NATIONAL STONE CENTRE: ANSWER SHEET FOR PUPIL ACTIVITY SHEETS A to G

The National Stone Centre Trail

Children will need copies of the Pupil Worksheets for Sites A to E and F to G

The Lime Kiln and Railway Bridge – Site A

Look closely at the blocks of stone used to build the wall between the railway bridge and lime kiln. You should be able to spot two different rock types. Feel them.

1. Name the rock that is made of grit **……..gritstone**
2. Name the rock that is made of broken shells and lime mud. It also reacts with acid. **…… limestone**
3. At the lime kiln what was "burnt" to make quicklime? **……limestone**
4. Name one use for quicklime. **…… mortar, agriculture, lime wash[paint]**

Look at the railway bridge. The stones used are mostly larger than in the wall.

5. What has been used in building the arch of the bridge that was not used in building the wall? **…….mortar**
6. Why do you think this was used? **……increased strength/prevent stone from moving**
7. What do you think was the main reason for building this railway? **…carry limestone from quarries to rest of country**

The Lead Mine Shaft – Site B

If you have been shown samples of minerals you should be able to answer this question:

1. What is the name of the mineral which contains lead and is heavy? **…… galena**

The shaft has been almost filled in, but you could measure how deep it is:

2. The shaft is now**……about 7……**metres deep.

Figure 1. Site C

First Exposure – Site C

Look carefully at this first exposure of the local rock and you should be able to see that it is made of broken shells and lime mud. It fizzes when tested with acid.

1. What rock type is it? ……**limestone**
2. The broken shells are the remains of creatures which lived millions of years ago. What are these remains called? ……..**fossils**
3. Try to find the remains of three different groups of animals. Use the identification sheet. Name two of them: ……**coral, crinoid (Sea Lilly), brachiopod**
4. Use three of these words to describe where these groups of animals live today: warm/cold, shallow/deep, land/sea. ….**warm….shallow …sea…**
5. The rocks and fossils tell us what this area was like 300 Million years ago in Lower Carboniferous times. Use three words to describe it: Warm/cold, shallow/deep, land/sea. … **warm… shallow …sea.**
6. What rests on top of the limestone? …….. **soil.**
7. It feels smooth and clayey and contains pebbles. What are these pebbles made of? ……**limestone.**
8. Use a water dropper to test the limestone and see if it is porous or not. .... **not really porous.**

North East Quarry – Site D

From the viewpoint, look around you.

1. How can you tell that this was a quarry **vertical faces, signs of blast holes, flat floor**
2. Where was the original land surface before quarrying began? … **top of the face**
3. What was the limestone used for? … **building M1 in Derbyshire, Quarry closed in 1966**

You have just walked across an ancient sea floor, treading on fossil shells.

4. What do think the whole floor of the quarry once was? ……**An ancient sea floor**

Look at the quarry face. Notice that it is made of layers or beds of limestone.

5. What does this layering tell us about how the limestone formed? **Settled in water[sedimentation experiment in preparation]**
6. Where is the oldest bed? …….. **at the bottom**
7. Where is the youngest bed? ……..**at the top**

These rocks are now over 200 metres above sea level. They are gently tilted to the north-east and are broken by cracks, called joints.

8. How do you think all this happened? ……**Earth movements over millions of years uplifted & tiled the rocks/**

A labelled picture of the field sketch exercise is given below

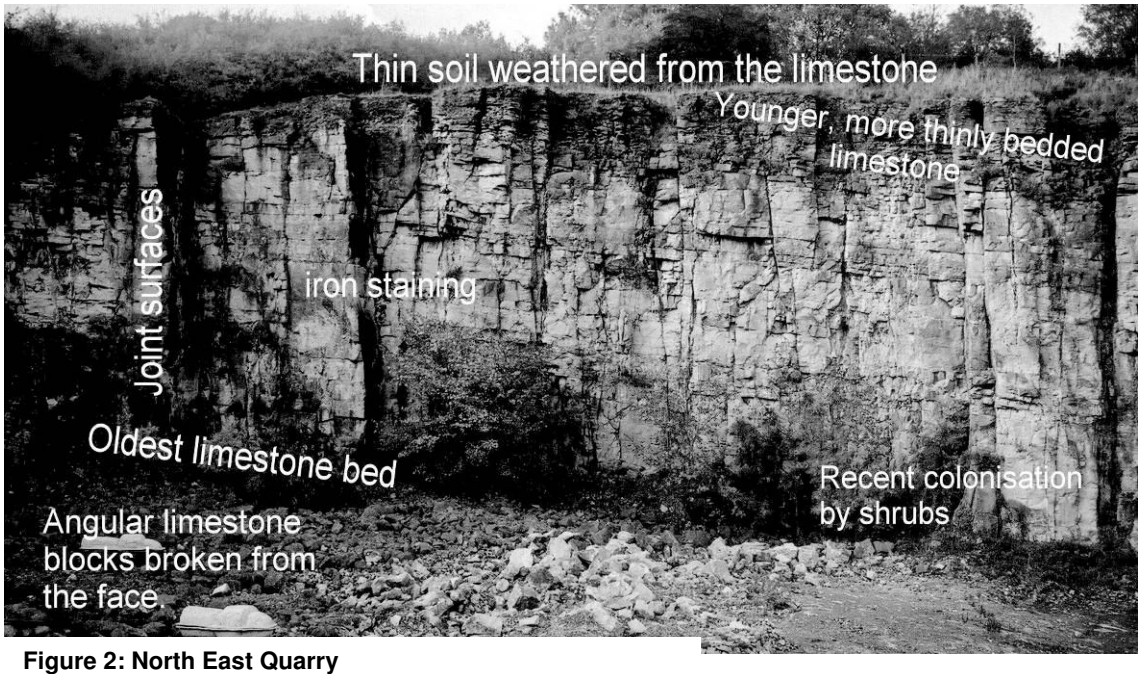

Figure 2: North East Quarry

The Crinoid Bed – Site E

Look at the blackened surface of limestone. See if you can spot the crinoid fossils.

1. Use the Site E Pupil Sheet to make a list of the crinoid parts you can see: .. **stem arms, cup ….**
2. When they die, crinoids usually get broken up by waves and currents, especially on reefs. Why do you think these were not broken up much? … **Very quiet conditions**
3. Why do you think that this area is fenced off? ……**To conserve these rare fossils**

The Millennium Wall – Site F

The **NSC8 Info Wall** document summarises the details for each section of the wall.

Try to match the rock description given below with examples of rocks used to build sections of the Millennium Wall. The information on the plaque will help you to complete the details.

Check with a water dropper to see if the rock is porous. Note if the shape of the rocks are flat [easy to lay], blocky [need fitting] or round [difficult to lay].

To give you an idea, the first description matches the gritstone [coarse sandstone] used to in the first section of wall at the right of the circular plinth.

Now find another gritstone, filling in the details, then match the other three.

Note: sedimentary, igneous, metamorphic added for teacher ref.

Rock description	**More details**
I am made of grains of sand or grit. They are mostly bits of a glassy mineral called quartz. They are stuck together with quartz cement. I split easily in layers.	Rock: gritstone [choice of 7] sedimentary From: Age in Ma: Geological Period: mostly Carboniferous Porous [or not]: several are Shape: mostly flat
I am made of shelly bits with lime mud sticking them together. Sometimes I have rounded grains, like fish eggs. I fizz when acid is put on me. I split easily in layers.	Rock: limestone [3] - sedimentary From: Age in Ma: Geological Period: Porous [or not]: some are Shape: flat/blocky
I am mostly made of small black or dark green minerals. My minerals interlock because they crystallised together. I am very hard and break into irregular lumps	Rock: dolerite [2] or basalt – igneous From: Age in Ma: Geological Period: Porous [or not]: not Shape: blocky
I am made of microscopic minerals. I may be grey, purple or green in colour. I am quite hard and can often be split into thin sheets because I have been squeezed that way.	Rock: slate [2] - metamorphic From: Age in Ma: Geological Period: Porous [or not]: not Shape: flat/blocky

To the left of the circular plinth is a wall that is only partly built. This is to show us how dry-stone walls are constructed. The plaque gives some details.

See if you can answer these questions:

1. What does “dry-stone” mean?..... **Built without wet mortar sticking it together**.

2. Why are the walls usually wider at the base than at the top?..... **Stability**

3. What is the name usually given to the long stones passing through the wall?
Throughs or throughstones.

4. What is the name given to the stones on top of the wall? … **Coping/cap/top stones**

5. What rock has been used to produce the thinnest wall?..... **Sheets of slate**

6. What else might this rock be used for?..... **Roofs.**

7. Which wall do you thing was the most difficult to build and why?
Boulders. Round shapes roll rather than stacks. Needs plenty of packing.

Now that you have completed your matching of the rocks used in the Millennium Wall you should be able to answer these questions:

8. How many years has the Millennium Wall been standing here getting wet and dirty?

Even though this is much less than the hundred or more years that the railway bridge has been built, many of the rocks in the wall are showing signs of weathering on the freshly broken faces. Lighter colours tend to darken and other things are happening.

If you look at the limestone walls you may find that acid rain has been at work, but this will not be as clear as on the railway bridge.

9. Look at the stones on the tops of the walls. Several are beginning to split. This is caused by the freezing and thawing of water.in winter. See if you can find an example. Name the rock type... **Several of the gritstones/sandstones**

10. Look for walls which have lichen or moss growing on the stones. Name one rock type
……**moss on a gritstone; lichen on Cumbrian green slate.**
They are under trees, which may have helped them to grow here.

South East Quarry – Site G

This is the view into the lowest part of the old quarries that make up the National Stone Centre site.

1. Is there any sign of water in the bottom of the quarry?..**A few gullies in sands on floor.**

We have tested and found that the limestone is not really porous, with very little water soaking into the rock itself.

2. When it rains where does all the rainwater go? …**Down the cracks/joints**

Although the limestone is not porous, water can pass through beds and we can say that the limestone is permeable.

Return to the Discovery Centre for other activities.