



## Palaeogene (PGN)

### Block Description

Visit <https://jncc.gov.uk/gcr-site-list>, for more information on GCR blocks and sites  
For Mesozoic-Tertiary Stratigraphy GCR block descriptions and GCR site lists,  
visit <https://jncc.gov.uk/gcr-blocks-mesozoic-tertiary-stratigraphy>

## Introduction

The GCR sites selected for this GCR Block represent the British geological record of Earth history from about 65 to 24 million years ago (Ma). This interval is the first period of the Cainozoic Era, which encompasses the history of the Earth from the end of the Cretaceous Period (65 Ma) to the present day. Rocks that formed during the Palaeogene Period constitute the Palaeogene System, which in turn comprises the Palaeocene, Oligocene and Eocene Series. Together, the Palaeogene and succeeding Neogene periods form the Tertiary Sub-Era. The Tertiary sub-era comprises all but the final two million years or so of the Cainozoic Era of 'recent life'. The definition of the end of the Tertiary sub-era, the Pliocene–Pleistocene boundary has been the subject of some debate.

## Outcrop pattern

In England, Palaeogene rocks are preserved in two east–west trending tectonic basins, the London Basin and the Hampshire Basin, and in small outliers further west as far as Devon. The oldest rocks occur in the London Basin (and its northward extension into East Anglia) where late Palaeocene to mid Eocene strata are found. A thicker and stratigraphically more extensive succession occurs in the Hampshire Basin, and it is at its thickest in the Isle of Wight where some 600 m of strata represent the late Palaeocene to early Oligocene stratigraphy.

Tertiary rocks of igneous origin are particularly well developed in Scotland (**see Tertiary Igneous (TER-IGN)**), but are also represented much further to the south by, for example, the Lundy Granite.

The British onshore sites in these two tectonic basins provide a record for some 25 Ma; from the sediments of NP Zone 6 age exposed in Pegwell Bay to the youngest surviving uneroded remnants of the Palaeogene on the Isle of Wight, where the uppermost part of the Bouldnor Formation may possibly be as young as NP Zone 23 in age.

Understanding the Tertiary has been particularly enhanced by the existence of large expanses of undisturbed and non-lithified oceanic sediments which provide unbroken successions representing the whole of the sub-era and contain a record of organic, isotopic and other data for this period of geological time.

## Palaeoenvironment and palaeogeography

As the Cainozoic Era began, the Earth presented several unusual aspects. It had been warm for many millions of years, with the Jurassic to Cretaceous the longest period of the Phanerozoic without a global glaciation. Such global warmth continued into the Cainozoic Era. Apparently there were no ice-caps at either the North or South Poles. Temperatures were up to 10–15°C higher than at present in southern latitudes, but the tropics in early Tertiary times were no warmer than they are now. Whilst the difference between tropical and polar temperatures today is about 40°C, in the Eocene this was smaller by one-quarter to one-third. At the beginning of the Palaeogene Period, Britain was at a latitude of 40° N, 12° south of its present position and was considerably warmer than at present, although from latest Early Eocene times, floristic changes indicate that the climate was gradually becoming cooler.

Not surprisingly, global sea level was considerably higher during the early Tertiary than at the present day, producing a wide expanse of epicontinental seas. Later, sea levels were generally lower but there is evidence for a succession of rises and falls throughout the whole of the sub-Era. As the Tertiary began, the separation of Europe and North America continued in the North Atlantic area, with the breakup of the Greenland–Rockall Plate and the production of volcanic rocks including those of Northern Ireland and Scotland. Movement of Eurasia south-eastwards was to result in compression and shear in the Mediterranean region culminating in the various Alpine orogenic mountain-building phases. **See Alpine Structures of Southern England (ALP-STR-SE).**

During the Late Cretaceous Epoch, much of north-western Europe was an area of marine carbonate deposition with a few areas emergent such as the Scandinavian massif and perhaps parts of Wales and Scotland. Signs of more general emergence appeared in Maastrichtian (71–65 Ma) and more widely in Danian (65–61 Ma) times, at the end of which clastic sediments replaced the limestones that had dominated the area for the previous 40 Ma. Such a change is thought to reflect increased erosion (both subaerial and submarine) resulting from uplift associated with ocean-floor spreading in the northern Atlantic region. The latter was associated with extensive igneous activity which reached its climax in Palaeocene times and which in the British area culminated in early Eocene times.

At the beginning of the Palaeogene Period, Britain lay on the western margins of what has been called the Northwest European Tertiary Basin which extended eastwards at least as far as Poland. To the west of Britain lay the proto-Atlantic with which the latter was sometimes connected via the so-called 'Central Channel and Western Approaches Basins'. To the immediate east of Britain, lay the major North Sea Basin where a long period of Tertiary sedimentation, fed by rejuvenated source areas particularly to the north and west, ultimately gave rise to deposits, in excess of 3000 m thick at their depocentre, representing a wide variety of environments from non- or marginal marine to bathyal.

The contrast between the thick Palaeocene succession of the North Sea area and the relatively thin and younger strata of this age in southern England indicates that much of Britain was land during the early part of the Palaeogene Period. Its existence contrasts markedly with the situation in the Upper Cretaceous Epoch which was one of almost total submergence.

This land area was undergoing active erosion. In places, the Chalk cover had been reduced to a residuum of insoluble flints (as seen at the Tower Wood site), whereas elsewhere (e.g. the Bolter End site) evidence indicates the breaching of the Chalk and the erosion of older rocks.

Palaeogene deposits are characterized by alternating marine transgressions and regressions, thought in the main to reflect global sea-level changes.

## **GCR site selection**

The majority of sites represent a variety of facies preserved in the paralic succession of the tectonic London and Hampshire Basins. Many of them are important both lithostratigraphically and chronostratigraphically and contain a variety of sediments and fossils which have facilitated palaeoenvironmental and palaeogeographical interpretation.

The following networks are identified:

- London Basin: eastern localities
- London Basin: western localities
- Hampshire Basin: Isle of Wight localities
- Hampshire Basin: mainland localities
- Western Outliers of Devon and Dorset

## **Palaeontology, fauna and flora**

That Tertiary faunas and floras are essentially modern in aspect has made the task of palaeogeographical and palaeoenvironmental interpretation considerably easier than for earlier periods of geological time. Using ostracods and forams, for example, it has been possible to determine quite narrow ranges of water salinity and depth, rather than the broader generalizations so often unavoidable with older strata. The dinosaurs which had dominated the Earth in Mesozoic times had died out before the Tertiary began, to be replaced by the more readily comprehensible mammals which began to establish

themselves in the Palaeocene prior to their great diversification at the beginning of the Eocene. The flora too became distinctly modern in aspect; the angiosperms flourished.