Charnage Down Chalk Pit, Mere, Wiltshire

[ST 837 329]

Introduction

Charnage Down Chalk Pit is a working lime quarry located 2 km east of Mere, Wiltshire (Figure 3.38), on the north side of the A303 (T). It is cut into the south-facing Chalk scarp controlled by the east–west Mere Fault (Figure 3.10), overlooking the Vale of Wardour. The pit is famous as an example of extreme condensation of the Turonian Chalk Rock. However, some 30 m of Chalk are exposed in this pit, from a few metres beneath the Upper Turonian Chalk Rock to the base of the Middle Coniacian Seaford Chalk Formation. This large section provides a link to Shillingstone Quarry to the south (see GCR site report, this volume). It was in this area that William Smith (in Townsend, 1813), recognized the 'green-tinctured chalk' (Chalk Rock) separating 'useful white chalk' above from 'useless malmy chalk' below This is probably the first reference to a division of the Chalk that subsequently became the traditional Middle–Upper Chalk boundary and it is now the boundary between the New Pit Chalk and Lewes Nodular Chalk formations.

Description

Although there are many references to exposures of Chalk Rock in the area of Mere Down (e.g. Jukes-Browne and Hill, 1904, p. 75) it was not until 1916 (Scanes, 1916, p. 133, pl. 24B) that the Charnage Down Chalk Pit was illustrated and the thickness of the Chalk Rock identified. Jukes-Browne and Hill (1904) noted the changing aspect of the Chalk Rock when traced from Mere Down to West Knoyle and Chapel Farm, Upton (Figure 3.38) and (Figure 3.39) to the east of Charnage Down. They also recorded that the dip increased rapidly towards the Great (Mere) Fault. The stratigraphy of the pit was briefly outlined by Smith and Drummond (1962), together with some fossil records. Charnage Down was also incorporated in two long-range skeletal correlation diagrams for the lower and upper Lewes Nodular Chalk respectively (Mortimore, 1983, figs 4a,b) and another section was given by Mortimore (1987, fig. 5). The most recent published section is in the British Geological Survey Wincanton Memoir (Bristow *et al.,* 1999, fig. 29) but this does not extend up to the Seaford Chalk Formation and is difficult to interpret.

A photographic illustration of the section was given by Bathurst (1976), which showed how much the section with the Chalk Rock had degraded since the time of both the earlier photograph and a later photograph (Edmunds, 1938, pl. 12). Bromley (1967) investigated the Chalk Rock section and discussed burrow-fills associated with one of the hardgrounds, which were so closely spaced that they made up over 50% of the rock. He also produced an elegant block diagram (Bromley, 1975a, fig. 18.7) to show the detailed architecture of two of the hardgrounds, the higher one with a hummocky surface and the lower with a planar surface. This figure also demonstrates the effect of 'imposed horizontality' on the *Thalassinoides* burrow systems, i.e. the burrows extending down from the higher surface are unable to penetrate the hardened lower surface and divert to run along the top of it. Subsequently, Bromley and Gale (1982, fig. 12) published a detailed section of the Chalk Rock interval from a trench ([ST 808 342]; see (Figure 3.38)) at or near the original Jukes-Browne and Hill (1903) Mere Down locality, and illustrated that this was one of the most condensed Chalk Rock sections, but they did not actually publish a section of Charnage Down Chalk Pit.

Lithostratigraphy

The exposed succession (Figure 3.41) extends from a few metres below the Chalk Rock to some 5 m above the Shoreham Marls at the boundary between the Lewes Nodular Chalk and Seaford Chalk formations of the White Chalk Subgroup (Mortimore and Pomerol, 1987). Formerly 40 ft (12 m) were exposed beneath the Chalk Rock (Scanes, 1916).

The most conspicuous feature of the Chalk succession is the Chalk Rock, here about 1 m thick, comprising a number of glauconitized hardgrounds and associated chalkstones. Bromley and Gale (1982, fig. 3) divided the Chalk Rock into three suites of hardgrounds based on their type section at Ogbourne Maizey, near Marlborough, Wiltshire, some 58 km to the north-east (Figure 3.1). Each of these suites can be recognized in highly condensed form at Charnage Down (Figure

3.41) and (Figure 3.42), and a correlation established with exposures in the area, based almost entirely on lithological features. The basal Ogbourne Hardground has a flat top surface here, in contrast to its convolute morphology elsewhere. The middle suite of hardgrounds is the most difficult to distinguish, but the uppermost 'Hitch Wood' Hardground, of the top suite, with many *Micraster leskei* Desmoulins on its top surface and in the soft chalk burrow-fills, is the most easily identified hardground.

Beneath the Chalk Rock, some 4 to 5 m of New Pit Chalk Formation are exposed. These contain weakly developed marl seams and one better-developed marl seam (Figure 3.41). None of these marl seams is comparable to the group of marker marl seams used for correlation in the Middle Turonian New Pit Chalk and Middle–Upper Turonian lower Lewes Nodular Chalk formations.

In the first 6 m above the Chalk Rock there is a group of nodular chalk beds containing sporadic flints. More continuous flint bands enter above a hardground that can be correlated with the Hope Gap Hardground of Sussex. Sheet-flints are also present above this hardground, some on curving shear planes. In the highest accessible exposures a conspicuous marl seam overlain by a bed of tubular flints is correlated with the Shoreham Marl 1 and the Shoreham Tubular Flints. The chalk up to this point is very pure white, but noticeably gritty with fossil debris, as is typical of the highest part of the Lewes Nodular Chalk Formation.

Biostratigraphy

Fossils beneath the Chalk Rock are scarce. Only fragments of inoceramid bivalves having affinities with *I. cuvieri* J. Sowerby have been obtained. Smith and Drummond (1962) assigned these beds to the top of the *Terebratulina lata* Zone. Within the Chalk Rock no diagnostic fossils have been recorded, with the exception of *Micraster leskei* in the uppermost (Hitch Wood) Hardground.

In the nodular beds above the Chalk Rock, a typical suite of Upper Turonian fossils is present, including *Sternotaxis placenta* (Agassiz), *Echinocorys, Micraster praecursor sensu* Drummond and *Micraster normannie* Bucaill.e. Well-preserved inoceramid bivalves from this level include *Inoceramus websteri sensu* Woods *non* Mantell. Beds presumed to equate with the interval between the Navigation and Cliffe hardgrounds (i.e. Lower Coniacian Substage) contain late forms of *Micraster normanniae* and inoceramid bivalve debris derived from *Cremnoceramus waltersdorfensis* (Andert). The Hope Gap Hardground is associated with abundant *Micraster decipiens* (Bayle). Large *Cremnoceramus crassus crassus* (Petrascheck) are common in beds some 2–4 m below Shoreham Marl 1.

Interpretation

Charnage Down Chalk Pit is located on the north side of the Mere Fault (Figure 3.39) and correlation of the Chalk Rock interval illustrates the influence of this structure on Late Turonian sedimentation (Figure 3.42). To the south-east, at the Donheads on White Sheet Hill [ST 937 238], the Chalk Rock is 5 m thick (see Bromley and Gale, 1982, fig. 10); from there it thins northwards to some 2 m in the Hindon Tunnel section and further thins across the Mere Fault to 1 m at Charnage Down. The surfaces of the hardgrounds also change from strongly convoluted away from Charnage Down to flatter surfaces at Charnage Down Chalk Pit itself.

Despite the extremely condensed Chalk Rock here, the presence of *Inoceramus cuvieri* beneath the Chalk Rock, and *Micraster leskei* on the terminal Hitch Wood Hardground top surface provide excellent biostratigraphical control, indicating the age range of the Rock. This is comparable with expanded sections at Beggars Knoll, Shillingstone Quarry, and Fognam Quarry (see GCR site reports, this volume) and constrains the Chalk Rock interval to the uppermost Middle Turonian Substage and the lower part of the Upper Turonian Substage, an interval corresponding to the lower Lewes Nodular Chalk.

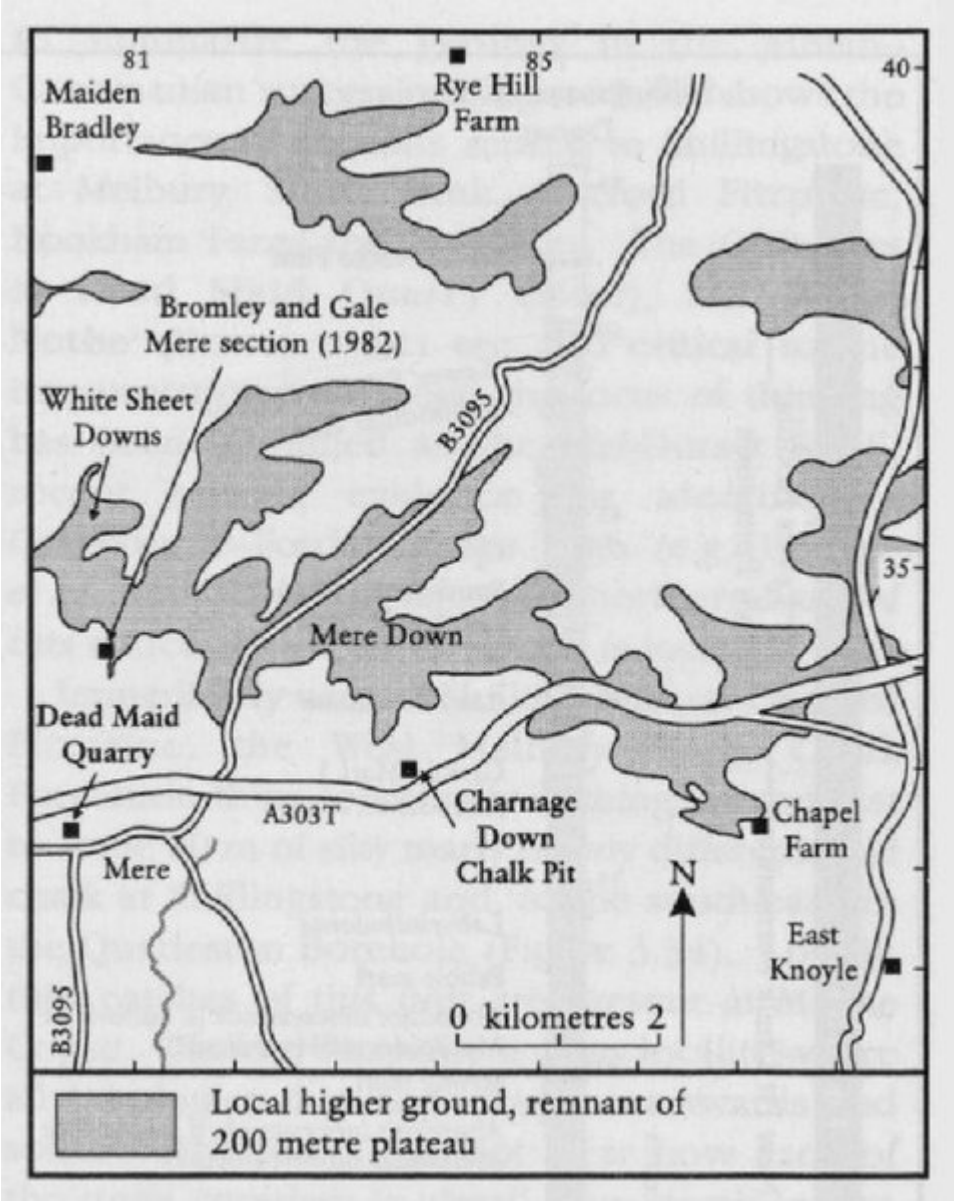
(Figure 3.42) shows that there is considerable lateral variation in the succession overlying the Chalk Rock. The fossil records, notably abundant specimens of the echinoid *Sternotaxis placenta* (Agassiz) from the left-hand section indicate a level above the Chalk Rock, and the conspicuous flint (also seen in Bartlett and Scanes, 1916, pl. 24B) could possibly be the same White Nothe Flint that is seen at Shillingstone Quarry and in other sections nearer Shaftesbury (see Bristow *et*

al., 1995, fig. 52). However, the interpretation of the succession in the right-hand section between the Chalk Rock and the Hope Gap Hardground is highly problematic, and requires further investigation.

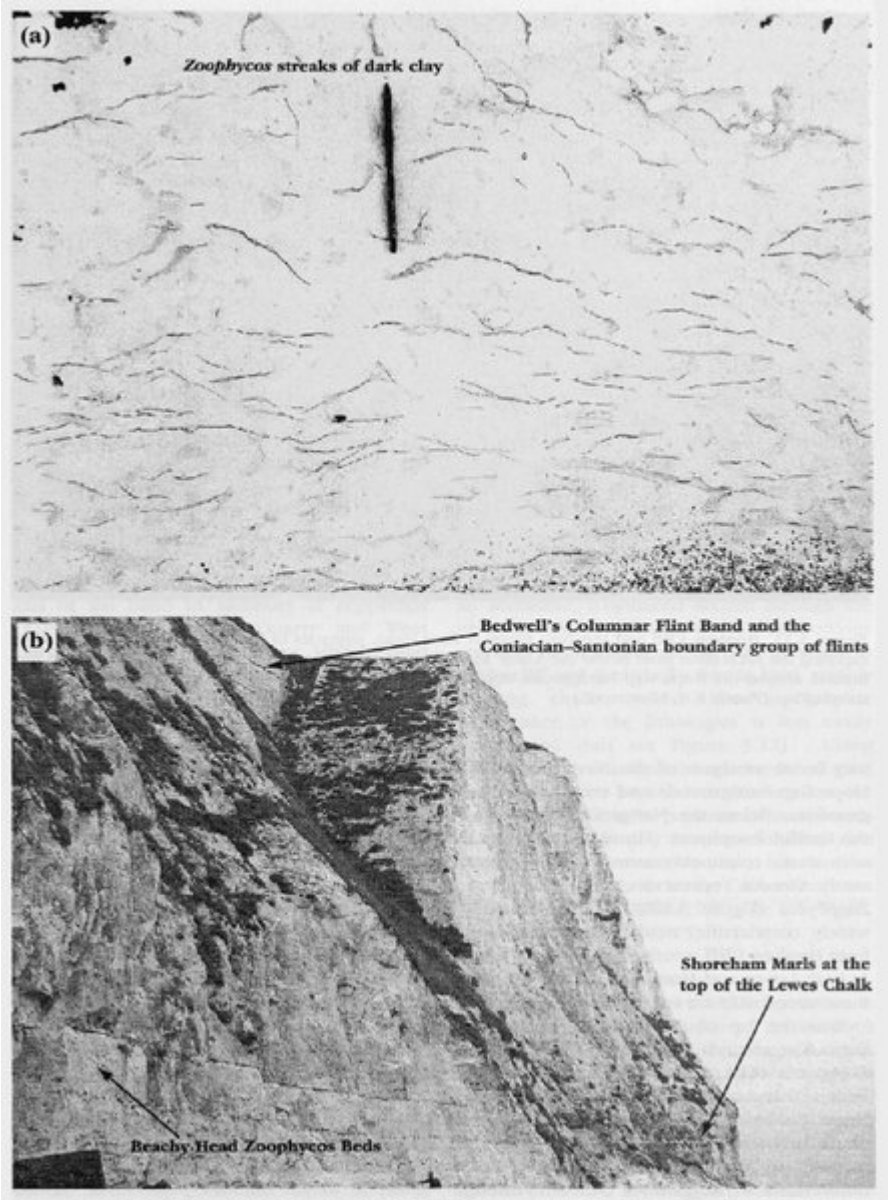
Conclusions

Charnage Down Chalk Pit is a key Chalk Rock locality illustrating the influence of a major tectonic line, the Mere Fault, on Late Turonian sedimentation. This is one of the most condensed successions in the Chalk. The overlying section in the upper Lewes Nodular Chalk and basal Seaford Chalk formations provides evidence for detailed correlation in these beds using typical Late Turonian and Early Coniacian fossils, particularly the inoceramid bivalves and the echinoid *Micraster.*

References

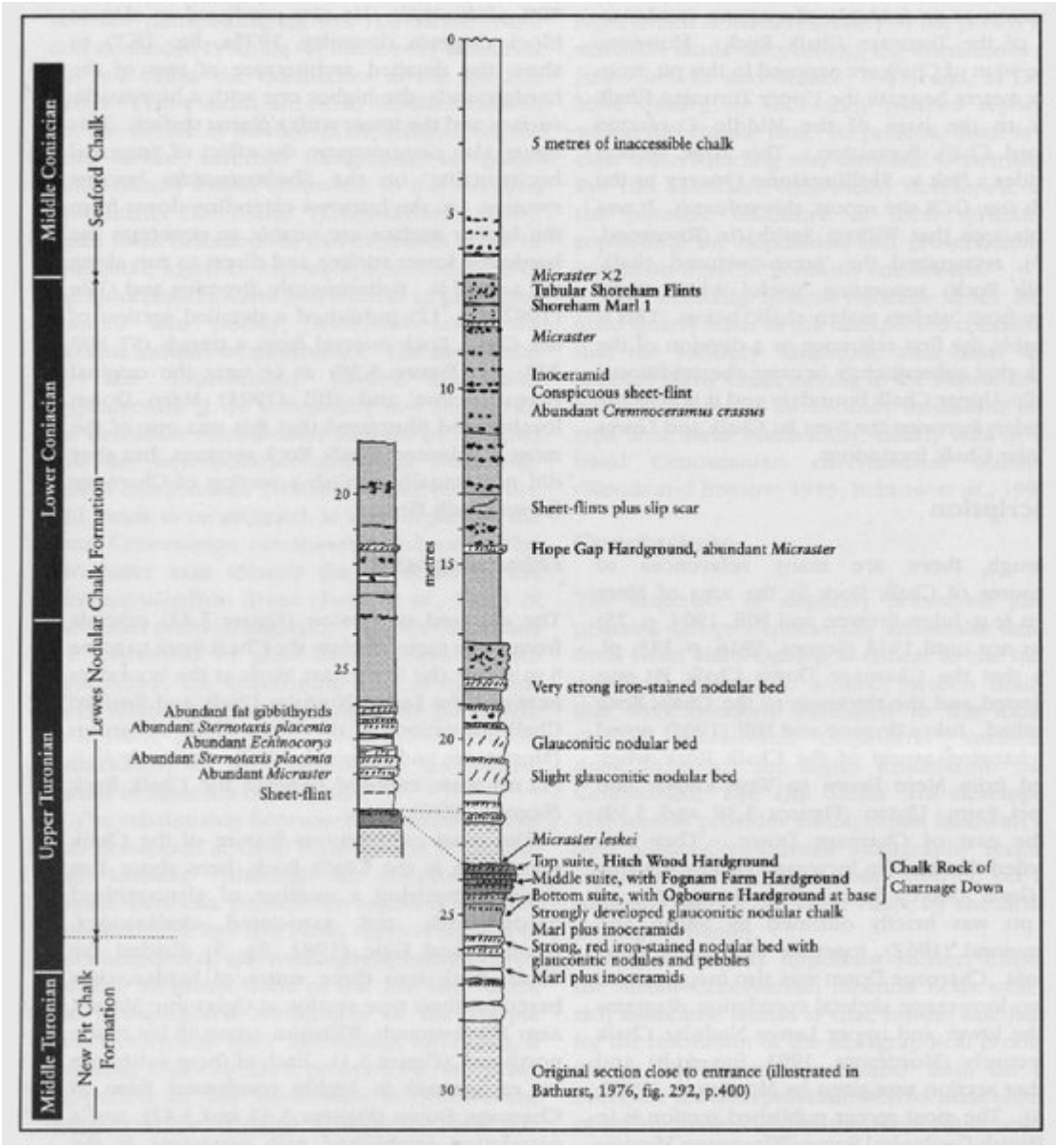


(Figure 3.38) Position of Dead Maid Quarry and Charnage Down Chalk Pit, Mere, Wiltshire.

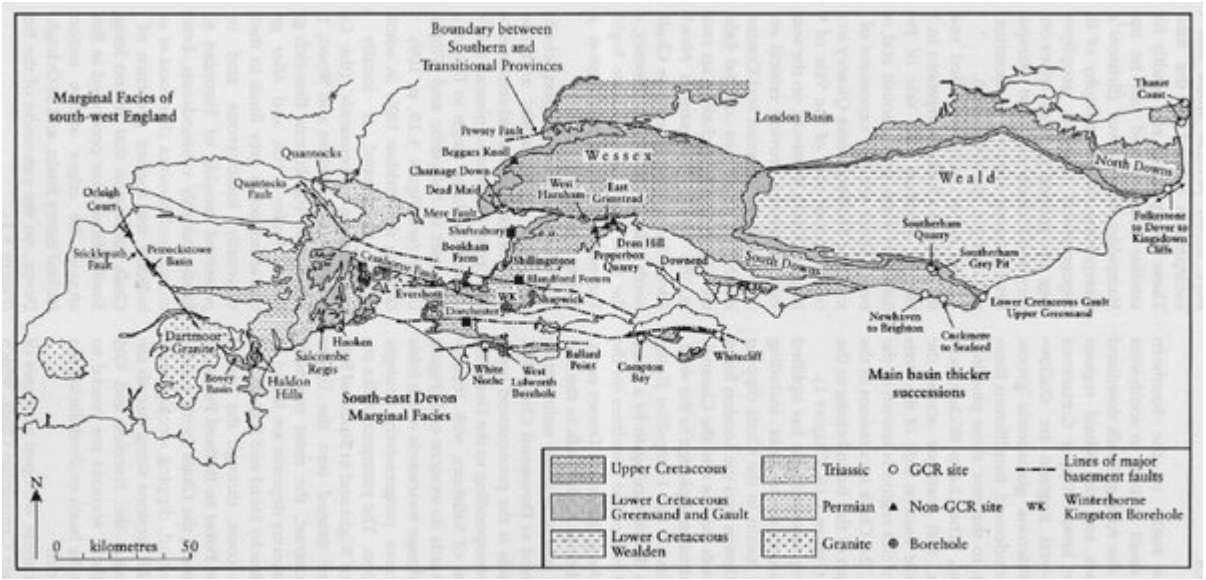


(Figure 3.10) Chalk adjacent to St Margaret's Bay, Dover. (a) South side of St Margaret's Bay beyond the South Foreland, showing the Cuilfail Zoophycos in the topmost Turonian strata. (b) North side of St Margaret's Bay, showing the topmost Lewes Nodular Chalk and basal Seaford Chalk formations. (Photos: R.N. Mortimore.)

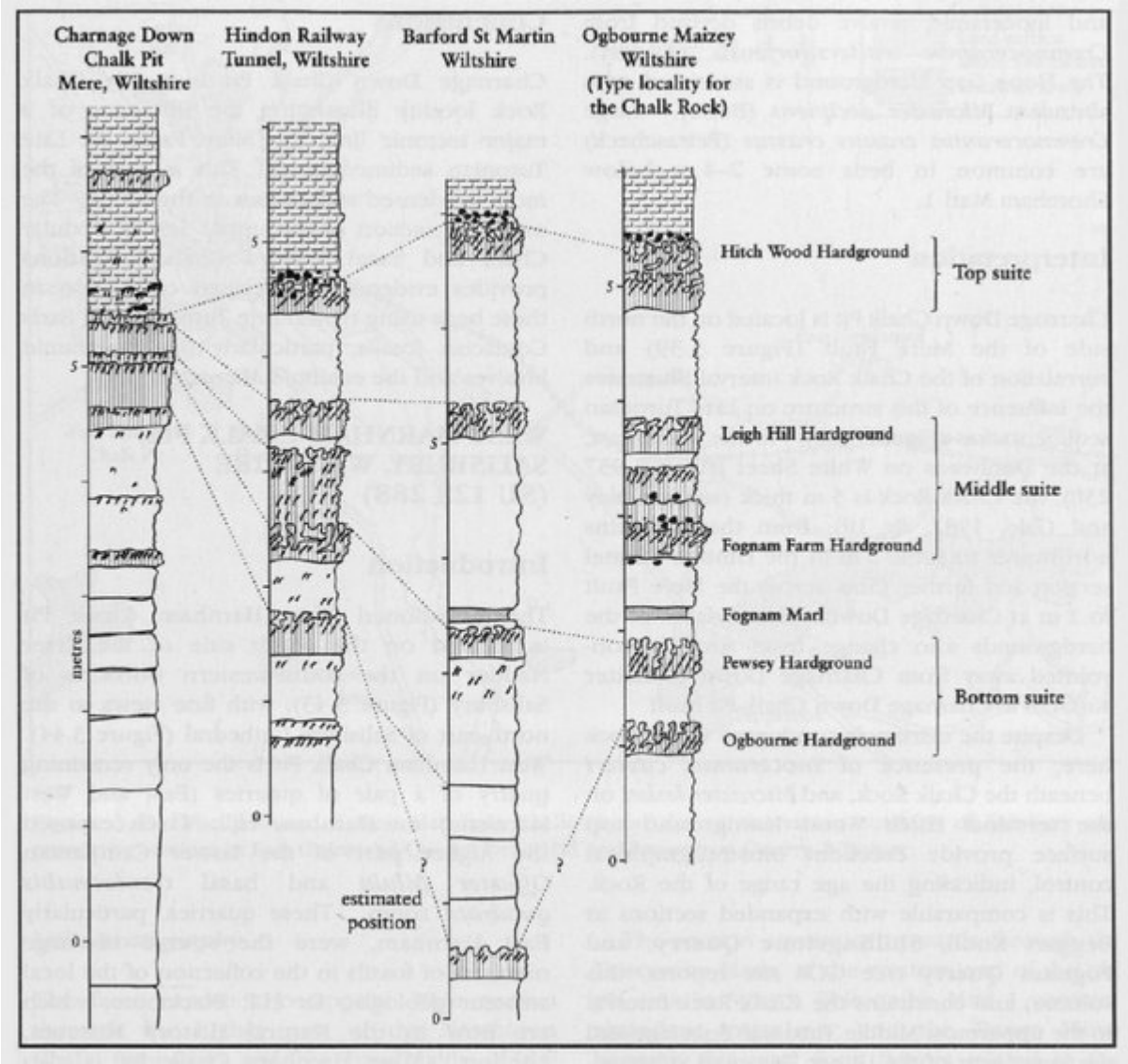
(Figure 3.39) The position of Dead Maid Quarry and Charnage Down Chalk Pit in relation to the Mere Fault and other key localities in the area. (After Scanes, 1916.)



(Figure 3.41) The succession of Chalk at Charnage Down Chalk Pit, Mere, Wiltshire, showing lateral variation along section.



(Figure 3.1) Southern Province GCR localities in relation to the Upper Cretaceous outcrop and major tectonic lineaments. For south-east Devon GCR sites, see also (Figure 3.19), p. 109.



(Figure 3.42) Correlation of the Chalk Rock stratigraphy from its type locality to Charnage Down Chalk Pit and nearby localities, illustrating the condensation present at Charnage Down. (After Bromley and Gale, 1982.)