ELC_20: Kidlaw Quarry

Site information

Location and summary description:

The site comprises a disused quarry just to the north-west of Kidlaw Farm, 5 km south-west of Gifford. The site exposes basanite, an extrusive basaltic rock composed chiefly of plagioclase, olivine and augite. The Kidlaw Plug belongs to the Scottish Carboniferous to Early Permian Plugs and Vents

Suite.

National Grid reference:

Mid-point: [NT 50689 64322]

Site type: Artificial quarry works

Site ownership: Kidlaw Farm

Current use: Disused quarry adjacent to pastoral land.

Field surveyors: Rachael Ellen and Eileen Callaghan

Current geological designations: None

Date visited: 10th June 2014

Other designations: None

Site map

(Figure 25) Kidlaw Quarry Location Map. The site boundary has been drawn to include the rock exposures within the quarry, and related access and viewpoints (geologically significant site areas). The site boundary for the Kidlaw Erratic (ELC_22) to the east is included for reference (shaded area).

Site description

Background

The quarry was opened between 1855 and 1895, and was worked until at least the 1920's for road- metal; it was once regarded as one of the better sources of road-metal in East Lothian (Ewing, 1913). The analcime-basanite exposed in the quarry was originally thought to be a sill intruding into the country rock by Clough et. al. in 1910. However, a fresh phase of quarrying in the 1920's exposed a vertical contact between tuff and basanite leading Simpson (1928) to suggest that it was in fact a volcanic plug.

Today the quarry is accessed via a muddy grass path from a gate at the junction of two roads to the west of Kidlaw Farm (ELC_20_P1). The quarry floor is overgrown by vegetation, and is uneven due to agricultural and other rubbish dumped in the pit (ELC_20_P2). The south-eastern face of the quarry is completely covered by a rubbish tip.

Volcanic rocks

The main quarry face to the north is approximately 5 metres high, composed of a dark grey, fine- grained basanite (a silica poor, alkali rich form of basalt, associated with continental rift magmatism) displaying roughly columnar cooling joints (ELC_20_P3). The basanite is occasionally porphyritic, containing phenocrysts of olivine, augite (ELC_20_P4) and plagioclase. The groundmass contains alkali feldspars with analcime, which have been weathered out and account for the speckled nature of some of the weathered surfaces in the quarry (ELC_20_P5). The basanite also contains ultra-basic nodules (0.5 – 2 cm in diameter), which are interpreted as altered spinel lherzolites. The ultra-basic rocks are rich in elements such as magnesium and iron, which have been altered through hydrothermal processes (ELC_20_P6). The basanite also contains clasts of biotite granites, which are believed to be related to a Devonian age granite intrusion 500 m to the ESE of the quarry (ELC_20_P7). Agates are known to have been collected from the quarry in the past. A number of the joints running throughout the basanite are mineralized, some displaying excellent examples of quartz prisms (ELC_20_P8).

A fissile, grey – brown tuff and breccia dyke is intruded in the basanite to the west of the quarry. The dyke, and basanite adjacent to the dyke, is well jointed and mineralized. The mineral veins form impressive cross-cutting relationships (ELC_20_P9), and multiple phases of mineralisation (clay and carbonate minerals) can be identified (ELC_20_P10).

N.B. The East Lothian Guide Book mentions that small outcrops of reddish tuff can be seen upon entering the quarry – however, at time of visit, the tuff is no longer visible due to the area being overgrown and covered by tipped waste.

Access and additional information

Access to the site is by a gate at the junction of two minor roads to the west of Kidlaw Farm [NT 50710 64203]. Parking is possible at Kidlaw Farm with permission from the farmer. The quarry is accessed track which leads to the quarry. The quarry face is accessible and relatively stable but due care should be taken when working beneath quarry faces. The ground of the quarry is uneven due to the presence of tipped waste.

N.B. The Kidlaw Erratic (ELC_22) lies 170 m to the east of this site.

Stratigraphy and rock types

Age: Carboniferous

Formation: Kidlaw Plug — Scottish Late Carboniferous to early Permian Plugs and Vent Suite

Rock type: Basanite

Assessment of site: access and safety

Road access and parking Good access and parking for the quarry with the farmer’s permission.

Safety of access Rough uneven ground within the quarry. Caution if cattle are in the field.

Safety of exposure Care should be taken as in all quarries, and an assessment made of each face before approaching. The quarry faces are relatively stable.

Access Access via farm tracks and agricultural land.

Current condition Good exposure of basanite and tuff within the quarry but no exposure of the reddish tuff mentioned in previous documentation due to the ground being overgrown.

Current conflicting activities Farming

Restricting conditions Cattle

Nature of exposure Outcrop and quarry faces.

Assessment of site: culture, heritage & economic value

Historic, archaeological & literary associations Quarried up to at least 1926 for road-metal. Considered one of the best quarries for road-metal in East Lothian.

Aesthetic landscape No association

History of earth sciences Revised interpretation of a sill (1910) to a plug in a vent (1928)

Economic geology Quarried up to at least 1926 for road-metal. Considered one of the best quarries for road-metal in East Lothian.

Assessment of site: geoscientific merit

	Rarity	Quality	Literature/collections	Primary interest
Lithostratigraphy				
Sedimentology				
Igneous/mineral/metamorphic geology	Regional/National	Good	Simpson (1928), Clough et al., (1910)	X
Structural geology				
Palaeontology				
Geomorphology				

Site geoscientific value

The site comprises a good exposure of analcime-basanite, forming a plug within a volcanic vent, which allows interpretation of the volcanic character of East Lothian during the Late Carboniferous to Early Permian. Xenoliths of granite and ultra-basic nodules allow interpretation of the strata the basanite was intruded into. Numerous plugs of volcanic material are littered throughout the Midland Valley, but very few are composed of analcime-basanite.

Kidlaw Quarry provides a good example of an analcime-basanite plug with regional to national significance.

Assessment of site: current site usage

Community The quarry is in open countryside, and rarely used by the local community. There is little aesthetic value for the community to visit the site due to rubbish within the quarry, and the use of the field for sheep and cattle grazing.

Education The site presents the best, albeit artificial, exposure of an analcime-basanite plug in East Lothian. This site may be a good locality for educational fieldwork relating to basanite petrology and xenolith studies within Carboniferous intrusions in Scotland.

Assessment of site: fragility and potential use of the site

Fragility Natural overgrowth, geohazard

Potential use School education, higher/further education

Geodiversity summary

The analcime-basanite exposure within Kidlaw Quarry provides a good opportunity to study textures and mineralogy of a Carboniferous volcanic plug. It allows an interpretation of the country rocks the plug intruded into, and an appreciation of the scale and diversity of volcanic activity throughout East Lothian.

Site photos

(ELC_20_P1) Entrance to Kidlaw Quarry is accessed via a muddy grassy track through grazing fields. Photo looking north. © BGS, NERC.

(ELC_20_P2) Kidlaw Quarry. Basanite outcrops to the right of the photo, with the tuff and breccia dyke cropping out in the centre of the photo on the grass bank. The quarry is littered with recent rubbish including tyres, bits of concrete, bits of machinery etc. Photo looking west. © BGS, NERC.

(ELC_20_P3) The north face of Kidlaw Quarry is composed of basanite, a mafic igneous rock. The basanite displays sub- vertical cooling joints, with a roughly columnar form. Photo looking north, © BGS, NERC.

(ELC_20_P4) Augite phenocryst within basanite. © BGS, NERC

(ELC_20_P5) The speckled appearance of some of the weathered surfaces within the basanite is due to weathering of alkali feldspar with analcime. These weathered out crystals are around 2mm in diameter. © BGS, NERC.

(ELC_20_P6) Ultrabasic nodules are found within the basanite. On weathered surfaces, these nodules are replaced by soft clay, and as a result weather in to form shallow hollows. © BGS, NERC.

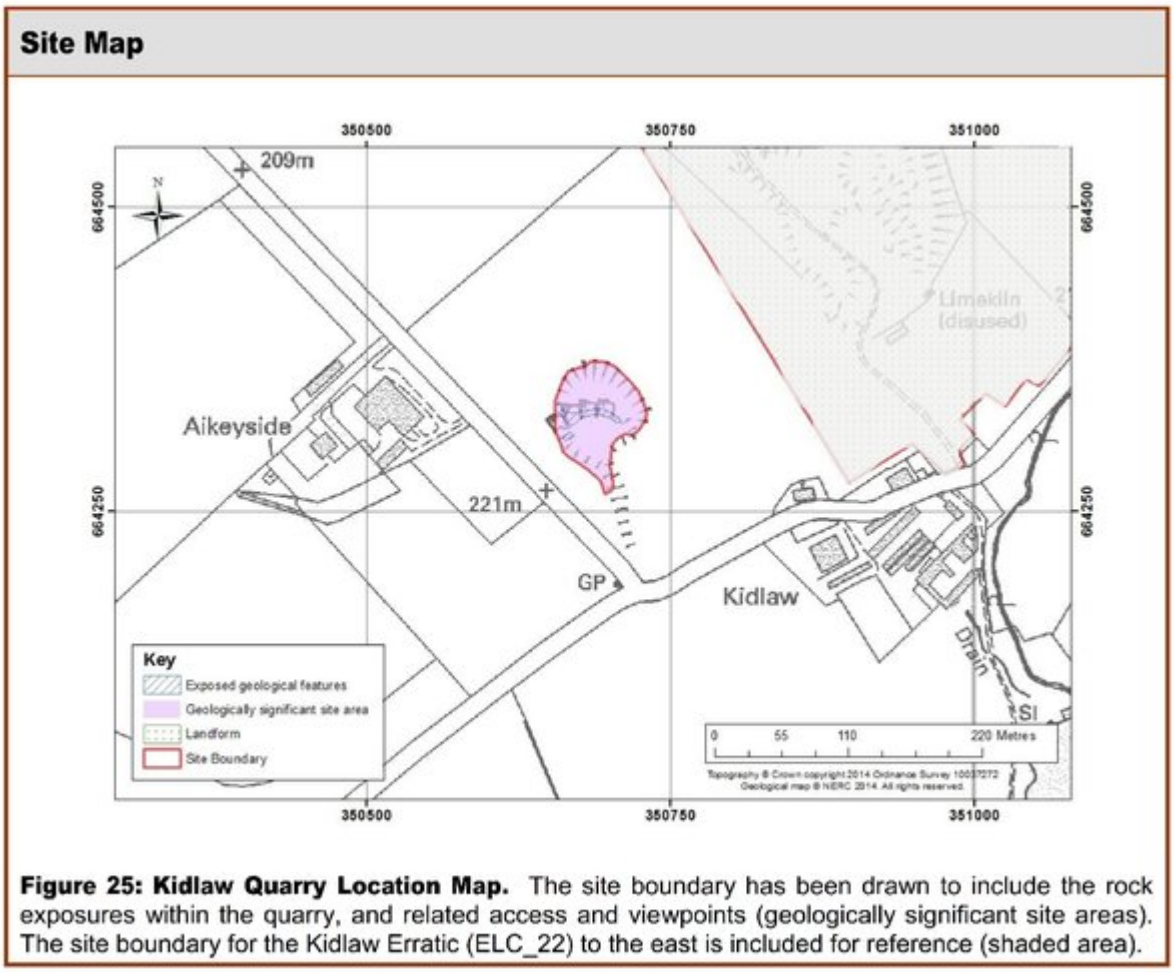
(ELC_20_P7) Xenoliths of biotite granite are found within the basanite, and are thought to be related to a Devonian granite 500 m to the ESE of the quarry. © BGS, NERC.

(ELC_20_P8) Cooling joints within the basanite are occasionally mineralized. The example above has been mineralized by quartz. The quartz has formed prisms (see above finger) - this crystal morphology gives a clue as to the mineralization history of this joint. For quartz prisms to form, the quartz must be growing into, and finish forming, in an empty space, otherwise, a solid vein would form. This suggests this particular cooling joint was open when the quartz formed, allowing the beautiful natural crystal shape of quartz to form. © BGS, NERC.

(ELC_20_P9) Joints within the basanite (adjacent to the intruded tuff and breccia dyke) are mineralised, and form impressive cross-cutting relationships. The mineral veins are typically sub vertical, and stand proud of the surrounding rock. © BGS, NERC.

(ELC_20_P10) Unlike the quartz mineralisation of the basanite in the north face of the quarry, in this western sector of the quarry, orange clay and white carbonate minerals fill the joints. In the photo, the margins of the vein (white) represent carbonate minerals, and the orange/brown centre represent clay infill. This suggests this vein saw at least two fluid phases – one which precipitated firstly the vein marginal carbonate, followed by fluid which precipitated clay in the remaining joint space between the carbonate mineral linings. © BGS, NERC.

References



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