REVEALING THE GEOLOGY OF THE LICKEY HILLS

The Continuing Importance of the Amateur Geologist

Alan Richardson

WRG Geol Soc 12 November 2024

Generations of academics, students and professional geologists have studied UK geology using a wide array of technical resources.

Is there anything the amateur can add to our body of knowledge with just handlens and hammer?

GEOCONSERVATION GROUPS

The natural home of the amateur geologist?

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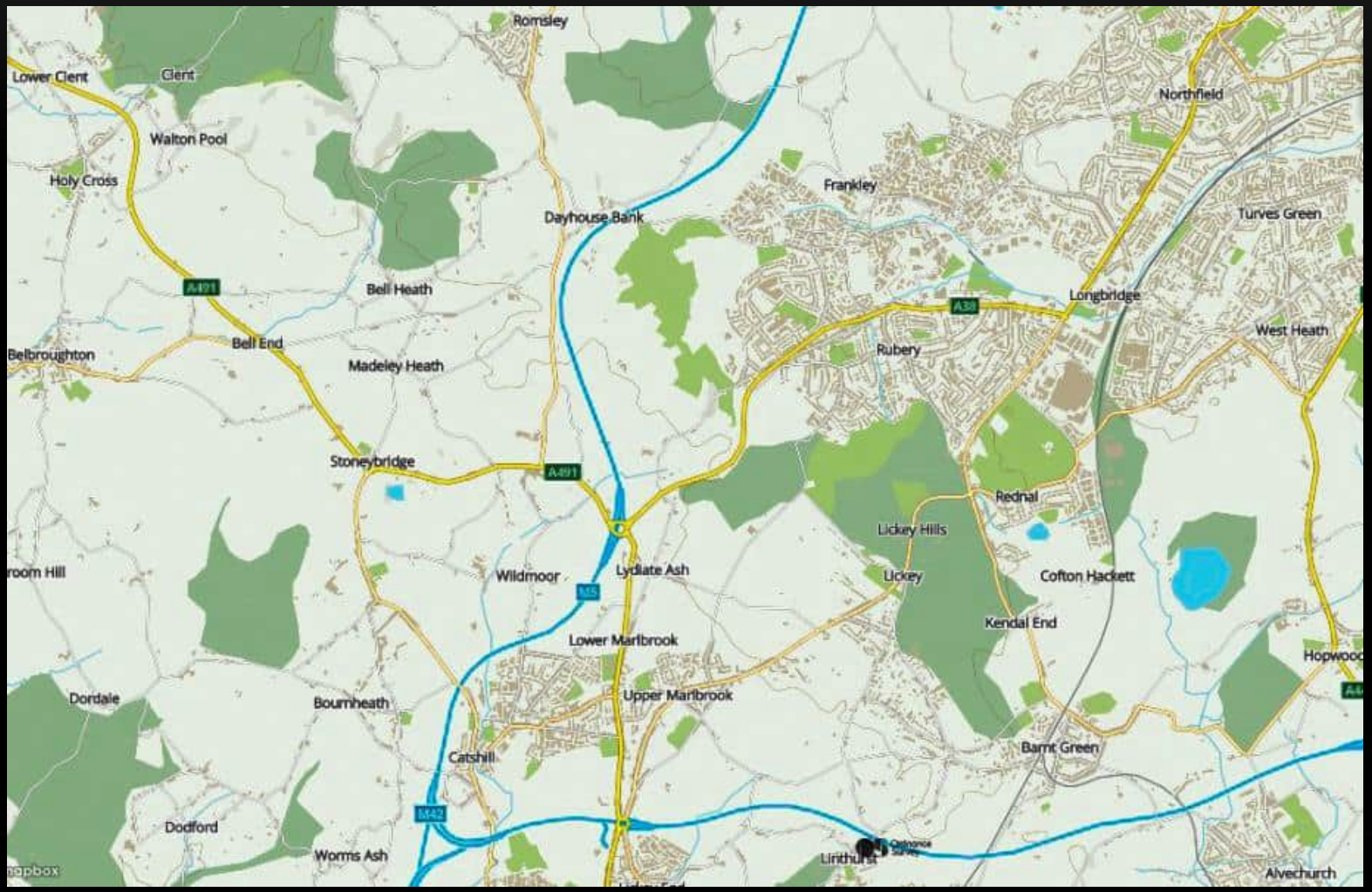
The natural home of the amateur geologist?

The Lickey Hills Geo-Champions

One of several local 'community conservation champions' groups established in 2008 under the auspices of the Herefordshire & Worcestershire Earth Heritage Trust. Together, they cover 19 locations across the two counties.

THE LICKEY HILLS COUNTRY PARK




The Lickey Hills
Google Earth
Image © 2022 Maxar Technologies
700 m
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The Solid Geology © BGS

THE LICKEY RIDGE SITES

Leach Heath Quarry

CURRENT LICKEY RIDGE SITES

- 8 Quarries:
  - Warren Lane (LGS)
  - Kendal End (LGS)
  - Barnt Green Road (LGS)
  - Rose Hill (x3) (LGS)
  - Eachway Lane (Incorporated into Rednal Hill SINC)
  - Leach Green Lane (LNR but inaccessible)
  - Leach Heath Quarry (inaccessible)
  - Holly Hill (overgrown – no exposure)
- Plus the Rubery A38 Road Cutting (LNR), the summits of Bilberry Hill (LGS) & Rednal Hill (Incorporated into Rednal Hill SINC), & Kendal End Farm (RIGS).


The Lickey Hills
Rubery Hill
Rubery Cutting &
Leach Green Quarry
Eachway Lane
Rednal Hill
Bilberry Hill
Rose Hill Quarry
Visitor Centre
Warren Lane Quarry
Barnt Green Road Quarry
Kendal End Quarry
Kendal End Farm
Google Earth
Image © 2022 Maxar Technologies
700 m

SKETCH OF THE GEOLOGY OF THE BIRMINGHAM DISTRICT. WITH SPECIAL REFERENCE TO THE LONG EXCURSION OF 1898. BY PROFESSOR C. LAPWORTH, LL.D., F.R.S.

CAMBRIAN OF THE LOWER LICKEY HILLS.

The core of the long wedge-like range of the Lower Lickey Hills, extending from the neighbourhood of Barnt Green to the railway station of Rubery, about two miles to the north -eastward, is formed **of a thick mass of quartzite**, which rises in one locality (Coston Hill) to a height of more than 800 feet above the level of the sea**. This Quartzite, which is very similar in its general characters to the Hartshill Quartzite of Nuneaton**, is laid bare in several natural and artificial sections.

The best, natural section is afforded by the transverse hollow at Rednal, where the Lower Lickey ridge is cut through by the little stream of the Arrow. The most conspicuous artificial section is seen at Rubery station, where the quartzite is at present being excavated for use at the Frankley reservoir, now in course of construction for the Birmingham Water Supply. This Lickey Quartzite has also long been utilised as road metal, and is cut into by many quarries often of great size, as at Bilberry Hill, Rubery village, and elsewhere. Unlike the Hartshill Quartzite of Nuneaton**, this Lickey Quartzite is much folded, jointed, and shattered. Neither the base nor the summit of the formation is exposed, and the disconnected sections do not afford a sufficiency of evidence to enable us to construct a complete ascending succession.**

BGS REDDITCH MEMOIR 1991

Lickey Quartzite 485-444Ma*

The Lickey Quartzite crops out in the north-north-west trending inlier of the Lickey Hills…between Kendal End [001 746] and Holly Hill [991 784**]. It is a hard, brittle, jointed and very shattered rock…** The inlier seems to be fault bounded on all sides, except **at Rubery where the Lickey Quartzite is overlain unconformably by the [Llandovery] Rubery Sandstone or the [Upper Carboniferous] Halesowen Formation. Elsewhere, its stratigraphical relationships are unclear….**

Tuffaceous material occurs most commonly in what are probably the oldest beds exposed, and **there may be an upwards passage from the [Barnt Green Volcanic Formation 485-478 Ma*].**

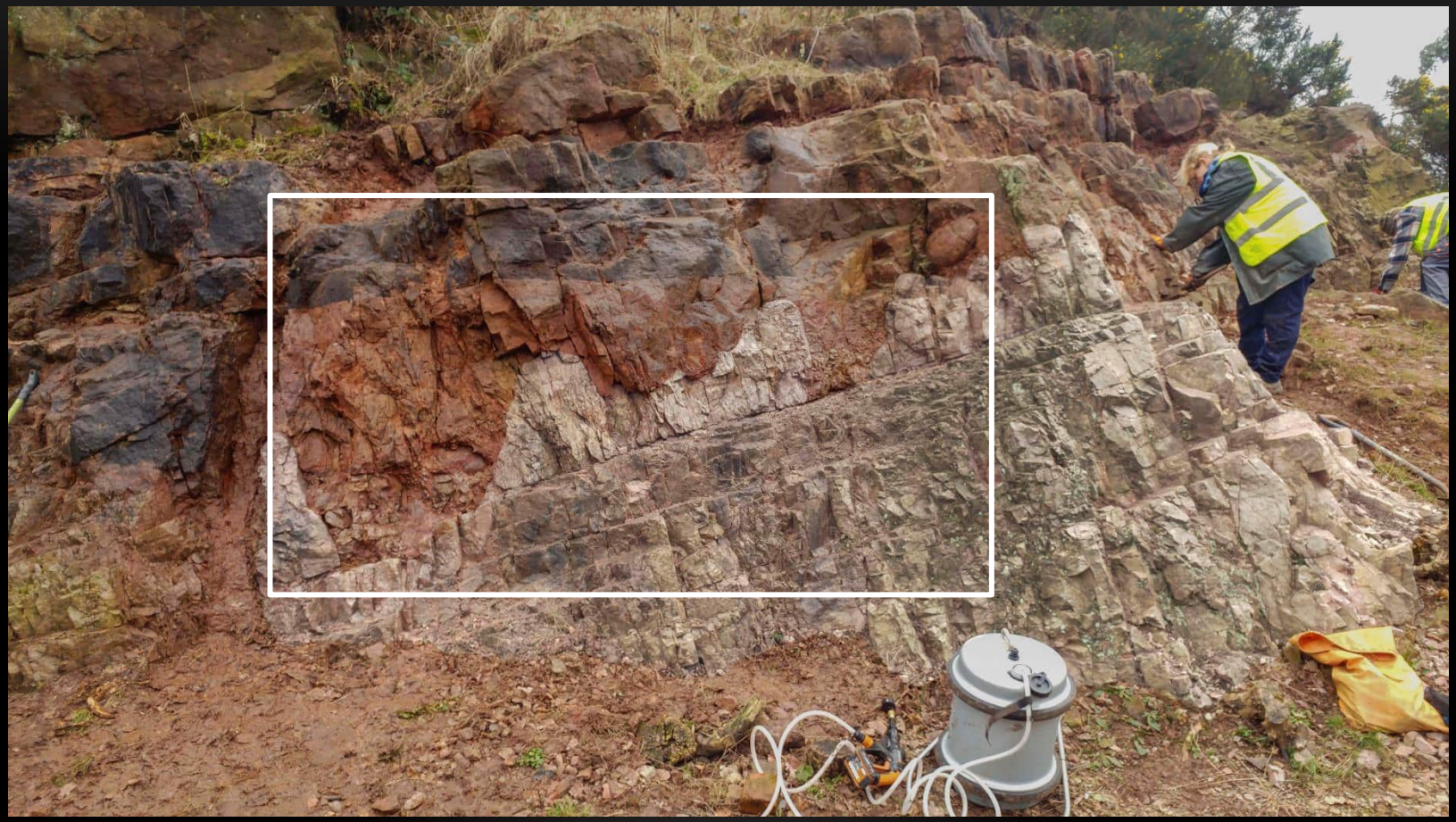
Ascending the sequence, the Lickey Quartzite becomes paler and incorporates less tuffaceous material.


The Lickey Hills
Rubery Cutting &
Leach Green Quarry
Google Earth
Image © 2022 Maxar Technologies
700 m

THE RUBERY ROAD CUTTING

THE RUBERY ROAD CUTTING

THE RUBERY ROAD CUTTING



THE RUBERY ROAD CUTTING

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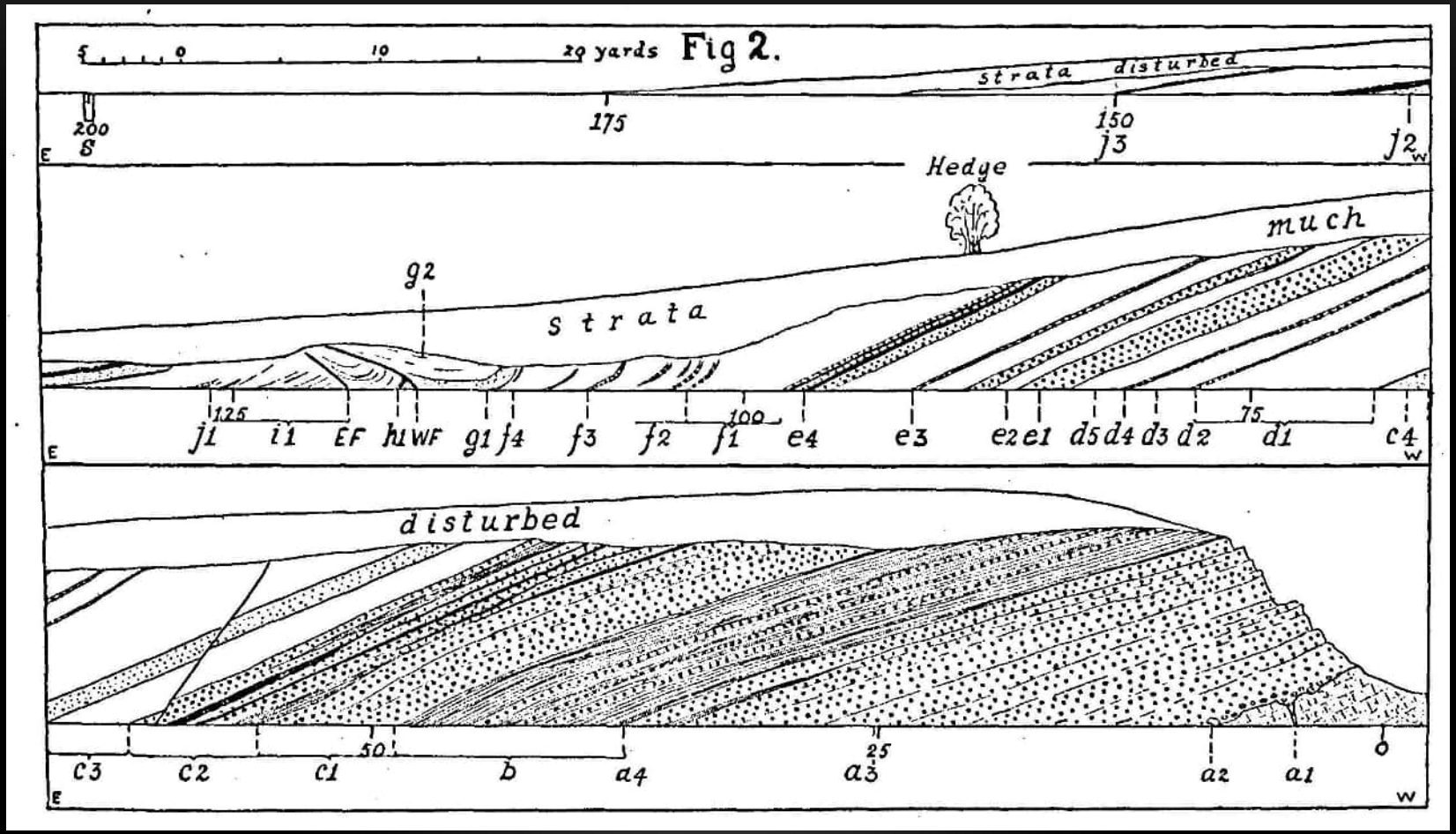
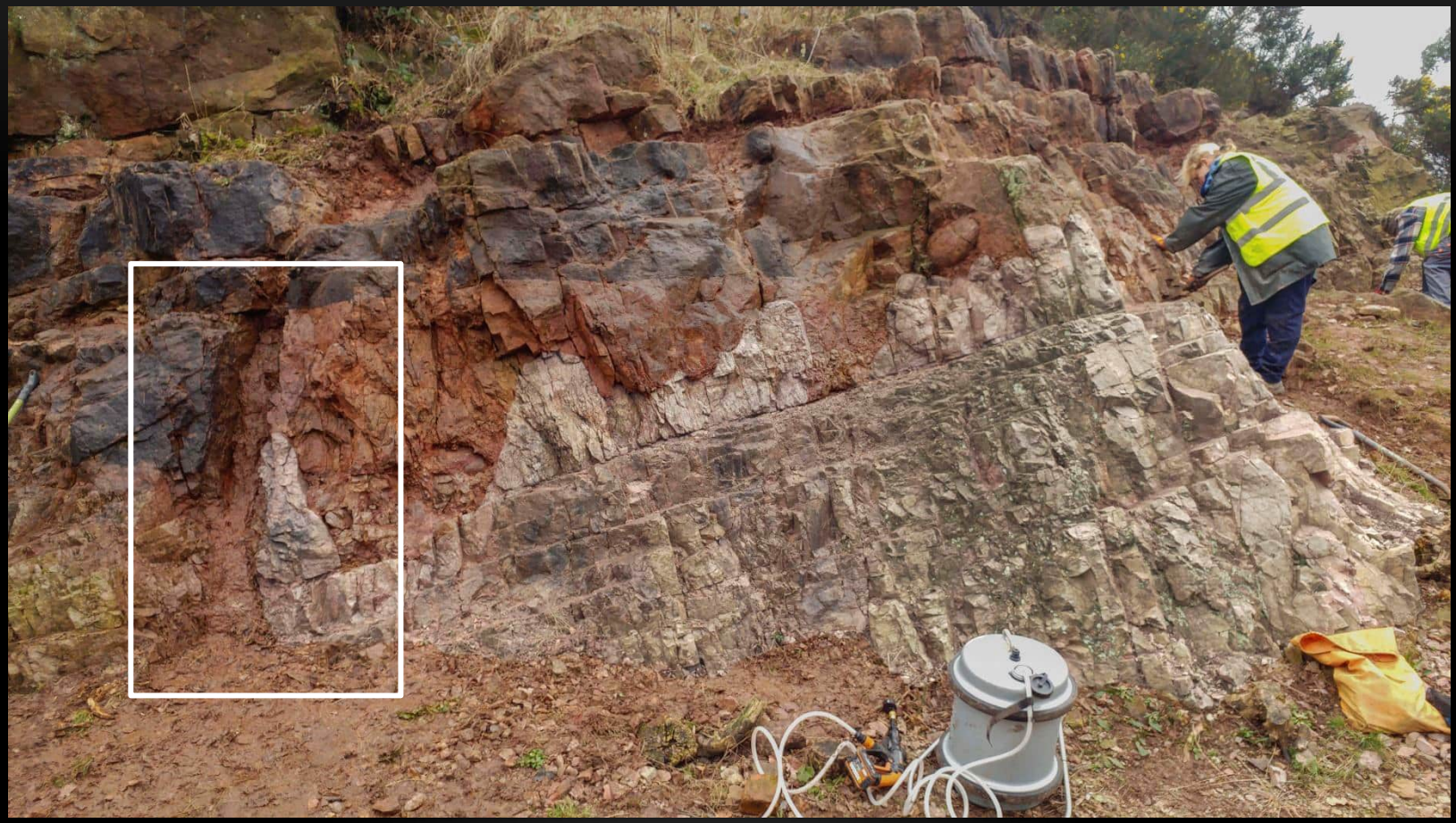


The Upper Llandovery Series of Rubery: Leonard J Wills, MA, PhD, FGS - 1925

THE RUBERY ROAD CUTTING



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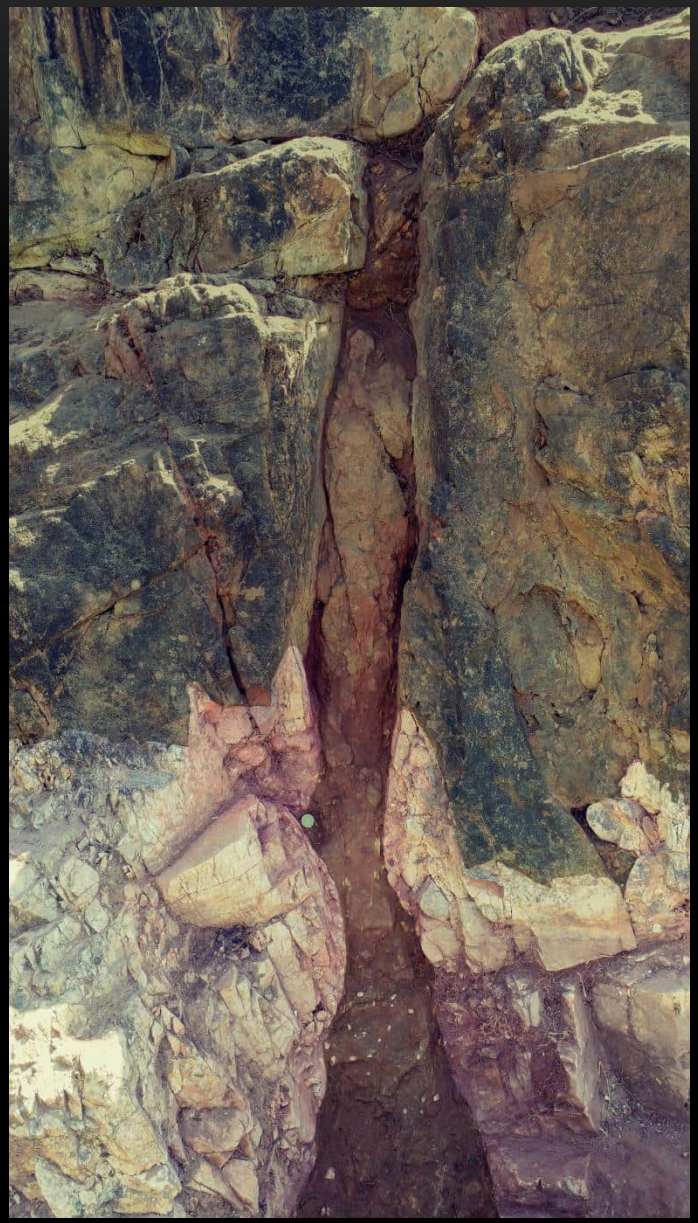
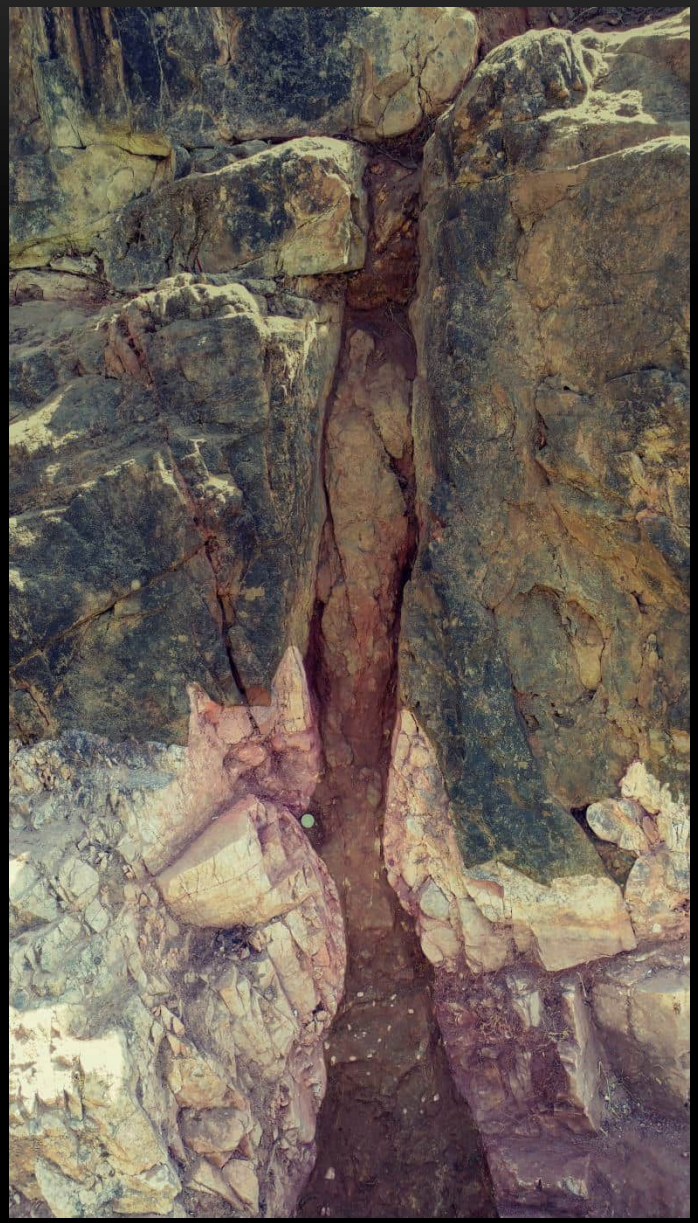


"Joint in quartzite filled with Llandovery sandstone."
(Wills, 1925)

THE RUBERY ROAD CUTTING



LEACH GREEN QUARRY

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BGS REDDITCH MEMOIR 1991

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Tuffaceous material occurs most commonly in what are probably the oldest beds exposed, and there may be an upwards passage from the [Barnt Green Volcanic Formation 485-478 Ma*].

The Solid Geology © BGS

KENDAL END FARM
THE BARNT GREEN VOLCANIC FORMATION

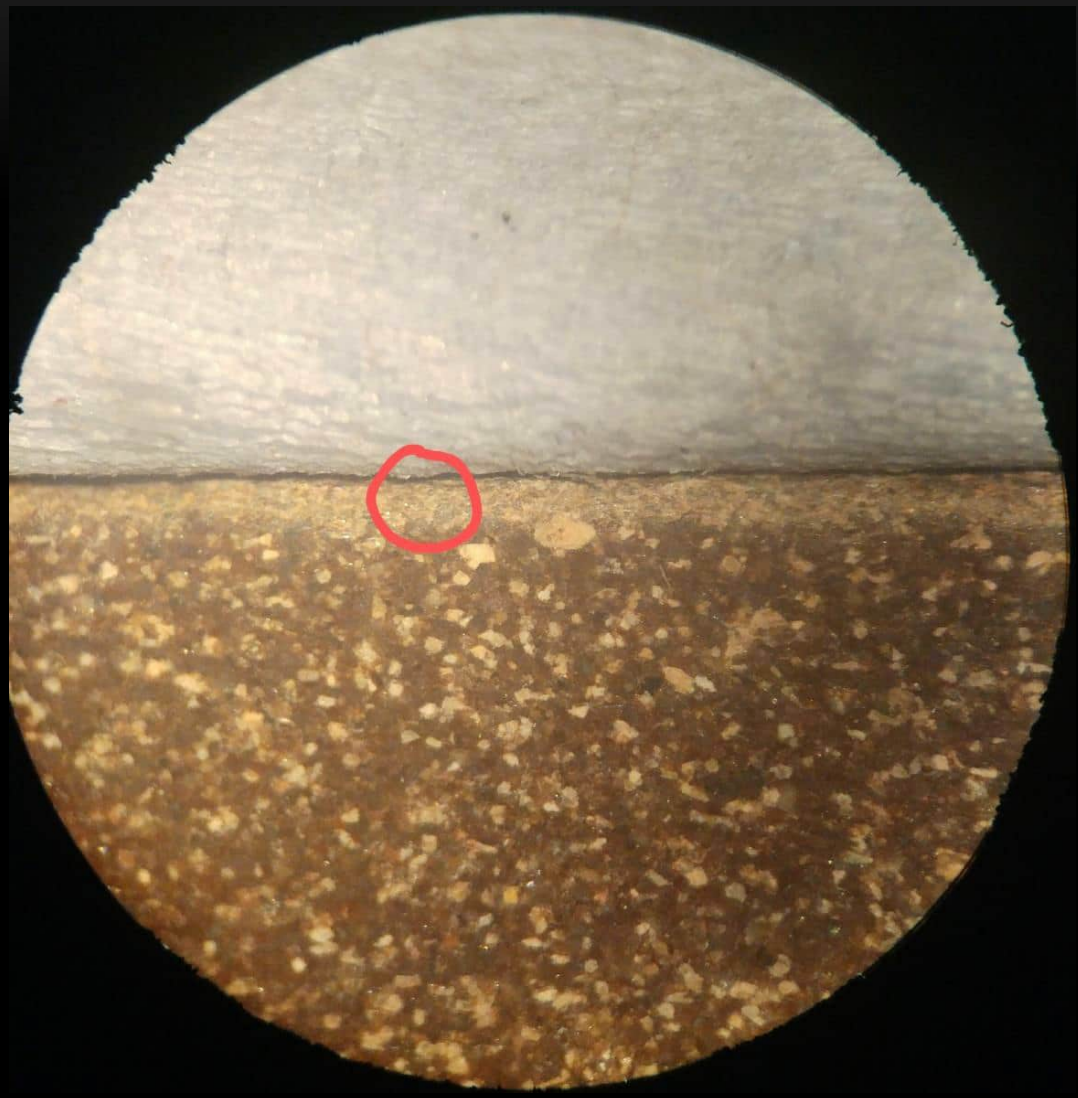
Photo - BGS P212584


The Lickey Hills
Barnt Green Road Quarry
Google Earth
Image © 2022 Maxar Technologies
700 m

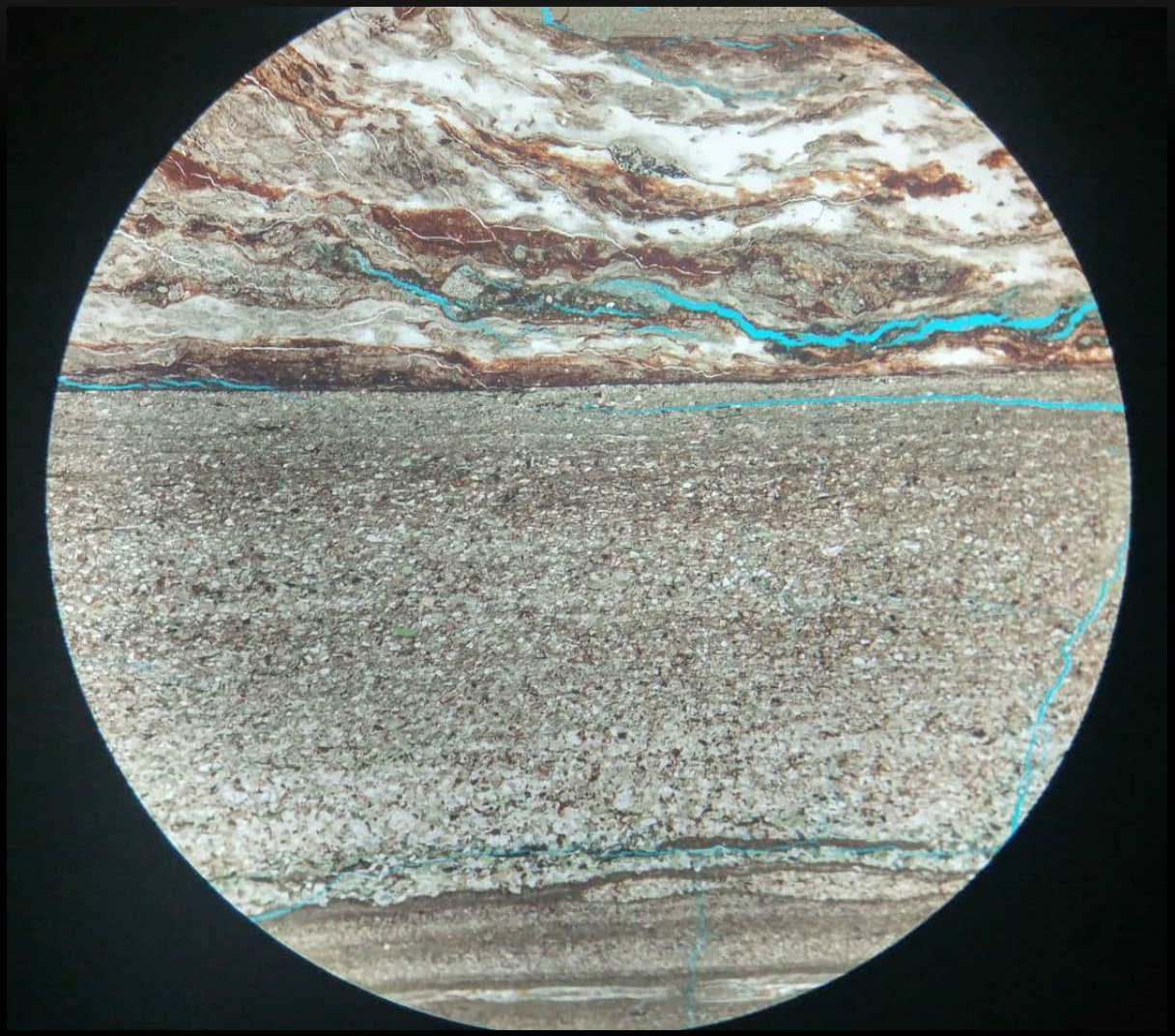
BARNT GREEN ROAD QUARRY

Photo P237646 Bilberry Hill. Overfolded Cambrian [sic] Quartzite reproduced courtesy of the British Geological Survey, UKRI 2019

LITHOLOGY – BARNT GREEN ROAD QUARRY



LITHOLOGY – BARNT GREEN ROAD QUARRY



BARNT GREEN ROAD QUARRY

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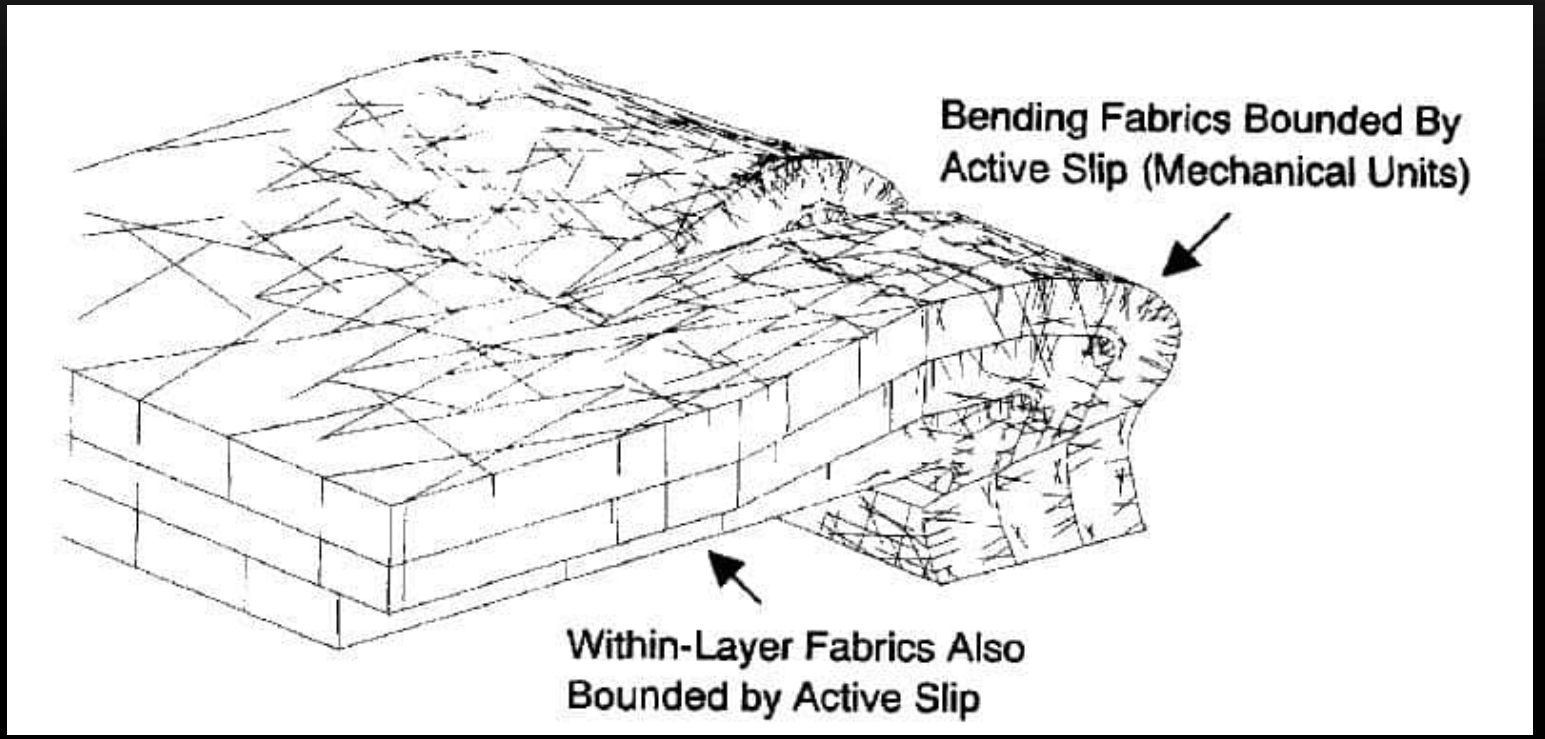
BARNT GREEN ROAD QUARRY – FLEXURAL SLIP



Distribution of fractures in typical asymmetric anticline illustrating strain partitioning associated with mechanical units and layer-delimiting of fractures (after Lewis & Couples 1993).

BARNT GREEN ROAD QUARRY

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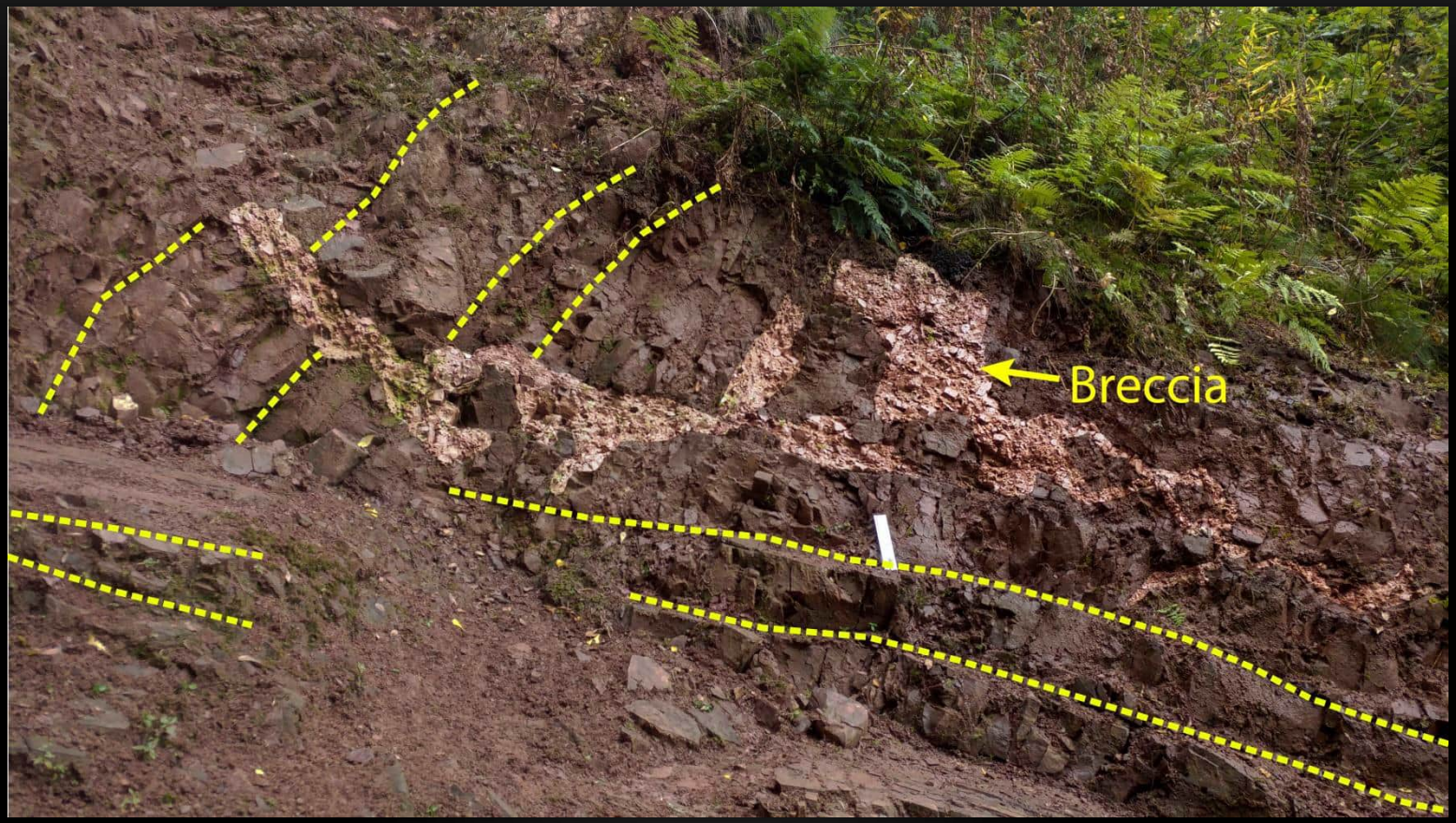

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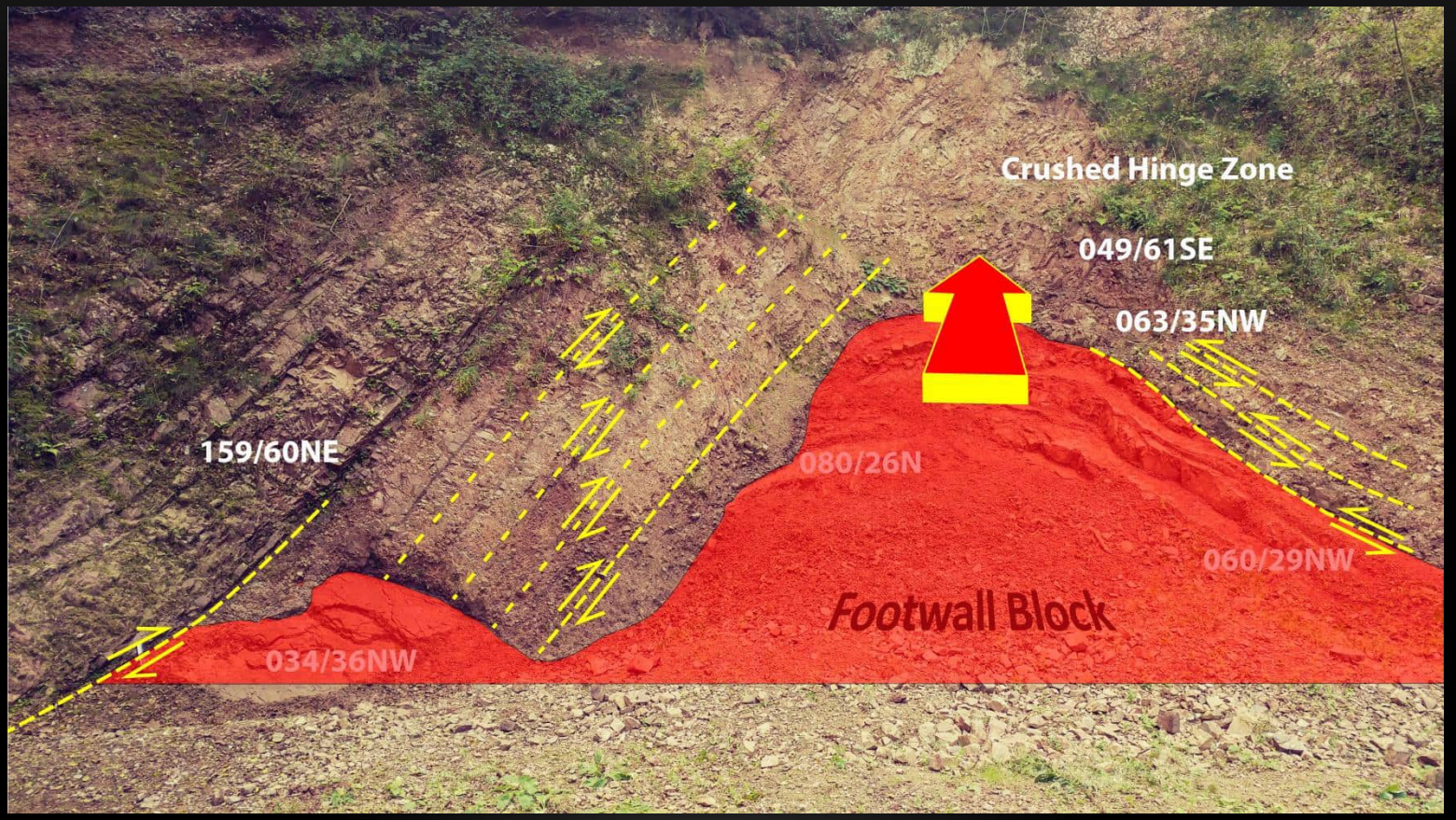

BARNT GREEN ROAD QUARRY – PROBLEM?

A wraparound panorama: the left half of the picture is at almost 90° to the right half. If this interpretation of the fracturing in the SE corner of the quarry is correct, the pattern of folding must be regarded as anomalous. From this viewpoint, the fold should exhibit an "S" pattern, rather than the "Z" pattern seen in the quarry face.

BARNT GREEN ROAD QUARRY – PROBLEM?

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However, the pattern of folding is consistent with a northward movement of the hangingwall block, along a northward-dipping thrust plane.

BARNT GREEN ROAD QUARRY

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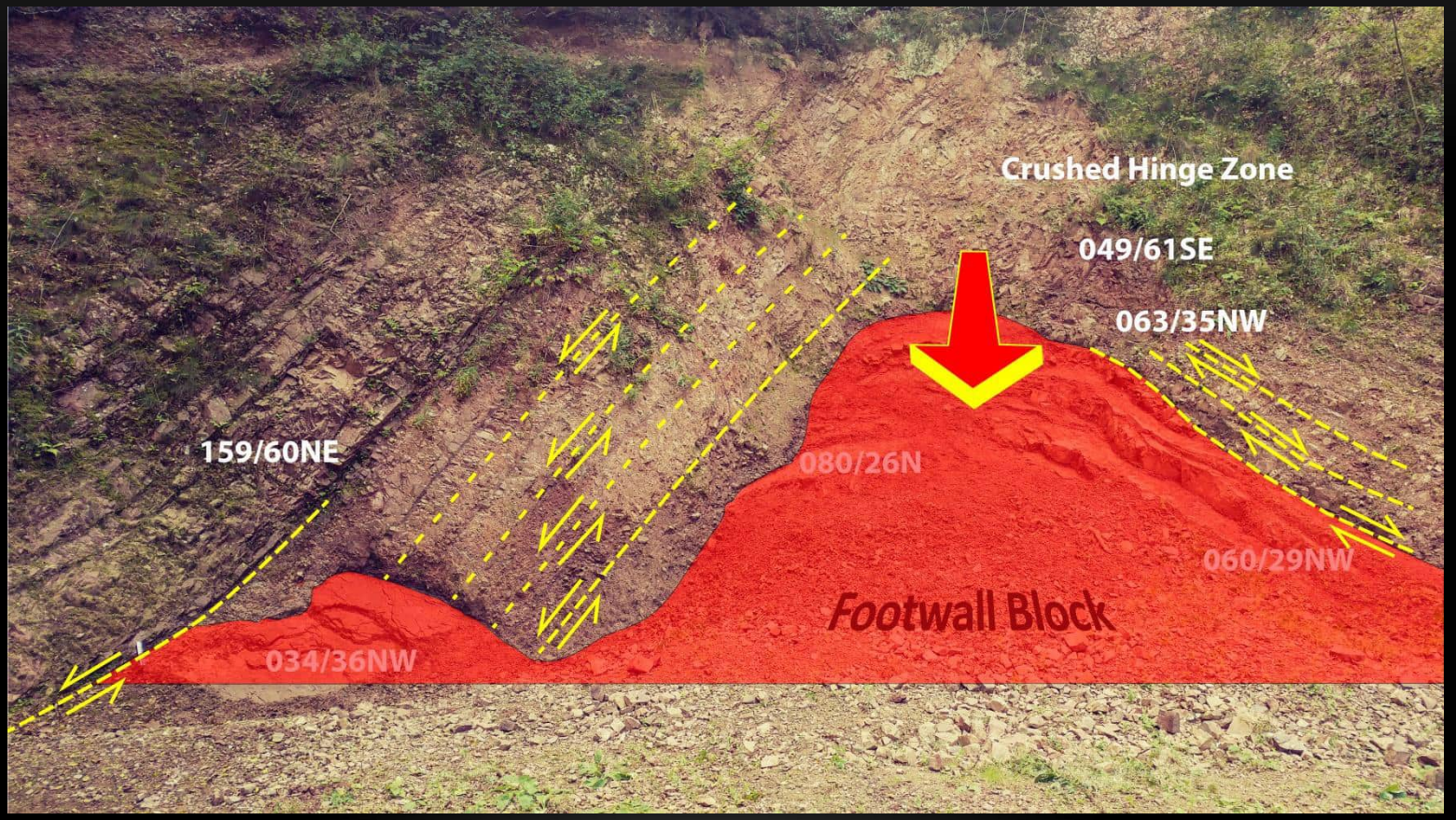
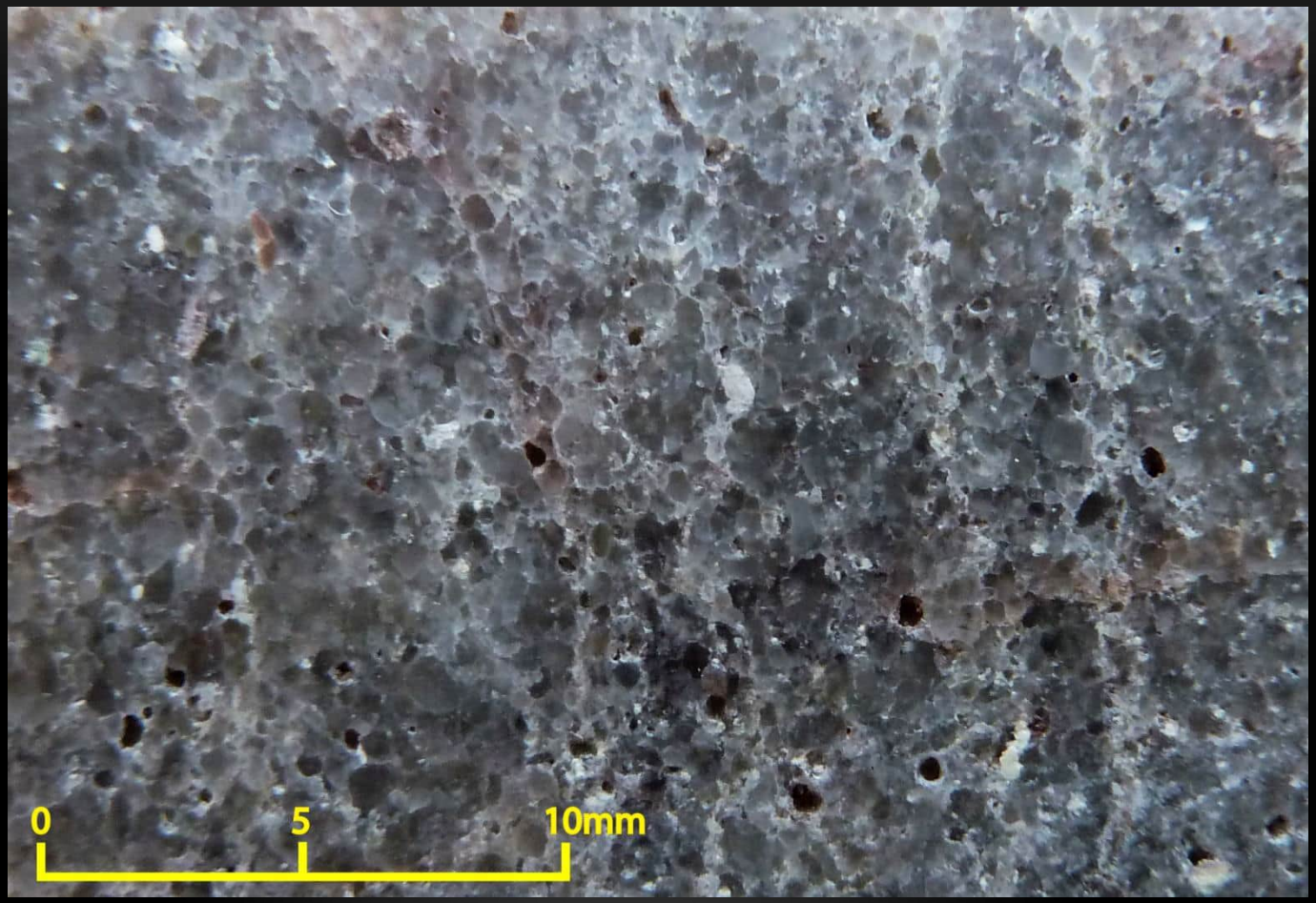
Chalk arrows indicate the orientation and direction of movement of the hangingwall block suggested by the slickensides

BARNT GREEN ROAD QUARRY

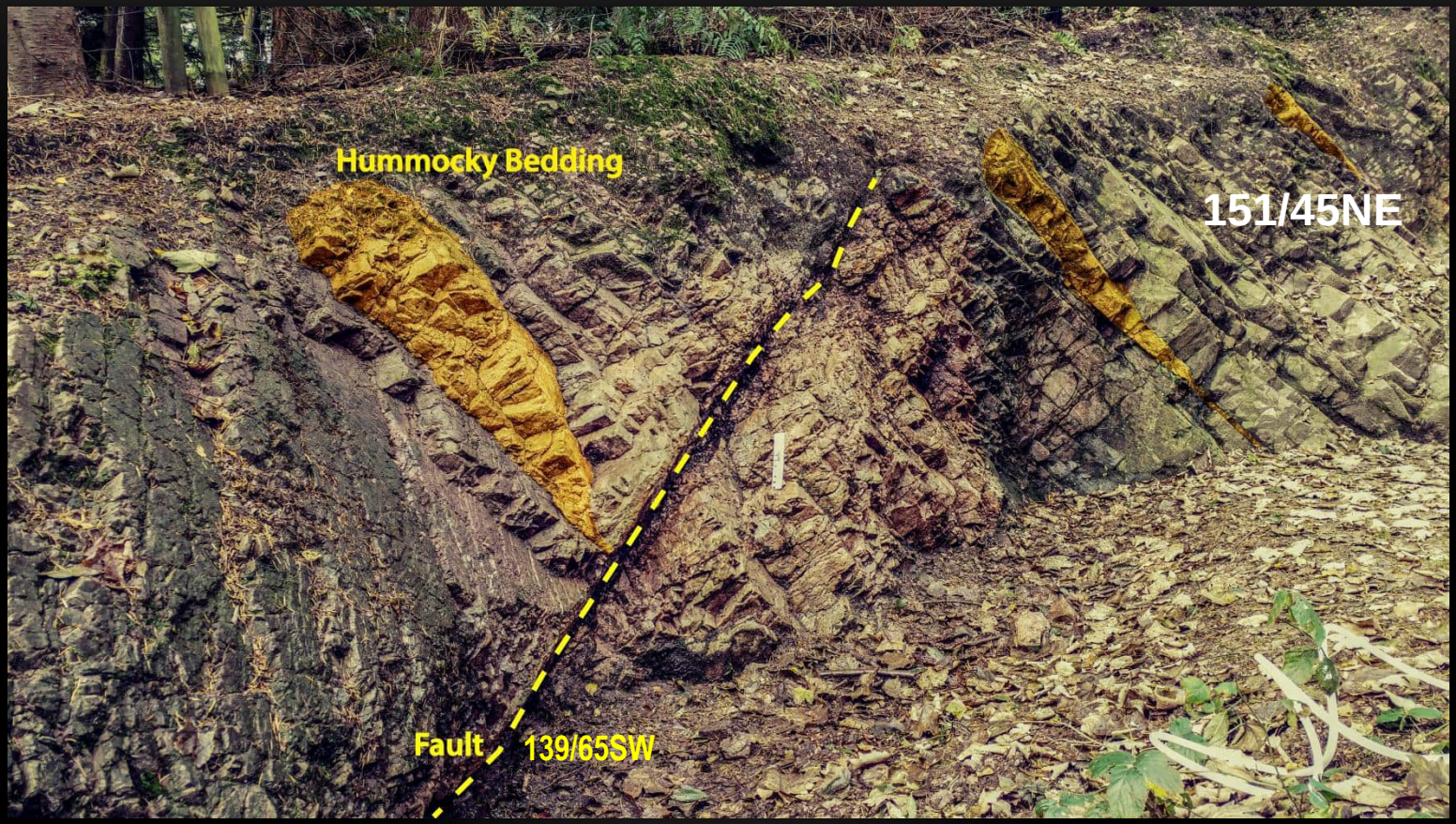



The Lickey Hills
Barnt Green Road Quarry
Kendal End Quarry
Google Earth
Image © 2022 Maxar Technologies
700 m

LICKEY QUARTZITE – KENDAL END QUARRY

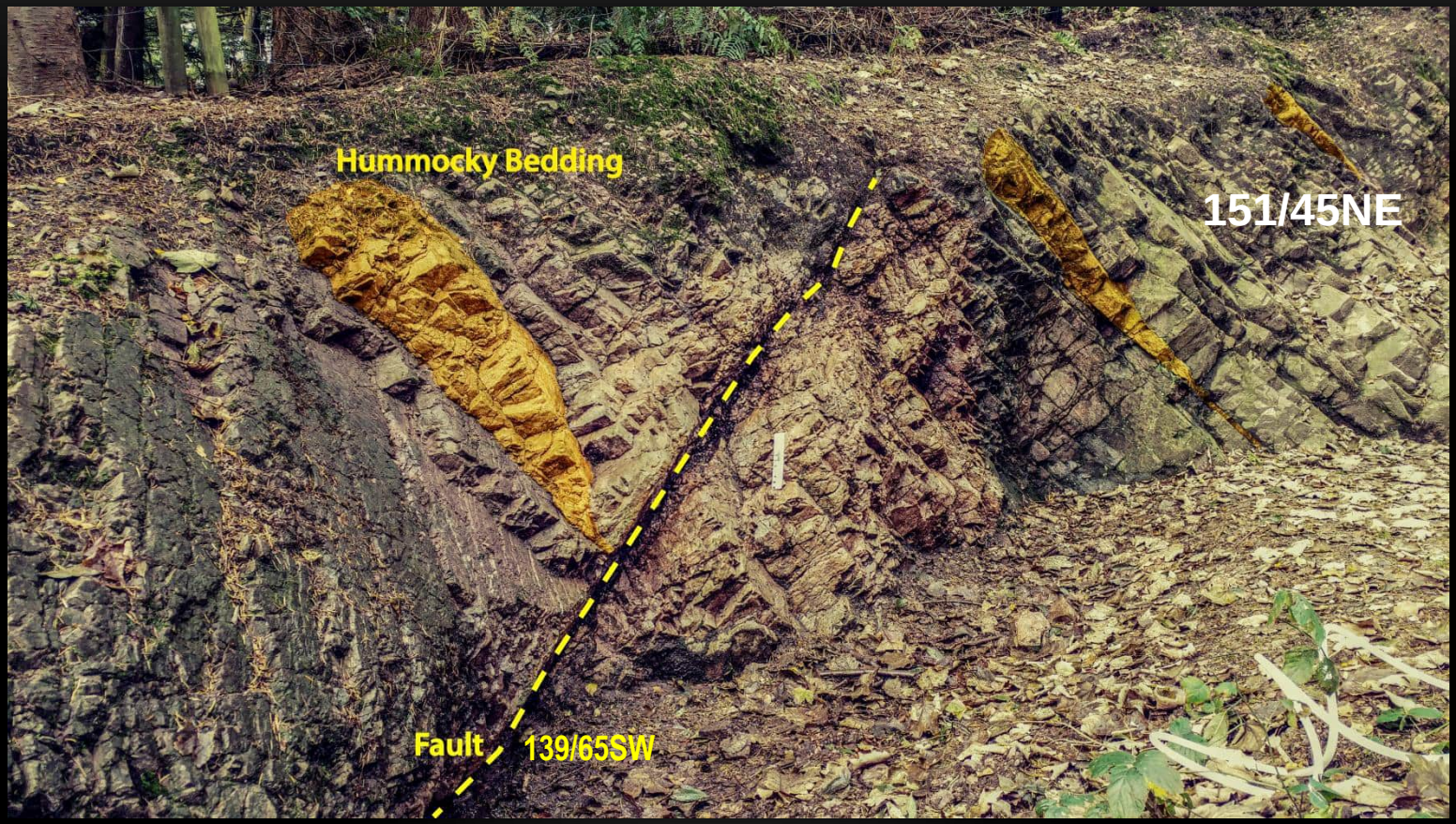


KENDAL END QUARRY – SEDIMENTARY STRUCTURES



Strike and Dip of Bedding (KEQ value – average of 9 readings)

KENDAL END QUARRY – SEDIMENTARY STRUCTURES



KENDAL END QUARRY – SEDIMENTARY STRUCTURES


The Lickey Hills
Rose Hill Quarry
Google Earth
Image © 2022 Maxar Technologies
700 m

ROSE HILL QUARRY

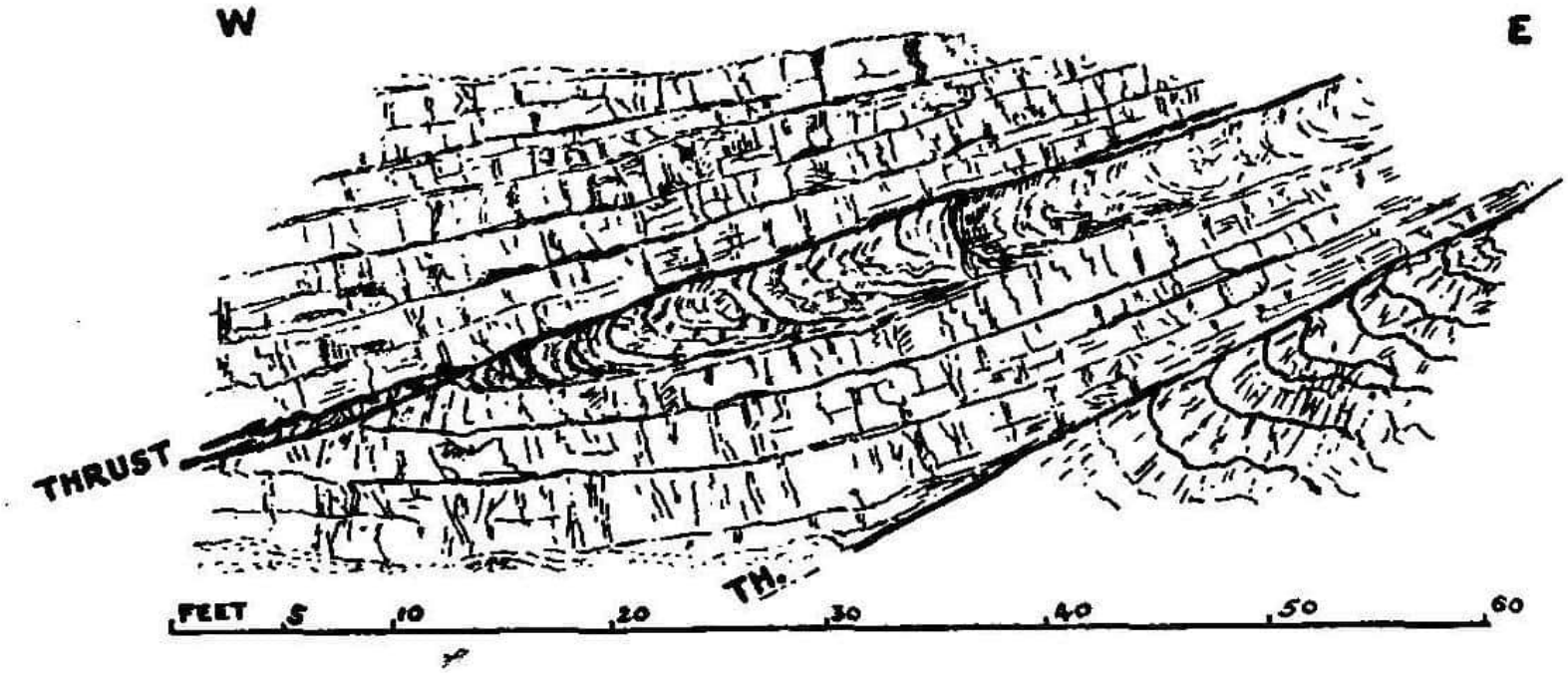


FIG. 5.—Sketch showing two thrust-planes in quartzite at base of quarry, north side of Rednal Gorge.

The Geology of the Lickey Hills (1927) - Prof W S Boulton DSc, FGS

ROSE HILL MAIN QUARRY

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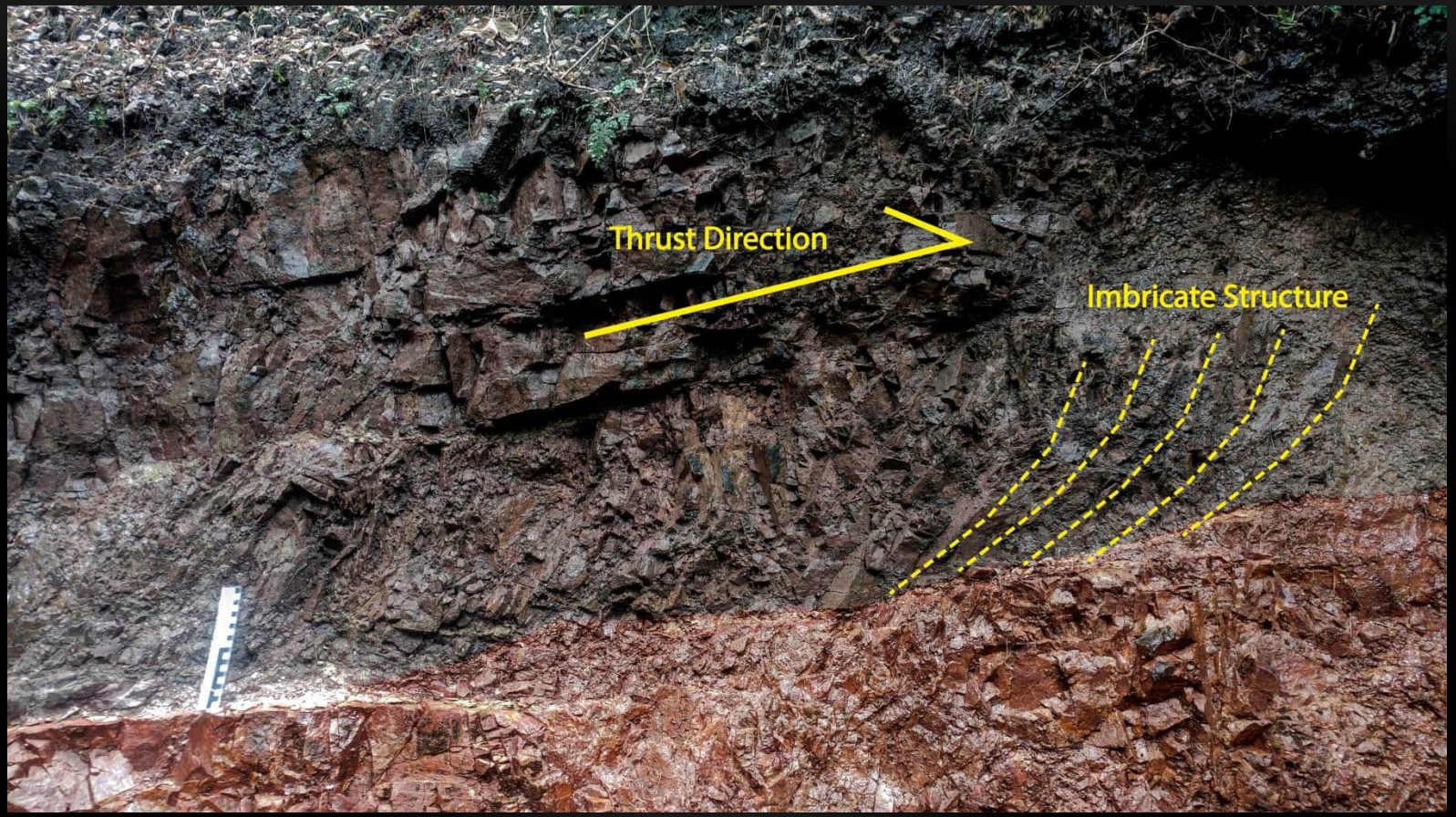

ROSE HILL WEST QUARRY

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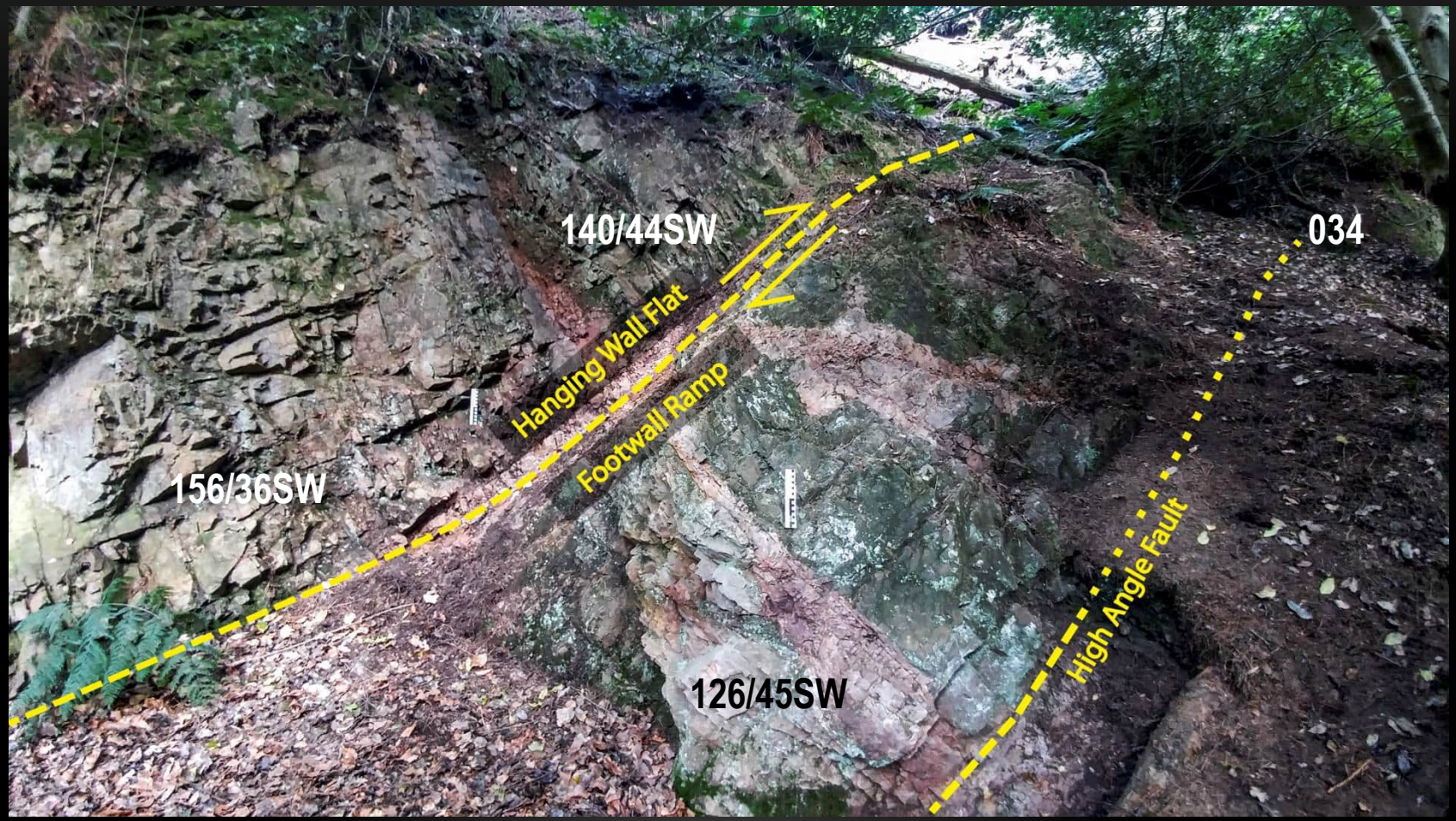

SKETCH OF THE GEOLOGY OF THE BIRMINGHAM DISTRICT. WITH SPECIAL REFERENCE TO THE LONG EXCURSION OF 1898. BY PROFESSOR C. LAPWORTH, LL.D., F.R.S.

"No fossils, except worm-burrows, have yet been detected in this Lickey Quartzite…"


The Lickey Hills
Eachway Lane
Google Earth
Image © 2022 Maxar Technologies
700 m

EACHWAY LANE - TRACE FOSSILS

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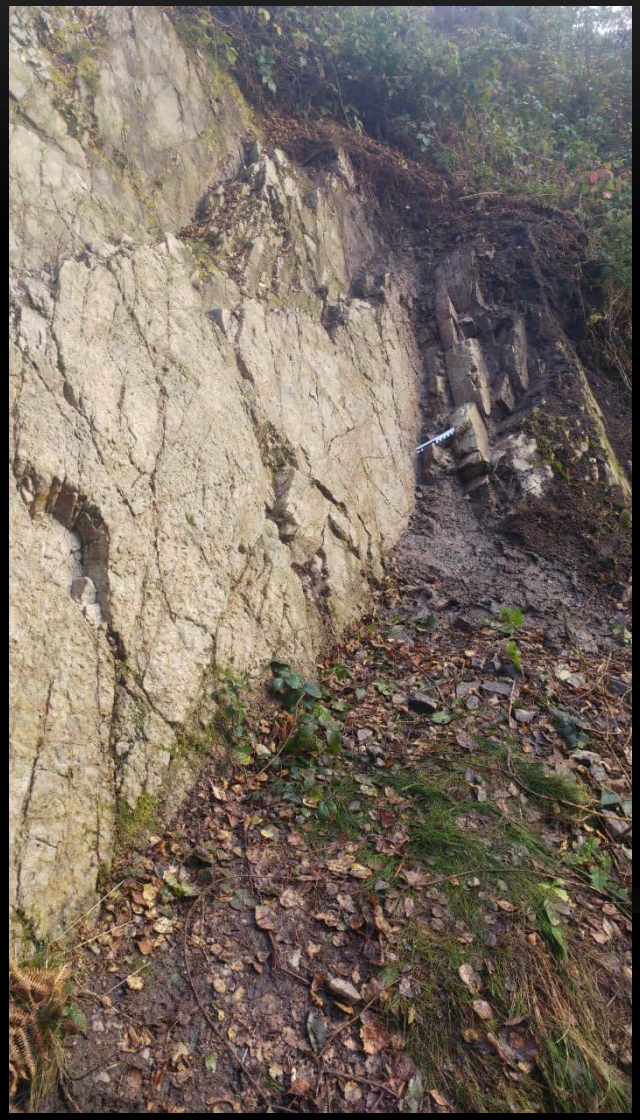

EACHWAY LANE - TRACE FOSSILS

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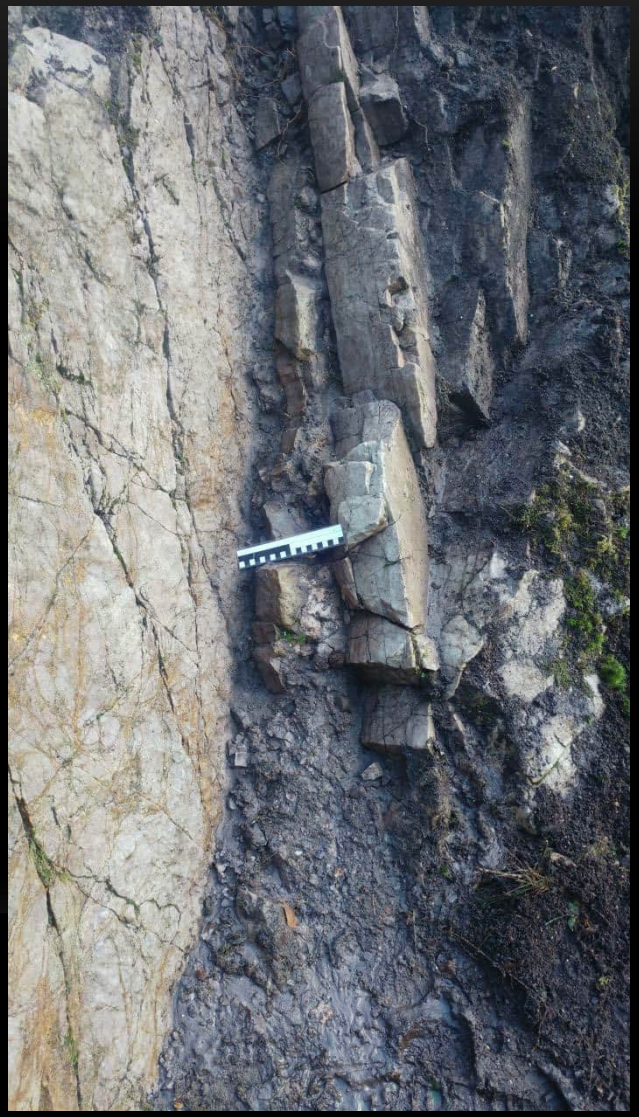

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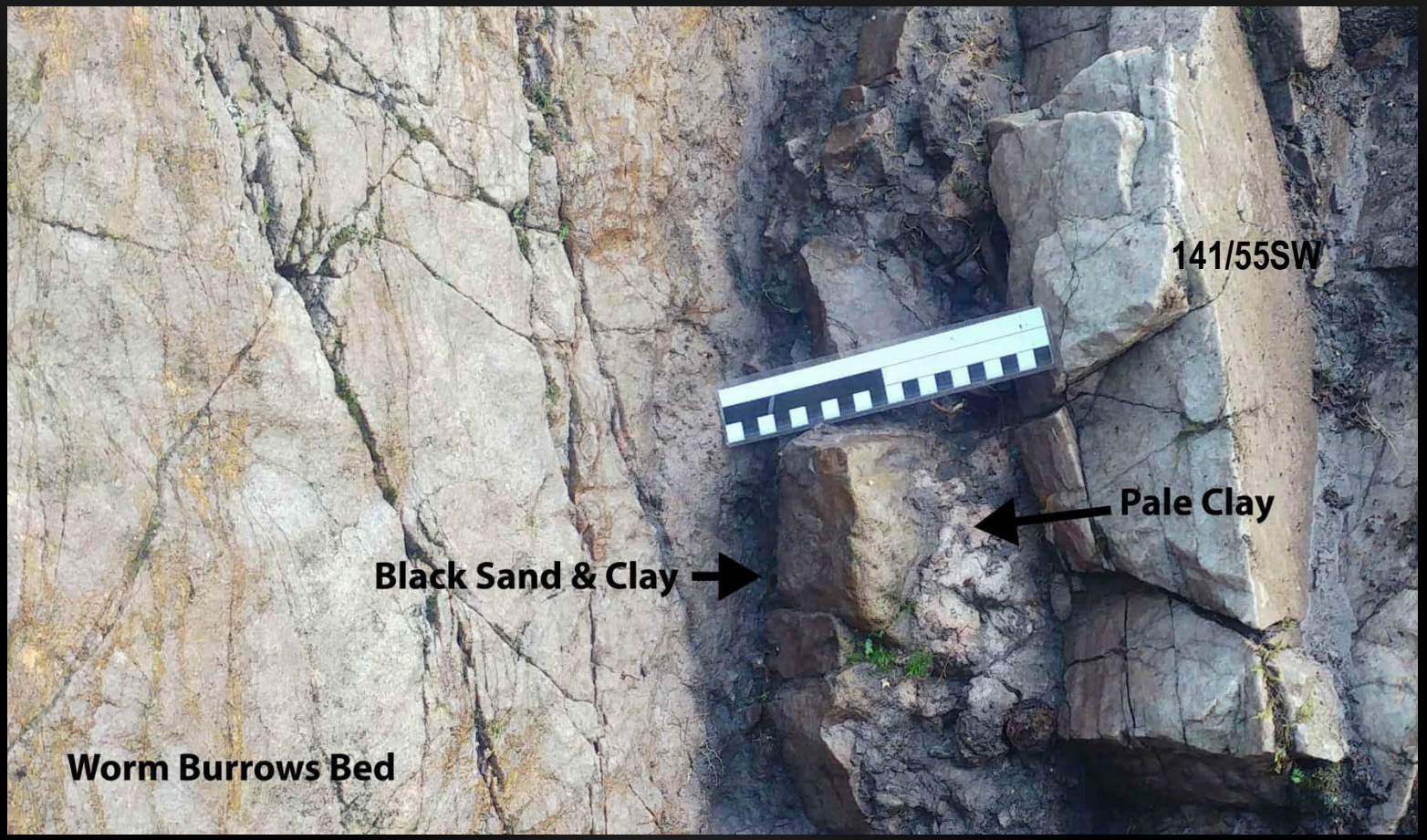



The Lickey Hills
Visitor Centre
Warren Lane Quarry
Google Earth
Image © 2022 Maxar Technologies
700 m

WARREN LANE QUARRY

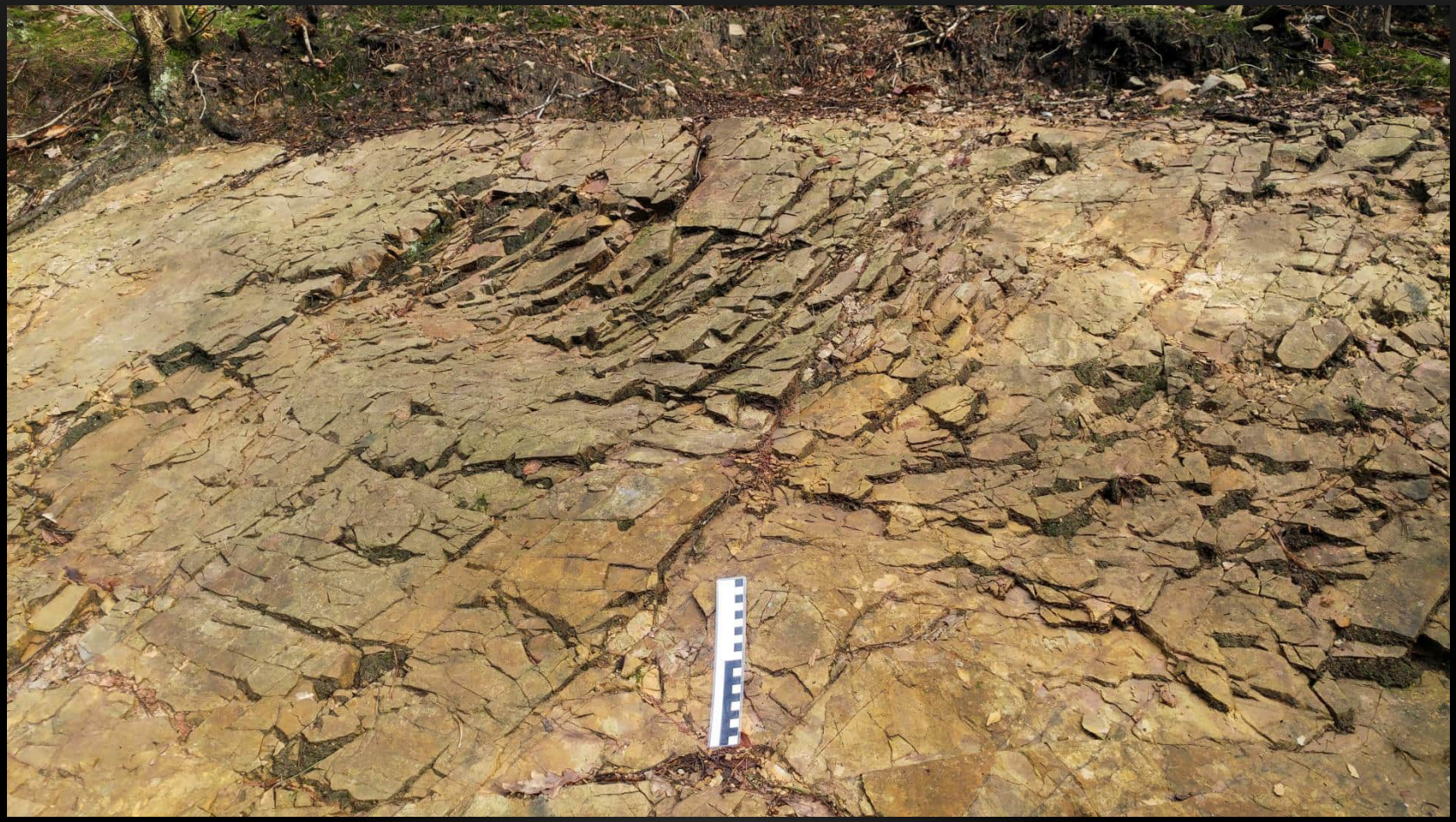
BGS REDDITCH MEMOIR 1991

The sorting, grain shape and sedimentary structures of the rock suggest deposition in a high-energy marine environment..

WARREN LANE QUARRY: SYMMETRIC RIPPLES

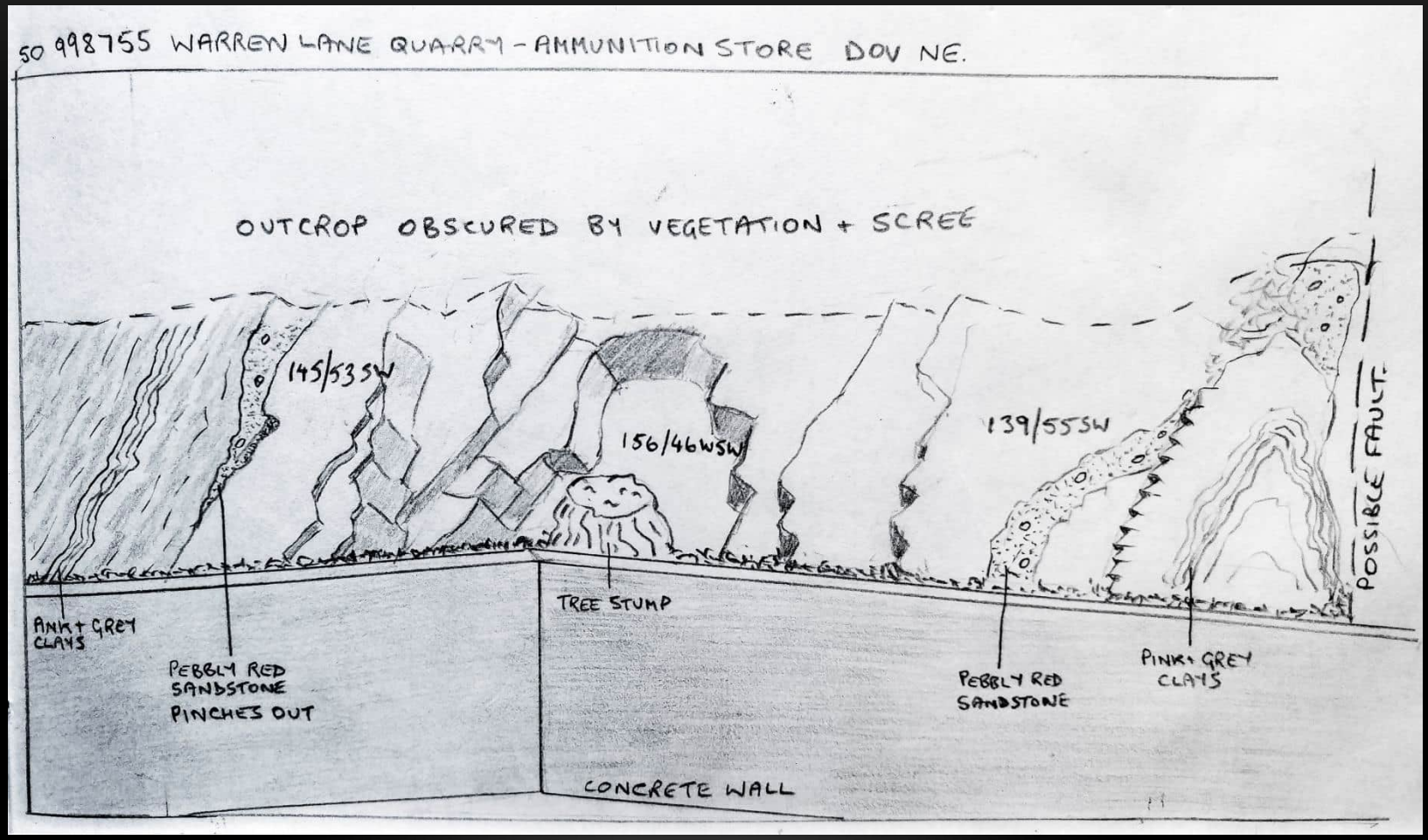
WARREN LANE QUARRY: ASYMMETRIC RIPPLE

WARREN LANE QUARRY – CHANNEL STRUCTURE



WARREN LANE QUARRY – TRACE FOSSIL

WARREN LANE QUARRY – THE AMMUNITION STORE



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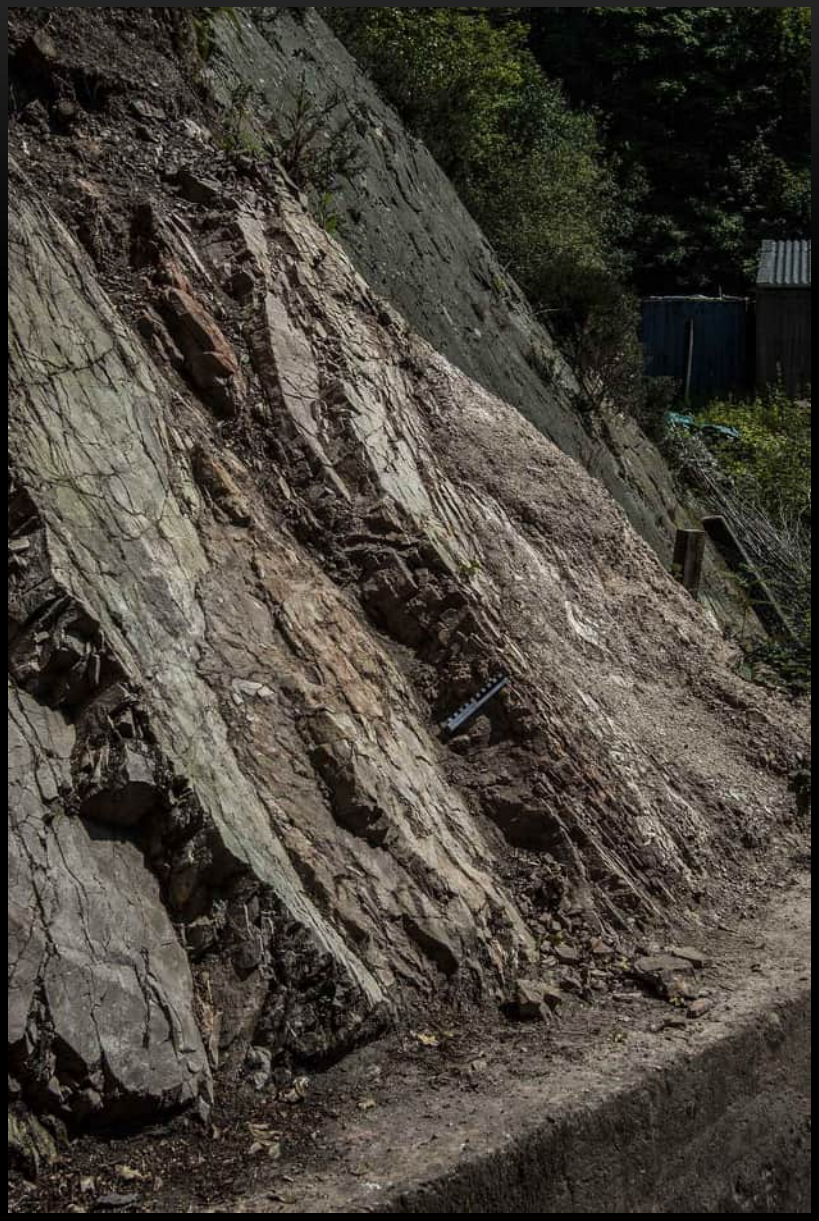

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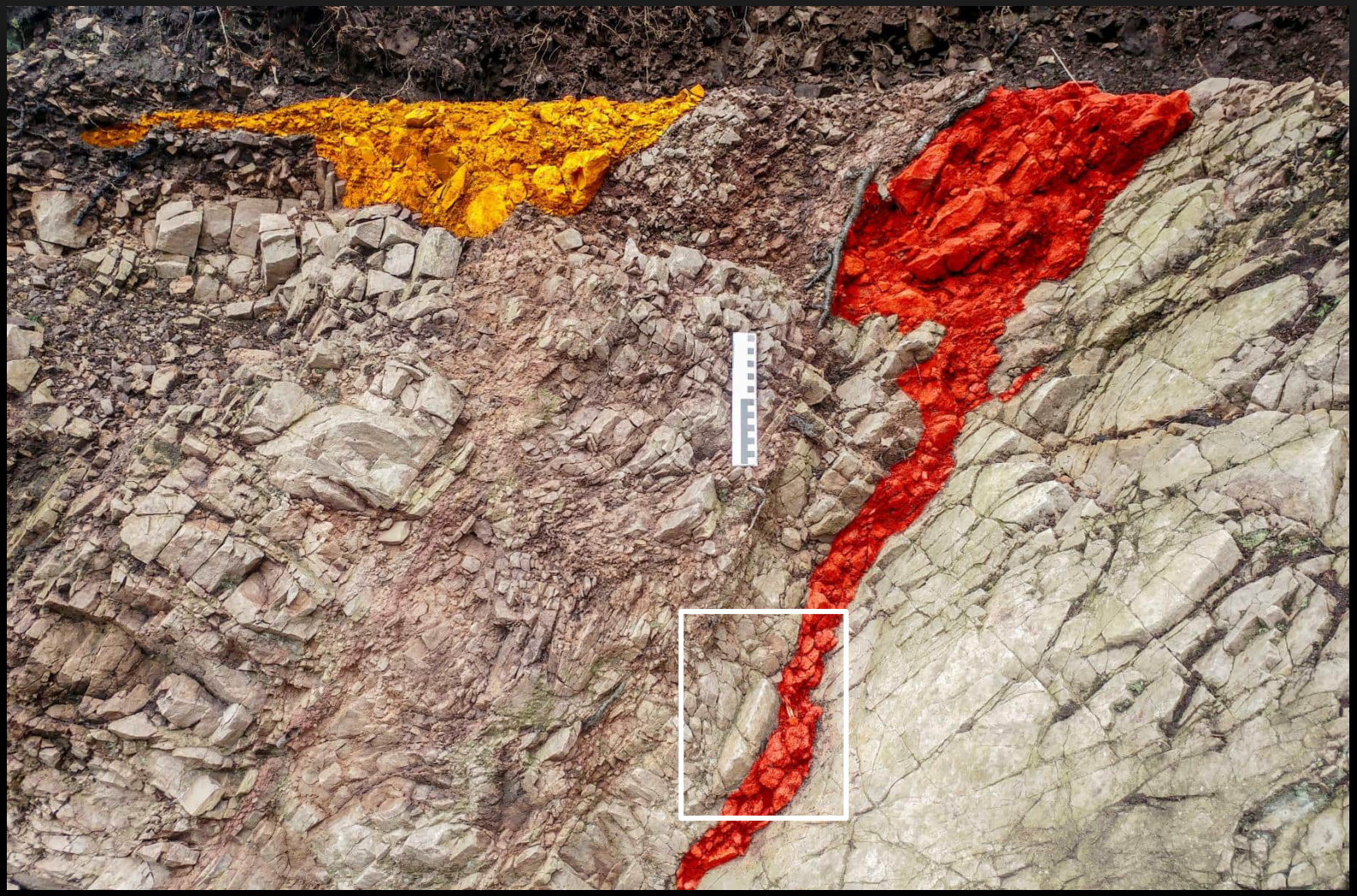

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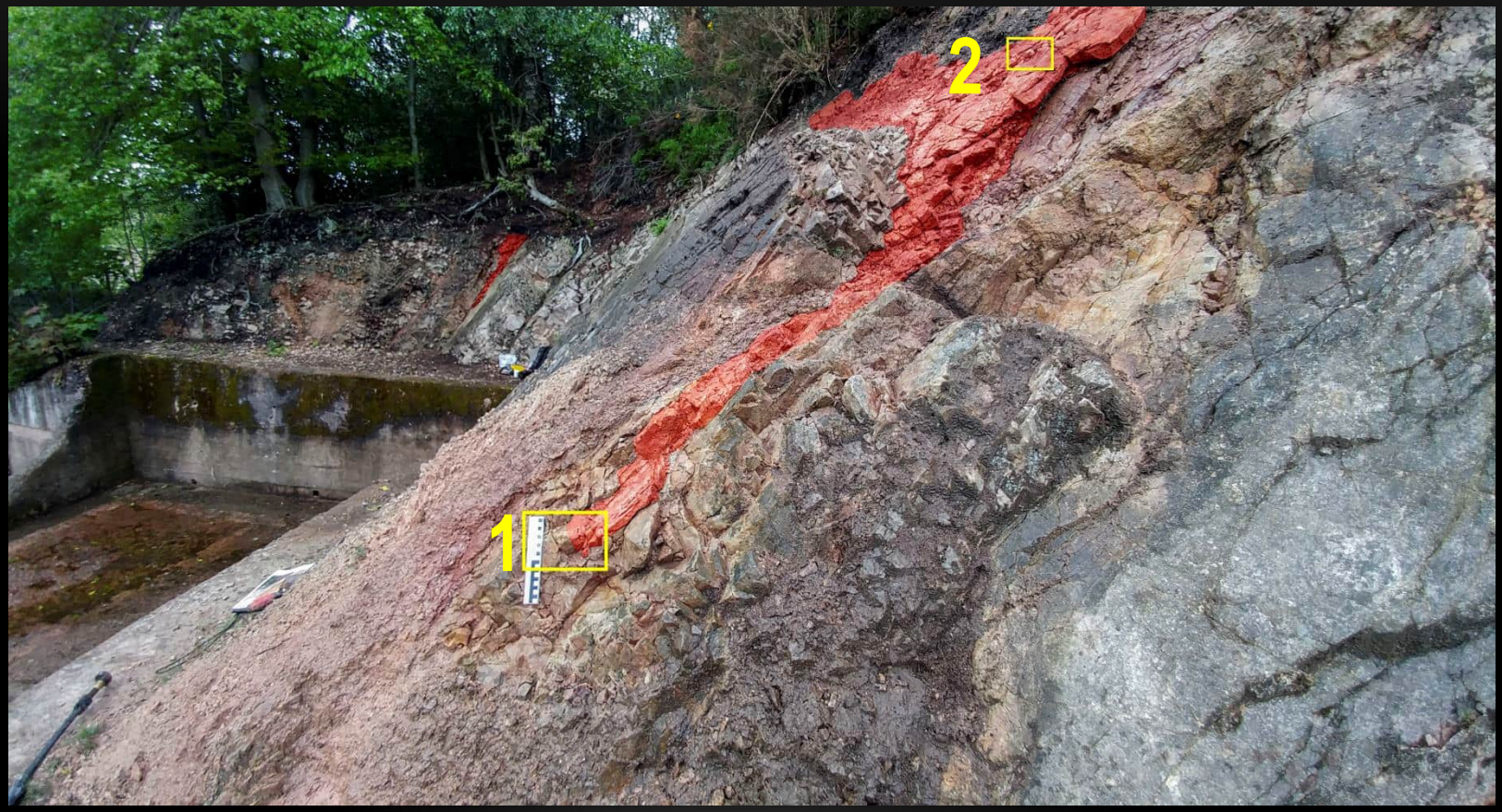

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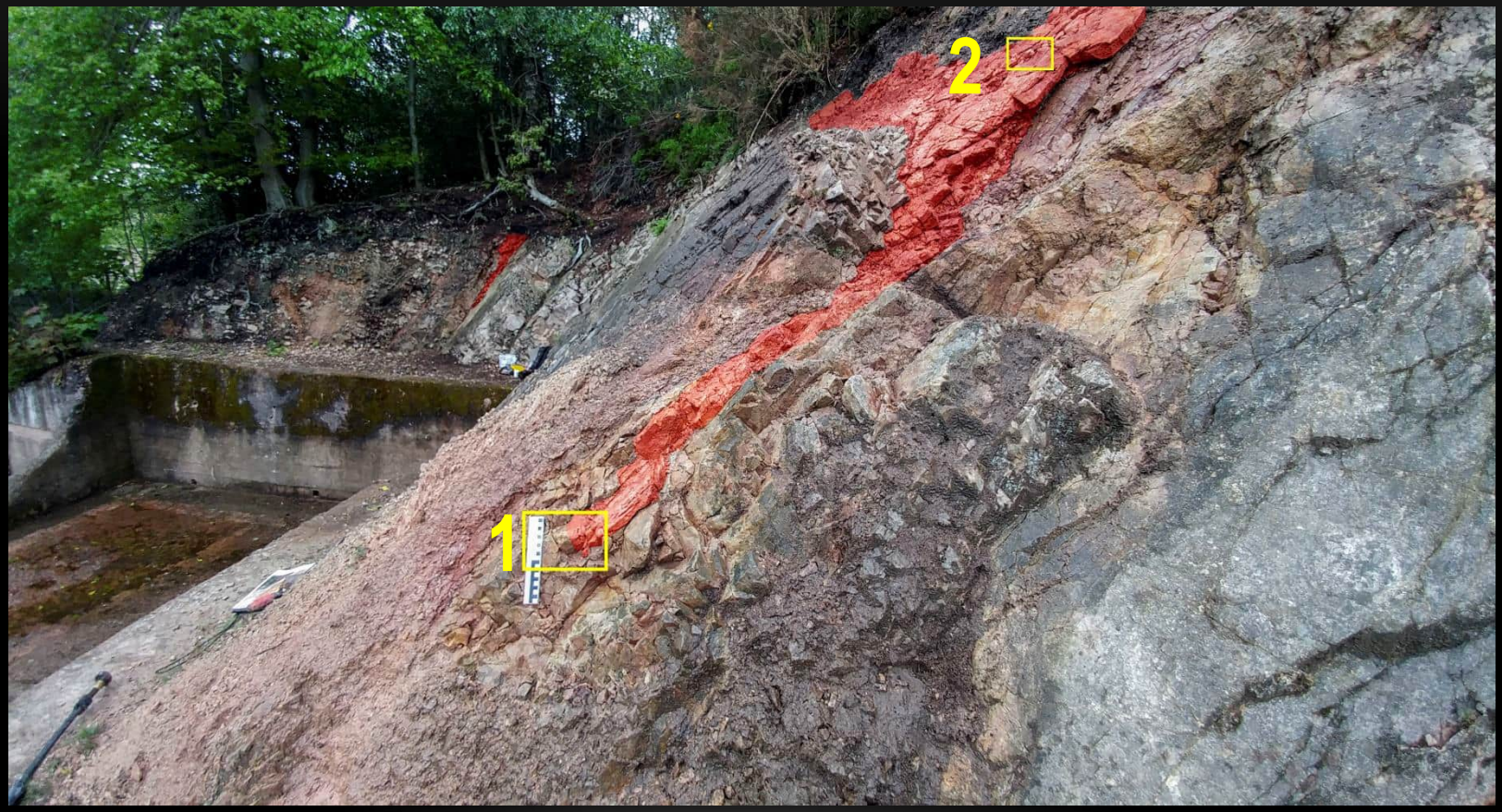

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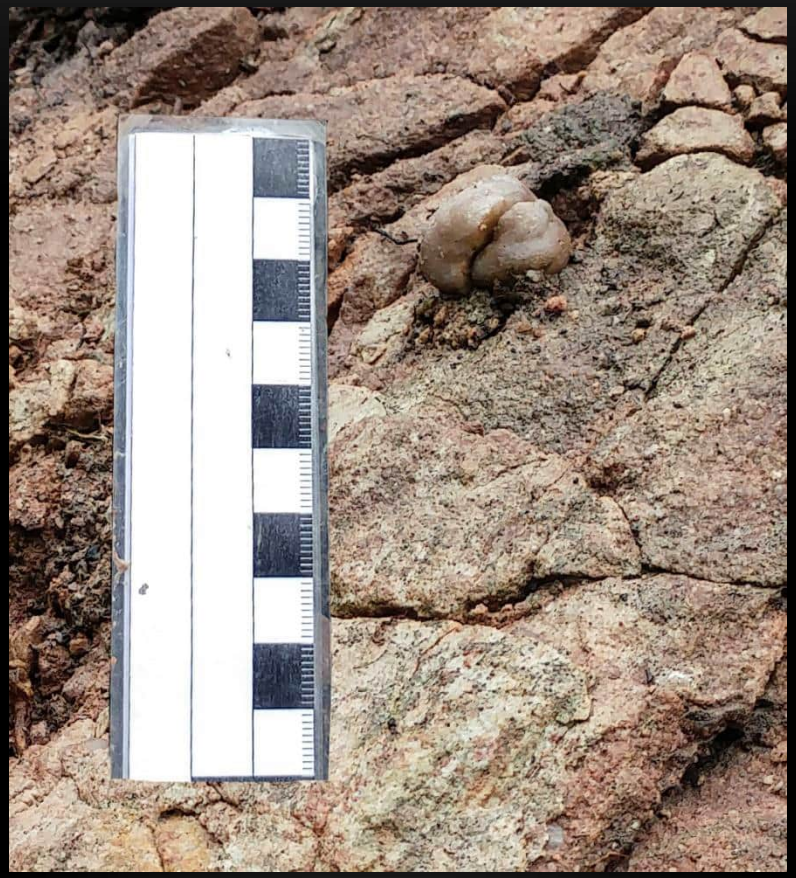

WARREN LANE QUARRY

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Lickey Quartzite

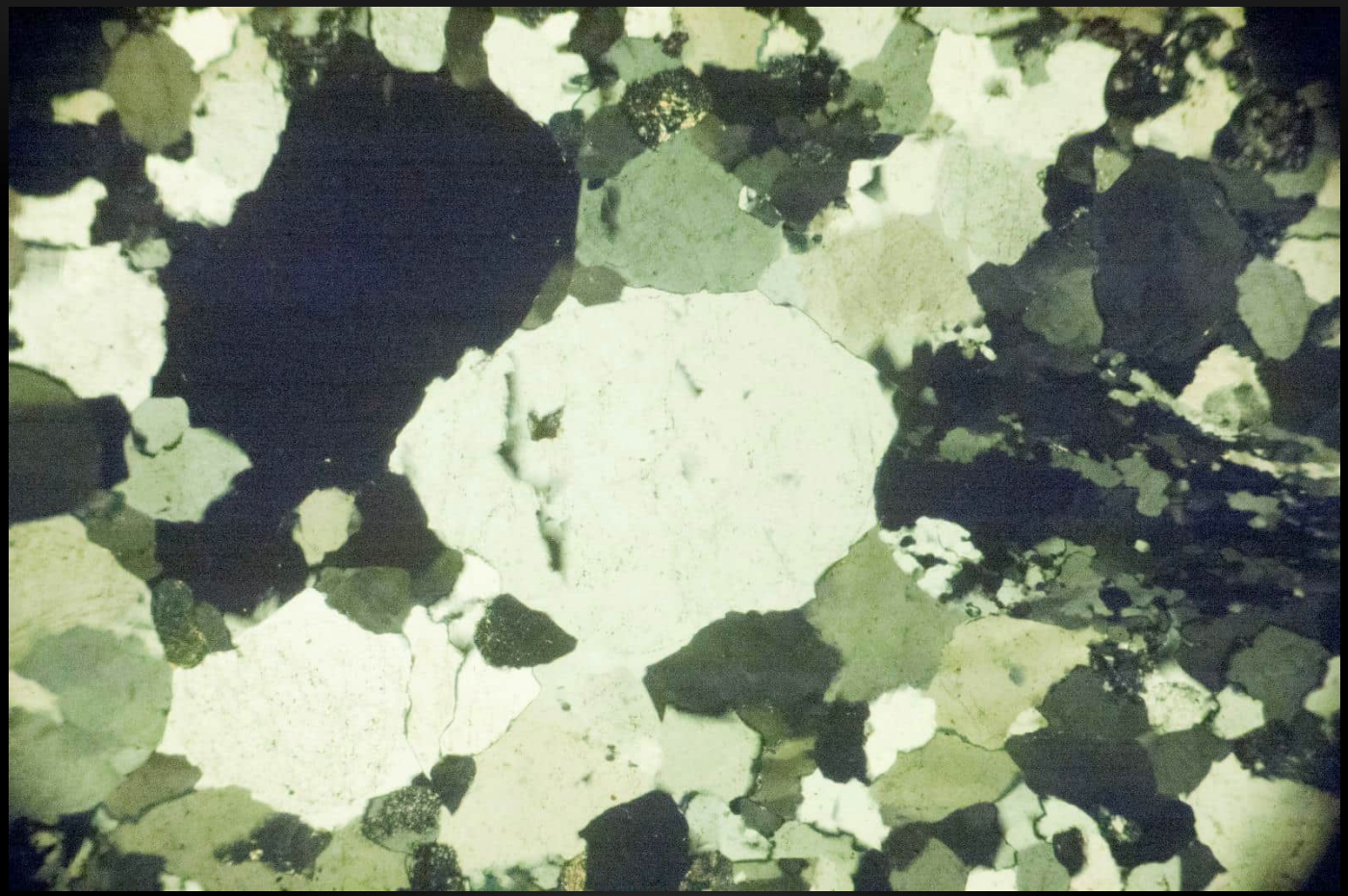
WARREN LANE QUARRY

Fissure Infill

WARREN LANE QUARRY

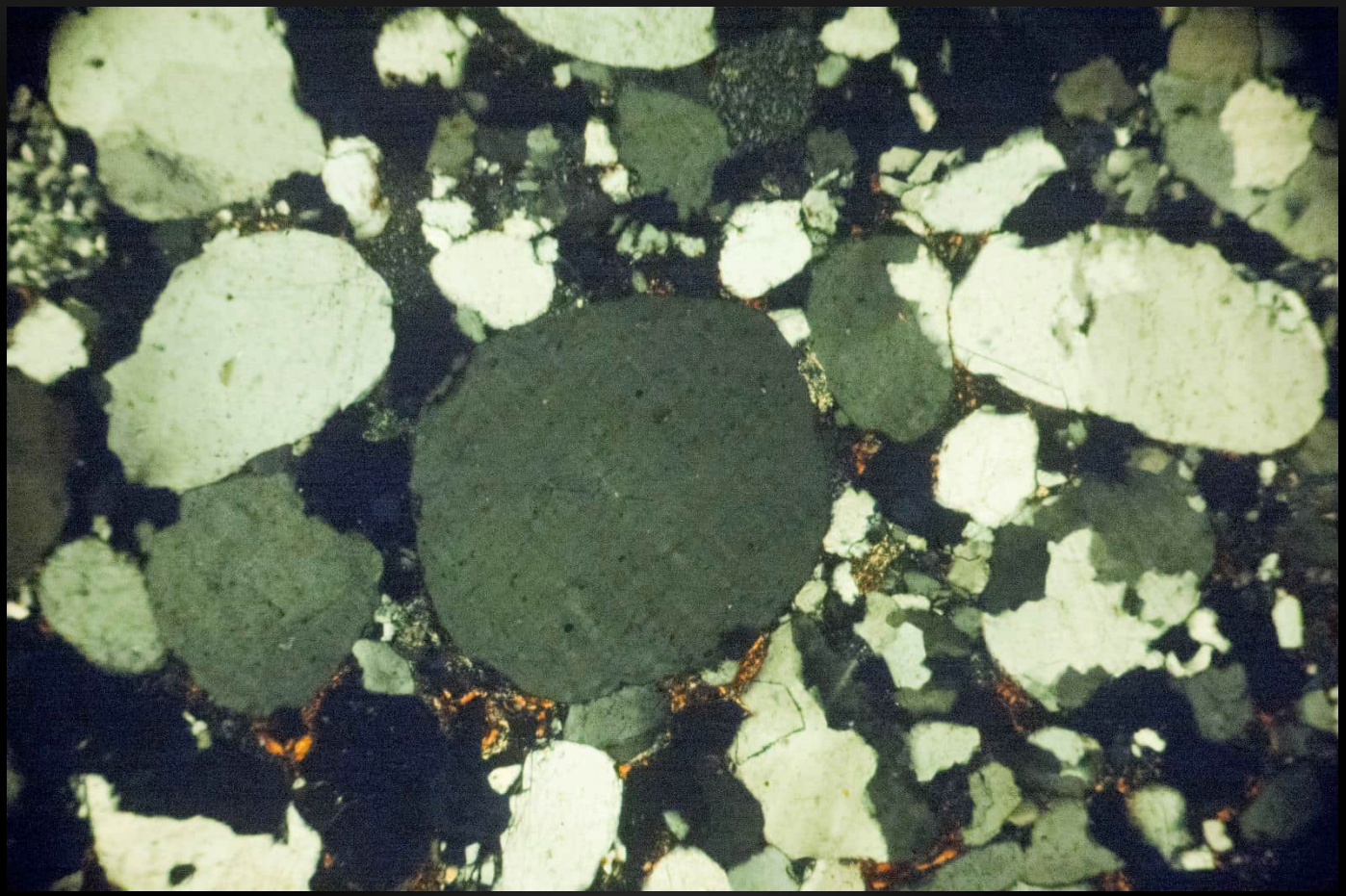
Fissure Infill

WARREN LANE QUARRY



Lickey Quartzite

WARREN LANE QUARRY



Fissure Infill

WARREN LANE QUARRY


The Lickey Hills
Bilberry Hill
Visitor Centre
Warren Lane Quarry
Google Earth
Image © 2022 Maxar Technologies
700 m

BILBERRY HILL

A Guide to the Rocks and Scenery of the Lickey Hills Area (1991)

W G Hardie BSc, FGS

"Some unusual examples of brecciated quartzite, which have been strongly cemented by quartz following brecciation (crushing) are of particular interest. These are strongly resistant to erosion, and form small but conspicuous masses standing about 1 metre above the general level of the quartzite."

BILBERRY HILL

BILBERRY HILL

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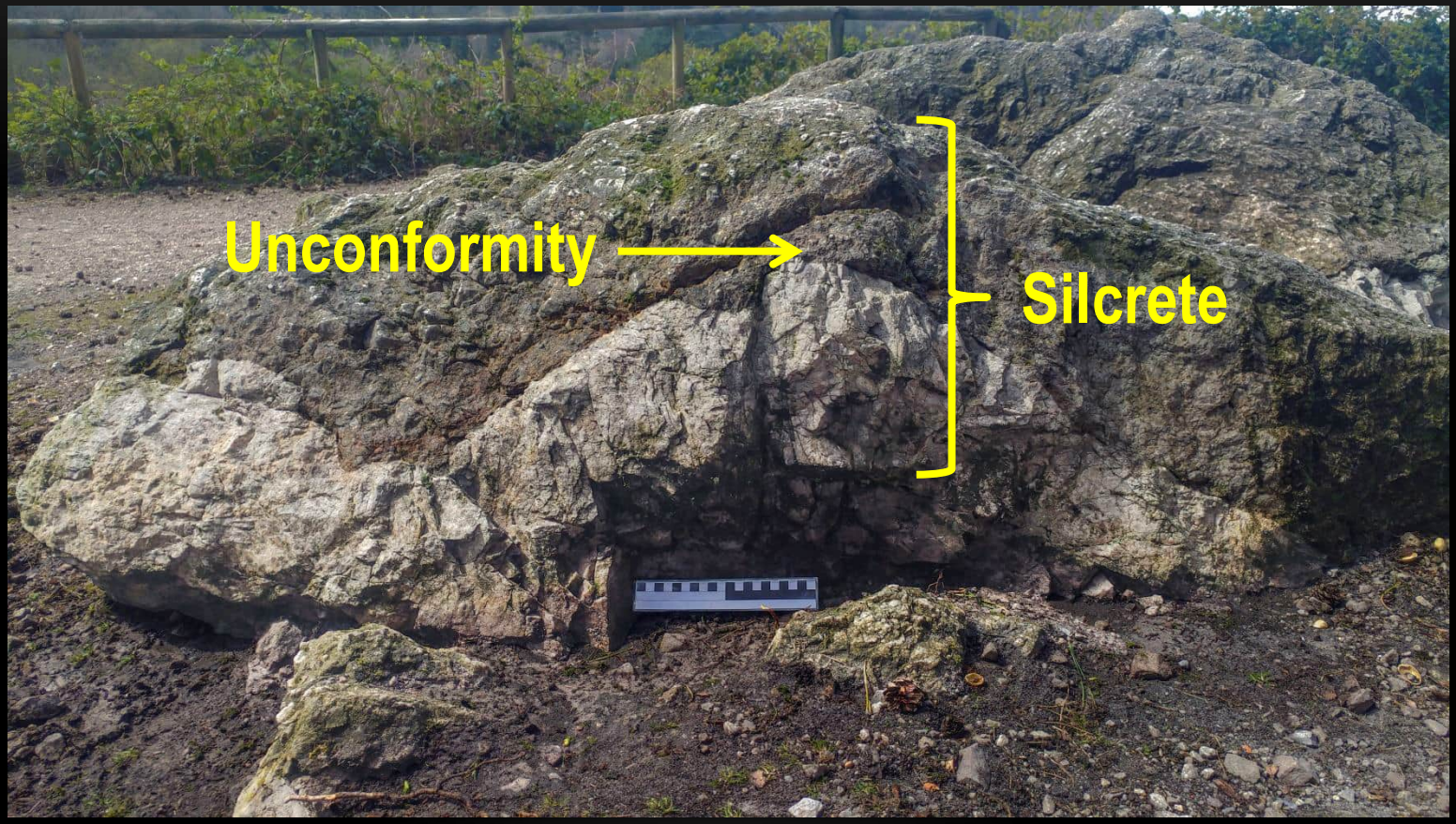
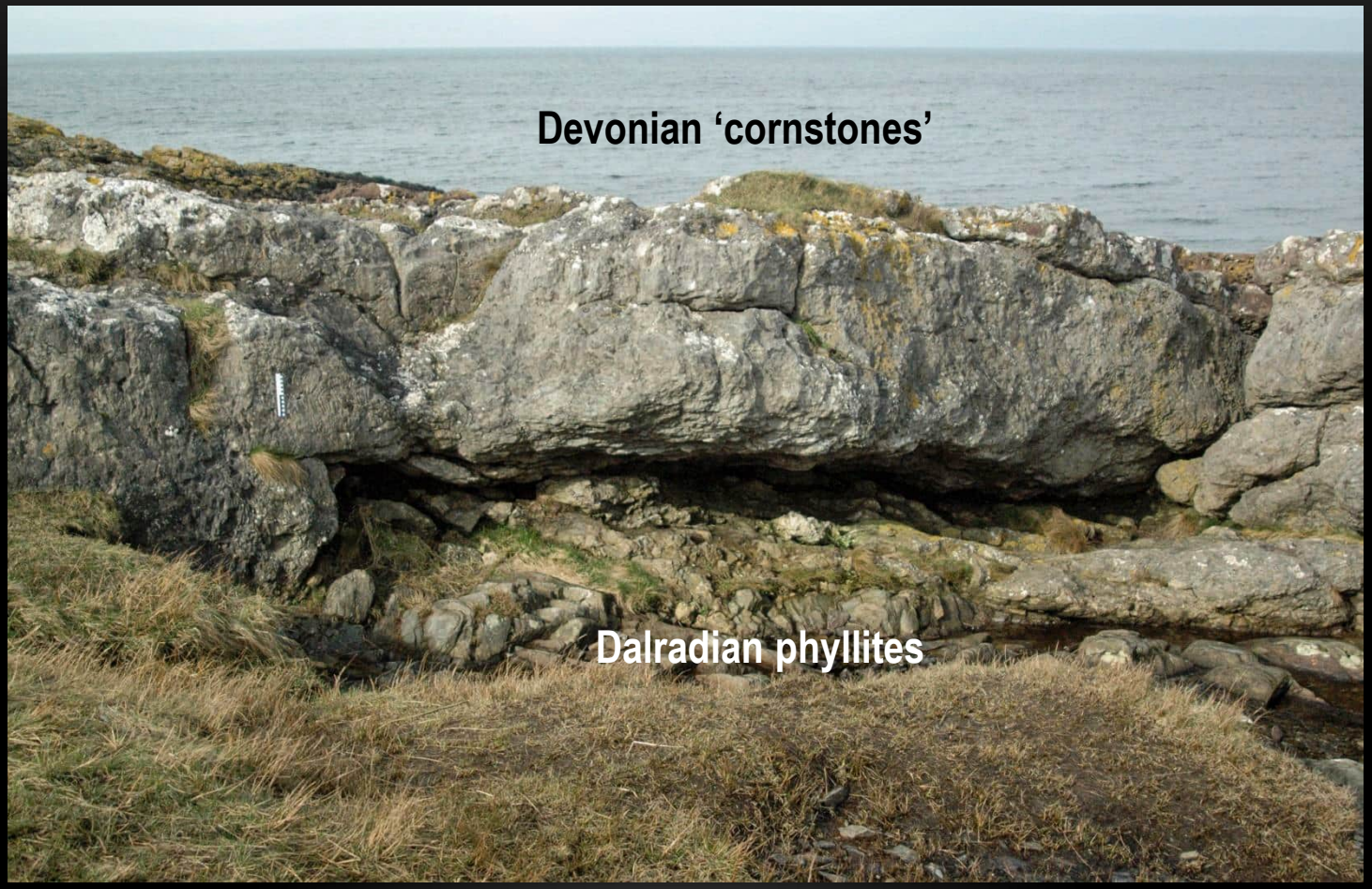
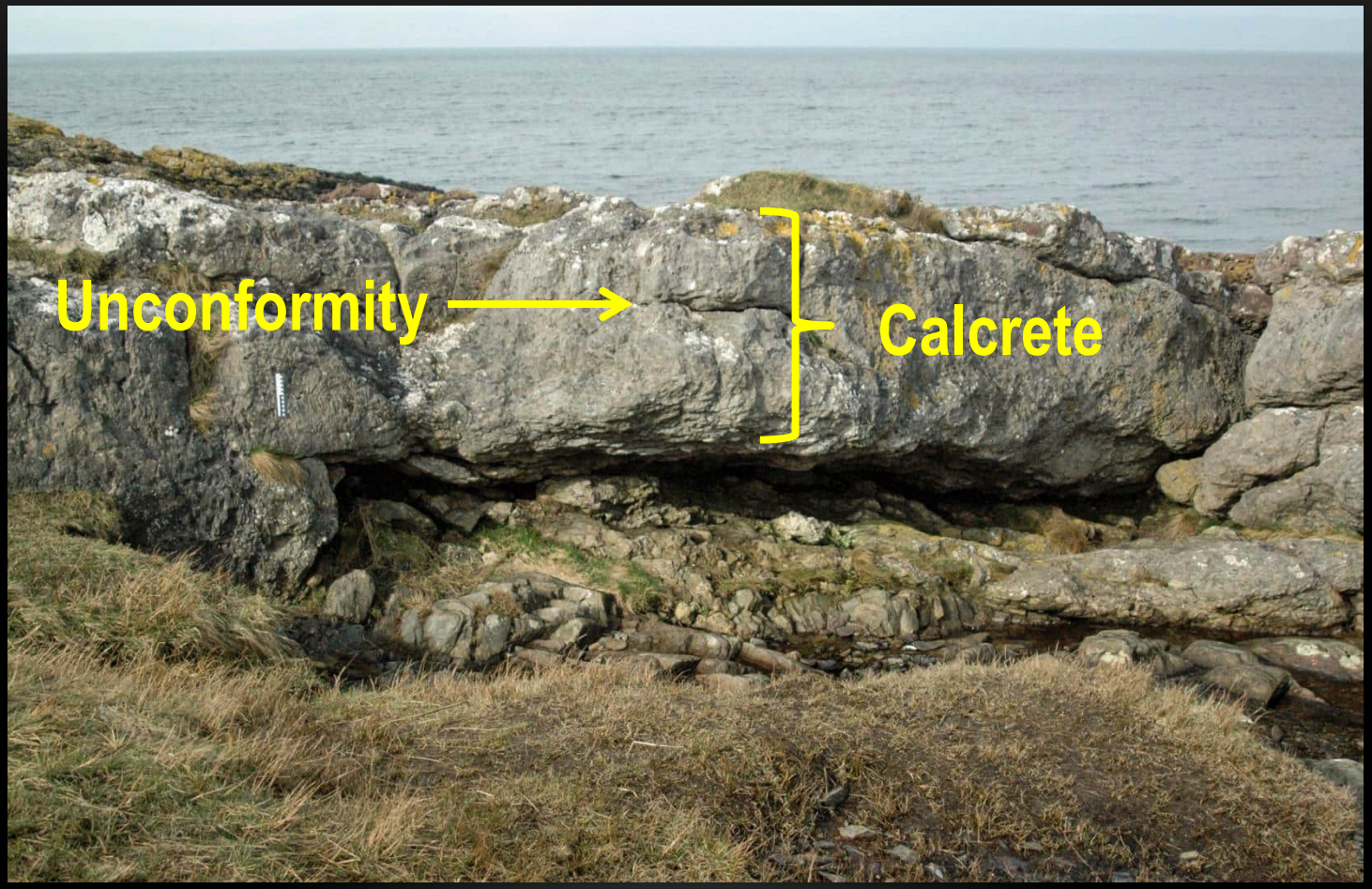


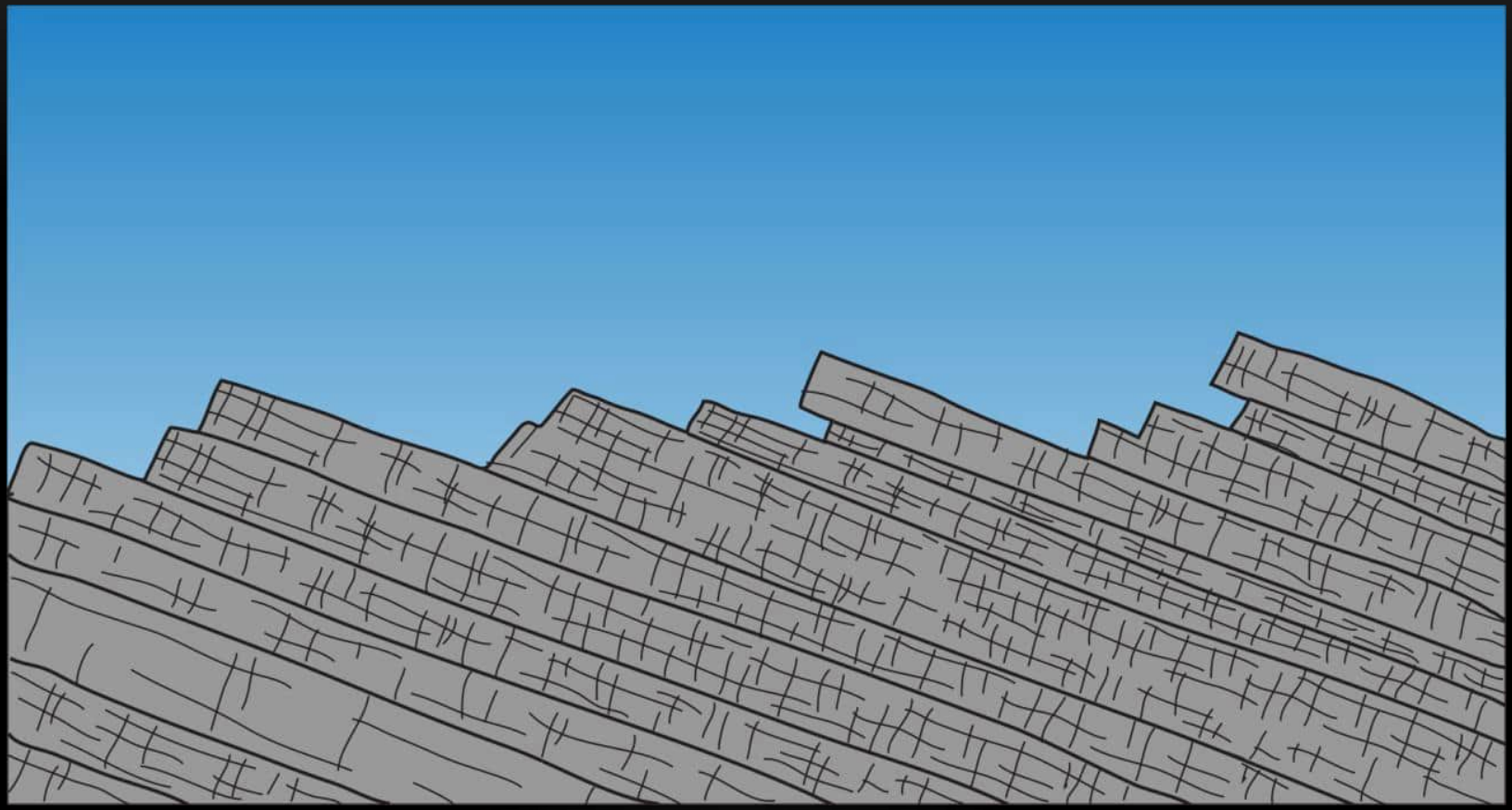
HUTTON'S UNCONFORMITY - ARRAN



HUTTON'S UNCONFORMITY - ARRAN



SILCRETE



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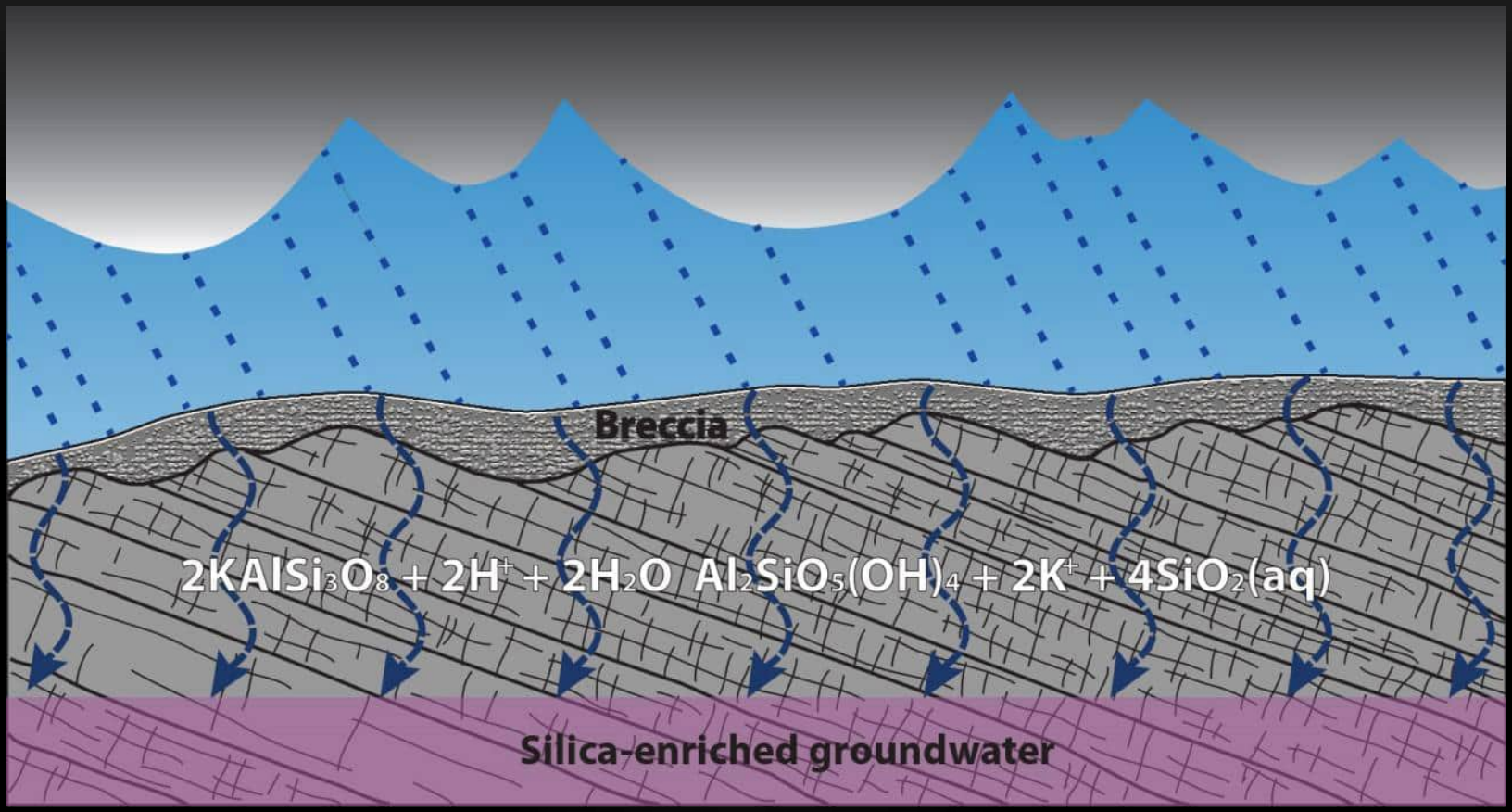
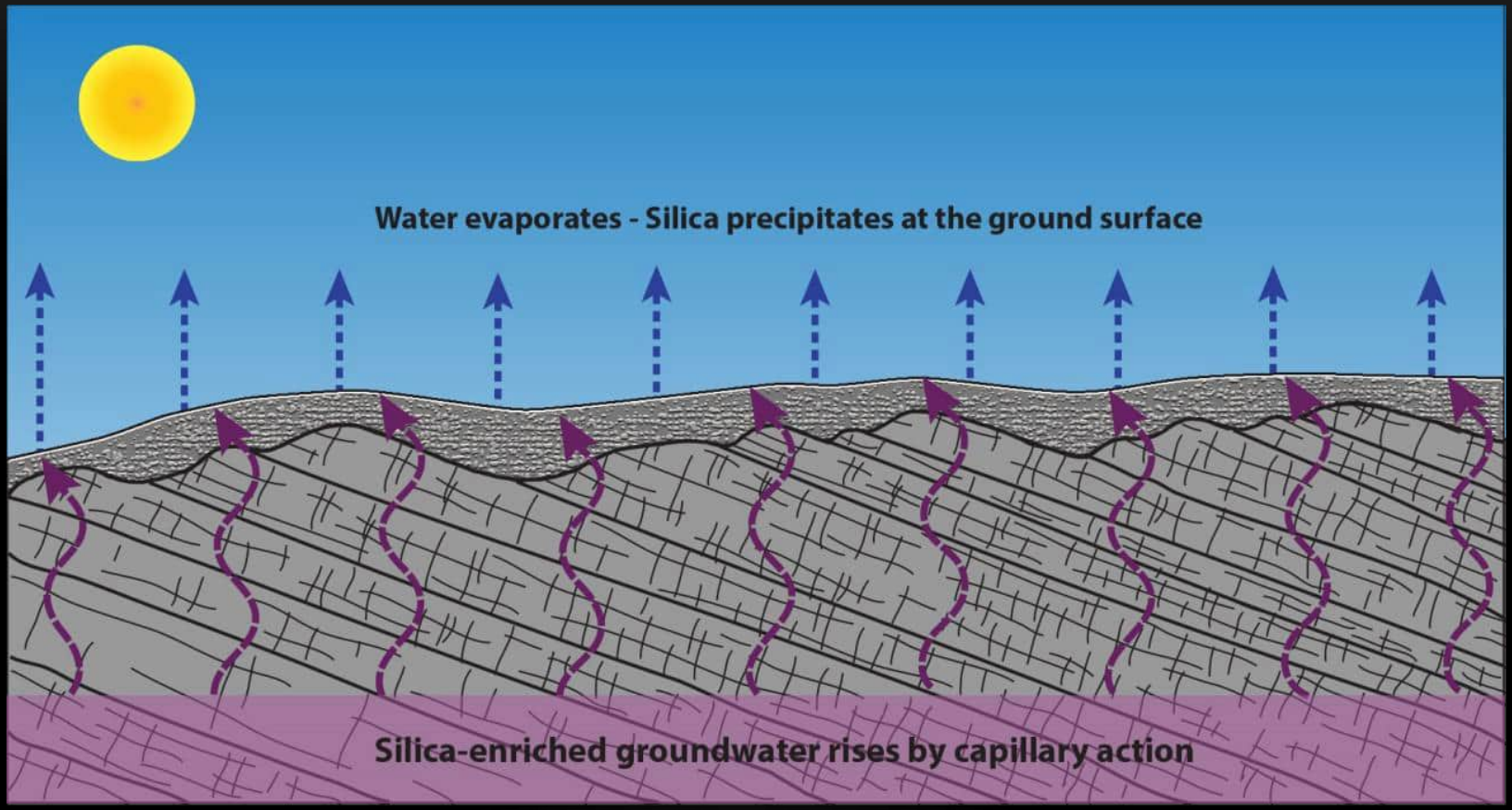
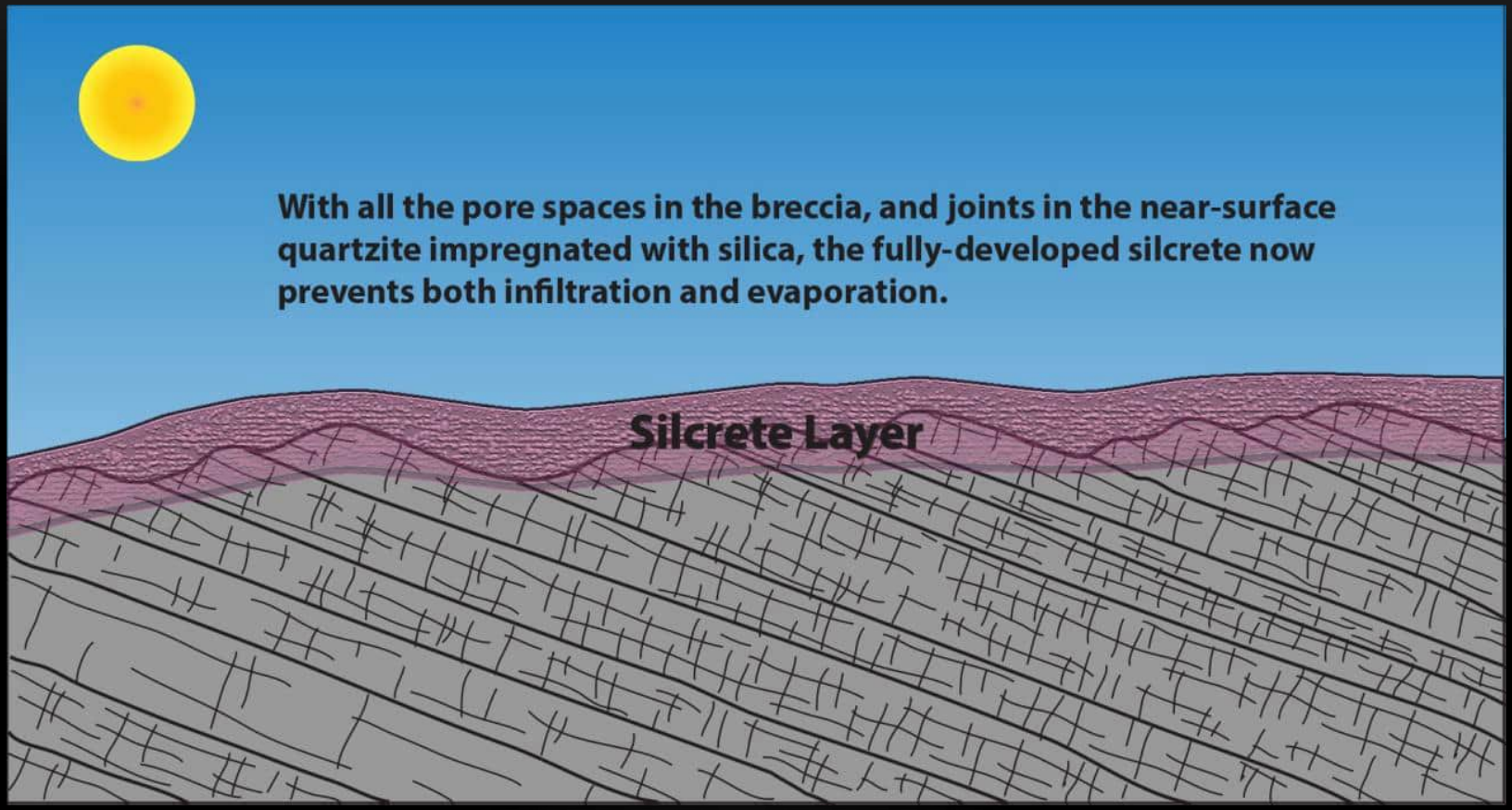

Breccia
$2KAlSi_3O_8 + 2H^+ + 2H_2O \rightarrow Al_2SiO_5(OH)_4 + 2K^+ + 4SiO_2(aq)$
Silica-enriched groundwater

SILCRETE


Water evaporates - Silica precipitates at the ground surface
Silica-enriched groundwater rises by capillary action

SILCRETE

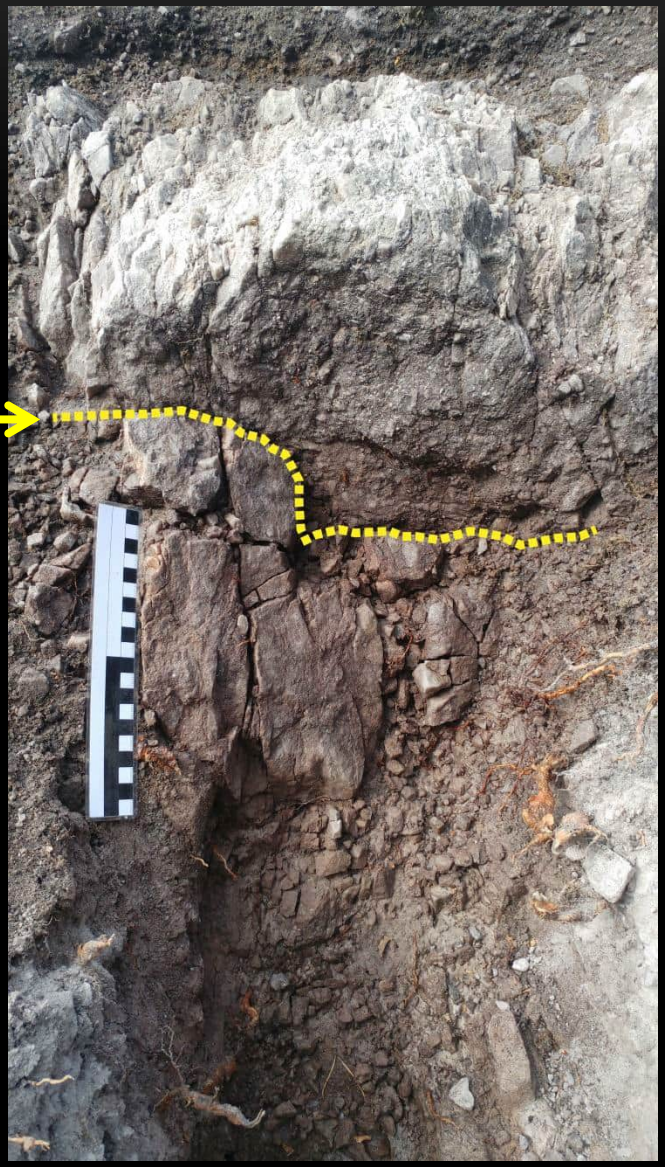

With all the pore spaces in the breccia, and joints in the near-surface quartzite impregnated with silica, the fully-developed silcrete now prevents both infiltration and evaporation.
Silcrete Layer


The Lickey Hills
Rubery Hill
Rednal Hill
Bilberry Hill
Visitor Centre
Cofton Hill
Google Earth
Image © 2022 Maxar Technologies
700 m

REDNAL HILL

REDNAL HILL

REDNAL HILL



FALLEN BLOCKS OF SILCRETE

Rednal Hill - Northern End

Rednal Hill - South West

Bilberry Hill – South West

Cofton Hill – Southern End

REDNAL HILL NORTH
UNCONFORMITY IN SILCRETE BOULDER

COFTON HILL SOUTH UNCONFORMITY IN SILCRETE BOULDER


The Lickey Hills
Rubery Hill
A38
Rednal Hill
Bilberry Hill
Visitor Centre
Cofton Hill
Google Earth
Image © 2022 Maxar Technologies
700 m

IS THE SILCRETE TRIASSIC?

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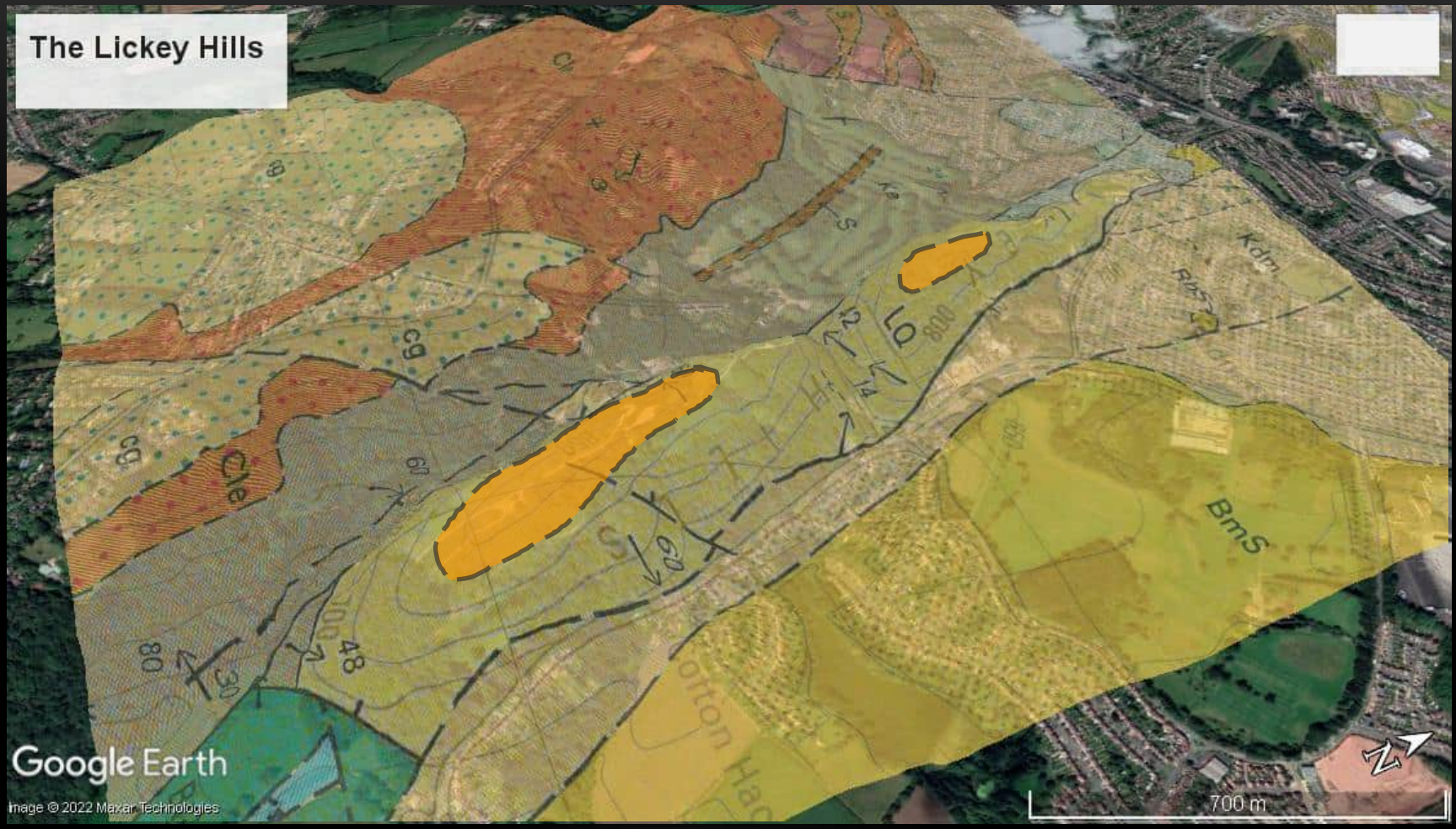
- The BGS has linked the Tessal Lane Breccia to the laterally impersistent Lower Triassic Hopwas Breccia, which is interpreted as having accumulated in topographical lows in the early Triassic landscape. (Powell et al., 2000) Palaeomagnetic studies at several sites, including boreholes at Shenstone suggest a palaeolatitude of about 20^{o} N, consistent with a Triassic age (Johnson, 1995).

The Solid Geology © BGS



The Solid Geology © BGS

KENDAL END QUARRY – FRACTURES

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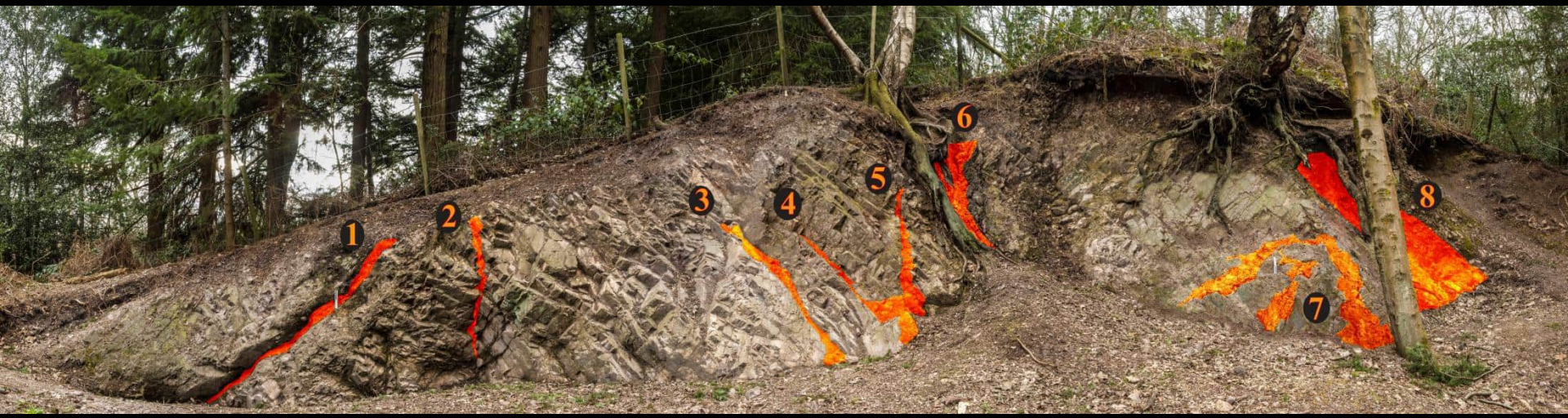

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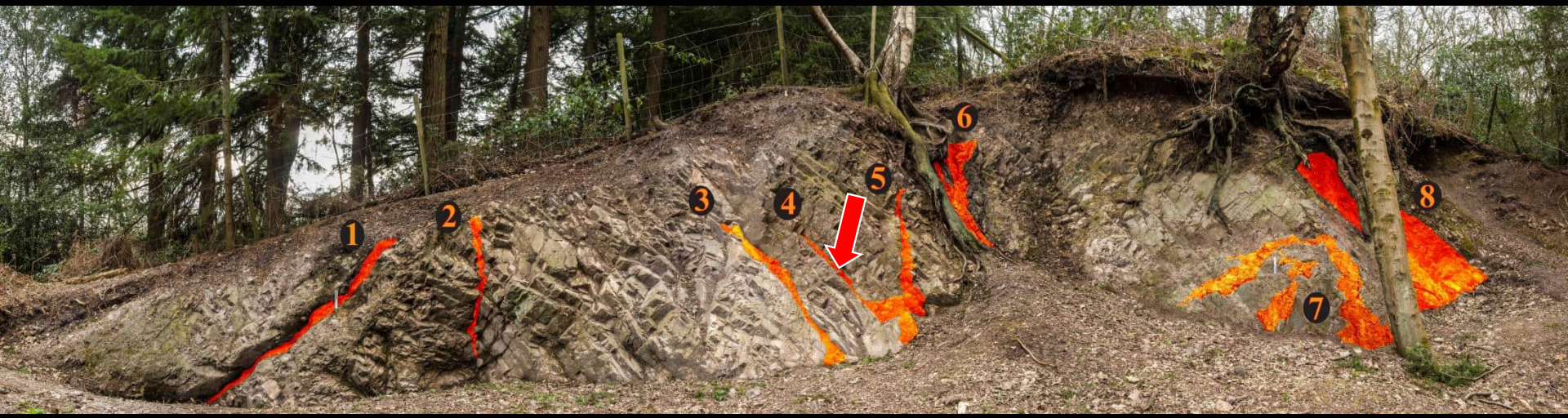
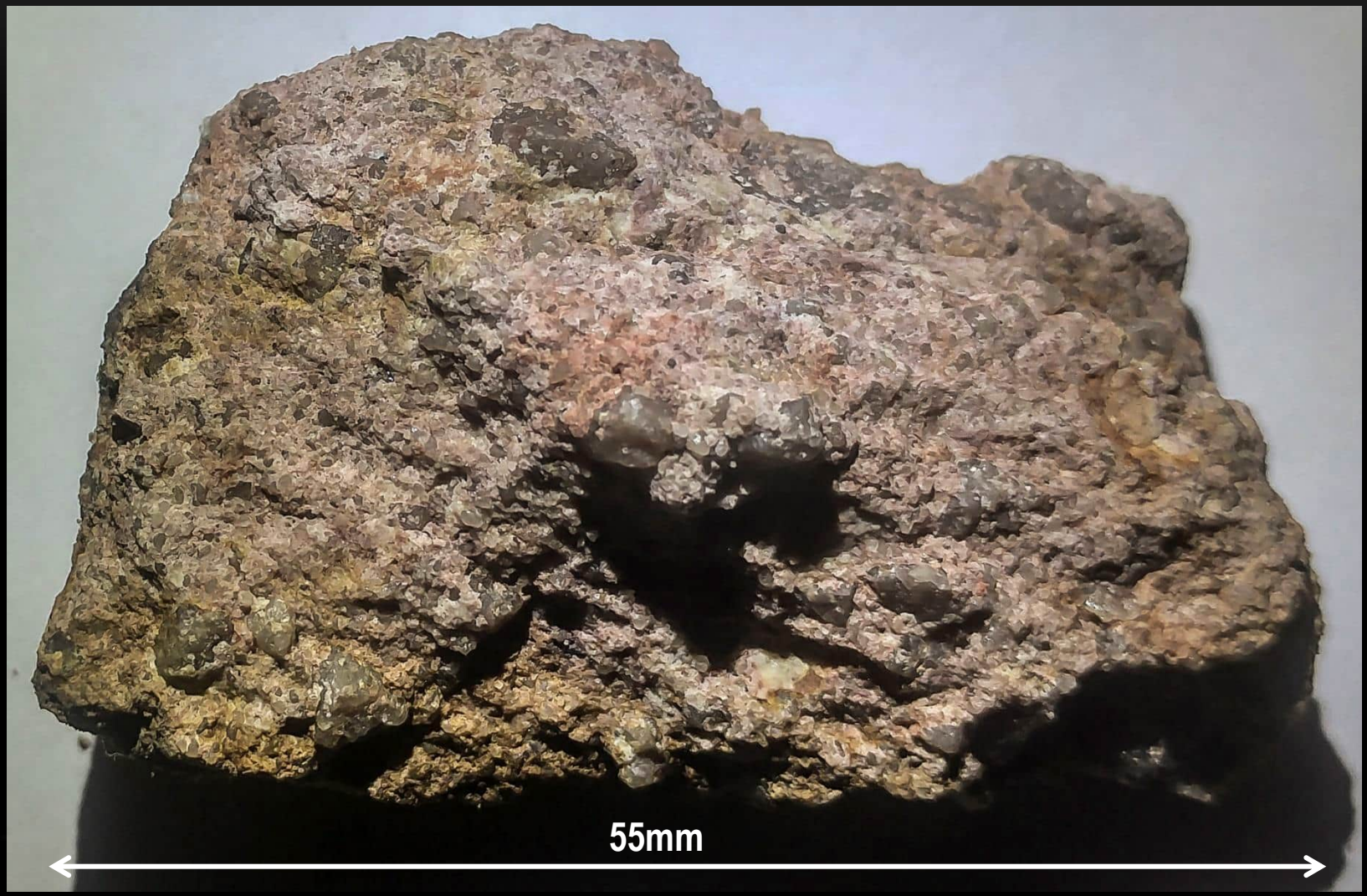


KENDAL END QUARRY – FRACTURE #4



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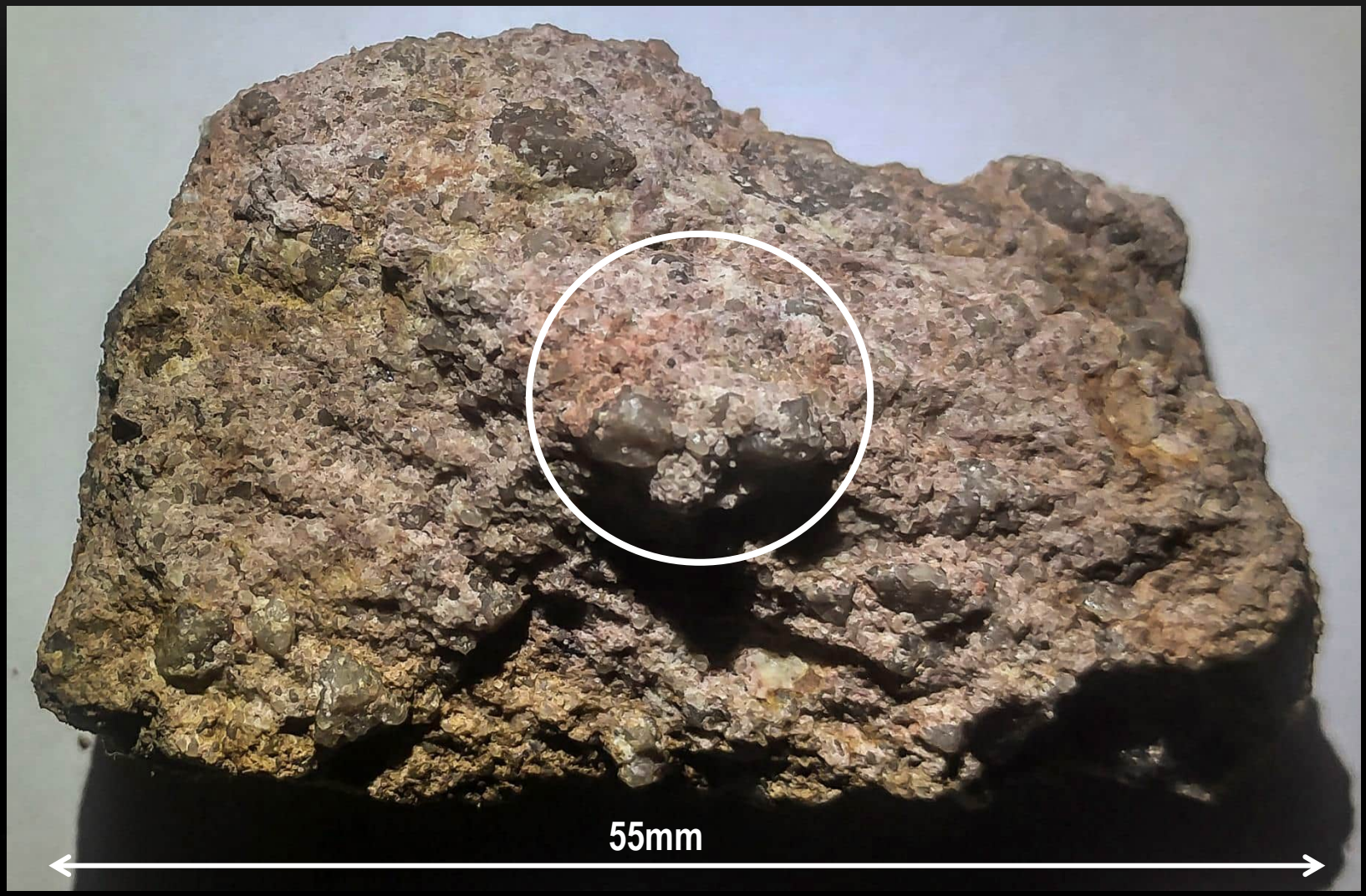

KENDAL END QUARRY – FRACTURE #4

ROSE HILL QUARRY – FRACTURES

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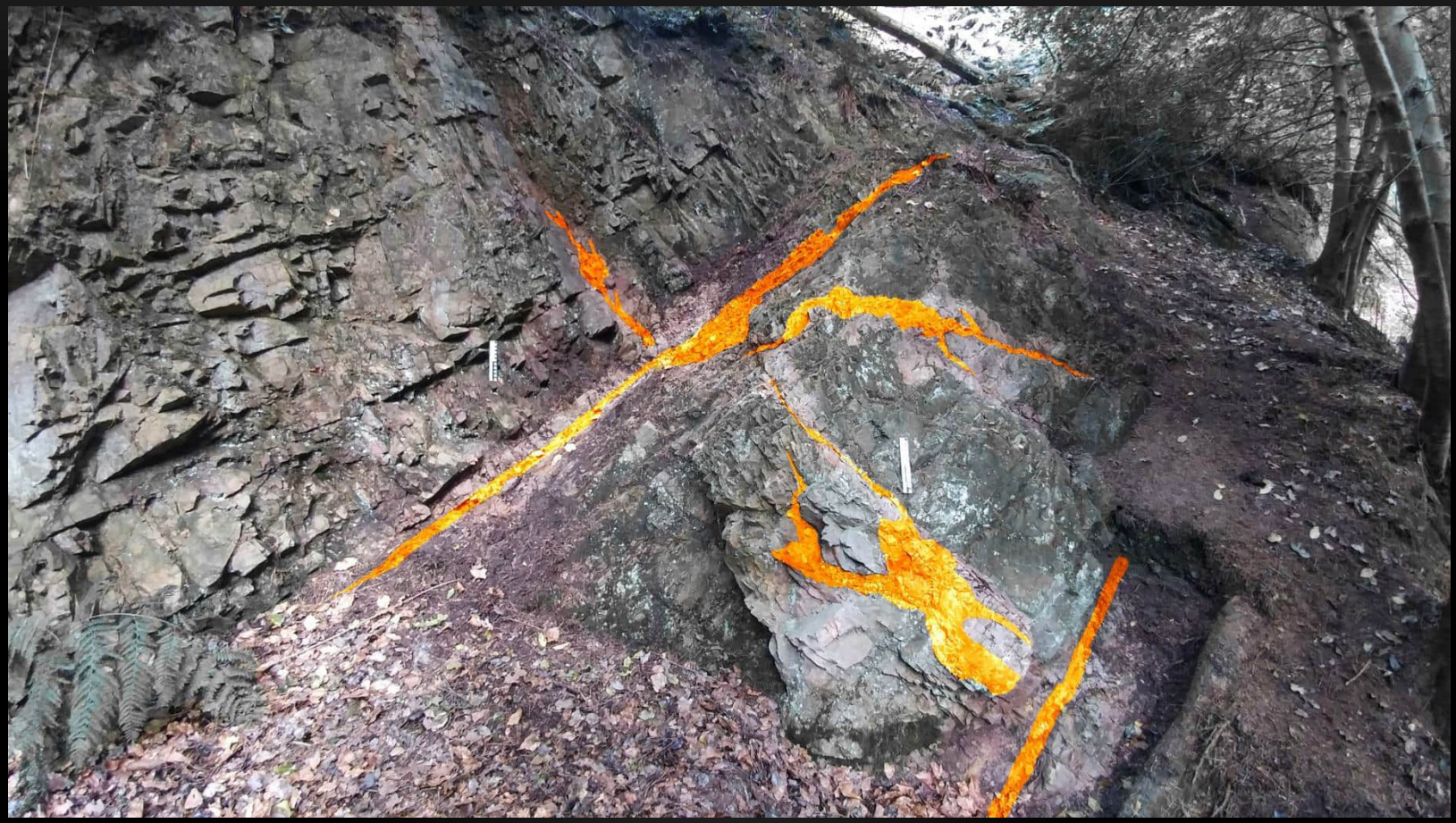

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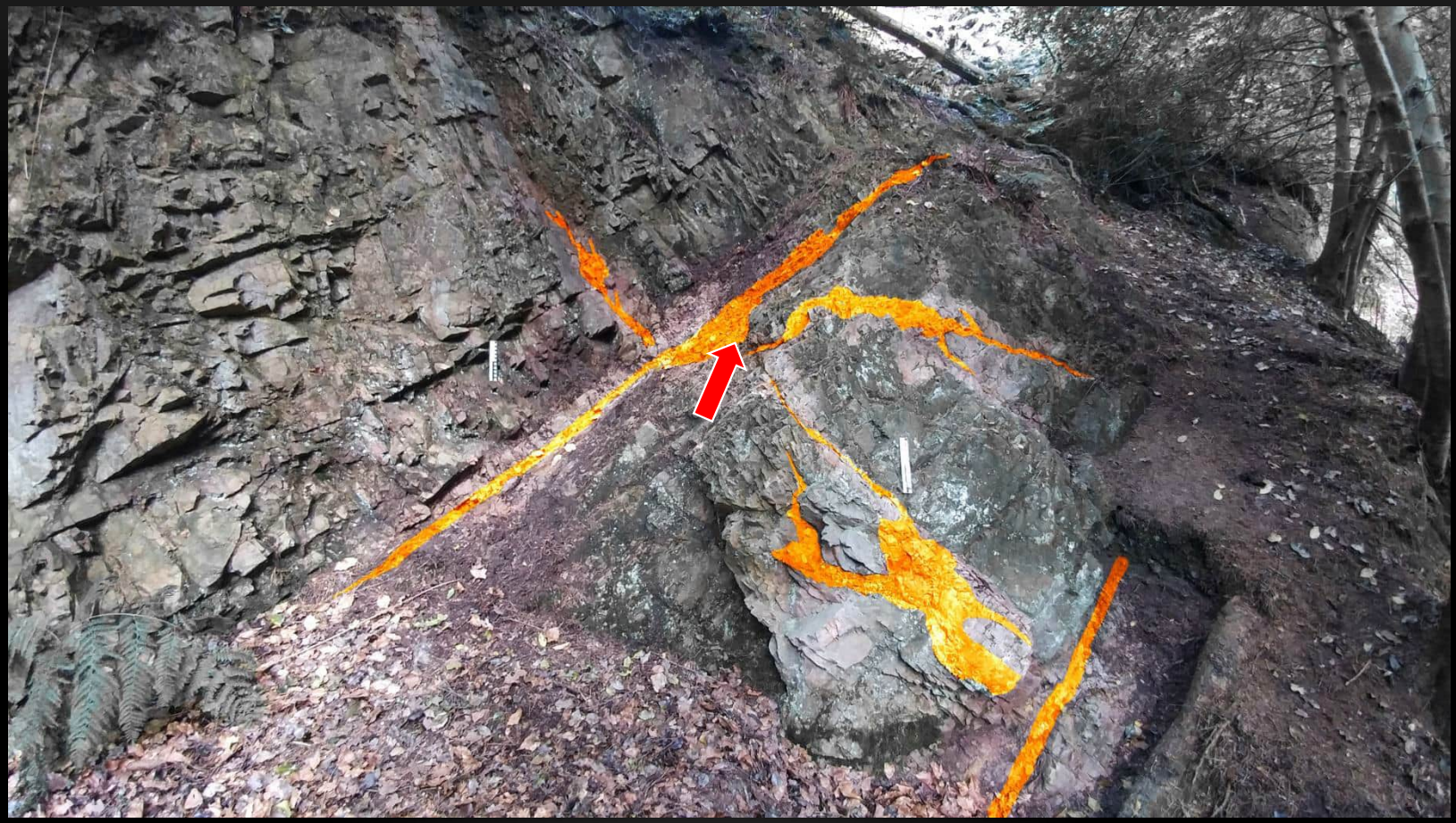

ROSE HILL QUARRY – FRACTURE SAMPLE #8

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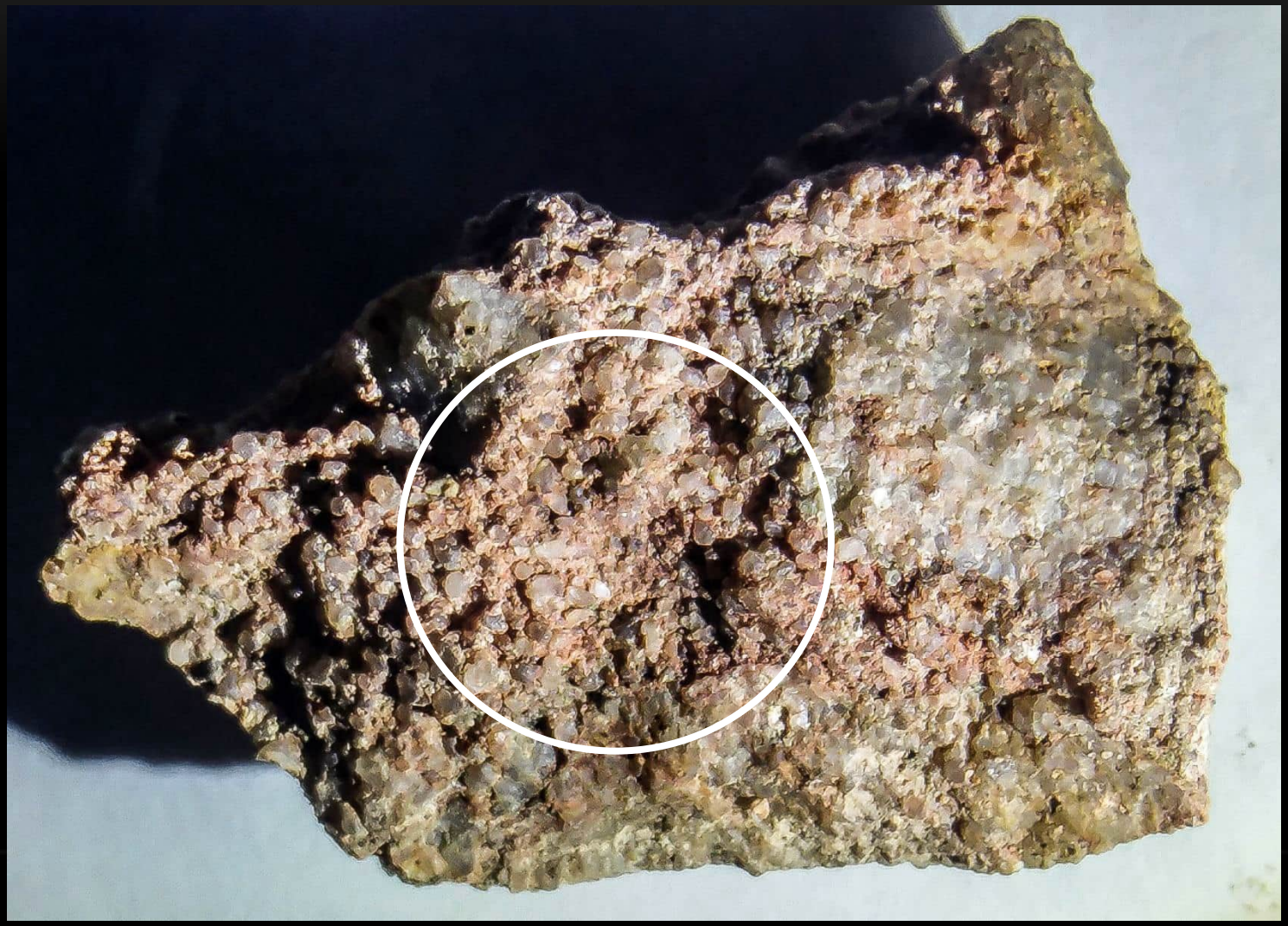

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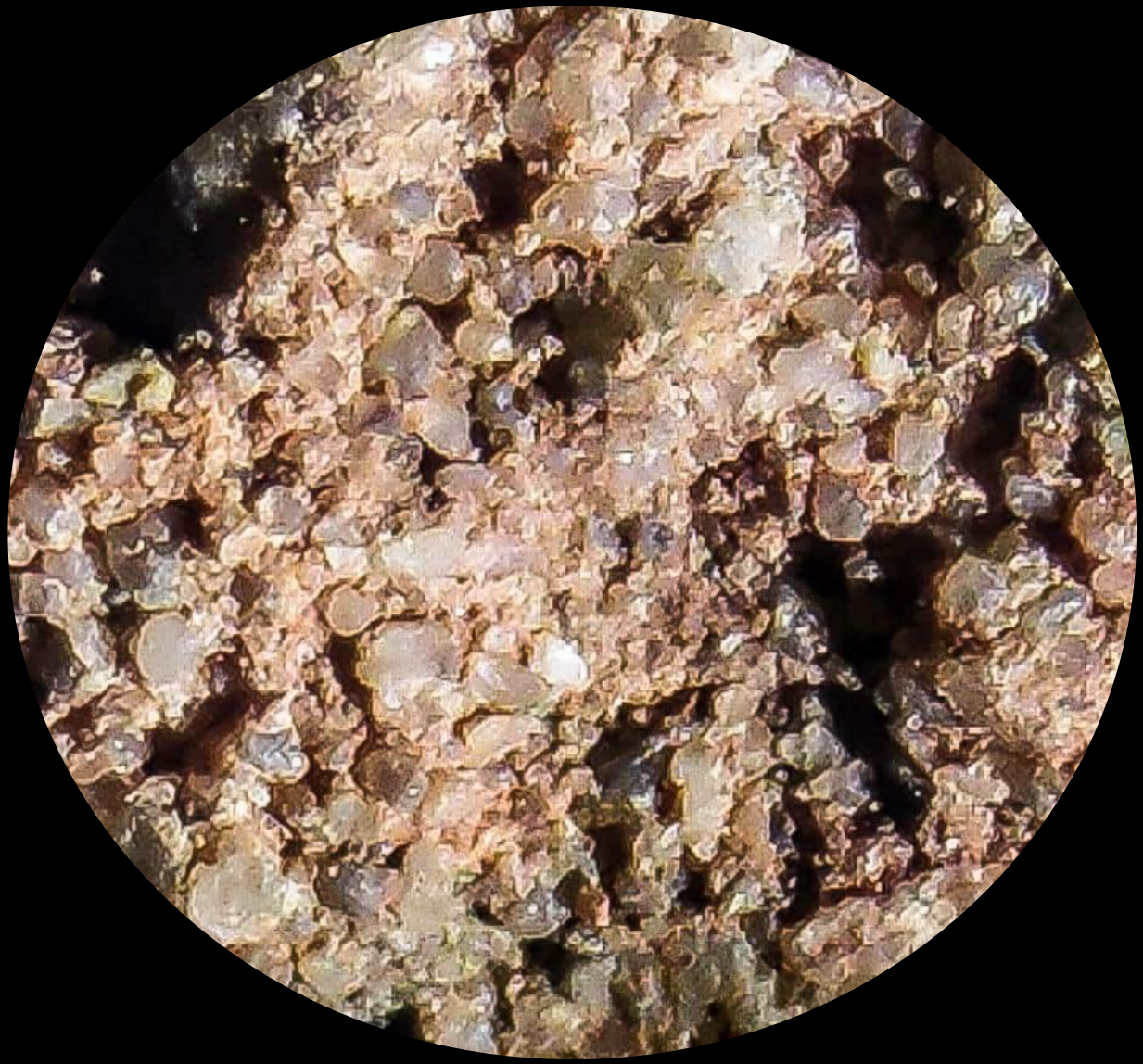
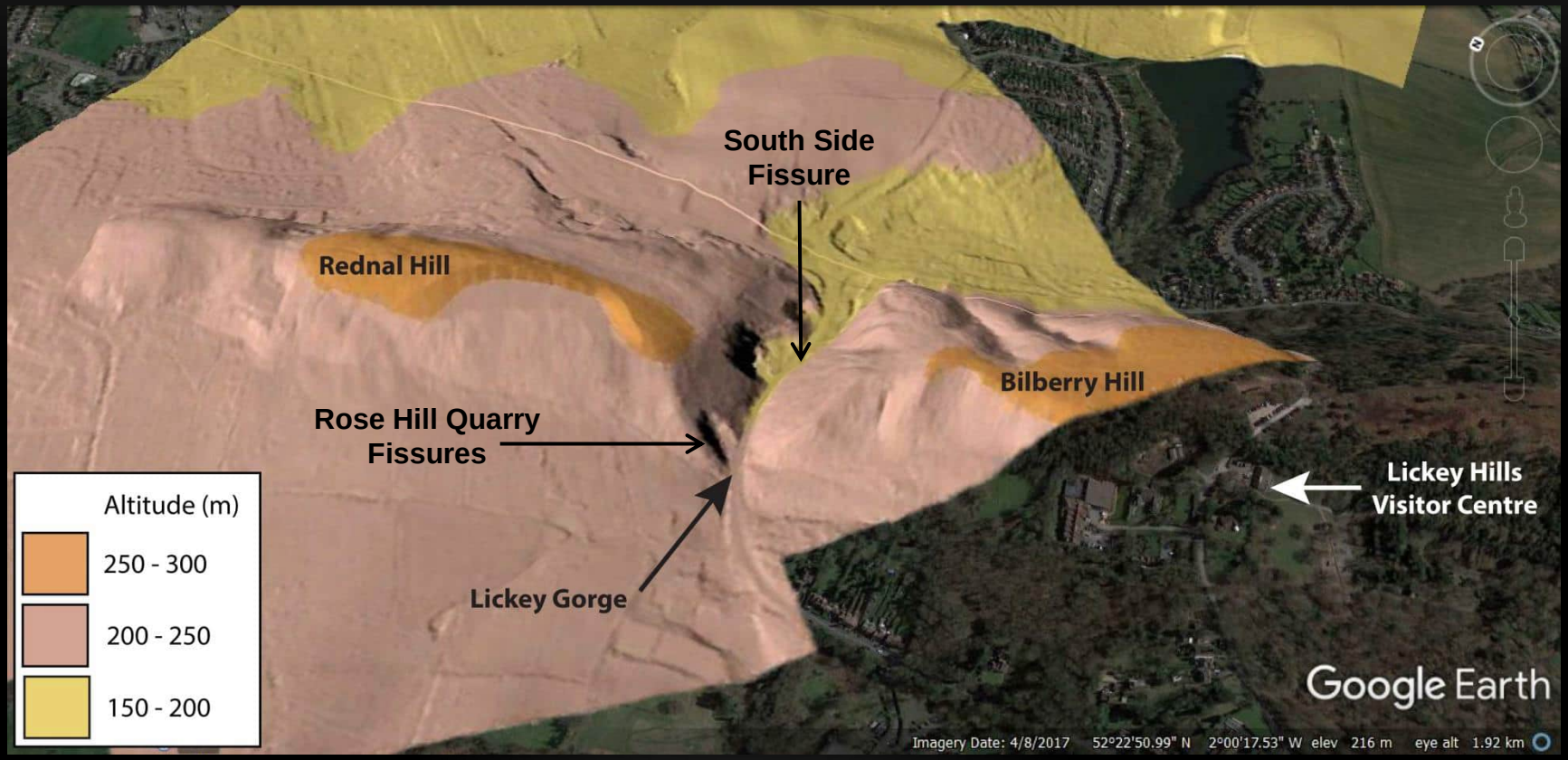


LICKEY (REDNAL) GORGE



LIDAR over Google Earth - Vertical exaggeration x3

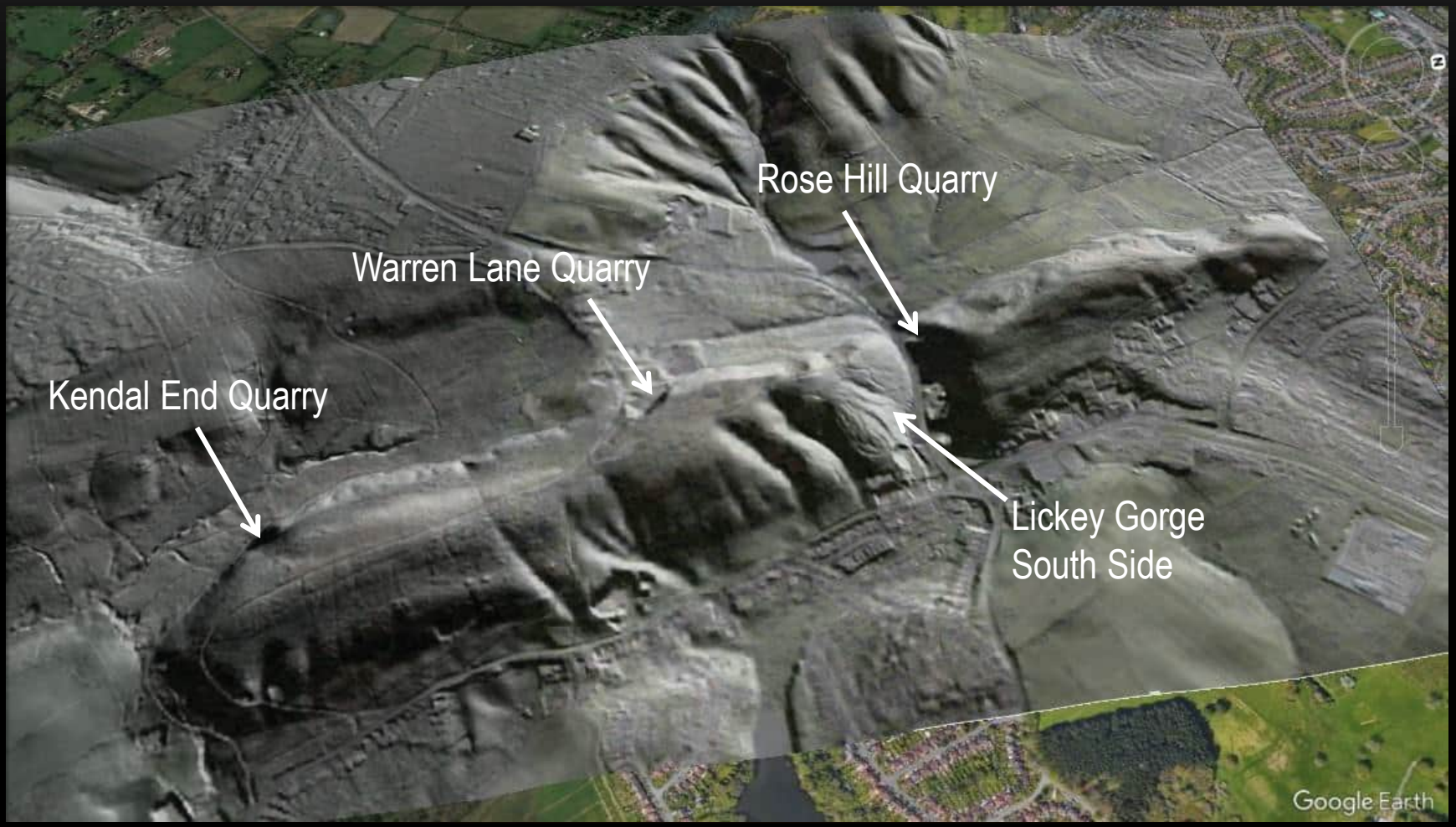
NEW CLIFFE QUARRY, LEICS.

Rocks of the Mercia Mudstone Group fill a palaeovalley in Pre-Cambrian Diorite

LIDAR OVERLAY ON GOOGLE EARTH

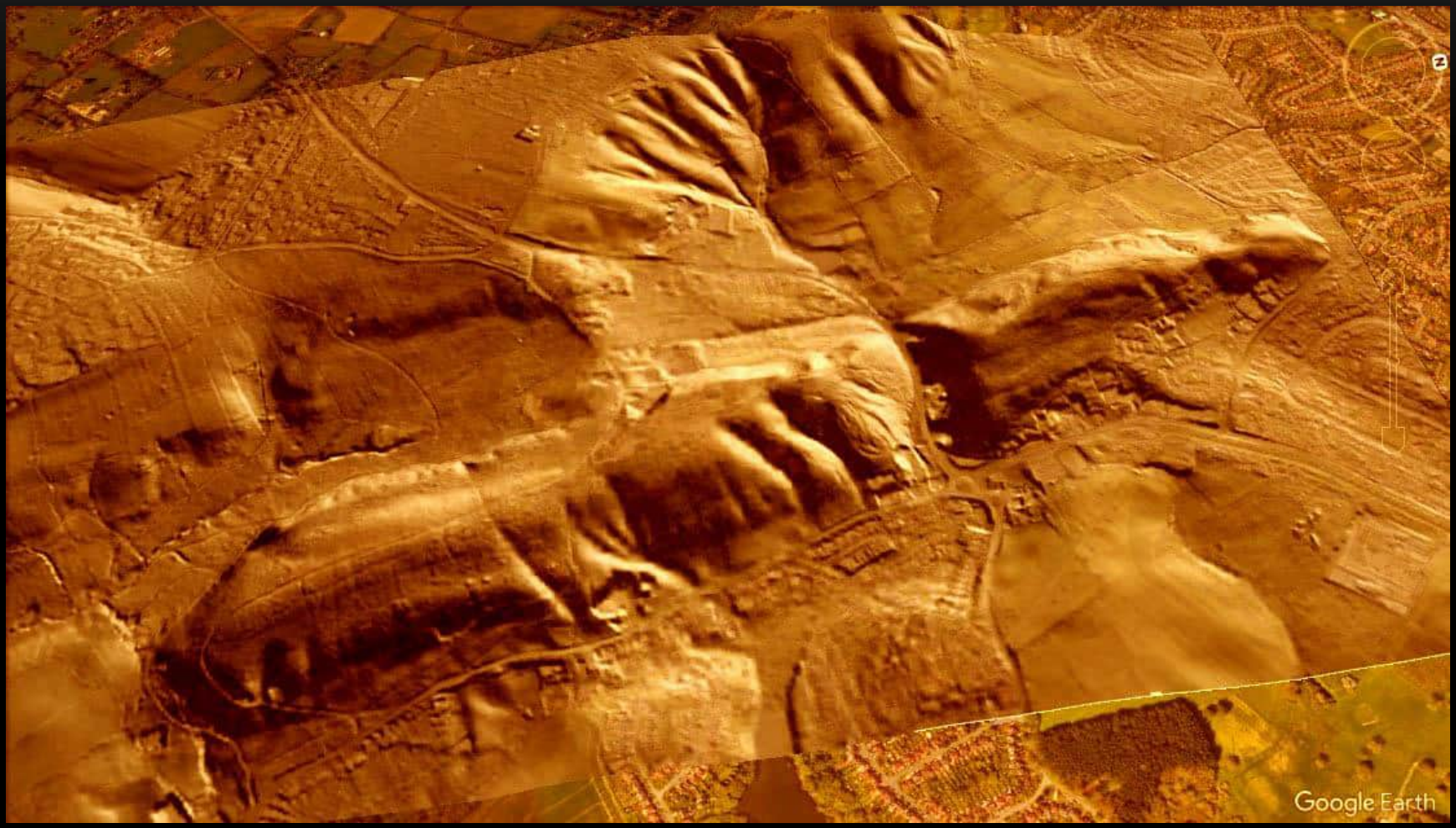
LIDAR over Google Earth - Vertical exaggeration x1.5

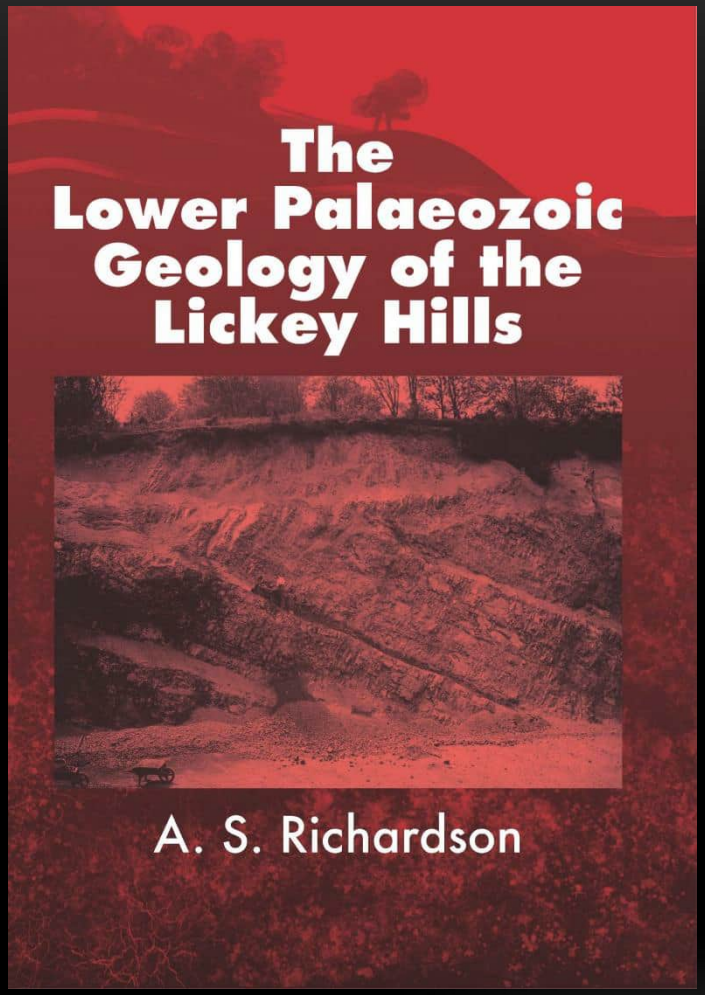
LIDAR OVERLAY ON GOOGLE EARTH



LIDAR over Google Earth - Vertical exaggeration x1.5

A TRIASSIC LANDSCAPE EXHUMED?





- 48 pages
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With thanks to the Herefordshire and Worcestershire Earth Heritage Trust, the Lickey Hills Rangers, and fellow members of the Lickey Hills Geo-Champions.