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shaped your world

Delve Deeper

Poldice: Riches and poison in the old Copper Kingdom

Gwennap,
Kennall
Vale and
Perran
Foundry

If you wish to delve deeper into the history of Poldice's links with Cornish Mining then this short guide will provide you with more information.

Mining and ore processing have changed the landscape of Poldice dramatically. The valley is scattered with the remains of buildings, while strange lunar like humps rise out of the heathland, so poisoned by mining that nothing grows on them.

Poldice lies in the parish of Gwennap, the latter once described as the 'richest square mile anywhere on Earth'. Also once known as 'the Copper Kingdom of the Old World', the area produced a major proportion of the world's copper in the 18th and 19th centuries. Poldice, however, was perhaps better known for tin and was the richest mine in Gwennap, and the last to close down.



Poldice Mine. Photo: Eva Kröcher

Gwennap's fine houses, well-preserved industrial remains and dramatic, alien-looking mining landscapes tell the compelling story of Cornwall's mining heyday. For this reason, it is one of the 10 Areas of the Cornish Mining World Heritage Site.

Poldice riddle!

The start of a well-known local rhyme shows how 'Poldice' is usually pronounced:

At Poldice the men are like mice,

The tin is very plenty,

Captain Teague is one of Breage

And he'll give ten for twenty.

The rhyme implies that the mine had a large workforce because it was so rich in tin. Breage was the mining area near Helston where Captain Teague came from. He paid tributers the value of 10 cwt of white (smelted) tin for every 20 cwt of tin concentrate. Tributers were men who were paid an agreed price for the amount of ore they brought to the surface.

HISTORY OF MINING IN POLDICE

Reports of early mining success

Poldice had the greatest and deepest early tin mines in Cornwall. A document dated 28th September 1512 - one of the earliest records of Poldice - relates to a quarrel about a theft of tin 'near Poldyth in Wennap'.

Poldice was again recorded in the late 1500s by John Norden who wrote that 'Poldeese, nere Truroe' was among 'the chiefe tynn mynes in Kirier hundred'.



In the 1690s, another writer described Poldice as 'that unparalleled and inexhaustible tin work...which for about forty years space hath employed yearly from eight hundred to a thousand men and boys.'

Copper takes over from tin

Although Poldice began as a tin mining area, it gradually switched to copper production – as copper became more valuable than tin. Between 1792 and 1798, over £150,000 worth of copper was sold, giving Poldice a healthy profit.

Ever changing ownership



Photo: Cornwall Centre Collection

Poldice Mine was amalgamated with Wheal Unity in the early 1800s, and is recorded as making an overall profit of over £45,000 from the sale of copper and some tin.

In 1852, it became part of St Day United Mines, but that closed in about 1867. From 1870 to 1873, it operated again as Poldice Mines, then was reworked for arsenic until 1929.

Rare minerals tempt smuggling!

Apart from the enormous quantities of tin and copper mined at Poldice, the area was also known for its rarer and more valuable minerals. These included chalcophyllite, olivenite, mimetite and lironite. Miners, well aware of the value of such minerals, would smuggle them out of the mine concealed in the soft white clay found underground. Sometimes they enlisted the help of bal maidens to hide the precious finds in their voluminous skirts.

STATE OF THE ART MACHINERY

Pumping engines

Keeping the mines drained of water was one of the most challenging problems for the mine owners.

As early as the 1720s, pumping engines, presumably water powered, were already draining the levels at Poldice. There are records in the 1780s of two Newcomen steam engines on the site that pumped water into the Great County Adit (see below). A decade later there were four Boulton & Watt engines.

In 1821, a 90 inch Woolf single-cylinder pumping engine was installed at the mine. There were only two other engines of this size in Cornwall, both at nearby Consolidated Mines and these were by far the largest steam engines in Cornwall at the time. In 1842, Poldice's engine was raising an average of 887 gallons per minute. It was one of the most heavily-worked engines in Cornwall as the mine, like others in this area, was very wet.

By the 1860s, the copper industry was in decline, and sometime between 1869 and 1872 the mine sold £12,000 worth of redundant equipment. Despite these sales, the mine then purchased a new 85-inch pumping engine which was again in operation by early 1873. At the time it was needed to deal with the water flooding into the mine as a result of a very wet winter. But, after working for just six months, the engine was for sale and the mine had closed, unable to cope with the cost of pumping water out of the deep workings.

Californian stamps

Some of the most prominent remains at Poldice Mine are the bases for the Californian Stamps (audio track 5). These stamps crushed the ore bearing rocks into fine sand – and the noise would have reverberated all around the valley. Californian stamps were similar to Cornish stamps but were more rapid in action. They had slowly revolving stamp heads which both reduced wear and ground more thoroughly. A single head could crush 1.5 tons of ore per day as opposed to the Cornish stamps which could only crush one ton.

ARSENIC – THE POISON THAT SAVED POLDICE’S MINES

The sudden increase in demand for arsenic as a pesticide during the early 1870s delayed the final closure of many mines. During this period, a handful of mines in Cornwall and west Devon were to produce over half of the world’s supply of arsenic.

What is arsenic?

Arsenic is a semi-metal chemical element which can be found in many minerals, usually combined with other metals or sulphur. It became a valuable by-product of tin and copper mining in Cornwall and was widely used in a variety of industries.



Inside an arsenic works
Photo: Cornwall Centre Collection

Processing arsenic

In tin processing, the ore had to be roasted to a high temperature (over 300 degrees Celsius) to burn off impurities such as sulphur and arsenic which otherwise made the cast tin brittle. This was done using a calciner or furnace.

If the arsenic was wanted, the fumes from the calciner were passed through a long zig zag flue known as a ‘lambreth’ or labyrinth. It had a tall stack at the end to create a strong through draught and also to reduce the damage caused by the noxious fumes. The stack at Poldice still survives (audio track 9)

As the gas cooled in the lambreth, the arsenic condensed and formed crystals on the walls. When sufficient had collected, the calciners were stopped, iron doors in the lambreth were opened, and the arsenic ‘soot’ was swept off the walls and shovelled out.

Toxic workforce!

Arsenic is highly toxic, and surface workers risked arsenic poisoning through continued exposure. Precautions to protect the arsenic workers were very basic. They put wads of cotton wool in their nostrils and a cloth over their mouths. They also followed strict regulations about washing.

Skin rashes and sores were common, especially in warm weather when the men sweated. In general though, the workers seemed to have remained surprisingly healthy, perhaps developing immunity to the poison. It was even claimed that arsenic promoted a good complexion and shiny hair!

Bare lunar landscape

The large whitish heaps along the track from Poldice Mine (audio track 6) known as 'The Sands', consist of arsenic rich waste. The toxic nature of arsenic is evident in the Poldice landscape – the spoil heaps remain almost free of vegetation even after around 80 years! The only things that grow there are specialist plants called bryophytes – a nationally important simple plant species.

From pesticide to wallpaper – the uses of arsenic

The boom in arsenic production came in the 1870s. It was used as a pesticide to control the Colorado beetle in America which had devastated cotton, potato, tobacco and other crops.

Another principal market was the Lancashire cotton industry, which used arsenic in pigments and dyes. Arsenic was also used in glass manufacture (as a decolouriser), in the production of lead-shot, in leather tanning and in sheep dips. It was popular in Victorian wallpaper manufacture to create green and yellow print, but its use became notorious when acidic pollution in the city air reacted with the arsenic to produce deadly arsene gas!

Although the arsenic trade declined during the 1880s, there were revivals later, particularly in the First World War when arsenic was used to make poison gas.



RELATED MINES AND WORKINGS

Killifreth Mine – the tallest surviving stack in Cornwall

One of the most noticeable engine houses in the Poldice landscape is the pumping engine house at Hawke's Shaft (audio track 2), part of Killifreth Mine. Built in 1891 for an 80 inch engine, it has the tallest surviving stack in Cornwall.



Hawke's Shaft Engine House.
Photo: Audio Trails

However, in 1896, a dispute between the owners and shareholders led to closure of the mine, despite the fact that there was still a considerable amount of tin ore underground. For some time afterwards, the mine was used by Truro Mining School.

Hawke's Shaft re-opened in 1912 with a new 85 inch engine. It required four boilers, and in order to create enough draught, the brick built upper section of the stack was doubled in height.

In its later years, Killifreth Mine went over to the production of arsenic, but finally closed in 1928. The Hawke's Shaft engine house was restored in 1987, using local St Day manufactured bricks from the former arsenic works at Bissoe. The two other engine houses close to Hawke's Shaft, to the east, also belonged to Killifreth Mine.

Wheal Unity – one of the richest mines in Gwennap

Although there are few visible remains of Wheal Unity, it was one of the richest mines in the area. By 1798, it had profits of over £100,000, mainly from the sale of copper ore. Soon after, it was amalgamated with Poldice Mine. By the mid 1800s, Wheal Unity was dependent largely on arsenic production.

The dressing floors for Wheal Unity were in the valley bottom below Unity Wood. The floors needed a constant supply of water, and it was decided that the best source was Pednandrea Mine in Redruth. This necessitated the building of a six mile leat that wound its way from Redruth to St Day.



Wheal Unity. Photo: Audio Trails

Great County Adit – Poldice's great feat of engineering

By 1730, Poldice Mine was becoming too deep for the pumping engines to cope. Another method of drainage was needed to prevent flooding of the mine.

This led the manager of Poldice, John Williams, along with its chief 'adventurer' or shareholder William Lemon, to start the construction of a system of adits (long, slightly sloping tunnels created to drain water from mines by gravity). Begun in 1748, its interconnected tunnels eventually extended for nearly 40 miles, providing drainage to over 100 mines.

It became known as the Great County Adit, and was arguably the most dramatic engineering achievement within the district. In 1839, it discharged around 66 million litres per day and had more steam engines pumping into its course than were used by the whole of continental Europe and America combined.

The Great County Adit brought many benefits, but it also had its problems. In 1872, a blockage in the abandoned Wheal Damsel threatened to flood Poldice. The four men who were sent to investigate narrowly escaped with their lives when the blockage gave way. It released a torrent which poured down the shaft with a 'with a roar like that of the Falls of Niagra'.



EVER-IMPROVING TRANSPORT NETWORKS

Portreath to Poldice Plateway

In the early days of mining in the area, ore and other materials were transported by mule or horse drawn wagons. But the tracks could be muddy, pot holed and impassable in winter.

The first major transport improvement for local mines came with the opening of the Portreath to Poldice Plateway in 1812. The first of its kind in Cornwall, it was a private route for horse drawn wagons, the wagon wheels running along L shaped cast iron tracks called plates.

Redruth & Chasewater Railway

John Taylor, industrial rival to William Lemon at Poldice, built the Redruth & Chasewater Railway in 1824 to link his principal mines in Gwennap – including Consolidated – to his new port at Devoran.

The railway ran through the Wheal Maid valley close to Poldice. It was the first railway in Cornwall to use wrought iron rails and to employ wagons with flanged wheels.

PLACES TO VISIT

Wheal Maid Valley

Poldice's neighbouring valley has a similar lunar landscape, and you can also see the former trackbed of the Redruth & Chasewater Railway. The valley is named after an old copper mine called Wheal Maiden, which later joined Poldice as part of St Day United Mines.

Gwennap Pit

A couple of miles from the Poldice Valley at Busveal, and to the north of Redruth, is Gwennap Pit, an impressive open air amphitheatre. It was made famous by Methodist founder John Wesley. It is free to visit.

www.gwennappit.co.uk

Mineral Tramways

The Mineral Tramways offers over 37 miles of accessible cycling and walking trails around Portreath, Camborne and Redruth, including the famous Coast to Coast trail.

www.cornwall.gov.uk

Bike Barn and the Mineral Tramways Exhibition

Discover Cornwall's tramroad history by browsing the exhibition at the Bike Barn at Cambrose, where you can join a guided bicycle tour or hire your own bike.

www.cornwallcycletrails.com

King Edward Mine Museum

In Troon, near Camborne, the museum specialises in the history of Cornish mining, telling the remarkable story of how the mine has been preserved for 100 years. In the tin processing mill, rare examples of ore dressing machinery can be seen in action, just as these would have worked in the early 1900s.

www.kingedwardmine.co.uk



The Royal Cornwall Museum (Truro)

The museum holds a wealth of information and artefacts from Cornwall's history including a magnificent collection of local minerals.

www.royalcornwallmuseum.org.uk

Wheal Peevor

This is a well preserved example of a 19th century tin mine with remains of all aspects of the mining operations at surface, from pumping out water to raising, crushing and treating the ore. Free access. Near Radnor, Redruth.

www.cornwall.gov.uk

FOR FURTHER INFORMATION

Visit www.cornwalltrails.net to download the St Day Trade and Industry Trail, created by the Mining Villages Trails Project.

'Exploring Cornwall's Tramway Trails, Volume 2' by Bob Acton, Landfall Publications

'The Mining Villages of St. Day, Town Trail', 'The Mining Villages of Gwennap' – leaflets produced by Gwennap Parish Council

For more information on Cornish Mining visit www.cornishmining.org.uk