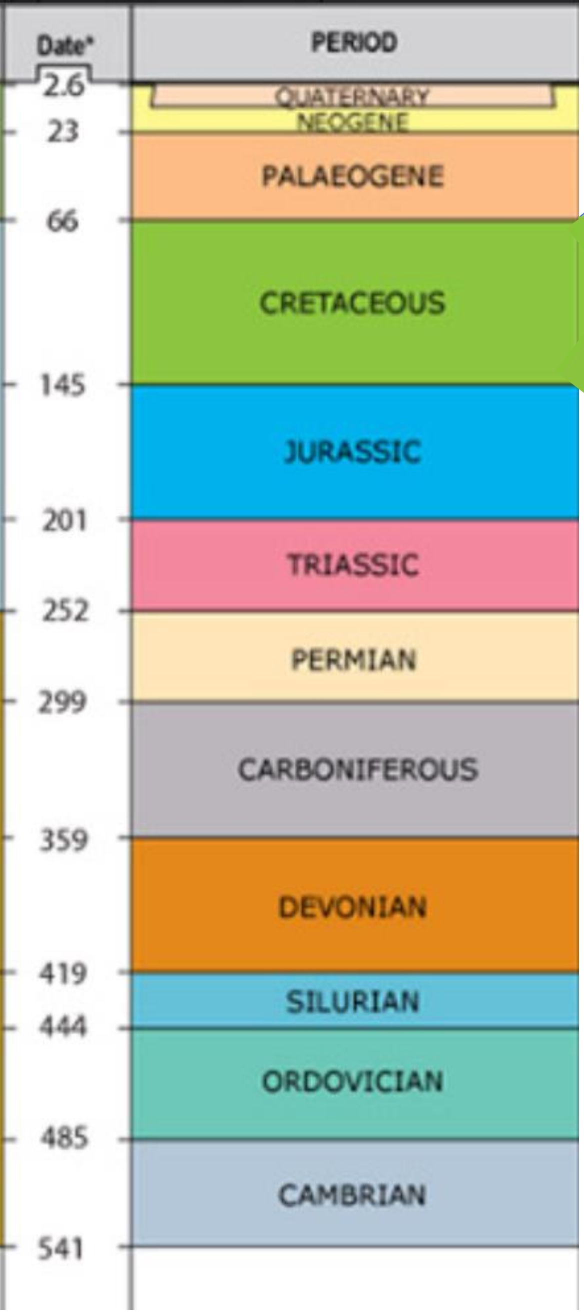
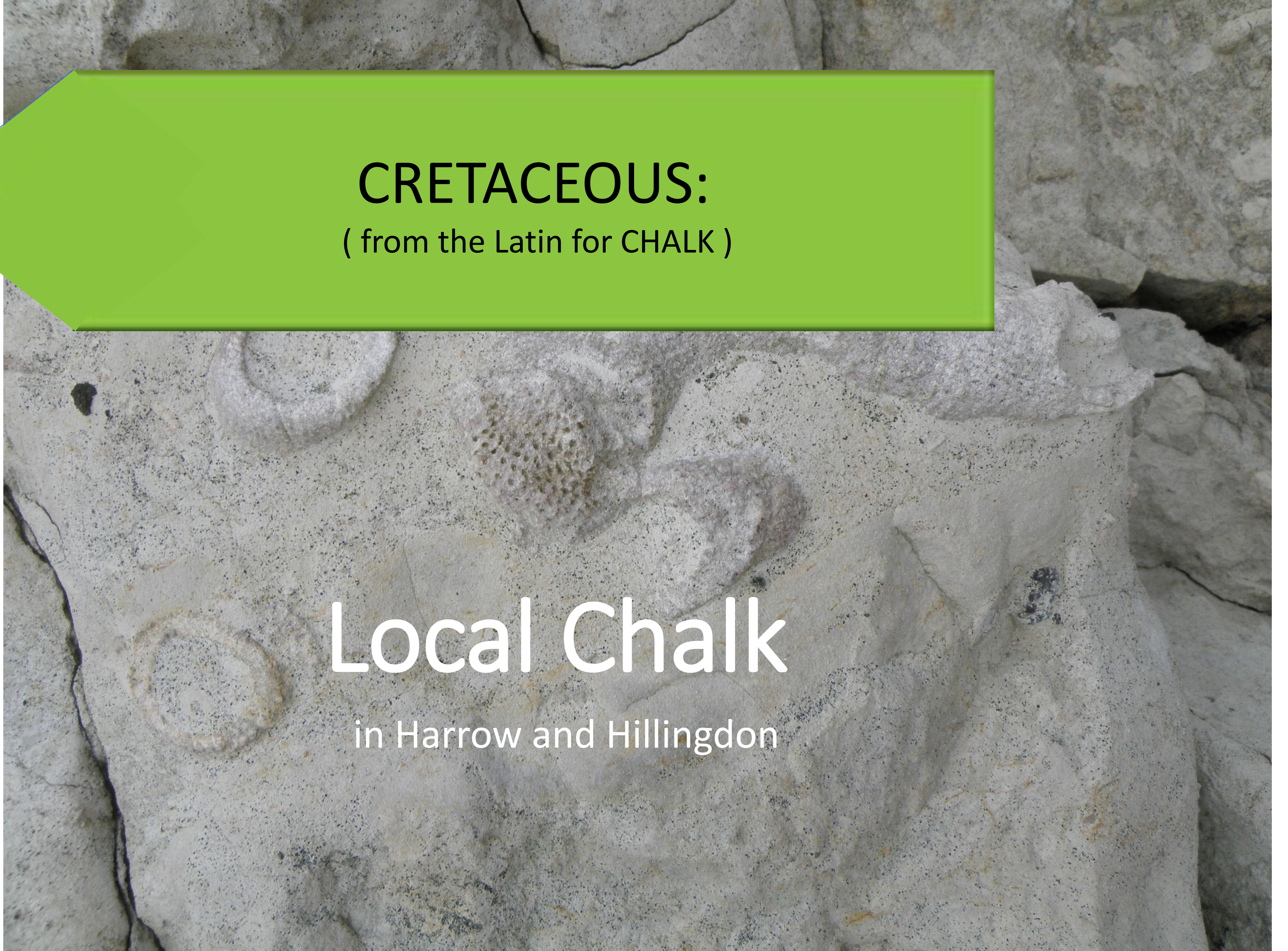


The BGS geological timechart is based on The Geologic Time Scale 2012.



CRETACEOUS:

(from the Latin for CHALK)

Local Chalk

in Harrow and Hillingdon

Geological Map of the London Basin

Thames Group: Paleogene Period (Eocene epoch) Clays from 52 -48 million years ago

Lambeth Group: Paleogene Period. (Paleocene/ Eocene epoch) 56-55 million years ago

Chalk Group: Cretaceous Period. London's chalk dates from 88 -85 million years ago

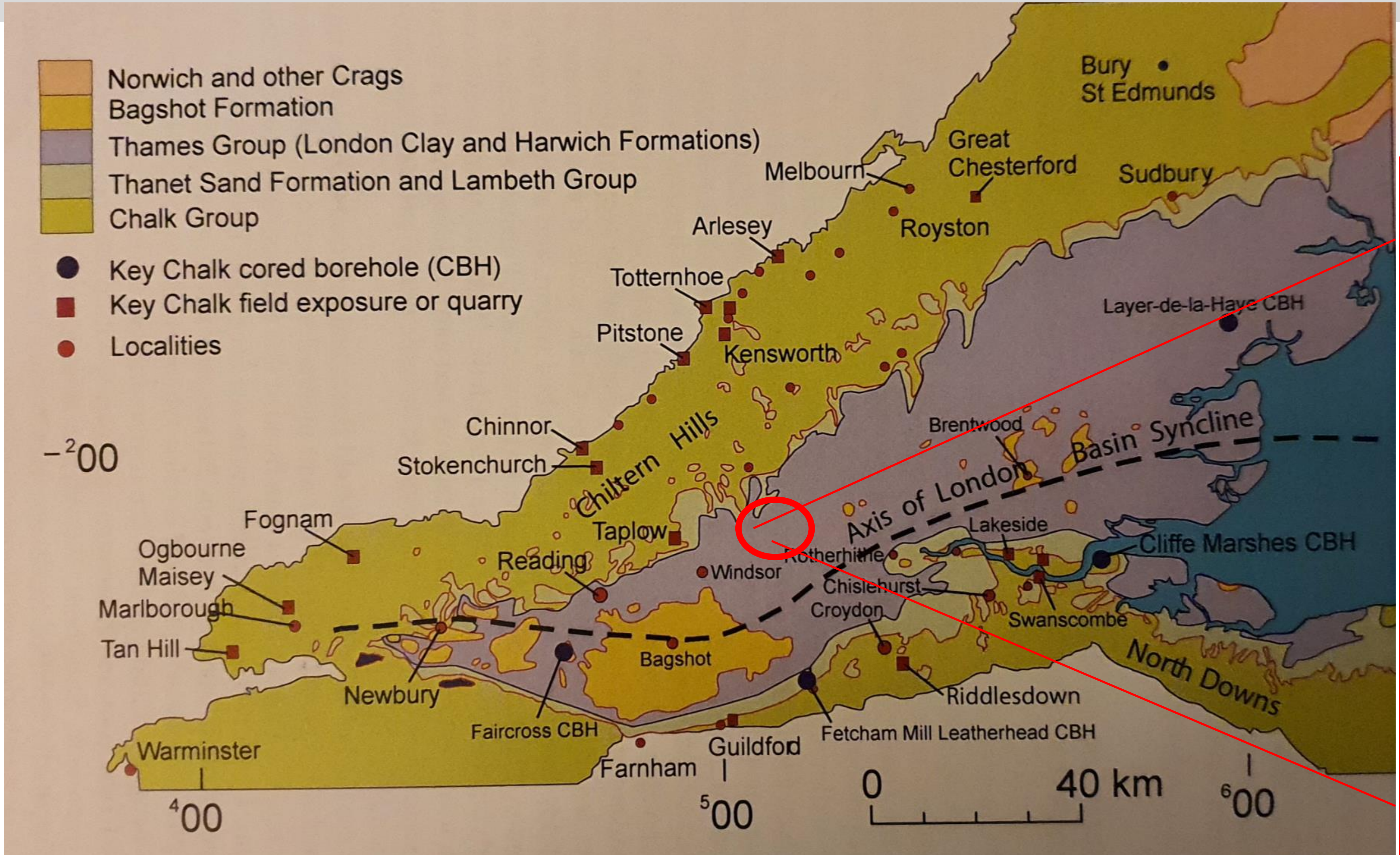


Figure 2. Geological map of the London Basin region (based upon BGS 1: 625 000 Ten Mile Map, South Sheet, 1979 with the permission of the British Geological Survey.) (*R.N. Mortimore*)

Geologists' Association Guide No.68: The Geology of London, compiled by Diana Clements

Harefield in Hillingdon was the site of former chalk quarries. It has some remaining exposures of Seaford Chalk.

Pinner in Harrow has disused chalk mines underground

Cross Section of the London Basin

For the past 56 million years, the London Basin has been accumulating sediments such as clay, gravel and sand. These lie on top of older rocks from the time of the dinosaurs.

These older rocks include the white chalk that is found across southeast England. If you dig deep enough anywhere in London you will find it.

Dig even deeper and you will find even older rocks - such as those found in the southwest of England and Wales. However, we cannot see those at the surface anywhere in London.

In Harrow and Hillingdon we find chalk of the Seaford Formation.

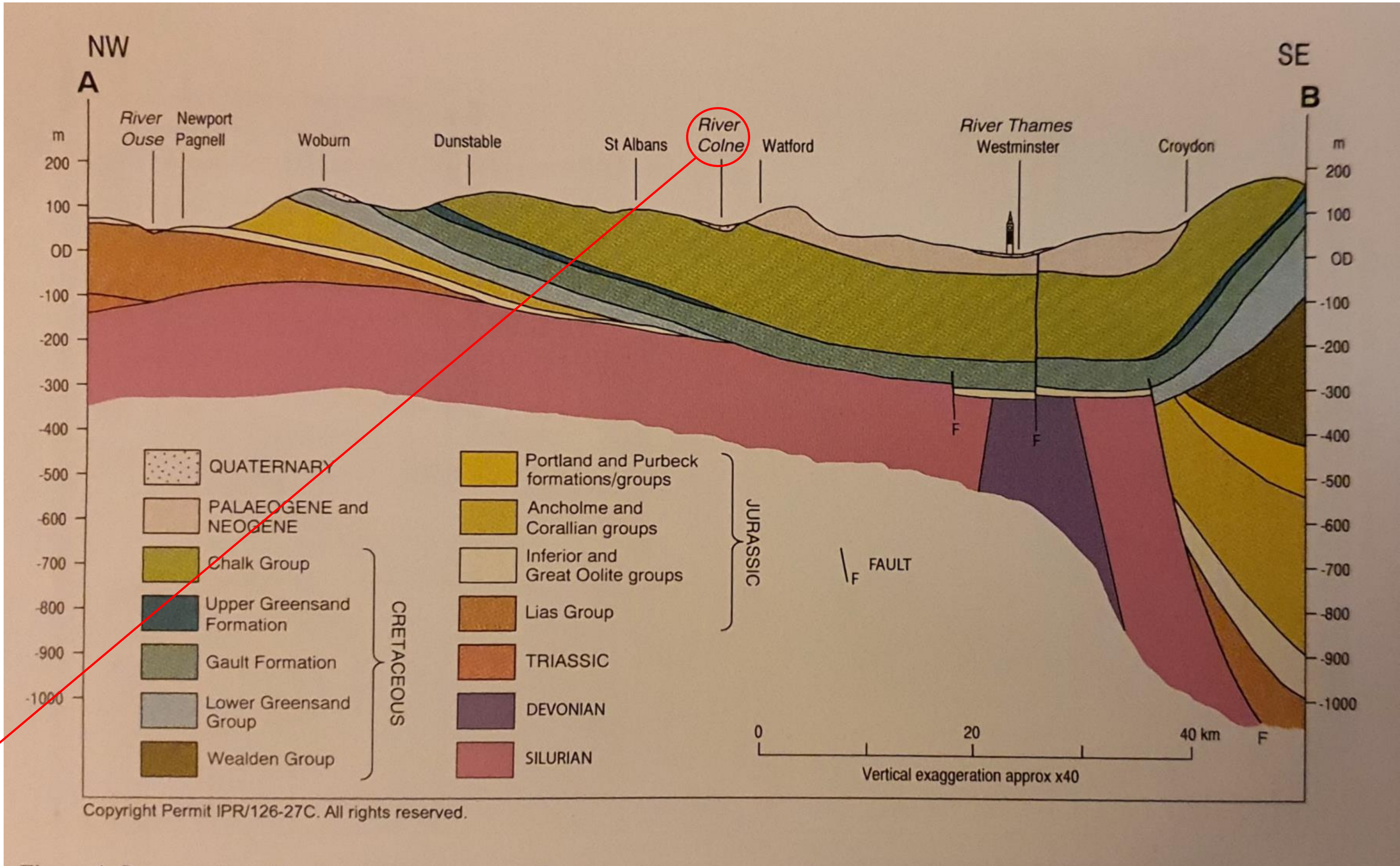


Figure 4. Cross-section of the London Basin showing how the older outcrops can be seen on either side of the Thames Valley. The syncline is superimposed on the older anticline of Palaeozoic rocks. *IPR/126-27C British Geological Survey © NERC. All rights reserved.*

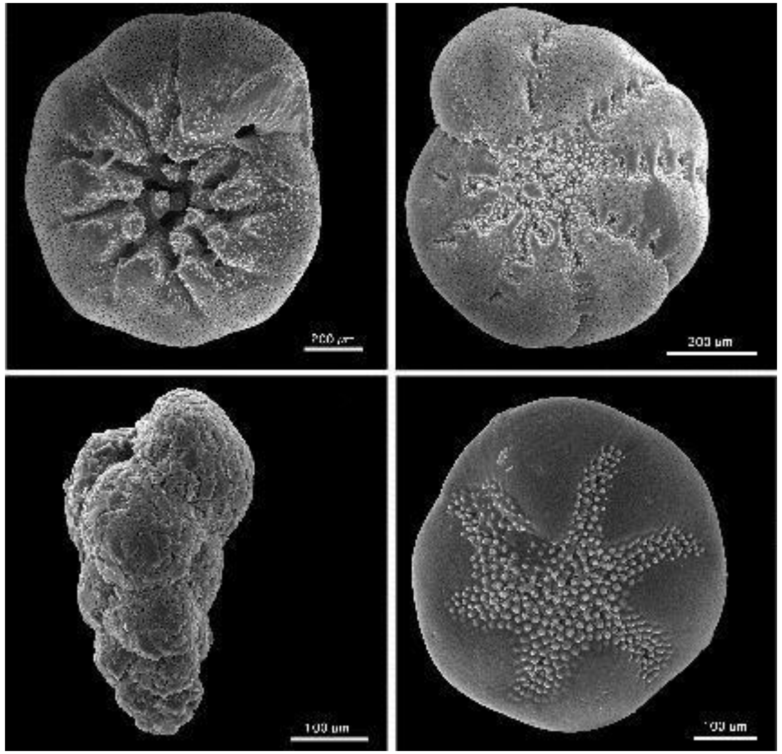
Image from the Geologists' Association Guide No.68: The Geology of London, compiled by Diana Clements

What is Chalk?

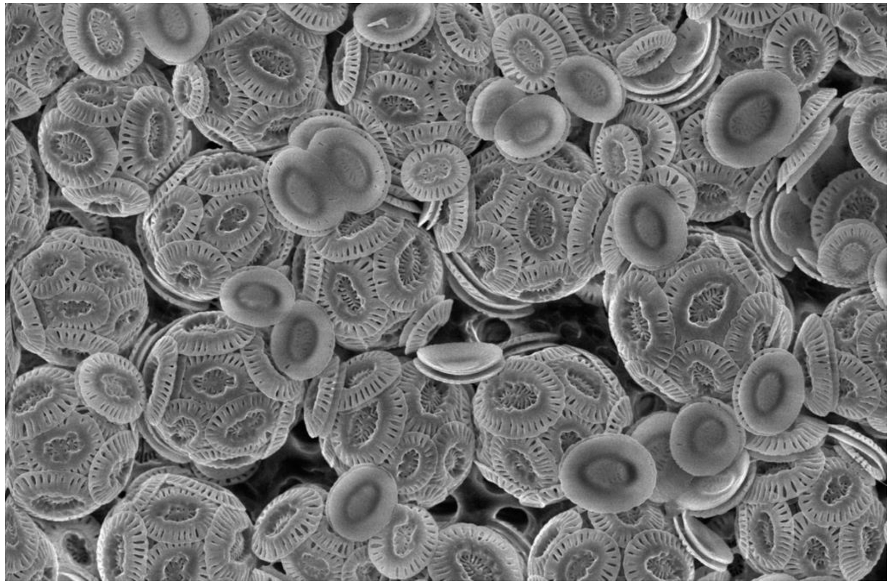
[Read about it on Geology.com]

The remains of tiny micro-organisms in the sea create a marine sediment which accumulates on the sea floor as ooze. If this is high in calcium carbonate ($CaCO_3$) and the sea conditions are just right, chalk will form.

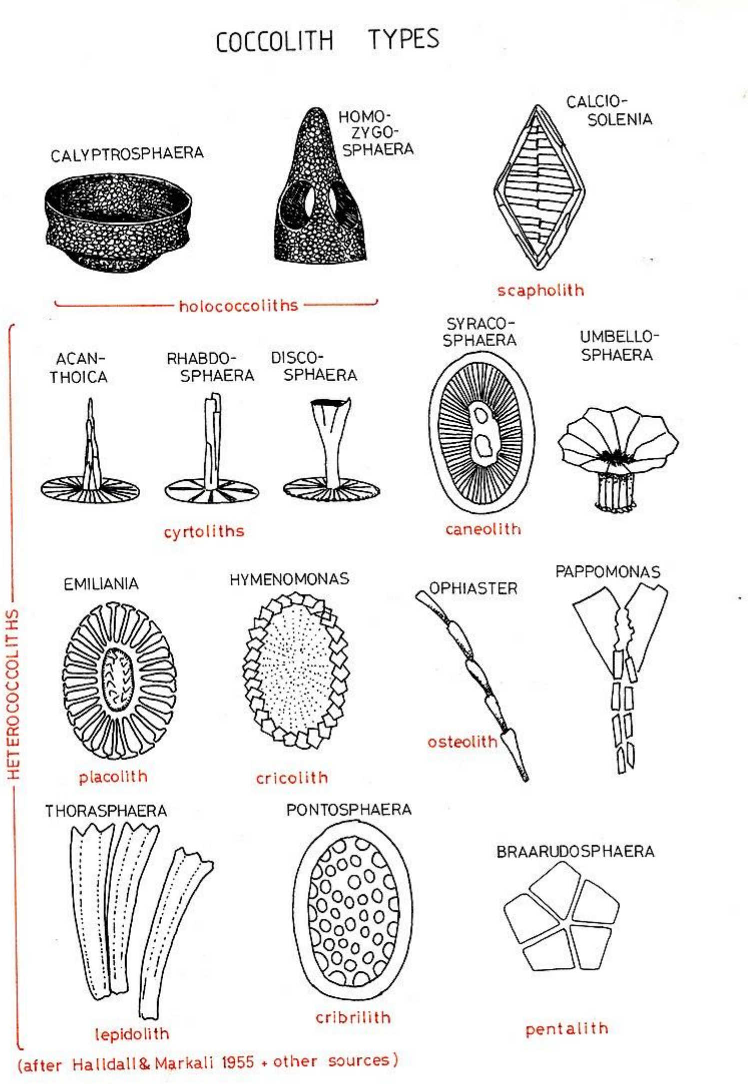
By examining chalk under a scanning electron microscope it is possible to identify plates of calcium carbonate called coccoliths from single-celled algae (coccolithophores), and the shells of tiny marine animals known as foraminifera (also high in $CaCO_3$).



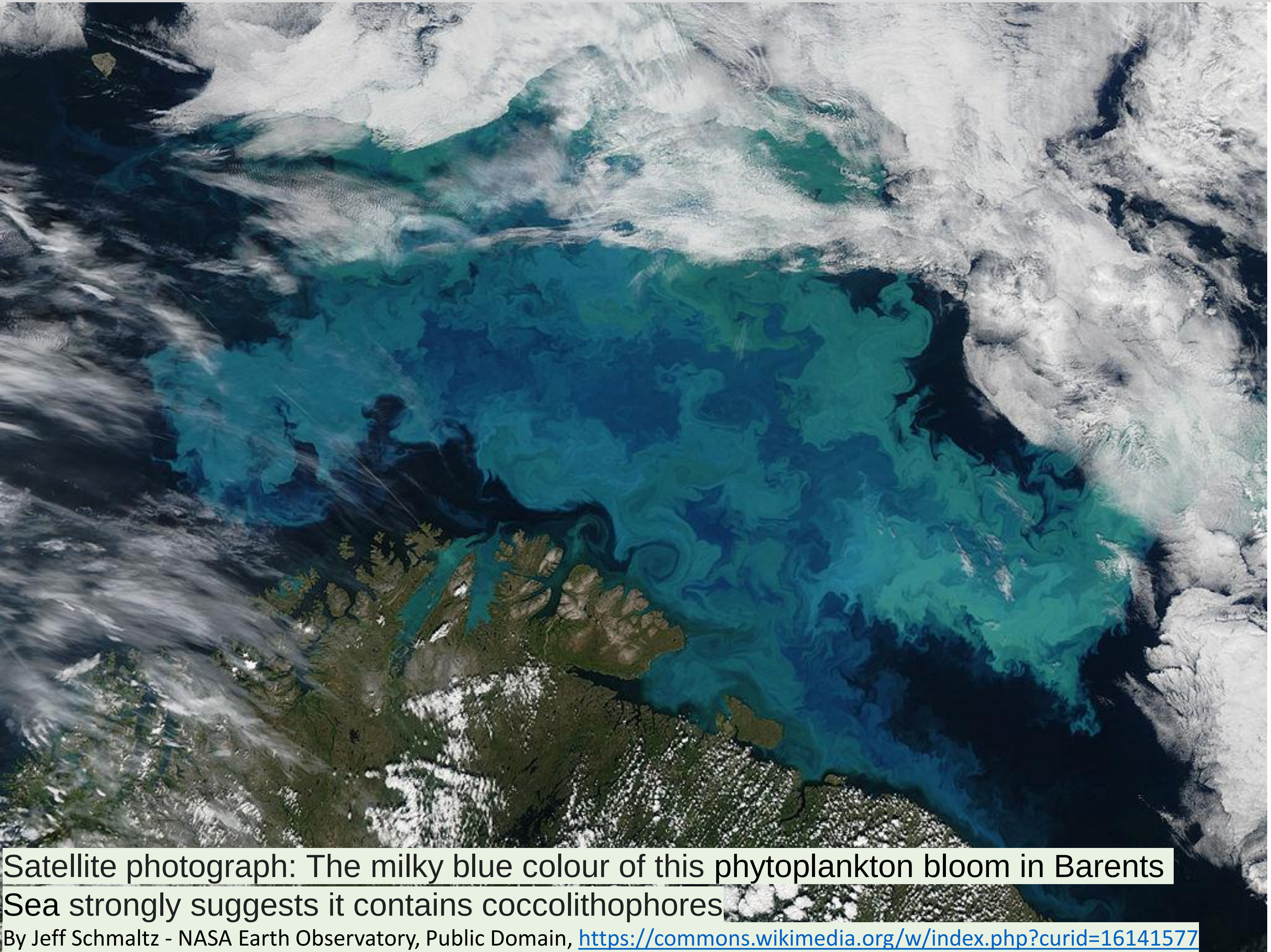
Present day foraminifera shells. Photo by Roger B. Williams – http://www.kgs.ku.edu/Publications/ancient/f06_fusulin.html



Present day coccolithophores. Photo by Robin Mejia.(Dr. Alison Taylor. - [1] doi:10.1371/journal.pbio.1001087, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=99404892



Chalk and Climate



Satellite photograph: The milky blue colour of this phytoplankton bloom in Barents Sea strongly suggests it contains coccolithophores.

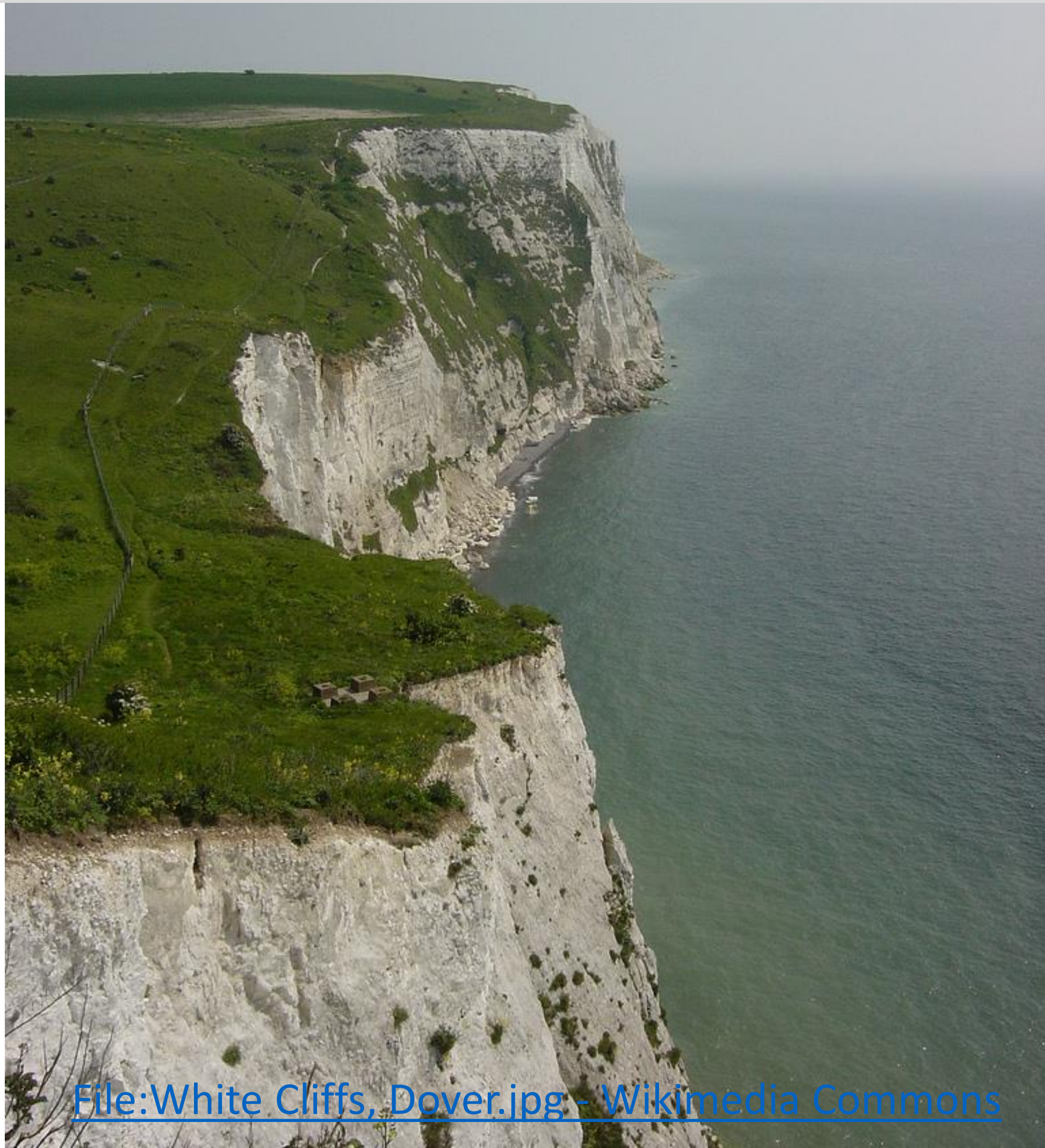
What do we know about the climate at the time when the Chalk was forming?

Sea-levels were particularly high when the white chalk formed, over 150m above the present sea level with no ice at the poles and warm sea surface temperature; southern England lay beneath a warm shallow sea. The chalk formed at depths of 100m-300m and contains few impurities from river sediments due to arid conditions on land.

The level of CO_2 in the atmosphere was high, creating ideal conditions for algae to bloom and create massive quantities of sediment and an ooze rich in calcium carbonate.

The Southeast of England is characterised by the great bands of white chalk which form the hills of the Chilterns and the Downs.

File:Alton Barnes White Horse (48744910806).jpg - Wikimedia Commons



File:White Cliffs, Dover.jpg - Wikimedia Commons

Hope Gap

Seaford, Sussex (HHGS field trip, 2018)

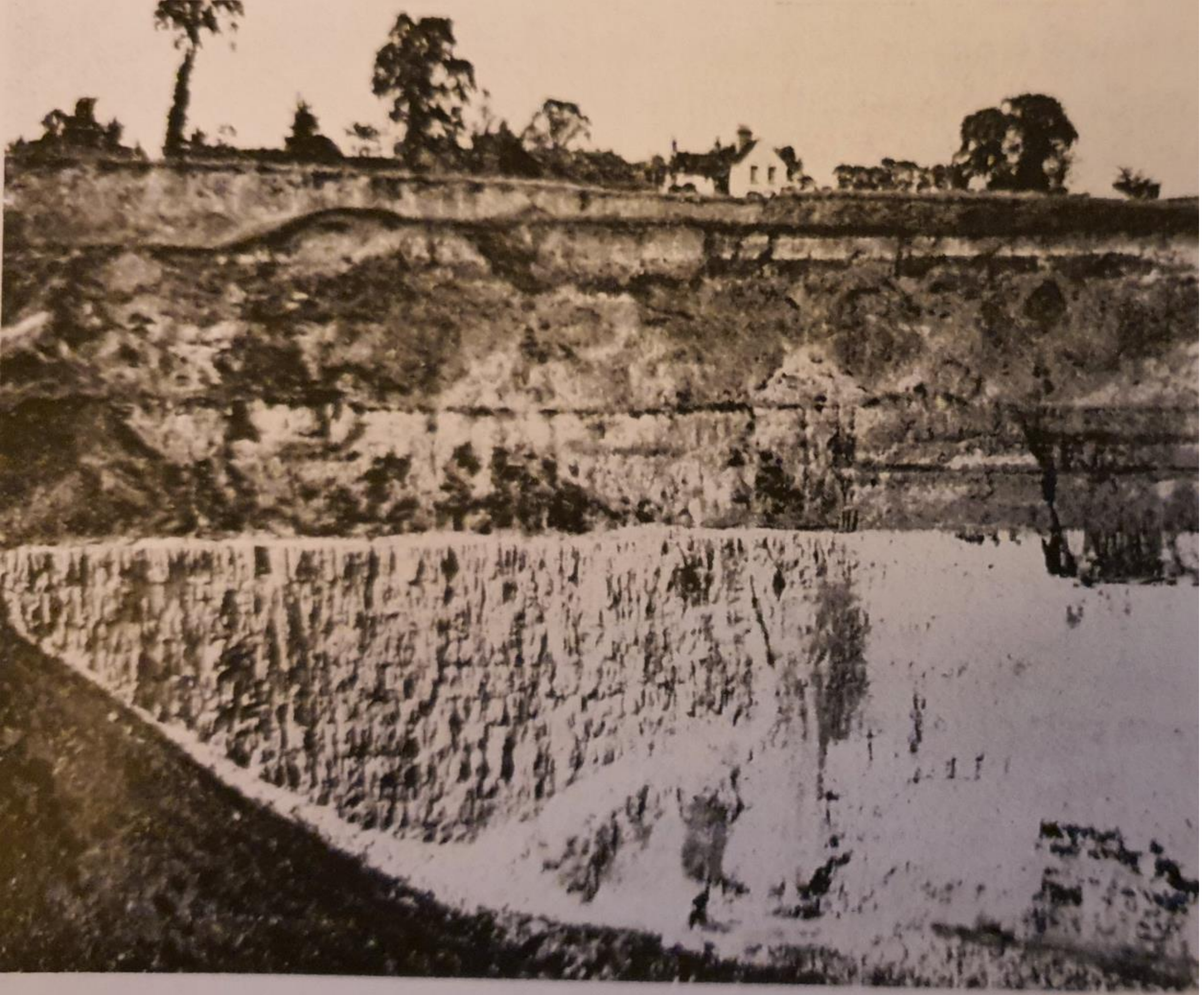


Figure 14. Harefield quarry when operating in 1914. (*Davies, 1914 Pl.IIa*)

Figure 19. Summerhouse Lane Pit in 2005 showing dissolution pipe (centre). This pipe reappears at the base of the pit.

Seaford Chalk is the same White Chalk that is found in Hillingdon at Harefield Pit SSSI and Summerhouse Lane Pit, and also at the Pinner Chalk Mines in Harrow; other outcrops in the London area occur near Greenwich, Bromley and Croydon.

Across London we find sand and clay above the chalk, sediments laid down mostly in shallow seas and coastal plains covering the area where London stands. The London Basin had formed after the chalk as a result of tectonic movements.

White Chalk from Harefield Pit SSSI

Chalk Group

White Chalk Subgroup

Seaford Chalk Formation

flint pebbles eroded from chalk and deposited later

Glyphichnus Harefieldensis crustacean burrows

Dingles Chalk Mine, Pinner

Images from the Geologists' Association Guide No.68: The Geology of London, compiled by Diana Clements

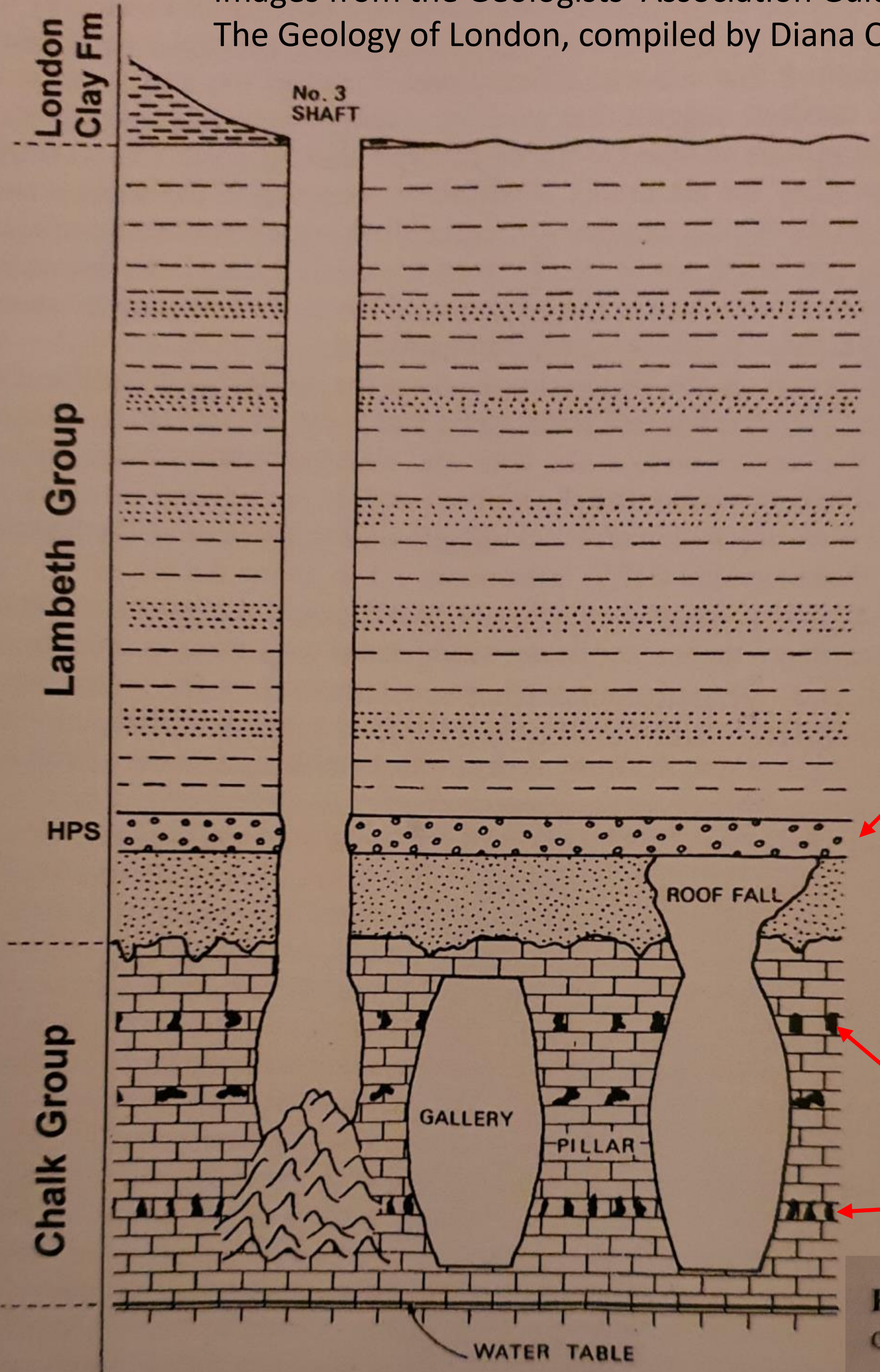


Figure 22. Section through the Dingles Mine showing the geology and method of working. HPS = Hertfordshire Puddingstone. (*After Gallois, 1982*)

Hertfordshire Puddingstone

Above the chalk in Pinner we find a layer of this beautiful rock, 55.6 million years old.

Figure 25. Portion of Hertfordshire Puddingstone from a roof fall in Dingles Mine, Pinner. Length of clast is *c.* 10 cm. (*Collection J. Pester*)

Cementation at the time of formation indicates a warmer climate; this was the time of the thermal maximum.

[Find out more.]

Flint layers

Dingles Chalk Mine in 2001 *(Photo: Bryan Cozens)*

Chalk Group

White Chalk subgroup

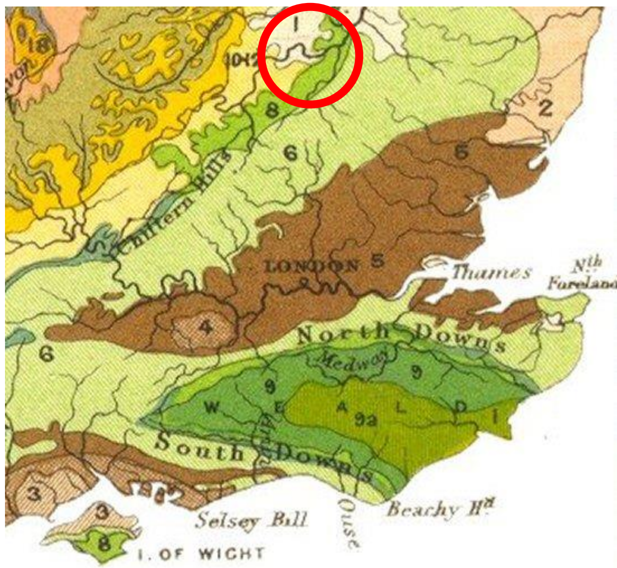
Seaford Chalk Formation

Upper Chalk with flints

Pinner Chalk Mine 2001

HHGS often visits sites in the southeast important for chalk

Beachy Head, Eastbourne, (HHGS field trip, 2015)



Kensworth Chalk Quarry, Dunstable (HHGS field trip 2009)

Chafford Hundred, Essex, (HHGS field trip, 2011)