

Wye Valley 2 – an A' Level Mapping Exercise

This is a full-day geological mapping exercise covering an area of about 0.7 km² over the hills between Little Doward and the River Wye. It follows on from the Wye Valley 1 Palaeoenvironmental Exercise, which is also a full-day exercise and introduces you to the eight rock units present in the area.

A base map is provided on the app which shows 36 locations. These are some of the rock exposures in the area and visiting them will provide sufficient information to draw a geological map; but you can record observations from additional locations as you go if you wish, or choose not to visit all 36 locations if you deem it unnecessary as your map develops.

It is assumed that before attempting this mapping exercise that you will have already visited sites 1 – 10 during the Wye Valley 1 exercise and will not need to re-visit them today. You will have described the eight rock units encountered, and mapped them by using the **'define a rock type'** and **'assign rock to site'** tools in the app. This will have enabled you to start today reasonably well familiar with the rocks that you will

see and to map them as you find them in other parts of these hills. You will struggle to complete the mapping in one day if you have not done this.

Should you need reassurance about your observations from Day 1, then there is a checklist of the distinctive and common features of the eight rock units on the deepTime website at www.deeptime.voyage (look in the Resources section). If necessary, carry small labelled samples of each rock unit for the purposes of comparison if you collected these on Day 1.

TERRAIN: Much of the terrain is woodland and some of the slopes are quite steep – take care. There are tracks and paths through the woods but you will need to leave the paths to visit some of the locations.

LOCATING YOURSELF: The forest tracks are marked on the map as red lines. Note that although the suggested locations are numbered, there is no set route – it is for you to decide what order you visit them in. For each location, the app provides a brief bit of information and one or more pictures so that you can be sure that you are in the right place – access this by touching the location marker on the

map and then the '**tasks**' flag that appears. The GPS feature of the app also shows your location on the map at all times. Bear in mind that locations can look very different in winter, spring, summer and autumn. In summer, it can be harder to get to some of the smaller outcrops as there is a lot of ground cover in the woods and vegetation may hide them.

START / FINISH: You can access the mapping area from the Ganarew entrance to the Doward woodland or from the small car park between King Arthur's Cave and Doward campsite. Both parking points are marked on the map. It will save you time if you can be dropped off at one parking point and picked up at the other.

AIM: To collect data sufficient to draw a geological map of the area between Little Doward and the River Wye.

EQUIPMENT: Tablet / phone, hand lens, notebook, pencil, rubber, various coloured pencils, compass-clinometer, grain size/sorting/shape card, ankle-supporting boots having soles with good grip, weather-proof clothing. The app toolbox provides a

compass-clinometer and grain charts, and the means to record notes and photos, but it is always wise to have a back up by also carrying traditional kit and a notebook.

N.B. It is helpful to have a geological hammer and a small dropper bottle of dilute HCl (0.5 mol / 10%) for this type of fieldwork. However, if these are not available to you, there are pictures of fresh rock surfaces and their reaction to dilute HCl throughout the exercise that will assist you instead. If ever a hammer is used it should be on a small area (a few cm) of exposure that will not spoil the appearance of the rock to public view.

PROCEDURE:

1. In the field

At each location, first check the GPS marker on the app map and the information provided for the site (tasks flag) to make sure that you are in the right place. Then take notes of the lithology and structure at that location. The app allows you record all of this.

On Day 1 you should have used the '**define a rock type**' tool to describe and assign a colour to each of the eight rock units. Today as you recognise those rock types at various locations, you can use the '**assign rock to site**' tool. This will turn the colour of the location marker on the map at that site to the colour that you assigned to the rock type. If you then use the compass-clinometer to take a dip and strike reading at the site, the location marker will also show the strike and direction of dip.

Every item of data that you record is GPS located. As well as dip and strike, you can take notes, voice recordings and photos at a site. These can be accessed by touching the location marker on the map, then the '**data**' flag that appears.

Lithology: observe the colour, grain size, grain shape, grain sorting, mineral composition (hardness, cleavage, reaction with dilute HCl, colour). Make sure any specimen you look at is **representative** of the outcrop as a whole, by looking at a range of samples. Beware of loose fragments, especially on steep slopes and near to made paths – they may not belong there, though it should be obvious if the fragments have come from a solid outcrop nearby.

Note too that some rocks are more resistant to modern weathering and erosion than others and may produce ridges or valleys, steep or gentle slopes and boundaries between rock types may be indicated by a break of slope. Different rocks may also produce different soils and thereby different vegetation. This, together with any loose “brash”, may be useful in coming to a conclusion about the position of boundaries between rock units. Remember, the main aim here is to **recognise and place rocks in a mappable rock unit** (a lumping-together of lots of beds of roughly similar/dominantly similar types). This does NOT require detailed description and analysis of rock types.

Structure: take dip and strike readings. It is good practice to take more than one reading at a site if there are suitable bedding surfaces for this. Note: if you take more than one reading at a site, the dip and strike shown on the map for that location will be the average of these readings.

Photographs, and field sketches, if correctly labelled and oriented, may provide an additional way of recording and illustrating structural features.

As you go, if you use the app to assign rock types to the sites you visit, the app will be plotting both the lithology and structure (from your dip and strike readings) on the map. This will give you a 'feel' for what is happening on the larger scale of the map as you move around the area. Mapping in a forest area can be confusing with changes of path orientations and lack of visibility due to forest cover, so seeing your map develop as you go will help. Remember that the strike directions you plot will also be the direction taken by the boundaries between rock units on the map.

2. Writing Up

If you have visited all the locations, you should certainly have collected enough data to manually draw your geological map (on a fresh OS base map of the area) when you are back at base.

First plot the dips and strikes, as strike bars, by using the compass and the N-S gridlines to plot strike and dip centred on the location of the reading. Remember that the strike directions you plot will also be the direction taken by the boundaries between rock units on the map.

The lithology can next be added. The convention is to colour **boldly** the places where you actually observed the rocks, then use the strike direction to plot the direction of boundaries between the rock units, in the position you have determined as most likely. Where data is lacking or doubtful the boundary should be drawn as a dashed line. Where a boundary has been observed or is very well-supported by the data, solid boundaries can be drawn. Areas now enclosed by these boundaries can be lightly shaded using the same colours as for actual exposures.

With the addition of a key to the colours, your map is now complete. The structure of the area could be further illustrated by completing a cross section drawn along a line A – B, using your own data, and summarised in a short paragraph, using the technical terms you have learned during your A' level course.

3. Evaluation

It is a very important scientific principle that you are able to judge how reliable, complete and accurate are your findings. Which parts of the map are you most confident/least confident about and why?