
Aller Sand Pit, Devon

[SX 880 695]

Highlights

This site, the type locality for the Aller Gravel, gives an important insight into the local palaeogeography during early Palaeogene times. Its coarse sediments indicate the former presence of fast-flowing juvenile streams whilst the pebbles present indicate derivation from the Chalk, Palaeozoic rocks, the Dartmoor Granite and its metamorphic aureole.

Introduction

The Aller Sand Pit GCR site comprises a conserved section towards the eastern margin of a quarry complex immediately to the east of the Newton Abbot–Torquay road (A380), around map reference [SX 877 694]. The complex includes the former Royal Aller Vale Quarry and has also been referred to as Aller Pits. This site, which has recently ceased aggregate production, is the northerly of two quarries adjacent to the village of Aller, the other being Zigzag Quarry [SX 880 690].

The sediments quarried comprise cross-bedded and channelled gravels and sands with subordinate muds, and represent the formation known as the Aller Gravel, an account of which has been published by Edwards (1973). The Aller Gravel occurs along the eastern side of the Bovey Basin and around the Decoy Basin south of Newton Abbot (see sketch map in Selwood *et al.*, 1984, fig. 25). For the most part, it rests unconformably on the Upper Greensand which, although not exposed, probably occurs not far below the surface at the bottom of the conserved section.

Nineteenth century papers such as that of Woodward (1876) referred to the large number of sand and gravel pits around at that time, some of great size. Whilst the gravels of the Bovey area are broadly discussed in various early papers (De La Beche 1839; Reid, 1898b; Clayden, 1906; Jukes-Browne, 1907), there is no specific mention of the locality later called the Royal Aller Vale Quarry or Aller Pits. Reid (1913) referred to old gravel pits in Milber Down, but the earliest specific mention of the site appears to be by Pickard (1949), whose Aller A and B quarries coincide with the position of the former Royal Aller Vale Quarry. Vachell (1963), who first introduced the name Aller Gravel, referred to typical exposures of this unit being found in the gravel pits at Aller. A very brief description of the quarry is given in Edwards and Freshney (1982), whilst that in Selwood *et al.* (1984) is a little more detailed and includes references to both sedimentological features and gravel composition, together with a photograph (plate 16) illustrating the characteristic lenticular nature of the gravels. There is no separate published description of the conserved face comprising the Aller Sand Pit GCR site.

Description

Together with the gravels preserved in the Haldon Hills, the nature of the Aller Gravel sheds considerable light both on the earliest Palaeogene environment of this part of England and, from pebble provenance, the geological character of the area from which it was derived. Whilst there are a number of mainly overgrown, relatively shallow Aller Gravel pits in the area (see Selwood *et al.*, 1984, p. 129), the former Royal Aller Vale Quarry was designated the type area (sic) for the formation (see Edwards and Freshney, 1982, p. 234). The current type locality is the Aller Sand Pit GCR site (Figure 7.7).

Lithological succession

Information derived from the quarry complex to the west of the site indicates a succession dipping westwards at between 4° and 10°, comprising a lenticular-bedded sequence of abraded gravels and sands with subordinate silts and clays. From time to time, from 25 to 30 m of the formation have been exposed. The quarry complex was around 0.2 km² in size in the late 1980s. By November 1997, this had partially been backfilled although exposures of the Aller Gravel still existed at this time in addition to the GCR site itself.

The present Aller Sand Pit GCR site comprises a face some 80 m in length and 5–8 m high. The succession comprises a complex of alternating cobble to granule gravels and very coarse to gravelly sands. The gravels are clast-supported but poorly sorted with a sandy matrix (Figure 7.8). A small number of pebbles are of boulder size (>256 mm). Most pebbles are well-rounded but a minority are more angular. In the inaccessible upper part of the section, the pebbles appear to be more angular. The sands and granule gravels are moderately sorted.

Stratification is lenticular with units bounded by undulose to planar surfaces. The bases of the gravel units are often but not always sharp. Bedding within the coarser gravels is obscure, except where they contain sandy lenses. The sands and granule gravels are internally lenticular-bedded.

Detrital mineralogy and petrology

Both the nature of the heavy mineral suite and the pebble composition provide considerable insight into the source of the Aller Gravel. Scrivener and Beer (1971) found cassiterite in the heavy mineral suite from the quarry, in addition to large quantities of tourmaline, lesser chlorite, zircon and topaz, and a little iron oxide, ilmenite, garnet, epidote and rutile. Cassiterite is confined to the sandy lithologies and only those which are ill-sorted. Interestingly, these authors suggested the likely occurrence of high-grade cassiterite concentrate within the formation, although stanniferous gravels have, in fact, long been recognized in the South West Peninsula and were mined by the Romans (Edmonds *et al.*, 1975, pp. 85–6).

Whilst moderately abraded flint pebbles predominate, pebbles of vein quartz, tourmaline and schorl rock are also abundant and those of Greensand chert fairly common. Other pebbles present include Palaeozoic rocks, especially Lower Carboniferous cherts, Upper Carboniferous sandstone, dolerite, hornfels and other metamorphic aureole rocks (Edwards, 1973; Edwards and Freshney, 1982; Selwood *et al.*, 1984). Such pebbles indicate a northerly or north-westerly source.

Interpretation and evaluation

According to Scrivener and Beer (1971), the thickness of the Aller Gravel varies from around 10 m in the most northerly outcrop to 38 m to the east of Newton Abbot. Whilst the maximum thickness was not exposed in the Royal Aller Vale Quarry, the latter has been, with the Zigzag Quarry nearby, the best and most revealing Aller Gravel pit of the large number which previously existed in the Bovey area. The present GCR site indicates the general nature of the formation but probably does not fully represent all the elements of the up to 30 m thick, laterally variable succession described from the Royal Aller Vale Quarry by Edwards and Freshney (1982, p. 234).

Sedimentology

The dominantly boulder to granule gravel and gravelly to coarse sand, together with the frequent erosion surfaces, channel structures and cross-bedding found in the present site and the adjacent quarry complex, demonstrate the very high energy and probable braided stream origin of these sediments. The lenticular geometry and marked lateral and vertical variation characteristic of braided stream sedimentation is particularly well developed. The presence of fine-grained lenses (cf. Selwood *et al.*, 1984, plate 16), although not a feature of the conserved section, indicates periodic channel abandonment.

Provenance

In terms of provenance and the nature of the source area, the Aller Sand Pit GCR site and the former Royal Aller Vale Quarry provide useful information. The predominance of flint confirms the former westerly extension of the Chalk cover, although polycyclic derivation from an earlier gravel or gravels remains a possibility. The presence of aureole rock pebbles indicates clearly that the Cretaceous cover had been breached, whilst the presence of cassiterite, a relatively high-temperature ore mineral (see Edmonds *et al.*, 1975, p. 92), implies a source in or close to the Dartmoor Granite itself. Again, however, the polycyclic derivation of the exotic pebbles cannot be ruled out.

The altitude of such a source land cannot be determined with any degree of certainty, although the association of pebbly braided streams with the upstream, juvenile reaches of rivers suggests some topographic relief.

Relationship of the Aller and Haldon Gravels

Good exposures, such as those of the Royal Aller Vale Quarry, have contributed to discussion on the stratigraphical relationship between the Aller Gravel and the gravels of Haldon to the north.

De la Beche (1839) was the earliest writer to discuss the stratigraphical position of the Aller Gravel. Clayden (1906) considered that the latter gravels dipped 'as if they formed the floor of the Bovey deposit', and had in mind a direct correlation with the Haldon Gravels. Reid (1913) rejected the correlation of the Aller and Haldon gravels, since he considered the former was a marginal facies of the 'lacustrine' Bovey Formation and in part derived from the Haldon Gravel sheet. Vachell (1963) concurred with this derivation but thought that the Aller Gravel overlaid the Bovey Beds. The latter relationship had been earlier suggested by Woodward (1876) and subsequently by Reid (1898b).

Edwards (1973, 1976) had favoured a direct correlation between the Aller Gravel and the Buller's Hill Gravel of the Haldon area, dating from the interval preceding the subsidence of the Bovey Basin, and arguing that they were lithologically similar, a mere 2 km apart and the remnants of a single sheet whose westerly dip reflected the subsidence associated with the formation of the Bovey Basin. Small outliers of Aller Gravel north of Kingsteignton and at Connybear Brake [SX 891 693], at greater heights than the main outcrop, perhaps add support to the suggested formerly continuous gravel sheet.

Hamblin (1969, 1974) rejected this correlation and concluded that the Aller Gravels were younger. Amongst his arguments were that, in terms of sedimentary structures, the two gravels were quite different. Certainly the lenticular and other larger scale sedimentary structures in the Royal Aller Vale Quarry contrast markedly with the structureless gravels in the Buller's Hill Quarry. He argued that the petrological similarities were only to be expected, since fluvial gravels formed in this region at any time during the Eocene would likely have a broadly similar composition. He did, however, also point out that differences included the greater presence of sand, silt and clay in the Aller Gravel and its greater variety of exotic pebbles. It is, of course, possible for lateral variation to occur within a single stratigraphical unit for a number of reasons. Scrivener and Beer (1971) pointed out that in two quarries in the Aller Gravel at Sands Copse, further north ([SX 866 759] and [SX 871 752]), there was more coarse detritus than in the Aller Vale Quarry and a lack of the lensoid stratigraphy typifying the gravels developed in the Aller Valley. In terms of post-depositional lateral variation, it has been argued that the contrast in sedimentary structure development between the Royal Aller Vale Quarry gravels and those at Buller's Hill Quarry may reflect marked periglacial (cryogenic) modification at the latter locality.

Both Reid (1898b) and Jukes-Browne (1907) considered that the Aller Gravel was older than the Bovey Formation and recent work broadly confirms this view. Edwards (1973), for example, refers to the Institute of Geological Sciences (now the British Geological Survey) 'Higher Sandgate' [SX 8672 7507] borehole near Kingsteignton where typical pink-mottled clays of the lower part of the Bovey Formation are underlain by flint gravels of the Aller type. Here, along the eastern side of the main basin, the Aller Gravel predates the Abbrook Clay and Sand (Edwards, 1973, p. 18), but its relationship to the concealed pre-Abbrook beds in the centre of the basin is not yet known. Earlier interpretations that the Aller Gravel was younger than the Bovey Formation may in part reflect the fact that the former is in places reworked to rest on the latter.

No clear indication exists as to whether the gravels in the Aller area are the downwarped remnants of gravels such as those of Haldon, which accumulated on a laterally extensive Tertiary erosion surface such as that discussed by Waters (1960a,b) or whether the Aller Gravel is younger and developed coevally with the initiation of the Bovey Basin. What is clear, is that since the lower part of the Bovey Formation is considered as Eocene (Edwards and Freshney, 1982, p. 218), the underlying Aller Gravel must be at least of this age.

Conclusions

Aller Sand Pit is the type locality for the Aller Gravel of probable Eocene age. It comprises a conserved face within the former Royal Aller Vale Quarry which for many years provided a thicker exposed succession than at most of the other

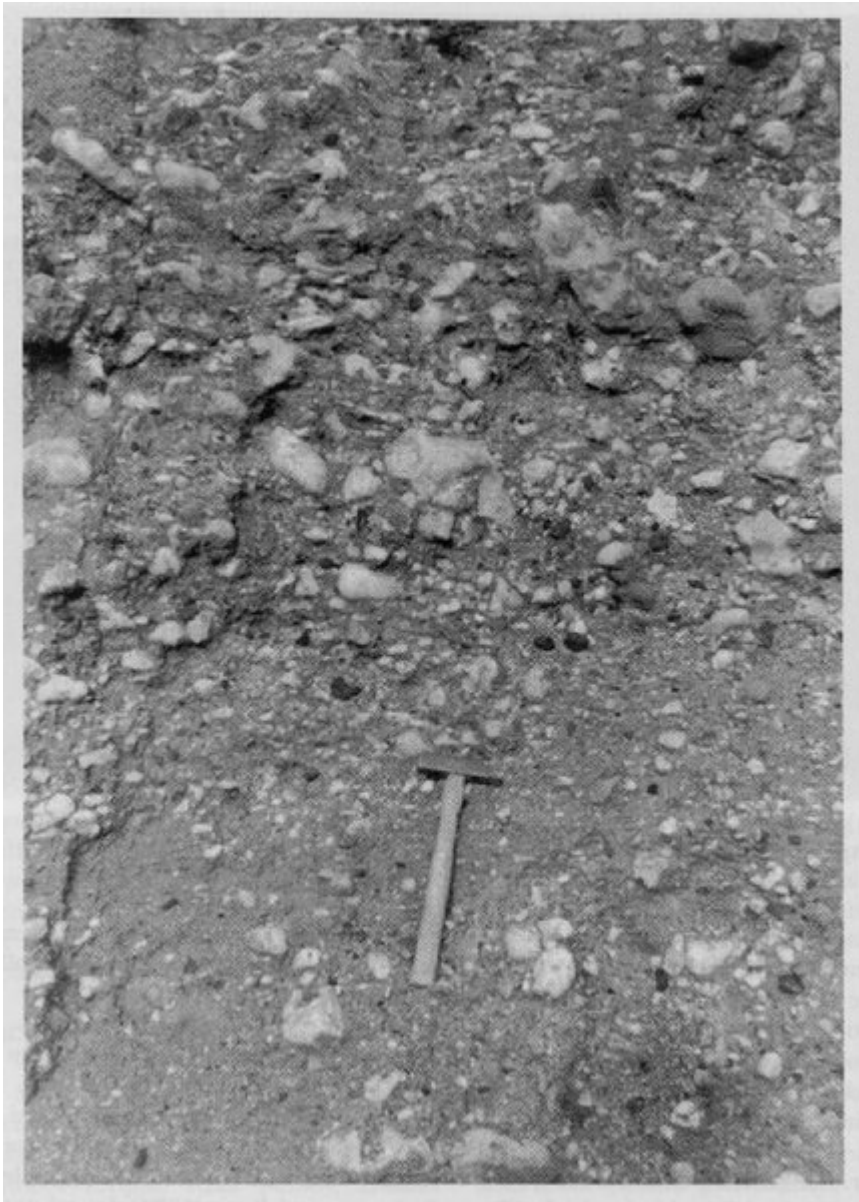
pits in this formation, of which the majority are now overgrown.

Aller Sand Pit comprises a small section from the former large quarry complex, which, over the years, has provided valuable data to facilitate the interpretation of Eocene times in this area. The nature of the pebbles found confirms the former presence of a cover of flint-bearing Upper Cretaceous Chalk, whilst exotic pebbles and the heavy mineral suite found implies a source area including both non-metamorphosed Palaeozoic rocks, aureole rocks and probably the Dartmoor Granite itself. The Aller Sand Pit GCR site section supports the interpretation of the formation as the product of juvenile, braided streams.

References



(Figure 7.7) The Aller Gravel in the conserved section of the former Royal Aller Vale Quarry now known as Aller Sand Pit, showing alternating gravels and sands. (Photograph: B. Daley, taken in November 1997.)



(Figure 7.8) Badly sorted, poorly bedded gravel unit within the Aller Sand Pit section. The larger pebbles are predominantly flints. The small, dark pebbles comprise chert and various exotic lithologies. (Photograph: B. Daley, taken in November 1997.)