 **Preparation Reminder:** Make sure that the children have seen the sedimentation demonstration and worked on the activities in Working With Rocks. Teachers and adult helpers should have seen the animated sequence [ercall 05.exe]. See **ERC1 Index** for the link.

On the journey: On the journey to Ercall pupils should be encouraged to look out for ways in which stone is being used in the environment. If this topic has not been part of the preparation for the visit, it should be explored in the follow-up.

Items to bring on the Visit: Samples of the four main rock samples found at Site A which have been cut and varnished would be useful.

Appropriate warm and waterproof clothing & footwear. Wellies are easy to clean.

Enough copies of the pupil map and worksheets listed below, either as single sheets or combined in a workbook:

- *Map of Ercall Quarries
- *Site A pupil activity sheet - identifying four rocks
- *Site B pupil activity sheet - sketch from viewpoint to NE
- *Site C pupil activity sheet - sketch from stile
- *Site D/E pupil activity sheet - two different rocks
- *Site E pupil activity sheet – sketch of boundary [unconformity]
- *Site F pupil activity sheet - from rock to soil
- *Summary – could be used in follow-up

The follow-up notes have a sequencing exercise.

Plus: Notebook, sketchbook, digital camera, magnifiers, water dropper bottles, tape measure, compass and materials for any other fieldwork activities.


Equipment for collecting soil samples.

On Arrival: There are currently no toilets on site. From the car park in Forest Glen take great care to walk the group along the right hand side of Ercall Lane, the road round to the north, for about 400 metres to the entrance to Ercall Quarries Nature Reserve, at Buckatree Glen. Follow the quarry road eastwards for 150 metres to an open clearing on the left. This is the first locality on the KS2 Teaching Trail.

Remind the children of Health & Safety issues.

Avoid dog poo on this public open-access site

Using the pupil activity sheets

 The Earth Science teaching trail and pupil activity sheets are very detailed, as there is a lot of information to be found in the rocks. In the notes for each locality there are teaching points related to key observations and interpretations on the formation of rocks and soils, with additional reference to wildlife. The pupil activity sheets are linked to these observations/teaching points. **Teachers will need to decide which materials are appropriate for their pupils to use and adapt the sheets accordingly.** Teachers may wish to add more detailed material related to wildlife aspects of the site. There are plenty of opportunities to record information by taking photographs, sketching, mapping and note-taking to aid follow-up work. When soil samples are taken the locations should be marked on the pupil map.

With younger or less-able children it may be useful if the adult helper acts as a “scribe”, recording the agreed answers on a copy of the activity sheet. All should complete their own sheets as part of follow-up work, as an individual record of the work they did on the visit.

Key points to investigate

We are looking for three lines of evidence from these exposures of rock:

- 1 - to find out how the rocks were formed;
- 2 - to find out what happened to the rocks after they were formed.
- 3 - to find out what is happening to them today or in the recent past.

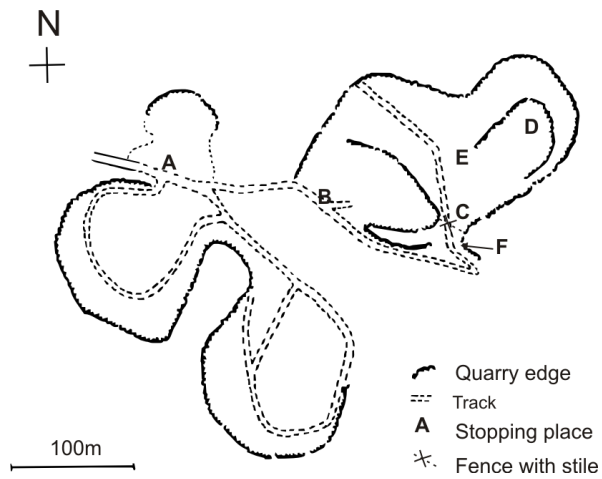


Figure 1: Location Map of the Erccall Sites.



Location A



Location B



Location C



Location D



Location E



Location F

Site “A”: Small Quarry

Required: Map of Ercall Quarries and Site A pupil **activity sheets 1 & 2** – “Identifying four rocks”.

Where are we on the map?

The children should be able to use a compass and orientate their map at this small clearing which is an old quarry, though they won't be able to see all the other quarries from here, as they are rather overgrown!

Activity: Using **activity sheet 1**, mark North on the map, and circle site “A”.

What can we see?

There is plenty of wildlife and vegetation to be seen, with a range of trees, shrubs, grasses, mosses etc. Of particular note is the way in which silver birch rapidly invades open land in the quarry to the south. Teachers may wish to include activities relating to vegetation and wildlife as part of the visit.

Is it a quarry?

Look out for vertical rocky faces, with slope of rocky debris beneath [these are scree slopes showing gravity at work!!] and flat floor of hard rock or rock fragments.

Years ago people worked here. Some visited the active quarries to look at the rocks!

Why is there a Quarry at Ercall?

Ercall and Wrekin are hills made of very hard ancient rocks, which resist weathering and erosion compared with the surrounding landscape with softer rocks.

Using hard rocks

As building stone and aggregates for making roads and concrete. Look out for rocks used in local buildings and M54 was built using them. Uses of these rocks can be investigated in follow-up work.

Which hard rocks are here?

Take a look around your feet. This small old quarry nearest the road was used as a storage place for piles of crushed rock from other quarries in Ercall Hill. Encourage the children to gather together different kinds of rock from the piles and discuss similarities and differences of the four different rock types. Their observations and descriptions will lead to the detailed identification of the four main rock types in these quarries. Cut and varnished samples of the four will aid identification.

Activity: After discussion, complete pupil **activity sheet 2**, “**Identifying four rocks**”

[See the table below which will assist with this activity]

Observations/teaching points	Interpretation/comments	Teacher information
What colour is the rock?	There are four different kinds: pinkish, pale grey, black, and mixed [see 4 rocks-below]	
What is its shape & size?	Variable. [All crushed by machine, different rock types break differently]	
How does it feel & what is its hardness?	Some feel rougher than others, mostly hard [test by rubbing one type against a different one – the pale grey very hard rock is more likely to scratch the others]	
Look closer: What are these rocks made of?	Use a magnifier. 1. Pinkish rock contains white and pink minerals [quartz and feldspar] as interlocking crystals rather than grains. 2. Pale grey rock has similar sized fragments of quartz sand grains, cemented together by quartz. 3. Black rock contains mostly small black crystals with a few grey ones. 4. Mixed coloured rock contains bits of various sizes including pebbles of different rocks and quartz sand grains cemented together. Some of the pebbles are recognisable rock types e.g. the pinkish rock.	Rock Names: 1. An igneous rock, similar to granite, called granophyre [“grano-fire”] 2. A sedimentary rock called quartzite, a hard sandstone. 3. An igneous rock called dolerite [basalt has even finer crystal size]. 4. A sedimentary rock called conglomerate. Looks like concrete!
Test for porosity - Use a water dropper bottle, as used in preparation.	None should be porous, though water will likely spread on dusty surfaces	
Others	Welcome other observations!!	

☛ Assemble party and move to site B, viewpoint.

Leave site “A” and follow the left – hand track eastwards for about 150m to the engraved rock on the left [north] side of the path.

Site B Viewpoint to NE

Required: Site B pupil **activity sheet 3** – sketch from viewpoint to NE.

Where are we?

Use the map on **activity sheet 1** to locate and circle site “B”.

What can we see?

This is a larger quarry than the last one. Look to the NE and see the bench, the top of the hill and the quarry faces of exposed rock. You are standing on the floor of a large quarry, from which thousands of tonnes of rock has been removed.

What is growing here?

A wide range of plants from trees to mosses grow in various parts of the quarry. In many places the quarry floor is poorly drained, giving waterlogged conditions suited to moss and peat development. You have already established that the rocks are not porous, though some water will go down fractures in the rocks.

Which rocks can you see?

Prompt the children. (“Which rocks seen on the dump in site A can be seen here in the quarry faces?”). The two will be **the pinkish and light grey rocks**

Use the pupil sketch on **activity sheet 3** and view to distinguish the two rock types in the quarry face.

Activity; Complete pupil **activity sheet 3** for site “B”. For additional help see the table below and the sketch from viewpoint to NE for annotation.

Observations/teaching points	Interpretation/comments
Two different rock types: Pinkish & Light grey.	This is the source of the two main rocks seen in the dump at site A, extracted from the quarry & taken away for use.
Straight ahead is mostly Pinkish rock, with a clear boundary with the light grey rock to the top right hand side of the quarry.	Clearly, two different rock types
The light grey rock shows clear layering. The pinkish one does not.	The layering indicates a sedimentary origin to the light grey rock. [Refer to the sedimentation experiment in the preparation work]. The lack of layering in the pinkish rock indicates that it is not sedimentary. It is igneous.
The light grey, layered rocks are sloping towards the SE.	It is tilted as a result of later Earth movements.
The boundary between the two is an irregular surface.	The pinkish rock is older than the light grey one and was eroded before the sedimentary rock was deposited on top. [We take a close look later]

☛ Assemble party and move on to site C

Follow the path eastwards for about 120m, and turn sharp left towards stile. On the right is a weathered exposure of rock. We shall return to look at this later.

THE ERCALL: THE KS2 TEACHING TRAIL

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From the stile at site C view the tilted beds of pale grey rock to the right.
Required: Site C pupil **activity sheet 4** – “View from the stile”.

Where are we?

Use the map on **activity sheet 1** and circle Site “C”.

What can we see?

This is a smaller quarry with fractured/broken and tilted beds.

What rocks are they?


Pale grey rock – the same as seen on the top right-hand side of the quarry from site B.

What should we be careful of?

Falling rocks – keep away from faces, no climbing – rocks may be loose....
 But we can look closely at samples on the quarry floor.

Observations/teaching points	Interpretation/comments
Beds are clearly layered.	Deposited in layers as sandy sediment. [Remind pupils of the preparatory demonstration on sedimentation - oldest at the bottom, youngest at top].
The layers [beds] vary in thickness from 20cm to over 1 metre.	The beds were laid down flat, one at a time. The thickness depends on the amount of sediment. The breaks in between the layers happened when there was little sediment.
Fossil seashells have been found in some of these rocks.	Indicates that the sediments were deposited in the sea in the early part of the Cambrian Period, 540 Ma.
Some beds show ripple marks [as seen to the left].	Sediment moved and deposited by waves or water currents or wind on shallow water.
The beds are fractured [shown by joints at right angles to the bedding] and tilted at about 45° to the SE.	Long after they were laid down in the sea, the rocks were uplifted, broken and tilted by great Earth movements from 440 Million years ago.
Oldest beds are on the left, under the younger rocks.	Remind pupils of the preparatory demonstration on sedimentation.

Activity: Complete Pupil **activity sheet 4** for Site C – “View from the stile”.

 Cross over stile and approach the warning sign below the quarry face 70m to the NE of the stile.

Site D Quarry floor

Required: Pupil **activity sheet 5** for sites D and E – “Two different rocks”.

Circle site “D” on the map on **activity sheet 1**.

On the floor of the quarry there are many samples from the faces.

Use magnifiers to look closely at loose samples.

Note that parts of the floor may be wet, as water cannot drain away

Observations/teaching points	Interpretation/comments
The pale grey rock has similar sized fragments of quartz sand, cemented together by quartz.	It is a hard sandstone, often called quartzite.
The sand grains don't rub off.	They are well cemented by quartz.
The grain size is 0.5 – 2 mm [medium grained].	
Grains tend to be more rounded than angular.	They were transported a long way.
Find the thickest bed. Estimate its thickness.	It is to the right [NE side], almost 2m thick.
Note the scree of broken rock debris.	Gravity and weathering are at work

Activity: Complete the first column of pupil **activity sheet 5** for sites D and E – “Two different rocks”

➡ **Return towards the stile**, [rather than scramble along the face].
Follow the track to the right, up the ridge in single file. Warn children about the steep slope to the left. **Go as far as the fence, which is site E.**

Site E by the fence

Required: Pupil **activity sheet 5** [which was handed out at Site D– “Two different rocks”], and site E pupil **activity sheet 6** – “Sketch of boundary” [unconformity].

Where are we?

Activity: Circle site “E” on the map on **activity sheet 1**.

What do you see in the rock face? [The view from here can be discussed later].

Teaching points/observations	Interpretation/comments
Pinky rock on the left, pale grey rock [quartzite/hard sandstone] to the right and the boundary between them.	Near the wooden fence there are many samples of the pinkish rock from the face. Use magnifiers to look closely at samples
The rock shows no layering and contains white and pink minerals [quartz and feldspar] as interlocking crystals rather than grains.	This is an igneous rock which cooled at depth, forming visible crystals. It is a type of granite called granophyre and formed about 560 Ma in the Precambrian.
You have seen the boundary from below. Now take a close look for the boundary between the two rock types. This is not a straight line [or flat surface in 3D]. It is an irregular surface, called an unconformity.	It represents millions of years of erosion of the underlying rocks [including granophyre], before the later deposition of the younger sands [540 Ma] which eventually became quartzite.
In places, the granophyre is not very hard and shows signs of weathering.	This happened in the period of time when erosion was also taking place, before the Cambrian sands were deposited on top.
The lowest layers of the sandstone contain many pebbles of older rocks [eg granophyre and a pinkish striped silica-rich lava called rhyolite. One exposure of rhyolite is in the western end of quarry A].	They are called conglomerates and are similar to the pebbly layers deposited in modern beaches.

Activity: Pupils should complete the second column on **activity sheets 5** and **activity sheet 6** for site “E”.

Hands on Time – a close look at the boundary [unconformity].

Teaching points/observations	Interpretation/comments
To the right of the fence, at the low face above the steep track, ask several children [c5] to find the granophyre and put their left hand on it.	
Ask the same children to find the quartzite and put their right hand on it [It is above and to the right]. Bring hands closer together, whilst still being on two different rocks.	
The rest of the group can guide them from a distance.	It should be possible for their hands to be brought quite close together – at the boundary between the two rock types. The boundary is called an unconformity and is a time gap.
As a group the children should be asked about the shape of the boundary	It is irregular, not fairly smooth planar [flat] like the boundaries they have already seen between the layers of quartzite/sandstone.
If the granophyre was formed 560 Ma and the quartzite was formed 540Ma, what happened in the 20Ma time gap represented by the unconformity?	The granophyre and the rocks above it were weathered and eroded to sea level, which then rose to cover the landscape with water and sediment. All of these rocks have since been tilted about 45° to the southeast.
Ask the children if they noticed anything different about the bottom layer of the quartzite/sandstone. Have you seen it anywhere else??	This is the conglomerate, the mixed coloured rock containing bits of various sizes including pebbles of different rocks and quartz sand grains cemented together. Some of the pebbles are recognisable rock types e.g. the pinkish granophyre.

Complete Site E pupil activity sheet 6 – “Sketch of boundary” [unconformity]

☛ Assemble party for a view over the whole area.
The panoramic view from here may give the group the opportunity to locate several of the other quarries marked on the map. The view is very different from the days when these were working quarries. The bare rocks are being weathered and eroded, soil is being formed and they are now well-colonised with trees and other vegetation. Many important exposures of rock are now hidden. A point for discussion on conservation of both wildlife and geology!

☛ **Assemble party and retrace steps carefully down to the stile and go over it.** 10 metres on the left is an **overgrown exposure**. This is Site F

Site F - From Rock to Soil

Required: Site F Pupil activity sheet 7 – “From Rock to Soil”.

Where are we?

Activity: Locate site F on the map in activity sheet 1, and circle it on map.

What can we see?

Slope of weathered rock debris [scree] forming soil and being colonised by plants, beneath an exposure of soft sandstone.

Observations/teaching points	Interpretation/comments
This sandstone is softer than the quartzite in the other quarry. It lies on top of the quartzite and so must be younger.	This sandstone has less quartz cement, with calcite [lime] cement in places. It also contains clay. [You can smell it].
Is this sandstone any use for making roads?	No, it is too soft!
There is a thin soil on top, with trees and other plants growing there.	When rocks are weathered they break down to form soil. Look out for a soil profile on top of solid rock.
Between the face and the track there is a slope which is made of a mixture of broken rock debris, sand and clay, called scree	Gravity is at work all the time. The broken rock material has fallen from the face in recent years. This will have been assisted by weathering processes, including freeze-thaw and plant roots. Relate to Working with Rocks as part of your preparation.
The scree slope is being colonised by vegetation and soil is being formed. The soil feels sandy and smells clayey.	Link to work on soils and plants. Make note of plant species. Collect soil sample for later investigation. See Working with Soil.

Activity: Complete Site F Pupil activity sheet 7 – “From Rock to Soil”

The Summary sheet may be completed here, or used as “revision” in follow-up.

☛ Return down the path.
If bits of striped rhyolite have been found in the conglomerate, and time permits, it may be worth looking at the exposure of rhyolite at the north-western end of Quarry A. It is slightly older than the granophyre.

Assemble at the entrance to the Nature Reserve for the walk along Ercall Lane to the car park in Forest Glen.

Take care along the narrow road!