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

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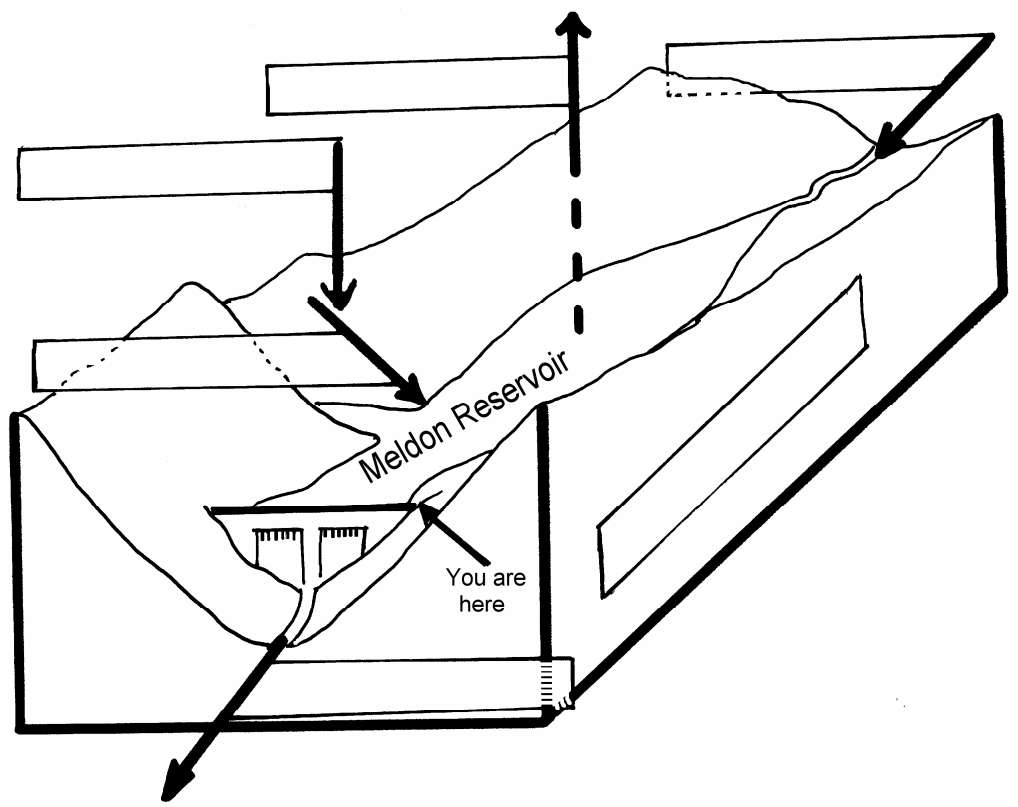
WORKSHEET 1 **Pupil Name .....**

Site 1: The Water and Rock Cycles at Meldon Reservoir.

Write the following labels in the correct boxes on the diagram showing water flow through the Meldon reservoir.

Evaporation; River inflow; River outflow; Rainfall;
Soil water flow; Impermeable rocks.



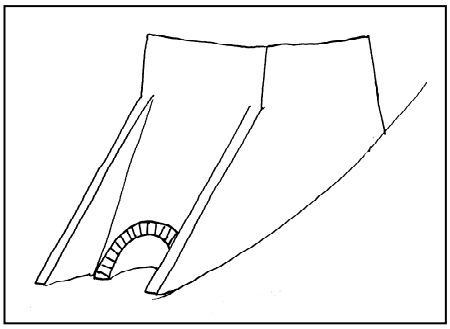
Summarise the effect on the Rock Cycle, of this dam being built here.

1. What happens to the sediment carried by the river <u>downstream</u> from the dam?

2. What happens to the sediments carried by the river <u>upstream</u> of the dam ?

WORKSHEET 2 **Pupil Name .....**

Site 2: Meldon Lime Kiln.



When limestone is roasted, it breaks down into a gas and a solid. Complete the equation.

$CaCo_3$ + energy = _____(solid) + _____(gas)

When fully working, the limekiln might have looked something like the sketch. Shade in on the sketch those parts of the kiln that you can still see today.

What evidence can you see for weathering attacking the kiln?

Physical:

Chemical:

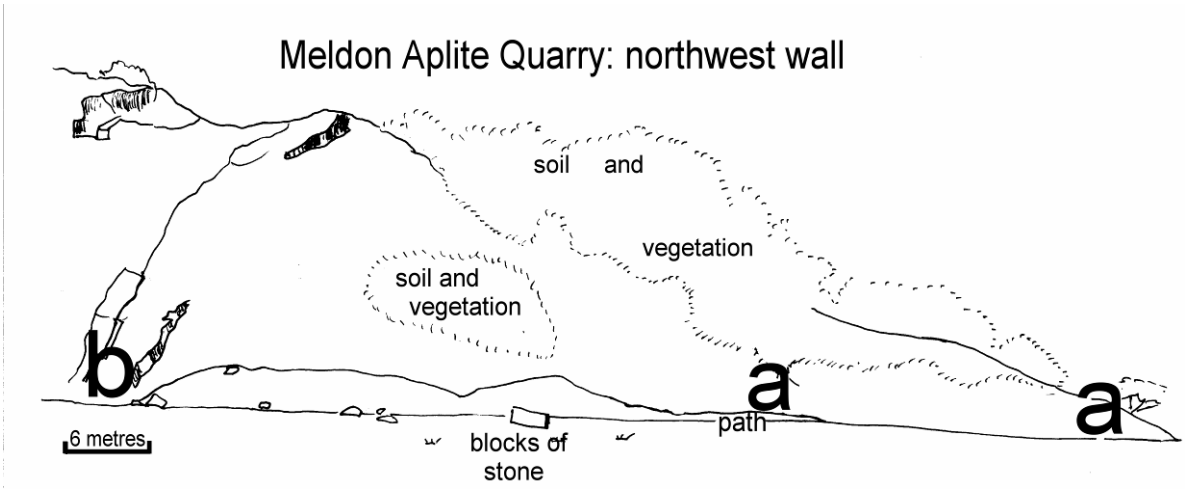
Biological:

Investigating The Spoil Heap.

Describe the colour, size and shape of the blocks in the spoil heap.	
Do some of these blocks show signs of bedding?	
Are they porous (do they let water through)?	
Do they react with dilute HCl?	
To which rock type did these blocks belong before they were metamorphosed?	
Are there many lumps of limestone in these spoil heaps? If not, why not?	

WORKSHEET 3 **Pupil Name .....**

Site 4: A Study Of The Rocks At Meldon Aplite Quarry.



Between **a – a**: draw in the line of contact between the two rocks, aplite (the white rock) and the hornfels (the dark rock).
Label the two rocks on the sketch.
Then describe the two rock types using the table below.

	Hornfels	**Aplite**
Does the rock show bedding?		
Is the bedding horizontal or not? Can you give the dip amount and direction?		
Is it a coarse, medium or fine grained rock?		
Is it made of grains or interlocking crystals?		
Is it porous? (Does it let water through?)		
Does it contain fossils?		
Does the rock react with dilute HCl?		
Is the rock type Igneous,. Metamorphic or Sedimentary?		
Explain how this rock was formed.		

WORKSHEET 4 **Pupil Name .....**

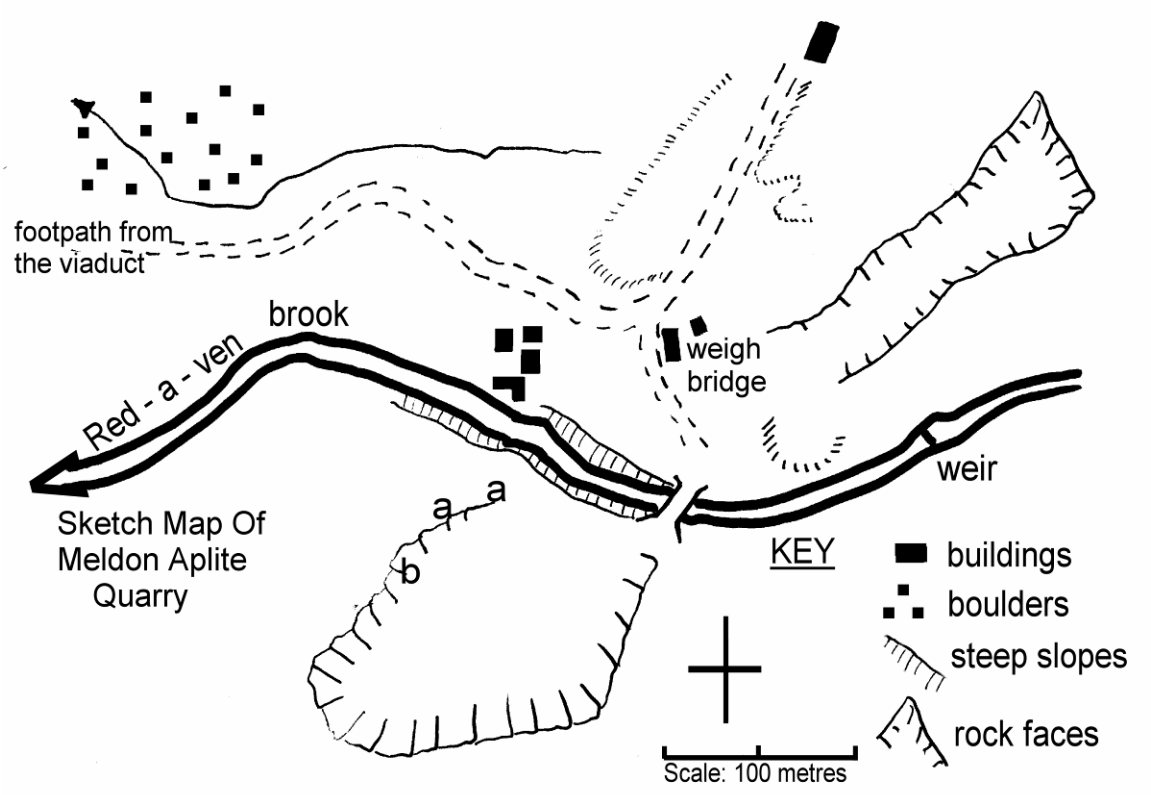
Site 5: A Study Of The Aplite At Meldon Quarry.

Sketch part of the contact between the two rocks at point "**b"** on the map which shows that one rock must have been liquid. Label the following features on your sketch**: hornfels; aplite; earlier veins** and **later vein**. Give a scale.

On the map below:

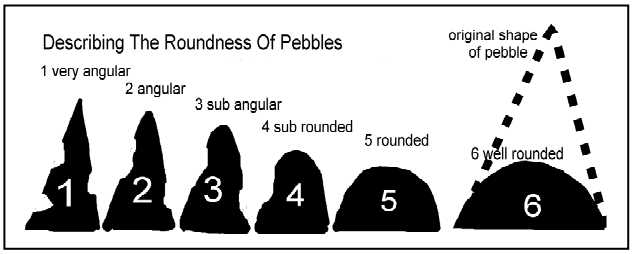
1. Mark on the north arrow in the key
2. If you measured the dip at site **a**-**a** then draw in the dip arrow in the correct direction, and write the amount of dip in degrees next to it.
3. On the map draw in the soak-away that drains the water from the quarry.
4. Use the scale to estimate the maximum thickness of the aplite in metres. Write your answer on the map.

The aplite has now been quarried away. Shade in the area on the map you think it originally covered.



WORKSHEET 5 **Pupil Name .....**

Site 6. Four Steps To Describing Red-a-ven Sediments.



INFORMATION: The diagram to the left helps you to describe rounding or angularity.

Step 1. Describing The Sediment. (Circle the answers)

Is it cemented together? **Y / N**

Is it bedded? **Y / N**

Is it sorted? **Y / N**

Is it in a channel? **Y / N**

Do the fragments include any of the following? IGNEOUS
SEDIMENTARY
METAMORPHIC

Are the fragments mainly rounded or angular? _____

SEE YOUR COLLECTED DATA IN STEP 2

Step 2. Data Collection On Angularity / Rounding:

Rounding Scale (1 to 6)	Place a cross in this column for each of the 20 fragments you describe.	Count the number of fragments in each of the 6 categories.
Very Angular 1		
2		
3		
4		
5		
6 Well rounded		

Add up the number of angular fragments (1, 2 & 3) and the number of rounded pebbles (4, 5 & 6).
Calculate the percentage of ANGULAR fragments.
(multiply the number of angular pebbles out of 20, by 5)

% angular = _____.

The longest axis of the fragments I measured is

_____mm.

The minimum stream velocity needed to deposit this fragment is (see step 3):

_____ cm per second.

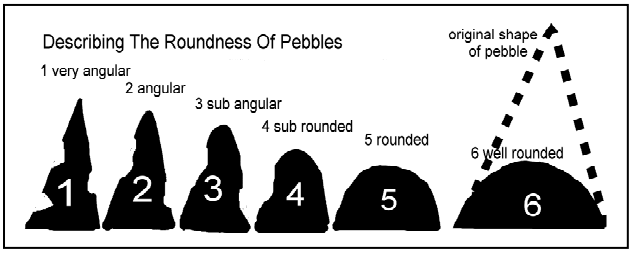
Step 3. Use the longest axis you measured to estimate speed of flow using the table below.

Diameter of Fragment in mm.	Minimum Stream Velocity to Deposit this Fragment
Over 64mm (Cobble)	300 cm per second. (extremely high flow)
4mm to 64 mm (Pebble)	100 cm per second (very strong flow)
2mm to 4 mm (Gravel)	60cm per second (very fast flowing stream)
2mm to 0.5 mm (Coarse sand)	12 to 15 cm per second (more normal stream flow)

Step 4. Now explain how you think this deposit was formed?
Remember to include weathering, erosion, and transport (flow velocity), followed by deposition. How did these things happen? What is your evidence for these conclusions? (SEE STEPS 1 TO 3)

WORKSHEET 6 **Pupil Name .....**

Site 7. Four Steps To Describing The Mystery Sediment.



INFORMATION: The diagram to the left helps you to describe rounding or angularity.

Step 1. Describing The Sediment. (Circle the answers)

Is it cemented together? **Y / N**

Is it bedded? **Y / N**

Is it sorted? **Y / N**

Is it in a channel? **Y / N**

Do the fragments include any of the following? IGNEOUS
SEDIMENTARY
METAMORPHIC

Are the fragments mainly rounded or angular? _____

SEE YOUR COLLECTED DATA IN STEP 2

Step 2. Data Collection On Angularity / Rounding:

Rounding Scale (1 to 6)	Place a cross in this column for each of the 20 fragments you describe.	Count the number of fragments in each of the 6 categories.
Very Angular 1		
2		
3		
4		
5		
6 Well rounded		

Add up the number of angular fragments (1, 2 & 3) and the number of rounded pebbles (4, 5 & 6).
Calculate the percentage of ANGULAR fragments.
(multiply the number of angular pebbles out of 20, by 5)

% angular = _____.

The longest axis of the fragments I measured is

_____mm.

The minimum stream velocity needed to deposit this fragment is (see step 3):

_____ cm per second.

Step 3. Use the longest axis you measured to estimate speed of flow using the table below.

Diameter of Fragment in mm.	Minimum Stream Velocity to Deposit this Fragment
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Step 4. Now explain how you think this deposit was formed?
Remember to include weathering, erosion, and transport (flow velocity), followed by deposition. How did these things happen? What is your evidence for these conclusions? (SEE STEPS 1 TO 3)

WORKSHEET 7 **Pupil Name .....**

Site 8: A Study Of The Stone In The Seat.
Use the table below to help you describe the stone used in the seat and in the cap rock to the viaduct.

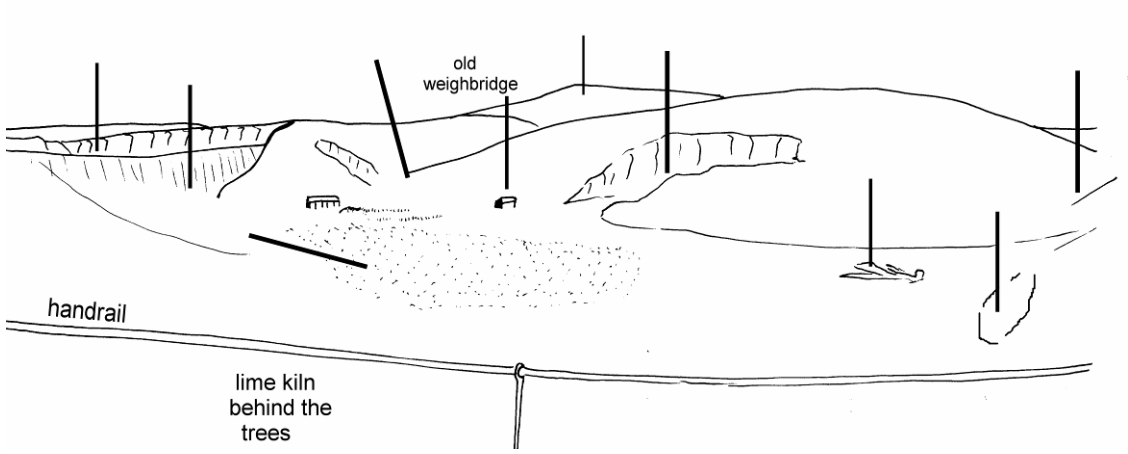
	The polished stone in the seat.
Does the stone used in the seat show any bedding?	
Is it a coarse, medium or fine grained rock?	
Is it made of separate grains or interlocking crystals?	
How many different minerals can you see? What colour are they?	
Is the rock porous? (Does it let water through?)	
Does the rock contain fossils?	
Does the rock react with dilute HCl? (Wash with water afterwards!)	
Is the rock type Igneous, Metamorphic or Sedimentary?	
What name do we give to this rock?	
What properties does this rock have which makes it suitable to be made into a seat?	
What properties does this rock have which makes it suitable to be made into the nearby cap rock for the viaduct?	

WORKSHEET 8 **Pupil Name .....**

Site 9: The View From The Viaduct.

On the sketch label the following features:

1. **Meldon Dam;**
2. **West Okement valley;**
3. **Meldon Pool,**
4. **Fingertip dumps;**
5. **Meldon Aplite Quarry;**
6. **Yes Tor (granite);**
7. **Red-a-ven valley;**
8. **Peri-glacial boulder field;**
9. **Screen wall for working quarry;**
10. **Meldon Aggregate quarry.**



Looking out from the viaduct, what evidence can you see for the processes listed below that are active in this landscape?

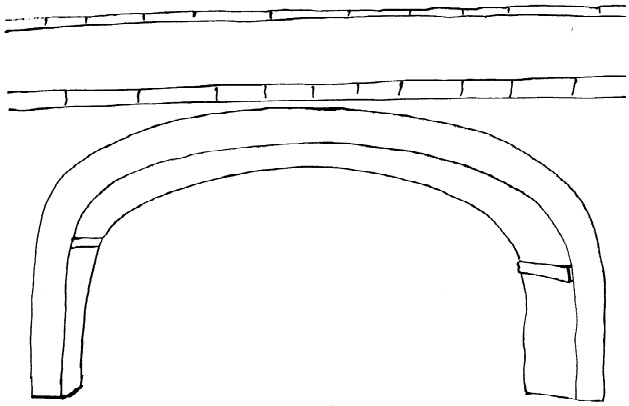
Process	Evidence seen from the Viaduct.
Human activity	
Freeze-thaw activity (in the past)	
River erosion	
Uplift of the Earth's crust	
Chemical weathering	
Photosynthesis	
Biological growth	
Biological decay	

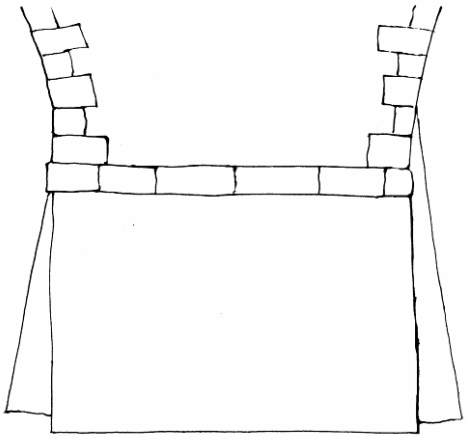
WORKSHEET 9 **Pupil Name .....**

Site 10: Study Of The Railway Bridge.

On the sketches of the bridge below mark on the following features:

north; south; stone blocks; red bricks; cycle path; signs of chemical, biological and physical weathering.

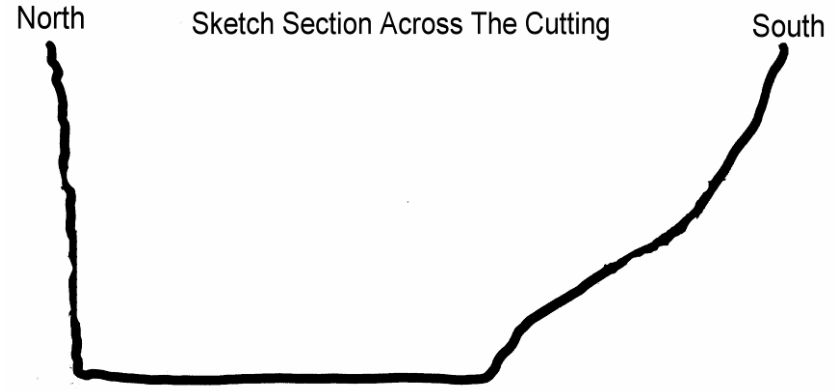




Describe the evidence for chemical and biological weathering of this bridge.

Study Of The Railway Cutting.

After measuring the dip sketch in the line of several (imaginary) bedding planes across the section of the cutting below (dashed lines above ground). Mark on the oldest and youngest beds.



Estimate the height, depth and length of the cutting back to the bridge and calculate the volume of rock removed during its construction. (volume = length **x** width **x** depth)

To get the weight in tonnes multiply the volume by rock density: 2.9 gm ^{3} cm.

WORKSHEET 10 **Pupil Name .....**

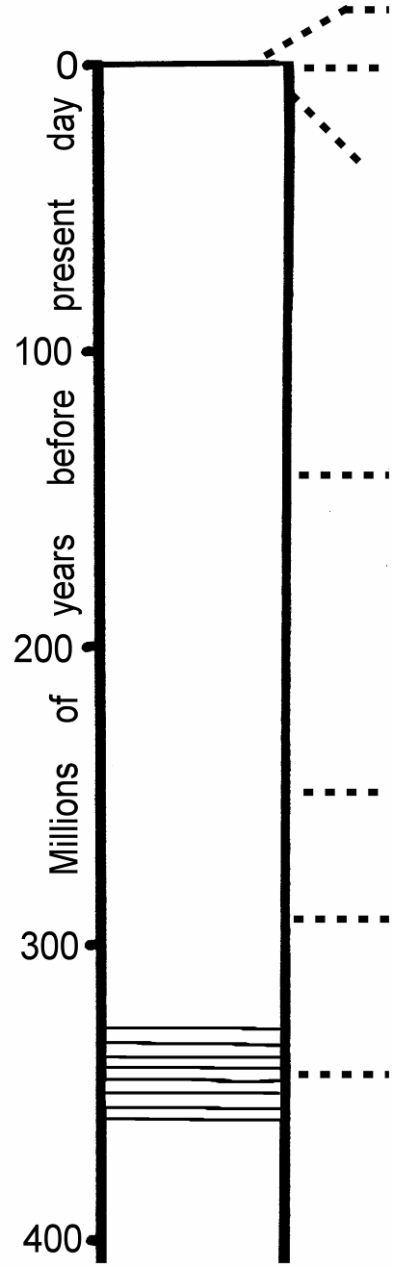
Site 11: Spot Those Blocks.
Between here and the car park see how many of the following blocks you can find and describe in the walls and gateways:

granite; bedded hornfels; mineral veins; man made rock.

Your sketch of the wall block	Brief description of block
	Granite: Size of block (mm) Size of largest crystal Signs of weathering
	Hornfels showing bedding Size of block (mm) Thickness of beds Signs of weathering
	Mineral veins. Size of block (mm) Number of veins (do any later veins cross-cut earlier ones?) Signs of weathering
	Man-Made "rock" What colour is it? What is it made of?

WORKSHEET 11 **Pupil Name .....**

Summary Worksheet.



Write each of the sentences below in the correct box in the summary column above:

1) **Intrusion of aplite and granite with metamorphism of rocks to hornfels.**
2) **Deposition of fine sedimentary muds in a deep sea.**
3) **Freeze – thaw weathering at end of last glacial period.**
4) **Human use of rocks (quarrying and cuttings).**
5) **Mountain building period (of tilting, folding and metamorphism).**
6) **Present day rivers began eroding the landscape (e.g. red-a-Ven brook).**
7) **Ancient period of erosion and no deposition in the Meldon area.**