

KS3 DENE QUARRY (BLACK ROCK)

CROMFORD MOOR MINE: VIEWPOINT.

*Pupils will require a clipboard, copies of the relevant exercise sheets(in document **BR7 KS3 worksheet**) and access to tape measure and hand lens. Members of staff should carry a small plastic bottle of dilute HCl*

☛ First, bring the group to the high point of the Cromford Mine spoil heap. Avoid close inspection of the information boards! The small depression at the top, usually filled with water, is close to the site of the nineteenth century headgear to the shaft. (see **Figure 1.**).

Figure 1. Black Rock & Cromford Mine viewpoint.



The following exercises can be conducted in sequence as a group, or turned into a series of more competitive “tasks”, with a time for summary and questions at the end of each one. Worksheet 9 is provided at the end of the section.

Task 1: Investigating the three rocks of the area.

(about 30 minutes)

“How many different rock types can you find within 20 metres of this spot?” Can you give them their correct rock name?

There are three: all sedimentary. The outcrop of Black Rock is sandstone (also called gritstone), the loose fragments of grey rock lying on the ground are limestone, and the black mud, mixed in with the limestone blocks at the top of the viewpoint of the south (that few will probably notice) is badly weathered black shale. The limestone is from the lead mine in the area which was dug through the shale and was thrown away as spoil.)

☛ Move the group to the SW corner of Black Rock Crag where the bedding can be clearly seen

“Are the rocks here still horizontal? What has happened to them since they were deposited”

The beds have been uplifted and tilted about 10 degrees to the ESE. The base of the southwest corner of the crag shows the bedding, visible as linear features in the side of the outcrop. This is the “false dip” (ie it doesn’t show the maximum slope of the bedding). Use a clipboard aligned with the bedding to give a surface for measuring dip amount and direction of true dip (the maximum slope). See **Figures 2 & 3**. Measurements should give a South Easterly direction at around 10 to 15 degrees.

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☛ This SW corner is on a rubbly slope, and it may be safer to have larger groups of pupils watch a demonstration by the group leader and just two or three pupils.

Ask pupils to make a labelled field sketch of the Black Rock outcrop, using Worksheet 9

Figures 2 and 3. Taking a Dip Measurement at Black Rock



<p>“If these rocks are dipping almost directly to the south east, which way would you need to walk in order to get onto younger rocks?” and “Which way to get on to older rocks?”</p>	<p>Younger rocks usually lie in the direction of dip (unless faulted or overturned) i.e. south east, and the older rocks lie in the opposite direction i.e. north west.</p>
<p>“Can you now work out the order of deposition (ie oldest to youngest) of these three rocks: shale, limestone and gritstone?”</p>	<p>The shale is clearly below the gritstone at Black Rock, (and so is older) and the limestone is under the shale, and also visible to the west, outcropping extensively in Dene Quarry. It is clearly dipping towards, and under, the shale (and so is oldest).</p>

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Task 2: Investigating the Gritstone.

(20 to 30 minutes)

☛ : Remind pupils they still have the final column on Worksheet 6 to complete



Figure 4. Sandy Soil Weathered from Black Rock Crag

<p>“Why does the Gritstone form an escarpment (or hill) in this area?”</p>	<p>It is more resistant to weathering than the shale, which forms the valley below. The quartz grains in the sandstone are very resistant, and it is weathered by chemical attack on the cement holding it together.</p>
<p>“Can you find any evidence to support this explanation?”</p>	<p>The soil at the foot of the sloping face of Black Rock is largely made up of sand grains released from the rock and washed down by the rain. See Figure 4</p>
<p>“What evidence can you find for the use of this gritstone in this area?”</p>	<p>To the east is a drystone wall and two large gateposts made of gritstone. Also, the old track at the southern end of the spoil heap still has some remaining rough “cobblestones” of gritstone.</p>
<p>“Where do you think these pieces of gritstone came from?”</p>	<p>Stone isn’t usually moved very far, due to the extra cost it adds to a relatively cheap and heavy material. There is no sign of quarrying at Black Rock itself. The likely source is the Barreledge Quarry, just visible in the bracken and trees 150 metres upslope to the east. See Figure 5. Records suggest this site also provided millstones.</p>



Figure 5. Barreledge Quarry from Black Rock Crag

👉 : Before leaving the viewpoint at Cromford Mine group leaders might want to draw attention to the view to the west, and summarise the key points with the group.

Making Sense Of The View To The West.

From the viewpoint on the Cromford Mine spoil heap, at different times of the year, some of the following points can be observed:

Gritstone: vegetation heather and birch woodland; soils sandy and drier; forms hillslopes. Notice the birch colonisation in the joint planes of Black Rock itself.

Shale: vegetation grassy fields (including cotton grass) and woodland; soils heavier and damper due to low permeability, and the springs flowing from the permeable gritstone over the impermeable shale. (Often there is a small pond behind the spoil heap, on the shale) The shale is eroded to form the valley as it is less resistant to weathering and erosion. Some landslipping, but not easy to see

The spoil heap: little vegetation due to the presence of lead. At certain times of the year lead resistant plants like Spring Sandwort and Alpine Pennycress can be seen.; without vegetation to bind it, rainwash is gullyng the material in the spoil heap – the start of overland flow to rivers.

Limestone: thin soils; no surface water; grassy fields for rough grazing; affected by chemical weathering the slope of the land more or less follows the dip of the bedding planes visible in Dene Quarry (i.e. it is a dip slope), where the soils can be seen to be thin. (The hummocky landscape to the west marks the area of lead mining on the limestone, where the mineral veins outcropped.)

👉 Return to the transport, either back to the National Stone Centre along the High Peak Trail (about 15 minutes) or arrange for minibus transport to meet the party at the picnic site, or, if you use a coach, in the area next to the Steeple Arch cemetery. (about 5 minutes)