

## Embedding fieldwork into the curriculum

This fieldwork can be used to support the QCA scheme of work Unit 13 Limestone landscapes of England. The unit develops students' knowledge and understanding of the patterns and processes associated with massive limestone landscapes such as Cheddar Gorge. Students look at the impact of quarrying on the local community, the use of limestone areas as tourist attractions, and the management and conservation of areas of limestone features and quarrying sites (old and current). Topics that can be linked to the fieldwork include:

- Limestone habitats and species
- Types of rocks and rock formation
- Formation of limestone features (sinks, swallow holes, caves, caverns, karsts, scar, pavements, dry valleys)
- Geological timescales and geological mapping
- Cave and gorge formation
- Uses of limestone
- Limestone tourism
- Quarry conflicts of interest and environmental issues
- Used and disused quarries
- Quarries as SSSIs

There are several cross curricular themes such as:

- Links to other geography units such as unit 14 'Can the earth cope?', unit 19 'Tourism- good or bad?' and unit 23 'Local action, global effects'
- Mathematics links including interpreting maps and scales
- ICT links such as using a presentation package, using internet search engines
- Key skills developed include problem solving and working with others
- Links to science such as work on rock cycles and geological changes
- Citizenship links including conflicts of interest and forming opinions.

QCA unit schemes available to download for:

Geography [http://www.standards.dfes.gov.uk/schemes2/secondary\\_geography/?view=get](http://www.standards.dfes.gov.uk/schemes2/secondary_geography/?view=get)

Science: [http://www.standards.dfes.gov.uk/schemes2/secondary\\_science/?view=get](http://www.standards.dfes.gov.uk/schemes2/secondary_science/?view=get)

## Accompanying scheme of work

The scheme of work below has been adapted from QCA Unit 13: Limestone landscapes of England  
[http://www.standards.dfes.gov.uk/schemes2/secondary\\_geography/geo13/?view=get](http://www.standards.dfes.gov.uk/schemes2/secondary_geography/geo13/?view=get)

You may also find the following useful:

Unit 14: Can the earth cope? Ecosystems, population and resources

[http://www.standards.dfes.gov.uk/schemes2/secondary\\_geography/geo14/](http://www.standards.dfes.gov.uk/schemes2/secondary_geography/geo14/)

Unit 19: Tourism - good or bad?

[http://www.standards.dfes.gov.uk/schemes2/secondary\\_geography/geo19/](http://www.standards.dfes.gov.uk/schemes2/secondary_geography/geo19/)

Unit 23: Local action, global effects

[http://www.standards.dfes.gov.uk/schemes2/secondary\\_geography/geo23/](http://www.standards.dfes.gov.uk/schemes2/secondary_geography/geo23/)

# Limestone landscapes and their uses

## About the unit

The unit is adapted from the QCA scheme of work 13 *Limestone landscapes of England*. This unit develops pupils' knowledge and understanding of the patterns and processes associated with softer limestones such as oolitic limestone and chalk. Pupils are involved in two problem-solving activities: one that asks them to consider the impact of quarrying on the local community; the other to consider sustainable development as the way forward.

This unit focuses on specific landforms above and below ground in the Cheddar region although other areas could be substituted.

Throughout the unit pupils are encouraged to work collaboratively, to discuss issues and solve problems. There are also numerous opportunities for pupils to develop literacy skills.

This unit is expected to take 8–11 hours.

This unit is expected to take 12–20 hours.

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## Key aspects

### Geographical enquiry and skills

Pupils will:

- ask geographical questions
- suggest investigation sequences
- collect/record/present evidence
- analyse evidence and draw conclusions
- appreciate values and attitudes
- communicate appropriately
- use extended geographical vocabulary
- use atlases/globes/maps
- use secondary evidence
- draw maps, plans and graphs

### Knowledge and understanding of places

Pupils will:

- locate places and environments
- describe scale contexts
- describe and explain physical features

### Knowledge and understanding of patterns and processes

Explored through:

- geomorphological processes

### Knowledge and understanding of environmental change and sustainable development

Pupils will study:

- environmental change and management
- sustainable development

## Expectations

### At the end of this unit

**most pupils will:** know about the different types of limestone landscapes and where they are to be found in England; describe and begin to explain how physical processes interact to form limestone landscapes and limestone landforms (above/below ground) and their formation; recognise how conflicting demands on an environment may arise because of the need for an important industrial resource; appreciate that different values and attitudes result in different approaches for managing such an environment sustainably, and that these may have different effects on the environment and people living there; begin to suggest relevant geographical questions and a sequence of investigation into limestone landforms and related issues; select and use appropriate skills and sources of evidence; suggest plausible conclusions and present their findings both graphically and in writing

**some pupils will not have made so much progress and will:** know about some of the different types of limestone landscapes and where they are to be found in England; recognise and describe how physical processes create a limestone features (above/below ground); begin to understand ways in which a human activity/process like quarrying causes changes to a limestone environment, how it can affect the lives and activities of people living there, and the different views people hold about it; recognise how people try to manage such an environment sustainably; suggest suitable geographical questions and sequences of investigation; use a range of skills and sources of evidence and communicate their findings using appropriate vocabulary

**some pupils will have progressed further and will:** distinguish between the different types of limestone landscapes, where they are to be found in England and why they are there; describe and explain the physical processes which create limestone landscapes and limestone landforms (above/below ground); understand that many factors, including people's values and attitudes, influence decisions about extraction of a valuable industrial resource in such an area and how people who live there may be affected; appreciate the need for considerations of sustainable development in the planning and management of similar environments in the future; suggest relevant geographical questions and sequences for investigation into landform formation and environmental issues; select and use effectively a range of skills and sources of evidence; begin to evaluate critically sources of evidence, present well-argued reports and begin to reach substantiated conclusions

### Prior learning

It is helpful if pupils have:

- used thematic maps in an atlas
- sent and received e-mail messages
- used OS maps at 1:10,000 scale
- surfed the internet

#### ● Language for learning

Through the activities in this unit pupils will be able to understand, use and spell correctly:

- words relating to rock formation, *eg sedimentary, limestone, Karst, clints, grikes, stalagmites, stalactites, pervious, permeable/impermeable, chemical weathering, swallow holes, joints, bedding planes, caves, caverns, calcium carbonate*
- other separate vocabulary:
  - evaporate, minerals, crystallise, waterfall, moor, springs

Speaking and listening – through the activities pupils could:

- discuss and respond to initial ideas and information, carry out tasks and refine ideas

Reading – through the activities pupils could:

- undertake independent research using knowledge of how texts, databases, etc, are organised and of appropriate reading strategies

### What do I already know about the relief of England?

- to use an extended vocabulary
- to use atlas maps to describe physical features

- Using an atlas, ask pupils to consider a relief map of England. Divide them into pairs and give them a series of true/false statements (between 10–15), *eg There is no land above 300 metres, All low-lying land, below 50 metres, is in the east.* Ask pupils to note true statements and correct false statements. Ask pupils, either in pairs or individually, to write a summary paragraph to describe the relief of England at a national scale. A glossary of key vocabulary may be helpful to support weaker pupils, who may also benefit from more structured guidance to write the paragraph, *eg using the cards as prompts.*
- Different types of limestone could be assessed in terms of their resistance to weathering, erosion and use for building materials etc. The influence of jointing should be approached e.g Oolitic limestone is closely bedded and jointed, carboniferous limestone is more likely to be massive and less jointed.

- classify information correctly based on map evidence
- describe the general relief pattern of England

Where are some of the areas of higher land?			
<ul style="list-style-type: none"> <li>to use atlas maps to obtain information and locate environments</li> </ul>	<ul style="list-style-type: none"> <li>Ask pupils, working in pairs, to find the areas of higher ground in the north, south-west and south-east of England and locate and name these on an outline map which already has them outlined. Ask them to add a suitable key to distinguish height range.</li> <li>Provide pupils with a simple geology map of England and, using the key, draw out the link between relative height and geology in the various parts of England. Stress that height is also a function of the juxtaposition of rocks, for example chalk is relatively high in the south east of England because of the less resistant rock (mainly clays) around it.</li> </ul> <p>A brief explanation of geological time will help pupils to group rocks into older/younger and describe how the Mendips were formed. Then, by moving to rock types, help pupils to identify the rocks which stand out as the higher ground. Eventually narrow this down to types of limestone and, if possible, show examples and test reaction with acid. Finally focus on the limestone area chosen for study</p>	<ul style="list-style-type: none"> <li>use atlas maps to name and locate relief features correctly</li> </ul>	<ul style="list-style-type: none"> <li>The teacher may wish to consider carefully the pairings for this activity to facilitate some peer tutoring.</li> <li>Key skills: links with problem solving, where a problem is posed and there are options for a solution, of which a suggested activity is one, and which involves pupils in confirming their understanding of the problem, identifying ways to solve it, planning and implementing the option, and reviewing how to improve their approach.</li> <li>Science: links with materials and their properties – rock formations</li> </ul> <p><b>Safety</b> – use of acid and other issues: consult with the science department</p>
What is special about the Mendips and the Cheddar area			
<ul style="list-style-type: none"> <li>to identify the processes responsible for the development of a particular landscape</li> <li>how one type of landform is formed</li> </ul>	<ul style="list-style-type: none"> <li>Use a discussion activity to find out what pupils know about the area.</li> <li>Using resources, <i>eg videos, photographs, text</i>, discuss with pupils key limestone features and how they are formed. Include features found above and below ground. Then ask pupils to work in groups of three or four to select one landform feature and to list its characteristics on cards, which they present to the rest of the class. Give pupils the choice of medium of presentation, <i>eg video, presentation software, poster, overhead transparency (OHT)</i>. The presentations need to be shared with the whole class, either orally or by display. Alternatively, pupils can extract the information from texts, following guidelines they are given.</li> </ul>	<ul style="list-style-type: none"> <li>describe the characteristics of a selected feature in a presentation and explain how it was formed</li> </ul>	<ul style="list-style-type: none"> <li>ICT: this activity provides pupils with the opportunity to use a package for mixed-media presentations.</li> <li>Language for learning: this activity provides pupils with the opportunity to discuss and respond to initial ideas and information, carry out the task and then review and refine ideas.</li> <li>Key skills: links with working with others, where pupils work on a one-to-one or group basis and plan with others what needs to be done, confirm their understanding of the objectives, their responsibilities and working arrangements, carry out tasks and review progress.</li> </ul>

### What features are typical of areas of massive limestone?

- to select and use appropriate graphical techniques to present evidence
- to identify the processes responsible for the development of selected limestone features

- Give pupils a series of factcards about massive limestone, and ask them to produce a factual poster about this rock type. Pupils must choose five cards from those offered. They have 10 minutes to choose the information and prepare a poster. After eight minutes, give pupils two more factcards; they have to decide which, if either, of the new cards to select and which to reject. Factcards may include the following information, *eg 'limestone is made up largely of calcium carbonate', 'chemical weathering is especially effective on limestone', 'the calcium carbonate is slowly being dissolved', 'a limestone pavement of clints and grikes is a surface feature of limestone areas'*. It may be helpful to explain to pupils the difference between porous, pervious and permeable and for this to be noted, *eg in glossaries*. The posters may be used to form a classroom wall display.

- describe and explain the main characteristics of limestone

- Language for learning: this activity provides pupils with an opportunity to learn about word derivation.
- Science: links with work in science on pollution and chemical weathering.

### What is distinctive about the Cheddar and Mendips region?

- to follow the geographical route of enquiry
- how to distinguish between national and regional scales and how a region may be identified
- how to locate other regions with similar features, using an atlas

- Ask pupils to consider what makes a distinctive limestone area or region. Discuss with them how a region may be defined. Ask pupils to carry out an investigation of surface limestone features.  
  
Pupils undertake a field work investigation using field sketches and measurements along a limestone transect to discover the distinctive features of a limestone area.

- examine a variety of sources to gather information for a particular purpose
- research and select information independently of the teacher
- describe and explain selected physical features of one region of England to exemplify landforms typical of limestone

- In this worked example the Mendips have been chosen. Any limestone region would be appropriate, depending on the resources available to the teacher.
- ICT: this activity provides pupils with an opportunity to use the internet to access resources.
- Language for learning: the activity provides the opportunity for pupils to undertake independent research using knowledge of how texts, databases, etc, are organised and of appropriate reading techniques. Pupils may need reminding of efficient approaches for selecting and recording what they find.

### What can an area of limestone look like underground?

<ul style="list-style-type: none"> <li>• to use OS maps at a range of scales</li> <li>• to select and use appropriate graphical techniques to present evidence on maps and diagrams</li> <li>• to identify the processes responsible for the development of underground limestone features</li> </ul>	<ul style="list-style-type: none"> <li>• Give pupils an OS map (preferably 1:10,000) of an area within the Mendips. Ask pupils to produce a sketch map to show the Cheddar Gorge and to illustrate in a separate annotated diagram about how it was formed. Ask pupils to annotate the diagram with the names of features, and labels explaining the processes. Encourage them to refer back to their earlier investigation of limestone features to ensure accuracy. Some pupils may benefit from the support of a factsheet outlining features and processes, to use as stickers to add to their own sketches.</li> </ul>	<ul style="list-style-type: none"> <li>• interpret an OS map of a massive limestone area</li> <li>• use geographical skills and techniques to present the information</li> <li>• use correctly specialist vocabulary</li> <li>• describe and explain the processes responsible for the formation of a specific limestone feature</li> </ul>	<ul style="list-style-type: none"> <li>• The most appropriate map scale is 1:10,000, although other scales may be used. This scale encourages pupils to be detailed in their analysis and to think about a small area for local study.</li> <li>• Key skills: links with problem solving where a problem is posed and pupils are given options for a solution. This could involve pupils confirming their understanding of the problem, identifying, planning and implementing solutions.</li> <li>• Mathematics: interpret maps and scales.</li> </ul>
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### How is the landscape being changed?

<ul style="list-style-type: none"> <li>• to appreciate how people's values and attitudes affect environmental issues</li> <li>• to communicate in ways appropriate to task and audience</li> <li>• to consider how conflicting demands on an environment arise and may lead to change</li> <li>• to explore the idea of sustainable development and its implications</li> </ul>	<ul style="list-style-type: none"> <li>• Undertake a more substantial investigation into the sorts of conflicts of land use that occur in some areas of natural beauty. An appropriate conflict to study may be the value of limestone as an industrial resource and the impact of quarrying on a community, through a real case study undertaken during fieldwork. Divide the class into two groups, one which supports quarrying and one which wants to preserve the landscape for today's and future generations. Ask each group to present its views in the form of a debate, during which pupils make their own notes. Ask pupils to write up a report including both viewpoints. Ask pupils to make and justify a decision on whether the quarry should go ahead or not. There is opportunity here to explore the concept of sustainable development as a possible way forward.</li> </ul>	<ul style="list-style-type: none"> <li>• apply problem-solving strategies to solve a given problem</li> <li>• follow the investigative sequence to plan, follow and report on a specific issue</li> <li>• describe and explain how people's different values and attitudes about development may affect an environment which contains an industrial resource</li> </ul>	<ul style="list-style-type: none"> <li>• Language for learning: this activity provides pupils with the opportunity to learn about word derivation.</li> <li>• Language for learning: this activity provides opportunity for pupils to discuss in groups and respond to initial ideas and information, carry out tasks and refine ideas.</li> <li>• Key skills: links with problem solving, where pupils confirm their understanding of the problem, identify ways of solving it, plan and implement the option, and formulate a review for improving their approach.</li> <li>• Citizenship: this activity provides pupils with the opportunity to justify orally and in writing a personal opinion about such issues, problems or events.</li> </ul>
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**What do I like/dislike about limestone scenery?**

- to express substantiated views about geographical features
- to use geographical vocabulary correctly

- Pupils could use an environmental survey to describe their feelings about an area affected by quarrying and an area which has not been used for quarrying. They can compare and contrast the two locations and the nature of the area

As an alternative to the last suggested activity, ask pupils to produce a 'shape poem' about limestone, using the shape of a limestone feature, as an outline. The writing could be a descriptive piece of prose or a poem, with pupils using some geographical vocabulary to say what they like and/or dislike about that particular feature or limestone features in general.

- produce a shape poem which describes their feelings about the landscape

- English: this activity provides pupils with an opportunity to write creatively.



## Potential fieldwork locations

### **Introduction**

There are around 2,000 working quarries and 160 mines in Great Britain. Most operational quarries and mines today work closely with the local community and many have open days and sites visits. During these visits, the working site is open to the public and schools for a supervised tour to learn more about the industries operations, its products and the geology of the area. Former quarry and mine workings also offer fascinating study sites for fieldwork; mosaics of habitats are created either by nature alone through natural succession or by managed restoration schemes and many offer rare opportunities to study areas of geological interest that would have otherwise remained hidden. Many old extractive workings are accessible to the public as nature or geological conservation areas.

(Source: <http://www.quarried.co.uk/fieldstudies.html>)

### **Working quarries**

The following are aggregates companies which currently operate quarries in the Bristol/Bath area which may be used for field visits (please note- not all these quarries may run school visits)

#### **Bath Stone Company**

<http://www.bath-stone.co.uk/coprofile.html>

The Bath Stone Company own Stoke Hill Mine near Bath. Stoke Ground Bath Stone is widely used throughout the UK in both restoration and new build projects, and is regularly specified by the National Trust and English Heritage. It was even used for fire damaged Windsor Castle. They are happy to host interested parties who can see first hand how their stone is won and can usually organise mine visits.

#### **Hanson Aggregates**

<http://www.hanson.biz>

In June 2001 Hanson in the UK launched a curriculum-based educational programme, Material World. The programme uses school visits to introduce children to quarrying and brick making, as well as their associated environmental and community issues. It aims to bring 20,000 children aged between 7-11 into quarries and brickworks each year. Hanson in the UK also supports three study centres. The East Mendip study centre at Whatley Quarry has welcomed 12,000 pupils through its doors since it opened in 1997.

#### **Stanleys Quarry**

<http://www.cotswoldstone.com/Contact%20Us.htm>

Stanleys Quarry is set in the heart of the Cotswolds. Stone has been processed there for over three hundred years. Over the last decade Stanleys Quarry has become one of the best equipped limestone processing facilities in the country. Quarry address: Westington Hill, Chipping Campden, Gloucestershire. GL55 6UR. There is no information about quarry visits on their website, so you will need to contact the quarry directly with any requests.

#### **Tarmac Group**

<http://www.tarmac.co.uk/>

Tarmac welcomes school visits to most of its operational quarries. Ones near Bristol are:

Durnford Quarry, N. Somerset	01275 392 471
Halecombe Quarry, Somerset	01373 812 800
Stancombe Quarry, N. Somerset	01275 464 441

### **Hanson East Mendip Study Centre, Whatley Quarry**

<http://www.hanson.co.uk/Responsibility/communityandeducation/eastmendip.html>

Contacts: Stephanie Greshon, Sarah Bailey or Gill Richardson

Telephone: (01373) 452 515.

Address: Hanson East Mendip Study Centre, Whatley Quarry, Whatley, Frome, Somerset BA11 3LF

Email: [billurwin@argonet.co.uk](mailto:billurwin@argonet.co.uk)

Activities are linked to the National Curriculum and work sheets are available for all topics at key stage 1 to 4. Schools use the study centre for geological field studies at nationally important local sites and for geography projects linked to the quarrying industry.

Experienced study centre staff are available to lead the day's activities and help you plan your day. The study centre is fully equipped with classroom displays, a projector and screen, maps and reference books.

Information leaflet

[http://www.hanson.co.uk/Responsibility/communityandeducation/teachers\\_leaflet.pdf](http://www.hanson.co.uk/Responsibility/communityandeducation/teachers_leaflet.pdf)

**Former quarries** (please note- some may not be suitable for school visits- you will need to visit before you decide which to use)

The following list names former quarries, pits and mine workings in the Bristol/Bath area that are now Sites of Special Scientific Interest. The information is taken from the English Nature website: <http://www.english-nature.org.uk/special/sssi/search.cfm>. These sites may be suitable for field visits, although the website does not specify the levels of public access.

- Barnhill Quarry (Yate)
- Bowlditch Quarry (northern edge of Midsomer Norton)
- Cattybrook Brickpit (near Almondsbury)
- Combe Down and Bathampton Down Mines (eastern edge of Bath)
- Compton Martin Ochre Mine (Compton Wood near village of Compton Martin)
- Cullimore's Quarry (near Charfield)
- Dundry Main Road South Quarry (1.5 miles north of Chew Magna)
- Hawkesbury Quarry (4 miles northeast of Yate)
- Huish Colliery Quarry (near Radstock)
- Kilmersdon Road Quarry (near Radstock)
- Lulsgate Quarry (near Felton, near Bristol International Airport)
- North Road Quarry (edge of Bathampton Down, Bath)
- Tytherington Quarry (Tytherington village, just southeast of Thornbury)

### **Durnford Quarry, Bristol**

#### **Location and names**

The Durnford Quarry is in Ashton Court Park, hence also known as Ashton Court Quarry. It is accessed via Longwood Lane, hence also known as Longwood Quarry. It is run by Pioneer Aggregates Ltd.

#### **History of the quarry**

Ashton Court Estate is a large park with woodland on the outskirts of Bristol. Durnford Quarry is located in the corner of the park. The park was given over to the people of Bristol as public open space in 1959. In early 1994 Pioneer Aggregates put in an application to extend the quarry by 34 acres into Top Park meadow. Top Park meadow is a calcareous grassland surrounded with woodlands (100s years old Oak trees). Bristol County Council were told that they would face legal action if they officially opposed the application for 34 acres. A further application was submitted in November 1995 for another 20 acres. The City Council had granted an option (signed in 1985) to Pioneer allowing them to lease it for quarrying. The lease states that the council "would use their best endeavours" to support the planning application for it to be quarried. In April 1996, when Avon County Council was abolished, the application was passed to North Somerset Council. Despite lobbying and a site visit attended by objectors, the Planning Committee resolved to grant planning permission for the expansion in July 1996.

Source: <http://www.joolz.demon.co.uk/campaigns/ashtonct/about.html>

### ***Callow Rock Quarry***

Callow Rock Quarry just outside Cheddar village is run by the company Bardon Aggregates. They are happy to take visits from student groups of primary, secondary and university age at any time. There is no fixed educational programme or pre-prepared resources, so visits can be tailored to the age group and subject matter. Visits tend to last between 1 and 2 hours during which the students are driven round the quarry site.

Quarry staff point out the different aspects of production and the environmental impacts of quarrying, as well as answering questions from the students. Minibuses and coaches of up to 45-seater size can be taken, although for Health and Safety reasons, school-age children must remain in their vehicle on site. Just beyond the site boundary, however, above the quarry is an accessible viewpoint which gives a good views of the quarry workings and the Mendips. For further enquiries and bookings contact Bob Sheffield, Callow Rock Quarry (Bardon Aggregates), Shipham Gorge, Cheddar, BS27 3DQ. Tel: 01934 742 621

***Other limestone sites*** (please note- not all these sites will be suitable for fieldwork, they will need to be checked before a visit takes place)

The following list names some other areas of limestone scenery in the Bristol/Bath area that are Sites of Special Scientific Interest. The information is taken from the English Nature website: <http://www.english-nature.org.uk/special/sssi/search.cfm>. These sites may be suitable for field visits.

- *Avon Gorge* (western side of Bristol city centre) – The Gorge has natural cliffs and quarry exposures of Carboniferous limestone, which are of great geological interest and, together with the screes, scrub, pockets of grassland and adjacent woodland, support an exceptional number of nationally rare and scarce plant species. You may have difficulties parking here.
- *Banwell Caves* (5 kilometres east of Weston Super Mare) – A site of national importance for understanding mineralisation processes in the Mendip Hills and an excellent example of in situ bones from the Pleistocene age when the caves acted as a trap for catching animals.
- *Dolebury Warren* (near Lower Langford) – A Carboniferous Limestone hill supporting a continuous gradation of communities from species-rich calcareous grassland, through acid grassland to limestone heathland and bracken, with large areas of mixed scrub.
- *Goblin Combe* (in Wrington Warren, 1.5 miles north of Wrington) – A steep-sided dry valley with extensive areas of limestone scree with a semi-natural ancient woodland and areas of unimproved calcareous grassland and limestone heath.
- *Hampton Rocks Cutting* (near Bathampton) – This site on Ham Hill is important because of the exposures of the sandy limestone known as Ham Hill Stone which is particularly important to geologists because of the assemblages of fossils which it contains.
- *Harptree Combe* (near East Harptree) – A narrow limestone gorge containing a variety of habitats, including Ash woodland, rough grassland, natural and artificial rock faces, and a small, marshy stream.
- *Purn Hill* (south of Weston Super Mare) – A small promontory of Carboniferous Limestone projecting southward from the main Mendip ridge of interest for its exceptionally diverse unimproved calcareous grassland flora which includes three nationally rare species.
- *Spring Cove Cliffs* (Weston Super Mare) – A classic locality for the study of volcanic rocks of Early carboniferous age in southern England.
- *Uphill Cliff* (Weston Super Mare) - This site consists of species-rich calcareous grassland and rock-face situated on Carboniferous Limestone. It is also an outstanding locality for rare plants.
- *Walton Common* (Northeast of Clevedon) – Walton Common lies between 80 m and 90 m above sea level on a Carboniferous Limestone ridge and supports a complex mosaic of grassland, scrub and woodland, and is of high botanical and entomological interest.

## **Cheddar Gorge**

Cheddar Man and the Cannibals

Cheddar Caves and Gorge, Cheddar, Somerset BS27 3QF

Type: Private/site

Managing Body: Longleat Enterprises

Telephone: Cheddar (01934) 742343

Fax: 01934 744637

e-mail: [caves@cheddarcaves.co.uk](mailto:caves@cheddarcaves.co.uk)

web-site: [www.cheddarcaves.co.uk](http://www.cheddarcaves.co.uk)

Curator: Bob Smart

Opening Hours: Daily 10.00am - 4.30pm, July and August 10.00am - 5.00p.m.

Admission: Adult £11.50, Child £8.50 (Showcaves inclusive ticket), Family ticket, £31.50 (2 adults and 2 children)

Collections Owner: Longleat Enterprises

Collections: Formation of Cheddar Gorge and Caves. Palaeolithic "Cheddar Man" - 9000 year old skeleton - and tools from Gough's Cave. Cheddar local history - Romans, Saxons and Victorians. One hundred years of Cave Exploration - Richard Gough 1890 to Cave Divers 1990.

Information taken from

<http://www.somerset.gov.uk/somerset/culturecommunity/museums/somersetmuseums/directory/at/oz/pagec.cfm>

Cheddar Gorge is a Nature Reserve, with karst limestone cliffs, rare plants and animals and archaeological remains. The Gorge has an 'Explorer Bus' which can be booked for school visits. The bus takes pupils up and down the Gorge, explaining its formation and management.



The Gough's Cave has a child's version of the audio commentary they supply, which can be hired for free during your visit. This explains how the caves have been formed over time, how they were used in the past and how they were discovered. Tours can be tailor made for schools if necessary, covering geography, geology, conservation, ecology, travel and tourism and environmental science. Online fact sheets for teachers are available on [www.cheddarcaves.co.uk](http://www.cheddarcaves.co.uk), and include information about how the gorge was formed.

Prices for a trip to Cheddar Gorge for school parties are:

3 attractions: £5.75 per student, with 1 adult free per 10 students

All attractions: £6.50 per student, with 1 adult free per 10 students.

The Gorge bus is an extra £1 per student.

Coach parking is free but must be booked in advance.

A school lunch room is available and also free, but must be booked.

A schools information pack is available on request, along with a DVD to watch before your visit.

## Severn Bridges Visitor Centre and crossings

<http://www.onbridges.com>

The **Severn Bridges Visitor Centre** is open 11.00 am - 4.00 pm at weekends and Bank Holidays until September.

It is located in Shaft Road, off Green Lane, Severn Beach, Bristol BS35 4HW. Any queries please call 01454 633511 or email [a.r.heath@talk21.com](mailto:a.r.heath@talk21.com)

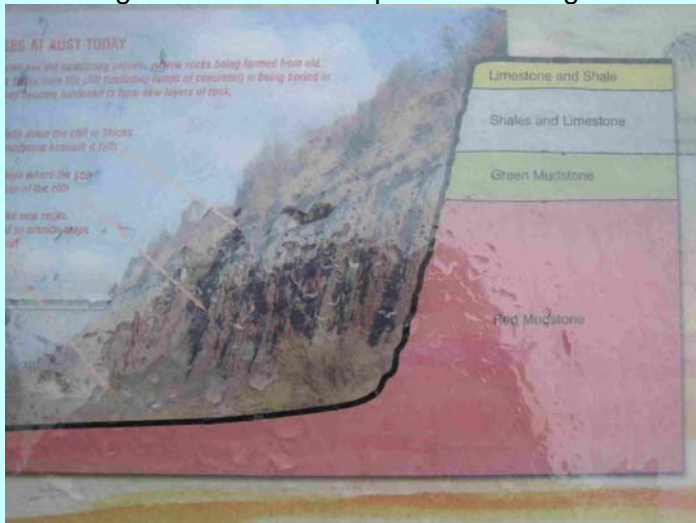
Run by the Severn Bridges Trust a registered charity. It offers a full exhibition as part of an education program, conference facilities, café, shop and temporary shelter to those taking the spectacular walk along the estuary.

### Severn Bridge (old)

The old Severn Bridge has an excellent view point over the Severn Estuary and also of the exposed geology (see below)



You can walk to this view point (on the English side of the bridge) from the Severn View services. The services display boards which tell you about the rock in the area, which can be used to provide teachers with information before the visit, and students with an opportunity to label diagrams and answer questions during the visit effectively.



The rock layers are also visible during the walk down the side of the motorway, so you do not have to walk onto the bridge to see the layers. The bridge can get very windy, and with the level of traffic students need to be briefed before the visit. We would recommend that students are taken onto the bridge in groups of around 5 at a time, to ensure maximum supervision.

See [www.avonrigs.org.uk](http://www.avonrigs.org.uk) for information about the geology of the area

## Fieldwork activities

### *Limestone formations study*

Various topics can be covered when looking at limestone formations, such as:

- The structure of the Mendips (using cross sections to show different types of rock)
- Phases in geological history and the formation of the Mendips over time
- How Cheddar Gorge was formed.
- The Cheddar drainage system
- Surface features on the Mendips (Mendip Plateau, Mendip Scarp)
- Groundwater hydrology on the Mendips
- Cave formation and development
- Formation of dry valleys
- Karst development
- Typical surface landforms
- Slope features in Cheddar Gorge
- Affect of quarrying on the local area

### *Quarry study*

A quarry study can be used to look at the method of quarrying itself, the types of rocks and where they are taken after quarrying. This can all be linked to economic geography. The quarry site can also be used to look at the environmental quality of a quarry area. Pupils can then draw a flow chart to show the stages and uses of the rock produced from the quarry.

Quarries usually will provide some information to schools, or will have information available on their website.

The questions below could be used during an interview with the quarry site manager, or just generally to help shape an investigation based around the quarry and surrounding environment.

1. What type of rock is being quarried?
2. What is the rock used for?
3. How much is produced in a year?
4. Where does it go?
5. How many people does the quarry employ?
6. What are the stages of extracting the stone?
7. What impacts does the quarry have on its local environment? (this could be the overall title of the investigation)
8. How have the quarry managed these problems?

Make sure that the positive and negative impacts of the quarry on the surrounding area are kept balanced expressed fairly from all angles. Also encourage students to think about long term as well as short term impacts, and on a variety of scales e.g local economy, national economy

### **Field sketches**

Encourage students to look at an OS map of the quarry area before the visit. What do they see? Students should annotate a section of map showing what they would expect the landscape and quarry area to be like, which should then be evaluated after the visit has taken place. Students could undertake a field sketch of the quarry, which could include buildings, access roads, rock type, settlements nearby and potential environmental and human risks. Think about the aesthetic view of the quarry for local people, and perhaps even visit local settlements to see how people feel about the pollution, noise etc.

### **Quarry traffic survey**

A survey of the main access roads to the quarry could be undertaken, with the type, number and size of vehicles going in and out recorded. Scores could be given for each vehicle in terms of noise and dust produced, or accurate noise readings could be taken using equipment loaned from your science department. Noise could also be measured at different distances from the quarry, including in residential areas to assess the noise pollution levels in the surrounding area.

### **Environmental survey**

Environmental surveys are a great way of assessing the impact that quarrying has on the surrounding area. Choose several locations around the quarry, including an area a fair distance away from the actual site. The information collected can then be used to discuss management and conservation options and conflicts of opinion.

Location:

Date:

Weather:

Observations:

	-2	-1	0	+1	+2	
Poor road access						Good road access
Few facilities						Many facilities
No room to expand site						Room to expand site
Ordinary						Distinctive
Cramped						Spacious
Dirty						Clean
Ugly						Beautiful
Noisy						Quiet
Boring						Interesting
Untidy						Tidy
Unattractive						Attractive
Unpleasant						Pleasant
Badly kept						Well kept
Dangerous						Safe
Unfriendly						Friendly
All the same						Varied
Smelly						Not smelly
Polluted air						Fresh air
Total score						

## ***Landscape transects***

Landscape transects can be done to show limestone features within an area. Select a fieldwork area which contains several features and get students to plan a hiking route out on an OS map (1:25,000 map is best). Make sure students explain:

- The reason for their chosen hiking route e.g. good scenery, already footpaths marked, goes through nice village etc
- What limestone features they think they will see along the way

On the field day, either select a student's transect to use or create one based around the areas you want the class to visit. The students should all look at this before they arrive at the area, and think about what landscape they expect to see along the way. You should then walk all or part of the transect with your students, who then annotate the map (features, sounds, how they feel, what they see that is unusual or not expected), take pictures and make field sketches along the route, discussing along the way how the features were formed. A good area to use for this is the road which goes through Cheddar Gorge. You could ask students to think about what they might see, then drive them through the Gorge (stopping to see interesting areas and information boards). Students could then annotate a map of the Gorge with what they see during their journey.



## Adding value to your fieldwork with additional data

### ***Using conflicts of interest***

The expansion of the quarry into a public park and conservation area presents a conflict of interest. There are many stakeholders including: local residents, park users, mountain bikers, city council, county council, quarry company and conservation groups. The main campaign against the expansion was in the late 1990s and there are many accounts on different websites representing different perspectives and stakeholders. The following are just a selection from a non-exhaustive search:

Information about Durnford Quarry / Ashton Court conflicts of interest

<http://www.wussu.com/roads/r98/r9803131.htm>

<http://www.joolz.demon.co.uk/campaigns/ashtonct/legals.html>

<http://www.urban75.org/archive/news019.html>

<http://www.bristolcyclingcampaign.org.uk/grim/reaper17.html>

<http://www.ngo.grida.no/ngo/nu/concrete/oldtexts/conc9.htm>

<http://www.forestofavon.org.uk/News1.asp>

<http://www.bristolfoe.org.uk/wildfire/quarrying/dontdigit.htm>

[http://www.eco-action.org/efau/issues/1998/efau1998\\_03.html](http://www.eco-action.org/efau/issues/1998/efau1998_03.html)

<http://www.visionwebsites.co.uk/Contents/Text/Index.asp?SiteId=121&SiteExtra=19594897&TopNavId=246&NavSideId=4045>

[http://archive.corporatewatch.org/magazine/issue5\\_6/cw5cu.html](http://archive.corporatewatch.org/magazine/issue5_6/cw5cu.html)

Some of these could be reproduced in a pack as part of a decision-making exercise.

### ***Using local campaigns as case studies: Durnford Quarry, Bristol***

Ashton Court Estate is a large park with woodland on the outskirts of Bristol. Durnford Quarry is located in the corner of the park. The park was given over to the people of Bristol as public open space in 1959. In early 1994 Pioneer Aggregates put in an application to extend the quarry by 34 acres into Top Park meadow. Top Park meadow is a calcareous grassland surrounded with woodlands containing oak trees that are hundreds of years old. Bristol County Council was told that they would face legal action if they officially opposed the extension application. A further application was submitted in November 1995 for another 20-acre expansion. The City Council had granted an option (signed in 1985) to Pioneer allowing them to lease it for quarrying. The lease states that the council "would use their best endeavours" to support the planning application for it to be quarried. In April 1996, when Avon County Council was abolished, the application was passed to North Somerset Council. Despite lobbying and a site visit attended by objectors, the Planning Committee resolved to grant planning permission for the expansion in July 1996.

This example could be used as a case study for a decision-making exercise where students can debate the conflicts of interest arising over the proposed quarry expansion into a public park and area of conservation value. There are many stakeholders including: local residents, park users, mountain bikers, city council, county council, quarry company and conservation groups. The main campaign against the expansion was in the late 1990s and there are many accounts on different websites representing different perspectives and stakeholders. Some of them could be compiled into a work pack and different groups of students are allocated to represent different points of view. The websites mentioned in the 'Using conflicts of interest' box are just a selection of accounts found during a basic Google search.

## Using Quarryville

<http://www.tarmac.co.uk/quarryville/teachers/curriculum/>

Tarmac's Quarryville website is an education resource for schools that supports key content areas of the National Curriculum, Key Stages 2 and 3. Use of the pupil activities will meet many of the aims of the curriculum, especially those related to Science and Geography. However, there are opportunities to incorporate other subjects, notably ICT and Citizenship. Tarmac welcomes school visits to most of its operational quarries. Ones near Bristol are:

Durnford Quarry, N. Somerset	01275 392 471
Halecombe Quarry, Somerset	01373 812 800
Stancombe Quarry, N. Somerset	01275 464 441

## Using British Geological Survey material

Unfortunately you cannot access much BGS material online for free, but several of its publications may be useful for finding material for geology based fieldwork. These include:

Map and book catalogue [http://www.bgs.ac.uk/catalogue/docs/entire\\_catalogue.pdf](http://www.bgs.ac.uk/catalogue/docs/entire_catalogue.pdf)

Geological Memoirs- England and Wales

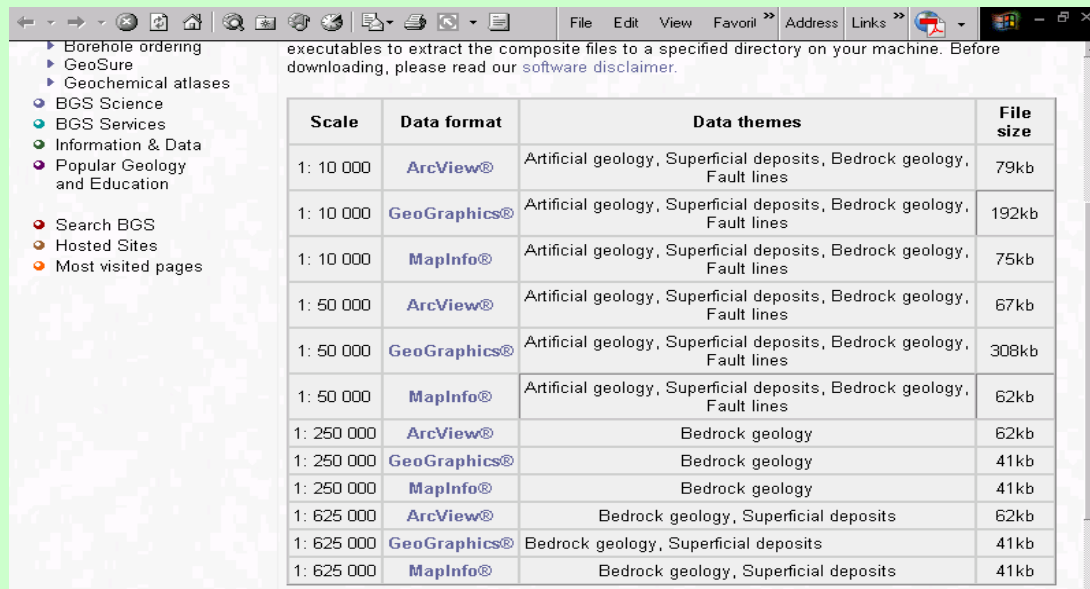
<http://www.bgs.ac.uk/catalogue/docs/memoirsew.pdf>

Classical areas of British geology maps and booklets

<http://www.bgs.ac.uk/catalogue/docs/classical.pdf> (includes number 32, Cheddar)

## Using GIS

The British Geological Survey has a range of data that can be downloaded into a GIS, found at <http://www.bgs.ac.uk/products/digitalmaps/data.html> (see screen shot below)



executables to extract the composite files to a specified directory on your machine. Before downloading, please read our [software disclaimer](#).

Scale	Data format	Data themes	File size
1: 10 000	ArcView®	Artificial geology, Superficial deposits, Bedrock geology, Fault lines	79kb
1: 10 000	GeoGraphics®	Artificial geology, Superficial deposits, Bedrock geology, Fault lines	192kb
1: 10 000	MapInfo®	Artificial geology, Superficial deposits, Bedrock geology, Fault lines	75kb
1: 50 000	ArcView®	Artificial geology, Superficial deposits, Bedrock geology, Fault lines	67kb
1: 50 000	GeoGraphics®	Artificial geology, Superficial deposits, Bedrock geology, Fault lines	308kb
1: 50 000	MapInfo®	Artificial geology, Superficial deposits, Bedrock geology, Fault lines	62kb
1: 250 000	ArcView®	Bedrock geology	62kb
1: 250 000	GeoGraphics®	Bedrock geology	41kb
1: 250 000	MapInfo®	Bedrock geology	41kb
1: 625 000	ArcView®	Bedrock geology, Superficial deposits	62kb
1: 625 000	GeoGraphics®	Bedrock geology, Superficial deposits	41kb
1: 625 000	MapInfo®	Bedrock geology, Superficial deposits	41kb

The data is based around 4 themes (follow hyperlinks for explanations)

[Artificial theme](#)

[Mass movement theme](#)

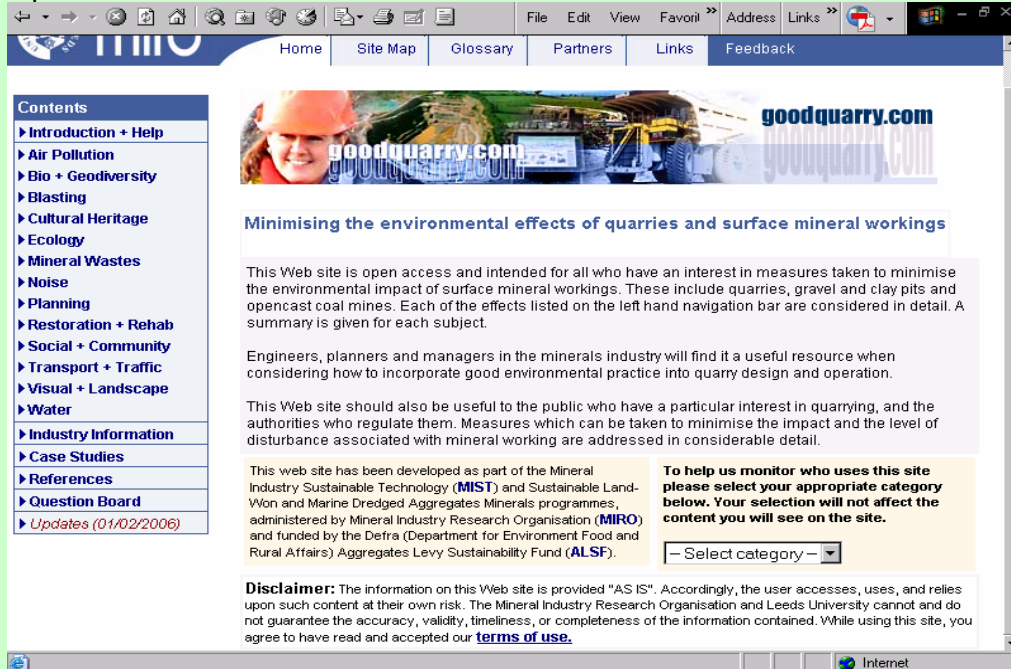
[Superficial deposits theme](#)

[Bedrock geology theme](#)

## Using GoodQuarry.com

<http://www.goodquarry.com/Default.aspx>

Run by The Mineral Industry Research Organisation and Leeds University, GoodQuarry.com is an excellent site for providing general background information about the environmental issues surrounding quarries including traffic, air pollution, noise pollution, planning, waste, ecology and visual landscape. It also provides ideas and links to other websites and documents that may provide further information about certain topics.



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- Blasting
- Cultural Heritage
- Ecology
- Mineral Wastes
- Noise
- Planning
- Restoration + Rehab
- Social + Community
- Transport + Traffic
- Visual + Landscape
- Water
- Industry Information
- Case Studies
- References
- Question Board
- Updates (01/02/2006)

goodquarry.com

### Minimising the environmental effects of quarries and surface mineral workings

This Web site is open access and intended for all who have an interest in measures taken to minimise the environmental impact of surface mineral workings. These include quarries, gravel and clay pits and opencast coal mines. Each of the effects listed on the left hand navigation bar are considered in detail. A summary is given for each subject.

Engineers, planners and managers in the minerals industry will find it a useful resource when considering how to incorporate good environmental practice into quarry design and operation.

This Web site should also be useful to the public who have a particular interest in quarrying, and the authorities who regulate them. Measures which can be taken to minimise the impact and the level of disturbance associated with mineral working are addressed in considerable detail.

This web site has been developed as part of the Mineral Industry Sustainable Technology (MIST) and Sustainable Land-Won and Marine Dredged Aggregates Minerals programmes, administered by Mineral Industry Research Organisation (MIRO) and funded by the Defra (Department for Environment Food and Rural Affairs) Aggregates Levy Sustainability Fund (ALSF).

**To help us monitor who uses this site please select your appropriate category below. Your selection will not affect the content you will see on the site.**

-- Select category --

**Disclaimer:** The information on this Web site is provided "AS IS". Accordingly, the user accesses, uses, and relies upon such content at their own risk. The Mineral Industry Research Organisation and Leeds University cannot and do not guarantee the accuracy, validity, timeliness, or completeness of the information contained. While using this site, you agree to have read and accepted our [terms of use](#).

The site also contains named quarry case studies, for example Whatley Quarry <http://www.hanson.co.uk/Responsibility/communityandeducation/eastmendip.html> which has the Hanson East Mendip Study Centre for school visits and educational purposes. See the website for information about school visits.

## Using atlases

Many schools atlases such as the Philip's Modern School Atlas <http://www.philips-maps.co.uk> contain a geology map of the British Isles. This should give you an idea of the geology of your area, and can be used when looking at geological timescales and ensuring students understand about ice sheets, rock formations, types of rock etc. The Philips Foundation Atlas has a simple geology map of the British Isles, which can then be used to locate areas of limestone.

## Using SSSI information

English Nature maintains the list of over 4,000 Sites of Special Scientific Interest (SSSIs) in England on their website: <http://www.english-nature.org.uk/special/sssi/index.cfm>. You can search the SSSIs by name or keyword and county. For each individual SSSI, the following information is available:

- Detailed site map
- Description of why the area was designated an SSSI
- List of permitted and prohibited activities on the site
- A short report on the management of the site
- Latest assessment of the current condition of the site



This information can be used in a variety of ways. If visiting the site, students could map the site, collect data about environmental quality and make observations about the conservation and management and later compare it to official reports and data from the website. The information on the website could also be the basis for creating a decision-making or role-play exercise whereby students have to examine the conflicts of interest.

## Web links

### ***The Sustainable Use of Aggregates: Myth or Possibility?***

<http://www.joolz.demon.co.uk/campaigns/ashtonct/joolzmasters.html>

Information about quarrying and the environment  
Uses Ashton Court quarry as a case study

### ***Institute of quarrying***

<http://www.quarrying-woe.co.uk/>  
<http://www.quarrying.org>

### ***Quarry management***

<http://www.qmj.co.uk>  
<http://www.goodquarry.com/>

### ***BGS minerals information***

[http://www.mineralsuk.com/free\\_downloads.html#EIM](http://www.mineralsuk.com/free_downloads.html#EIM)

### ***Good Quarry***

<http://www.goodquarry.com/>

A website about minimising the environmental impact of surface mineral workings including quarries, gravel and clay pits and opencast coal mines. Resources include:

- Details about different environmental impacts of quarries (such as air pollution, noise, waste and traffic).
- Details about different aspects of environmental management (such as restoration, ecology, biodiversity, landscaping, community issues, planning).
- Statistics about the quarrying industry in the UK.
- Case studies on a variety of topics.

### ***Quarry Products Association***

<http://www.qpa.org/home.htm>

The trade association for companies involved in supplying quarried materials. Website includes:

- Key issues and key facts about quarrying today.
- Latest news and press releases about the quarrying industry.

- Information about quarrying companies and environmental management.
- Details about the variety of different products from quarries and how they are used.
- A school zone for teachers and children.
- Statistics for quarrying by UK region.
- Details of how history, geology and archaeology relate to quarrying.
- Photographs which show how different types of quarry work.

### **Virtual Quarry**

<http://www.virtualquarry.co.uk/>

- Website include more than 20 curriculum- focused lesson plans developed by education experts and vetted by teachers.
- Search for active or restored quarries in your region which are suitable for school visits and access health and safety guidance for your trip – page under development.
- Image library.

### **QuarryEd**

<http://www.quarryed.co.uk/index.html>

A range of education resources designed to compliment a range of A-level subjects developed by [Camborne School of Mines](#), University of Exeter (Cornwall Campus). The website is split into sections for teachers, students and about careers. It includes:

- Details about active and dormant mines and quarries for educational visits.
- Resources which show how we rely on the extractive industry for many everyday items.
- Information about cutting-edge mining projects in the UK and worldwide.
- An assortment of education resources and information for A-level teachers.

### **Quarryville**

<http://www.tarmac.co.uk/quarryville/teachers/curriculum/>

An education resource for schools that supports key content areas of the National Curriculum, Key Stages 2 and 3. Use of the pupil activities will meet many of the aims of the curriculum, especially those related to Science and Geography. However, there are opportunities to incorporate other subjects, notably ICT and Citizenship.

### **Earth Science Education Unit, based at Keele University**

<http://www.earthscienceeducation.com/>

- Provides INSET in Earth science to UK teachers.
- [Resources include “South Elmsall Quarry: an example of how to use a local Site of Special Scientific Interest in teaching”.](#)

### **British Aggregates Association**

<http://www.british-aggregates.com/>

Website includes:

- Statistics about the UK quarrying industry.
- Details of current issues affecting the UK quarrying industry.
- Information about project to restore old quarry sites.
- Latest news and press releases about the quarrying industry.

### **Campaign to Protect Rural England**

<http://www.cpre.org.uk/>

- Publications about the minerals industry
- Information and news about campaigns against the extractive industries

### **The Countryside Agency**

<http://www.countryside.gov.uk/>

- Information about mines and quarries within
- Details of funding schemes to develop disused mining sites for biodiversity, education, recreation and other uses.

**The South West branch of the Royal Town Planning Institute** (RTPI) have produced a series of case studies for school teachers and students on recent planning and environmental issues in the region. The packs, available online, are mainly aimed at teachers and students aged from 14 to 18, particularly those studying geography. Case study 1 looks at **Stone Quarrying in the Mendip Hills**. <http://southwest.rtpi.org.uk/guide/mendip.pdf>