

Abandoned Mine Case Study: Wemyss Lead & Zinc Mine



The abandoned Wemyss Mine is 15km southeast of Aberystwyth, Ceredigion. It is located at the head of the Cwmnewydion valley, a tributary of the River Magwr, which joins the River Ystwyth at Abermagwr. The mine worked the Frongoch mineral lode alongside Frongoch and Graig Goch mines. Wemyss became an integral part of the larger Frongoch Mine and cannot be considered in isolation from its more illustrious neighbour. In the 1840s both mines came under the same ownership and the Wemyss drainage adit was extended to also serve the Frongoch workings, becoming the Frongoch Adit we know today.

The mines continued to be operated together with varying success throughout the latter half of the 19th century until they were acquired by the Belgian company '*Société Anonyme Minière*' in 1898. The Belgians invested heavily in modernising and electrifying the mining operations, which included constructing a state-of-the-art hydro-electric power station at Pont Ceunant and a large ore dressing mill at Wemyss. However, the venture was short-lived and by 1904 the company were in liquidation and all of the mine's machinery and effects were sold at auction.

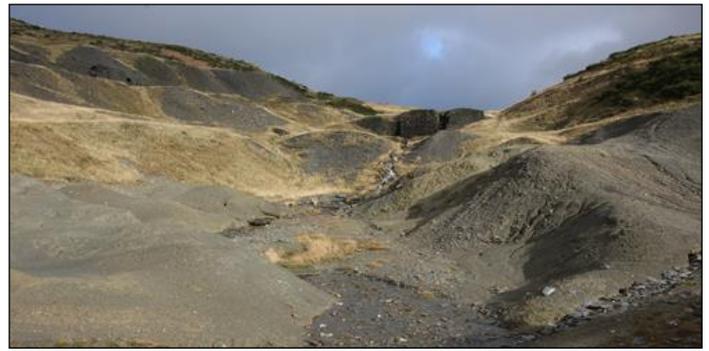
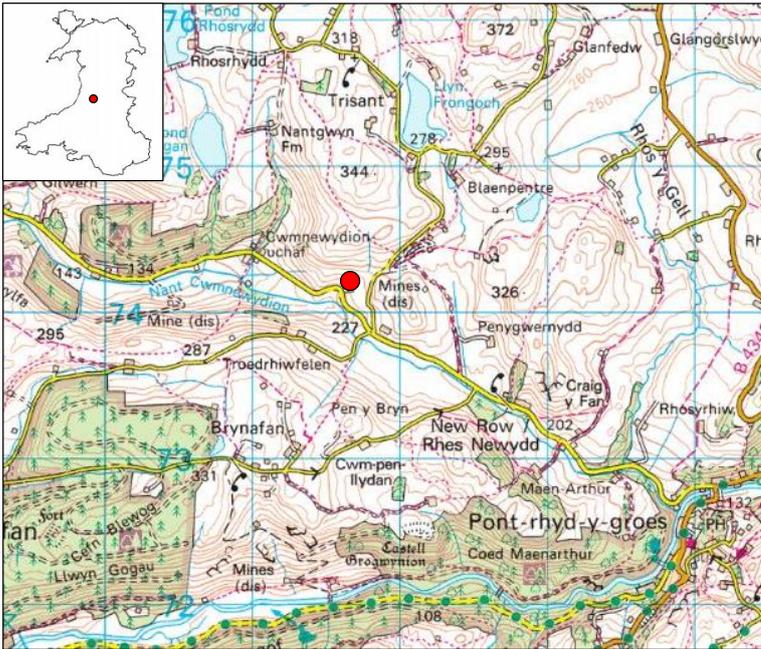
Today, the Wemyss site is dominated by the ruins of the dressing mill and its large spoil tips which are bordered to the south by the Cwmnewydion Stream and to the west by the smaller Mill Race Stream. There are also the remains of the wheel pit for a 56-foot waterwheel, which was fed by a leat from Frongoch.

Wemyss is a significant source of metal pollution and is causing a chemical and ecological impact on downstream watercourses. The mine is contributing to the Cwmnewydion, Magwr and Ystwyth failing to achieve the environmental quality standards for zinc, lead and cadmium required by the European Water Framework Directive (WFD). Fish population surveys carried out on the Cwmnewydion in 2009 showed the stream to be virtually fishless downstream of the mine to its confluence with the Magwr.

A number of studies have been carried out at Wemyss, including water quality and flow monitoring, to develop a conceptual site model from which remedial options can be considered. The primary sources of pollution are the leaching of metals from the spoil tips due to ponding and infiltration of rainwater, and contact with the Mill Race and Cwmnewydion streams which flow across and at the toe of the tips. These watercourses are also causing significant erosion of the spoil tips, resulting in the deposition of large quantities of metal-rich sediments downstream and their subsequent re-mobilisation during high-flow events.

Potential solutions include capping the spoil tips to prevent infiltration, and culverting or diversion of the Mill Race and Cwmnewydion streams to prevent further erosion of the tips. The latter could potentially utilise an abandoned leat that once conveyed water from Wemyss to Graig Goch Mine further down the valley. We have commissioned field surveys to identify areas of high archaeological and ecological interest across the site, providing information that will be key to safeguarding these features during the design of remedial works.





Impact on receiving watercourses	
Length impacted:	19km
WFD water body ecological status:	
• Cwmnewyddion & Magwr	Poor
• Lower Ystwyth to tidal limit	Moderate

In 2016 the Coal Authority will review all available information on a number of the most polluting metal mines across Wales, including Wemyss, to identify preferred sites for one or more remediation schemes in the near future, subject to securing funding.

Monitoring data

	Cwmnewyddion Stream		Mill Race Stream
	Upstream Wemyss	Downstream Wemyss	
Flow (L/s)	41	55	5
pH	7.0	7.0	6.5
Zinc (µg/L)	226	1,660	5,160
Lead (µg/L)	27	189	1,410
Cadmium (µg/L)	0.4	3.7	12
Zinc load (kg/yr)	294	2,340	645
Lead load (kg/yr)	35	308	236
Cadmium load (kg/yr)	0.5	3.4	1.5

Benefits of remediation

- Over 2 tonnes of harmful metals could be prevented from entering the Cwmnewyddion Stream and subsequently the River Ystwyth each year.
- Reduced contaminated sediment load to downstream watercourses.
- Reduced metal load to the Cardigan Bay Special Area of Conservation.
- Downstream water bodies will be more likely to achieve Good Ecological Status, although there are other mining pressures on these water bodies that will also need to be addressed.
- There is potential to develop an educational resource at the site in conjunction with the Pont Ceunant hydro-electric generating station.

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