy of Cornwall (the Duchy being an institution which tied Cornwall and parts of Devon into a close relationship with the Crown) and did so to their mutual advantage.



East Pool Mine (A5). The miners are enjoying the usual "croust time", having performed the first part of the day's labour. Some of the holes bored are often blasted before "croust", so that the smoke may clear away while the welcome and well-earned "crib" and pipe are being enjoyed. Photograph by J C Burrow (1852-1914).

Caption by W Thomas, as published in *Mongst Mines and Miners* (Camborne, 1893).

During the nineteenth century pasties became the compact Cornish miner's meal. They overcame the impracticality of leaving the workplace and their widespread popularity embedded them into Cornish mining culture - worldwide.

Cornwall's eighteenth-century mining activities, which were widely dispersed across the region, were characterised by elements of the older mining tradition coupled with new industrial practices. Together they produced a distinct regional culture. Employment relations, for example, became well-defined during this period. Although they harked back culturally to an older tradition of semi-independent tinner-smallholders, they were ideally suited to the requirements of a more capitalised industry. The payment systems known as 'tribute' and 'tutwork', which contained an element of self-employment, were developed in the nominated Site and prevailed in almost every mine.



Miner's cottage, Beacon, Camborne (A5). Numerous similar cottages in the rural mining districts were built by miners and leased on a three-lives tenure.

The practice of leasing out smallholdings on unenclosed land within the mining districts enabled a proportion of the miners to build cottages, rear pigs and grow some vegetables. This lessened their dependence on both the market and the mine. It also maintained the economic role of the family unit and guaranteed relatively egalitarian relations between the men and women within the household. The characteristic landscape of small fields and scattered cottages associated with this practice can still be found in many parts of the nominated Site.

As to religion, the dispersed settlement pattern associated with industrialisation in eighteenth-century Cornwall provided fertile ground for Methodism. When new mines were developed and a mining village sprang up to house the miners and their families, the Methodists were able to establish themselves immediately, unlike the Anglicans who had to undertake



Scorrier chapel (A6)

a lengthy legal process. So a network of small chapels provided the focal point for people's spiritual life. By 1851, Cornwall had a higher proportion of Methodist members and chapel-goers than any other part of England. Methodism continued to exert an important influence until the mid-twentieth century. Well over 700 chapels still survive in Cornwall and more than 80 per cent of them are Methodist in origin.

From the 1840s onwards, there was an outpouring of work in the Cornish dialect. In the 1880s and '90s a distinct school of literature emerged and included Edward Bosanketh's *Tin* (set in A1) and H. D. Lowry's *Wheal Darkness* (A5). John Harris (1820-1884), the Cornish poet and miner, published several volumes of poetry celebrating his native landscapes, including *Lays from the Mine, the Moor and the Mountains* (1853) and *A Story of Carn Brea* (1863).

These developments provide clear evidence of mining's position at the centre of local culture.

As to popular culture, a number of distinct elements became central to mining communities: they ranged from sports such as Cornish wrestling to food such as pasties and saffron buns. The folk tales of the region and its rich oral culture were captured by collectors such as Henry Hunt and William Bottrell in the 1860s and '70s. Later, the Cornish adopted cultural activities which were enjoyed in other parts of industrial Britain, including male voice choirs, brass and silver bands, carol singing and rugby. They all became mainstays of local cultural life and came to be identified as quintessentially 'Cornish' by the 1900s.

The Cornish family was distinctive in that it was the custom for there to be a relatively equal division of labour regardless of gender. This practice was retained well into the nineteenth century. Boys (as young as eight years old) worked underground, whilst Cornish women had in any case developed a sense of relative independence from the late eighteenth century onwards due to the common practice of employing girls and women in the copper mines as surface workers, or 'bal maidens'. This independence was reinforced in the latter part of the nineteenth century when mass migration produced another distinct family form, that of the Cornish 'dispersed' family. In this case there was a stark division of labour, with the men working overseas for variable amounts of time while their wives undertook total domestic and financial responsibility at home in Cornwall.

What had been a singular regional culture based on mining gained global significance when some 200,000 Cornish people migrated overseas. In America and Australia, in particular, it was the Cornish who often established the culture of the mining 'frontiers'. Cornish words became commonplace, often derived from Cornwall's Celtic language: words such as 'wheal', meaning mine working; 'bal', which originally referred to a group of individual workings but which later applied to a single mine that incorporated these earlier and smaller workings; and 'gunnis', meaning a stope (a chamber from which ore is excavated) that is empty or no longer worked.

The Cornish wage systems known as 'tribute' and 'tutwork' were applied. So too was the cost book system of mine finance. Cornish folk traditions were adopted: choir-singing in California and pasties in Mexico, for example. And Cornish chapels were built in South Australia. In the latter part of the nineteenth century and the early twentieth century, Cornish entertainers such as Fanny Moody, and novelists such as Silas, Joseph and Salome Hocking became household names in Australia, South Africa and parts of North America.

The trans-national aspect of Cornish culture was cemented by family links, by constant trans-continental migration and by the return of so-called 'Cousin Jacks' to Cornwall. It blossomed from the 1880s to just before World War I, receding only with the collapse of international metal mining after 1919.

The region's mining communities have bequeathed a vibrant cultural heritage. Social and family history is

intertwined with a living tradition of music, art and literature. This heritage continues to shape the modern Cornish identity, even though the mining industry itself has contracted.

In the late twentieth century, the industrial cultural heritage of rugby, choirs and dialect merged with the revival of other cultural traditions such as Celtic music and dance, and the Cornish language itself, and together they now underpin a vibrant, dynamic and changing cultural identity. Perhaps the most visible sign of this development is the flag of St Piran, the patron saint of Cornish tanners, which is in widespread use. The flag - a white cross on a black background - symbolises the tin metal set in a black background of charcoal ashes and represents contemporary Cornish pride in a sense of identity and inheritance.



The closure of South Crofty Mine, 1998. The flag of St Piran, the patron saint of Cornish tanners, is a symbol that unites the Cornish in Cornwall; and with the global diaspora of people of Cornish descent.

St Piran's flag is also unfurled at events in North America and South Australia connected with a renewed sense of trans-national Cornishness. This reinvigorated global sense of Cornishness influences contemporary Cornish culture. It manifests itself in such twinning agreements as those between the Cornish towns of Redruth and Bodmin and their respective counterparts in the U.S.A. at Mineral Point, Wisconsin, and Grass Valley, California. A similar arrangement is proposed between Camborne in Cornwall and Pachuca in Mexico. In this way 'Cornishness' continues to have a unique international dimension.

Criterion (a) (iv): Be an outstanding example of a type of building or architectural or technological ensemble or (and) landscape which illustrates (a) significant stage(s) in human history.

The nominated Site is an intrinsic part of that greater landmark of human history known as ‘the Industrial Revolution’. Cornish mining made substantial technological, social and economic contributions to the British industrial revolution and it was Cornish mining which made pioneering use of industrial practices overseas. This occurred at a crucial formative period in the development of modern industrial society and played a key role in the growth of a global capitalist economy.



Basset Mines (A5, Listed Grade II). Pumping engine house (foreground) and whim engine house (background) at Pascoe's Shaft, South Wheal Frances section.

Metal mining transformed the landscape and society of Cornwall and West Devon. The serial nomination represents the most significant of the dispersed industrial areas within the Site and includes a range of highly visible components, all relatively close to one another. Together they exemplify the evolution and development of Cornish mining technology in its entirety.

Steam power was the greatest of the technical innovations to be developed during the Industrial Revolution, and the nominated Site was central to its introduction and development. Neither transport nor many of the strategic industries of that era could have continued to advance without the innovative application of steam power. The developments which came from within the nominated Site were often owed to everyday tinkering by empirically-trained, local working engineers rather than to innovative flashes of genius. The acme of steam development was the Cornish Beam Engine. There are more than two hundred Cornish engine houses spread across the nominated Site. They are among the most distinctive industrial buildings in the world. The variations in their design reflect the evolutionary development of the Cornish engine, and the form of each individual engine house reflects the type and size of the engine it once housed.

Four beam engines survive in situ in Cornwall. There is a winding (hoisting) engine at Levant Mine (A1), a winding and a pumping engine at East Pool & Agar Mine (A5), and a pumping engine at South Crofty Mine (A5).

Another significant contribution to steam technology was made by the foundries that manufactured the engines. The principal surviving foundries are: Perran (A6); Harvey's (A2); Holman's and Sara's (A5); Mount, Tavy and Bedford (A10); and Charlestown (A8). These foundries also manufactured a wide range of other mining products. Holman's, in particular, was internationally renowned for the production of compressed air rock drills. Their products dominated the mining world.



Holman's Rock Drill Works, Camborne (A5). Holman's made a global impact with their rock drills and compressed air mining equipment during the late nineteenth- and early twentieth century. By 1896 there were more than 1,000 Cornish rock drills in use in the Rand gold mines in South Africa. Cornish manufacturers did much to pioneer dust-suppression by delivering a water spray to the drill bit.

Cornish copper ore was the basis on which the Bristol and Birmingham brass industries were founded. These were the largest producers in the world. Cornish copper ore was also responsible for Swansea (South Wales) becoming the global centre for copper-smelting during most of the nineteenth-century. The copper output from west Cornwall during the first three decades of the nineteenth century amounted to two-thirds of the world's supply. During the 1850s, Devon Great Consols in West Devon became the largest single producer in Western Europe.

There is a great deal of evidence of the former importance of Cornish copper both at the sites where it was extracted and also in the form of the substantial transport infrastructure needed to export it. Millions of tonnes of copper ore were carried from the mines to the new purpose-built mineral ports. A high-capacity transport network had to be developed rapidly from the early nineteenth century and substantial remains of this network occur right across the nominated Site in various forms. There is an internationally significant group of late eighteenth- and early nineteenth-century industrial ports (A2, A5, A6, A8 and A10), together with former tramways and railways (A2, A5, A6, A9 and A10) and canals (A8 and A10).

Until the last quarter of the nineteenth century, Cornwall and West Devon produced more tin than any country in the world. The ore was mined, 'dressed' and smelted locally. Tin was the foundation of the English pewter industry and later of tin plate manufacturing, and that in turn led to the development of the canning industry.

There are substantial remains of the technologies used to dress and to smelt tin, particularly in A1, A5, A7 and A10.



King Edward Mine (A5, tin dressing plant Listed Grade II*). A convex buddle, used to concentrate fine-grained tin-ore.

Arsenic began to be produced in Britain as a by-product of tin and copper mining in West Cornwall during the early nineteenth century. In the 1870s, Devon Great Consols and a few other mines in West Devon and East Cornwall produced half the world's supply. The Lancashire cotton industry used arsenic in dyes and pigments. Then demand grew when it became popular as an insecticide during the last quarter of the nineteenth century. It helped to control Colorado Beetle which had devastated potato, tobacco and other crops across America. There is a rare group of technological monuments of international significance in the nominated Site in the form of arsenic calciners and refining works, particularly in A1, A5 and A10.

Kenidjack arsenic works (A1).



"Mining in Cornwall played a major part in developing one of the chief prime movers in the process of industrialisation in the eighteenth and nineteenth centuries. I can't think of many things that have more universal significance."

Dr Frank AJL James
President, The Newcomen Society