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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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7 Regional context: Magdalenian sites in the Meuse-Rhine loess area

7.1 Introduction

In the preceding three chapters we reported on characteristics of technology and typology of the flint industry (chapter 4), the results of use-wear analysis (chapter 5), and the spatial distribution of the archaeological materials (chapter 6) of the Eyserheide site. The aim of this chapter is to put the site in a wider geographical perspective and to include in our investigation data of nearby Magdalenian open-air sites. The information of these sites will hopefully contribute to a well-founded interpretation of the Eyserheide site itself. As we already noted in chapter 1, Eyserheide is not a unique Magdalenian open-air site in this part of the Northwest European continent. Together with a few nearby Dutch, Belgian and German sites, the site forms a small group of c. ten open-air sites on the northwestern edge of Magdalenian territory. They are related to the earliest occupation of the loess belt north of the Ardenno-Rhenish Massif after the Glacial Maximum of the Weichsel ice age, c. 20,000-18,000 BP. As far as we can say now, they reflect activities of the first modern people (=representatives of the species *Homo sapiens sapiens*) who lived in the loess area in small temporary camp sites.

Evidence of human occupation from the early phases of the Upper Palaeolithic, that is from the periods of the Perigordian, Aurignacian and Gravettian and with a date between c. 35,000 and 18,000 BP, is absent from the same area. This absence of evidence does not mean that during this long timespan people did not sporadically visit the area. An indirect indication of this forms the presence of good quality flint in Aurignacian and Gravettian sites in the Central Rhineland in Germany. This flint originates from Cretaceous deposits between Maastricht and Aachen and points to the presence of exploitation sites from the early Upper Palaeolithic, of which no traces have yet been found.

The Magdalenian sites that will be discussed in this chapter lie in a predominantly gently undulating hilly landscape, the surface of which consists of loess deposits (see 7.2). This area covers a surface of c. 180 × 50 km and lies between the cities of Brussels in the province of Brabant (Belgium) and Cologne and Düsseldorf in the Lower Rhine region (Germany). It comprises the central and northeastern part of Belgium, the southernmost part of the Netherlands, and the Niederrheinische Bucht in Germany. In this monograph this area will be referred to as the Meuse-Rhine loess area. On the basis of the landscape characteristics mentioned, we have chosen to take this area as unit of analysis and discussion. Moreover, Magdalenian sites there share an important archaeological characteristic: they are exclusively open-air sites. In contrast to the Belgian Ardennes, Schwabische Alb and other more southern areas with traces of occupation from the Magdalenian, no prehistoric caves or rock shelters (*abris sous roche*) are known from the Meuse-Rhine loess area. This does not mean that we should not allow for remnants of human activities in caves and rock shelters, for instance in the Dutch-Belgian Cretaceous area. In limestone formations in deeply incised stream valleys are possibly karst phenomena (caves and rockshelters) present, which were used as natural shelters in the Palaeolithic. If present, they are hidden under metres-thick layers of washed-down loess (colluvium) and have so far remained beyond the reach of archaeological observation.

After a short description of landscape features of the Meuse-Rhine loess area (7.2), the Magdalenian sites will be briefly presented (7.3). Subsequently, we shall go into the landscape setting of the sites in this area (7.4), and the circumstances that have led to conservation and erosion of occupational traces from the Magdalenian (7.5). Similarities and differences in the size and material content of the sites, such as exploited raw materials and composition of the tools, are the focus in paragraphs 7.6 to 7.8. The chapter is concluded with a discussion of the meaning of observed differences in terms of inter-site variability and site function (7.9).

7.2 Geology and landscape

The loess zone, to which Eyserheide and nearby Magdalenian open-air sites are connected, is part of the most northern margin of the Northwest European loess belt. A small number of sites is located just north of the northern boundary of the loess zone. There layers of cover sands from the last ice age or fluvial deposits of the Rhine and Meuse are lying on or close to the present-day surface.

On a larger geographical scale, the Meuse-Rhine loess area forms a transition zone between the uplands of the

Ardenno-Rhenish Massif in the south and the cover-sands landscape of the North European Plain in the north (fig. 7.1). Meuse and Rhine are by far the most important rivers in the area and, together with numerous large and small tributaries, such as the Méhaigne and the Geer in Belgium, the Geul in Dutch Limburg, and the Rur in Germany, take care of the drainage of water from this area. Both the Meuse, Rhine and smaller watercourses have formed the present-day landscape to a large extent. The hills are largely lower than 200 m +NAP and are for a large part covered by a layer of fine-grained, aeolian loess (Mücher 1973; Bouten et al. 1985). Characteristic landforms are elevated, loess-covered plateaus and deeply incised, often asymmetrical stream and dry valleys. The loess deposits date from the Saale and/or Weichsel ice age(s) and can attain a thickness from a few metres up to 30 metres in the Niederrheinische Bucht. More or less complete loess profiles are known from several quarries and have partly been described and studied extensively, such as near Nagelbeek (Haesaerts et al. 1981), Kesselt (Gullentops 1954), and Maastricht-Belvédère (Vandenberghe et al. 1985). Holocene fluvial sediments are found in stream valleys. Loess washed down from slopes (colluvium) is present everywhere in stream and dry valleys.

7.3 Presentation of the sites

Since the discovery and excavation in 1974 of a Magdalenian site near the German town of Alsdorf (Löhr 1979), the following sites have been investigated in the Meuse-Rhine loess area by means of excavations: Orp-le-Grand and Kanne in Belgium (Vermeersch et al. 1985, 1987) and Sweikhuizen-Groene Paal, Mesch and Eyserheide in the Netherlands

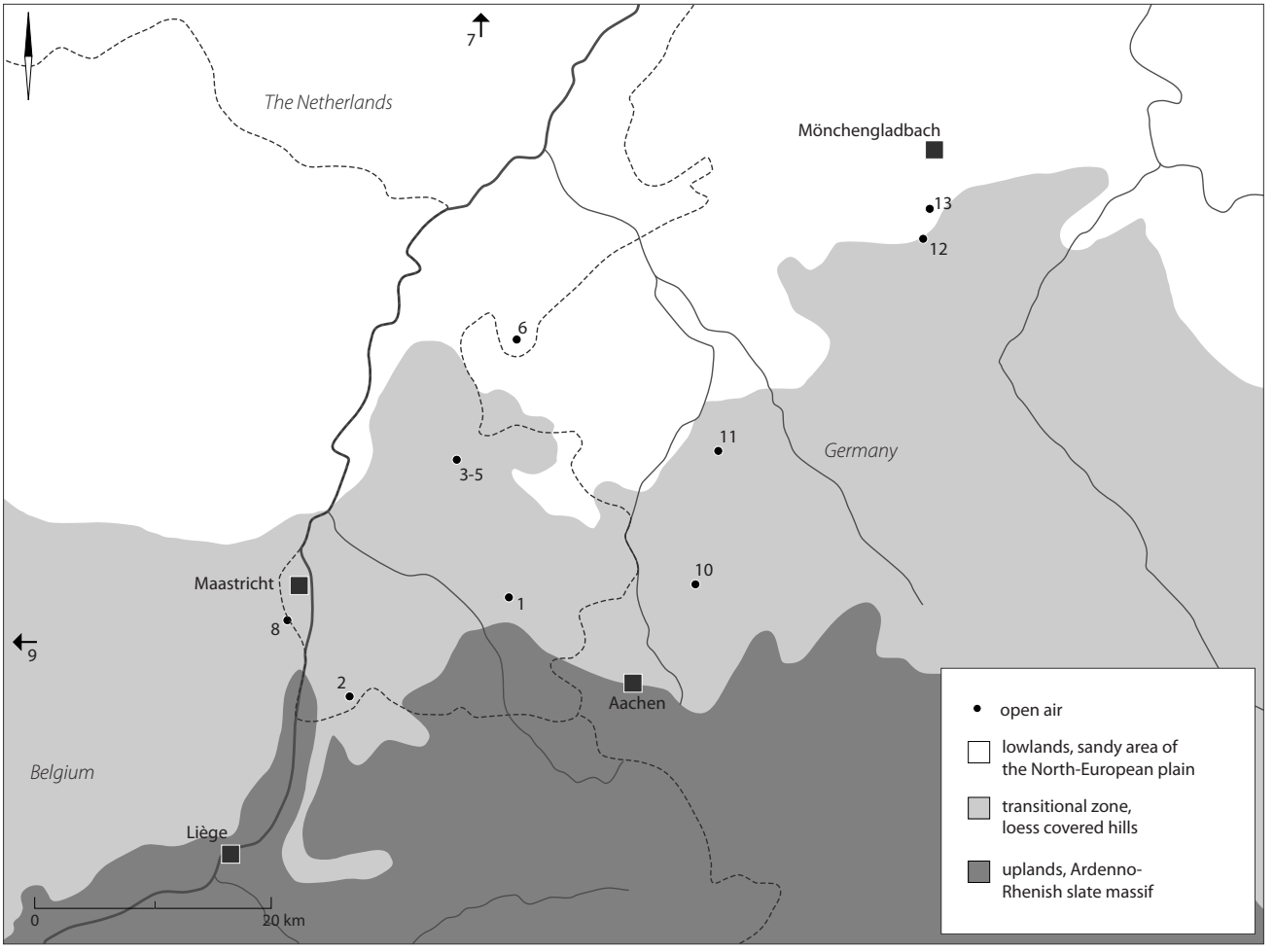

Figure 7.1 Location of Magdalenian sites of the Meuse-Rhine loess area: 1 Eyserheide, 2 Mesch-Steenberg, 3-5 Sweikhuizen, 6 Echt-Koningsbosch, 7 Griendtsveen, 8 Kanne, 9 Orp-le-Grand, 10 Alsdorf, 11 Beeck, 12 Kamphausen, 13 Galgenberg.

(Arts and Deeben 1987b; Rensink 1993). A number of sites is exclusively known from surface finds, among which Koningsbosch in Dutch Limburg, and Kamphausen (Thissen 1989) and Beeck (Jöris et al. 1993) in Germany. For an overview of the data on the above mentioned sites, see tables 7.1 to 7.8.

Kanne:
Kanne is located in northeast Belgium, c. 5 km southwest of the Dutch city of Maastricht. The site lies along the alluvial plain of the small river Geer (in Dutch: Jeker). Magdalenian artefacts were revealed in 1979 at several locations during the digging of a canal in the valley of the river Geer (Vermeersch et al. 1985). Three sections were investigated, whereby three concentrations of archaeological material were found in sector Central. The most find-rich of these, on the boundery of the excavated area and already partially destroyed by bulldozers before excavation, consisted of an accumulation of flint waste, blades and blade fragments and three cores. Also most of the tools and a few hammer stones were recovered from this concentration. The second concentration was located only 5 m away and has yielded preparation flakes, (fragments of) blades and tools. The third concentration, also at the edge of the excavated area, revealed mainly fragments of heated stones. In addition, two hammer stones and a core were found there. Both latter concentrations were interpreted as *zones d'évacuation des déchets* (Vermeersch et al. 1985, 44). In the second concentration it concerns debris of flint working, and in the third concentration stones that formed part of a hearth (*produits de vidange de foyer*). The presence of in particular burins and burin spalls in the third concentration points to an area of specialised activity (*zone d'activité domestique*) or a depository of tools that were used in domestic activities. Artefacts, among which only a few tools, were found in the base of an erosion channel in *secteur sud*.

In the publication of Kanne, the dynamics of core reduction have extensively been described, also using data of refitting (Vermeersch et al. 1985). The list of tool types, which F. Bordes (1978) formulated for the French site of Laugerie-Haute, was used as basis for the typological classification of the retouched tools.

Orp-le-Grand:
The sites of Orp-le-Grand are located in the province of Brabant in the central part of Belgium on a loess-covered plateau above the valley of the Ruisseau de Jauche, a very small tributary of the Petite Gette. In 1979, two lithic concentrations, designated as sector East and sector West, were excavated there by the Katholieke Universiteit Leuven (Catholic University Louvain) by P.M. Vermeersch and his team (Vermeersch et al. 1987). The centres of these two concentrations were only nine metres from each other. Orp-East was excavated over an area of 63 m^2 and consisted of a very dense accumulation of stone artefacts, among which 63 large cores and 438 retouched tools. In Orp-West, investigated over an area of 88 m^2, the concentration of artefacts was less dense and 27 cores and 143 tools were found. Despite the fact that both concentrations were lying close together, they probably do not date to the same time. As the artefacts of sector West have been more affected by cryoturbation, it is assumed that this concentration is older than that of sector East (Vermeersch et al. 1987, 49). Also the fact that artefacts of both concentrations could not be refitted onto each other indicates a difference in age (Vermeersch et al. 1987, 11).

According to the excavators, the distribution of flint artefacts in the east section, and in particular in two find-poor zones (A1 and A2, Vermeersch et al. 1987, fig. 32) in the centre of the concentration, points to the presence of an obstacle, possibly the wall of a tent or a comparable construction. It would concern a circular tent with a floor space of 9 m^2 and a diameter of 3.4 m. Based on the distribution of sandstone (*grès*) and burnt artefacts, it is assumed that there was hearth in the entrance of the 'tent'. An intact hearth was not found. Also for Orp-le-Grand a typological classification of the tools is based on the list of F. Bordes (1978).

Sweikhuizen:
In the Dutch part of the Meuse-Rhine loess area, three Magdalenian sites are known from the loess plateau of Sweikhuizen-Puth, south of Geleen near the village of Sweikhuizen. They are lying between 95 m and 108 m +NAP (fig. 7.2). Further south, at the foot of the plateau and c. 50 m lower, flows the Geleenbeek.

The site of Sweikhuizen-Groene Paal (GP) was completely excavated in 1982-1983 (Arts and Deeben 1987b). The finds consists of 481 tools and 25 complete cores. In the middle of the find concentration, hundreds of pieces of quartzite were found, of which the larger fragments formed a circular structure with a diameter of three to four metres. A plausible explanation is that these stone represent the remains of a small habitation structure. In the eastern part, there where the stone circle was interrupted, was presumably the entrance to the tent. Here fragments of a sandstone slab were found with traces of heating. It is assumed that these finds mark the location of the hearth, near the entrance to the tent.

It appears from the distribution of the finds that the working of flint also largely took place near the entrance to the tent, near the supposed location of the hearth. Various backed bladelets were lying in the vicinity of the hearth. Presumably these implements were on the spot removed

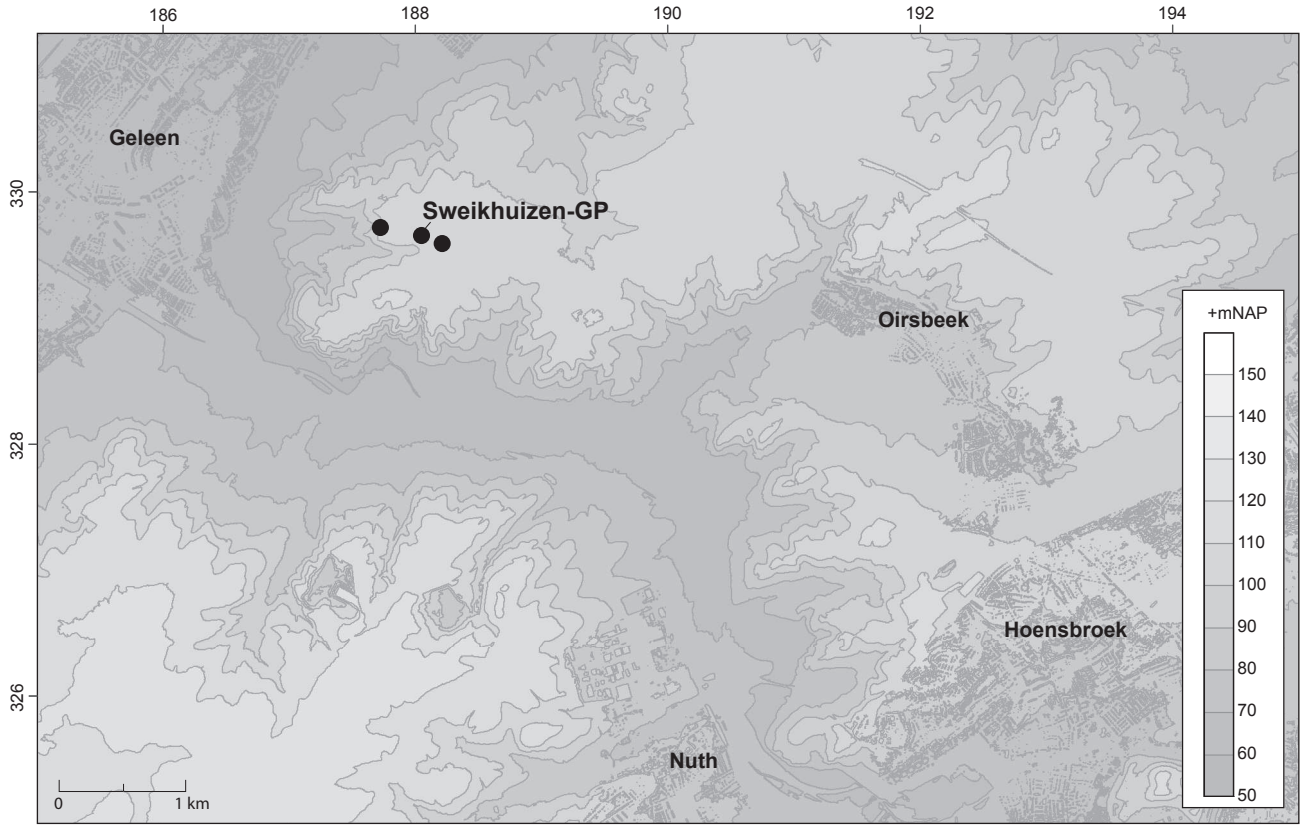

Figure 7.2 Contour map of the area between Geleen and Hoensbroek in Dutch Limburg. Location of the sites of Sweikhuizen-Oude Stort (OS), Sweikhuizen-Groene Paal (GP), and Sweikhuizen-Koolweg (KW). Source: Actueel Hoogtebestand Nederland.

from arrows and replaced by new ones (retooling). Relatively few finds were made in the northwestern part of the stone circle; we are possibly dealing here with a sleeping area. An accumulation of tools against one of the tent walls further points to a storage place.

The nearby site of Sweikhuizen-Oude Stort (OS) was at the time of discovery in 1954 already completely disturbed (dug up). Based on the characteristics of the retouched tools, this site was also attributed to the Magdalenian (Wouters 1985). The third site, Sweikhuizen-Koolweg (KW), located to the east, was investigated with a small-scale trial excavation. Possibly this location and the completely excavated settlement of Sweikhuizen-GP were occupied simultaneously. Some artefacts of non-local Simpelveld flint from the two settlements could be refitted onto each and this could indicate that a few families put up their tents simultaneously at Sweikhuizen. However, because refitted artefacts from Sweikhuizen-KW are surface finds, there are some uncertainties concerning the exact provenance of these artefacts (J. Deeben, pers. comm. 2011).

Mesch:

The site is located northeast of the village of Mesch in the rural district of Eijsden on the southern margin of a loess plateau, at a height of c. 120 m +NAP (Rensink 1991). The site occupies a very strategic position on the southern margin of the loess-covered plateau that is bordered in the south by the valley of the Voer, a small tributary of the Meuse (fig. 7.3). The wide Holocene valley floor of the Meuse is only 3 km to the west. The gently sloping surface of the Pleistocene terrace of the Meuse changes into a steeper slope about 100 metres south of the site. This slope connects the margin of the plateau with the valley floor of the Voer. The difference in height between the site (120 m +NAP) and the valley floor near Mesch is c. 50 m.

The site of Mesch was excavated in 1986 to a large extent. The finds consist of more than 6000 flint artefacts, including over 60 cores and 72 retouched tools. No indications were found of the presence of a habitation or hearth structure. The small number of retouched implements and the occurrence of large, roughly knapped cores and large flakes

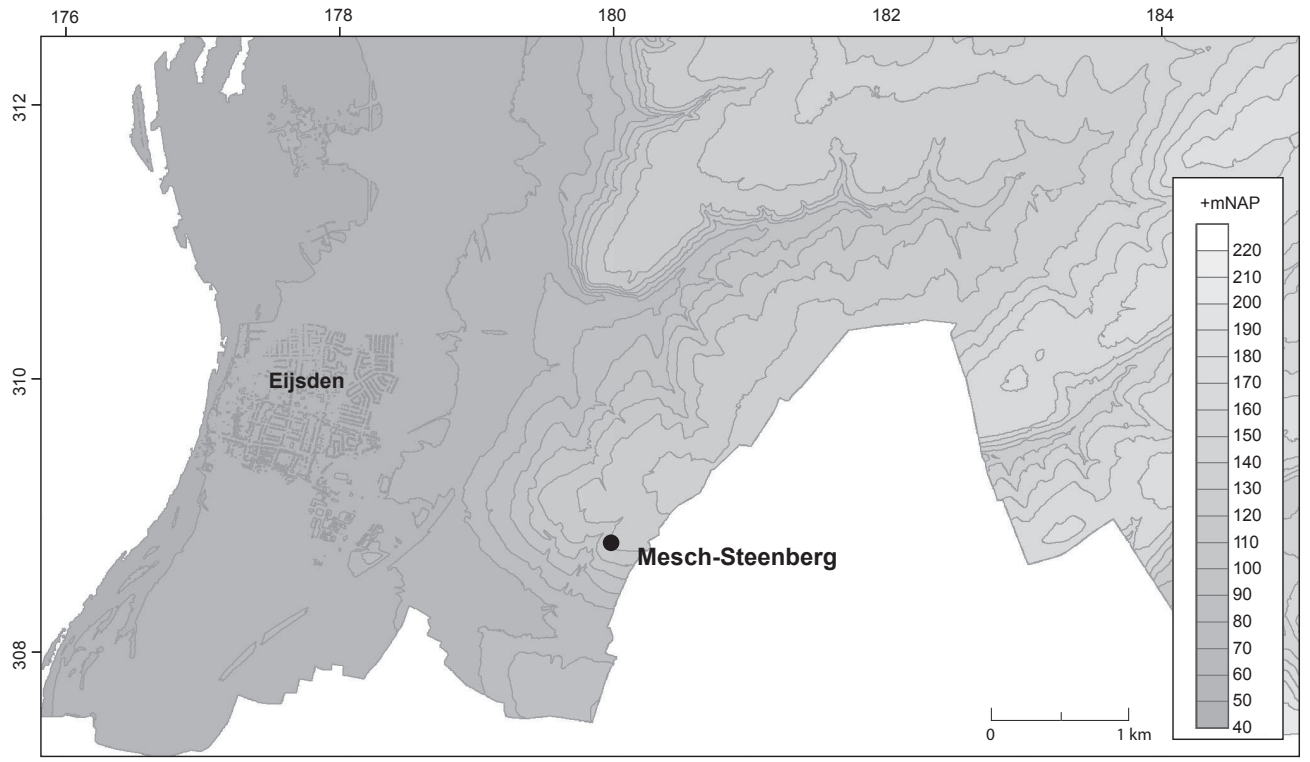

Figure 7.3 Contour map of the area south of Maastricht (Eijsden and surroundings). Location of the site of Mesch-Steenberg. Source: Actueel Hoogtebestand Nederland.

with cortex remains lend the site the character of a flint working place. But also large and regular blade cores occur as well as numerous fragments of long blades with parallel sides. At least part of the flint originates from gravel deposits of the river Voer and was carried up to the margin of the loess plateau. Subsequently, selected (fragments of) blades produced on the spot seem to have been transported to other camp sites, as can be inferred from the small number of retouched tools and many pieces of (deliberately?) broken blades found at the site. These could be camp sites in the valley of the Voer or the valley of the Meuse, or slightly further away and southward, settlements in caves in the nearby foothills of the Belgian Ardennes.

Koningsbosch:
This site is located on Dutch soil in the rural district of Echt-Susteren, immediately north of the loess area at a short distance from the Dutch-German border. The site was discovered in 2007 and lies at c. 52 m +NAP on the high terrace of the Rhine. Circa 1 km west is a prominent steep terrace edge which marks the transition from the Rhine terrace to the high terrace of the Meuse. The latter terrace has a height of 30 to 35 m +NAP and lies several metres lower in the landscape. The finds of this newly-discovered surface recovered to date amount 58. Based on the morphological characteristics of the cores, the scars of long, regular blades and the occurrence of frost cracks, the site can be attributed to the Magdalenian. Among the tools are five large and thick burins on flakes and a blade end scraper. There are also a few fragments of crested blades and blades.

Griendtsveen:
In a sand quarry near Griendtsveen in the rural district of Deurne (province of North Brabant) near the moorland area of the Peel, flint artefacts came to light in 1958, which later were attributed to the Magdalenian (Wouters 1983). This is the first site from the Magdalenian that was discovered in the Netherlands. Situated c. 45 km north of the loess area, it is moreover the most northerly site from this period in the Netherlands. The site is located on a gentle ridge in a

low-lying sandy area in which peat had formed in the Holocene. There was no excavation at the time. In view of the circumstances of the find, the site must already have been largely disturbed (dug up) by the time of the discovery. By far the most artefacts were found *ex situ*, at the bottom of the sand quarry and in piles of sand. Besides, a few finds were collected in stratigraphical context from the face of the quarry. According to Wouters (1983), they were located c. 60-80 cm underneath the level of the layer of Usselo. The number of artefacts from the site amounts to 1365. Of these, 142 specimens were described as tools. Also cores, flakes, blades and a soft hammer stone (*retouchoir*) form part of the inventory. The location was completely levelled in 1958.

Alsdorf:
The Magdalenian site of Alsdorf (Kreis Aachen-Land) was discovered in 1974 on a loess plateau at a height of 178 m +NAP and between the valleys of the Rur and the Wurm. At the start of the investigation, a part of the site had already been dug up as a result of quarrying gravel: the site was noticed at the edge and in the profile of a gravel quarry. In a small area of a few square metres, a clear concentration of stone slabs and flint artefacts was observed (Löhr 1974). At the time of discovery about 10,000 artefacts could be saved. The University of Cologne carried out a rescue investigation in the same year. Over a surface area of 34 m^2, another 5000 stone artefacts and stone slabs were thereby revealed. Possibly the stone slabs, c. 200 specimens of quartzite and quartzitic slate (*quartzitischer Schiefer*), formed part of a pavement. The flint artefacts have a remarkable composition of raw materials and tools. Burins were found frequently and end scrapers are lacking almost completely among the documented finds. A comprehensive publication on the excavation and the finds appeared written by H. Löhr (1979).

Beeck:
The Magdalenian site of Beeck (Stadt Geilenkirchen, Kreis Heinsberg) was discovered in 1986, and is located only 15 km from Alsdorf on a loess plateau at a height of 80 m +NAP (Jöris et al. 1993). The plateau borders onto the valley of the Rur in the northeast and onto the valley of the Wurm in the northwest. The finds were collected from the surface and originated from the middle and lowest part of a gentle slope which slants towards the east to the Beeckfließ. The upper part of the slope west of the site lies c. 10 m higher above the valley of this stream. Most finds were made in an area of approx. 20 × 15 m. Thanks to measuring in of the artefacts a few find-rich and find-poor zones could be distinguished. A concentration of artefacts was interpreted as a place of flint working for the production of blades. In 1993, the number of artefacts of this site amounted to 1195, of which 51 were described as tools. Also some 35 cores occur which were intended without exception for the production of bladelets and blades.

Kamphausen:
Kamphausen (Gemeinde Jüchen, Kreis Neuss) is a surface site, from where in the 1980s and 1990s Magdalenian artefacts were collected during systematic field surveys. Of these finds, the artefacts collected in the period 1982-1992 have been extensively described by Höpken (1994). The site is located on a south-orientated slope on the south side of the Kamphausener Höhe, with a position of 90 m +NAP a prominent height in the wider surroundings. Although artefacts were found dispersed over an area of maximally 90 × 60 m, there is a concentration of 20 × 20 m. As in Eyserheide, the artefacts were made of various types of flint. We can mention seven flake cores and two bladelet cores, burins, scrapers and backed bladelets. Scrapers occur rarely and the implements that were found are in general a-typical.

Galgenberg:
Also known from surface finds is the site of Galgenberg (Stadt Mönchengladbach), c. 1 km north of the site of Kamphausen. Also this site was described by Höpken (1994, 32-34). Up to 1993, 23 stone artefacts were collected from this site, among which three cores, two fragments of blades, and a fragment of a crested blade. Given the characteristics of the patina and the high degree of similarity between the cores of this site and those of Kamphausen, Galgenberg is also regarded as a site from the Magdalenian. However, retouched tools are lacking among the 23 artefacts mentioned by Höpken and a date of the site in a later phase of the Late Palaeolithic cannot be excluded.

Vermeersch and Symens (1988, 247) further mention a small number of surface finds in the Belgian loess and sand area which presumably date to the Magdalenian: Lixle-Sur le Bois (Cahen and Peuskens 1977-79), Tourinnes-la-Grosse and Oedelen-het Maandagse. An isolated find is a blade core with two opposite striking platforms and long and regular blade scars from Rijckholt-Sint Geertruid in Dutch Limburg. The artefact can probably be attributed to the Magdalenian (Roebroeks 1994).

7.4 Position in the landscape (site location)

Compared to the flat cover-sand landscape of the Northwest European Plain, the hilly landscape of the Meuse-Rhine loess area shows a variety in relief and other landscape features. At relatively short distances, elevated plateaus, gentle to steep valley slopes, partly deeply incised dry valleys and flat valley floors of mainly smaller watercourses succeed each other. Assuming the continuous character of the spatial behaviour of prehistoric hunters and gatherers (Zvelebil et al. 1992), we

can imagine that at the time of Magdalenian occupation main landscape zones and intermediate zones offered specific possibilities in terms of shelter (occupation), view (resource monitoring), raw material exploitation, water supply, and for the exploitation of faunal and floral food resources (hunting/fishing and gathering respectively). Also ritual activities, for instance during the gathering of two or more groups, are not expected to have taken place randomly in the landscape. They were probably connected to locations with specific terrain features and/or of historical meaning, and strategically located with respect to seasonally and/or year round available food resources.

The mentioned diversity of characteristics of the landscape and possibilities in terms of occupation and exploitation is not reflected in the location of Magdalenian sites in the northern loess area. The majority has an elevated landscape position on or near the margin of a loess-covered plateau. In a few cases the plateau dominates one water-carrying stream valley (Sweikhuizen-GP and -KW) or a dry valley (Eyserheide). But sites are also located on plateaus that form part of a watershed and that separates water courses of two different catchment areas. Good examples are the sites of Alsdorf and Beeck located on plateaus between the catchment areas of the rivers Rur and Wurm. Further north is the site of Kamphausen on a height which functions as a watershed between the Niers and the Kommer Bach. The loess plateau on which the site of Mesch is situated dominates the valley of the Voer in the south and the valley of the Meuse in the west.

Despite the elevated position of the sites in the landscape, running water in the form of streams and small rivers is never far away (table 7.1). Thus the distance from the concentrations of Orp-le-Grand to the Jauche is 500 m as the crow flies, from the site of Sweikhuizen-GP to the Geleenbeek 1 km, from the site of Mesch to the Voer 500 m and from the site of Alsdorf to the Broichbach 200 m. Such distances could be covered in a short time with differences in altitude between plateau areas and valley floors not exceeding a few dozen metres. We should note though that at the time of occupation of the sites the relief was more pronounced than it is nowadays (see also Thissen 1989, 315). In the course of the Holocene, and in particular from the period when agriculture appeared in the area (Linear Pottery Culture, c. 5300 BC), the erosion of loess deposits has increased sharply. As a result, the lower parts of the landscape have become filled up with thick layers of colluvium. Together with sedimentation by rivers and streams, these processes of erosion and colluviation have led to levelling of the relief as was present during the stay of Magdalenian hunters and gatherers in the area.

Another shared characteristic is the topographical position of sites at 'the entrance' to a dry valley. As we mentioned in chapter 2, the site of Eyserheide lies a stone throw from the spot where a dry valley cuts into the margin of the plateau. A comparable position in the landscape is known from Kamphausen (Höpken 1994). For Orp-le-Grand, Vermeersch et al. (1987, 8) point to the nearness of a *petite valon sec* that is largely filled with colluvium. We can imagine such dry valleys functioning as a kind of 'entrance ways' to the slopes and valley floors of the deeply incised stream valleys a few dozen metres lower in the landscape (and *vice versa*).

And finally, there is a similar orientation in the slope or landscape section on which the sites are situated, namely facing south, southeast or east (table 7.1). This orientation applies to the sites of Orp-le-Grand, Mesch, Eyserheide, Beeck and Kamphausen, and is probably connected to a preference for the warmer, southerly plateau margins and slopes as temporary place of residence.

7.5 Conservation and erosion

The conservation of Magdalenian sites on elevated plateaus is due to the embedding of the finds in a layer of loess and the conservation of the loess deposits on flat or slightly sloping parts of the terrain. In all excavated sites (Orp-le-Grand, Kanne, Eyserheide, Sweikhuizen, Mesch and Alsdorf) artefacts were found in loess sediments, in the B2t horizon of a Holocene podzol soil which is characterised by illuviation of clay (*un sol brun lessivé*). Based on this pedological position, a few dozen centimetres under the present surface, we can assume that the finds were covered by a layer of loess (see for instance Löhr 1974). Regarding the find situation in Orp-le-Grand, Vermeersch et al. (1987, 47) note:

"Considérant que les vestiges archéologiques étaient situés à l'intérieur de l'horizon B2t, il nous semble logique de supposer que l'accumulation loessique n'avait pas encore pris fin, de sorte que l'aire d'occupation a pu être recouverte d'un apport continu de loess qui, finalement, a scellé le site sous environ 60 cm de sédiments".

In Kanne, the flint concentrations were at a depth of at least 25 cm beneath the top of a layer of loess (Vermeersch et al. 1985, 45). There the artefacts were also found in the B-horizon of a Holocene soil.

The presence of a conserving layer of loess presumably kept the sites located on or near the margins of plateaus from complete destruction by erosion (Löhr 1974, 293). But there is one exception, and in this context the special position of the site of Mesch should be pointed out. The location lies on the southern margin of an extensive plateau that slopes slightly towards the valley of the Voer with a slope gradient of more than 2.5%. Around the site, no loess deposits, but gravel-rich deposits of the Pleistocene Meuse terrace outcrop.

Site number	Site name	Year of discovery	Year of excavation	Excavated area (m2)	Topographic location	Altitude above sea-level	Orientation	Distance to waterstream (m)	Water course	Difference in height (m)
1	Eyserheide	1985	1990-1991	159	edge loess plateau	193	southeast	1100	Eyserbeek	90
2	Mesch	1979	1986	152	edge loess plateau	120	south	500	Voer	50
3	Sweikhuizen-OS	1954	no excavation	.	slope loess plateau	95	west	750	Geleenbeek	40
4	Sweikhuizen-GP	1981	1982-83	625	loess plateau	107	indet	1000	Geleenbeek	40
5	Sweikhuizen-KW	?	1985	46	loess plateau	108	indet	1100	Geleenbeek	40
6	Koningsbosch	2008	no excavation	.	plateau, river terrace	52	indet	3500	Saeffeler Bach	15
7	Griendtsveen	1958	no excavation	.	low sand ridge	30	indet	indet	indet	indet
8	Kanne Central	1978	1978	115	edge valley floor	64	west	200	Geer	5
8	Kanne South	1978	1978	90	edge valley floor	65	west	200	Geer	5
9	Orp-West	?	1979	88	loess plateau	108	south	500	petit Gette	30
9	Orp-East	?	1979	63	loess plateau	108	south	500	petit Gette	30
10	Alsdorf	1974	1974	34	loess plateau	178	.	200	Broichbach	.
11	Beeck	1986	no excavation	.	loess plateau	80	east	.	Beeckfließ	<10
12	Kamphausen	1982	no excavation	.	loess plateau	90	southeast	.	erosion gully	22
13	Galgenberg	1984	no excavation	.	loess plateau	78	northeast?	1000	Niers	.

Table 7.1 Magdalenian sites of the Meuse-Rhine loess area: general data.

This indicates that at the margin of the plateau either no loess was deposited or, and this is more probable in view of the slope gradient, the loess cover has completely eroded. Nevertheless, the majority of the artefacts were in the loess and underneath the plough zone. For a better understanding of the local geological situation, a deep trial trench was dug during the excavation of 1986. This showed that the horizontal distribution of the flint artefacts coincided with the location of a former karst subsidence with a diameter of 25-30 m (Rensink 1991). This karst subsidence was already (almost) completely filled with loess sediments at the time of the occupation or use of the location by Magdalenian hunters and gatherers. Because of the slightly deeper position of the archaeological layer below the present-day surface (= top Meuse terrace), this layer has not eroded in the area of the karst subsidence. But the layer was ploughed, whereby a part of the artefacts became incorporated into the plough zone.

At some sites, such as Orp-le-Grand, Mesch and Eyserheide, the loess layer was subjected, in the course of the Holocene, to first soil formation and subsequently to erosion, as can be inferred from the occurrence of truncated Holocene loess soils. Erosion has led to the upper part of the Holocene soil (A and partly B2t horizon) having been removed or having been incorporated into the plough zone, whereby artefacts were brought to the surface. The degree of erosion of the archaeological layer and/or disturbance of it by ploughing however differs from location to location. The southern part of the settlement of Sweikhuizen-Groene Paal had already disappeared at the beginning of the excavation in 1981-82 as a result of erosion. In Orp-le-Grand, few artefacts were damaged by ploughing, from which can be inferred that the archaeological layer was only recently ploughed (Vermeersch et al. 1987, 8). A relatively low degree of disturbance also accounts for the surface site of Beeck, as the finds collected from the surface and plotted on distribution maps still showed meaningful spatial patterns (Jöris et al. 1993). In Alsdorf, the majority of finds was found in the plough zone, which points to a high degree of disturbance of the archaeological layer (Löhr 1974, 293). On finds collected from the surface and plough zone at Mesch much damage as a result of ploughing was recognised. Apparently, these artefacts had been incorporated into the plough zone for a long time prior to the excavation. Of the finds of Kamphausen (n=339), as much as 45.4% was recently damaged by a plough (Höpken 1994).

It is expected that traces of activities of Magdalenian hunters and gatherers were eroded in particular in relatively steep slopes, which connect the elevated plateaus with the valley floors. As a result of the presence of sloping terrain, combined with deforestation and cultivation, the loess layer was more vulnarable to erosion there. In the Dutch part of the loess area, only one Magdalenian site (Sweikhuizen-Oude Stort) has been documented from a slope, and it is plausible that the finds were in secondary position. The site of Beeck lies on a slope orientated to the east and, despite the heavily truncated soil profile that was demonstrated on the basis of borings (even the Bt horizon has not been preserved), has been described as a well-preserved site (Jöris et al. 1993). If this classification is correct, the find situation in Beeck shows, depending on the time of covering of the archaeological layer by loess and the depth of this layer beneath the present-day surface, that remains of camp sites from the Magdalenian can also be found *in situ* in slope zones.

Finally, little can be said about the conservation of Magdalenian sites in river and stream valleys in the Meuse-Rhine loess area. In these low-lying sections of the landscape not only erosion but also sedimentation has occurred. Hence, open-air sites dating from the Late Upper Palaeolithic, but also from later prehistoric periode may have ended up deep under the present surface. It is clear that for such traces to become accessible we will have to rely on deep soil interventions by man, such as non-archaeological digging for the purpose of the construction of houses and roads and the development of 'new' nature, whereby river and stream sediments from the end of the Weichsel ice age are exposed. That Magdalenian sites can be present in low-lying zones is demonstrated by the special location of the site of Kanne in northeast Belgium (Vermeersch et al. 1985). As mentioned in paragraph 7.3, the site accidently came to light underneath a layer of loess and colluvium at the edge of the alluvial plain of the small river Geer. Such strokes of luck are very important to get a better insight into the diversity of site types and the regional character of the Magdalenian occupation of the Meuse-Rhine loess area.

7.6 Raw materials and technology

7.6.1 Introduction

The finds from the Magdalenian sites in the Meuse-Rhine loess area consist mainly of stone artefacts (table 7.2). Based on typological characteristics of the flint tools, they can be attributed to the Magdalenian (see below). This attribution is supported by morphological characteristics of the well-prepared blade cores and data on blade technology and the way in which the flint nodules were worked. Especially thanks to the results of refitting, insight has been gained for the excavated Belgian and Dutch open-air sites into the sequence of technological operations (in French literature described as *chaîne opératoire*, Pelegrin et al. 1988) during the process of core reduction. Compositions of refitted

Site number	Site name	Excavation	Cores	Core fragments and blocks	Flakes	Blades	Crested blades	Tools	Tool waste	Other artefacts	Chips <2 cm	N	References
1	Eyserheide	yes	16	100	1017	735	77	131	22	4	1314	3416	This publication, table 4.1
2	Mesch	yes	66	110	2196	1370	72	72	14	35	2185	6120	Rensink 1991, tables 2 and 3
3	Sweikhuizen-OS	no	.	.	.	.	.	ca. 60	.	.	.	.	Wouters 1985
4	Sweikhuizen-GP	yes	40	47	9868	1311	148	481	101	198	.	12194	Arts and Deeben 1987b, tables 7 and 26
5	Sweikhuizen-KW	no	.	.	.	.	.		.	.	.	.	.
6	Koningsbosch	no	3	7	24	11	3	8	.	2	.	58	.
7	Griendtsveen	no	present	.	present	present	.	142	present	.	.	1365	Wouters 1983, 104
8	Kanne Central	yes	19	.	2338*	2064*	120	83	60	83	11064	15748	Vermeersch et al. 1985, table 3
8	Kanne South	yes	6	.	744*	393*	30	15	1	12	579	1765	Vermeersch et al. 1985, table 3
9	Orp-West	yes	27	10	1428	703	35	146	158	198	7300	10005	Vermeersch et al. 1987, table 2
9	Orp-East	yes	63	16	7020	2913	213	438	830	718	71200	83411	Vermeersch et al. 1987, table 2
10	Alsdorf	yes	107	36	5326	3737	.	361	.	.	.	9567	Löhr 1979, 1995
11	Beeck	no	ca.35	.	.	.	.	51	.	.	.	1195	Jöris et al. 1993
12	Kamphausen	no	9	.	171	90	20	33	5	11	.	339	Höpken 1994, collection 1982-92
13	Galgenberg	no	3	.	11	3	.	.	.	6	.	23	Höpken 1994, collection 1984-92

Table 7.2 Magdalenian sites of the Meuse-Rhine loess area: numbers of artefacts per type. *For Kanne sector Central and sector South the numbers of flakes and blades mentioned include (retouched) tools.

artefacts were for the first time extensively described for Kanne (Vermeersch et al. 1985, 28-34) and Orp-le-Grand (Vermeersch et al. 1987). Also for the Dutch sites of Sweikhuizen-Groene Paal, Mesch and Eyserheide was refitting of stone artefacts carried out.

The aim of this paragraph is to discuss the characteristics of lithic raw materials and stone artefacts that were found in the camp sites of the northern Magdalenian. Based on their location with regard to geological formations and, hence, lithic raw materials associated with these formations, the sites have been divided into two groups: 1) in the immediate vicinity of Cretaceous sources of good quality flint: Orp-le-Grand, Kanne, Mesch, and Eyserheide (see 7.6.2), and 2) at a distance of minimally 5 km from these primary Cretaceous sources: Sweikhuizen, Alsdorf, Kamphausen, Galgenberg, and Beeck (see 7.6.3).

7.6.2 Sites in the area with Cretaceous flint sources

As discussed in chapter 2, part of the subsoil of the Meuse-Rhine loess area consists of flint-containing formations from the Upper Cretaceous (Gulpern Formation and Maastricht Formation). In the Belgian region of Haspengouw, north of the Meuse between Namur and Tongeren, and in the region of Maastricht-Aachen, these formations can attain considerable thicknesses of many dozens of metres (Felder 1975; Kuyl 1980). Flint nodules with considerable dimensions can be collected in the chalk itself (*in situ*) and in residual deposits, the so-called flint eluvium. Nodules of flint may have been displaced along slopes and incorporated into slope deposits. Rivers and streams have cut into the flint-containing Cretaceous layers in the course of the Pleistocene, whereby lumps of flint have ended up in the beds of water courses. In this regard, the Meuse has played by far the most important role. In Dutch Limburg and the immediately adjacent parts of Belgium and Germany, flint forms a considerable component of the Pleistocene terraces of this river. Magdalenian hunters and gatherers gratefully made use of the large supply of flint, as far as it could be collected in deposits on the surface. Only in the Middle Neolithic were flint nodules extracted at a large scale by means of open-cast mining and the quarrying of mine shafts, such as in Rijckholt in Dutch Limburg at only a few kilometres from the Magdalenian site of Mesch (Rademakers 1998).

Within the area with Cretaceous deposits, all sites show a strong dominance of artefacts manufactured of local flint (see next chapter, table 8.1). In Orp-le-Grand and Kanne, nodules used for the production of stone tools originated from flint-containing chalk that outcrops in stream valleys near the sites. In Orp-le-Grand these are lumps of flint with such large dimensions (c. 30 cm) that they cannot have been transported by the small river Petite Gette (Vermeersch et al. 1987, 8). The nodules are elongated (*allongés*), cylindrical or egg-shaped (*ovoïdes*) in shape. In Kanne, sectors Central and South, flint nodules with similar dimensions and shapes were used. A dominance of local flint also applies to the site of Mesch (Rensink 1991). The majority of the flint worked there has been designated as Rullen flint. This flint, that in its pronounced form is honey coloured, originates from the Lanaye Chalk (Gulpen Formation) and is known from several locations in the Voer region on either side of the Dutch-Belgian border, for instance near Rullen, Vrouwenbos and Rodebos (De Warrimont and Groenendijk 1993). Nodules of fluvial rolled cortex could have been collected from gravel-rich deposits of the small river Voer c. 50 m lower but at a short distance from the site (Rensink 1991). In Mesch also black-grey flint from the Lanaye Chalk, known as Rijckholt flint, occurs. One artefact, a roughly knapped pre-core, is made of Simpelveld flint and was carried to the site from the northeast over a distance of minimally 15 km. For the worked flint of Eyserheide, exploitation places are assumed within a radius of 5 km from the site. As sources qualify Tertiary and Pleistocene terrace deposits of the (ancient river) Meuse (terrace flint) and residual deposits and/or slope deposits (eluvial Simpelveld flint, Valkenburg flint and Orsbach flint) (see 4.2).

Technological studies of the stone artefacts of Orp-le-Grand, Kanne, Mesch and Eyserheide show that, within the general high standard of flint working that is typical of the Magdalenian, strategies of flint working can differ from nodule to nodule. In outline, three strategies can be distinguished. Of these, two were aimed at the production of blades and one at the production of bladelets.

The first strategy consisted of careful preparation of the core and regular maintenance of the striking platform and (the convexity of) the core face. Blade production started after the creation of a core crest on the front and back of the core and a careful preparation of the edge of the striking platform by *en éperon* technique. The strategy is synonymous with a high-grade, standardised working technique of flint, aimed at the production of several series of blades from one and the same core. For Orp-le-Grand and Kanne, Vermeersch and Symens (1988, 244) speak of *le débitage magdalénien classique*. In the publication on Kanne and Orp-le-Grand, Vermeersch et al. (1985, 1987) depict several *nucléus à lames avec un ou deux plans de frappe*, which can be regarded as the end result of this strategy. Large well-prepared cores with a succession of regular blades scars, a slightly curved (convex) core face and indications of *en éperon* preparation of the striking platform are good examples. In Eyserheide, a few RMUs (M3, M9) in the

group of terrace flint testify to this strategy and a careful handling of the flint nodules. For the tabular Simpelveld flint, RMUs S1 to S3 and S309 can be mentioned as example (see 4.6.2). The strategy described here fits in well in the tradition of the Magdalenian and is also known from 'classic' sites in other regions, such as Verberie and Pincevent in the Paris Basin (see 4.8).

Although the aim is also to produce blades, in the second strategy less time and energy has been spent on the preparation and maintenance of the core. There was a less careful and more 'uneconomic' way of core reduction compared to *le débitage magdalénien classique*. In particular the first stages of working show less investment in the preparation and shaping of the core. Cortex parts are commonly present and can even largely or completely cover the sides or back of the core (*dos cortical*). The creation of a core crest or *en éperon* preparation of the striking platform has not or only incidentally taken place. Also, for the production of blades in most cases only one striking platform and core face were used. The second strategy can be designated as *débitage simplifié*. In Kanne, sector South, this strategy has been determined for at least two cores, based on compositions of refitted artefacts. About one of these cores, the following is remarked (Vermeersch et al. 1985, 34):

"Du stade du plein débitage seuls les produits irréguliers ou corticaux ont pu être remontés. Les deux plans de frappe furent réaménagés à plusieurs reprises, mais ils subirent eux-mêmes très peu de préparation et restèrent souvent lisse. La table d'enlèvements est large (env. la moitié du contour du nucléus) et ne présente pas de convexité nette".

Among the finds of Eyserheide, compositions of refitted artefacts of terrace flint around the cores (RMUs M6, M8) comply with the criteria laid down for this strategy (see 4.6.4). The back of both cores consists completely of cortex and there is only one striking platform present that was obtained in a simple way by the removal of one large flake from the top of the core. Indications of *en éperon* preparation are lacking.

The third strategy of flint working was aimed at obtaining narrow, thin blades, i.e. bladelets. Although demonstrated in all sites, the production of bladelets seems to have played a subordinate role compared with that of blades. Of 19 cores in Kanne, sector Central, only one specimen has been described as bladelet core, made from a thick flake (Vermeersch et al. 1985, fig. 12.3). For Orp-East, a few blade cores can be pointed out that were used for the manufacture of bladelets in the end stage of core reduction. In addition, both in sector East and in sector West thick flakes were utilised for the production of bladelets (Vermeersch et al. 1987, 20 and 23). For a number of artefacts, we can speak of a transitional form between bladelet cores and core-shaped burins. In Eyserheide, bladelet cores made of flakes are lacking, and only one core, part of RMU M17, has served for the production of bladelets. One of these bladelets was retouched into a backed bladelet which could be refitted onto the core (see 4.6.4).

The proximity of sources of good quality flint and the large dimensions of the flint nodules are reflected in the dimensions of the cores (table 7.3). In Orp-le-Grand, the largest pieces have dimensions of c. 20 cm and weights of 2080 grams (sector West) and 3410 grams (sector East). The largest core of Kanne, sector Central has a length of 19.7 cm and a weight of 2655 grams. Of 61 complete cores found in Mesch, 34 pieces have a length between 10 and 15 cm and eight pieces a length between 15 and 20 cm. The largest specimen is 21.7 cm long and weighs c. 2 kg. This core is comparable in weight to the largest specimen of sector West in Orp-le-Grand. The majority of complete cores in Eyserheide is smaller with lengths between 5.7 and 15 cm. The largest specimen, made of tabular Valkenburg flint, has a length of 15.1 cm and weighs 880 grams. Apparently, in Eyserheide smaller flint nodules were used for blade production and/or the cores were reduced more than in the other three sites. Especially for the group of terrace flint we should take into consideration smaller dimension of the original material. Nonetheless, the cores of Eyserheide still have considerable dimensions and they were not completely reduced or exhausted.

In table 7.3 is indicated which types of cores are represented in the sites of Orp-le-Grand, Kanne, Mesch, and Eyserheide. Blade cores with one or two opposite striking platforms and one core face occur most frequently in all sites. Cores exclusively showing the negatives of flakes and which have been discarded before the stage of *plein débitage* are described by Vermeersch et al. (1985, 1987) as *nucléus informes*. In Orp-le-Grand, six (sector East) and one (sector West) specimens of such cores have been found. The site of Mesch takes a special position in this regard with a high number of 17 pieces, moreover six cores have been described as pre-cores. They are roughly knapped pieces of flint which were already discarded in the very first phase of core reduction. Pre-cores do not occur in the other sites. As we discussed in chapter 4, among the complete cores of Eyserheide is only one core with exclusively scars of flakes. This core is made of Orsbach flint (RMU O1). Cores with crossed or several striking platforms and cores made from flakes only occur in small numbers.

From the blade scars on cores can be inferred that the flint working was aimed at obtaining long blades with regular and parallel sides. In order to evaluate well the intentions of the

Site number	Site name	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Type 9	N	Cortex = 0	Mean dimension (cm)	Max.dimension (cm)	Min. dimension (cm)	Mean weight (gr)	Max. weight (gr)	Min. weight (gr)
1	Eyserheide	.	1	6	6	3	2	.	.	.	18	1	10.3	15.1	5.7	375	880	65
2	Mesch	6	17	14	18	.	4	.	1	1	61	12	11.9	21.7	6	677	2000	144
4	Sweikhuizen-GP	.	15	11	.	.	.	.	.	.	26	6	6.8	23.8	2.8	.	.	.
6	Koningsbosch	.	.	.	3	.	.	.	.	.	3	3	10.3	11.8	8.3	481	625	243
7	Griendtsveen	.	.	.	present	.	.	.	.	.	.	.	.	.	.	.	.	.
8	Kanne Central	.	.	7	6?	3	.	.	3?	.	19	.	14	19.7	9.1	1155	2655	290
8	Kanne South	.	.	.	6?	.	.	.	.	.	6	.	8.5	.	.	.	.	.
9	Orp-West	.	1	13	9	0	3	1	2	.	29	8	9.6	18.2	5.2	511	2080	64
9	Orp-East	.	6	31	13	4	2	3	4	.	63	18	10.7	22.5	5.5	600	3410	110
10	Alsdorf	.	.	.	.	.	.	.	45	.	107	.	.	.	.	.	.	.
11	Beeck	.	.	.	present	.	.	.	present	.	ca.35	.	.	.	.	.	.	.
12	Kamphausen	.	.	4	1	1	.	.	1	2	9	.	5.3	8.3	3.2	.	.	.
13	Galgenberg	.	.	1	.	.	.	.	2	.	3	.	6.6	7.5	6	.	.	.

Table 7.3 Magdalenian sites of the Meuse-Rhine loess area: data on complete cores. Type 1= block/pre-core; type 2= core for flakes; type 3= blade core with one striking platform; type 4= core with two opposite striking platforms and one core face; type 5= core with two striking platforms and two opposite core faces; type 6= core with two crossed striking platforms; type 7= core with several striking platforms; 8= core on flake or frost-split piece.

flint knappers during the stage of *plein débitage*, information has been collected on the dimensions of blades. Data concerning these were published for the sites of Kanne (Vermeersch et al. 1985, fig. 18) and Orp-le-Grand (Vermeersch et al. 1987, fig. 17). Moreover, blades recovered from the sites of Mesch and Eyserheide were measured by the author himself, as part of the processing of both sites.

In all four sites, blades are mainly present as broken pieces and the number of complete pieces is small. In Orp-East, the longest complete blade measures 17 cm and in sector West 9.1 cm (table 7.4). The average length of complete blades in both sectors is respectively 6.0 and 5.7 cm. These values do not say much though about the actual dimensions of the end products. Because long blades break easily, long specimens are underrepresented in the group of complete blades. Also the lengths of complete blades from Kanne, with a few exceptions all shorter than 10 cm, cannot be regarded as representative for the same reason. Also based on refitting of broken pieces, for Orp-le-Grand the production of blades longer than 12 cm and even 15 cm has been taken into consideration (Vermeersch et al. 1987, 27). The longest, complete blade in the inventory of Mesch measures over 13 cm and of seven other pieces the length is between 10 and 13 cm. Also at this site, the aim of flint working seems to have been the striking of minimally 12 cm long blades. These dimensions concur with those of the blades in Eyserheide and in particular with those of the group of Simpelveld flint (see 4.4).

The investigation of widths of blades is based on that of medial fragments, of which many hundreds of pieces have been found. In Orp-le-Grand, the widths of medial fragments from sector East and sector West are very comparable (table 7.5). The modal value lies between 1.8 and 2.6 cm (Vermeersch et al. 1987, fig. 17). As a rule, medial fragments in Kanne are narrower, in particular in sector Central, where widths between 0.8 and 1.2 cm form a clear peak with c. 140 pieces (Vermeersch et al. 1985, fig. 18.1). Medial blade fragments in sector South are on average broader, given the peak of the distribution between 1.2 and 2.0 cm. The data of Eyserheide fit well into the picture of Orp-le-Grand. Over two thirds (68%) of the measured medial parts has a width between 1.2 and 2.6 cm. Broad blades with a width of minimally 3 cm are rare in Eyserheide, as are narrow blades with a width between 0.8 and 1.2 cm, which are well-represented in Kanne, sector Central. In Mesch, the peak of the distribution lies between 1 and 2.5 cm, which is comparable with Eyserheide and Orp-le-Grand.

With regard to thicknesses of medial blade fragments, the highest values in Orp-le-Grand lie between 0.3 and 0.8 cm. In Kanne, sector Central many of the blades are not only narrower but also thinner with thicknesses between 0.1 and 0.3 cm.

Site number	Site name	N	Complete	Cortex=0	Proximal fragment	Cortex=0	Medial fragment	Cortex=0	Distal fragment	Cortex=0	Max. length (cm)	Mean length (cm)	Ecart type (cm)
1	Eyserheide	608	67	47%	170	54%	207	54%	164	53%	16.7	6.83	.
2	Mesch	962	41	63%	318	81%	457	78%	187	80%	13	5.82	.
8	Kanne Central	1947	81	.	571	.	1005	.	290	.	>10	.	.
8	Kanne Central not in situ	624	23	.	186	.	333	.	82	.	.	.	.
8	Kanne South	374	44	.	84	.	188	.	58	.	>10	.	.
9	Orp East	2913	78	76%	861	81%	1454	81%	520	74%	17	5.98	2.40
9	Orp West	703	21	.	187	.	384	.	111	.	9.1	5.71	1.73
9	Orp not in situ	501	6	.	142	.	292	.	61	.	6.9	4.54	2.18

Table 7.4 Data on blades from Orp-le-Grand (sector West and sector East), Kanne (sector Central, Central not in situ, and sector South), Mesch and Eyserheide. Average length of blades in the two Dutch sites has been calculated on the basis of complete blades, including complete specimens after refitting of broken pieces.

	Eyserheide	Orp East	Orp West	Kanne Central	Kanne South	Kamphausen
Width in mm	%	%	%	%	%	%
2-3	2.4	.	.	.	.	.
4-5	1.4	.	.	3.8	1.6	4.5
6-7	3.4	0.2		8.3	5.5	15.5
8-9	4.3	1.9	1.6	17.1	6.6	22.7
10-11	5.3	4.6	6.0	15.9	9.9	10
12-13	10.1	7.3	6.6	5.5	10.4	11.8
14-15	14.5	6.7	8.1	8.8	12.6	15.5
16-17	8.7	8.5	9.9	7.6	12.1	6.4
18-19	8.2	12.5	11.0	7.6	10.4	5.4
20-21	7.2	11.0	10.7	7.1	8.8	3.6
22-23	10.6	9.4	9.1	5.0	8.2	1.8
24-25	7.2	10.6	11.4	4.0	3.8	.
26-27	6.3	6.7	5.2	3.8	3.8	1.8
28-29	4.8	5.4	5.6	1.9	2.7	0.9
30-31	2.4	5.2	6.5	3.8	3.3	.
32-33	0.5	3.9	1.8	.	.	.
34-35	1.9	2.1	3.4	.	.	.
> 36	0.5	4.5	3.5	.	.	.
Total	99.7	100.5	100.4	100.2	99.7	99.9
	n=207	n=1454	n=384	n=422	n=182	n=110

Table 7.5 Proportion of medial broken pieces of blades according to width from Orp-le-Grand (sector West and sector East), Kanne (sector Central and sector South), Eyserheide, and Kamphausen. Percentages mentioned for Orp-le-Grand, Kanne and Kamphausen are given by approximation, based on Vermeersch et al. 1985 (table 18.1), 1987 (table 17A) and Höpken 1994.

7.6.3 Sites outside the area with Cretaceous flint sources

The sites of Sweikhuizen-GP and -KW, Koningsbosch, Alsdorf, Beeck, Kamphausen and Galgenberg are located outside the area with Cretaceous flint sources, at distances of minimally 5 km from primary sources of good quality flint. In the surroundings of the sites, flint occurs exclusively in secondary context in Pleistocene river deposits. These concern not only deposits of the Meuse. In the Niederrheinische Bucht in the southeastern (German) part of the Meuse-Rhine loess area, the Rhine has eroded Early Pleistocene terraces of the Meuse. As a result, flint nodules that were incorporated in the first instance into Meuse deposits ended up secondarily in younger and gravel-rich deposits of the Rhine (*Rhein-Maas-Mischfazies*; for a discussion, see Floss 1994, 96).

The location of the above sites near flint-containing terrace deposits of Meuse and/or Rhine is expressed in the composition of the raw materials used. In the sites of Sweikhuizen, fluvially rolled flint is by far the most frequently used material (table 8.1; Arts and Deeben 1987b). As a result of transport by water, the flint nodules are usually elongated or oval in shape. At the German site of Beeck, flints were obtained from Early Pleistocene terrace deposits of the Meuse, which contain nodules with considerable dimensions of more than 20 cm. More than 99% of the stone artefacts were made of this terrace flint (Jöris et al 1993, 261). Also in Alsdorf, Kamphausen and Galgenberg flint from local terrace deposits is by far the most frequently used material (Löhr 1979; Thissen 1989; Höpken 1994).

The strategies of flint working in Orp-le-Grand, Kanne, Mesch and Eyserheide also were also recognised in the sites outside the area with Cretaceous flint sources. For Beeck, Jöris et al. (1993) mention two strategies both aimed at the production of blades. The first strategy is characterised by preparation of the back of the core, including the creation of a core crest, and application of an *en éperon* technique. In the publication on Beeck, a core is depicted schematically which is the result of this strategy (Jöris et al. 1993, fig. 4.3b). This core can be regarded as product of *le débitage magdalénien classique*. Apart from carefully reduced blade cores, there are also cores present with one

striking platform, of which the back and the lateral sides consist largely of cortex. They are the result of a more simple, 'uneconomic' way of core reduction. Traces of *en éperon* preparation of the striking platform are absent. Finally, Jöris et al. point to the reduction of cores with the aim of the production of bladelets. Bladelet cores are as a rule smaller than blade cores and were made of frost-split pieces of flint, flat flakes or relatively thick blades. In the latter case, bladelets were first removed from the long (lateral) thin side, while in a later stage the dorsal side is also utilised for striking off bladelets (see Jöris et al. 1993, fig. 4.1).

In Kamphausen, the first mentioned, for the Magdalenian classic strategy of core reduction has not been determined on the basis of characteristics of cores. Only some proximal fragments of blades, of which the butt shows traces of *en éperon*-like preparation, point to the possible application of it (Höpken 1994, 25). As regards the second strategy, the picture of Kamphausen fits in with that of Beeck. Of nine cores, four pieces have one striking platform whereas the back of these cores is still largely covered in cortex and has been hardly or not worked. They are made of local terrace flint. On two cores are, despite their small size, still cortex parts visible (Höpken 1994, table 5, 5-6). This observation testifies to a minimal preparation and little investment in the first stages of core reduction aimed at decortication and preparation of the back of the core. The relatively large distances over which flint nodules have been transported by the Meuse are manifested in the sizes of the cores. The majority of the cores in Kamphausen has a length between 3 and 6 cm, while the length of the largest piece is less than 9 cm (Höpken 1994, table 5). In Galgenberg, the smallest and largest cores measure respectively 6 and 7.5 cm. Thus the largest cores of both sites are only a few centimetres larger than the smallest specimens in Orp-le-Grand, Mesch and Eyserheide. Besides, two small exhausted cores of Orsbach flint occur in Kamphausen. The intensive way of use points to a very economical handling of this non-locally available raw material (see 8.2).

Anong the finds of Sweikhuizen-GP, the largest core measures 23.8 cm and the smallest specimen 2.8 cm. Eleven complete cores have only flakes scars, but 14 blade cores also occur. The average length of the complete cores is 6.8 cm: they are thus on average significantly smaller than the cores found in sites located inside the area of Cretaceous deposits (table 7.3). Although located at minimally 20 km to the north of primary Cretaceous sources of good quality flint, three complete cores recovered from the Dutch surface site of Koningsbosch have considerable dimensions. The lengths of the largest and smallest specimens are respectively 11.8 and 8.3 cm. In all three cases we are dealing with a well-prepared blade core with one striking platform.

The use of nodules of Meuse terrace flint with relatively small dimensions is further manifest in the sizes of the blades. In Kamphausen are represented seven complete blades, the lengths of which vary between 1.6 and 4.5 cm (Höpken 1994, fig. 21). As regards the widths of the blades, there is a clear peak between 0.7 and 0.9 cm (39 of a total of 110 specimens), but also widths of 1.2 cm and between 1.4 and 1.6 cm occur relatively often (table 7.5). Blades with a width between 2.5 and 3 cm are an exception. Compared with the sites of Orp-le-Grand, Mesch and Eyserheide, the inventory of Kamphausen points to the removal of not only shorter but also narrower blades. It is obvious to link these differences to the smaller dimensions of the flint nodules as present in river terrace deposits in the direct surroundings of the site of Kamphausen. But also other factors could have played an important role, including the removal of blades from already largely reduced cores of (non-local) Orsbach flint.

Data on the dimensions of blades are not available for the site of Beeck. Judging from the blade scars on cores, considerably larger and more regular blades may have been produced at the site than is indicated by the blades actually found there (Jöris et al. 1993, 264). One possible explanation is that regular blades produced at the site have been retouched into tools and that they were used there in domestic activities. Blades that were struck off on the spot and were not used as tool have a less regular shape.

7.7 Characteristics and compositon of tools

From the large supply of blades, specimens with the desired shape, length, width and/or thickness were selected for immediate use or to be further worked into a tool. By means of retouching, long and regular blades could easily be transformed into several types of tools. In by far the most cases, tools were made of blades with regular and parallel sides, but also crested blades, bladelets and more irregularly shaped blades were used as tool. To a much smaller extent were tools made of flakes, for instance dihedral burins made of large and thick flakes in Echt-Koningsbosch.

Most sites are characterised by a wide repertoire of types of tools (table 7.6). Although the numbers and proportions in terms of percentages differ, backed bladelets, blade end scrapers, burins, borers and/or becs occur in all sites. They point to a broad variety of domestic activities (*activités domestiques*) carried out at the sites which are however difficult to specify. An important reason for this is that organic remains, such as tools made of antler, bone or ivory and faunal remains (butchering waste) have not been preserved. Moreover, as a rule, stone tools are not suitable for use-wear analysis due to patination. As yet, use-wear traces have only been identified on artefacts of Orsbach flint in the flint assemblage of Eyserheide (see contribution by Sano, chapter 5).

Site number	Site name	Backed bladelets	End scrapers on blade	Scrapers on flake	Burins	Becs	Borers	Retouched tools	Flakes and blades with edge-damage (use retouch?)	Notched tools	Truncated tools	Pièces esquillées	Combination tool	Other tools	N	References
1	Eyserheide	6	13	1	31	.	7	16	33	3	8	1	1	.	120	This publication, table 4.14
2	Mesch	9	10	.	9	9	6	20	.	.	4	.	.	.	67	Rensink 1991, table 7
3	Sweikhuizen-OS	19%	7%	.	20%	.	3%	.	.	.	.	2	1	.	ca.60	Wouters 1985
4	Sweikhuizen-GP	118	42	1	93	.	5	130	63	16	7	.	6	.	481	Arts and Deeben 1987b, table 11
5	Sweikhuizen-KW	.	.	.	.	.	.	.	.	.	.	.	.	.	?	
6	Koningsbosch	.	1	.	7	.	.	.	.	.	.	.	.	.	8	
7	Griendtsveen	29%	11%	.	39%	.	14%	.	.	.	2%	3		4	142	Wouters 1983
8	Kanne Central	1	7	2	35	3	.	21	.	5	3	.	2	6	85	Vermeersch et al. 1985, table 7
8	Kanne South	.	.	1	1	.	.	9	.	.	2	.		2	15	Vermeersch et al. 1985, table 7
9	Orp-East	30	51	2	220	8	6	59	.	26	14	.	8	14	438	Vermeersch et al. 1987, table 15
9	Orp-West	2	22	.	66	4	3	24	.	8	5	.	8	1	143	Vermeersch et al. 1987, table 15
10	Alsdorf	103	1	21	159	2	12	33	.	.	30	.	.	.	361	Löhr 1979
11	Beeck	1	3	4	18	8	.	4	.	.	6	.	.	1	45	Jöris et al. 1993
12	Kamphausen	5	1	.	5	5	2	9	.	.	2	.	.	4	33	Höpken 1994, 26-29
13	Galgenberg	no retouched tools			.	.	.	.	.	.	.	.	.	.	0	Höpken 1994, 32-34

Table 7.6 Magdalenian sites of the Meuse-Rhine loess area: tool composition.

A shared feature of all northern Magdalenian sites is the (almost completely) lack of lithic points. In the inventories of Orp-le-Grand, Kanne, Sweikhuizen-GP, Eyserheide and Alsdorf, such tools are absent. It reinforces the cultural attribution of the sites to the Magdalenian and not to a later period of the Late Palaeolithic (*Federmesser* culture, Ahrensburg culture), when lithic points commonly occur. In the site of Kamphausen a steeply retouched implement possibly represents the fragment of a flint point (Thissen 1989, 320). Prior to the excavation, a Creswell point was recovered from the surface at or near the excavation spot of Mesch. In the opinion of the author, no important conclusions should be linked to the occurrence of such isolated points. Especially when collected from the surface, it is very doubtful that they may be linked to the Magdalenian occupation of the sites. They could just as well be the result of hunting activities of Late Palaeolithic hunter-gatherers.

A type of tool that is generally seen as a component of the armature of Magdalenian hunters and gatherers are backed bladelets. These small lithic tools probably formed the lateral inserts of antler projectile points and occur in all excavated sites, but their numbers very considerably. In Sweikhuizen-GP, where wet-sieving of the excavated sediments was carried-out, backed bladelets are the dominant tool type (table 7.6). In Alsdorf, they take second place after burins, while in Orp-le-Grand sector East also relatively many backed blades occur. In the excavated sites of Kanne, Mesch and Eyserheide and in the surface sites of Beeck (one specimen) and Kamphausen (five specimens) they occur with low percentages. It should be noted that in Mesch and Eyserheide only a part of the excavated sediment was sieved. Nevertheless, also these sieved squares, among which squares in cluster A in Eyserheide, have yielded no backed bladelets. An evaluation of the number of found backed bladelets in the German sites of Beeck and Kamphausen is not useful as both inventories consist solely of surface finds.

From the above mentioned data, we may infer that activities related to hunting, such as the manufacture and the maintenance of projectile points (backed bladelets) have not played a major role in most of the sites. The almost complete lack of bladelets cores at most of the sites seems to be a further indication of this. All the same, indications of the maintenance of hunting gear by means of retooling are not completely lacking. In Orp-le-Grand, a concentration of backed bladelets at the entrance to the (supposed) tent is probably related to retooling, possibly close to the location of a hearth (Vermeersch et al. 1987, 50). The same may apply to a cluster of backed bladelets in the eastern part of the stone circle at Sweikhuizen-GP. Fragments of a heated stone slab indicate the presence of a hearth, near the entrance of the supposed tent.

Burins occur in all sites in rather high percentages. There is a clear dominance in Orp-le-Grand sector East, where 49% of the tools consist of burins (Vermeersch et al. 1987). Also in other sites are the percentages considerable, for instance between 30% and 45% in Kanne, Eyserheide and Beeck. In Sweikhuizen-GP burins are a less important tool category with a percentage of 19.3%. The group of burins comprises dihedral burins, burins on a break, burins on truncation and so-called Lacan-burins. The latter are characterised by the occurrence of an oblique retouched working edge and are well represented in Orp-le-Grand, Kanne, Sweikhuizen-GP and Beeck. The inventories of Mesch, Eyserheide and Alsdorf show a different picture. Lacan-burins are rare or absent, while dihedral burins dominate or occur in equal numbers with burins on truncation. Also noticeable is the occurrence of burins made of large and thick flakes in Echt-Koningsbosch. Although the number of artefacts from this surface site is small, all burins found (n=5) were so far made of such flakes. In all cases they are dihedral burins displaying a robust working edge on the distal end of the flake.

Another observation concerns the near total lack of blade end scrapers in the inventories of Alsdorf and Beeck. In the (very incomplete!) inventory of Beeck are three specimens which were described as a-typical. In Alsdorf, only one blade end scraper was found. These small numbers, however, do not necessarily point to a minor role of hide processing at both locations. An alternative explanation is that not blade end scrapers were used for this activity but broad scrapers made of flakes. Of these flake scrapers, four were found in Beeck (Jöris et al. 1993, fig. 7: nos. 15 to 18) and in Alsdorf as many as 21 specimens. These so-called *Breitkratzer* can be labelled as locally manufactured, opportunistic tools made of locally available terrace flint. In the sites of Orp-le-Grand, Kanne, Mesch, Sweikhuizen-GP and Eyserheide blade end scrapers occur more often. Judging from the specimens illustrated in publications, scrapers occur with both a broad, rather straight scraping edge and with a semi-circular working edge. Based on the rather steep scraping edge, the former scrapers were possibly used more intensively. Scrapers with a semi-circular working edge are usually retouched lightly. This could be an indication of short-lived use and/or the working of less hard materials (for instance hides). Scrapers also occur with continuous retouch on both lateral edges and an intentionally retouched, round scraping edge.

Another conspicuous element in the inventories is large borers with an often thick, pronounced working edge (becs). Long axial pointed becs are well-represented in the inventory of Mesch. Comparable becs are known amongst others from

the Magdalenian site of Marsangy in the Paris Basin (Schmider 1992). Schmider defines becs as tools with a narrow, beak-shaped point (working edge) that was obtained by means of unilateral retouching. In contrast to a bec, a borer (*perçoir*) has a finer and shorter working edge which displays bilateral retouches (Schmider 1988, 195).

In Mesch, nine retouched artefacts have been described as becs. Two of these are axial becs with a long, elongated point on the longitudinal axis of the tool. Other becs have a less pronounced working edge. There are also becs made of crested blades. The cross-sections of such blades are triangular and correspond with the usual cross-section of axial becs.

Taking into consideration measurements of the main types of retouched tools, the lengths of complete specimens are very variable in the sites of Orp-le-Grand, Kanne, Mesch and Eyserheide (table 7.7). Of a total of 53 complete end scrapers, burins and borers/becs, seven pieces have a length of more than 10 cm. In Orp-le-Grand sector East, two complete burins have a size of more than 12 cm. The lengths of other tools lie mainly between 4 and 10 cm, whilst complete end scrapers are slightly longer than burins and borers/becs. For the mentioned sites, the widths of retouched tools show a large degree of standardisation pointing to selection of blades with specific widths. Of 96 blade end scrapers, 76 pieces have a width between 1.5 and 3.0 cm (table 7.8). For dihedral burins this number is 40 of a total of 63 pieces. Burins on truncation and Lacan-burins are made of slightly narrower blades. Among 34 borers/becs are eleven pieces made of blades with a width between 2 and 2.5 cm.

For sites located outside the area with Cretaceous flint sources, fewer data are available on dimensions of tools. In Kamphausen, the longest, complete burins have a length of c. 5 cm (Höpken 1994, tables 6 and 7). Other tools have mainly been found as broken pieces and are considerably smaller in size, with the exception of a broken burin and a broken bec. Looking at the illustrations of the tools in Beeck, we can assume for the complete tools a length between 4.5 and 8 cm. Based on characteristics of the patinated break surface, a number of the broken tools was presumably hafted. In this connection, the width of Lacan-burins can be pointed out, which is very standardised, namely between 2.2 and 2.8 cm. This standardisation forms an indication of hafting and the selection of blades with specific widths for the production of Lacan-burins.

Finally, for the site of Beeck are taken into consideration 'typological transformations' of Lacan-burins (Jöris et al. 1993). As a result of use and resharpening, the long working end of Lacan-burins was shortened step-by-step, which caused a transformation into burins on truncation:

"Die Beecker Lacamstichel weisen eine umlaufende und auf die Fläche greifende Retusche auf, die bei anderen Stichelformen fehlt. Die macht es u. E. möglich, Stichel an Endretusche mit einer solchen umlaufenden Retusche als "Lacamstichel" in einem fortgeschrittenen Stadium der Nachschärfungssukzession anzusprechen" (Jöris et al. 1993, 264-265).

7.8 Site size and settlement features

Magdalenian sites in the Meuse-Rhine loess area consist of concentrations of stone artefacts which, as a general rule, are small in size. In many cases, the excavated surface covers less than 200 m^2, and the concentrations of Orp-le-Grand, Mesch and Eyserheide could each be documented (almost) completely within such an area (table 7.1). The possibility that the excavated concentrations form small sections of larger settlement areas, consisting of closely together positioned, simultaneously used habitation units (cf. Pincevent, Etiolles, Gönnersdorf), is not considered plausible. In Alsdorf, 80 trial squares were excavated east of the find concentration, however without any results. The excavation of a zone of c. 450 m^2 around the concentration in Sweikhuizen-GP yielded no indications of a second concentration. In the same area, at a distance of 400 m (Sweikhuizen-OS) and 150 m (Sweikhuizen-KW), two other Magdalenian sites were identified. Whether there was simultaneous occupation could not be determined with certainty. In Orp-le-Grand, we are dealing with two clear concentrations at a distance of only five metres from each other. In view of the results of TL-research (Vermeersch 1991) and differences in the extent to which artefacts have been affected by frost action, the two concentrations are not regarded as being contemporaneous. And finally, field surveys in the surroundings of the excavation locations of Mesch and Eyserheide have not yielded indications of nearby concentrations from the Magdalenian. We should take into consideration that in Mesch, outside the area of the karst subsidence in the zone where Pleistocene Meuse gravels outcrop, adjacent or nearby concentrations could have been eroded completely. Hence, it cannot be excluded that we are dealing with a relatively small section of an originally much larger activity area. On the loess plateau of Eyserheide, concentrations may be covered by a layer of loess and thus remained outside the reach of the plough. As a result they could possibly be present but have not (yet) been identified based on surface finds.

The site of Kanne deserves special mention. At this location, along the alluvial plain of the river Geer, we obviously are dealing with rather dispersed concentrations of mainly flint debitage and not with one, spatially bounded camp site. The data point to several locations of specialised activity and a zone in the landscape to which Magdalenian hunter-gatherers repeatedly returned (see discussion 7.9).

End scrapers	**Length in mm**													
	<10	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100-109	110-119	>120	N
Eyserheide	.	.	.	.	.	.		1	.	1	1	.	.	3
Mesch	.	.	.	.	.	.	2	.	.	.	.	.	.	2
Kanne Central	.	.	.	.	.	.		1	1	.	.	.	.	2
Orp-East	.	.	1	.	.	.	1	1	.	.	.	1	.	4
Orp-West	.	.	.	.	1	.	2	1	.	.	1	.	.	5
Total	0	0	1	0	1	0	5	4	1	1	2	1	0	16
Burins	**Length in mm**													
	<10	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100-109	110-119	>120	N
Eyserheide	.	.	.	.	1	.	.	3	3	.	.	.	.	7
Mesch	.	.	.	.	.	.	.	.	.	.	.	.	.	0
Kanne Central	.	.	.	.	1	.	2	.	.	1	.	.	.	4
Orp-East	.	.	1	.	.	1	2	1	1	.	.	.	2	8
Orp-West	.	.	.	2	2	.	2	1	.	.	.	.	.	7
Total	0	0	1	2	4	1	6	5	4	1	0	0	2	26
Borers/becs	**Length in mm**													
	<10	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100-109	110-119	>120	N
Eyserheide	.	.	.	.	1	.	.	.	1	.	1	1	.	4
Mesch	.	.	.	1	.	.	1	1	.	1	.	.	.	4
Kanne Central	.	.	.	.	.	1	.	.	.	.	.	.	.	1
Orp-East	.	.	.	.	.	.	.	.	.	.	.	.	.	0
Orp-West	.	.	.	.	.	1	.	.	1	.	.	.	.	2
Total	0	0	0	1	1	2	1	1	2	1	1	1	0	11

Table 7.7 Lengths (in mm) of complete end scrapers, burins and borers/becs in Eyserheide, Mesch, Orp-le-Grand (sector West and sector East), and Kanne (sector Central).

End scrapers	**Width in mm**											
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	>50	N
Eyserheide	.	.	.	3	6	1	1	1	.	.	.	12
Mesch	.	.	.	1	1	5	.	1	1	.	.	9
Kanne Central	.	.	1	.	3	3	.	.	.	.	.	7
Orp-East	.	.	4	9	17	11	5	.	1	.	.	47
Orp-West	.	.	.	4	6	6	4	.	1	.	.	21
Total	0	0	5	17	33	26	10	2	3	0	0	96
Burins	**Width in mm**											
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	>50	N
Eyserheide	.	2	4	6	9	4	1	.	.	.	.	26
Mesch	.	.	1	1	1	2	1	.	.	.	.	6
Kanne Central	.	1	3	9	5	3	3	1	.	.	.	25
Orp-East	2	2	10	28	17	17	7	3	.	.	.	86
Orp-West	.	5	2	10	13	5	4	1	.	.	.	40
Total	2	10	20	54	45	31	16	5	0	0	0	183
Borers/becs	**Width in mm**											
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	>50	N
Eyserheide	.	.	.	1	5	.	.	.	.	.	.	6
Mesch	.	3	3	3	2	3	1	.	.	.	.	15
Kanne Central	.	1	.	.	2	.	.	.	.	.	.	3
Orp-East	.	1	.	1	1	.	1	.	.	.	.	4
Orp-West	.	.	1	1	1	1	1	.	.	1	.	6
Total	0	5	4	6	11	4	3	0	0	1	0	34

Table 7.8 Widths (in mm) of complete and broken end scrapers, burins and borers/becs in Eyserheide, Mesch, Orp-le-Grand (sector West and sector East), and Kanne (sector Central).

Indications of settlement features (habitation structures) come from two locations: Sweikhuizen-GP (in the shape of a stone circle) and Alsdorf (in the shape of stone slabs which were possibly part of a floor pavement). And although heated stones were demonstrated within the concentrations of Orp-le-Grand sector East, Kanne, Sweikhuizen-GP and Eyserheide, no large hearths constructed with stones were found there, such as are known from Magdalenian sites in for instance the Central Rhineland (Gönnersdorf and Andernach) and the Paris Basin (for instance Etiolles, Pincevent). The latter sites were not 'ploughed up' and thus the circumstances of conservation are clearly better. Stones belonging to one and the same structure were found there in close spatial association with large quantities of settlement debris. Nonetheless, there seems to be an essential difference in investment in hearth structures between on the one hand the mentioned German and French sites and on the other the northern loess sites. During the excavations in Orp-le-Grand, Mesch and Eyserheide, no or only few fragments of (heated) stones were recovered from the surface or from the plough zone. In the case of intensive use of and/or prolonged stays at these settlements, comprising hearths that were used and cleared regularly, the number of such fragments should have been much higher.

7.9 Discussion

A traditional point of particular interest in regional Palaeolithic research is to determine the variability (in the position in the landscape and in material culture) between assemblages and their meaning in the wider context of prehistoric land-use and settlement systems. Ethnographic and ethnoarchaeological studies have contributed to a better insight into the way in which 'historically documented' groups of hunters and gatherers ('ethnographic foragers', see Porter and Marlowe 2006) in different parts of the world used their natural surroundings (see for instance Gamble and Boismier 1991). The majority of these studies centre on the relationship between on the one hand characteristics of the natural environment and on the other the exploitation of food and other resources and mobility of hunters and gatherers (Binford 1980; Kelly 1983). The studies demonstrate that mobility strategies can differ strongly, in response to variations in the supply and the nature of primary food sources in time and space. But also internal factors (social, religious) may have determined the selection of the location of camp sites, the mobility and composition of human groups and the organisation of the settlement system.

Among the broad range of ethnographic and ethnographical research, the work of L.R. Binford on the Nunamiut in North Alaska in particular has proved to be an important source of inspiration for archaeologists active in the field of the Late Upper Palaeolithic. Binford (1980) distinguishes foraging and logistical strategies of land use, which he considers characteristic of respectively foragers and collectors. Foragers position their base camps, so-called residential sites, in the immediate vicinity of resources, the exploitation of which occurs as required and on a daily basis. The exploitation takes place using an encounter strategy on locations at a short distance from the base camp. When the resources become depleted, the base camp is moved and a new territory is exploited. The frequency of moving the base camp is high, in other words there is a high residential mobility. The opportunistic way in which resources are exploited implies that the degree of anticipation and planning depth is low as a rule. Also hardly or no storage of goods takes place. A foraging mode of land use is characteristic of groups of hunters and gatherers that live in areas with varied but dispersed and (when it concerns time and place of supply) unpredictable food resources.

In a logistically organised system, the base camp is moved less frequently, in other words there is a low residential mobility. The camp is strategically positioned in relation to food and other resources and serves as operation base for logistical expeditions by task groups. These expeditions usually take place at larger distances from the base camp, directed at the exploitation of specific sources at specific locations. The collected goods are brought back to the base camp or stored elsewhere for later use. The settlement system of collectors comprises apart from residential sites and locations also field camps, observation stands and caches. Implementation of logistical strategies is characteristic of hunters and gatherers living in areas with mobile and in time concentrated occurring food sources. Binford mentions the system of land use of the Nunamiut in North Alaska as an example of this system.

Several researchers have pointed out that the forager-collector dichotomy is a strong simplification of the complexity of hunter-gatherer groups. In a comparable sense, residential and logistical strategies of mobility and land use must also be regarded as strong simplifications of in reality more complex forms of spatial organisation. Often it concerns "variable mixes of these two dimensions" (Kelly 1983, 278). Nonetheless, the distinction between the two strategies often serves as 'framework' for the description of various characteristics of behaviour of hunters and gatherers, such as technological organisation, social structure and degree of anticipation and planning depth. In other words, we are dealing with a set of interrelated notions while taking the forager-collector dichotomy as starting point.

In order to translate the statical data of the archaeological record into dynamic systems of mobility and land use, methods have been developed directed at analysis of intrinsic

characteristics of sites. An example of this is the method proposed by Chatters (1987). Following Binford, Chatters distinguishes residential and logistical mobility, of which he supposes that they leave behind different manifestations in the archaeological record. Making this assumption, he next formulates expectations regarding characteristics of base camps and field camps of foragers (foraging mode of land use) and of collectors (logistically organised system). Thus Chatters mentions archaeological measures for components that are directly linked to resource acquisition strategies: mobility, predation and technology. Each of these components has different dimensions. Mobility, for instance has: mobility type, mobility frequency, stability, demography, scheduling, and range. As archaeological measures of mobility type, Chatters considers diversity in tools and features, inter-assemblage variability, anatomic part distributions and bone fragmentation (Chatters 1987, 340-344).

The method proposed by Chatters (or comparable methods) has seen almost no application in the research of site types and strategies of mobility and land use in the Magdalenian. This may partially have to do with the scant influence of results of 'middle range' research published in English-language journals on the work of mainly French-speaking archaeologists working in the field of the northwest European Magdalenian. But also limitations of the method itself presumably play an important role. These limitations are recognised as such by Chatters. Hence he remarks regarding the applicability of the archaeological measures (1987, 353):

> "In all cases, application entails ordinal scale comparisons of assemblages among deposits for which all other conditions are equal with respect to the data category being investigated. For example, predation strategies can only be discerned through comparison of assemblages for which postdepositional histories and the influence of chemical weathering are demonstrably equivalent."

In the Magdalenian of Northwest-Europa open-air sites in the Paris Basin and along Lake Neuchatel in Switserland most meet the criteria that Chatters mentions. Lying in fine-grained sediments deposited by main rivers (Pincevent, Verberie, Etiolles, Marsangy, Marolles) and in lacustrine deposits (Monruz, Champréveyres), they are locations with comparable conditions of preservation. Because of the high degree of integrity (well-preserved habitation units with most of the finds concentrated around hearths) and the conservation of organic remains, these sites are in principle suitable for the application of methods as proposed by Chatters.

The research in the Paris Basin underlines the importance of the conservation of faunal remains for the determination of the duration of occupation and functions of sites (Olive 2004, 799). Thus for Pincevent, habitation units in level IV 20 are interpreted as belonging to a large seasonal camp connected with collective hunting of reindeer at the end of summer or beginning of autumn, "au moment du regroupement des troupeaux avant la migration d'automne" (Julien and Karlin 2001). In Pincevent IV.0 there is evidence for a longer duration of occupation, perhaps several months, and for mixed hunting of big game that may have been present all year long in the Paris Basin. For the concentrations of Etiolles, where the fauna remains were badly preserved, the duration of the occupation can be less well estimated. For the most find-rich units an occupation of no more than a few months is assumed. On the basis of data from archaeozoological investigations, also for other sites is mentioned "de séjours de courte durée", linked to hunting reindeer in the autumn in Verberie and hunting horses for instance in the site of Marolles near the confluence of the Seine and Yonne (Olive et al. 2000).

If we turn to the Magdalenian open-air sites of the northern loess zone, it is evident that archaeological measures of mobility, such as anatomic part distributions and bone fragmentation, cannot be 'scored' as archaeological organic remains have decayed completely. Also the measure of feature diversity is difficult to determine for the surface sites concerned. Through bioturbation and present-day land use, settlement features can be heavily disturbed, and thus the exact nature can no longer be ascertained (see Eyserheide). Hence they no longer qualify as 'measure' to determine the diversity between sites. Moreover, in the Meuse-Rhine loess area we are dealing with a number of open-air sites that have not been completely excavated or which are only known from surface finds. Finally, stratified sites (*gisements clairement stratifiés*) are missing, which are very important for the investigation into the 'time depth' of occupation and possible changes in the use of locations through time (see Olive 2005). Added together, these factors impose heavy restrictions on detailed, comparative research and the assigning of meaning to inter-assemblage variability and ultimately attributing functions to prehistoric hunter-gatherer sites. Given these restrictions, in the text below a broad, functional interpretation of the Magdalenian sites in the Meuse-Rhine loess area is presented, taking into consideration the following characteristics: location in the landscape and size of the sites, investment in habitation and hearth structures, and composition of the stone artefacts.

A topographic characteristic with which almost all sites comply is their location on or at the margins of elevated plateaus. Such an elevated location, often high above stream and/or dry valleys, is a generally known phenomenon of Late Upper and Late Palaeolithic open-air sites in Western Europe. Assuming that, during the occupation of the locations

at the end of the Pleniglacial of the Weichsel ice age (see chapter 8), a vegetation of trees on the higher parts of the landscape was completely lacking, the exposed position of the camp sites would offer a splendid view onto nearby valleys, slopes and plateaus. Thus they were important locations from a perspective of food supply and more specifically for monitoring animal food sources, among which horse and reindeer (see Thissen 1989, 315; Rensink 1991). But also the spotting of other groups of hunters and gatherers or the being recognisable themselves for these groups can have played an important role. Apparently more importance was attached to a panoramic view over the landscape than to the proximity of a river, stream or good quality raw material source. With the exception of Kanne, the distance of all sites to the nearest permanent water course was 500 m (Mesch) or more (table 7.1). Also the distance from the camp sites to the exploited flint sources was minimally a few hundred metres. The close proximity of a water or flint source thus seems not to have played a decisive role in the choice of location for the majority of the camp sites.

Earlier in this chapter we mentioned the presence of remnants of settlement features, such as a tent circle in Sweikhuizen-GP, a 'paved floor' in Alsdorf and a small hearth in Orp-le-Grand and Eyserheide. In addition to these investments, we can point to the transport of and bringing together of many kilos of flint to the camp sites for further working and use. In the case of the Eyserheide site, there are even indications for the transport of flint nodules from at least five exploitation places and from different directions (fig. 7.4). Such investments do not accord with the notion of briefly used camp sites, erected for the execution of specific, short-term activities and with a more or less random location in the landscape. They rather argue in favour of carefully chosen locations (fixed points) on or at the margins of loess plateaus with a temporary, central function in the regional settlement system. The occurrence of relatively high numbers and various types of stone tools is in keeping with this notion of a 'multi-functional' stay of at least a few days. In all excavated sites, tool types typical of the the Magdalenian occur side by side and only in one site (Orp-East) does one specific type make up almost 50% of the tool inventory (table 7.6). And even if the relatively high amount of burins at sites such as Alsdorf, Beeck, Eyserheide and Orp-East may illustrate the importance of antler, bone and/or ivory working, the variations in tool types are such that there is insufficient reason to speak of special-task camps (contra Jöris et al. 1993, 270-271). Such an interpretation does not take into account the combination of activities which are considered likely for most sites: resource monitoring (elevated position in the landscape), hunting activities (backed bladelets), core reduction and blade production (flint waste) and variation in domestic activities, such as working of antler, bone and/or ivory (burins and borers/becs), hide processing (scrapers) and maintenance of hunting gear (retooling). This set of activities and the investments connected with them rather argue in favour of an interpretation of the majority of the excavated sites (Orp-le-Grand, Sweikhuizen-GP, Eyserheide, and Alsdorf) as briefly used base camps of, in each case, a small social unit (one nuclear family), the precise composition of which cannot be further specified on the basis of the archaeological data.

In the sites of Mesch and Kanne, sector South the numbers of retouched tools are small, while knapping products linked to the first stages of core reduction, for instance large preparation flakes with cortex parts, are numerous. Notable for the inventory of Mesch is further the occurrence of large pieces of roughly worked flint (pre-cores). Moreover, both sites are lying a short distance from good quality lithic raw material sources. Based on these characteristics, Mesch and Kanne can be designated as flint extraction and production sites (*sites d'extraction et production*) where cores, blades and/or tools were produced for future purposes at other locations.

In Poland, sites interpreted as workshops from the Late Palaeolithic have been known for a long time and have been investigated through excavations (Ginter 1974, 1984). They can be divided into two groups: workshops located at extraction points and workshops location off extraction points (Ginter 1974, 83). The former workshops are associated with the locations of raw material extraction itself and are characterised by the occurrence of hardly worked pieces of flint, pre-cores unsuitable for further use, waste pieces and numerous flakes with cortex parts. Only few blades and blade fragments occur. Apart from Polish sites, also the Dutch site of Waubach (Arts 1984) and a number of concentrations in Groitzsch in Germany (Hanitzsch 1972) can be assigned to this category of workshops. The workshops located off extraction points are situated in the surroundings of extraction points, at a distance of a few hundred metres to a few kilometres. At these locations, nodules of flint were further worked, after the first preparation was already carried out at the point of extraction. Important features of these workshops are the occurrence of cores in various stages of reduction and a large volume of debitage material. Flakes without cortex outnumber flakes with cortex remains, and blades unsuited to the manufacture of tools generally occur.

If we compare the artefact composition of workshops located off extraction points in Poland with that of Mesch, there are important similarities in a number of aspects (Rensink 1991,

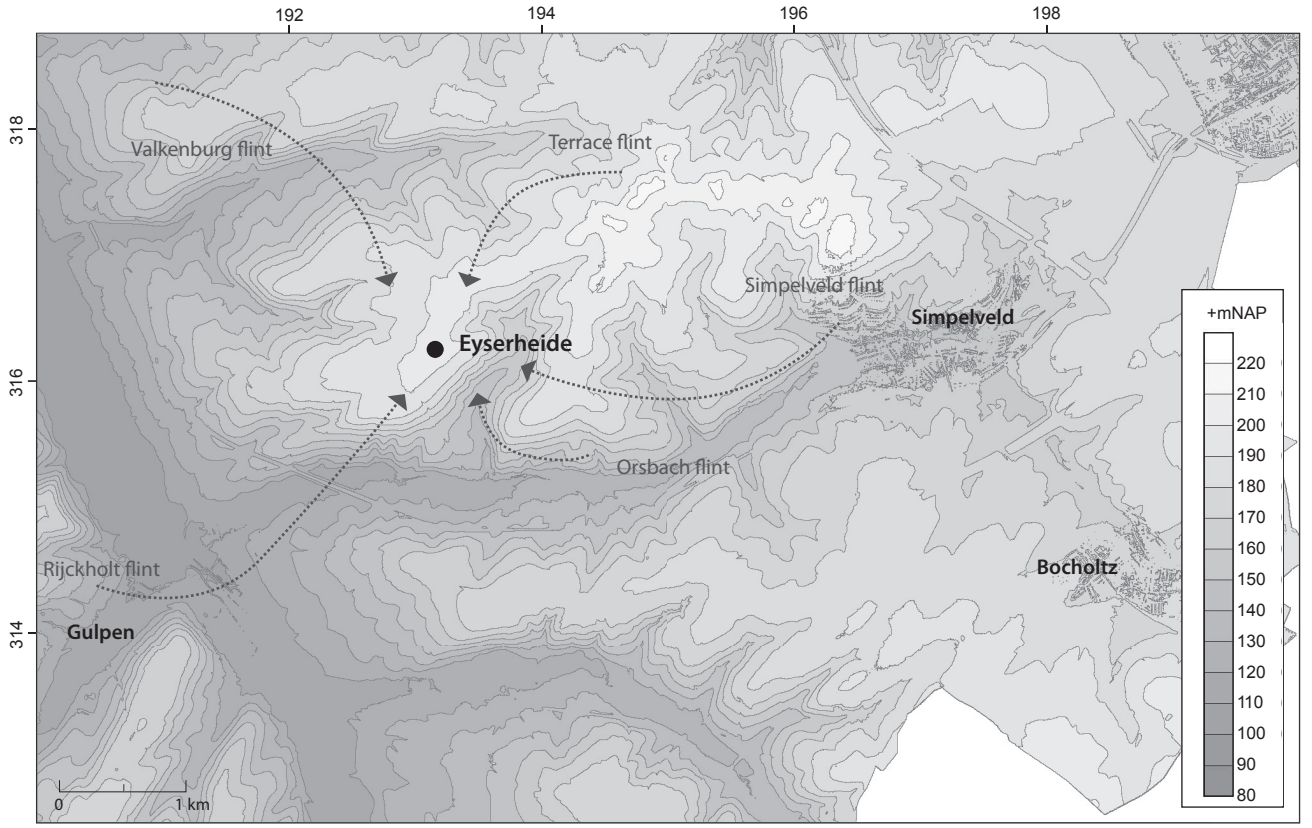

Figure 7.4 Contour map of Eyserheide and surroundings and (possible) directions of transport of types of flint worked at the site. Despite the fact that the exact locations of exploitation can not be determined, directions of transport can be reconstructed by approximation, based on the distribution of geological formations in the area.

table 11). In the Polish complexes, waste products take up considerable percentages, varying between 48% and 65% (flakes) and 29% and 49% (blades). Pre-cores and cores take up less than 5%. The percentages of retouched tools are low and amount to less than 1%. The fact that the percentage of tools in the inventory of Mesch is higher (2.1%) indicates that domestic activities and/or retooling may have played a bigger part there than at the Polish sites. Another difference is that so-called workshop and extraction tools are lacking in Mesch (or were not recognised as such?). Based on similarities in artefact composition and location of the sites in the vicinity of sources of good quality flint, the site of Mesch can be designated as workshop located off extraction point. We are dealing with a location where numerous flint nodules were brought to, were worked and discarded before the stage of blade production (*plein débitage*) was attained. Moreover, many flint nodules reached the stadium of well-prepared blade cores and from these cores many long and regular blades were struck.

In the publication on the Mesch site, the author proposed that Magdalenian hunter-gatherers used the location primarily as an observation post (Rensink 1991). This interpretation is based on the following observations:

1. from the elevated location, the occupants of the camp had a good view of large parts of the surrounding hilly landscape. They would have been able to spot herds of reindeer and/or other game at considerable distances;
2. blades manufactured at the location seem to have been principally intended for future use at other locations; accordingly, the execution of domestic activities, such as working of bone or hide, would not seem to be the main reason for singling out this location;
3. large nodules of flint were collected in the valley of the river Voer and subsequently transported to the edge of the plateau. It supports the idea that the location was primarily chosen for its splendid view. In this particular case, we have a fine example of the transport of *local* lithic materials, which has allowed us to gain a better

understanding of the function of the site and the activities performed.

It should be stressed that the above mentioned functional interpretation of the Magdalenian site of Mesch is exclusively based on the location of the site in the landscape and on data regarding provenance and use of lithic raw materials. Because organic remains have not been preserved in this and the other northern loess open-air sites, it is possible to make statements on only a part of the activities that were carried out in the camp sites. Moreover, archaeological data on seasonality are completely lacking. Assuming that burins were used in bone and/or antler working and that this was one of the main activities carried out in Eyserheide and in other camp sites, its meaning in terms of season of occupation is slight. This activity could in principle have taken place at any period of the year. Following the data of Pincevent, Verberie and other sites in the Paris Basin, antlers could have been obtained during the reindeer hunt, during the annual migrations of these animals in the spring and autumn. But "freshly" shed antlers could also have been collected in the landscape at the end of summer and in the beginning of autumn. Another option is that antlers were kept submerged in water as cache and were worked in other seasons than the spring and autumn. (B. Grønnow, pers. comm. 2009). Finally, hunting activities in the northern Magdalenian of course were not or not exclusively aimed at reindeer, as is clearly demonstrated by the large diversity of hunted species represented in the faunal assemblages of Andernach and Gönnersdorf in the Central Rhineland and those of the Belgian cave sites. Burins could also have been used for working bones of other animals which could be hunted in other or even all seasons of the year.

Though we cannot make inferences on seasonality from faunal remains (not being preserved) nor from the results of micro-wear analysis (burins could have been used for antler, bone and/or ivory working in all seasons), there are some indirect indications that may be worthwhile to mention in this context. With the exception of Kanne, which has a sheltered topographical position along the valley of the river Geer, all sites are located on high loess plateaus, in exposed places. Taking into account the still cold, stadial conditions of the late Pleniglacial in which the northern loess open-air sites should be dated (see chapter 8), the notion that these sites reflect cold-season occupations is not very likely. In this phase of the Weichsel ice age, loess was still being deposited in an open landscape characterised by a dry, steppe tundra landscape and completely devoid of trees at least in the higher sections. As pointed out by Straus and Otte in their paper on the Bois Laiterie Cave and the Magdalenian of Belgium (1998, 264):

"Following the logic that people would naturally prefer to take advantage of available shelter (i.e. caves) especially in winter, that game would seek shelter during winter in the protected, well-watered valleys of the Ardennes fringes rather than on the open, windswept plains of Middle Belgium, and that flint nodules would be difficult or impossible to obtain under the snow or in frozen earth, it can be hypothesized that the open-air Magdalenian sites of Limburg, Brabant and Hainaut were mainly occupied by people in the warm season."

In addition to the arguments mentioned above, a further indication of 'warm season occupations' would be the lack of large habitation structures or hearth structures, as has been discussed earlier in this chapter (7.8).

Following the suggestion made by Straus and Otte in the above quotation on the possibility of seasonal occupation and complementarity of areas which are characterised by different landscape features, in the next chapter we will place the Magdalenian open-air sites of the Meuse-Rhine loess area in a broader, Northwest European perspective, incorporation archaeological data from two more southerly regions in our investigation: the Central Rhineland in Germany and the Belgian Ardennes.