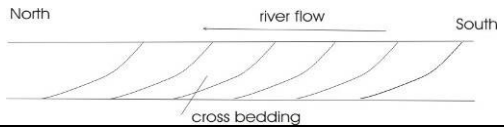
LOCALITY C: QUARRY FACE, EAST MARGIN OF THE QUARRY **50 minutes**

☛ Move the group 60 metres north and stand on the track below the face looking east.
This view shows the SSSI. Pupils will need a sheet of graph paper at this site

There should be no collecting from the face at this locality.

Figure 1 Site C

Possible questions/tasks	Possible answers (words in brackets indicate need or opportunity for further teaching)
T1 Collect a small loose sample of sandstone from the scree slope below the quarry face. Describe the colour of the rock and the colour left on your fingers when you rub the rock surface.	Red brown colour. (The red colour is due to the presence of **haematite**, an iron oxide in the clays that stick to the grains in the sandstone. This shows the rock was formed in an oxidising environment on land).
Q2 Now relate to what we saw at locality B and the evidence that the layers were deposited by water. Can you suggest how the sandstone was deposited?	In a river flowing over the land
Q2 Why are there so many loose pebbles in the scree slope?	The pebbles were not strongly cemented together/the conglomerate was friable/easily broke into bits. (This was an advantage when the pebble beds were worked in the quarry to provide aggregates for roadmaking).
T2 Work in small groups. From the scree slope below the quarry face collect 10 loose pebbles. Place these pebbles on a piece of graph paper. Estimate the average size of the pebbles. Are the pebbles about the same size? Are the pebbles rounded or angular?	Results will vary depending on the group sample taken, but the pebbles will all be more than 4mm in diameter. (By definition **pebbles** are 4-64mm diam., **cobbles** are 64-256mm diam., **boulders** are >256mm diam.) The pebbles are not about the same size. (The rock is described as **poorly sorted**). Pebbles are rounded (and with smooth surfaces).
Q3 Relate to what we saw in the class demonstration to the size of the pebbles. was the conglomerate laid down in low, medium or high energy conditions.	High (Higher energy conditions are needed to transport large particles such as pebbles).
Q4 Now relate to what we saw in the class demonstration to the pebble shape. What does the pebble shape tell you about how far the pebbles were transported?	The pebbles were carried over a long distance. (Grains **abrade** one another as they are transported and so become rounded & smooth).
T3 Look at the 10 pebbles collected by your group. Are most of the pebbles made of the same material? (Evidence?)	No - on the basis of different colours, different hardness, layering vs no layering, crystals vs grains. (Other answers may be given – ask for reasons) (There are many rock types represented in the pebbles, although most of the pebbles are made of quartz or quartzite).

Q5 Many of the pebbles match rocks found far south of Park Hall; some as far away as S.W. England & Brittany. What does this tell you about the direction of flow of the river transporting & depositing the pebbles?	Pebbles were moved from areas to the south of Park Hall as the river flowed from the south to the north.
T4 Extension work. In your group work out a way of collecting a random sample of 20 pebbles. Use the pebble identification sheet to identify the rock types, which were weathered & eroded to form the pebbles. Can you suggest where the pebbles came from? (Clue – if you wet the pebble surfaces it shows details that may help identification).	Most likely types identified are quartzite, quartz, conglomerate, breccia, sandstone, decalcified limestone, chert, granite, rhyolite. The source of some of the pebbles can be traced. (The provenance of the pebbles or where the pebbles came from identified in this activity may provide a suitable homework activity)
Q6 Look at the quarry face and refer back to the observations made at site B. How are the rocks similar?	Expect a range of answers. Both quarry faces show: - at least 4 beds, - two different sedimentary rocks, - sandstone and conglomerate, - tilted layers of rock, - similar colours.
Q7 Observe the layering in the rocks in the quarry. The beds at the top appear to show horizontal layers. Now look at the two beds at the base of the quarry face and describe the layering in these two beds?	Bottom bed is conglomerate. Looks like a thick horizontal layer. The second bed contains sandstone and conglomerate layers. Layers of varied thicknesses/some thin, some thick beds. Layers are not horizontal/are sloping by about 25 degrees to the left/to the north. (This second bed shows **cross bedding**)
Q8 Can you suggest how the cross bedding formed?	Sediment transported and deposited by currents/flowing water. (The cross bedding was produced by water currents in a river when moving sediment avalanched down a slope)
Q9 Now relate what we saw in the class demonstration to the rocks in this face of the quarry. Can you suggest the direction in which the river was flowing?	Flowing from the south to the north 
Q10 Observe the top of the cross bedded layer where a thick conglomerate bed cuts across the top of the sand and pebbly layers. Can you suggest how this conglomerate bed formed?	Pebbles were picked up when the river was flowing very fast. Pebbles were then deposited after a sudden decrease in river velocity. (Thick pebbly layers were moved and deposited by **flash floods** by the river)
Q11 Can you see cross bedding in other layers in this quarry face?	Yes. (Cross bedding is most clearly shown in the sandstone layer above the thick conglomerate bed, but be prepared to take other sightings)
T5 Students asked to complete and label the field sketch	A completed worksheet is shown at the end of this document. nb. Sketch of quarry to show bed, bedding plane, sandstone, conglomerate, oldest bed, cross bedding, current direction, flash flood deposit