Local Geological Site Proposal Form

To be submitted to panel meeting convenor

Site Name	Rose Hill Quarries (H&WEHT Ref. No. 1869)	
Grid Reference	SO 998759	
Landowner	Birmingham City Council	
Site Surveyor(s)/Proposer(s)	Alan Richardson	
Boundary Map included?	Yes	
Date proposed	22.02.22	
Panel decision	Date	Decision

(status determined using standard condition monitoring form or NE reports in case of SSSI)

Summary paragraph

The north-south ridge of the Lickey Hills is a unique inlier of Ordovician rocks protruding upwards through the surrounding younger formations. Located in the Lickey (Rednal) Gorge that cuts through the Lickey Hills, the three Rose Hill Quarries expose a number of structural features in the Lickey Quartzite Formation [LQF]. No comparable features have been identified anywhere else in the formation, and they may prove crucial in the interpretation of the geological history of the area.

The east-west trending Lickey Gorge transects the Lickey inlier. The three adjacent quarries, which lie on the northern side of the gorge, were exploited for quartzite to be used as road ballast. The abundance of clay bands in the quartzite suggest that the rocks here are quite low in the LQF sequence, and possibly close in age to those seen in the Barnt Green Road Quarry [BGRQ].

Of great significance is a series of thrust faults identified in the central (main) quarry. Like many structural features in the LQF, these fractures have been tightly constrained by the abundant clay bands separating beds of quartzite. Consequently they are not immediately apparent, but can be identified where a fracture jumps through the quartzite from one clay band to the next, and by brecciation adjacent to the clay. It suggests that, rather than fracturing occurring along a single well-defined plane, movement was accommodated by the rocks behaving more like a pack of cards, with the displacement being dispersed along multiple sub-parallel planes.

In *The Geology of the Lickey Hills*, Prof. W.S. Boulton made the following observation, "Other evidence of overthrusts in the Quartzite can be seen near the base of the large quarry on the north side of Rednal [Lickey] Gorge and about 900 yards south of Eachway Lane. Two adjacent thrusts converging eastwards are here exposed, the upper inclined to the west at 18^{o} and the lower at 25^{o}. Eastward they end rather abruptly against a vertical shatter belt in the quartzite." His sketch of the exposure (see Page 4) illustrates pronounced drag folding. This cannot be seen in the main face of the quarry, and may be buried under the considerable accumulations of quarry spoil at the foot of the face. If so, these two thrusts would be in addition to those currently exposed.

It has been suggested by Nigel Woodcock that the recumbent folding seen in the Barnt Green Road Quarry may be associated with thrust faulting in a California-type strike-slip tectonic

environment. If so, further analysis of the two quarries may identify links that will greatly enhance understanding of the structural evolution of the region.

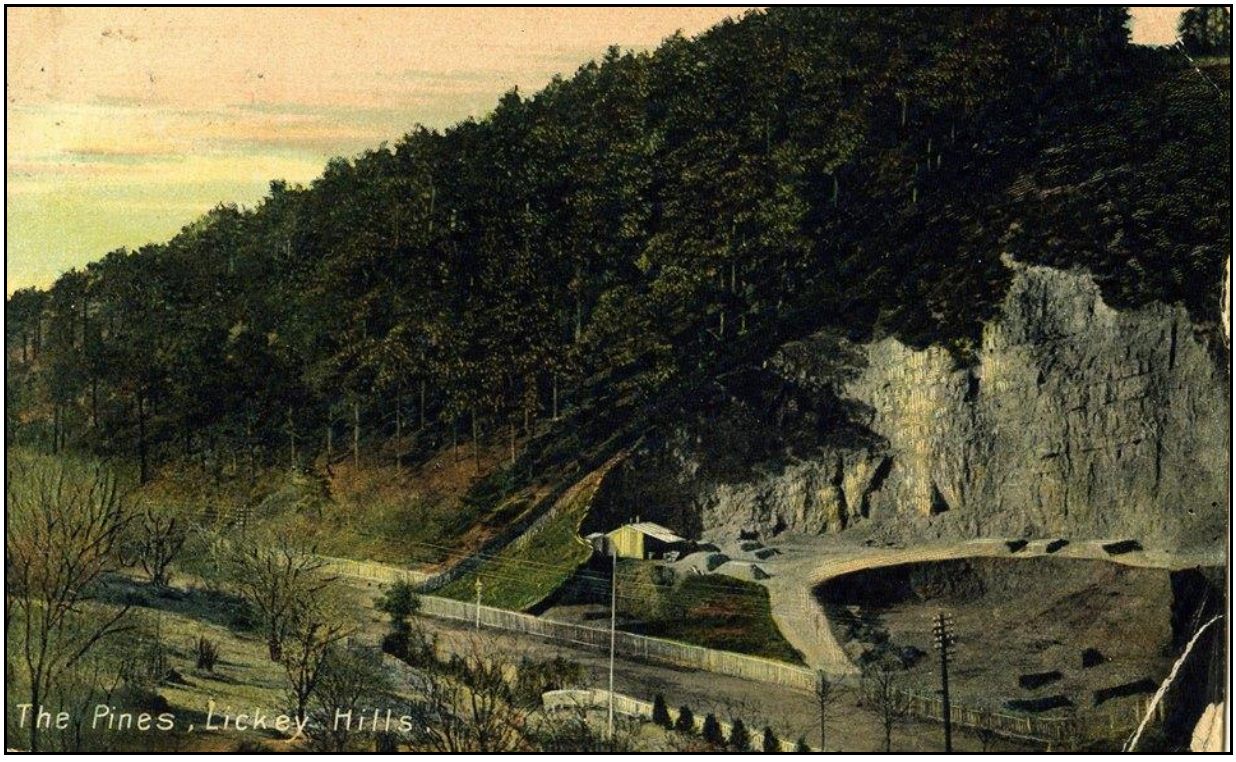
The smaller western quarry exposes two well-defined, sub-parallel, high angle fault planes, as well as at least one other that appears to be of greater age, as it is preserved as a discordant band of breccia, sufficiently well-cemented to weather at the same rate as the adjacent quartzite. An observation platform has been created to facilitate inspection of these features.

Designation Criteria

Scientific
The Rose Hill Quarries display features not exposed anywhere else in the LQF, and may prove crucial in the understanding of the structural evolution of the region.

Educational
Much of the evidence for faulting in these quarries is atypical, and serves to illustrate the diversity of fracturing styles that can develop in a single formation as a result of variations in stress geometry, lithologies and sequence.

Historical
Rock was extracted from these quarries during a period of major improvement of the nation's road network, but ceased production in the late 1920s. They have remained largely undisturbed since that time.

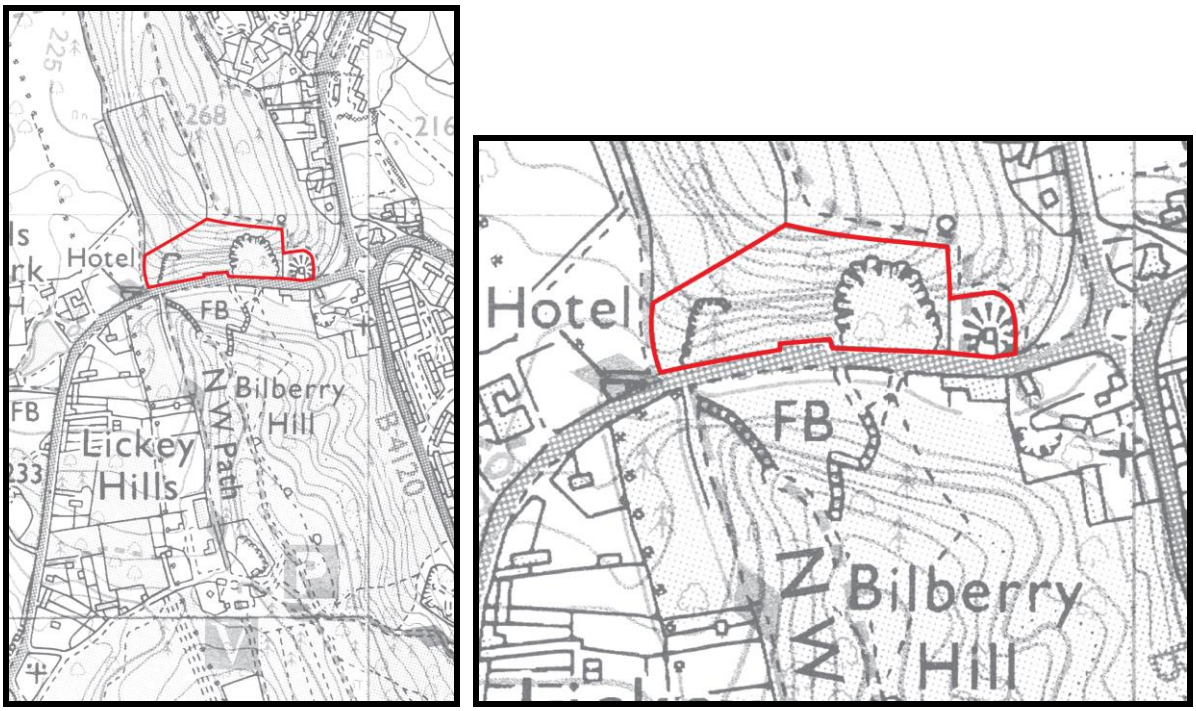


The main Rose Hill Quarry in the early twentieth century

Aesthetic
The towering main face of the central quarry presents a dramatic slice through Rednal Hill. It offers the viewer an insight into the scale of the geology underlying the Lickey Ridge, and an appreciation of the tectonic forces involved in fault movements.

Site Description

a) Boundary map

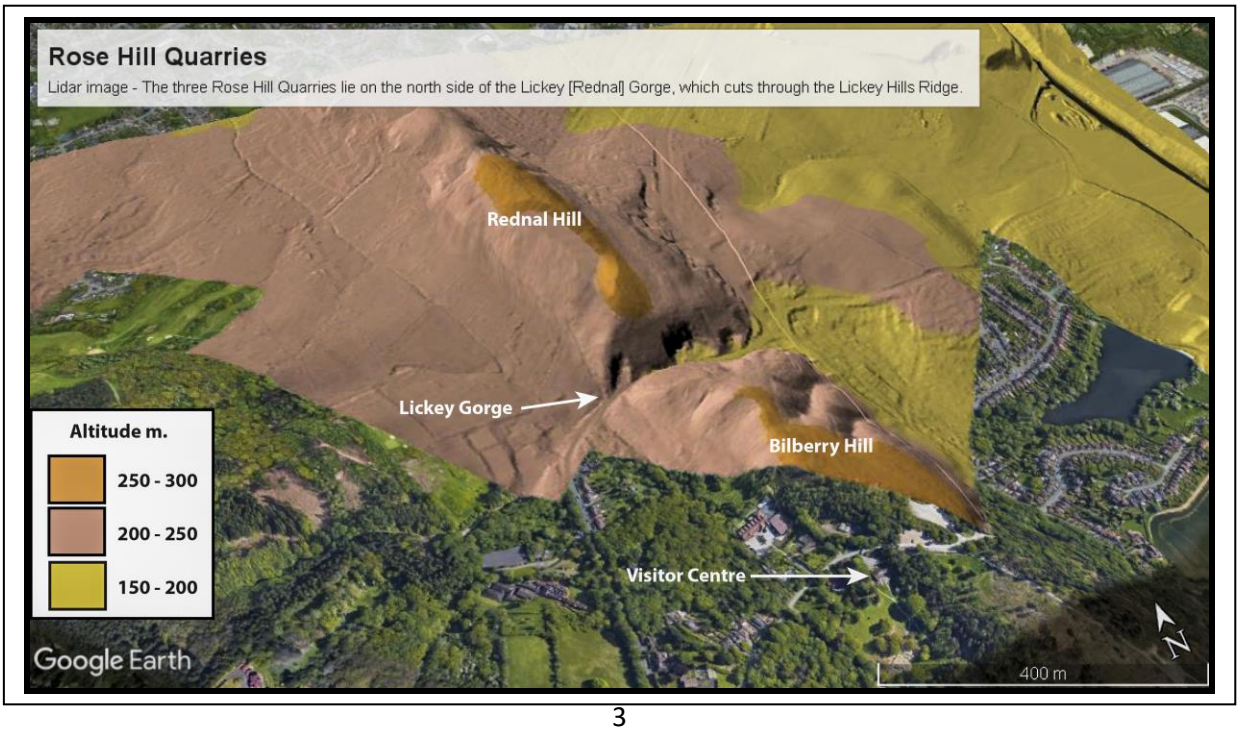


b) Access & Site Management

Access is by arrangement with the Lickey Hills Country Park Rangers who hold the key to the access gate. [lickey.hub@birmingham.gov.uk]. The Quarries lie within the Lickey Hills Country Park which is managed by Birmingham City Council.

c) Nature of site

The site comprises a large central quarry, flanked by two smaller ones, on the southern slope of Rednal Hill in the Lickey Hills Country Park.



d) Geological Units or landscape features present

The main face of the central quarry. The positions of two thrusts are shown: those described by Boulton may be hidden beneath the quarry spoil in the foreground.

The lower of the two thrusts exposed in the main face.

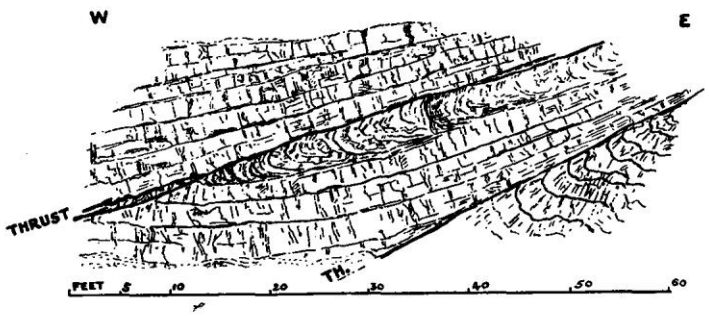
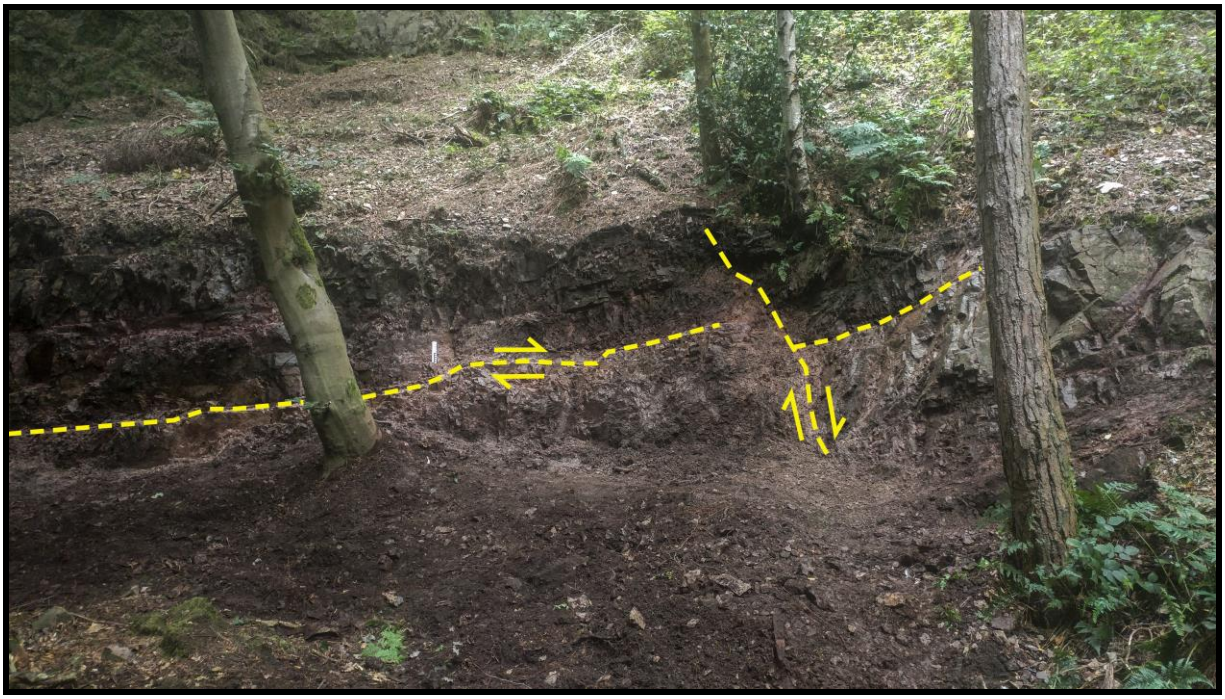


FIG. 5.—Sketch showing two thrust-planes in quartzite at base of quarry, north side of Rednal Gorge.

Boulton's sketch of thrusts in the Rose Hill Quarry showing pronounced drag folding which has yet to be unearthed.

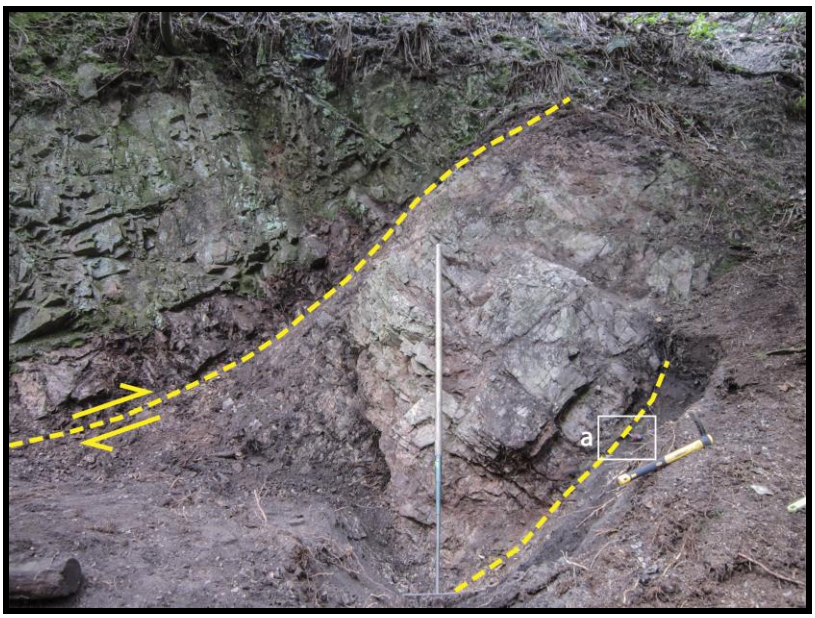


Below the main face of the central quarry, a lower terrace exposes one of the thrusts in the Lickey Quartzite Formation, which is offset by a minor normal fault. This allows inspection of the structure at a safe distance from the main quarry face.

The thrust can be seen to follow a clay band occasionally cutting up through quartzite to follow another clay horizon at a higher level. Fragments of brecciated quartzite incorporated into the clay provide evidence of movement.

On the west face of the western quarry, a viewing platform has been created to provide access to the fault structures. A fault plane can be seen dipping downwards from right to left.

The photographs below show two faults viewed from the platform. The rectangle 'a' shows the area of enlargement. Patches of breccia on the exposure are yet to be interpreted.



e) How this site complements existing sites

The quarries expose Ordovician Lickey Quartzite Formation arenites and clays. The abundance of clay bands suggests that the rocks here are quite low in the LQF sequence. The thrusting may be associated with the folding in the BGRQ.

Site Condition

Satisfactory, improving: general views of the main face are obscured by mature trees – there has been discussion about thinning them out. The efforts of the Lickey Hills Geo-Champions, in association with the Country Park Rangers, continue to reveal new structures by the removal of undergrowth and rock debris. A route has been established to join the central and western quarries, and a viewing platform has been created at the latter.

Why is the site at least regionally important?

Appreciation of nature	The central quarry in particular is an impressive sight, offering an appreciation of the scale of geological features.
Connectivity with landscape	The central quarry provides the largest exposure in Rednal Hill, and offers the greatest insight into the nature of the rock that underlies the Lickey Ridge, which gives it such prominence over the surrounding, lower-lying, younger rocks.
Diversity	The Ordovician Lickey Quartzite Formation is only exposed in the Lickey Hills and therefore makes a unique contribution to the variety of geology to be seen in the county. This site is the only one in the LQF in which evidence of thrust faulting has been identified, and will be critical in any future structural interpretation.
Education	The site is regularly maintained by the Lickey Hills Geo-Champions.There was concern over groups examining structures at the base of the main face, so a safer low-level exposure has been cleared to allow study in a low-risk situation.
Historical associations	The site is described in *The Geology of the Lickey Hills*, by Professor W. S. Boulton.
Naturalness	The episode of thrust faulting may relate to the recumbent folding in the Barnt Green Road Quarry, and may offer insights into Lower Palaeozoic tectonics.
Rarity	The thrust faulting is very unusual inasmuch as it has been strongly influenced by the ductile clay bands that have facilitated movement.
Typicalness	Lithology and sequence exercising control of deformation structures is one of the characteristics of the Lickey Quartzite Formation.
Cultural associations	The Rose Hill Quarries were three of the Lickey quartzite quarries which were once prominent features of the local industrial landscape. They provided road stone in the early 20th century, but were abandoned in the 1920s.
Fragility	The site is threatened by vegetation, and requires the continued efforts of the Lickey Hills Geo-Champions, alongside the Country Park Rangers, to maintain visibility and accessibility.

References

- Old, R. A. (1991) Redditch. Memoir for Sheet E183; BGS
- Boulton, W. S. (c.1927) The Geology of the Lickey Hills; pp255 – 266 ‘The Geology of the Northern part of the Lickey Hills, near Birmingham’
- Hardie, W. G., Bennison, G. M., Garrett, P. A., Lawson, G. A., Shotton, F. W. (1971)
- Geologists’ Association Guides No.1 The Area Around Birmingham; pp 12 – 15. Geologists’ Association
- https://ehtchampions.org.uk/ch/wpcontent/uploads/pdfs/Lickey_Hills_booklet.pdf Richardson, A. S. (2019) The Lower Palaeozoic Geology of the Lickey Hills. Richardson
- BGS, Geology of Britain Viewer; https://mapapps.bgs.ac.uk/geologyofbritain/home.html
- BGS, Lexicon of Named Rock Units; https://www.bgs.ac.uk/lexicon/lexicon.cfm?pub=LQ