100 YEARS CPRE Campaign to Protect Rural England Shropshire

SHROPSHIRE GEOLOGICAL SOCIETY

Geology Walks through Time in Shropshire

As part of CPRE's national centenary celebrations, join us - CPRE Shropshire and the Shropshire Geological Society - for six fascinating 'walks through time' between April and September visiting important geological sites in the county of Shropshire.

Saturday 16 May, 10.30am

Walk 2: Stiperstones

This walk combines an overview of the stratigraphy of the Ordovician strata of the area with a chance to consider the mining industry – once a major feature of life in south Shropshire but now rather forgotten in an area mainly known for its rural landscapes.

Shropshire during the Ordovician (510-439 ma)

The Ordovician was a time of enormous change. The Iapetus Ocean was closing, bringing Scotland and North England closer to the south of the country. Huge volcanic fields were born, creating the thick layers of lava and ash that are found around the Lake District and North Wales[1].

Through the Ordovician, Shropshire was split in two very different regions by the Pontesford-Linley fault which runs to the south east of the Stiperstones ridge. In the early Ordovician everything east of this was land, everything to the west was sea.

1. These notes have been prepared using text from Shropshire Geological Society's website, the BGS web text covering sheet 151 (Montgomery and Shelve), the JNCC GCR web text about Ordovician rocks in Shropshire and the Geologists' Association Guide No. 27 (The Geology of South Shropshire).

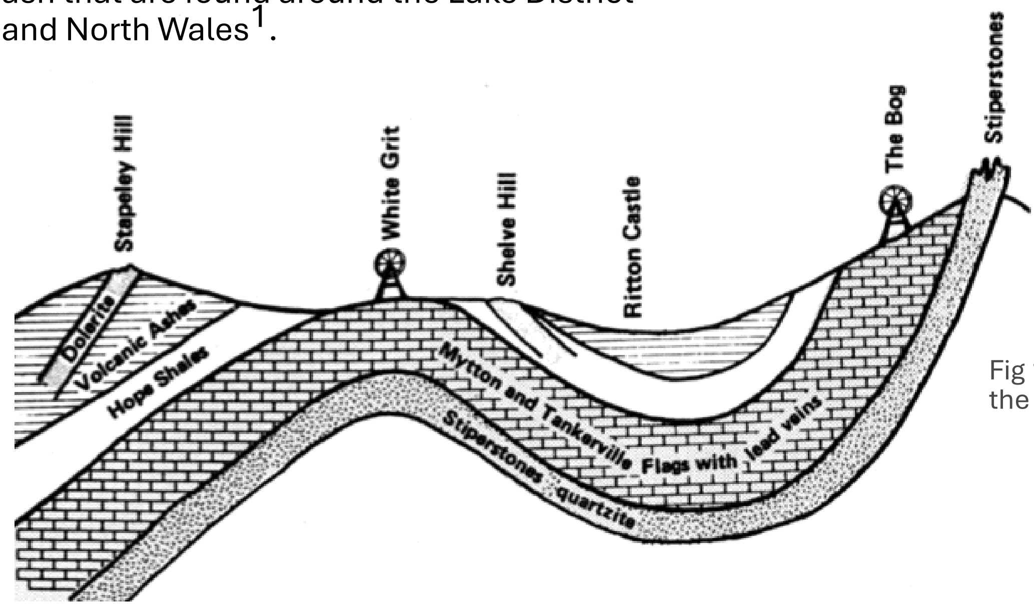

Fig 1: Diagrammatic section through the area West of the Stiperstones

- The area to the west of the Pontesford–Linley fault is peppered with volcanic rocks. The marine sediments that were building up here were punctuated by volcanic eruptions leaving interleaving layers of sea mud and volcanic ash, lava and large volcanic 'bombs', molten lumps of lava thrown out of a volcano that cool in the air before they hit the ground. There are also numerous intrusions of volcanic rock as dykes and sills.
- On the other side of the fault, things were quieter. Land was being steadily eroded through much of the early Ordovician. Sea levels rose slowly and the land became flooded.

At the end of the Ordovician sea levels fell dramatically as an unusually strong ice age gripped the planet for a million years. This locked up sea water as ice which could have stretched as far from the South Pole as 50º south of the equator. If the same thing happened today at the North Pole, the whole of Britain would be covered in ice.

The Stiperstones

The Stiperstones is an impressive ridge running NNE/SSW in the west of the county. Along the ridge are a number of dramatic exposures. These are made of a rock known as Stiperstones Quartzite. It is now an SSSI and NNR and is a popular beauty spot despite (or because of) it's rumoured connections with the Devil. It is an important landmark in Shropshire and has had a role in the industrial development of the area due to its geology – lead has been mined here since Roman times.

The tors forming the main ridge are formed of the very hard Stiperstones Quartzite with much softer shales to either side.

Stiperstones Quartzite

The Stiperstones Quartzite was probably deposited in shallow water with the conglomeratic bands possibly being laid down in a beach environment. The rock is very pure with a higher percentage of quartz than the similar, but older, Cambrian Wrekin Quartzite.

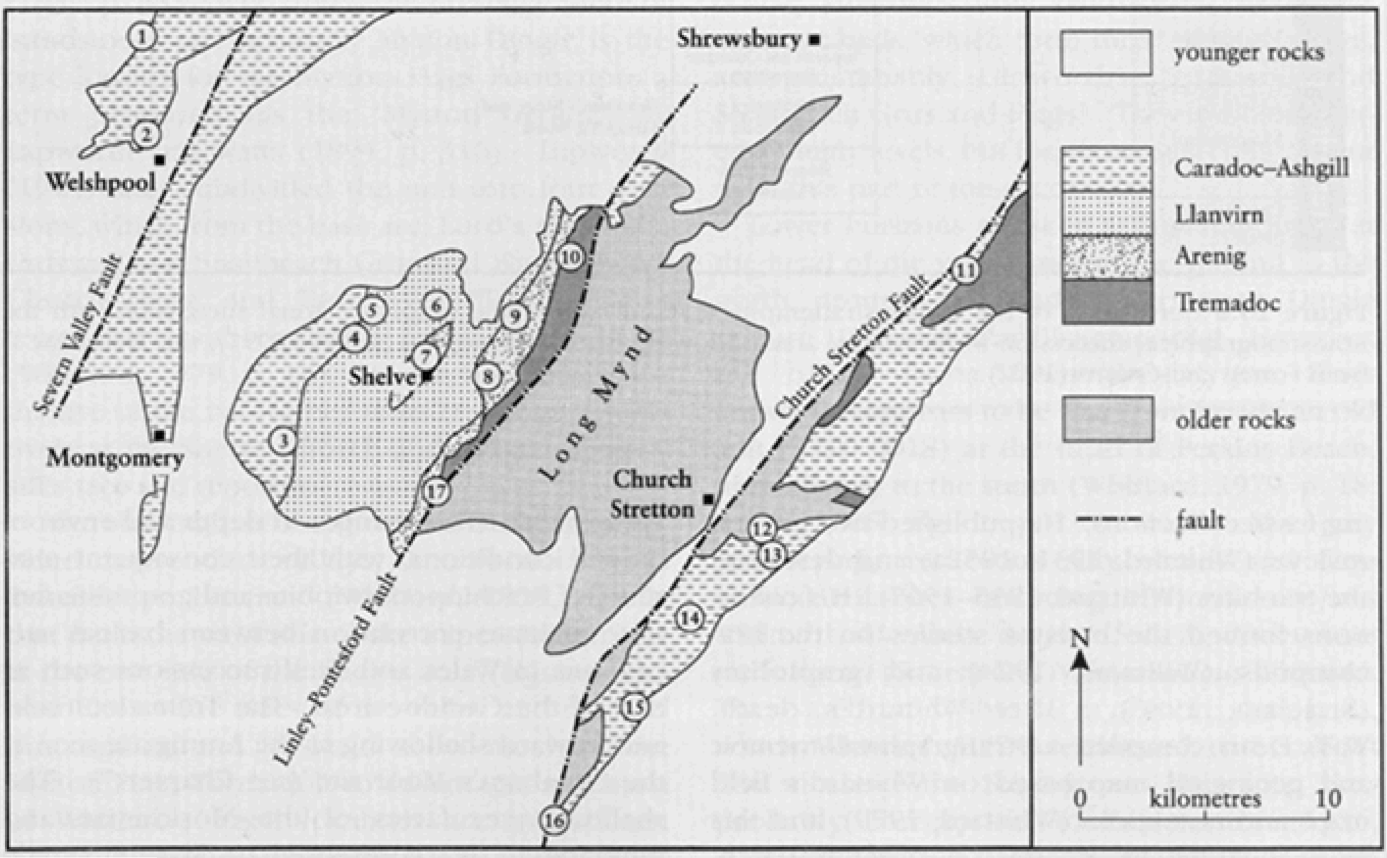

Fig 2:

Figure 10.1 Map showing the distribution of Ordovician rocks in south Shropshire and eastern central Wales, from British Geological Survey (1994c). GCR sites as follows: 1, Gwern-y-brain; 2, Trilobite Dingle; 3, Spy Wood and Aldress dingles; 4, Meadowtown; 5, Betton Dingle; 6, Hope Valley; 7, Shelve Church; 8, Bergam Quarry; 9, Mytton Dingle; 10, Granham's Moor (Tremadoc, see Chapter 7); 11, Coundmoor Brook (Harnage); 12, Hope Bowdler; 13, Soudley Quarry; 14, Marshwood; 15, Onny River; 16, Coston Farm; 17, Linley Big Wood (Tremadoc, see Chapter 7).

The texture of the rock ranges from poorly sorted, coarse conglomerate, with sub-rounded quartz pebbles of up to 1 cm in diameter, to the main blocks of the tors which are fine grained. The conglomerate pieces may contain pebbles which are of other rock types that have been incorporated into the quartzite at the time of its formation. These include clasts of purple Longmyndian sandstone. The formation is massive to well bedded with parallel, wavy and lenticular beds typically 0.10 to 0.50 m thick and exceptionally up to 1.5 m thick. Wave amplitude is generally 0.10 m. Faint cross-lamination is outlined by darker grey partings in some exposures.

The full sequence is best seen in the exposures at Linley Big Wood to the south west and Granham's Moor Quarry to the north east (Figure 1) where the quartzites rest directly on mudstones with fine-grained sandstones and siltstones (Shineton Shale). Towards the top of the sequence the bedding is thinner and interbeds of dark grey siltstone are common, creating a passage into the Mytton Flags Formation.

In many tors the steeply dipping beds of the quartzite can easily be made out. There are also two sets of joints. One set run at 90° to the bedding and the second set run 90° to the first set.

Along the ridge there are piles of boulder scree in which loose pieces of quartzite of all textures can be found. It is therefore unnecessary to hammer at any of the rock faces if visiting this site. Quartz veins can be found in many of the pieces some of which show well formed, if small, crystals.

Bioturbation is a common feature of the formation. Vertical burrows, up to 100 mm long and 25 mm wide, have been reported at certain horizons. Many are U-shaped burrows of Diplocraterion and trails of Cruziana, filled with sand coarser than the host rock. Such burrows indicate shallow water deposition. Apart from a few inarticulate brachiopods, and possible algal and sponge remains, the only fossil found in the formation is the trilobite Neseuretus grandior that characterised Gondwanan, shallow marine, arenaceous deposits of Arenig age.

The Shineton Shale

The underlying Shineton Shale was deposited as marine mud with occasional incursions of fine sand. Unusually uniform conditions covered a wide area during this epoch and great thicknesses of sediment (>900m) accumulated in a shelf-sea environment, which supported faunas of dendroid graptolites and inarticulate brachiopods and trilobites. The lowest parts exposed are graptolitic dark grey mudstones and siltstones; the middle part consists of grey and greenish grey blocky siltstones and shales with layers of micaceous laminated siltstone. The topmost 150 to 200 m are lithologically more diverse and more arenaceous. They include blocky laminated grey siltstones and shales, beds of sandstone, green-grey laminated siltstones and mudstones and at the very top up to 4 m of dark grey mudstone with flaggy, micaceous siltstone layers.

Burrows commonly disturb the silt laminae, especially in the upper portion where there is close lithological similarity to the Mytton Flags. Within the district, the junction between Arenig and Tremadoc strata shows no indication of an angular unconformity. Thus deposition may have been continuous, but the earliest Arenig sandstones are interpreted as nearshore deposits and brief emergence is therefore a possibility at this time.

The Mytton Flags

The slopes to the west of the tors are made up of the steeply dipping, softer rocks that were deposited on top of the quartzite. The Mytton Flags (and subsequent Hope Shale) attest to a deepening marine environment with detrital sources becoming more distant. The Mytton Flag sequence is about 1000 m thick,

The deposits were mainly of fine grain size; silt with thin, cleaner, strongly burrowed sandy beds. No massive sand bodies have been identified nor has storm-wave disturbance; channel-fill deposits likewise appear to be absent. This evidence suggests a low-energy, yet oxygenated, shelf sea. Atmospheric storms were mild or of small fetch, so that storm wave-base was shallow and storm currents transported only silt and fine sand. The transgressive sea probably flooded a

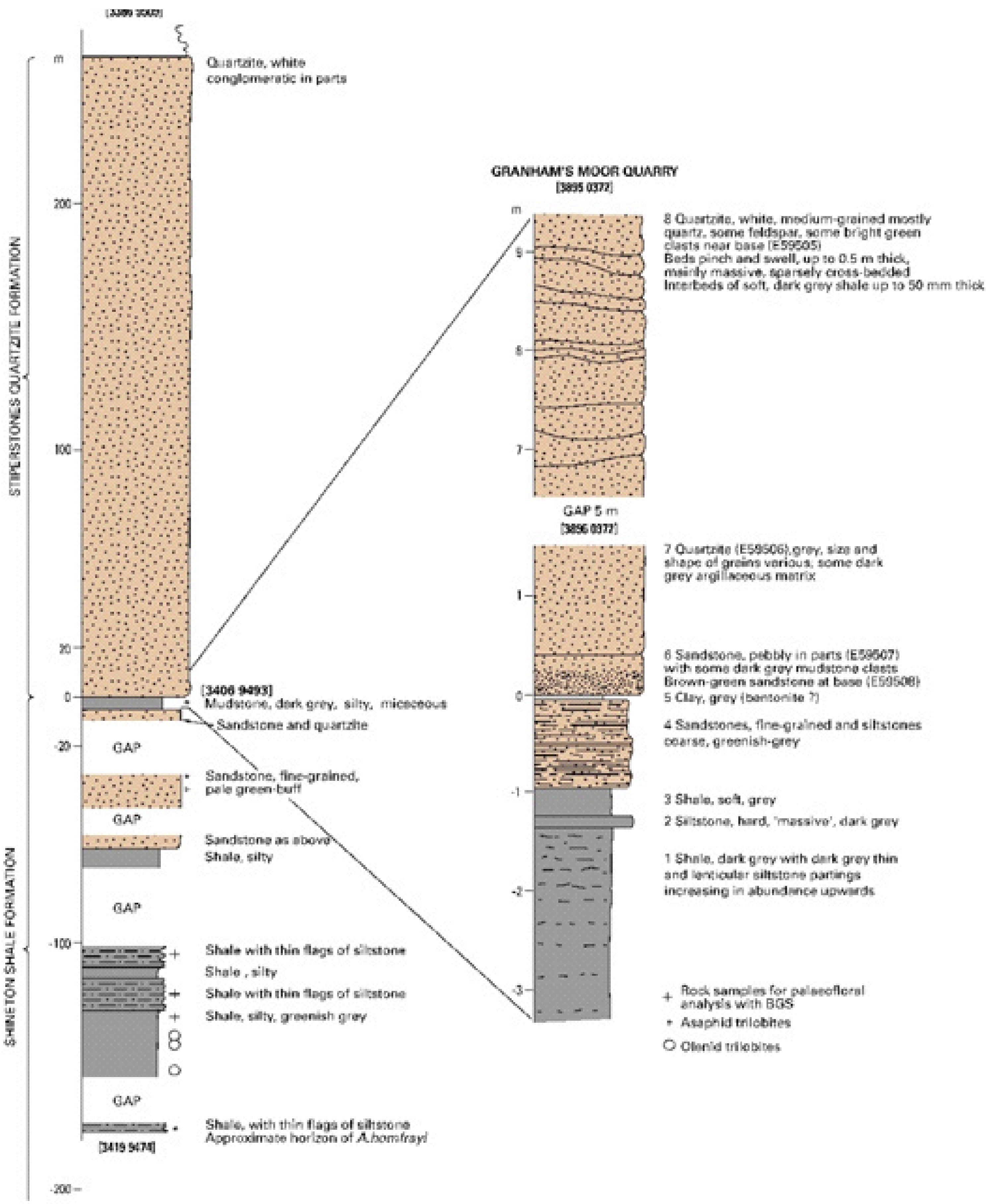

Fig 3: Stratigraphic sequence through Stiperstones Quartzite (recorded by Dr A W A Rushton, 1987) and Granham's Moor (Figure 5 from BGS text on Sheet 151)

subdued terrain which provided little coarse detritus; the position of the shoreline is not known.

The numerous fossils in the Mytton Flags show that the environment of deposition developed from shallow water sediments with trilobites and shallow water brachiopods to a deeper water environment in which there are other trilobites and where graptolites were much more common. The beds are ubiquitously burrowed so that the pale laminae are disturbed, commonly into subhorizontal and near-vertical pods (burrow fill); in places intensive bioturbation has homogenised the sediments.

Intrusive volcanics

The intrusive rocks of the Shelve area are mainly dolerites, with the exceptions of a picrite dyke at Cwm Mawr and an andesite dyke at Lower Wood and are thought to be of Caradoc age (458-448 ma). The intrusions take the form mainly of sills, but a small dyke swarm occurs in the north between Estell and Lower Wood. The largest intrusion in the district is that at Corndon Hill.

Mining

On the slopes of the Stiperstones there was once a thriving mining industry, particularly around Snailbeach. This was based around a series of veins that occur in some of the harder layers (mostly Mytton Flags) of rocks in this area. These veins are associated with the latest stage of igneous activity (Devonian) that occurred in this area causing hydrothermal convection through the joints of the overlying strata. As the water running through these cracks cooled minerals carried in solution would have been deposited. Different minerals are deposited at different temperatures and this results in mineral zoning.

Mineralisation is mainly located along two sets of faults trending approximately north-west and east-north-east, and the main ore bodies are commonly located at fault intersections. In the Stiperstones area the veins lie within two of these zones and relate to the three main minerals mined in the area. The lower zone contains lead and zinc whilst the upper (deposited at a lower temperature) contains barite. In general the lead and zinc were found in the central area of the mining district whereas the barite was found in the far west and to the east in Longmyndian rocks.

The lead was mainly found in the form of lead sulphide (PbS) known as galena. Galena is a distinctive metallic grey, cubic crystal and is the most common lead ore. Some of this lead ore also contained silver which the Romans, and later miners, extracted. Other minerals that can be found in these veins include, iron and copper pyrite, barium carbonate, lead carbonate, and zinc carbonate. There are places that can be (see map below) where it is possible to collect mineral specimens from the old spoil tips.

Mining activity declined rapidly in the early part of the 20th century, though barytes production continued until the 1940s.

Quaternary

The Stiperstones ridge has been shaped most recently by the action of ice and frost shattering (freeze thaw) on the rock during the last ice age. This has created the tors that line the top of the ridge that make this site so recognizable from the surrounding countryside.

Other evidence of periglacial activity here is demonstrated by the development of stone stripes, particularly on either side of the ridge between Cranberry Rock. The streams of boulders apparently flowing down the slope are ‘Stone Runs’, the result of solifluction. This is a process that was active during the last Ice Age when the groundwater was frozen and just the top few metres melted during the brief summer months. The resulting waterlogged ground slowly moved downhill, easily transporting blocks of rock fallen from the tors as it did so.

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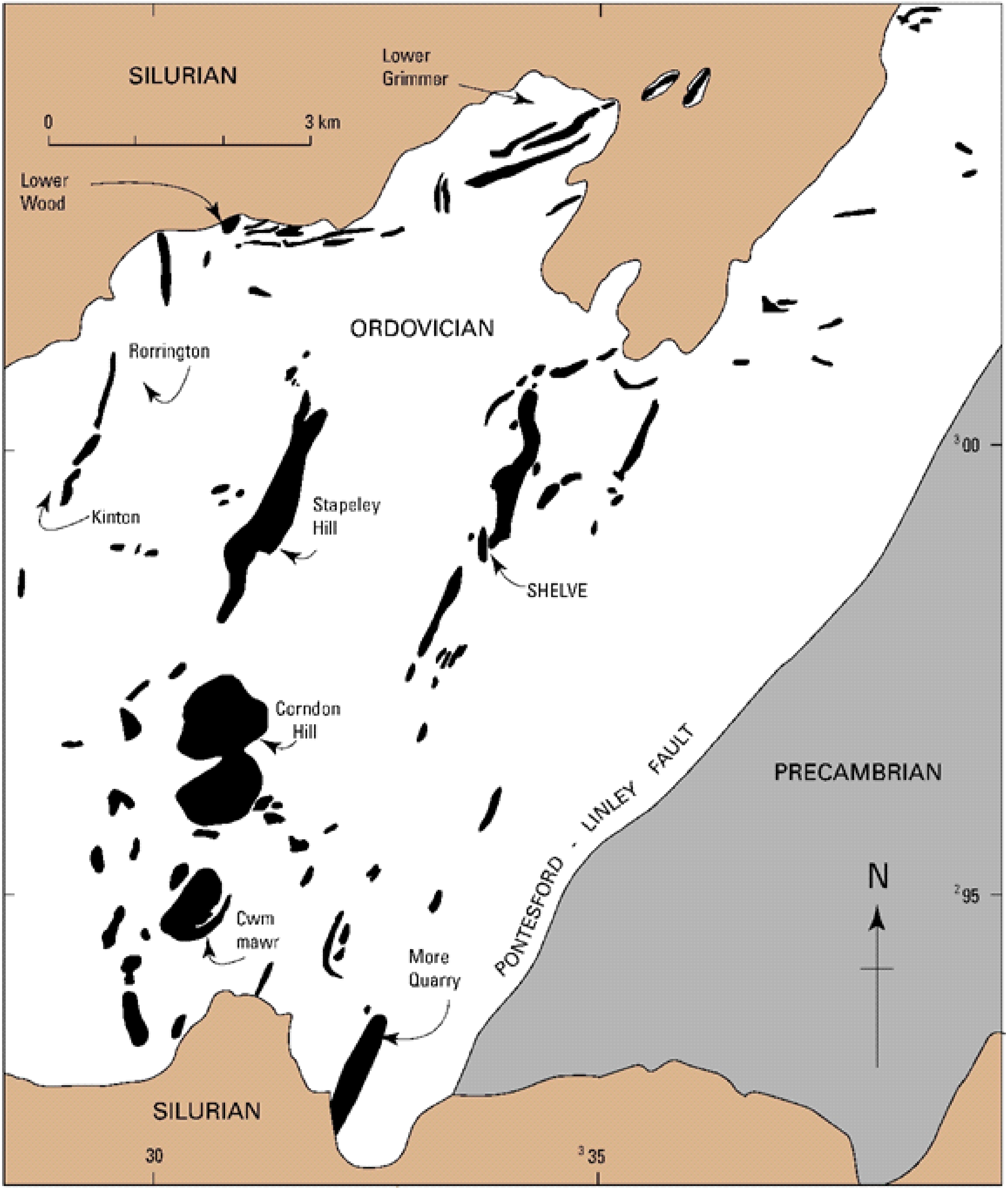

Fig 4: Intrusive rocks of the Montgomery and Shelve areas (Figure 32 from BGS text on Sheet 151)

Walk Detail

We will start the walk at the car park for The Bog Mine and walk up the field to the south east to the coll. From there we will walk north eastwards along the ridge to Cranberry Rock (look out for bedding and stone runs) and then to Manstone Rock examining the outcrops as we go.

We will then return by the same route and follow the Shropshire Geological Society trail around The remains of The Bog mine (see Figure 4):

1. The Bog School (visitor centre) Look up above the front door and you will see two types of stone. The dark blue-black slabby rock is the Mytton Flags. The other is a patch of Stiperstones Quartzite, the white crystalline quartz rock. The date (1830) suggests this may have been a chapel before it became a school.

2. Walk around the school playground, looking at the other three walls of the building. These are made out of the very hard Stiperstones Quartzite which can be used only in random blocks. This rock was the sand of an ancient beach about 500 million years ago, as the sea in an ocean to the west rose gradually over a continent to the east. There are also information displays to read in the playground.

3. The rough ground was the area where the ore was processed: crushed and separated from the waste minerals of quartz and calcite. This area is roughly in line with the Bog Vein. When first spotted, possibly in Roman times, the vein probably came to the surface as an upstanding feature. Patches of lichens, thinly covering the gravelly ground, are often the only plants as little else can tolerate the levels of lead and zinc in the soil.

4. The prominent embankment was the bed of a tramway. I t was a late feature of the site, built in 1916 to the Ramsden Shaft from which barytes was being mined, after lead mining had ceased. An area with trees growing in waterlogged ground was a reservoir needed to provide water for processing.

5. Note the remnants of the reservoir on your left. On the right is the old Miners Arms; now a private house.

6. In the car park area are information boards about the history, mining and wildlife of the site. T hey are on the foundation walls of the old Miners Institute. This in turn had been part of the site of the original Engine Shaft, the capped depression of which is still visible.

7. In 1902 you would have passed the buildings shown on this old postcard: cottages and workshops at the heart of the Bog Mine.

8. The old Powder Magazine is, as usual, well hidden in case of an explosion.

9. The Somme Tunnel was built in 1916 (the year of the battle of the Somme) in an unsuccessful search for barytes. It is gated to protect it as a bat roost.

10. another small pond, again built to supply processing water to the works and now a valuable wildlife habitat

11. Cow House. Along with the quartzite and flags seen earlier, the walls of this building used an extremely fossil-rich, hard sandstone quarried from a very small outcrop over the fields. Look closely and you will see the moulds of shells and corals from which the original calcite skeletons have been dissolved away.

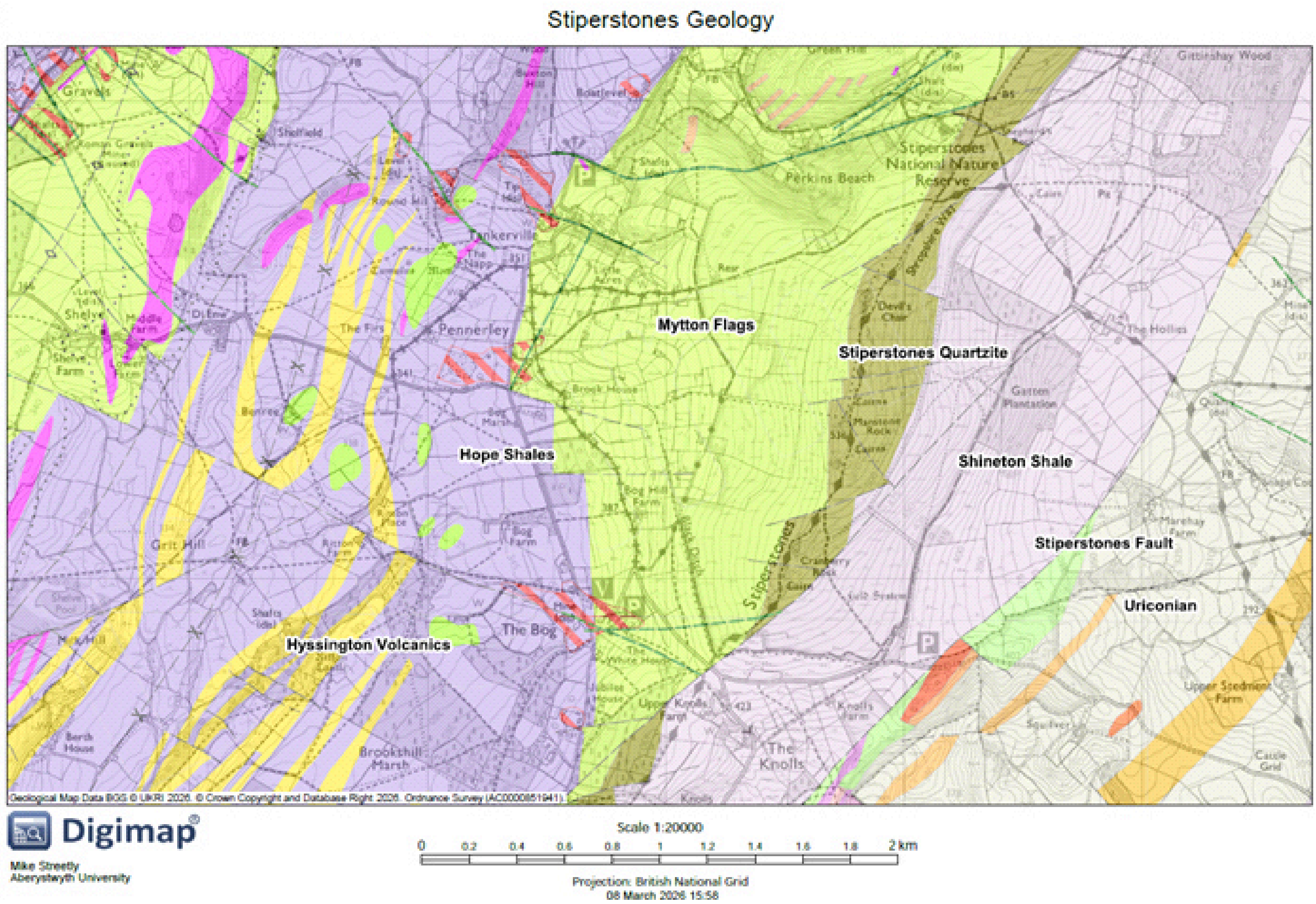

Fig 5: Geology of the area around The Bog

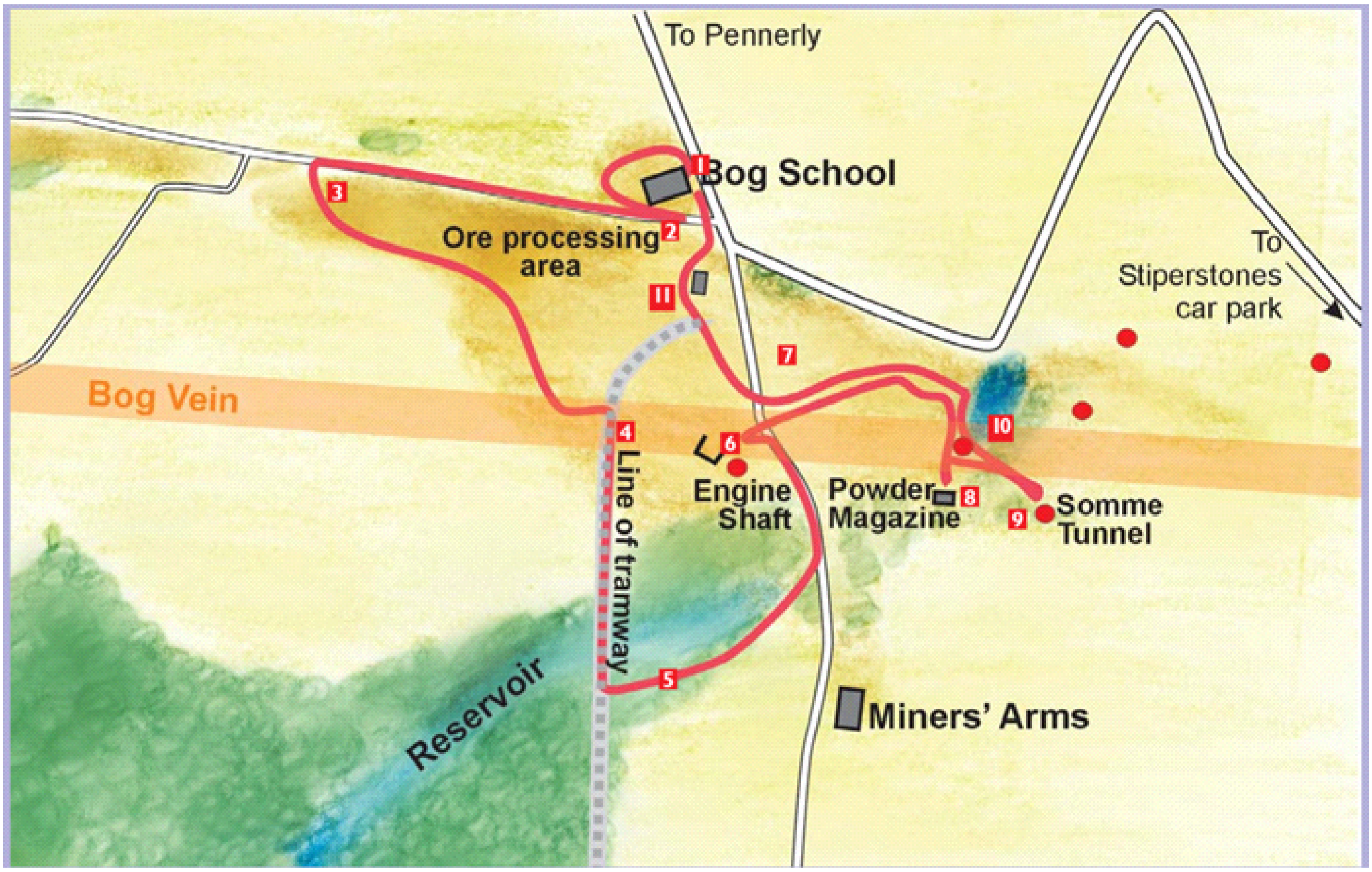

Fig 6: Geological trail around The Bog Mine