

5.4 Knowle Hill Quarry

Highlights • Quarry faces in Permian lamprophyric lava

Geographical Coordinates 50°48'24.4"N, 3°43'13.0"W

OS Grid Reference SS 7888 0221

Access Disused quarry with steep faces and much overgrown, also partly infilled with waste. This site is on private land, and arrangements to visit must be made with the landowner. A track leads from the metalled road into the quarry entrance, with steep and uneven paths leading 25m (82 ft) down to the quarry floor. New excavations have taken place in the upper part of the quarry, accessed by continuing along the track around the rim of the quarry. The new faces are at the easternmost extremity of the working, with much loose rock on the floor and sides of the excavation. In summer, the vegetation in the quarry is high: there is a particular risk of tick bites and the associated risk of contracting Lyme Disease. It is sensible to avoid wearing shorts at this locality and to make use of suitable insect repellents.

Distance to walk: 0.37 miles (0.6 km)

Elevation changes: 30 m (98 ft)

Time: 1 hour

Conservation status None

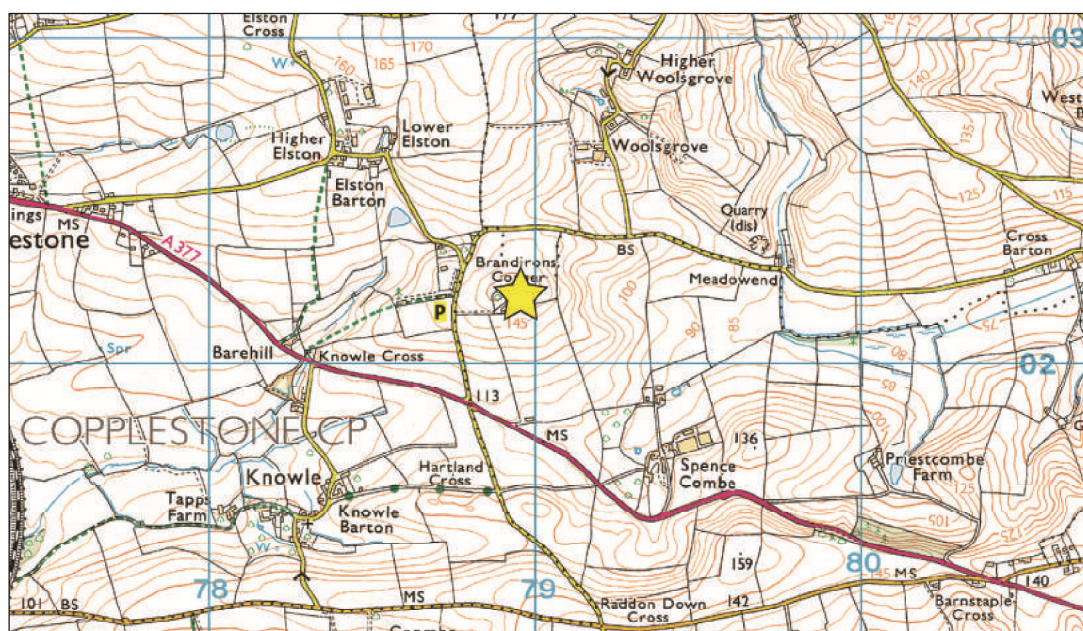


Figure. 5.8 Location map for Knowle Hill Quarry. © Crown Copyright/database right 2014. An Ordnance Survey / EDINA supplied service.

Directions

Leave Crediton on the A377 and travel towards Copplestone for 3 miles (5km) to the crossroads at Quarryfoot Cross. Turn left here into the minor road signed Woolsgrove and drive for 0.19 miles (0.3 km). Private parking is available in the farmyard (arrangements necessary). Leaving the farmyard back to the lane, take the track opposite leading up to the quarry at the summit of Knowle Hill.

Geology

This quarry was described in detail in Ussher (1902), when it showed faces up to 30m (100 ft) high in rocks 'having close affinity with minette'. The rocks were described as being vesicular, and in part, scoriaceous in the upper levels of the quarry, but more massive below. At the present day, the quarry is overgrown and partly backfilled (Figure 5.9a), but there are several exposures, mostly of the more massive type of material, which is fine-grained and composed of feldspar, biotite and olivine, the last mostly showing alteration to

'iddingsite' (Figure 5.9b). Secondary carbonate is abundant in most specimens and the feldspars are, in part, altered to clay. On the northern face of the quarry is a section in rock strongly replaced by carbonates, with numerous calcite stringers throughout (Figure 5.9c). In Edwards and Scrivener (1999) the rocks from Knowle Hill Quarry are described as olivine-biotite lamprophyre and olivine microsyenite.

A BGS report by Fortey (1991) gives a petrographical description of the Knowle Hill rock as follows: "The Knowle Hill rock is a strongly alkaline medium-grained variety in which abundant phenocrysts of unaltered biotite are by numerous iddingsitic pseudomorphs after olivine and possibly pyroxene". According to Knill (1969) the rock also contains pale green phenocrysts of pale green-brown diopside, much altered to calcite. Apatite, magnetite and basic plagioclase are also reported. The groundmass consists of allotriomorphic orthoclase grains accompanied by accessory quartz and possible analcime or altered nepheline. Minute plagioclase laths form an accessory constituent embedded within the K-feldspar crystals. SEM examination shows that kaolinitic clay material forms minute pockets within pores between the feldspar crystals'.

Recent excavations at the eastern rim of the quarry (Figure 5.9d.) expose up to 6m (20 ft) of purplish brown rock composed of K-feldspar with iddingsite pseudomorphs after olivine and biotite. Vesicles are present in places, and there are numerous ovoid inclusions, up to 50 mm across, some filled with manganese oxide minerals others with quartz or chalcedony. Joints in the lava are filled with iron oxide minerals, manganese oxide minerals and clay. The presence of 'mountain leather' recorded by Ussher (1902) at this end of the quarry has not been substantiated.

An Ar-Ar plateau age of 281.8 \pm 0.8 Ma was obtained for biotite from lamprophyre at Knowle Hill Quarry (Edwards and Scrivener, 1999). This age is similar to that quoted elsewhere for the Dartmoor Granite (280 Ma), but is considerably younger than that 290.8 \pm 0.8, Ma, given for the Killerton minette lava, in a similar stratigraphical position in the Exe Valley. The more altered state of the Knowle Hill lamprophyre compared with that at Killerton could suggest that the younger age of the former is the result of argon loss.

The field relations of the Knowle Hill lamprophyre are, to some extent, obscured by the present overgrown state of the quarry. At one section, on the upper face of the western

side of the workings red sandstone (Knowle Sandstone) can be seen overlying weathered and scoriaceous lava, but there is no evidence of the nature of the lower contact of the lamprophyre. To the east, at Meadowend and at West Sandford, the Knowle Sandstone overlying the lamprophyre outcrops includes distinct ash layers, which attest to the extrusive nature of the igneous rocks.

Literature

- Edwards, R. A. & Scrivener, R. C. 1999. The geology of the country around Exeter. Memoir of the British Geological Survey, Sheet 325 (England and Wales).
- Fortey, N.J. 1991 The Exeter Volcanic Rocks: petrology and mineralogy, British Geological Survey Technical Report WG/91/35
- Ussher, W A E. 1902. The geology of the country around Exeter. Memoir of the Geological Survey of Great Britain, Sheet 325.

Figures



Figure 5.9 (a) General view of Knowle Hill Quarry from the pit floor. (b) Detail of lamprophyre: note red iddingsite pseudomorphs after olivine, vesicles and flow structure parallel with long axis of vesicles, also Mn oxide minerals on upper part of surface. (c) Lamprophyre from northern face of quarry, with much carbonate replacement and numerous calcite stringers. (d) Recent excavations at eastern rim of the quarry exposing fresh rock: note Devon weather conditions!