A14 D20 – D22 Cadeby Cliff/Constitution Hill

Site information

Site name: Cadeby Cliff/Constitution Hill

Site key: D20 – D22

Grid reference: [SK 511 999] (centred on)

Site type: exposure, natural

Local authority: Doncaster Metropolitan Borough Council, South Yorkshire

Site dimensions: 1000 m x 25 m

Site owner: DMBC

Conservation status: Regionally Important Geological **Site date:** 16/9/97

Field surveyor: Scott Engering **Date:** 16/2/07

Stratigraphy and rock types

Time unit: Permian **Rock unit:** Wetherby Member, Cadeby Formation, Zechstein Group

Rock type: Dolostone **Details:** Massive bedded ooid-limestones, stromatolite reefs, and inter reef sediments

Time unit: Devensian, Late Pleistocene **Rock unit:** Head

Rock type: Sand and Gravel **Details:**

Time unit: Devensian, Late Pleistocene **Rock unit:** Glaciofluvial Deposits

Rock type: Sand and Gravel **Details:**

Site map

(Figure 69) — D20 – D22 Cadeby Cliff/Constitution Hill

Site description

Extensive site with several exposures of interest along a natural limestone escarpment from [SK 51000 40000] to [SK 51954 99568].

The survey was started at the eastern end, proceeded westwards along the top of the escarpment and returned eastwards following the line of the old railway. The exposures are as follows:

From [SK 51934 99567], the escarpment is seen to be covered in thick gorse, evidence of sandy soil associated with the position of fluvioglacial sands, with occasional outcrops of massive, cream coloured fine grained limestone. The soil is brown/black and full of limestone fragments. At the roadside at [SK 51857 99584] there is a small exposure (A) of coarse grey sandstone with large angular limestone fragments.

[SK 51846 99590]. Exposure B. 6–7 m of bedded fine grained limestone with individual beds up to 400mm with fine cross laminations. Throughout this outcrop, the surfaces of the joints provide excellent examples of calcite mineralisation, often iron stained and with well defined crystal growth, thick amorphous encrustations and in, places, stalactitic growth. These are often associated with fine limestone breccias.

Approximately 3–4 m above these limestones, exposures C and D reveal well cemented, coarse grained, pink gritty sandstone with rounded pebbles up to 10 mm with occasional concentrations of red and orange rounded sandstone pebbles, quartzite and ironstone. Together with large angular limestone fragments, these coarse sandstones appear as fissure deposits within exposed joints in the underlying limestone (B).

At [SK 51713 99601], above an angled stone retaining wall, exposure E comprises a massive block (6 m x 2.5 m) of grey/brown, well cemented shingle, with large angular and sub-rounded limestones and flattened pebbles which are imbricated to the east. This overlies a pink/orange gritty sandstone (as described at C and D). The difference in colour is in the fresh and weathered surface. Some surfaces are encrusted with calcite (flow stone) and beneath the exposure and the retaining wall, there is an accumulation of angular and iron stained limestone blocks.

At [SK 51670 98616] two large weathered slabs of limestone lie isolated at the edge of a ploughed field on top of the escarpment, the largest being approximately 2 m x 2 m x 700 mm. This has deeply weathered surfaces. Both are probably glacial erratics. From [SK 51540 99616], there are excellent views of the topography of the Conisbrough outlier, Conisbrough Castle, North Cliff Quarry, the limestone escarpment at Clifton and the Don Valley to the west.

In the old quarry in Cadeby Cliff (exposure F [SK 51271 99715], 6-7 m of massive shelly ooid-limestones with beds up to I metre thick are exposed. Beneath the soil horizon, 2 m of reddened sandy head are exposed with angular blocks of limestone which, in places, appear to have filled fissures and joints in the limestone.

At [SK 51271 99715], at the top of the quarry face, there is an elongate, flattened dome like irregular mass that is probably a stromatolite reef. A bed of overlying ooid-limestone defines the shape of the upper surface of the reef. At [SK 51281 99240], the underside of a slab preserves a mould of a Karst like erosional surface. The quarry is accessible from the road that runs along the bottom of the escarpment but moderately thick hawthorns and overgrown rock debris prevents very easy access to the exposed rock faces. The strata in the quarry dip moderately steeply to the south-west.

The old quarry at the west end of Cadeby Cliff is fenced off and not readily accessible but from the road at [SK 51116 99791], exposures G and H reveal thick, massive bedded ooid-limestones in the escarpment. In the railway cutting at [SK 451311 99601] an irregular reef mass is exposed (Exposures I and J). To the east of this, 2 m of head with a well defined soil horizon is exposed, which contains blocks with a black speckled appearance, fine black laminations and a fine grained granular texture similar to the limestones of the Sprotbrough formation.

From [SK 51340 99641] to [SK 51498 99585], massive bedded ooid-limestones are exposed along the length of the escarpment and at [SK 51340 99641] a thick section is seen to dip at approximately 35 degrees to the south-west (Exposure L). The hillside exposures commonly contain irregular reef masses and at [SK 51446 99595] (Exposure N), this is distinguishable from the surrounding exposures by a white weathered appearance. Also, along this section of the escarpment, there are odd exposures of coarse rubbly brecciated rock which at [SK 51498 99585] (Exposure O) is found below a thick bed of massive ooid-limestone and appears to be associated with the weathering of an adjacent irregular reef like mass.

RIGS assessment of site value

Ratings: 1–2 very poor; 3–4 poor; 5–6 acceptable/useful; 7–8 quite good; 9–10 very good/excellent; N/A not applicable; D/K don't know

Access and safety

Aspect/Description/Rating

Road access & parking Former Earth Centre Car park but DMBC owned land space at east end of Constitution Hill. Limited. Rating: 7

Safety of access Exposure on moderately steep scarp slope requires usual fieldwork precautions. Some access off tracks. Rating: 6

Safety of exposure Exposure on moderately steep scarp slope requires usual fieldwork precautions. No loose or dangerous outcrops. Rating: 7

Permission to visit Owned by Doncaster MBC but paths pass through the site. Rating: 7

Current condition Several natural rock features well exposed. Old quarry requires clearance to facilitate access. Rating: 8

Current conflicting activities None envisaged, except further development on the site

Restricting conditions No collecting

Nature of exposure Natural exposure on scarp slope at head of Don Gorge, with quarry exposures

Multiple exposures/ prospect for trail Good site to study varied lithology in conjunction with North Cliff Quarry, Warmsworth Park, Cedar Road Quarry and Hexthorpe Flatts

Notes Moderately safe and accessible taking usual fieldwork precautions

Culture, heritage & economic

Aspect/Description/Rating

Historic, archaeological & literary associations None known except a connection between Conisbrough and Ivanhoe. Rating: 4

Aesthetic landscape Good views of the Conisbrough outlier, the escarpment Carboniferous topography and Conisbrough Castle,. Rating: 9

History of earth sciences None known. Rating: 0

Economic geology Small quarry exposed. Rating: 5

Notes Conisbrough possesses a variety of interesting geological feature, a historic townscape and outstanding architectural monuments

Education and science

Surface processes Weathering of hard rock, calcite mineralisation and glacial deposition. Rating: 8

Geomorphology Cuesta, breached escarpment related to faultlines. Views of fault bound Conisbrough outlier. Rating: 8

Sedimentary Good range of lithologies and sedimentary structures in limestone, glaciofluvial sands and head. Rating: 8

Fossils Special interests in Permian marine fossils. Rating: 7

Igneous Not applicable. Rating: 0

Metamorphic Not applicable. Rating: 0

Tectonic: structural Evidence of South Don and associated faults from Conisbrough outlier and Cadeby Cliff. Rating: 7

Minerals Calcite mineralisation. Rating: 8

Stratigraphy Good site for stratigraphic correlation, especially reefs, and rare occurrence of cemented Quaternary sand and gravels. Rating: 8

Notes A very good site for education purposes, with some unusual geological features not seen elsewhere in the region

Geodiversity value

A very good geodiversity site with a variety of lithological, geomorphological and historical interests. Rating: 9

Site photographs D20 – D22 Cadeby Cliff/Constitution Hill

(Figure 70) General view of escarpment to west, with gorse marking the approximate location of glacial sand and gravel. [SK 51954 99568].

(Figure 71) Exposure B - stalactitic calcite growth along joint. [SK 51846 99590].

(Figure 72) Exposure B - growth of calcite crystals along joint. [SK 51846 99590].

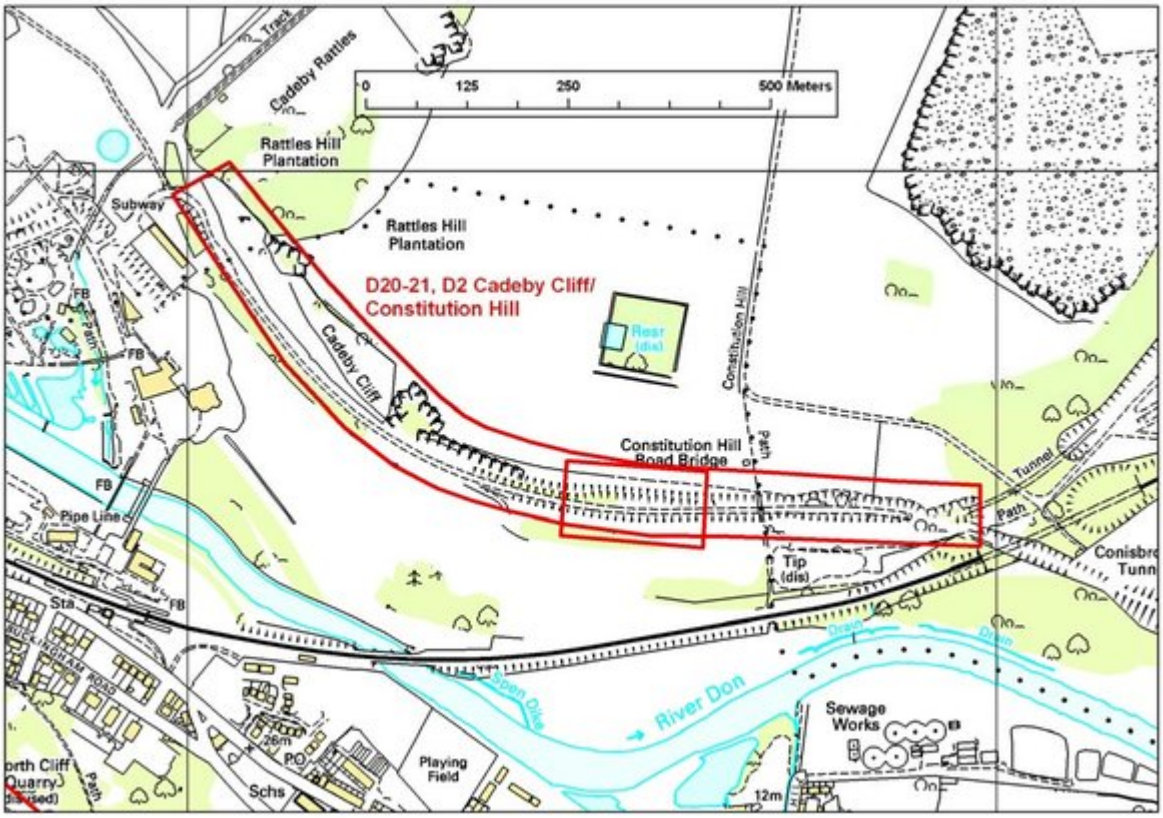
(Figure 73) Exposure E - outcrop of cemented coarse glacial sand and gravel. [SK 51713 99601].

(Figure 74) Exposure E - detail of cemented coarse glacial sand and gravel, showing imbricated pebbles. [SK 51713 99601].

(Figure 75) Exposure F - underside of limestone slab, showing cast of a Karst surface. [SK 51281 99240].

(Figure 76) Exposure J - detail of fine pyrolusite laminations in limestone fragment within head deposit. [SK 51350 99600].

(Figure 77) Exposure N - reef exposure in middle foreground, distinguished by white weathered appearance and irregular shape. [SK 51446 99595].



(Figure 69) D20 – D22 Cadeby Cliff/Constitution Hill. This map is based upon Ordnance Survey topographic material with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown copyright. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Licence Number: 100017897 [2007].

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