

© UKRIGS Education Project: Earth Science On-Site

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Introduction

☛ In order to complete this field work exercise you will need to ensure:
 Each pupil is provided with a clipboard and copies of the worksheets (but NOT worksheet 4, which should be held back until the appropriate time).
 Each small work group of pupils has a tape measure, a hand lens, a grain size comparator card, a clinometer and a compass.



It is best to read the signpost by the gate **after** the fieldwork, not before.
 Enter the site through the wide gate in the north western corner and group the party close to the large stones in the centre of the grassy slope to get a general view of the site. (See **Figure 1**)

Figure 1 A view of the South East corner of the Quarry

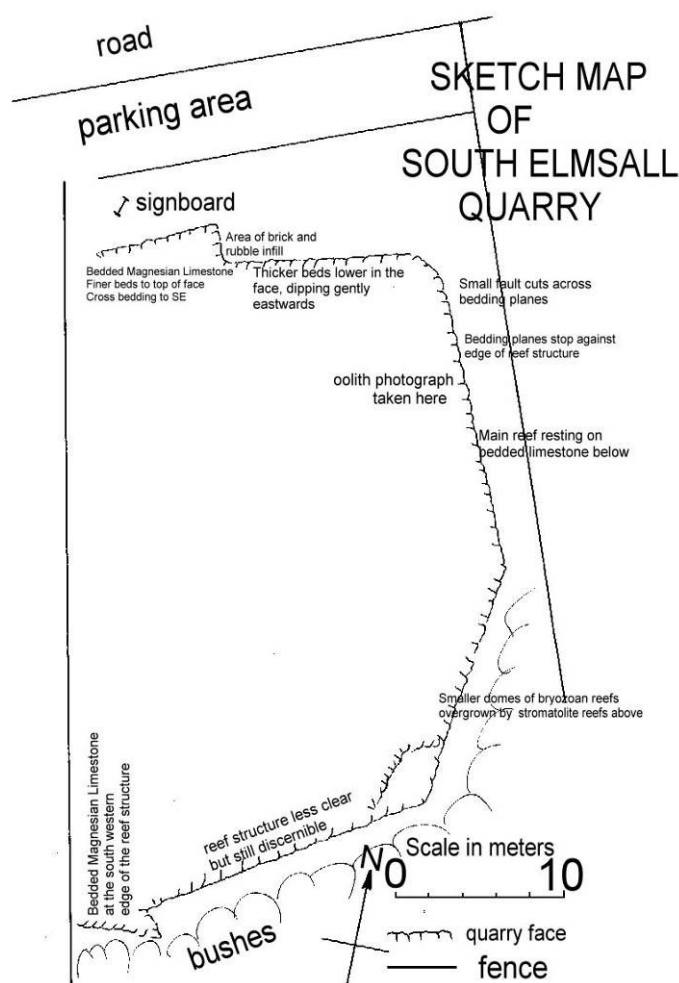


Figure 2 Annotated Quarry Map

SOUTH ELSMALL QUARRY: KS4 FIELD WORK EXERCISES

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EXERCISE 1. At the beginning of the visit, from the centre of the quarry, is the opportunity to focus pupils on the scientific nature of the activities. Select questions and themes most likely to engage your group.

Questions about size, extent and volume.	Possible responses
Using the scale on your base map estimate the length, width and height of the quarry you can see.	About 40m long x 20m wide x 7m deep. (Take the maximum depth, because the sloping surface is a later infill).
Can you calculate the volume of rock in cubic metres that has been removed from this area?	$40 \times 20 = 800$ $800 \times 7 = 5600$ cubic metres (approx)
If the density of the rock here is 2.7 (i.e. 2.7 tonnes per cubic metre), then how much weight of rock has been removed? (The density could be simplified to 3.0)	$5600 \times 2.7 = 15,120$ tonnes (approx) Or simplified to $5600 \times 3.0 = 16,800$ tonnes (approx)
Why do you think we are not standing on rock, at the bottom of this quarry?	It has been in-filled whilst preserving the eastern face of the quarry. In fact the quarry extended about 500 metres or so further west towards S Elmsall, but is now a landfill site.

Questions about the preliminary nature of the rocks	Possible responses
Do the rocks appear to be igneous, metamorphic or sedimentary?	Sedimentary: traces of bedding are clearly visible on the north face
Do the rocks appear to be the same throughout the quarry?	They are all cream coloured, but on the eastern face are many curving "shapes", very different from the north face. (To be investigated later!)
If they are sedimentary where will we find the oldest rocks? Where will we find the youngest rocks?	The oldest layer of rock is at the base of the northeast corner. The youngest rocks lie at the top, in the northwest corner.
Does the face look safe to work under?	Yes, it is a stable face and there are no overhangs, but that doesn't mean normal safety precautions should be ignored. Wear hard hats.

Group Work

It is possible for large groups to be divided into two and given similar exercises to do in different parts of the quarry whilst still being supervised. Using the field exercise sheets 1, 2 and 3 (the map) in **SE8 Worksheets** one group can work along the north face, and a second group can work along the northern half of the east face, allowing both to be under supervision. After about 30 minutes the groups can swap over and work on the other face. (Summaries of the main points for group leaders can be found in **SE9 Field notes**)

At the end of these exercises establish by discussion of the pupils' suggested origins for these structures on worksheet 2, that they are dealing with a stromatolite reef. Then give out worksheet 4 from the **SE8 Worksheets** document.

After the discussion about the reefs, invite the pupils to search for the "other edge" of the reef and mark it on the map. They will need to follow the face around to the top of the SW corner of the site where the bedded rocks again can be seen. However, there are sites along the way which seem to have no reef structures, and pupils will need to be asked to "check their conclusions" further along the face.

NOTE: Photosynthetic blue-green algae now have a more accurate scientific name, that of **cyanobacteria**. That is, they are bacteria and not algae at all, although the term is widespread still in the literature. The reef structures are called **stromatolites**, which means they are sheet, or layered in shape. This means the term "algal" stromatolite reef is no longer current scientific usage. Due to a more accurate understanding of these organisms the term "cyanobacterial" reef might be used. Group leaders may want to stress this point with some groups to demonstrate the dynamic nature of science and the terms in use.

Finally re – group the party around the large stones in the centre of the quarry and summarise the key points. Guidance for this can be found in **SE9 Field Notes**.