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EYSERHEIDE

A MAGDALENIAN OPEN-AIR SITE IN THE LOESS AREA OF THE NETHERLANDS AND ITS ARCHAEOLOGICAL CONTEXT

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2 Topography, soil and geology

2.1 Location

The Magdalenian site of Eyserheide is located in the municipality of Gulpen-Wittem in the southeastern part of the Dutch province of Limburg (fig. 1.1). This part of Limburg has landscape characteristics that are unique in the Netherlands. Pre-eminently, the area is a hilly landscape in which loess-covered plateaus, slopes and partially deeply-incised stream valleys and dry valleys follow each other at short distances. We are dealing here, at least by Dutch standards, with pronounced differences in relief and geomorphology. The highest point in the Netherlands near Vaals (321 m +NAP = Dutch Ordnance Datum) is located 11 km southeast of the site.

As are the adjacent parts of Belgium and Germany, the hilly landscape of Limburg forms part of an extensive loess area that extends from Brussels in the west to Krefeld in the east. From a geological perspective, this area forms the transition zone between the foothills of the Eifel and the Ardennes in the south, and the extensive area with coversands of the Northwest European Plain in the north. The small rivers and streams flowing in the Limburg loess area, among which the Gulp, Geul and Eyserbeek, form part of the drainage area of the Meuse river. They are fed by small brooks that often owe their existence to slope springs and other places where water seeps from the slopes.

2.2 Geology and soil

The southern part of Limburg where the site of Eyserheide is located can be regarded as the 'foreland' to the more southern Ardenno-Rhenish massif. This massif was formed in the Carboniferous period. According to the geological map of Southeast Limburg, scale 1:50 000 (Kuyl 1980), marine deposits (shales and quartzitic sandstones) from the Carboniferous only come to the surface in the deeper parts of the Geul valley southeast of Epen. This is the southernmost point of the Geul valley on Dutch soil. The distance from this point to the site of Eyserheide is c. 7 km.

Eyserheide lies on the southern side of a vast and elevated plateau, the so-called Eiland van Ubachsberg (figs. 1.3 and 2.1). This plateau, on which are located amongst others the villages of Voerendaal, Ubachsberg, Elkenrade and Trintelen, covers an area of c. 7 × 8 km. Its subsoil mainly consists of marine deposits dating from the Upper Cretaceous (Kuyl 1980; fig. 2.2). In this period, South Limburg formed part of a subsidence zone, and sedimentation of chalk occurred on a large scale in a sea that was becoming increasingly deeper. For a large part these chalk deposits belong to the Maastricht Formation, Kunrader facies (indicated by code Mt1 on the geological map). These deposits occur in South Limburg north of the Geul in particular and are characterised by alternating hard and soft chalk (Felder 1975). Immediately south of the Eiland van Ubachsberg surface older deposits from the Upper Cretaceous, namely those of the Gulpen Formation 3 (Gu3). They outcrop in the slopes of the deeply-incised stream valleys, for instance in the valley of the Geul and the valley of the Eyserbeek. The Gulpen Formation 3 is composed of chalk of Lanaye and Lixhe, a white chalk in which layers of irregular black flint occurs. Even deeper in the Geul valley and for a small part in the Eyserbeek valley at Eys occur deposits of the Gulpen Formation 2 (Gu2). These deposits are known as chalk of Vijlen and Beutenaken, and consist of light grey, glauconitic soft chalk.

East of the site, from Simpelveld to the Dutch-German border and south of it, marine deposits of the Vaals Formation (Va) are found at the surface. These deposits consist of glauconitic fine sands (Vaals greensands). And finally, south of Lemiers in the southeasternmost corner of Limburg, both chalk of the Gulpen Formation (Gu2) and sands of the Aken Formation (Ak) occur.

The geological map of the southeastern part of Limburg further shows marine deposits from the Tertiary in the highest part of the Eiland van Ubachsberg, in the immediate vicinity of the site. These are micaceous fine sands of the Tongeren Formation (Klimmen Deposits; ToK) dating from the Oligocene. Small areas with pene plain deposits from the ancient river Meuse can be found amidst these deposits, for instance near Trintelen. These sediments belong to the Kiezeloöliet Formation (Waubach Deposits; Koö) and consist of gravel, sand and clay layers. They date to the last phase of the Tertiary (the Pliocene).

The Eiland van Ubachsberg was created as a result of the Meuse shifting its channel westward at the beginning of the Pleistocene, under influence of the epeirogenetic uplift

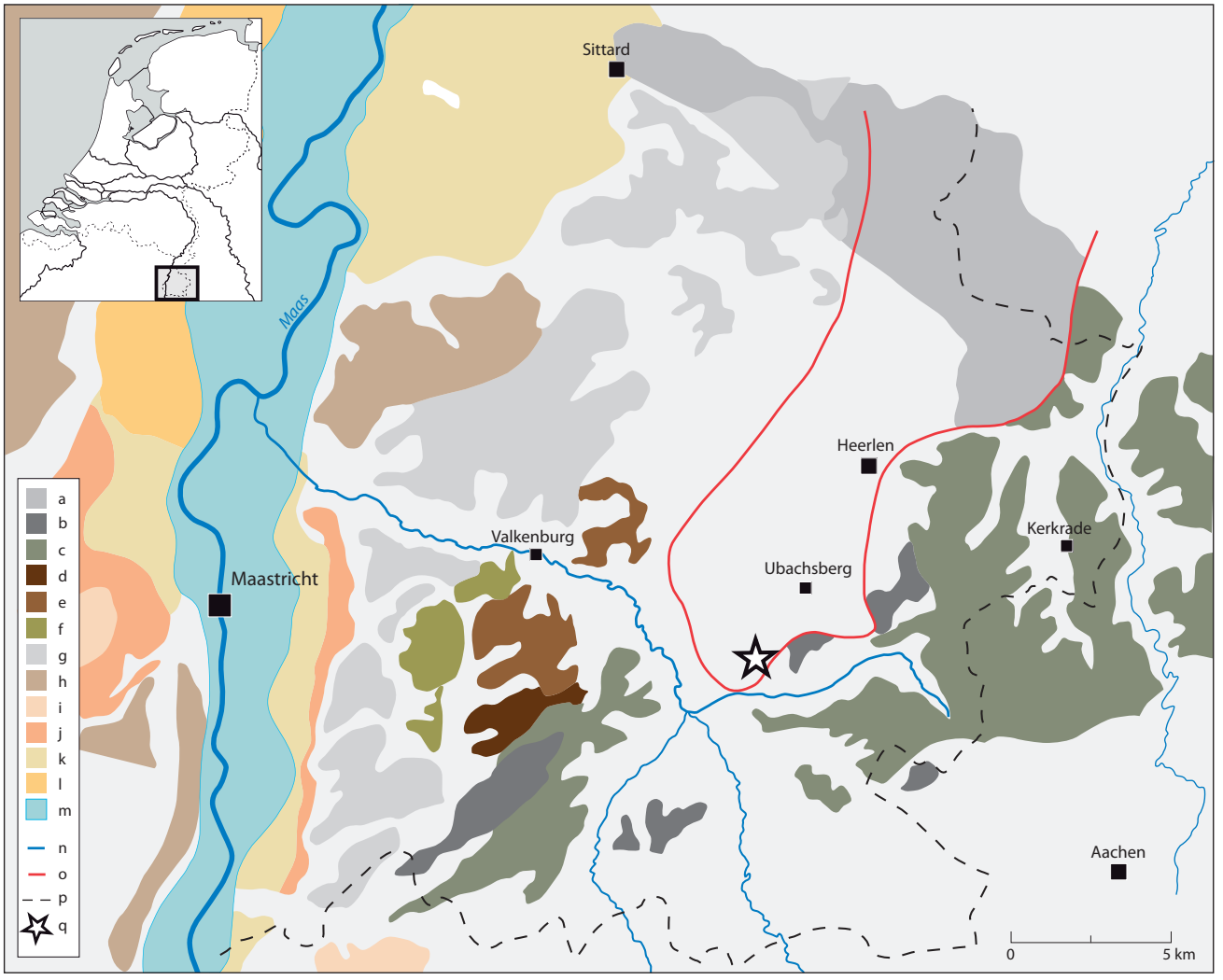

Figure 2.1 Meuse terrace geomorphology of South Limburg with the position of the site of Eyserheide (asterisk) and boundaries of the Eiland of Ubachsberg and terrace bodies of the Meuse (see fig. 8 in Roebroeks 1988, with adaptations). a= Waubach (Tertiary deposits), b= Kosberg, c= Simpelveld, d= Margraten, e= Sibbe, f= Valkenburg, g= St.Geertruid, h= St.Pietersberg, i= 's Gravenvoeren, j= Rothem, k= Caberg, l= Eisden-Lankaar, m= Oost-Maarland, n= river Meuse and smaller streams, o= the Eiland of Ubachsberg, p=land-frontier, q= position of Eyserheide site.

of the Ardenno-Rhenish massif. The island forms as it were the divide between the area with deposits of the East Meuse in the east, and the area with younger Pleistocene deposits of the West Meuse in the west. Small areas with remnants of Pleistocene terraces of the East Meuse, namely Kosberg Deposits (Kb) and Simpelveld Deposits (Sv), have been recorded on Dutch soil from Epen to Eygelshoven, east and southeast of the Eiland van Ubachsberg. By the shift of the Meuse and the concomitant erosion, the Kosberg Deposits in particular were cleared in many places. Deposits of the West Meuse are found in southeast Limburg southwest and west of the Eiland van Ubachsberg. The distribution area of these deposits is however considerably larger and extends to the Dutch-Belgian border near Maastricht. The fact that Pleistocene deposits of the Meuse are lacking on the Eiland van Ubachsberg demonstrates that this area remained free from activities (sedimentation and erosion) of the Meuse. Elsewhere in South Limburg, the West Meuse has asserted itself almost everywhere, leaving behind a fossil river terrace landscape (fig. 2.1).

In large parts of the South Limburg landscape, deposits from the Cretaceous and the Tertiary and/or the gravel-rich

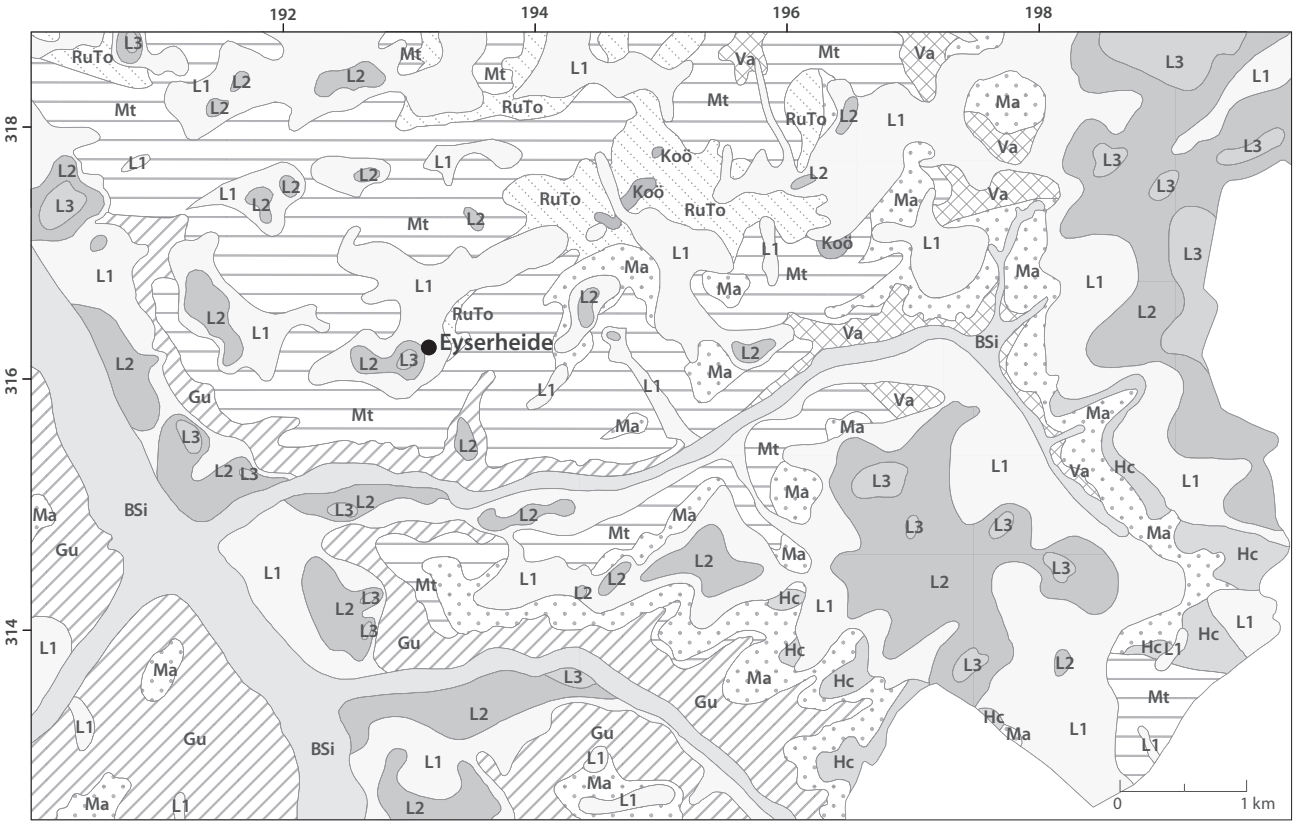

Figure 2.2 Detail of the Geological Map of the Netherlands (Kuyl 1980, Main map) showing Eyserheide and surroundings with the distribution of (pre)Quaternary deposits.
Holocene: *B*si= brook deposits (Singraven Formation); Pleistocene: L3= loess with a thickness >8 m, L2= loess 5-8 m, L1= loess 2-5 m (Twente/ Eindhoven Formation), Hc= fluvio-periglacial deposits (Hoogcruts Deposits), Ma= terrace deposits from the river Meuse (Sterksel Formation, Kedichem Formation, Tegelen Formation, Kiezeloöliet Formation); Tertiary: Koö= peneplain deposits from the ancient river Meuse (Kiezeloöliet Formation), RuTo= marine deposits (Rupel Formation and Tongeren Formation); Cretaceous: Mt= marine deposits, Kunrader facies (Maastricht Formation), Gu= marine deposits (Gulpen Formation), Va= marine deposits (Vaals Formation).

terrace deposits of the Meuse are covered by aeolian deposits from the Pleistocene. These are loess deposits from the Saale and/or Weichsel ice age. In particular on the flatter parts of the plateaus, the sequence of loess deposits can reach considerable thicknesses. On the plateau at Eyserheide, the thickness of the loess sequence measures in the main between 2 and 5 metres (code L1, Kuyl 1980). Circa 500 m southwest of the site, the loess sequence is thicker: loess with a thickness of 5-8 m (L2) and more than 8 m (L3) (fig. 2.2). Although loess was originally deposited rich in chalk, the upper 2-3 m of the sequence is completely decalcified under influence of soil formation (Mücher 1973). On the margins of the Eiland van Ubachsberg, at places where the loess sequence is completely eroded, slope deposits come to the surface. And finally, in the lower parts of the landscape, among which the stream valleys, deposits of eroded and reworked loess are found. Locally there was also peat formation (Singraven Formation).

2.3 Local geological situation

The excavation spot lies on the southern margin of the Eiland van Ubachsberg, at a height of 193 m +NAP and above a deeply incised dry valley (fig. 2.3). At Trintelen, about 1200 m northeast of the site, this dry valley cuts into the plateau to join the water-carrying valley of the Eyserbeek c. 2 km further south at Eys. From the starting point at Trintelen (210 m +NAP) to the valley of the Eyserbeek (c. 110 m +NAP), there is a difference in height of c. 100 m. Viewed from the south and southeast, the site occupies a prominent, elevated position in the present landscape (figs. 1.3 and 1.4). The presence of the dry valley reinforces this position.

As a result of the draining of water and the corresponding erosion, the margins of the plateau are very irregular, and at various points dry valleys have formed. At less than 30 m east of the site, the initial stage of such a valley can be

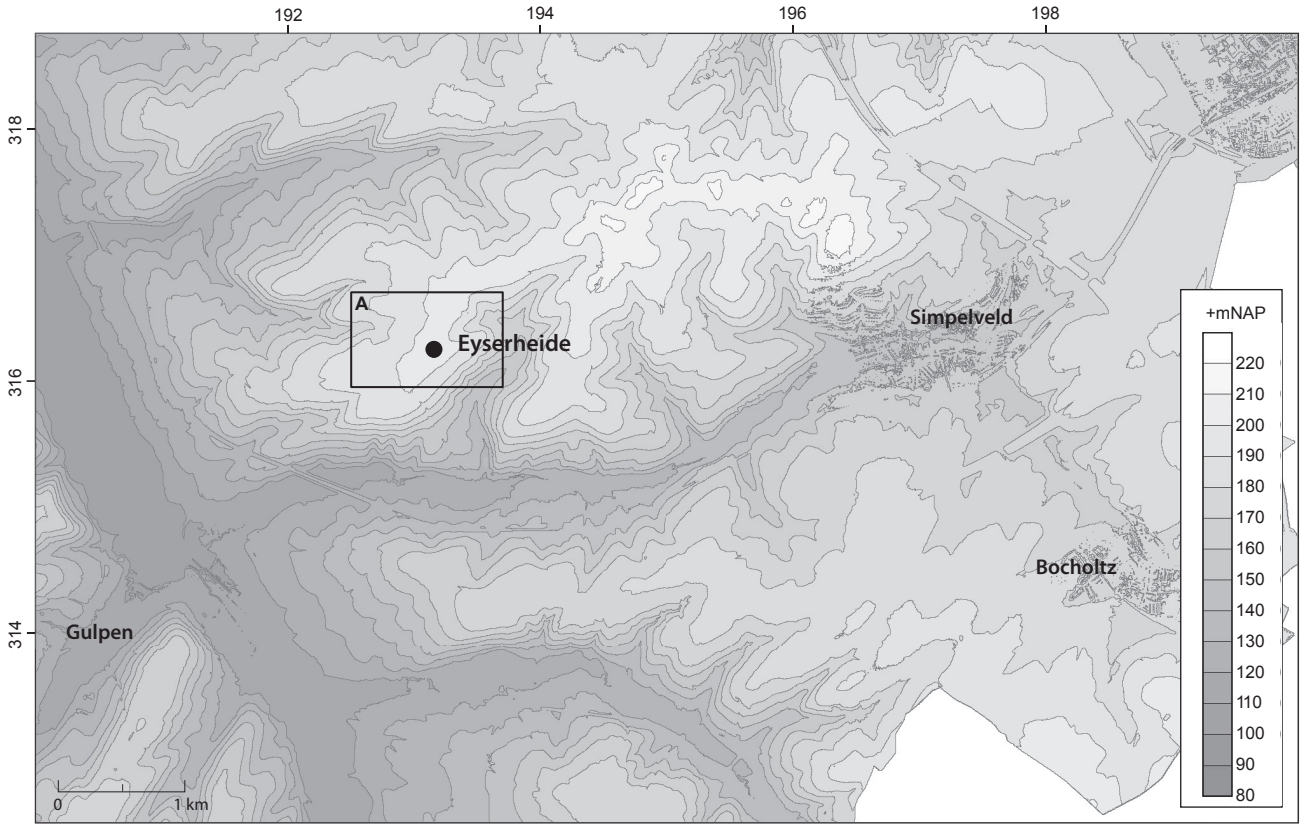

Figure 2.3 Contour map of Eyserheide and surroundings and location of the site at c. 193 m above Dutch Ordnance Level (*Normaal Amsterdams peil*) on the southwestern edge of the heavily incised plateau. Source: Actueel Hoogtebestand Nederland.

observed in the field (fig. 2.4). Today this valley no longer carries water and it forms the connection between the margin of the plateau on which the village of Eyserheide is located, and the southwest-northeast orientated dry valley between Trintelen and Eys. The Eyserbeek flows through Eys and, just north of Gulpen, discharges into the Geul, the most important tributary of the Meuse in this area. The Eyserbeek runs c. 1 km south of the site, whilst the distance to the Geul is c. 2.5 km.

When looking in detail at the situation of the terrain and the relief locally at the site, the following can be observed. The north-south section of the plot of land on which the site lies shows a rather flat surface with slope percentages varying between 0.7 and 1%. The west-east section on the other hand consists of a fairly steep slope with percentages that locally exceed 2.5%. In particular in the eastern part of the plot of land, towards the beginning of a dry valley, there is a steeper slope than in the central part of the excavation spot. Based on this, we allowed already at the start of the excavation for the possibility of (a higher degree of) erosion of this part of the site (see chapter 6).

Due to borings, it is known that at the excavation spot the loess sequence has a thickness of minimally 1 metre. The top of this sequence consists of a plough zone with an average thickness of c. 25-30 cm. In the profiles that were described during the excavation, a truncated Holocene soil could be recorded. This indicates that the top of the loess sequence has been subjected to erosion and/or was completely incorporated into the plough zone. In places where there are no disturbances (tree falls, and such like), a horizon can be followed under the plough zone that is red-brown in colour and into which illuviation and enrichment of clay has taken place. We are dealing here with the Bt horizon of a Holocene soil, the thickness of which can measure up to 90 cm. This horizon, particularly in the topmost part immediately under the base of the plough zone, is very homogenised and is transected up to the deeper parts by burrowing and root tunnels. In addition, cracks were observed in the Bt horizon which on the basis of their shape and size can be regarded as frost or contraction cracks. Disturbance of the original soil profile is further demonstrated by the occurrence of places where the Bt horizon is

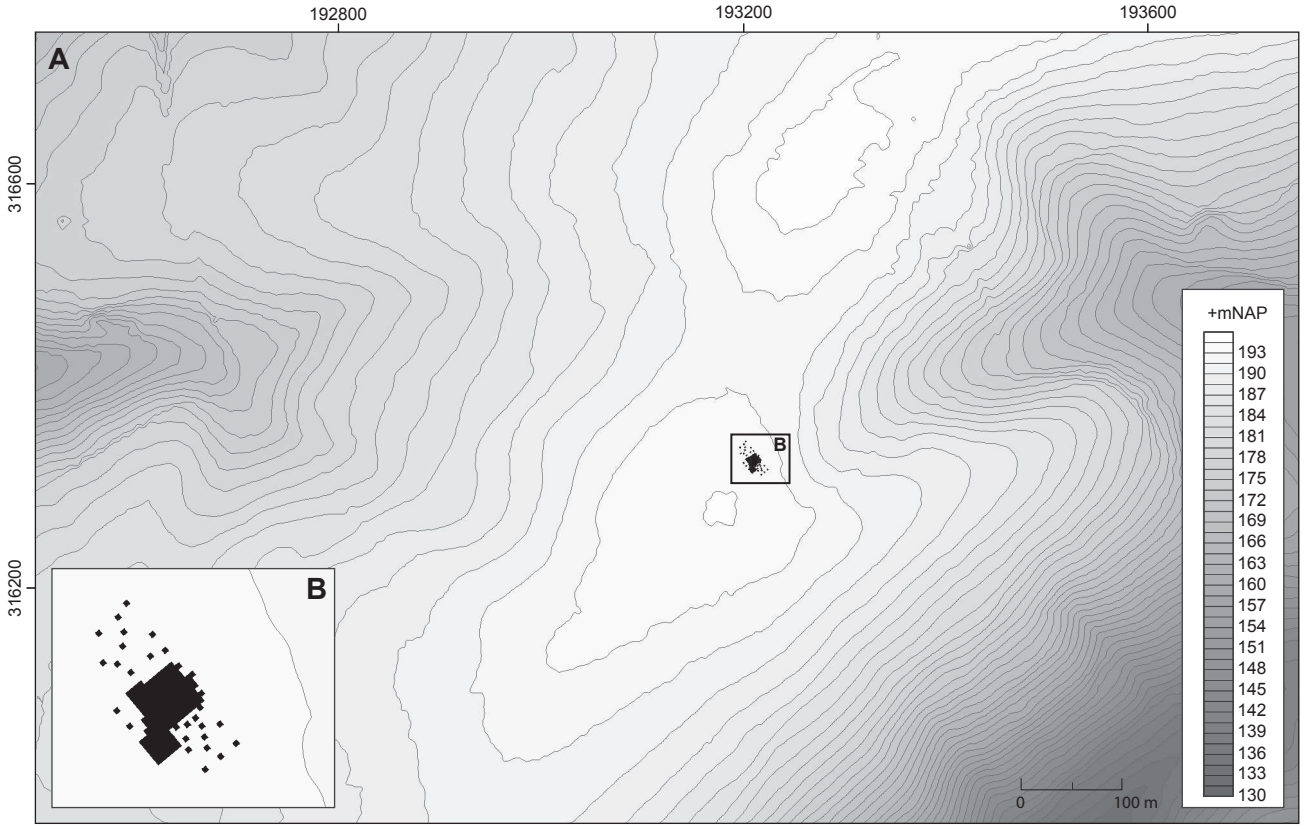

Figure 2.4 Detail of map in fig. 2.3 with position of trial trenches (April 1990) and excavation (Summer 1990, April 1991). The site is located on an elevated part of the terrain at the beginning of a dry valley. Source: Actueel Hoogtebestand Nederland.

lacking. These are visible below the plough zone in the plane and in the profiles as lighter discolourations and are filled in with relatively clay-poor sediment. We are probably dealing here with remnants of tree falls belonging to a former (Holocene) forest. The non-ploughed part of the archaeological layer was directly under the plough zone in the top of the Bt horizon. Besides, at various places finds have been made in the remnants of the backfills of the tree falls.

In spite of the effects of erosion, a substantial layer of loess still covers the plateau on which the site is located and the adjacent slopes. Apparently, erosion has brought the archaeological layer (nearer) to the surface, without affecting the archaeological site too much. It was probably only in the past century that serious disturbance of the archaeological layer occurred as a result of agricultural activities (Rensink 1992b). For a more detailed discussion of the pedological situation at the location of the site and the role of post-depositional processes on the preservation and location of the archaeological finds, the reader is referred to chapter 6.