Funded by Defra's Aggregates Levy Sustainability Fund, administered by English Nature.

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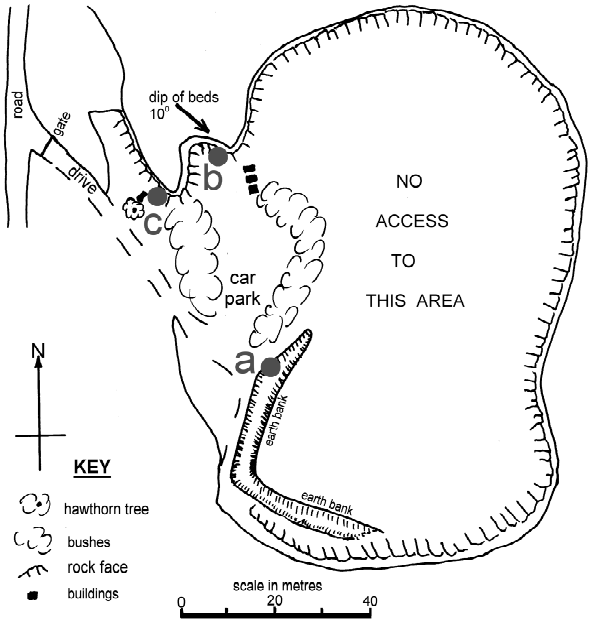
PUPIL WORKSHEET 1 Pupil Name.....

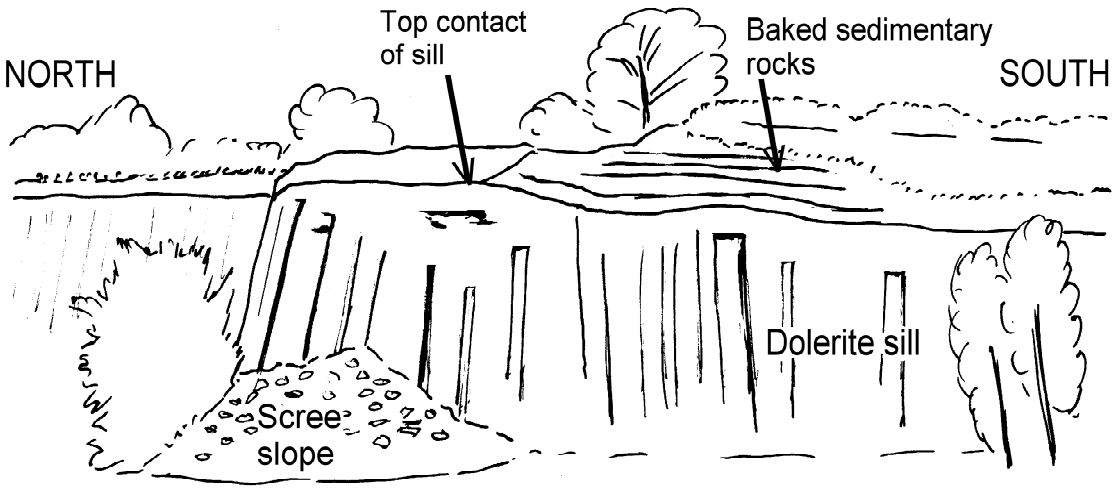
Site 1: Snableazes Quarry



1) **Mark on your position as site "a" on the map to the left.**

2) **As you come to site "b" and "c", mark those on the map as well.**

Site 1a: Snableazes Quarry, East Face.



3. Draw in the **bedding** and **joints** on the sketch above.

4. Mark and label the following features on the sketch of the quarry above:

a) North & South;
b) Dolerite sill;
c) Top contact of sill;
d) Baked sedimentary rocks;
e) Scree slope.

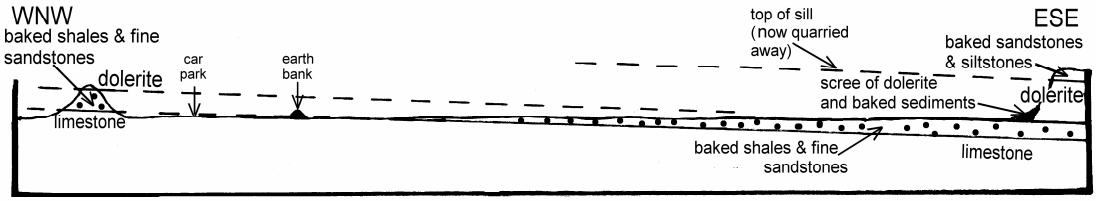
PUPIL WORKSHEET 2 Pupil Name……

1. At Site 1b measure the dip of the beds.

The dip of the limestone is **_10^0__to _15^0**_____ towards **__(SE)_130^0 north__**.

Use the sketch section below to help you investigate the rocks at sites **(t)** to **(z)** as you move through the quarry.

2. On the sketch section below draw in where you think the top of the sill might have been before it was quarried away.



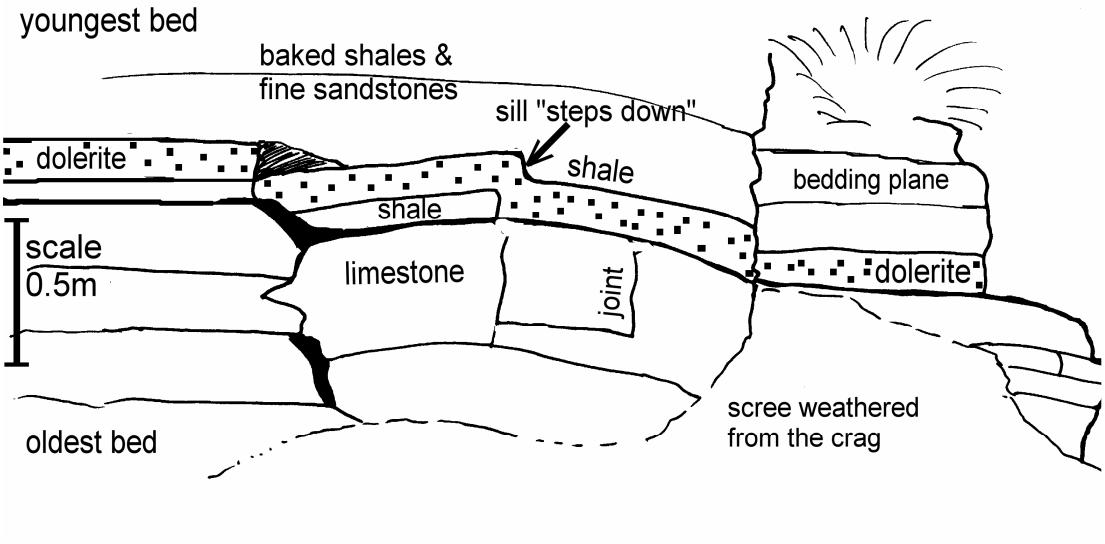
Location	Description of rock	Type of Rock (I, M or S).
t	**Vertically jointed dolerite about 15 to 20 metres thick**	**Igneous**
u	**Angular lumps of rock weathered from rock face to form a scree**	**Sedimentary**
v & w	**Bedded grey limestone.**	**Sedimentary**
x & y	**Baked shales and siltstones.**	**Sedimentary rocks now metamorphose d.**
z	**About 1m of vertically jointed dolerite sill**	**Igneous**

3. The quarry was used by tarmac for road-stone till 1987. Which of the rocks in this quarry would have been useful as road-stone and why?

The dolerite, as it is physically and chemically more resistant than the other rocks because it is made up of resistant interlocking crystals and has low porosity, and therefore lower surface area for chemical weathering.

PUPIL WORKSHEET 3 Pupil Name.....

Site 1c: Snableazes Quarry, West Crag.



1. The top of the limestone and part of the sill have been drawn on the sketch. Draw in the dolerite across the exposure. Label where it "steps down". Mark on the height of the scale bar on the left.

2. On the field sketch of the crag above draw and label the following features:

a. limestone; **b. baked shales and fine sandstones;**
c. a joint plane; **d. one or more bedding planes ;**
e. oldest bed; **f. youngest bed;**
g. scree slope; **h. dolerite sill.**

3. **Explain why the crystals in the dolerite are so small.**

The sill is very thin and so would have cooled quite rapidly, resulting in smaller crystals

4. Number the following statements in the order in which they happened. (Number the oldest as 1 and youngest as 5.).

5. quarrying for roadstone
4. uplift weathering and erosion
2. deposition of fine sandstones in delta conditions
1. deposition of limestone in marine conditions
3. intrusion of dolerite sill, baking the rocks top and bottom

PUPIL WORKSHEET 4 Pupil Name.....

Site 2a: Cullernose Point.

1. Sketch in the joints in the igneous rock around point (x) on the sketch below. Is this likely to be a dyke or a sill?

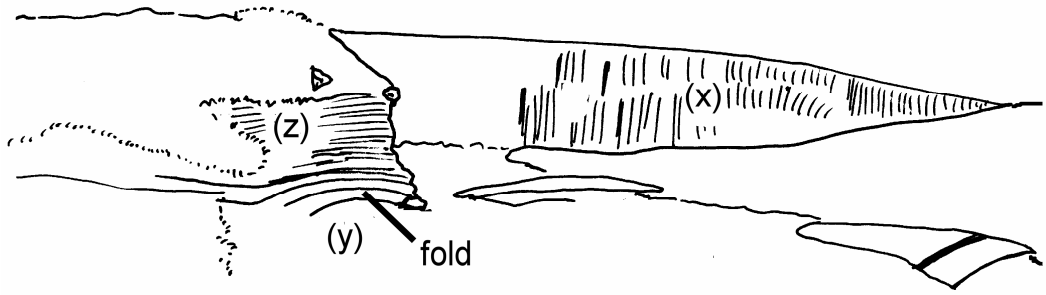
It is likely to be a sill, as it is (nearly) parallel to the bedding planes.

2. Describe the material on the beach near point (y) and explain how it got there.

Large boulders. They have been weathered from the cliff and rounded by wave action.

3. On the sketch below draw the bedding planes round point (z) and label an up- fold.

4. Explain what has happened to these beds since they were deposited below sea level.
They have been folded and uplifted by Plate Tectonic forces.



Site 2b: On Top Of Cullernose Point.

5. On the top of Cullernose Point count the number of **edges** of the columns. **Ideally** there should be 6 (hexagonal).
What is the highest, lowest and most frequent number of edges you have found?

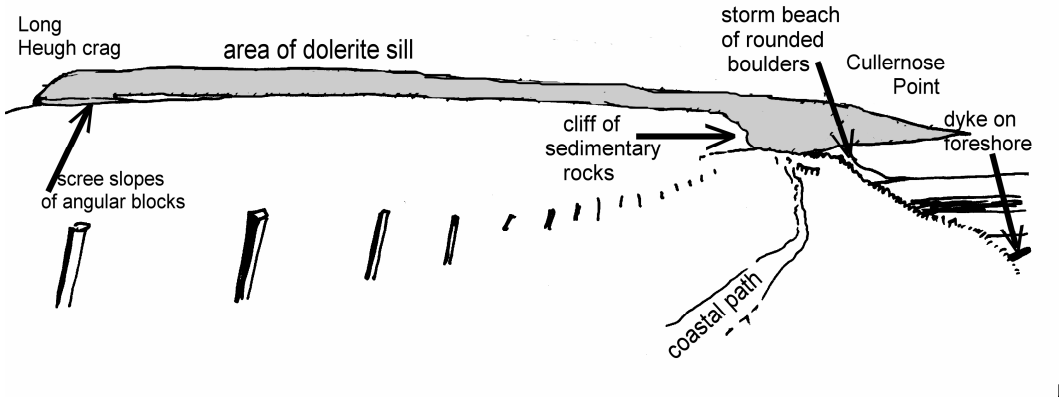
HIGHEST_____ LOWEST _____ MOST FREQUENT _____

6. Circle the word below which best describes the shape of **most** of these columns?
TRIANGULAR; RECTANGULAR; PENTAGONAL; HEXAGONAL

7. In the box below sketch one of the blocks of dolerite from the top of Cullernose Point.

PUPIL WORKSHEET 5 Pupil Name.....

View Of Long Heugh Crag.
On the way back to the road, stop at and look back at the skyline to the north.



1. Draw in the skyline at the eastern end of the sketch.

2. Label the following features on the sketch:
   Cullernose Point;
   dyke on foreshore (if visible above waves)
   rounded boulders on storm beach;
   Long Heugh Crag;
   sedimentary rocks;
   sill with vertical jointing;
   cliff of sedimentary rocks;
   screes of angular boulders;

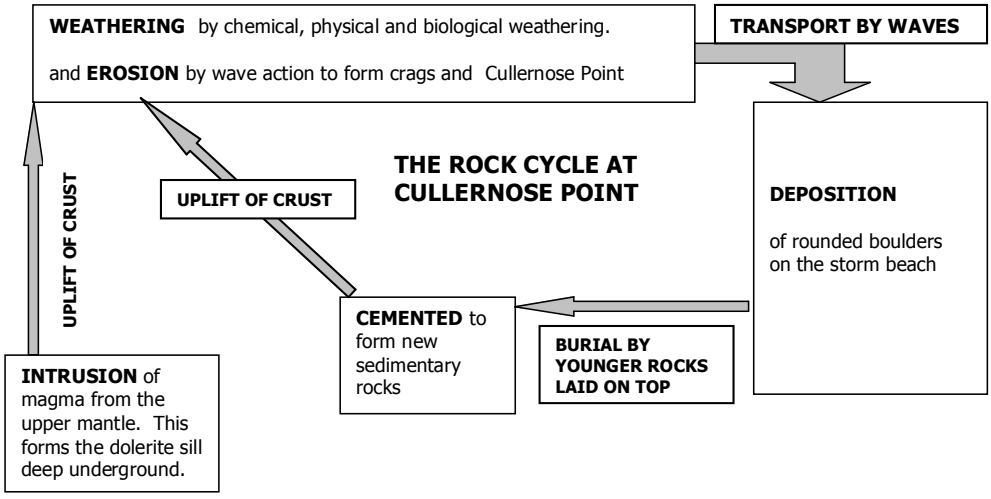
3. Explain why there is a hill at Long Heugh Crag and a headland at Cullernose Point.

Both the hill and the headland are made of more resistant dolerite rocks.

4. Shade in the hill on the skyline which is made of dolerite sill.

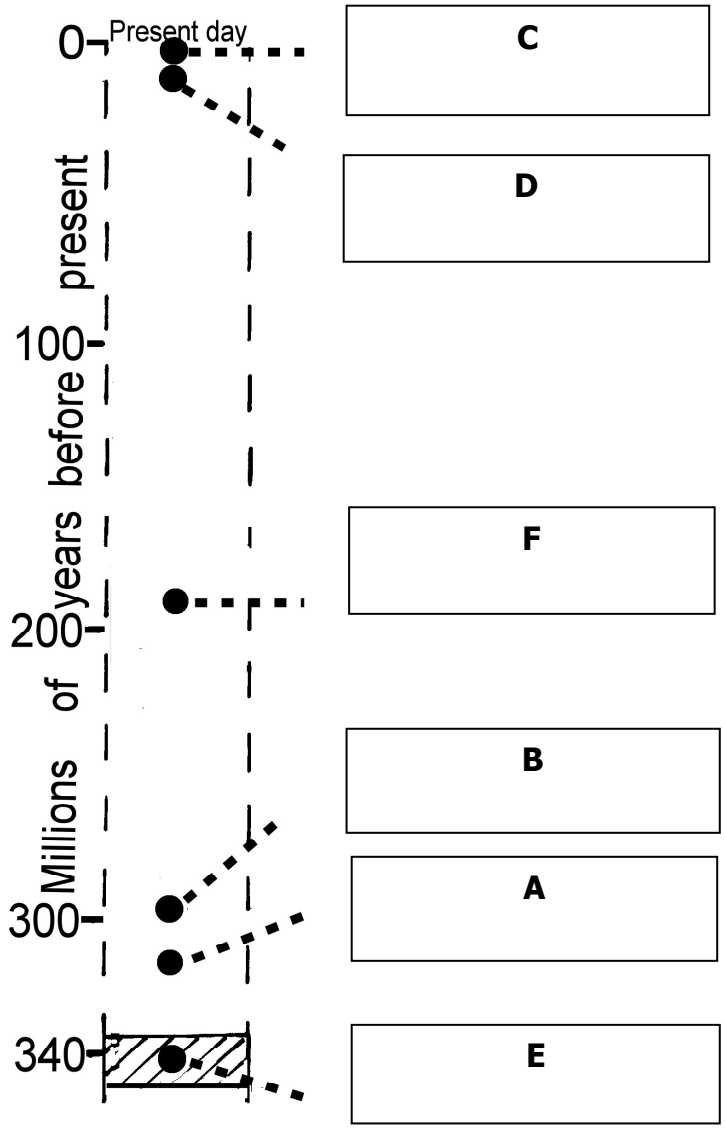
5. Label the boxes in the rock below with the following labels in the correct places:

Transport by waves; deposition, burial; physical and chemical weathering



PUPIL WORKSHEET 6 Pupil Name.....

Summary Of Events.



Summarise all of the geological events you have seen by writing the letter for each statement in the correct box on the geological event column above.

A. **Period of faulting**
B. **Period of dolerite sill intrusion**
C. **Deposition of dune and beach sands begins**
D. **End of glaciation and beginning of weathering and marine erosion continuing to present day.**
E. **Deposition of limestone and shales in a sea area**
F. **340 million years of erosion leaving no rock evidence behind.**

PUPIL WORKSHEET 7 Pupil Name……

1. SUMMARISING THE ROCK CYCLES:
PUPIL HOMEWORKSHEET: The Two Rock Cycles at **Snableazes / Cullernose Point.**

FIRST CYCLE: deposition. What can you say about the deposition of the sedimentary beds in the quarry? HINTS: fossils, limestone, shales, oldest / youngest etc. **The oldest bed seen in the quarry is a limestone, about 3m thick. We did (did not) see fossils in it.** **The younger sedimentary rock was a 6 metre thickness of shales and fine sandstones.**
FIRST CYCLE: uplift and tilting. What can you say about the changes to the beds cause by plate tectonics? HINTS: tilting, intrusions, metamorphism etc. **The beds have been tilted about 10 degrees to the SE (130^0 north).** **They have been intruded by a sill of magma (dolerite) which is about 15 to 20 metres thick. The sill was intruded in at least two layers, with the lower one stepping across a bedding plane proving that it was an intrusion coming after the sedimentary rocks, not a lava flow.** **The heat from the sill has baked the muds and fine sandstones into a metamorphic rock.** **In places the limestone has been baked to a re-crystallised marble by the heat.**
SECOND CYCLE: weathering and erosion. What evidence of **present day** weathering and erosion have you seen on the foreshore at Cullernose Point? **We saw the cliffs where the joints of the rock allow the rainwater to chemically weather the iron in it to brown. There was also vegetation (and bird guano!) attacking the rocks.** **On the beach were large black boulders eroded from the cliff by the waves and rounded off.**
SECOND CYCLE: sediment transport. In what ways have you seen sediments being transported on the foreshore? **Wave action (rounding the boulders and depositing them on the storm beach).**
SECOND CYCLE: deposition. What kinds of **modern deposits** have you seen and what rock types might they form in future? HINT: Don't forget plant and animal evidence – and which parts might survive as fossils. **Large rounded black boulders and sand. When these are cemented together they will form sedimentary rocks. They may contain fossil shells if they are not destroyed by the waves and boulders.**