# Charterhouse Lead Orefield, Somerset

[ST 506 553]

## Introduction

The Mendips (a name probably derived from the medieval term 'Myne-deepes') have been the scene of mining for some two thousand years, and were a major source of lead to the Roman Empire.

The large area of worked ground which forms the Charterhouse Lead Orefield GCR site is the finest remaining example of the Mendip lead orefield (see (Figure 6.8)). A historical account of the orefield has been presented by Gough (1930), whilst a detailed geological context was presented by Green (1958). The western end of the Charterhouse–Lamb's Leer orefield provides the best features of the lead mineralization and workings. Although surface exposure is now poor, the surface mining features ('rakes' and 'gruffy ground') (see (Figure 6.9)) are well preserved, and clearly show the forms and trends of the mineral veins, in this instance often as worked-out residual orebodies. Parts of some caves and mines (shafts) are still accessible, and although overgrown can demonstrate the nature of the residual ore deposits and the neptunian dykes that hosted the primary minerals. Of these the Grebe Swallet Mine (Stanton, 1991) provides the best evidence of mineralization. Ancient slags containing metallic lead litter the site in smelter areas, gravels and caves. The area was mined from pre-Roman times up to the 19th century. The Roman Charterhouse workings have been described by Elkington in Branigan and Fowler (1976).

## Description

Much of this account of the Charterhouse ore-field is based on the publication of Stanton (1981) and his related unpublished works. In the south and west parts of the. area, sharply defined sub-parallel veins trend between SSE and ESE, marked by rows of shafts spaced some 10 m apart along the bottoms of narrow shallow trenches. The veins are separated by 20–40 m of barren ground. Crossing the centre of the area in an east to ESE direction is a remarkable belt of closely packed shafts that seem to indicate the presence of several parallel and branching veins only about 5 m apart. In the north of the area are four huge trenches, up to 300 m long, 20 m wide and 10 m deep, the finest examples of their kind on Mendip. They trend east to SSE and are crossed and interconnected by smaller trenches and shaft alignments. As long ago as 1756 they were known as 'the Rakes on Charterhouse Liberty' (Gough, 1930).

None of the shafts mentioned above are currently open and available for examination (see later discussion of Grebe Swallet Mine). They appear to be aligned along vertical or steeply dipping veins. The irregularity and lateral impersistence of individual veins is a clear feature, explaining why planned methodical mining, of the kind that was normal for lead mining in Derbyshire, was not possible in the Mendip Orefield.

There is some evidence that veins die out, or become less productive, as their surface outcrop is followed down the side of valleys. If so, it illustrates the shallow nature of the Mendip ore. Contemporary writers quoted by Gough (1930) observed that it seldom paid to work the Charterhouse veins deeper than 40–60 m, a view that was confirmed when Cornish miners sank deep trial-shafts between 1845 and 1870.

A number of lead-bearing minerals have been reported from the Charterhouse Lead Orefield, including galena, cerussite and pyromorphite. The zinc carbonate mineral smithsonite occurs locally, along with sphalerite and pyrite and the associated gangue minerals calcite and barite.

## Interpretation

Throughout a large part of the Mendip lead ore-field the minerals occur in veins as fissure-fillings predominantly in the Carboniferous Limestone and Triassic Dolomitic Conglomerate, although mineralization is known to occur in much younger rocks of Inferior Oolite (Jurassic) age. The deposits worked contained galena and sphalerite (smithsonite was

the main ore of zinc), associated with gangue minerals pyrite, calcite, barite and rare fluorite. Extensive recent studies have made strong comparisons with worldwide occurrences of carbonate-hosted lead-zinc mineralization of the Mississippi Valley-type (Ixer and Vaughan, 1993). This model is based on the migration of diagenetically formed metalliferous fluids from adjacent sedimentary basins, possibly associated with intrastratal brines as ore-transporting fluids. However, there are strong indications that much of the upper part of the Charterhouse Lead Orefield was of a residual-ore-type, although it is supposed that at depth 'normal' veins of primary galena and gangue minerals were originally infilling the rakes in the solid Carboniferous Limestone.

The Charterhouse rakes are confined to the hill-top. They have no associated waste tips, which indicates that the volume of ore-bearing material removed was equal to the void volume of the rakes themselves. Such huge shallow ore-bodies are most likely to be residual deposits, being the products of secondary enrichment processes acting during Pleistocene and Holocene times, when the limestone plateau of the Mendip area was lowered 50 m or more by dissolution (Barrington and Stanton, 1977). Pliny's comment on the abundant superficial lead ore of Britain may well have referred specifically to Mendip, the only British Carboniferous Limestone orefield that escaped the glaciations which elsewhere may have scraped away any shallow residual deposits present.

It might be expected that the primary lead mineral, galena, would oxidize to cerussite during the process of superficial enrichment, but a cave excavation in the north-west corner of the area, in the valley floor, has shown otherwise. At this site, miners searching for galena worked solifluction deposits (pebbly clay) that had sludged down vertical fissures to depths of at least 20 m. Most of the pebbles were of insoluble rocks, such as chert, sandstone, shale and ironstone, but galena in lumps from less than 1 g to 23 kg in weight formed a significant constituent of the stony clay.

Residual orebodies of the kind envisaged would have consisted largely of unconsolidated material, principally stony, silty and clay, like the solifluction deposits of Grebe Swallet. The walls of the rakes provide evidence that such a fill existed where, as is sometimes seen, they are pitted with large solution pockets like those found in the walls of clay-filled fissures in quarries. Nowhere in the rakes are there traces of gangue minerals adhering to the rock walls, or other signs that veins of 'normal' kind were present near the ground surface.

It is believed that normal veins of galena and gangue minerals enclosed in solid rock were originally present in the rakes and in the 50 m or more of limestone that, since the late Tertiary or early Pleistocene, have been removed by dissolution from above the present ground surface. Indeed it is probable that all the lead orefields of the Mendips high plateau were likely to have consisted of secondary residual deposits similar to Charterhouse. The galena and other insoluble minerals in these steep to vertical veins, together with the insoluble fractions of the limestone and dyke rocks, along with such foreign materials as wind-blown silt, stones from sandstone outcrops and relic material from the ancient land surface, would have moved downwards in step with, or ahead of the wasting of the Carboniferous Limestone. Such material would then have been concentrated and preserved in the faults and fissures of the rakes. The evidence from Grebe Swallet suggests that similar residual deposits occupied the upper sections of the narrower veins of the area as well.

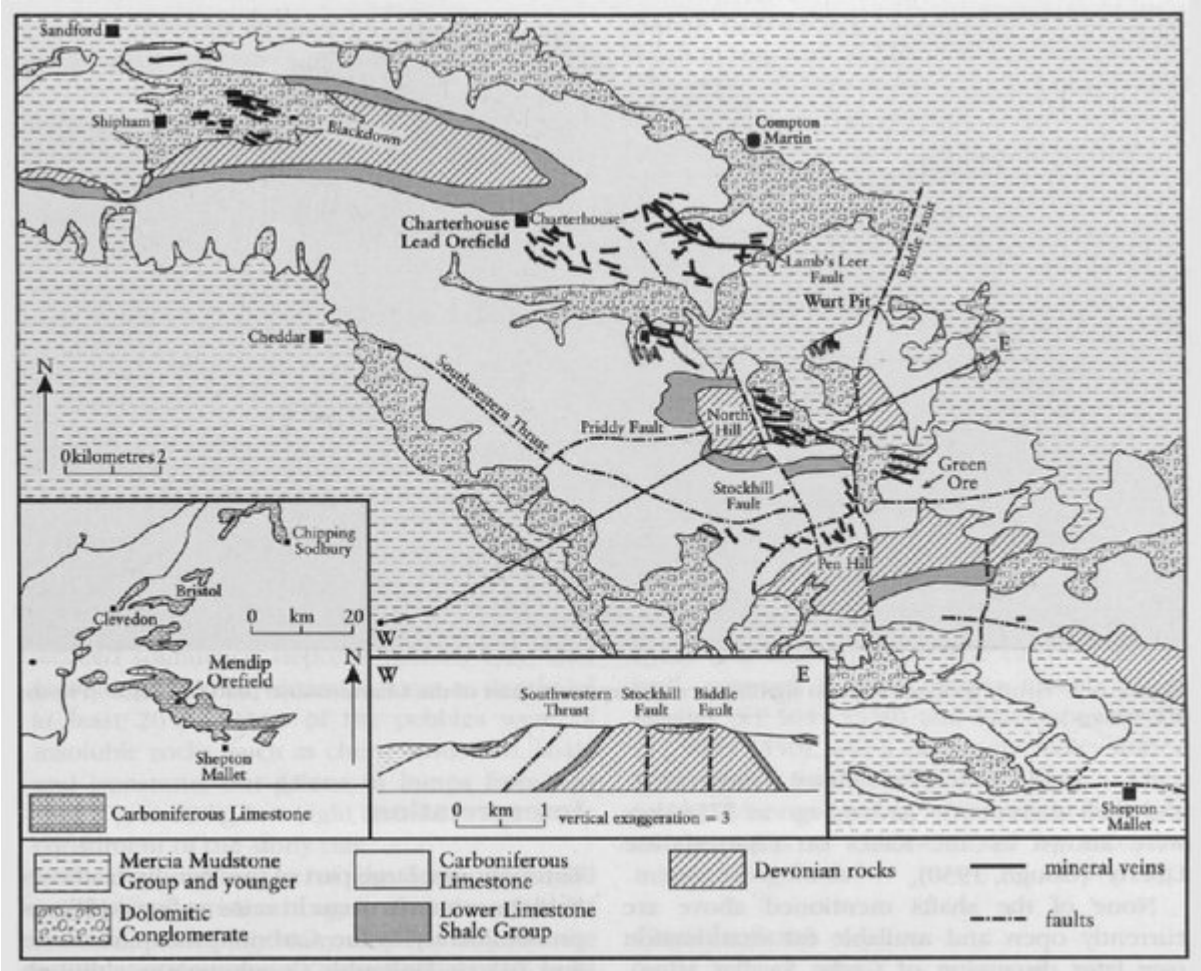
In the southern area of the rakes, the presence or absence of chert beds in the limestone cliffs trace several east–west faults. The clip of the bedding varies considerably, mainly in detached limestone pillars, which may have sagged into the residual orebodies, or have been undercut by mining activity Neptunian dykes of Upper Triassic and Lower Lias (Downside Stone) age, formed when fissures opened under tension, are present in the other rakes, as can be seen by the nature of the debris around shaft mouths. Neptunian dykes and coarsely crystalline calcite veins are well exposed in two mines, namely Grebe Swallet [ST 5044 5550] and Blackmoor Swallet [ST 5055 5550], and a cave in the valley floor at Waterwheel Swallet [ST 5048 5564]. These faults, dykes and veins are excellent examples of the types of channel used by ascending mineralizing fluids.

## Conclusions

Charterhouse Lead Orefield is the finest remaining example of the once extensive Mendip lead ore-fields. Having been little altered since mining, the nature of the original worked rakes and other associated workings are still clearly seen. Evidence from the important Grebe Swallet Mine is indicative of the residual nature to at least the upper parts of the orebody. The site provides much opportunity for. further study of the relationship of residual, orebodies to 'normal' vein

infill types.

## References




*(Figure 6.8) Outline map of the Mendip Orefield showing the location of the Charterhouse Lead Orefield, Wurt Pit and Compton Martin Ochre Mine GCR sites. Based on Ford (1976), and Pattrick and Poyla (1993).*

*(Figure 6.9) 'Gruffy ground' with no significant rock exposure, part of the Charterhouse Lead Orefield. (Photo: R.F. Symes.)*