

Slate quarrying around Corris

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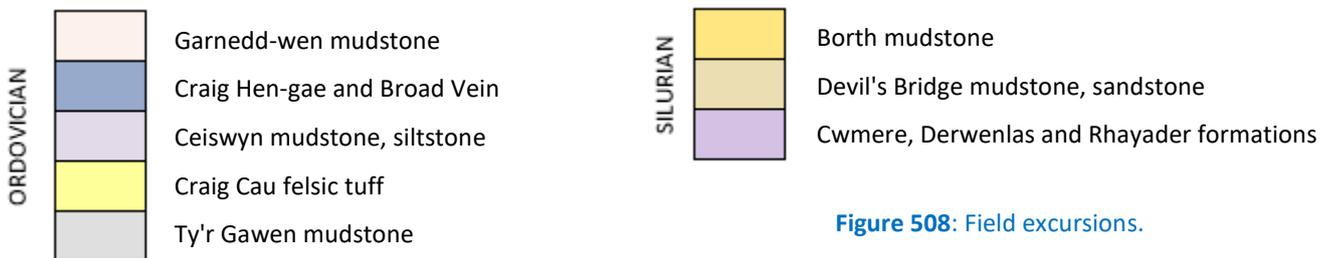
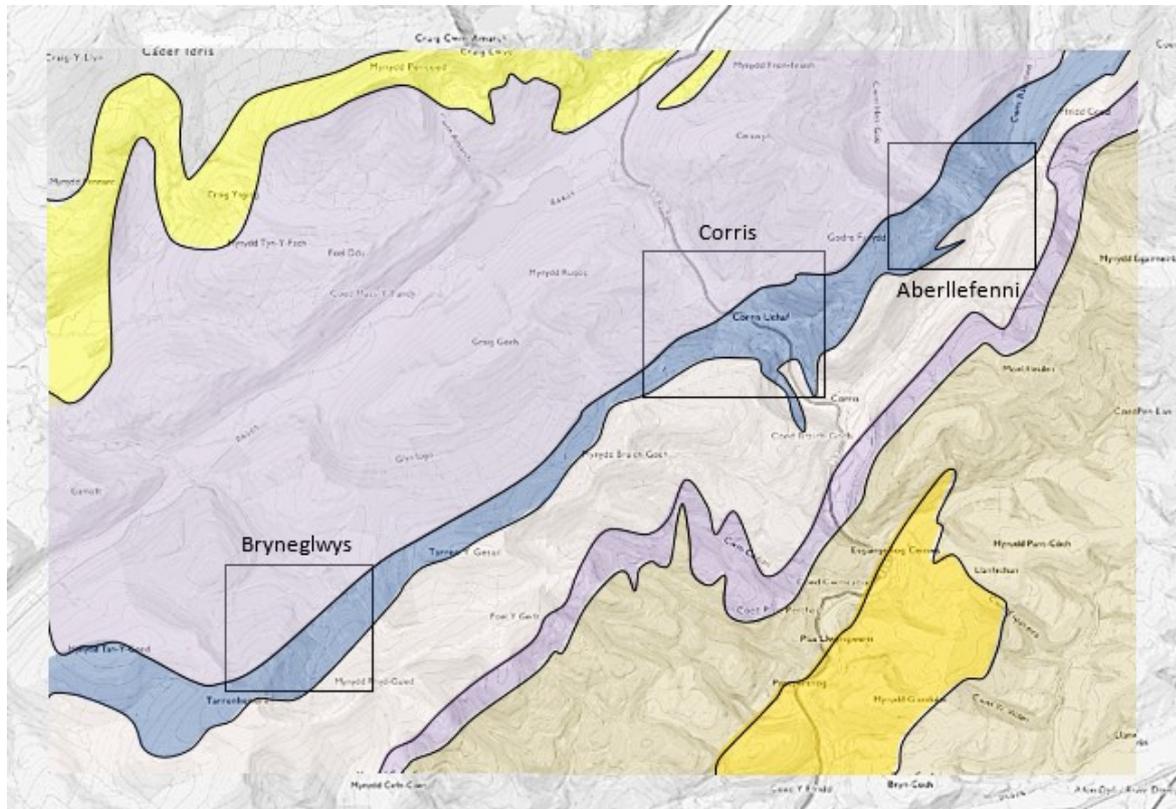


Figure 508: Field excursions.

We now turn our attention to the great expanse of Upper Ordovician and Silurian muddy sedimentary rocks to the south of the volcanic centres of Cader Idris and the Aran mountains. We begin by examining a series of small quarrying areas centred on the village of Corris which worked slate beds in the upper Ordovician, close to the junction with the overlying Silurian strata.

The geological sequence, which at first sight seems to be a monotonous succession of mudstones, has local variations which provide important evidence of the changing environments in which the sediments were deposited. From geological evidence collected in many regions, it is believed that global sea level varied considerably during late Ordovician and Silurian times. In particular, a very significant ice age occurred at the end of

Ordovician times which trapped large amounts of water in snow and ice, causing a shallowing of the world's oceans. This event is known as the **Ashgill regression** in Wales. The Welsh marine basin was reduced in width as falling sea level exposed more of the marginal land areas.

As the Ordovician ice age ended, fresh water was released into the oceans and sea levels increased. This led to the **Llandovery transgression** in the Welsh basin, with marginal land areas again being flooded.

The occasional coarser sandstone formations which occur within the mudstone sequence can be correlated with the periods of shallower water in the Welsh basin. Fig.510 gives a reconstruction of the palaeogeography of late Ashgill times. Low sea level led to emergence of large areas of the

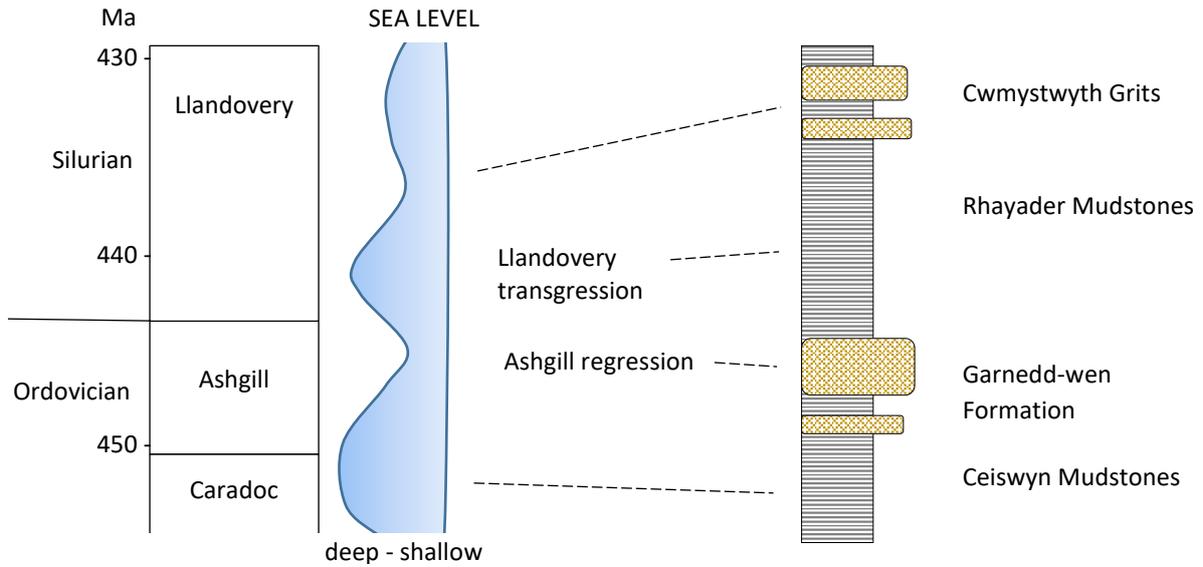


Figure 509: Changes in sea level during the late Ordovician and early Silurian.

Midland platform and the Irish Sea landmass. Palaeocurrent measurements suggest that both of these landmasses were discharging sediment into the Welsh basin, with the largest volumes carried

by rivers from the Midland platform. Localised tongues of coarse sand extended across the shallow shelf to discharge into the deeper waters of the central basin.

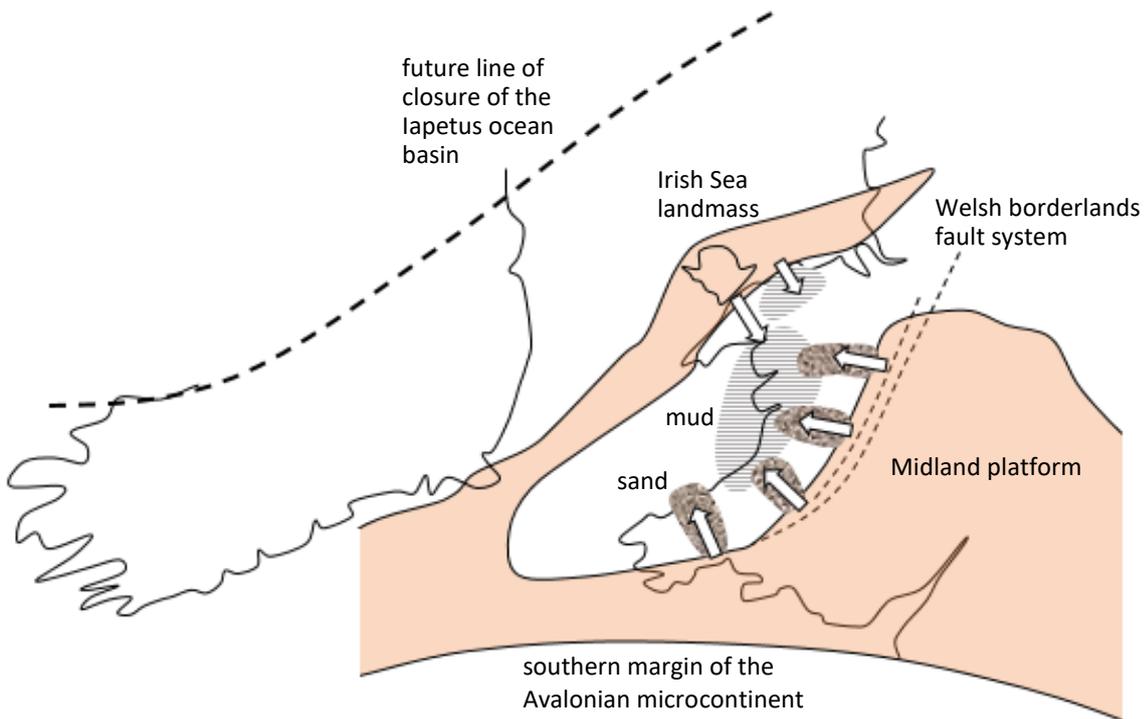


Figure 510: Palaeogeography of late Ashgill times.

It is known that fault movement was continuing through late Ordovician and Silurian times along the major fracture zones bordering and within the Welsh basin. Within our area of north-west Wales, continued faulting in the Corris-Rhobell and Bala-Mawddach fracture zones produced breaks of slope on the basin floor (fig.511). Mixtures of

sediment spilled down the slopes, with coarser sand quickly settling to form deltas, whilst finer silts and muds were carried into the deeper waters.

The sequence of strata in the Corris slate quarrying area is illustrated by a cross section at Aberllefenni (fig. 512).

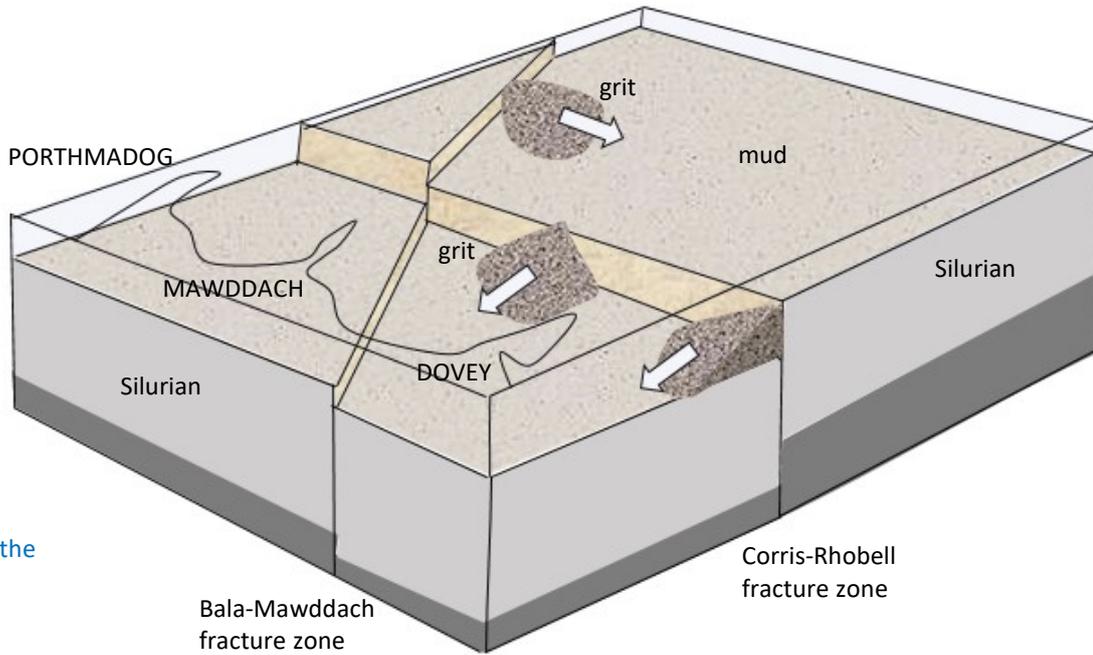


Figure 511: Deposition of the Garnedd-wen formation.

The Aran Volcanic Group is overlain conformably by a thick succession of mudstones with occasional siltstones, sandstones and conglomerates. The Nod Glas formation is a characteristic black **hemipelagic** mudstone deposited in deep oxygen-poor conditions by quiet settling of suspended mud particles from the overlying column of seawater. Other formations are made up from a mixture of hemipelagic muds and fine grained mud and silt turbidites deposited by sediment flows travelling across the basin floor. Two formations,

the Broad Vein and the Narrow Vein, contained sufficiently pure mud to produce workable slate deposits.

Field locations visited in this section are: the Bryneglwys quarry at Abergynolwyn, the Corris slate quarries; and the Aberllefenni quarries. Bryneglwys is disused, whilst Aberllefenni quarry continues to produce slate. The Corris quarries are no longer in production, but a visitor centre provides tours of the underground workings.

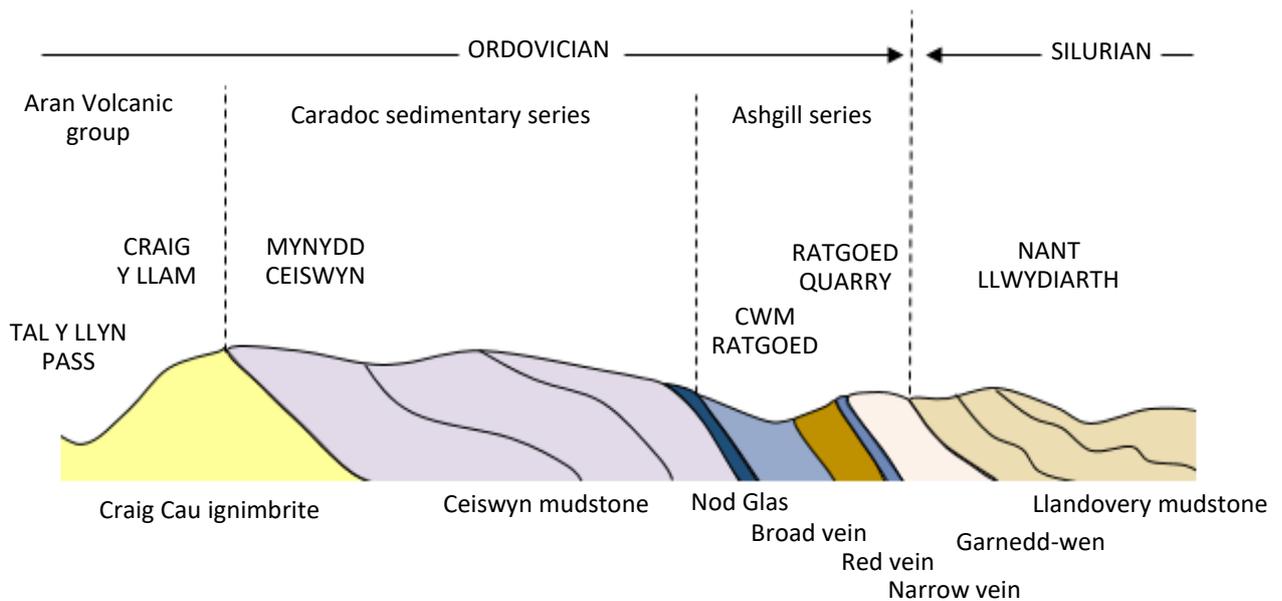
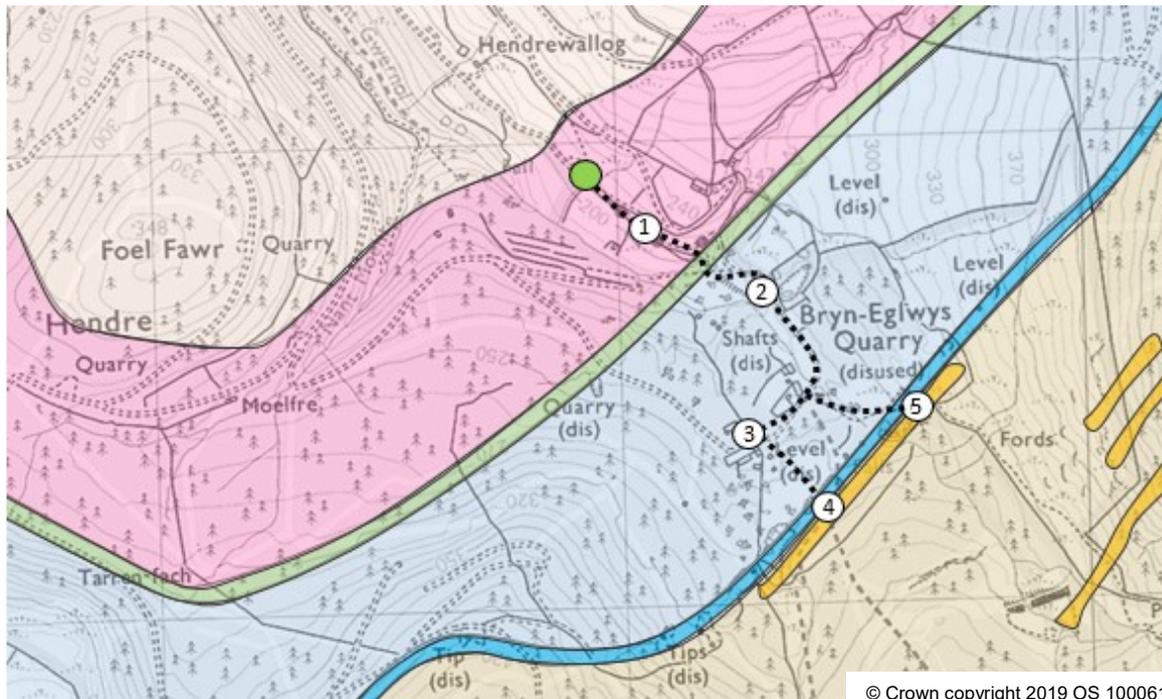


Figure 512: geological cross section of the Aberllefenni area.

Bryneglwys



2 miles: approximately 1½ hours



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- | | | | |
|---|-----------------------------|---|-----------------------|
|  | Broad Vein mudstone |  | Garnedd-wen mudstone |
|  | Nod Glas mudstone |  | Garnedd-wen sandstone |
|  | Craig Hen-gae mudstone |  | Narrow Vein mudstone |
|  | Ceiswyn mudstone, siltstone | | |

Figure 513:
Field excursion.

The objective of this excursion is to examine the relatively undeformed sequence of sedimentary formations dipping south-eastwards at approximately 30 degrees at Bryn-Eglwys quarry. Surface and underground quarrying was carried out in the Broad Vein and Narrow Vein slate beds. The quarry opened in the early 1840s, and the Tallylyn narrow gauge railway was built to transport the slate to Tywyn where it was transferred to the standard gauge railway for onward shipment. The quarry continued in production into the 1900's. Production gradually declined, until in 1946 a major collapse of the workings led to its final closure.

Start: Drive up the steep and narrow road from Abergynolwyn, then park at the forestry road junction beyond Hendrewallog [SH690059].

1: Take the level track which runs up the valley towards Bryneglwys quarry. Extensive waste tips are visible (fig.514). The area is heavily forested, both by natural regeneration of broadleaf woodland and by the planting of conifers by the Forestry Commission. Care is needed to locate the features of interest around the old quarry site.



Figure 514:
Bryneglwys quarry.



2: The path passes a large open pit excavated in the Broad Vein slate formation (fig.515). The Broad Vein Formation is a pale grey, silty mudstone of early Ashgill age. Most of the sediments show evidence of bioturbation by burrowing organisms, which suggests oxygenated conditions on a shallow sea bed. It is possible to identify occasional thin silt bands below thicker mud layers, representing the products of muddy turbidites discharging into the marine basin. The turbidite deposits were sufficiently deep to protect the basal silt layers from disruption by burrowing creatures. It is likely that quiet mud sedimentation from the sea water then resumed between the turbidite events.

3: Continue along the path to reach the area once occupied by the manager's house and quarry yard. An information point provides an audio description of the quarrying.

4: Take the path which enters the forest along the boundary fence of the conifer plantation, then climbs to a view point at the top of the waste tips.

A series of deep pits lie along the outcrop of the Narrow Vein slate, which include both opencast

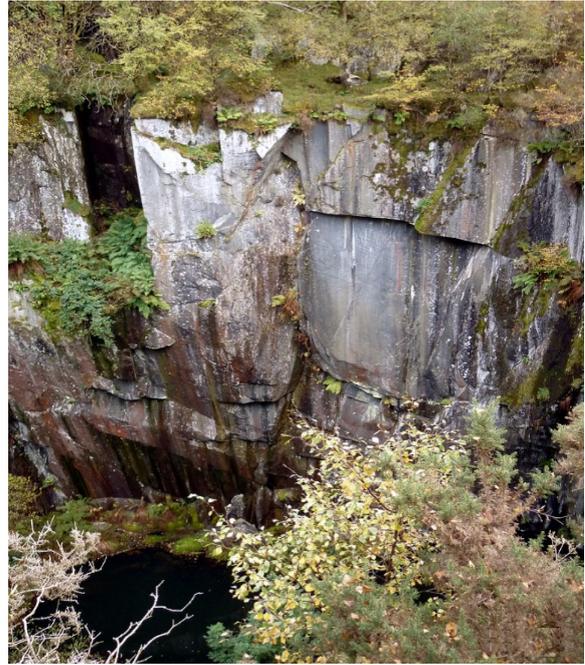


Figure 515: Open pit workings in the Broad vein slate.

workings and collapsed underground chambers. An information point provides further audio information about the work of the quarrymen.

Figure 516:

Narrow vein workings, Bryneglwys quarry.



The Narrow Vein Formation is a dark grey mudstone. It has a well developed cleavage and produces the highest quality slate in the Corris area. Thin silt layers are present (fig.517) which have not been disrupted by bioturbation. This suggests oxygen-poor conditions unsuitable for

burrowing organisms. Localised deepening of the basin may have occurred due to tectonic activity. Settling of sediment from sea water took place very slowly over many thousands of years. The dark colour is due to organic particles precipitated

Figure 517:
Narrow vein mudstone.
A thin silt band is
visible.
A layer of iron pyrite
has developed along a
bedding plane.



with the mud. Colonies of anaerobic bacteria on the sea bed produced iron sulphide which has recrystallized in places as pyrite.

Walk around to the eastern side of the workings. Here, the Narrow Vein slate is overlain by Garnedd-wen sandstone (fig.518). The coarsening of the sediment entering the Welsh basin is the result of emergence of the Midland platform and an increase in erosion rate. This was due to the global fall in sea level linked to ice age conditions at the end of the Ordovician.

5: Return down the forest path to the quarry yard. Retrace your steps to the bend in the track, where a footpath rises up the hillside to waste tips and a winding drum house where an incline carried trucks of slate down to the mill. Behind the drum house is an adit, now flooded, which leads to underground workings in the Narrow Vein slate.

Return down the path from the quarry to the parking area near Hendrewallog.

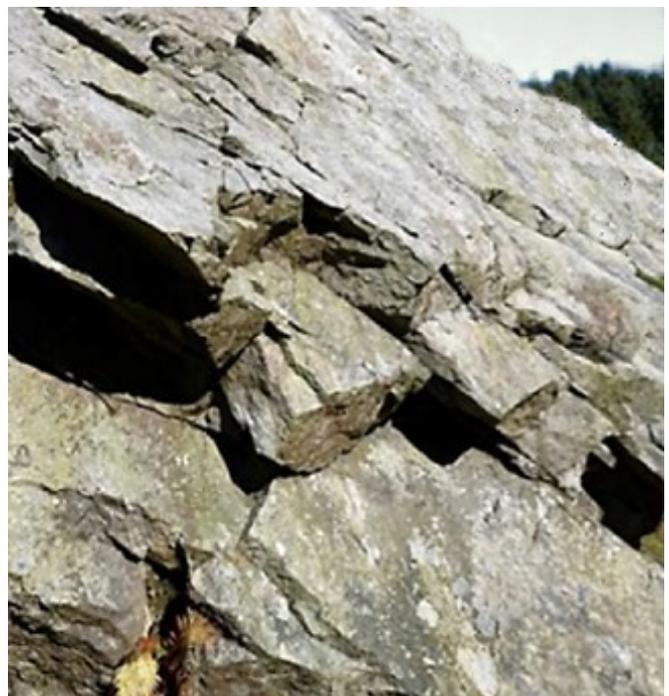
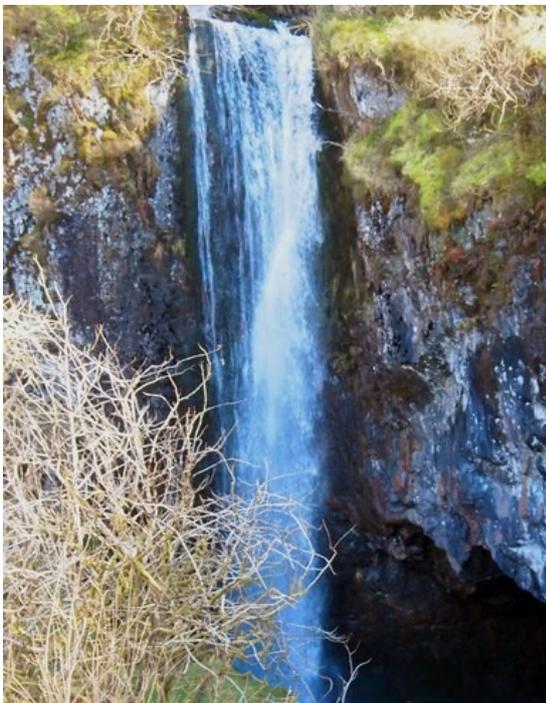
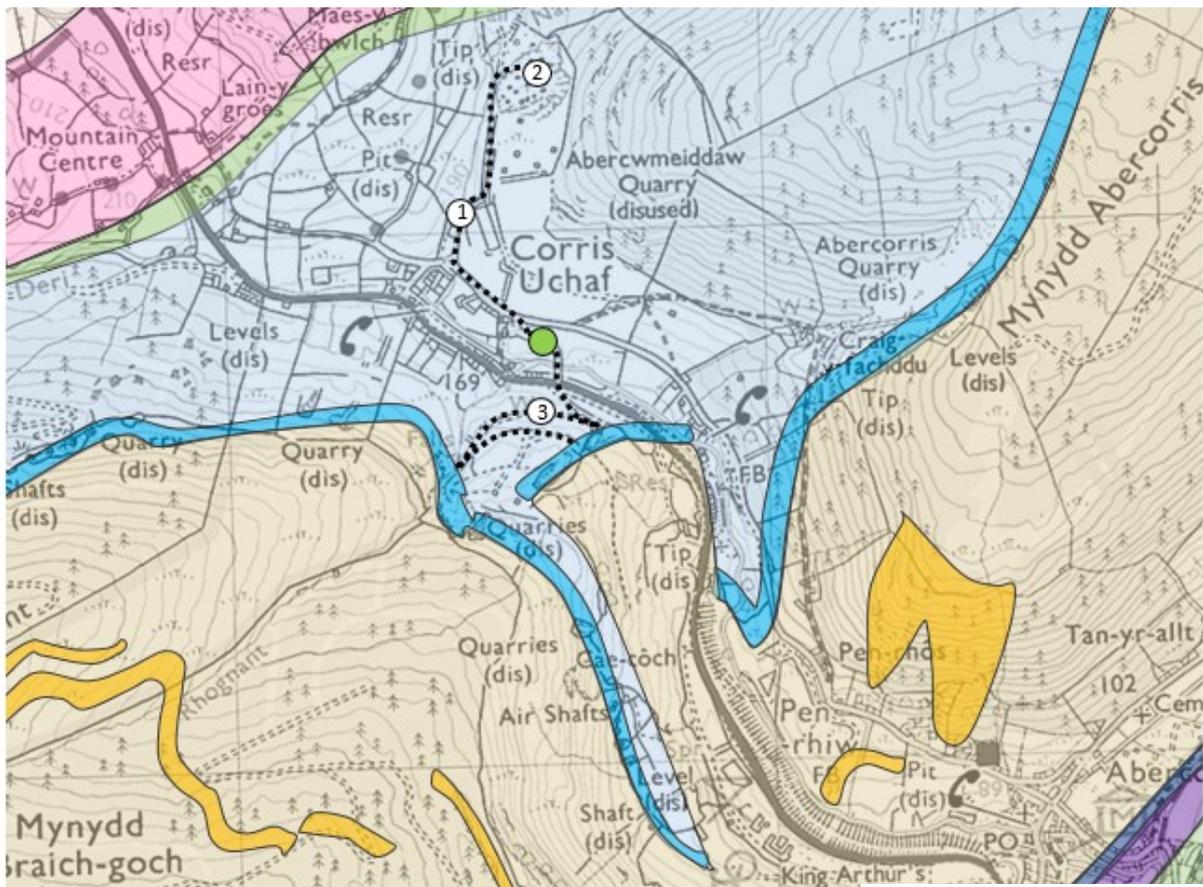


Figure 518: (left) Waterfall descending over more resistant Garnedd-wen sandstone overlying the Narrow Vein slate. (right) Garnedd-wen sandstone.

Corris



2 miles: approximately 1½ hours



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	Narrow Vein mudstone		Derwenlas mudstone
	Broad Vein mudstone		Cwmere mudstone
	Nod Glas mudstone		Llandovery Mottled Mudstone
	Craig Hen-gae mudstone		Garnedd-wen mudstone
	Ceiswyn mudstone, siltstone		Garnedd-wen sandstone

Figure 519:
Field excursion.

This excursion explores the quarries around the village of Corris in the centre of the slate producing area. The Narrow Vein has again been extensively worked, along with the Broad Vein.

The simple southeast-dipping sequence of strata seen at Bryneglwys is considerably disrupted by folding and faulting at Corris. This is due to the position of the Corris area above the southwards extension of the Rhobell crustal fracture active during Devonian earth movements. The structure is illustrated diagrammatically in fig.520.

The Acadian orogeny initially caused east-west crustal shortening in the central Wales area, probably in response to the Midland platform crustal block being compressed into the softer sedimentary infilled sequence of the Welsh basin.

An anticlinal fold developed above the Rhobell-Corris fracture zone where basement faulting could accommodate the crustal shortening.

Later vertical and transverse fault movements in the basement caused the fold structure to be fractured along its axis. The Narrow Vein outcrop in Corris valley has been split into three segments. The Braich Goch quarry worked the most westerly outcrop, whilst the Gaewern quarry worked the central segment between the faults. On the opposite side of the valley, the Abercorris quarry worked the easterly Narrow Vein outcrop. At Corris Uchaf, Abercwmiddaw quarry worked the Broad Vein slate.

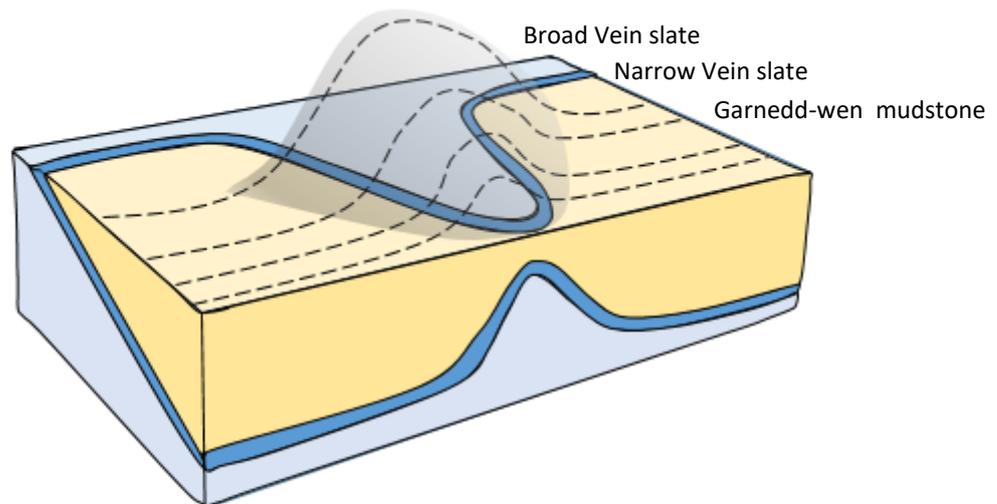
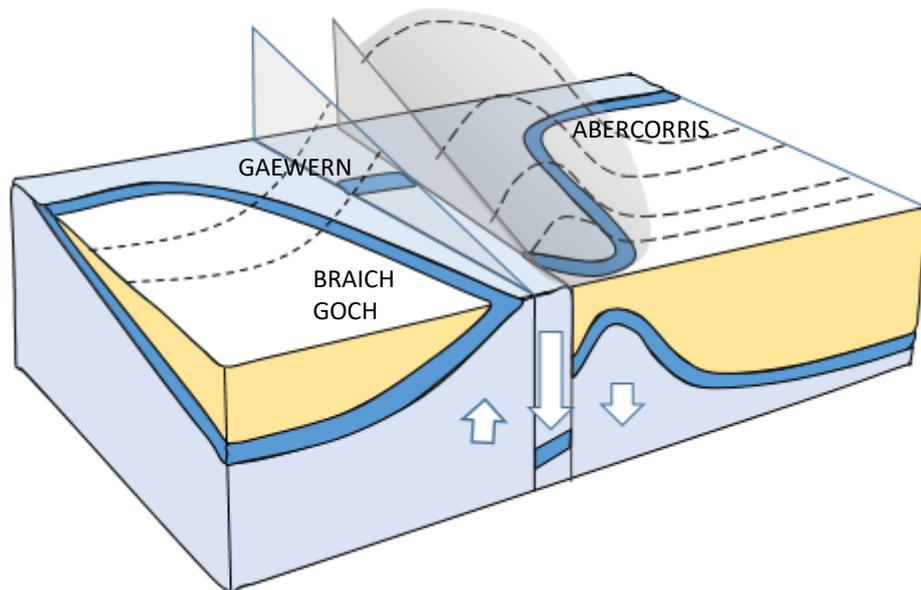


Figure 520:

(above) Initial anticlinal fold.

(below) Anticline disrupted along its axis by faulting.



Start: Turn off the main road in Corris Uchaf and park on the roadside near the river [SH746088].

1: Join the minor road on the eastern side of the river. Turn to the right away from Corris Uchaf village, then after a short distance take the gravel track which rises up the hillside to Abercwmiddaw quarry. On reaching the quarry, the track passes the remains of the mill building and steam engine house for powering the mill machinery. Beyond is a large opencast pit with working faces extending up the hillside in a series of terraces.

The quarry developed from 1850 onwards, first as surface workings and then underground. As the open pit became deeper, problems of drainage developed. These were solved by driving a tunnel from the bottom of the pit out to the hillside. This tunnel was also used to bring slate to the mill.

Finished slates were carried down an incline to the narrow gauge Corris railway in the valley below, then on to Machynlleth for transfer to the standard gauge railway.

2: Continue to the quarry opencast pit, then descend along the track to the base of the pit.

The quarry worked the Broad Vein slate. Bedding can be seen dipping at approximately 45° to the south-east. The rock is again a mixture of quietly precipitated hemipelagic mud, and mud turbidite flows with silt layers at the base.

A curious feature of the quarry is a pair of circular tunnels cut by machine. This was the site of an early Victorian experiment in tunnel boring, and the machine was later taken to Folkestone for use in an early attempt to construct a tunnel under the English Channel.

Figure 521:
Abercwmiddaw
quarry. Dip of the
bedding is indicated.



3: Return down the quarry road to Upper Corris. Take the minor road across the river bridge to reach the main road down the valley. Cross the road, then almost immediately take the track which climbs up the valley side to Gaewern quarry.

Gaewern is one of two major quarries on the western side of the valley in Corris working the Narrow Vein slate. The other quarry, Braich Goch, lies a short distance down the valley. Both began in the 1830's, initially as open quarries on the hillside before extending underground.

Production reached its peak in the 1880's, but

continued at Braich Goch until 1970. Most of the slate output from the two quarries was carried by the Corris railway.

Many surface features are visible at Gaewern, including open pits, a drum house and inclines. At the northern end of the site, a track skirts around the waste tips and reaches an old working face in the Narrow Vein where a stream now descends in a waterfall. The Narrow Vein slate formed as a dark grey mudstone under conditions of low oxygenation of the sea bed. The dark colour is the result of carbonaceous organic matter being precipitated with the mud.



Figure 522: Gaewern quarry, showing the two areas of Narrow Vein workings.

The complexity of the geological structure around Corris is clear from the pattern of the opencast workings at Gaewern. High on the hillside are a series of pits and working faces in the Narrow Vein which lie along the steeply dipping western limb of the anticline. The angle of dip is close to vertical. Lower down the hillside are outcrop workings in the Narrow Vein between the two major axial

faults of the fold structure. From Gaewern, we can look across the valley to the Abercorris quarry. A series of waste tips are visible (fig.523), although the quarry itself is largely hidden within the dense conifer plantation. It is just possible to make out the line of opencast pits along the Narrow Vein outcrop on the eastern edge of the anticline.

Figure 523:
Abercorris quarry. Positions of inclines are shown.



Return down the quarry track to the main road, then continue to the parking point.

Whilst in Corris, it is well worth visiting the quarry visitor centre where underground tours of the Braich Goch workings are provided by Corris Mine Explorers (www.corrismineexplorers.co.uk).

Braich Goch developed to become the largest and most productive of the Corris quarries, employing 250 men at its peak. Underground chambers were worked on a number of levels. An extensive area of mills and workshops existed below the mine entrance, but these were mostly removed during a reclamation and road improvement scheme after the quarry closed in the 1970's.

Underground chambers visited during the quarry tour show the Narrow Vein to be dipping steeply in the western limb of the anticlinal fold.

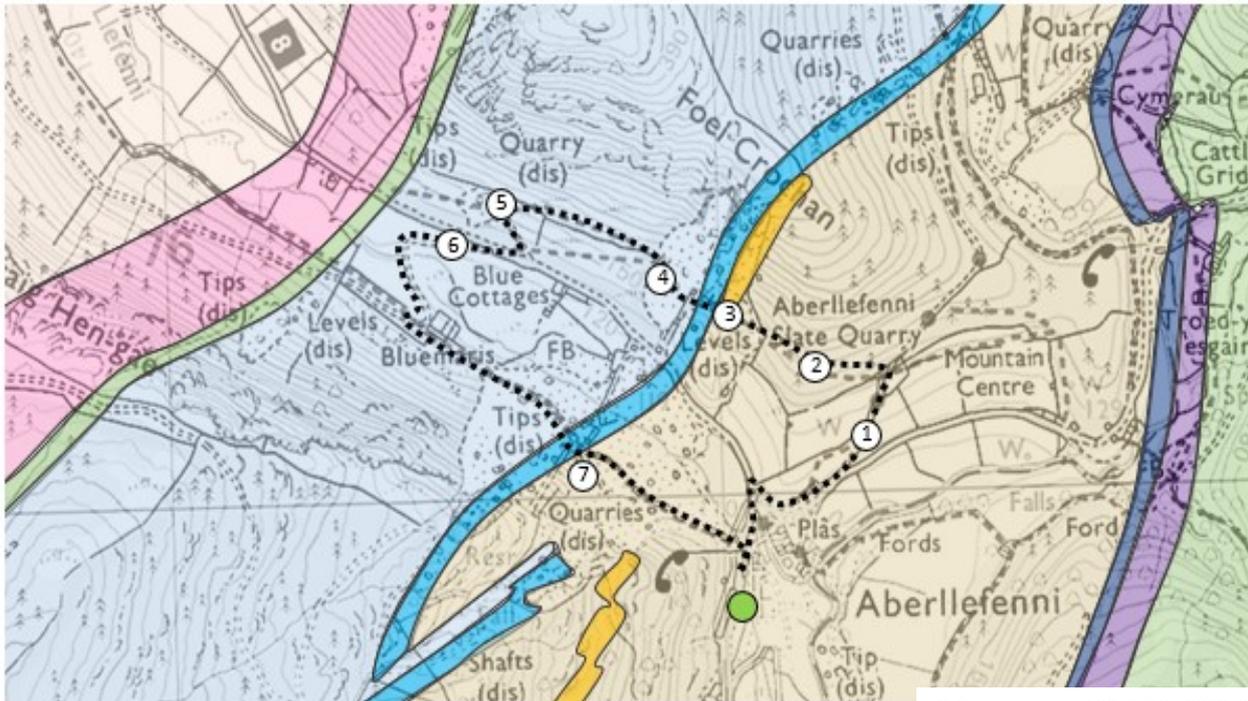
Figure 524:
Braich Goch quarry underground tour. The steep dip of the Narrow Vein is visible.
Photograph by Jon Knowles.



Aberllefenni



2 miles: approximately 2 hours



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	Narrow Vein mudstone		Derwenlas mudstone
	Broad Vein mudstone		Cwmere mudstone
	Nod Glas mudstone		Llandovery Mottled Mudstone
	Craig Hen-gae mudstone		Garnedd-wen mudstone
	Ceiswyn mudstone, siltstone		Garnedd-wen sandstone

Figure 525:
Field excursion.

In this excursion we visit Aberllefenni slate quarry, which is probably the oldest continuously working mine or quarry in Wales. The site has been producing slate, with very few interruptions, from 1500 up to the present day. The quarries reached their peak of production during Victorian times, when an extension of the Corris railway was constructed to Aberllefenni.

As in Corris, the Aberllefenni slate deposits lie on the limbs of an anticlinal fold. The geological structure at Aberllefenni is again affected by faulting, which causes repetition of the Narrow Vein outcrop on the south of the valley.

Quarries working both the Narrow Vein and Broad Vein deposits are found on the north side of the valley at Foel Crochan, and on the south side at Hen Gloddfa.

Start: Park in Aberllefenni village near the slate mill [SH770098].

1: Take the road towards Aberangell, then join the track which climbs to the left up the valley side through the woodland.

2: Join a footpath through the forestry plantation which contours around the hillside to reach Foel Crochan quarry.

3: The path emerges from the forest at the middle quarry level. Climb the incline to reach the upper level beneath the large open chamber known as the Alma Cavern. This was the earliest area of quarrying in the Narrow Vein, with slate later being extracted from underground chambers. The dip angle is about 70° at this point.

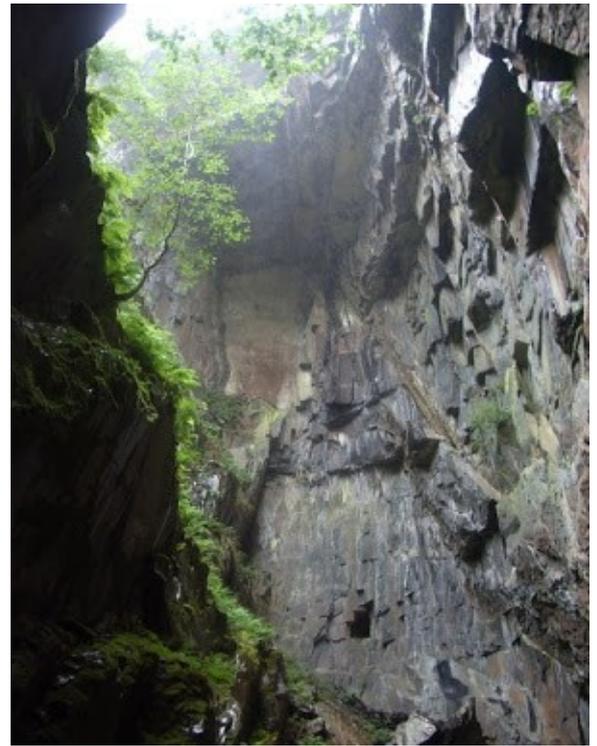
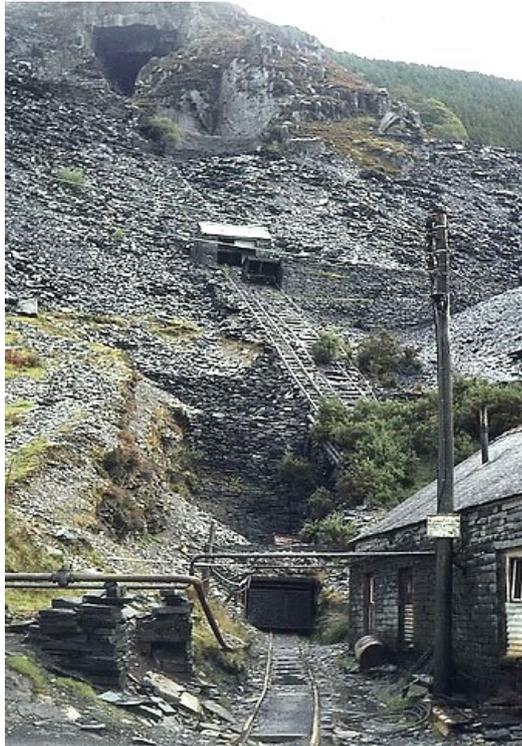
The Narrow Vein is overlain by fine grained grey sandstones of the Garnedd-wen formation, which have not developed a cleavage of the type found in the mudstone strata.

Underlying the Narrow Vein and extending westwards up the valley from the Alma Cavern is

Figure 526:

(left) Low level adit and incline to the upper workings on the Narrow Vein.

(right) The Alma Cavern.



the outcrop of the Broad Vein slate. The upper section of the Broad Vein at Aberllefenni contains significant amounts of disseminated iron pyrite which weathers to an iron oxide rusty colour. For this reason, these rocks were known by the quarrymen as the Red Vein.

4: With care, it is possible to contour around the slate tip to re-join the footpath up the valley.

5: Continue along the footpath to a quarry pit in the Broad Vein, then descend the track to Blue Cottages.

6: Take the turning to the left across the valley floor to Bluemaris.

7: Continue along the track to the Hen Gloddfa quarries. An extensive waste tip extends up the hillside, with levels linked by inclines. At the top of the valley side are two large opencast quarry faces, separated by a spur of the hillside. These represent parallel repetitions of the Narrow Vein due to faulting.

Return along the quarry track to Aberllefenni village.

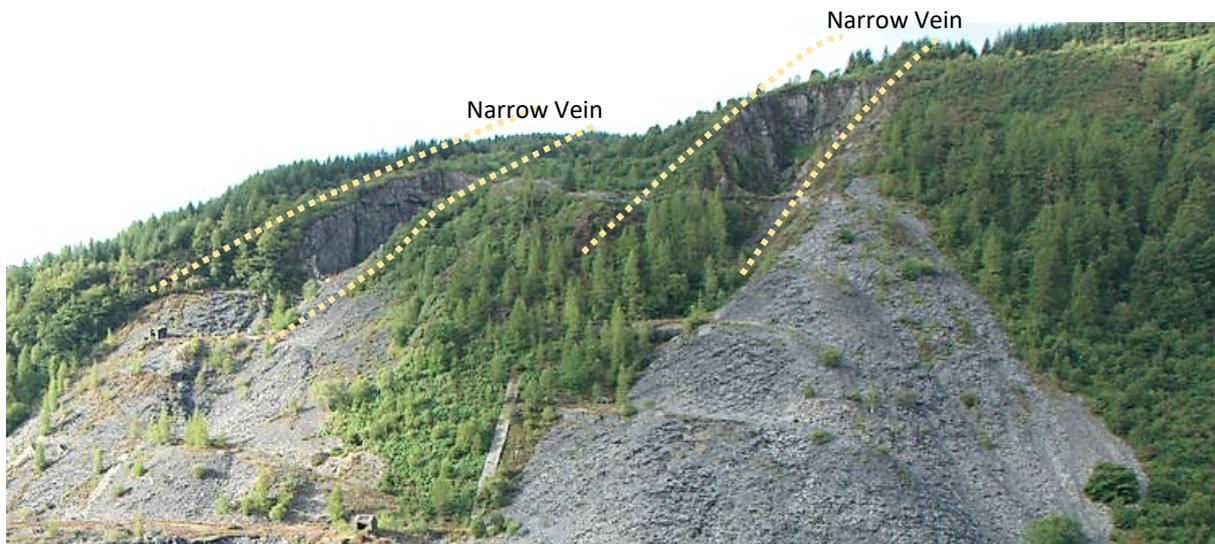


Figure 527: Hen Gloddfa quarry.