An aerial photograph of a Dutch river landscape. A winding river flows through a vast, flat, brownish-green landscape, likely a marsh or polder. The river has several sharp curves and small islands. In the background, there are dense green forests and more water bodies under a clear sky.

APPENDICES TO **A LIVING LANDSCAPE**

Bronze Age settlement sites in the Dutch river area (c. 2000-800 BC)

Stijn Arnoldussen

APPENDICES TO:
A Living Landscape

Bronze Age settlement sites in the Dutch river area (c. 2000-800 BC)



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APPENDICES TO:
A Living Landscape

Bronze Age settlement sites in the Dutch river area (c. 2000-800 BC)

PhD Thesis, Leiden University,
Faculty of Archaeology

by

Stijn Arnoldussen

2008

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Preface

This publication contains the six main appendices to the PhD thesis ‘A Living Landscape. Bronze Age settlement sites in the Dutch river area (c. 2000-800 BC)’ which was published in 2008 (Arnoldussen 2008). That study entails an analysis of the nature (*i.e.* the constituent components) and dynamics (*i.e.* diachronic approaches to settlement dynamics) of Bronze Age settlement sites in the Dutch river area. It aimed to integrate and synthesize interpretations of Bronze Age settlements based on a number of relatively large-scale excavations in the Dutch river area.

The discussion of the archaeological and geological histories of research for these sites, detailed source criticism and long-term overviews of the occupation histories of six macro-regions around these main excavated sites could – for sake of conciseness – not be incorporated into the main study’s text. However, such discussions contain critical information necessary to correctly interpret the results of these excavations and to evaluate their representativeness. Therefore, it was decided to make this information available separately.

While these texts are primarily appendices to the PhD study referred to above, they can be read separately by those who are particularly interested in the results – thus far published nearly exclusively in Dutch – of a specific excavation. In addition, the appendices provide a recent overview of the palaeogeography and occupation history of six c. 30 km² large macro-regions in the Dutch river area. This information may be of relevance to those studying other sites within these macro-regions for the period under study (c. 2000-800 BC).

I Palaeogeography and occupation history of the Zijderveld macro-region

I INTRODUCTION

The Zijderveld macro-region is chosen to include a large number of Bronze Age find-spots around the excavation of a Bronze Age and Iron Age settlement site c. 100-300 m to the northeast of the hamlet called Zijderveld. The site was one of the first Bronze Age settlement sites to be excavated in the Dutch river area (the first excavation campaign was in 1966) and showed a remarkably good preservation, with shallow features such as hoof-imprints and stake walls and fences being preserved. Some construction wood, a willow axe haft and a brushwood trackway were also preserved. As the initial excavations were part of a rescue campaign when the bordering sand-dredging site was expanded, conditions were sometimes less than ideal for excavation. Recently (2003-2004), the widening of the A2 motorway necessitated excavation of the areas bordering the initial excavation. This campaign resulted in the discovery of three additional Bronze Age house-sites. No excavation had taken place when the sand-dredging site was first established, or prior to the initial construction of the A2 motorway, leaving a considerable part of the settlement site(s) unexcavated and presumably disturbed.

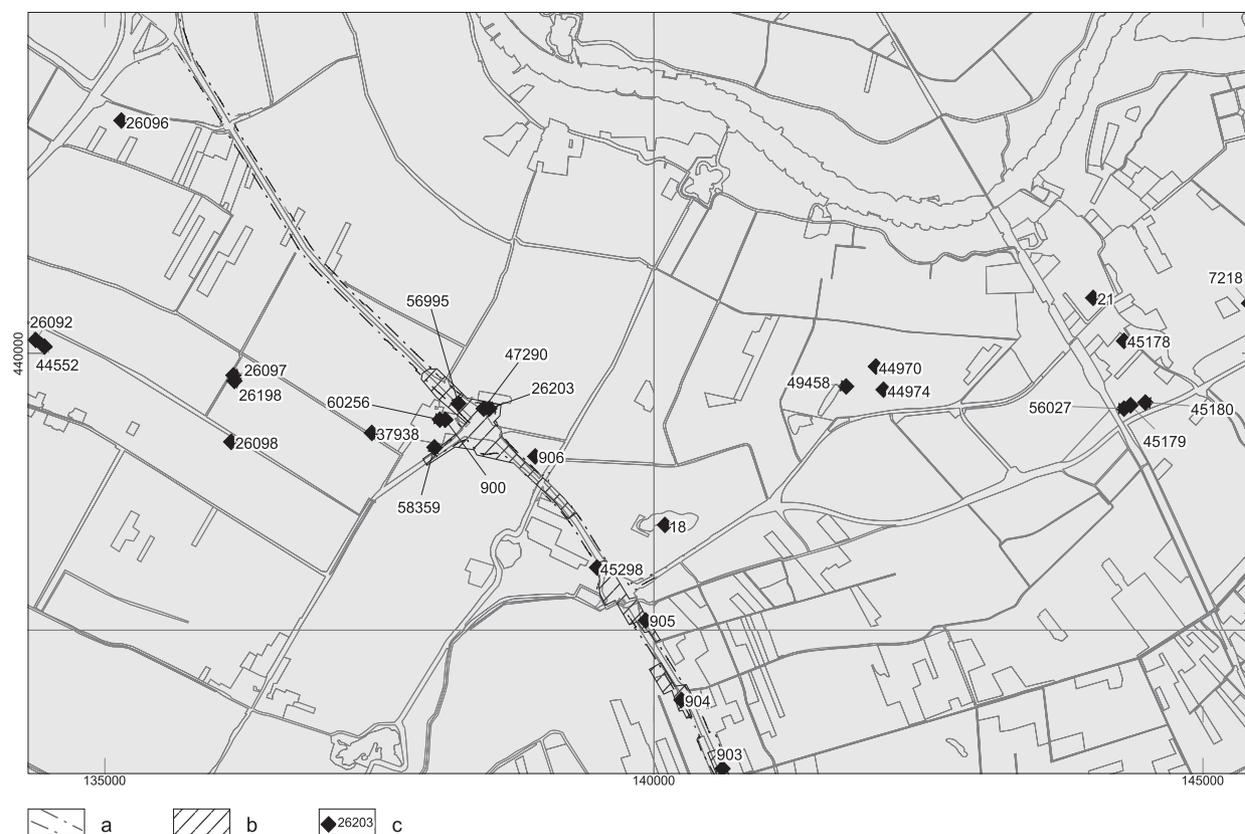


Fig. I.1 Research and find-spots in the Zijderveld macro-region. The initial Zijderveld excavations are indicated as no 26203. a: A2 motorway construction zone, b: area subjected to coring campaigns, c: location of find-spots.

History of archaeological research

The site of Zijderveld was discovered by two local archaeologists in 1965 (Theunissen & Hulst 1999b, 156). They executed some corings and dug a number of test-trenches in an orchard that was going to be destroyed when the

adjacent sand-dredging site was to be enlarged (Hulst 1967, 2). One test-pit turned out (in 1971) to be situated within a Middle Bronze Age house plan and yielded various ceramics, bones and stone artefacts. The local archaeologists contacted the State Service for Archaeological Investigations (ROB, now RACM), who initiated three large scale excavation campaigns (total c. 1.2 Ha) in 1965, 1966 and 1971 (fig. I.1, no 26203; Hulst 1965a-b; 1966; 1975a (1973); 1975b; 1991; Hulst & Theunissen 1999b; Archis 26303 (coordinates not within excavation)). As a consequence, two plots to the north and south were declared protected archaeological monuments (fig. I.2; Archaeological Monument Map (AMK) nos. 38F41/10385 and 38F42/10386).

In the wider region, local archaeologists continued with campaigns of test-pitting and monitoring of construction works (fig. I.1, nos. 18, 83, 7218, 26092, 26096-26098, 37938, *cf.* Halbertsma 1964; De Kok 1965; Louwe Kooijmans 1974, 370-372, nos. 80-84, 92-93; Sloos 1988; Koorevaar 1998), many of which yielded remains datable to the Bronze Age. Only one of these sites, known as Culemborg - Den Heuvel (fig. I.1, no 18) was excavated in 1965 to some extent (0.33 ha; Louwe Kooijmans 1966; Sloos 1988; Arnoldussen & Van Zijverden 2004). In 1997, a plan to broaden the A2 motorway led to the decision to execute an archaeological coring campaign along various parts of the A2 motorway (Haarhuis 1998).

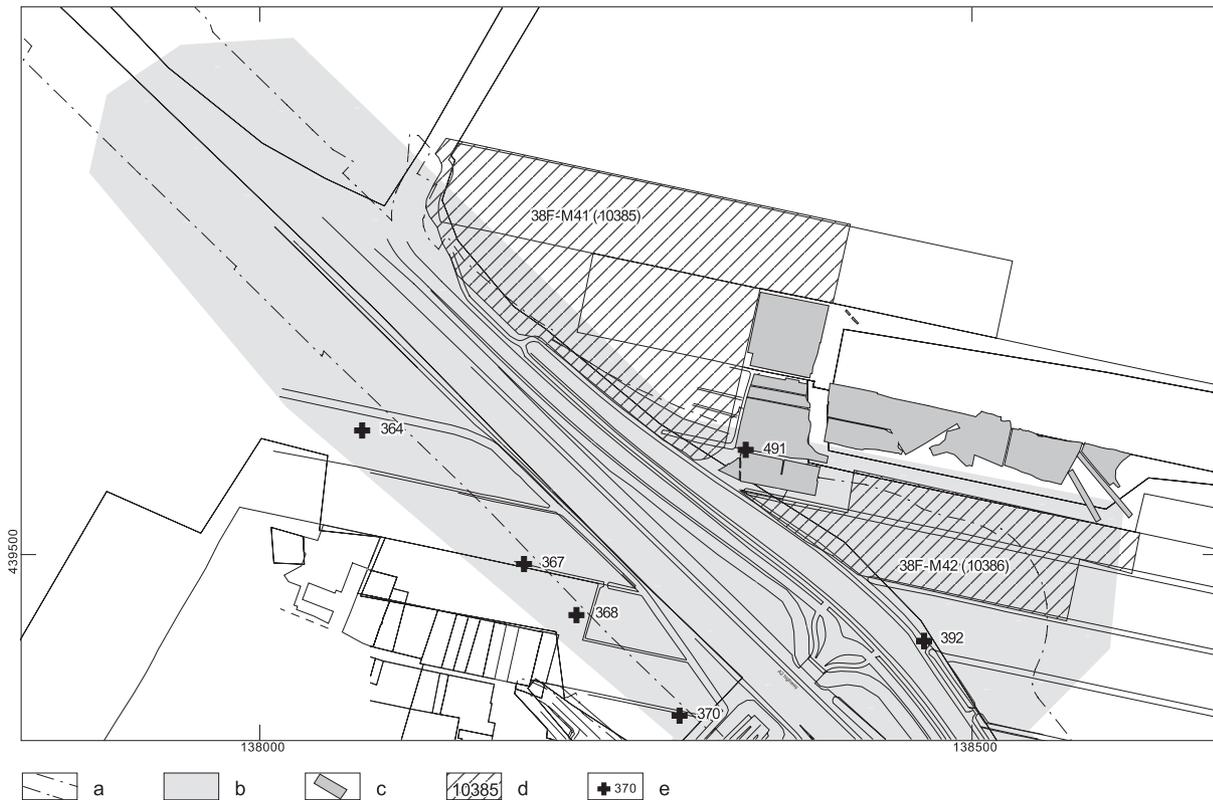


Fig. I.2 Results from coring campaign near Zijderveld.

a: A2 motorway construction zone, b: area subjected to coring (Haarhuis 1998), c: original Zijderveld excavations (Hulst 1991; Hulst & Theunissen 1999b), d: plots designated archaeological monument, e: coring with archaeological remains (Haarhuis 1998).

Despite the fact that only a small number (N = 6, c. 7 %) of the corings in the vicinity of the excavated site yielded archaeological materials (fig. I.2, corings 363, 367, 368, 370, 392 and 491; Haarhuis 1998; Arnoldussen 2003, 3; Archis 45299-45301) it was decided to investigate the site further with test-trenches (fig. 1.3, b). In nine test-trenches, c. 1140 square meter was investigated (Arnoldussen 2003). All test-trenches yielded features and finds which were datable to the Bronze Age. Based on the results of the campaign of test-trenches, it was decided to excavate a larger area directly adjacent to the former excavations, as well as a part of the settlement site discovered to the southwest of the A2 motorway. During this excavation, the three additional Bronze Age house-sites already referred to above

were uncovered (Knippenberg & Jongste 2005). In 2007 an area adjacent to the northwest of the area excavated in 2004 was excavated as part of a watching brief (fig. 1.3, d; Knippenberg *in prep.*)

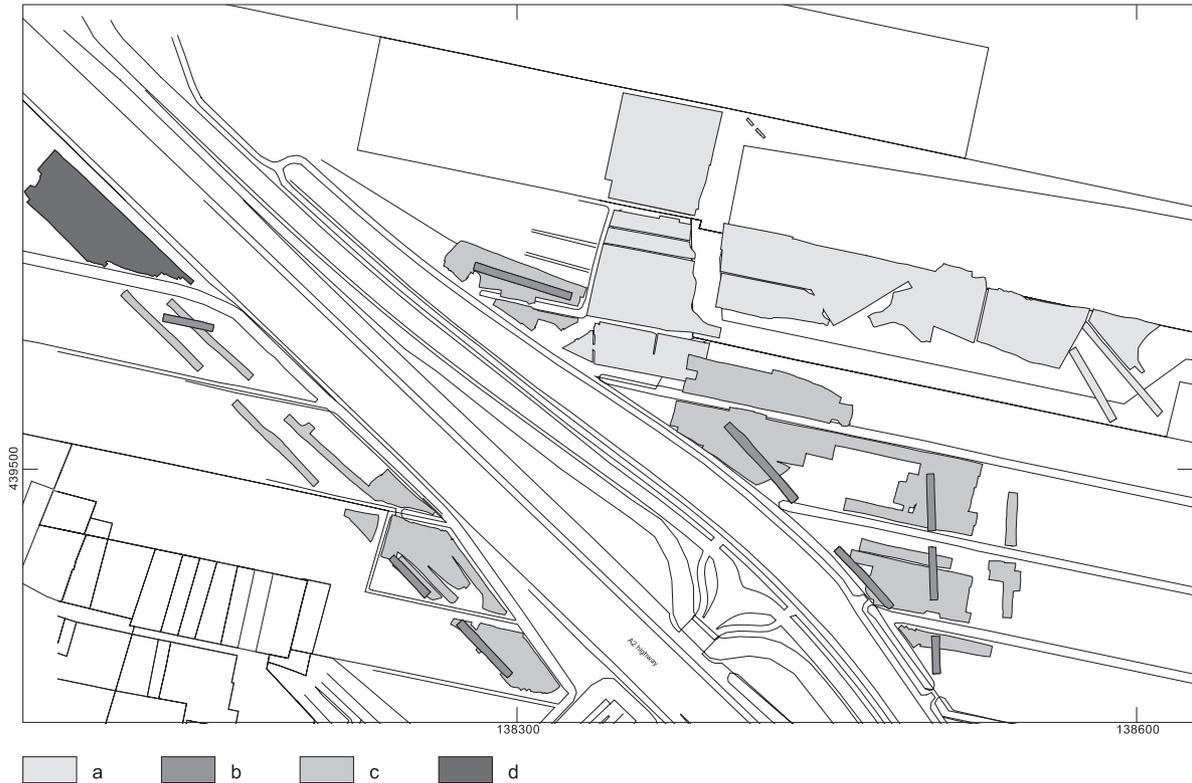


Fig. 1.3 Archaeological excavations at Zijderveld.

a: original Zijderveld excavations (Hulst 1991; Hulst & Theunissen 1999b), b: test-trenches (Arnoldussen 2003), c: the 2004 excavations (Knippenberg & Jongste 2005), d: watching brief (2007; Knippenberg *in prep.*).

In 2003, a small (3200 m²) area near the town of Culemborg was excavated and yielded some Early Bronze Age remains (Culemborg - Lanxmeer-B; Odé & Haartsen 1998; Huis in 't Veld 2004; Archis 56027). Planned construction works in the centre of the hamlet of Zijderveld necessitated coring campaigns on two small plots in 2004, but no evidence for (Bronze Age) occupation was found there (fig. I.1, nos. 60256 and 58359; Van Benthem & Smit 2004). Nonetheless, based on the location of the plots on the Zijderveld levee and/or crevasse deposits, test-trenches were advised (Van Benthem & Smit 2004, 14).

The geological context

The Bronze Age settlement site of Zijderveld is situated in a part of the central river area that has seen a complex palaeogeographical development. Various river systems have contributed to the Holocene development of the macro-region. The best known fluvial systems in the area are depicted in figure I.4 (overleaf).

The settlement site of Zijderveld is situated on the levee-deposits of the eponymous fluvial system and possibly also on crevasse deposits of the Schoonrewoerd fluvial system which directly overlie the crevasse and/or levee deposits of the Zijderveld channel. The morphology of the landscape is thus influenced by levee and crevasse formation of two fluvial systems, resulting in a locally strongly variable micro-topography. This variation may explain the often different forms of the fluvial deposits as depicted on the various geological and soil-survey maps compiled for the area (Van Zijverden 2003a; references to Vink 1926; Verbraeck 1970; De Boer & Pons 1960; Berendsen & Stouthamer 2001).

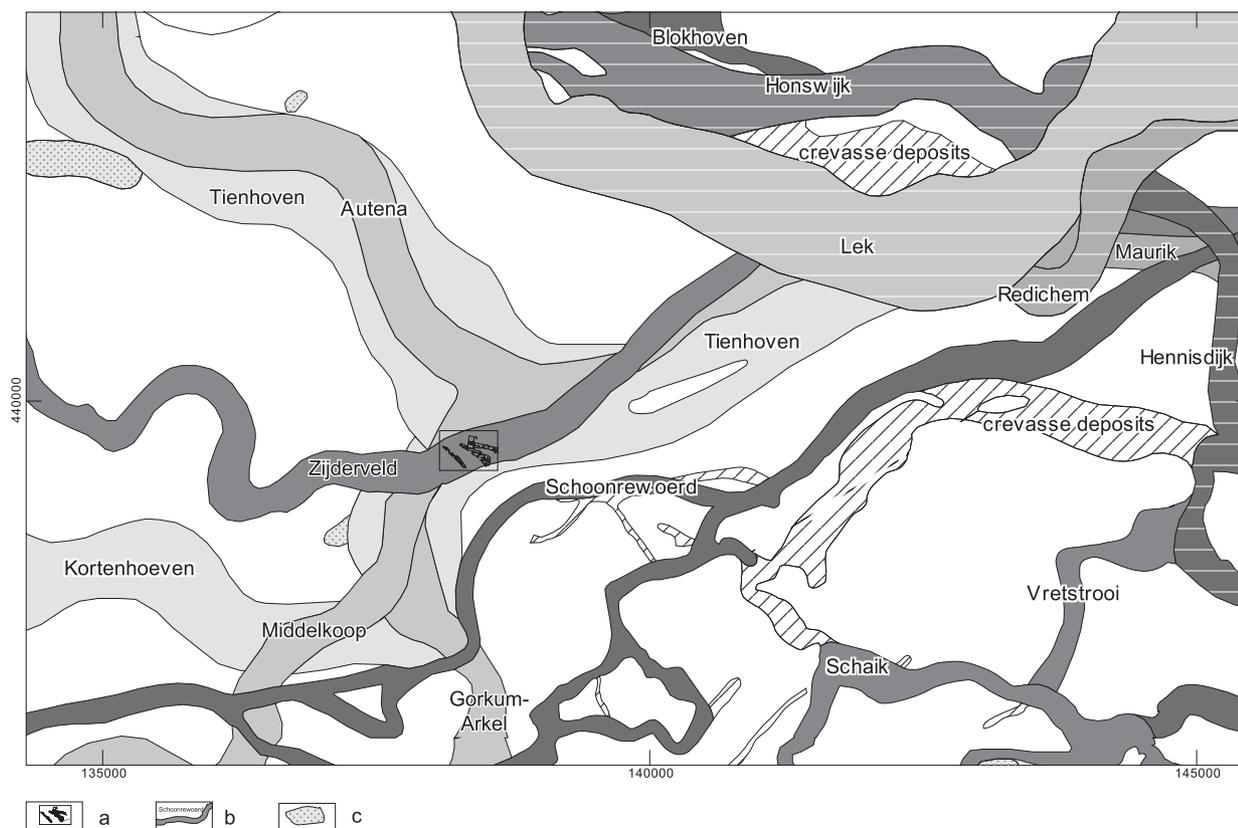


Fig. 1.4 Fluvial systems in the Zijdeveld macro-region (after Berendsen, Faessen & Kempen 1994; Berendsen *et al.* 2001; Berendsen & Stouthamer 2001). The location of the Zijdeveld channel bed deposits is based on Van Zijverden 2003a and differs from the previously quoted publications).

a: the Zijdeveld micro-region and excavated areas, b: fluvial systems, c: location of possible river dunes.

II SOURCE CRITICISM

Coring campaigns (soil mapping)

Although Vink (1926, 6-8) offered a short introduction to the methodology applied during the soil-mapping campaigns prior to the publication of his 1926 thesis and maps of the ‘Lek’ district, no information on coring density and depths is available. For the soil-mapping campaign in the ‘Vijfheerenlanden’ district, published by De Boer & Pons (1960, ref. to Pons 1951), the applied methodology was also not described in the publication. The geological map of the area, based on corings executed between 1957 and 1964, was published in 1970 by Verbraeck. This map was based on an average of nine corings per square kilometre, with a general depth between 6 to 10 m (Verbraeck 1970, preface). Mapping archaeological sites (or ‘ancient settlement soils’) was not an objective with any of these three studies. Consequently, although considerable attention was paid to correctly mapping the location of the fluvial channels, their archaeological potential was not addressed.

Coring by RAAP

The trajectory that was going to be disturbed by the widening of the A2 motorway was – based on available palaeogeographical and geological maps – divided into three units which had a low, moderate or a high probability of encountering archaeological remains (Haarhuis 1998, 10-11). Where expectations were high, two rows of corings (40 m apart and 25 m offset, with 50 m between corings in a row) to either side of the A2 motorway were undertaken. The corings were generally two metres deep and were combined with fieldwalking where possible (Haarhuis 1998, 12). In the areas with a moderate expectation, only one row was executed to either side of the motorway. In the remaining

areas, no corings were executed (Haarhuis 1998, 11). This decision not to undertake archaeological research in the areas where – based on the available maps – no levee or crevasse deposits were expected, can be criticised with hindsight. The available maps indicate only the general location of the channel-bed deposits and the intricate morphology of the levee- and crevasse deposits need not be represented accurately. Moreover, unmapped systems can of course always be encountered. Although the coring grid applied in the other areas is too wide to be usable for detailed mapping of the morphology of crevasse/levee deposits (*cf.* Weerts 1996, 43-44; Van Dinter & Van Zijverden 2002) their presence could nonetheless have been established by chance in areas where none were expected or mapped beforehand.

Test-trenches

Although additional archaeological investigation (by means of more corings) was suggested for all sites investigated by RAAP in the Zijdeveld macro-region (Haarhuis 1998, 33), test-trenches were used to determine the extent and quality of the various sites (sites 12-14; Arnoldussen 2003; sites six, seven, nine to eleven; Schrijer 2003a-b, see also Ter Wal 2004a-b (sites one and two, four and five) and Schutte 2005 (site 3).

Based on administrative grounds, three sites (12-14) were designated in the vicinity of the former Zijdeveld excavations. The location of the test-trenches at these sites was predetermined and several trenches were planned across modern drainage ditches. As it was not allowed to change these orientation of the test-trenches, the trenches could not be dug to their maximum extent. Furthermore, a large area to the southwest of the A2 motorway and the orchard next to the plot excavated in 1971 could not be investigated (Arnoldussen 2003, 6; 66; 69). Although the nature of the features discovered in the test-trenches indicated that prehistoric house-sites were to be expected close-by, no clear houses or outbuildings could be reconstructed from the features uncovered (Arnoldussen 2003, 60).

The 2004 excavations

The extent of the 2004 excavation was limited to the areas which were to be disturbed by the motorway construction. Within these zones, a total of 1.4 ha of a Bronze Age settlement site was uncovered. Despite this large area, the three new house-sites discovered are all located within 10 m of the excavation limits. This, unfortunately, hampers interpretation of the house-site layout and structuring. The presence of modern buildings and drainage ditches also contributed to unwanted partitioning of the excavated surface. Nonetheless, three reasonably continuous surfaces could be excavated to the north-east of the motorway, only separated by a modern house in the north(west) and the residual gully in the south(east). To the south-west of the A2 motorway, a more or less continuous surface was uncovered in the south(east), while funding and time allowed only for test-trenches to be used in the north(west) part (fig. I.3; Knippenberg & Jongste 2005, 13). Although most of the larger postholes have been sectioned, large groups or stretches of stakes holes in which no structures (*e.g.* fences) were discernible, have been described as one feature and only some features within these clusters were sectioned (Knippenberg & Jongste 2005, 14-15). The fence-lines uncovered in the 2007 watching brief (fig. I.3, d; Knippenberg *in prep.*), yielded little additional information other than on their spatial extents and trajectories.

III OCCUPATION HISTORY AND PALAEOGEOGRAPHICAL DEVELOPMENT

Early and Middle Neolithic

Several early Holocene river systems are found in the Zijdeveld macro-region. The Kortenhoeven, Tienhoven and Gorkum-Arkel fluvial systems start their sedimentation around 5650 cal BC, 5050 cal BC and 4565 cal BC respectively and their end of sedimentation is estimated to 4130 cal BC (Kortenhoeven and Tienhoven) and 3640 cal BC (Gorkum-Arkel; Berendsen & Stouthamer 2001, 211; 236; 201). Sedimentation by the Maurik fluvial system – which was previously dated to between 4250 and 3080 cal BC (Berendsen & Stouthamer 2001, 218) – has recently convincingly been dated to between 5310/5140 and 4430/4040 cal BC (Cohen 2003, 52; 163). Parts of the Tienhoven fluvial system were rejuvenated later-on and – although slightly different dates are reconstructed for the Autena (4160 to 3080 cal BC) and Middelkoop (5420 to 3400 cal BC) river systems (Berendsen & Stouthamer 2001, 218; 189

; 220) – the Autena and Middelkoop may represent a single fluvial system that followed parts of the former fluvial channel deposits. The Zijderveld fluvial system also followed parts of the former river courses (the Zijderveld system was connected upstream to the Zoelmond river system (Berendsen & Stouthamer 2001, 249; Cohen 2003, 163). The start of sedimentation by the Zijderveld system is dated through a sample of clayey *phragmites* peat underneath the levee-deposits to c. 4330-4040 cal BC (GrN-18922: 5345 ± 40 BP; Törnqvist 1993, 144, cf. Berendsen & Stouthamer 2001, 247). For the end (c. 3650-3100 cal BC) of sedimentation by the Zijderveld system, a date of a *phragmites* peat sample from the bottom of the residual gully is available (GrN-5221: 4620 ± 60 BP; De Jong 1970-71, 82, cf. Berendsen & Stouthamer 2001, 247). A second sample of terrestrial macro-remains from the lowermost part of the Zijderveld residual gully was dated to c. 2870-2480 cal BC (UtC-13084: 4082 ± 50; Berendsen & Hoek 2005, 21). The latter (younger) date is thought to be the most accurate (*ibidem*). In the south-east part of the Zijderveld macro-region, three river systems were active during the Middle Neolithic: The Vretstrooi system, which was active between c. 5260/4940 cal BC and 4560/4350 cal BC (Cohen 2003, 164-165), the Regulieren system – for which no dates are available – and their successor the Schaik system (Berendsen & Stouthamer 2001, 239; 230; 232-233). For the Schaik system, several radiocarbon dates for the start (estimated around 3335 cal BC) and end of sedimentation (around 2290 cal BC) are available (Berendsen & Stouthamer 2001, 232-233).

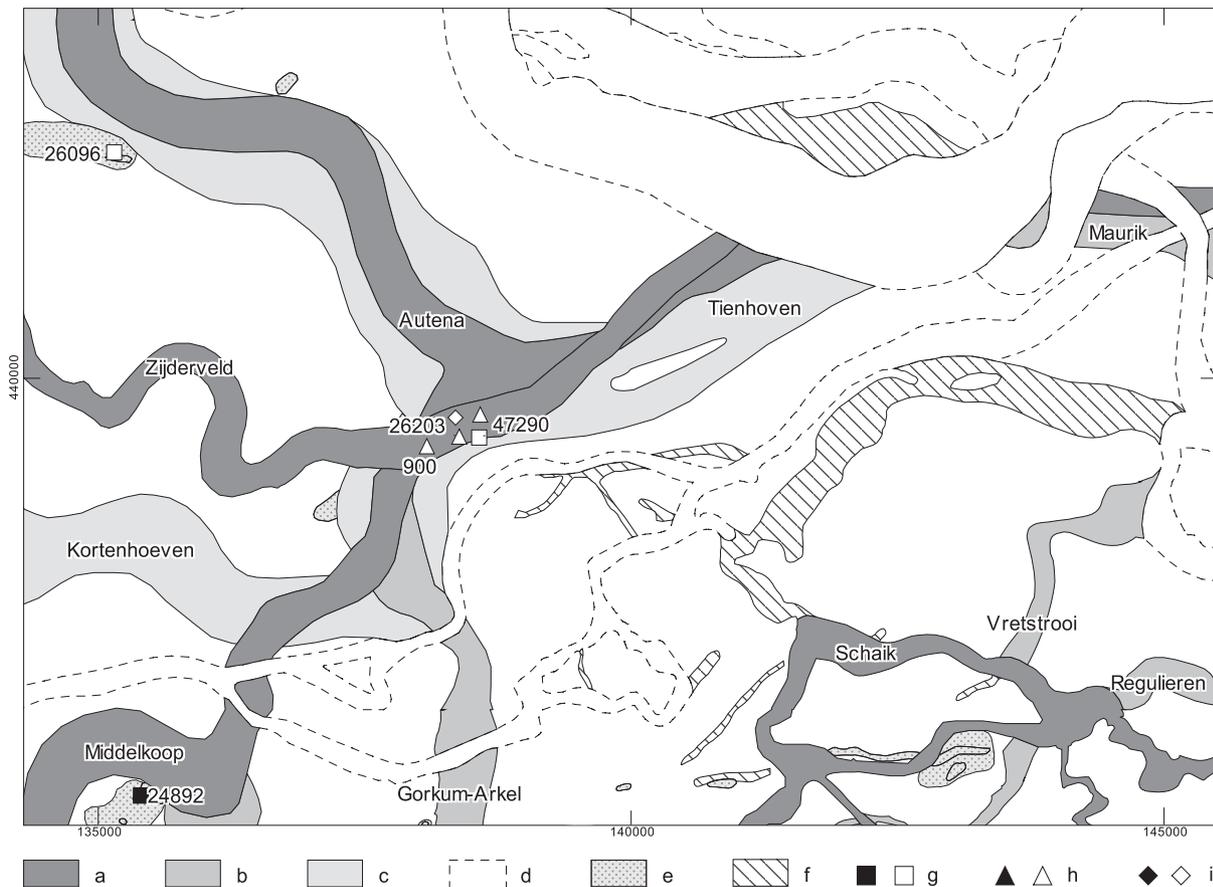


Fig. 1.5 Early and Middle Neolithic fluvial systems and Middle Neolithic find-spots (filled symbols are certain identifications, outlined symbols uncertain identifications) in the Zijderveld macro-region.

a-c: Early (light) to Middle (dark) Neolithic fluvial systems, d: younger fluvial systems, e: aeolian (river) dunes, f: crevasse deposits of unknown age, g: ceramics, h: flint implements, i: botanical remains.

Few archaeological remains datable to the early and middle Neolithic periods are known from the macro-region. Near the town of Leerdam, river dune sediments were uncovered in sand-extraction pits dug by a farmer on a plot

known as ‘Polder Hoogeind - Schoonrewoerdse donk’ fig. I.5, no 24892). There, in the extraction pits and a few test-pits dug later, amongst other archaeological finds, some Vlaardingen period sherds were found (De Kok 1965; Louwe Kooijmans 1974, 371, no 92; Archis 24892). A test-pit dug into a river dune known as ‘Autenase Donk’ (fig. I.5, no 26096) yielded ceramics that could not be assigned a more precise date than Neolithic or Bronze Age (De Kok 1965; Louwe Kooijmans 1974, 370, no 79; Archis 26096). Within the 2004 excavations at Zijderveld (fig. I.5, no 47290), some finds datable to the Middle Neolithic were recovered. Embedded in the levee-deposits, one retouched and one burned blade fragment, were found in the southwest part of the site (fig. I.5, no 47290; Knippenberg & Jongste 2005, 84). In the south-eastern part of the excavation, a flint core and a chip from a polished flint axe were recovered from the levee deposits, in association with ceramics that are cautiously dated to the Middle Neolithic (Knippenberg & Jongste 2005, 84). One additional part of a polished flint axe was found during the 1970’s excavations at Zijderveld (fig. I.5, no 26203) and yet another one from a ditch near the church of Zijderveld (fig. I.5, no 900; Theunissen & Hulst 1999b, 158; 175). Further evidence for human activities near the Zijderveld excavations during the Middle Neolithic consists of *Cerealia* and *Plantago lanceolata* pollen in the lowermost fill of the Zijderveld channel residual gully (De Jong 1970-1971, fig. 8; Theunissen & Hulst 1999b, 158).

It seems that both dunes as well as river levees were used by Middle Neolithic communities in the Zijderveld macro-region. As the levee-deposits of the Zijderveld fluvial system have been partially eroded and reworked by crevasses of the younger Schoonrewoerd fluvial system (see below), we cannot be sure that the ceramics and flint fragments represent activities on these parts of the levees of the active Zijderveld fluvial system. Neither do the recovered tools and ceramics allow for a more precise dating or interpretation of these human activities. The pollen and radiocarbon date from the lowermost fill of the Zijderveld system residual gully in any case indicate that during the 2nd part of the fourth millennium, these – or upstream – parts of the Zijderveld area were brought under cultivation.

Late Neolithic

Various fluvial systems within the Zijderveld macro-region become active during the Late Neolithic. For the Blokhoven fluvial system – situated in the extreme north of the macro-region – no direct dates are available and the active period is estimated to between c. 2650 and 1850 cal BC (Berendsen & Stouthamer 2001, 192-193). The Honswijk fluvial system is located a few hundred meters to the south and cross-cuts parts of the Blokhoven deposits. The start of sedimentation by the Honswijk system is not dated directly, but linked to that of the Hennisdijk system (GrN-6230: 3945 ± 35 BP, c. 2570-2300 cal BC; Berendsen & Stouthamer 2001, 207; 205; GrN-6229: 3895 ± 40; Makaske 1998, 204). Two Honswijk residual gully dates are available (GrN-7961: 3245 ± 35 BP and GrN-8714: 3050 ± 30 BP; Berendsen 1982, 170; Berendsen & Stouthamer 2001, 207), pointing to a cessation of sedimentation around 1410-1210 cal BC. For the start of sedimentation by the Hennisdijk system, two relevant radiocarbon dates have already been mentioned above. However, another radiocarbon date of botanical remains from the top of the sediment underneath overbank deposits (UtC-4643: 3818 ± 42 BP; Makaske 1998, 203) is used by Berendsen & Stouthamer (2001, 205) to date the start of sedimentation by the Hennisdijk system to c. 2460-2130 cal BC. A residual gully date for the Hennisdijk system points towards an end of the sedimentation around c. 1370-1050 cal BC (UtC-4642: 2975 ± 35 BP; Berendsen & Stouthamer 2001, 205, but see Van den Broeke (2001, 164; 166) on 4th century BC brooches from the bottom of a residual gully of the Hennisdijk system). The Hennisdijk system formed extensive stacked crevasse splay deposits in the western floodbasin, which were clearly formed in several phases, but which unfortunately cannot be dated more precisely (Makaske 1998, 204; appendix, section 13).

For the Schoonrewoerd fluvial system, which crosses the study-area from east to west, various dates for the start and end of sedimentation are available (Törnqvist & Van Dijk 1993, 133; Makaske 1998, 217; 2007; Berendsen & Stouthamer 2001, 233-234; Berendsen & Hoek 2005, 27). The top of a peat deposit underneath overbank deposits by the Schoonrewoerd system was dated to c. 3500-3010 cal BC (GrN-10886: 4520 ± 60 BP; Törnqvist & Van Dijk 1993, 133). A much younger date obtained from peat underneath the Schoonrewoerd levee deposits near Culemborg (UtC-13075: 3887 ± 35 BP; Berendsen & Hoek 2005, 27) has led to a dismissal of earlier starting dates for the Schoonrewoerd system as a whole by Berendsen and Hoek (*ibid.*). However, it is equally well possible that this date corresponds solely to that particular branch in question of the Schoonrewoerd system. The find of a possibly Vlaardingen Culture period (c. 34000-2600 cal BC) axe from a crevasse of the Schoonrewoerd system (Arnoldussen

2000, 82 fig. 6.5; Archis 21897) is in support of the older, rather than the younger start dates. This would also better explain the otherwise very high sedimentation rates for the Schoonrewoerd floodbasin (Makaske 2007, 121-122). Botanical remains from the Schoonrewoerd residual gully are dated to c. 2460-2140 cal BC (UtC-4647: 3823 ± 40 BP; Makaske 1998, 203), indicating that activity ceased well before the Early Bronze Age.

Prior to the later Middle Bronze Age-B occupation, the inactive residual gully of the Zijderveld fluvial system was reactivated (De Jong 1970-1971, esp. 85; Van Zijverden 2003a). There is no absolute date available for this reactivation phase, but it may have been caused by crevasses of the Schoonrewoerd system. A smaller possible residual crevasse gully in the northwest part of the 1966 excavations may also have been created from the Schoonrewoerd fluvial system, but for this gully as well, no direct dates are available. Therefore, it remains possible that other fluvial systems (e.g. the Hennisdijk or Honswijk fluvial systems; fig. I.6) were responsible for this phase of reactivation and gully formation.

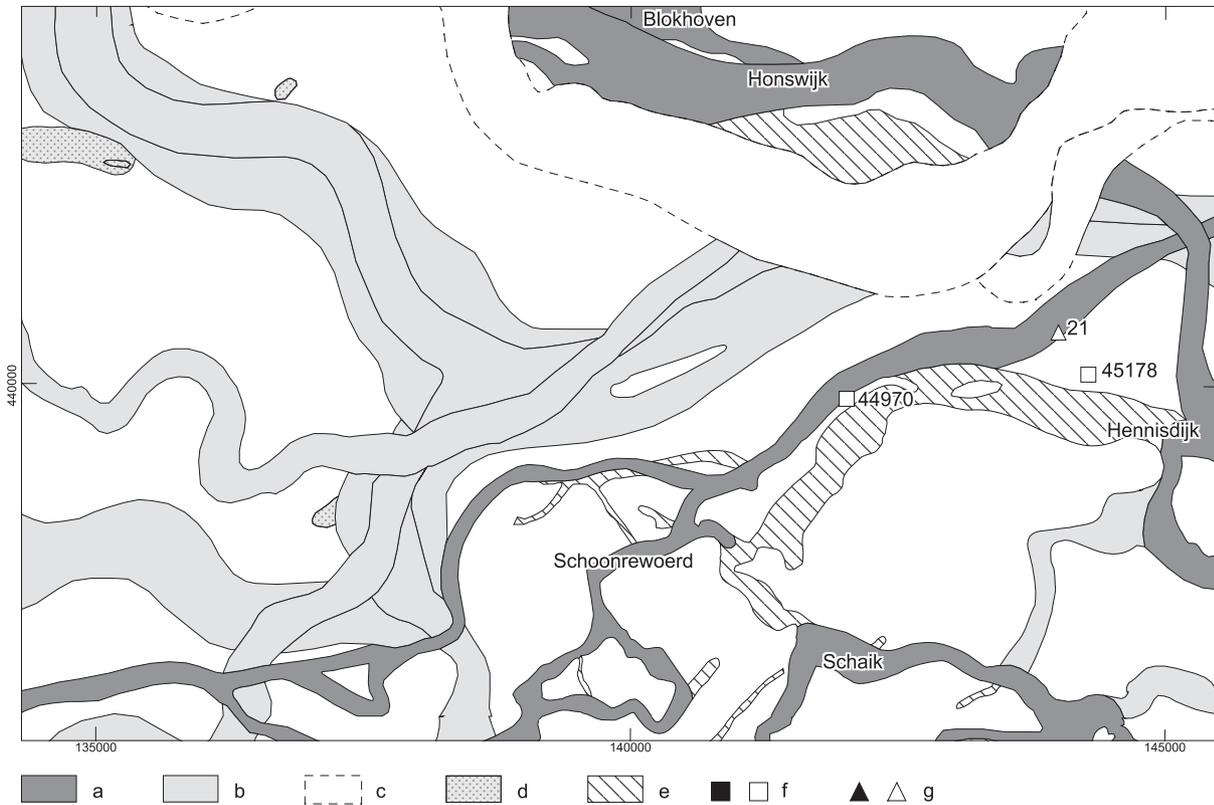


Fig. I.6 Late Neolithic fluvial systems and find-spots (filled symbols are certain identifications, outlined symbols uncertain identifications) in the Zijderveld macro-region.

a: active fluvial systems, b: fossil fluvial systems, c: younger fluvial systems, d: aeolian (river) dunes, e: crevasse deposits of unknown age, f: ceramics, g: flint implements.

Clear indications for human activities within the Zijderveld macro-region during the Late Neolithic (2900-2000 cal BC) are absent. In part, this may be related to the recently claimed longer period of activity for the Zijderveld fluvial system (possibly up to c. 2480 cal. BC; Berendsen & Hoek 2005, 21). The absence of remains from the second half of this period – and especially on the Schoonrewoerd deposits – is remarkable, as the downstream Schoonrewoerd levee deposits seem to have been used intensively during the final phase (*Veluwe*-type decoration, cf. Drenth & Hogestijn 2006 on beaker typology) of the Bell Beaker period (Louwe Kooijmans 1974, 364-367, fig. 18 nos. 50, 42, 39, 32 and possibly also 43, 34, 29, 25, 24a). The excavated sites of ‘Ottoland - Oosteind’ (Louwe Kooijmans 1974; Deunhouwer 1986; Thanos 1995) and ‘Molenaarsgraaf’ (Louwe Kooijmans 1974, 169-339) are the best known of these sites. Within the Zijderveld macro-region proper, fragments of a stone battle axe allegedly originate from the

town of Culemborg (Klasens 1973, fig. I.6, no 21). A small peak of *Cerealia* pollen in the (reactivated) Zijderfeld residual gully could not be dated precisely, but must date on stratigraphical grounds between the Middle Neolithic and Middle Bronze Age (De Jong 1970-1971, 86; Theunissen & Hulst 1999b, 158). Other inconclusive indications for Late Neolithic activities are offered by assumed dates for (vegetation horizons with) archaeological remains discovered during coring campaigns at 'Culemborg - Parijsch A/B' (Odé & Haartsen 1997; Archis 44970 and 49458; fig. I.1, no 44970) and 'Culemborg - Lanxmeer' (Odé & Haartsen 1998; Archis 45178; fig. I.61, no 45178). Half a kilometre to the south of the Zijderfeld macro-region, on top of the Schaik fluvial system's deposits, four possible Late Neolithic sherds were found at the site 'Beesd - A2 vindplaats 6/7' (Ter Wal 2005a, 20-21).

Explaining this scarcity of find-spots datable to this period on the Schoonrewoerd levee deposits within the macro-region is difficult. Perhaps the highest parts of the stacked levee and crevasse deposits of the Early and Middle Neolithic fluvial systems to the north offered a more suitable environment for human activities. The excavations at Zijderfeld and Culemborg (fig. I.1, nos. 47290 and 18, see also below) have, however, not yielded any clear Late Neolithic(-B) finds, despite their scale of excavation (2.4 and 0.33 hectares respectively). Conversely, it is also possible that the floodbasin deposits by the Schoonrewoerd fluvial system on top of the Zijderfeld deposits posed a less favourable landscape for practising agriculture as compared to the Schoonrewoerd deposits proper. Additionally, the possibility that crevasses from other active fluvial systems – e.g. the Hennisdijk, Blokhoven or Honswijk system – created unfavourable conditions in this part of the river area during the Late Neolithic must be considered (cf. Berendsen & Stouthamer 2001, 233, who discuss a rejected younger residual gully date for the Schaik fluvial system (UtC-1410: 3630 ± 40 BP, reference to Törnqvist 1993, 143). However, it is most likely – especially for the Schoonrewoerd deposits – that only a difference in research intensity (cf. Louwe Kooijmans 1974, 12; 37, 106) has created an apparent scarcity of sites from this period in this region.

Early Bronze Age and Middle Bronze Age-A

During the Early Bronze Age and Middle Bronze Age-A periods, no new fluvial systems emerge within the macro-region of Zijderfeld. The Honswijk and Hennisdijk fluvial systems are still active (see above for details) and some crevasse formation by these systems occurs. Despite this period of relative fluvial tranquillity, few find-spots with artefacts datable to the Early Bronze Age are known from within the Zijderfeld macro-region. At 'Culemborg-Lanxmeer -B' an Early Bronze Age hearth and some postholes were uncovered (fig. I.7, no 56027; Odé & Haartsen 1998; Huis in 't Veld 2004, 11; Archis 56027). At the site 'Culemborg - Den Heuvel' (fig. I.7, no 18) two Barbed Wire-stamp decorated sherds and a plano-convex flint knife were recovered in secondary contexts, indicating that Early Bronze Age activities must have taken place close-by (Louwe Kooijmans 1966; Sloos 1988; Arnoldussen & Van Zijverden 2004). To the west of the macro-region, many Early Bronze Age find-spots are known from the Schoonrewoerd levee deposits (Louwe Kooijmans 1974, 364-367, fig. 18 nos. 42, 36, 32, 30, 28/27 and 26). This high number of sites is interpreted by Louwe Kooijmans as reflecting 'one long ribbon settlement' (1974, 109). In explaining the absence of similarly large numbers of find-spots on the Schoonrewoerd levee deposits within the macro-region, the same arguments apply as used for the Late Neolithic (see above). Thus, without additional research focused on the more upstream areas of the Schoonrewoerd system, it is impossible to tell whether a comparable density of settlements ever existed within the Zijderfeld macro-region.

For the Middle Bronze Age-A, evidence for activities within the Zijderfeld macro-region is equally scarce. Although more than 3500 Bronze Age sherds have been uncovered in the excavations at Zijderfeld, not a single sherd with a 'Hilversum'-style of decoration – which was current during the Middle Bronze Age-A – was found. The only indication of human presence is a radiocarbon date for the outer growth rings of a wooden post from the 1970's excavations at Zijderfeld (c. 1880-1490 cal BC, GrN-5376: 3370 ± 80 BP; Lanting & Mook 1977, 120; Theunissen & Hulst 1999b, 158; 164-165; fig. I.7, no 26203). It may also be the case that already centuries old wood (or a centuries old tree) was used in later centuries (cf. Van Rijn 2001; 2003; Hielkema, Prangma & Jongste 2002, 107).

In conclusion, evidence for human activities during these two periods cannot be established with certainty, but neither are there arguments to expect absence. Especially the crevasse and levee deposits of the Schoonrewoerd fluvial system, that will have formed the highest parts in the environment of those times, may have provided ideal (settlement) site locations.

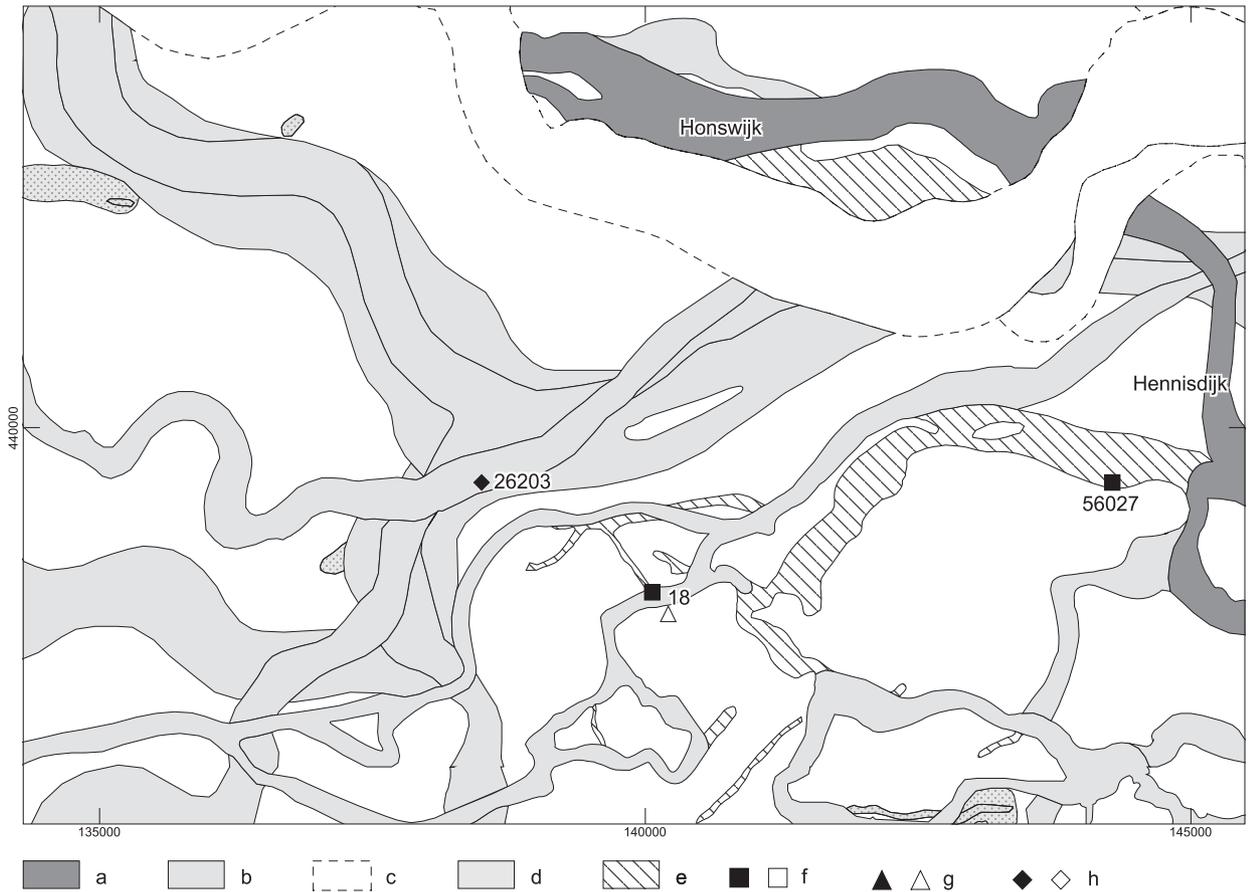


Fig. 1.7 Fluvial systems and find-spots dated to the Early Bronze Age of Middle Bronze Age-A (filled symbols are certain identifications, outlined symbols uncertain identifications) in the Zijdeveld macro-region.

a: active fluvial systems, b: fossil fluvial systems, c: younger fluvial systems, d: aeolian (river) dunes, e: crevasse deposits of unknown age, f: ceramics, g: flint implements, h: botanical remains.

Middle Bronze Age-B

Like in the directly preceding periods, no new fluvial systems came about in the Zijdeveld macro-region during the Middle Bronze Age-B. The Honswijk fluvial system remains active at least until the 14th or 13th century BC (see above). It has also been suggested above that the Hennisdijk fluvial system – whose end of sedimentation is dated by Berendsen and Stouthamer (2001, 205) to *c.* 1370-1050 cal BC – may have had branches which functioned well into the start of the Iron Age. In addition, one may suspect some of the extensive Hennisdijk crevasse splays to have been formed at the end of this period, as crevasse formation often accompanies the end of sedimentation by an anastomosing river (*cf.* Stouthamer 2001, 21-22).

Various sites that were test-trenched by local archaeologists yielded pottery fragments datable to the ‘Bronze Age’. As these finds cannot be dated more precisely, they are discussed in this section. Most find-spots represent materials recovered from the levee and crevasse-deposits of the Zijdeveld channel belt. Three main patches with a Bronze Age ‘occupation layer’ at a site known as ‘Heicop - Zijdeveldse stroomrug’ could be defined through coring and have been published on a physiographical map by Louwe Kooijmans (1974, 112 fig. 30a). A test-trench of 3 by 0.6 m dug at that site yielded a 15 to 20 cm thick ‘culture layer’ with stones, bones and Bronze Age ceramics on top of sandy and silty deposits (fig. I.8, no 26092; Halbertsma 1964, 310-311; Louwe Kooijmans 1974a, 114; 370, no 80; Archis 26092). Another, yet smaller, test-pit was dug at ‘Overboeicop - Mariahoeve’, where a sandy to silty ‘culture layer’ was uncovered. This layer was rich in burned clay, charcoal and contained some quartz-tempered

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Bronze Age ceramics (fig. I.8, no 26097, Louwe Kooijmans 1974, 370, no 81; Archis 26097). In a test-trench at a site on the Zijderveld stream ridge now known as ‘Heicop - Polder Nederheicop’, a layer with Iron Age ceramics on top of a – 45 to 85 cm deep – layer with Bronze Age ceramics was investigated by local archaeologists in 1965 (fig. I.8, no 26098; Louwe Kooijmans 1974, 370, no 82 ‘Schoonrewoerd - Overboeicop’; Pons 1951; 1961; Archis 26098). At the site ‘Zijderveld - De Hoogt’ *c.* 28 Bronze Age sherds were recovered from a *c.* 40 cm thick layer of dark grey to blackish humic sandy clay (fig. I.8, no 37938, Koorevaar 1998; Archis 37938. These sherds are interpreted as having been washed from an unknown settlement site located higher up on the Zijderveld fluvial system’s levee deposits (Koorevaar 1998, 7).

A few decorated (fingertip impressions on the rim and in two rows on the outer wall) Bronze Age sherds are listed in the Dutch central archaeological database (ARCHIS) as originating from a site called ‘Heicop - Polder Nederheicop’ (fig. I.8, no 26098; Archis 26098), but no information on their exact context is available. As the specified coordinates (accuracy 100 m) would place this find-spot in the floodbasin, and the description speaks of ‘other sites on this stream ridge’, one may assume that this material also originated from the nearby Zijderveld levee or crevasse splay deposits. Four sherds discovered during a coring campaign near the town of Culemborg are dated between the Bronze Age and the Iron Age (Odé & Haartsen 1997; Archis 49458; burned bone ‘dated’ to ‘Late Bronze Age-Iron Age’). At test-pit dug into a Late Pleistocene or Early Holocene river dune near the town of Vianen, also yielded some Bronze Age, Iron Age and Mediaeval ceramics (‘Vianen - Autenase Donk’; fig. I.8, no 26096, De Kok 1965, 122; Louwe Kooijmans 1974, 370, no 79; Archis 26096, see also fig. I.5, no 24892 and references there for another dune with Bronze Age ceramics).

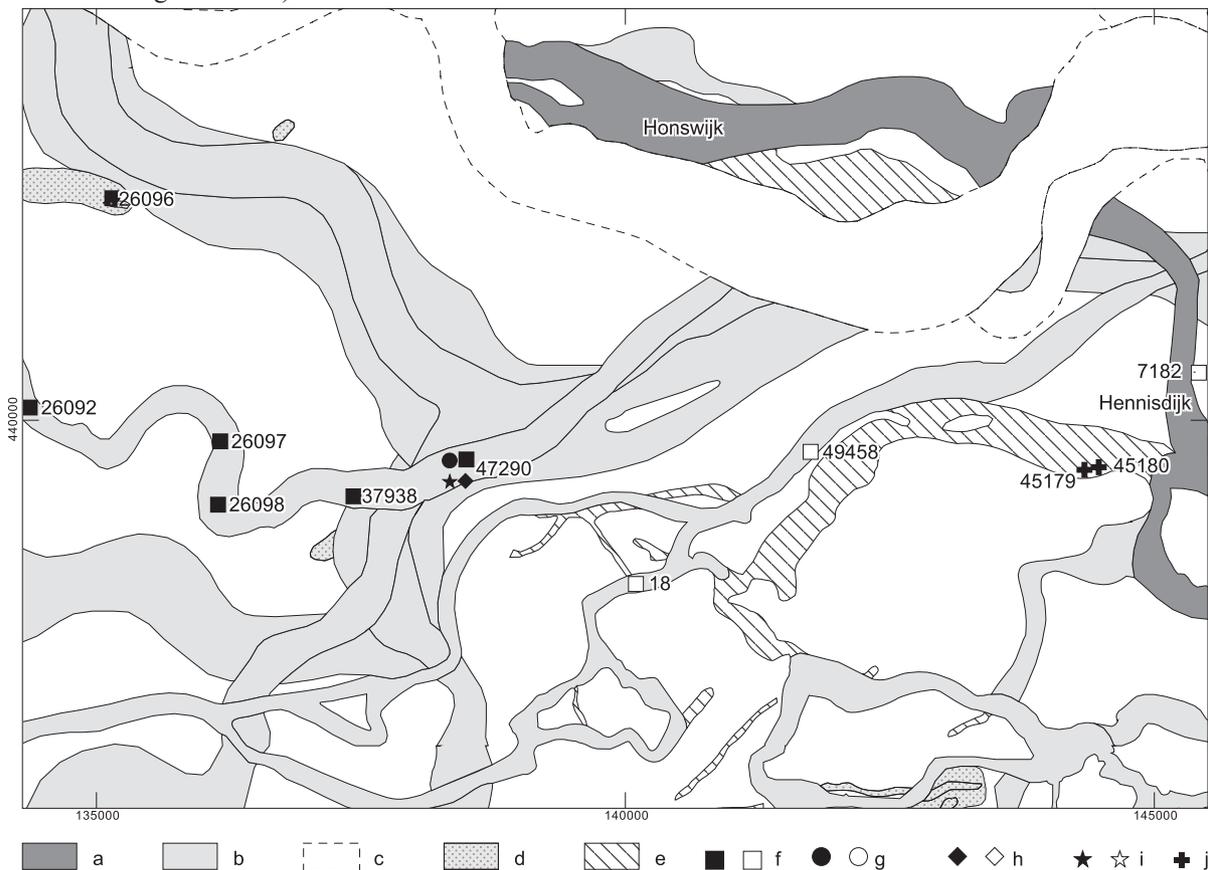


Fig. I.8 Fluvial systems and find-spots datable to the Middle Bronze Age (-B), (filled symbols are certain identifications, outlined symbols uncertain identifications) in the Zijderveld macro-region.

a: fossil fluvial systems, b: younger fluvial systems, c: aeolian (river) dunes, e: crevasse deposits of unknown age, f: ceramics, g: features, h: botanical remains, i: zoological remains, j: corings with archaeological remains.

Presumably, the Schoonrewoerd deposits within the Zijderveld macro-region were also occupied during the Middle Bronze Age-B, but evidence is not as clear-cut as for the Zijderveld stream ridge. A minimum of 24 Bronze Age sherds were found in the finds-layer and in later Iron Age features at the site ‘Culemborg - Den Heuvel’ (fig. I.8, no 18; Arnoldussen & van Zijverden 2004, 65-66; Sloos 1988, 20; table 11) but these sherds could date both to the Early and/or to the Middle Bronze Age. The single Bronze Age sherd discovered during fieldwalking of a plot called ‘Culemborg - Voorkoop’ cannot be related to any specific fluvial system (fig. I.8, no 7182; Louwe Kooijmans 1974, 373, no 101; Archis 7182). The same applies to the finds-layers discovered in two corings executed at ‘Culemborg - Lanxmeer’, which are cautiously dated (based on their depth, at 50-130 cm below the surface) to the Bronze Age or Iron Age (fig. I.8, nos. 45179-45180; Odé & Haartsen 1998; Archis 45179-45180; *cf.* Huis in ‘t Veld 2004). Downstream of the Zijderveld macro-region, several find-spots with evidence for human activities during the Middle Bronze Age on the Schoonrewoerd levee deposits are known (Louwe Kooijmans 1974, 364-367, nos. 26-28, 37, 39, 41, 43, 49, 52, 4, possibly on Schoonrewoerd crevasses: nos. 55 and 56).

In conclusion, there are many indications for human presence and occupation of the Zijderveld macro-region during the Middle Bronze Age-B. Most find-spots, nonetheless, cannot be used to shed light on the exact nature of the Bronze Age occupation, as features were often absent and the distinction between ‘culture layers’, ‘finds-layers’ and ‘vegetation horizons’ was not always made. Luckily, the consecutive excavation campaigns at Zijderveld can be used to shed light on Bronze Age settlements in this region during the Middle Bronze Age-B.



Fig. I.9 House-site one of Zijderveld (see fig. I.6 for an overview).

a: not excavated, b: features associated with structures, c: features not associated with structures.

The Zijderveld excavations have uncovered four Bronze Age house-sites and various structures and features normally encountered on Bronze Age settlement sites such as granary-type outbuildings, pits, wells, ditches, fences of various types and pits. The presence of shallow features such as hoof-imprints and stake-holes indicates that the feature preservation was excellent in parts. The construction wood of various outbuildings and houses has also been partially preserved (Hulst 1967a, 5; Theunissen & Hulst 1999b, 175-177; Vermeeren 2005), allowing for direct radiocarbon and dendrochronological dating (Knippenberg & Jongste 2005, 17). Nonetheless, some erosion of the Bronze Age occupation levels appears to have occurred and although the lowermost parts of the Bronze Age vegetation horizon are nearly always preserved, a well developed finds-layer was absent in most trenches (but see fig. I.17).

One house-site from Zijderveld was already known (Hulst 1975a; Hulst & Theunissen 1999b) and the 2004 excavations have uncovered three additional house-sites. This first known house-site comprises a large (over 30 m) farmhouse with a plethora of granary-type outbuildings in the direct (< 25 m) vicinity (fig. I.9). This farmhouse was interpreted as having been extended in an eastward direction (Hulst 1975a, 103; Theunissen & Hulst 1999b, 160), but a measuring error during archaeological fieldwork may also have caused the irregular plan (*cf.* Theunissen & Hulst 1999b, 160). If the house truly ever was extended, one would expect to have found traces of the former wall-stakes, entrance portal and a roof-bearing post where now none were discovered (fig. I.10; the location of features that may be expected if the house had been extended are indicated in light gray). Nonetheless, the clear doubling of many of the roof-bearing posts indicates either large scale repairs or consolidations, or may alternatively be related to the construction of an attic (Theunissen & Hulst 1999b, 160-162).



Fig. I.10 House one of Zijderveld.

a: not excavated, b: features associated with house one, c: hypothetical features associated with house one, d: features not associated with house one.

There is no direct dating evidence available for this farmhouse or any of the structures and features in the direct vicinity. This makes it complicated to determine which outbuildings functioned contemporaneous with the farmhouse. The majority of granaries conform in orientation to that of the longhouse and – save for one six-post structure that crosscuts the southernmost eaves-drip ditch – do not overlap with the farmhouse ground plan. The dense concentration of postholes to the south of the western end and central part of the farmhouse implies that numerous additional structures must have been present, but that they could not be interpreted as outbuildings with sufficient reliability (*i.e.* they were not identified by Theunissen & Hulst 1999b, 163-167). The recurrent placement of single-stake types of fences – defining rectangular plots with rounded corners – is interpreted as delimiting Bronze Age farmsteads (Theunissen & Hulst 1999b, 169; Knippenberg & Jongste 2005, 58; 63; 124). In that case, many of

the granary-type outbuildings to the east of the farmhouse on house-site one may not have been part of the farmstead suggested by these fences. Nonetheless, they too seem to conform in orientation to the farmhouse, which itself may have been aligned to the trajectory of the Zijderveld residual gully. One of the most typical aspect is the recurrent rebuilding and overbuilding of the granaries (fig. I.11), testifying to a persistently adhered to vision of structuring the farmhouse surroundings.

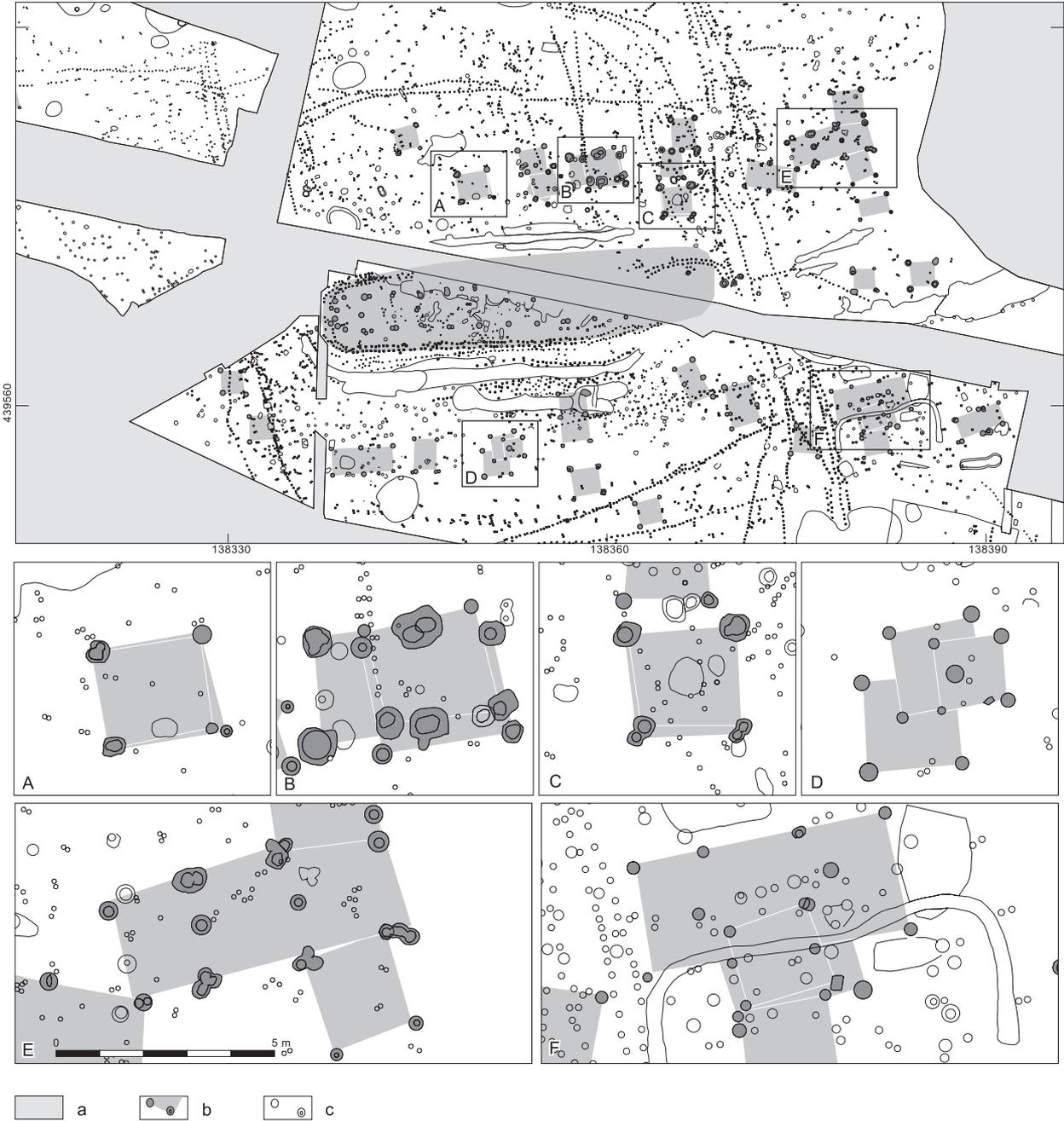


Fig. I.11 Granary-type outbuildings rebuilt on house-site one.
a: not excavated, b: features associated with a structure, c: other features (A to F all to same scale).

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House-site two is located directly to the west of house-site one but the presence of modern drainage ditches and a dirt road prohibited the excavation of the two house-sites in a continuous trench. These ditches also have disturbed the central part of the 19 m long farmhouse, which is orientated at a right angle to all other Bronze Age houses in the excavated area. To the west, north and east of the farmhouse single four-post outbuildings are found, whose orientation matches that of the farmhouse (fig. I.12).

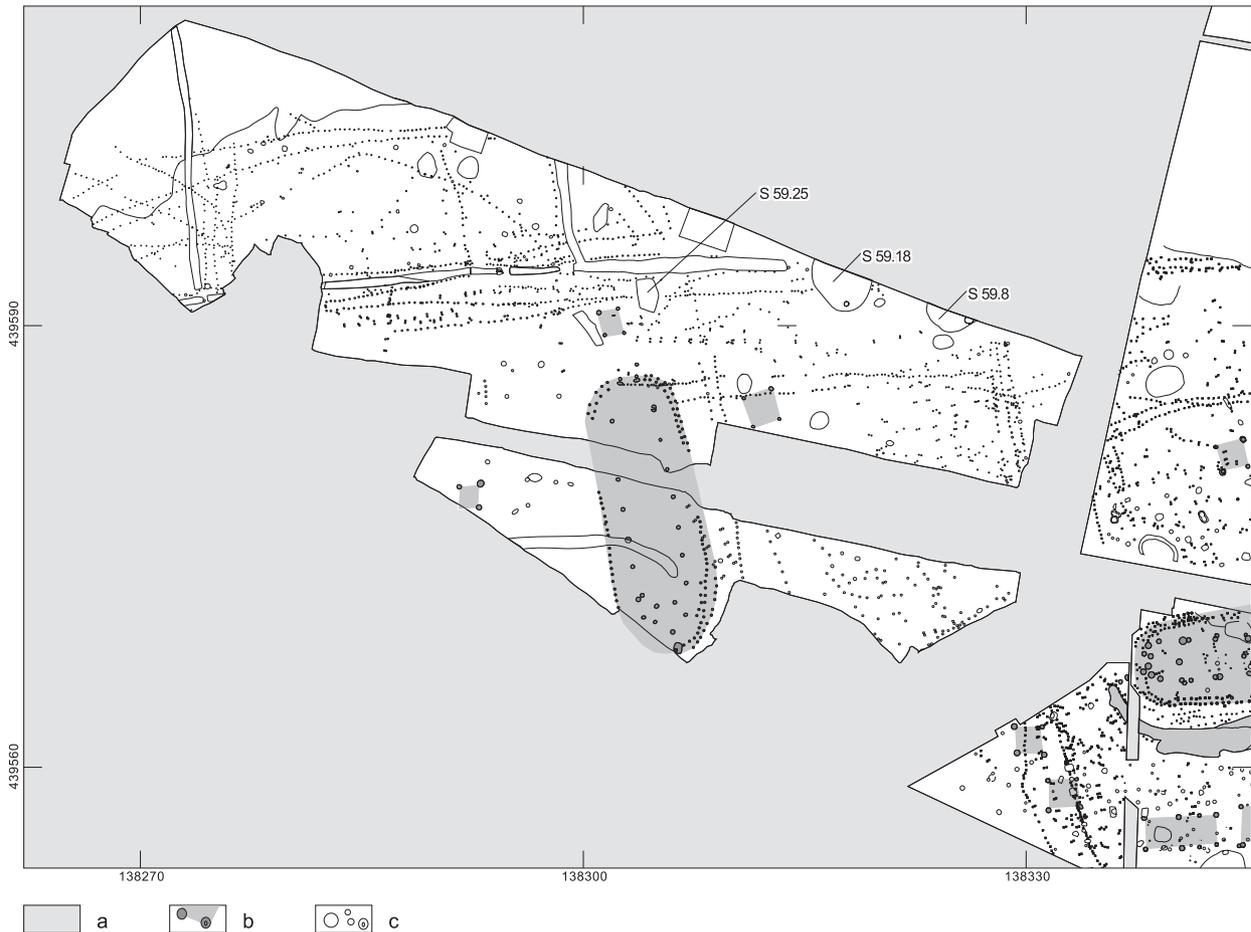


Fig. I.12 House-site two of Zijderveld.

a: not excavated, b: features associated with structures, c: features not associated with structures.

In the vicinity of the house, several larger features were found that could be identified as drinking pools for cattle (fig. I.12, S59.8 and S59.18) and as a well (fig. I.12, S59.25; Knippenberg & Jongste 2005, 63-65; Bakels 2005, 115). A fragment of *Salix* charcoal from feature S59.8 was dated to *c.* 1410-1130 cal BC (GrA-27173: 3040 ± 35 BP; Knippenberg & Jongste 2005, 17).

House-site three is located *c.* 75 meter to the southeast of house-site one (fig. I.13). It can be identified by a large (29.5 m) longhouse with dug 'eaves-drip' ditches and entrance portals in the short sides. The longhouse may have been orientated parallel to the trajectory of the Zijderveld residual gully, which is located 32 m to the southeast of it. Many of the postholes of the house still contained parts of the oak and alder posts (Vermeeren 2005, 112). One alder post was radiocarbon dated to *c.* 1460-1310 cal BC (fig. I.13, S67.53; GrN-28929: 3120 ± 30 BP; Knippenberg & Jongste 2005, 17). Two oak posts could be dated by dendrochronology to 1421 ± 5 cal BC and 1396 ± 6 cal BC respectively (estimated felling dates; fig. I.13, S67.42 and S67.34; Knippenberg & Jongste 2005, 17). It seems probable that the house was erected between 1426 and 1390 cal BC. An alder post from feature S67.21 however, radiocarbon

was dated to *c.* 1390-1120 cal BC (GrN-28932: 3025 ± 30 BP; Knippenberg & Jongste 2005, 17). This can indicate two things: either the assessments of the felling dates are too confined and the entire house was built somewhere around 1390 cal BC, or alternatively – and this is the option favoured by the excavators – that the feature represents a repair or reinforcement of the eastern entrance at least a decade after the erection of the house (Knippenberg & Jongste 2007, 125, *cf.* Arnoldussen 2008, section 3.4.2).

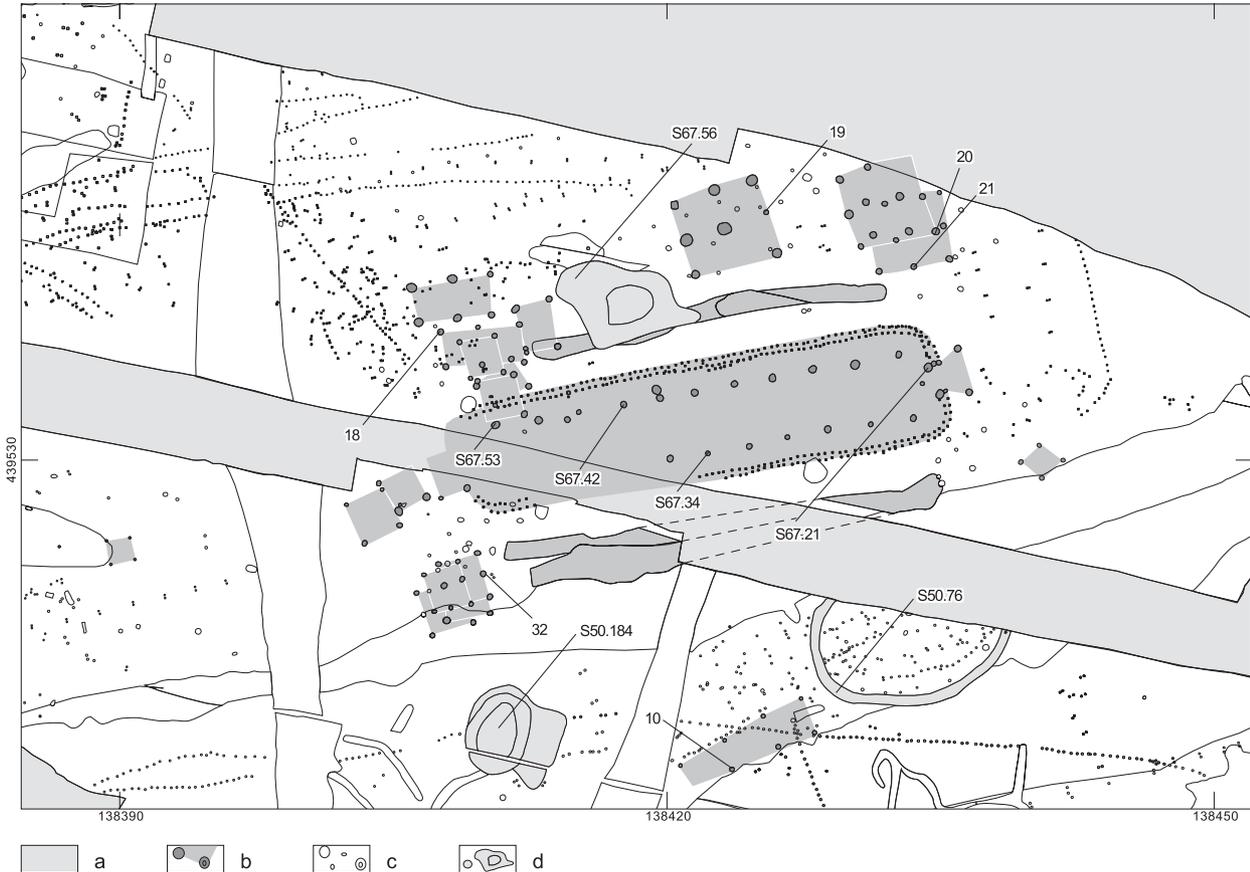


Fig. I.13 House-site three of Zijderveld.

a: not excavated, b: features associated with structures, c: features not associated with structures, d: pits and ditches associated with house-site (the lines connecting the labels indicate the features dated).

Around this longhouse, nineteen outbuildings have been reconstructed, of which five have been radiocarbon dated. Besides two four-post granary-type outbuildings that cross-cut the ground plan of the farmhouse, most outbuildings may have been contemporaneous. An oak post from a nine-post outbuilding was dated by dendrochronology to 1483 ± 6 cal BC (estimated felling date; fig. I.13, no 19; Knippenberg & Jongste 2005, 17), which is several decades older than the estimated erection of the farmhouse. It is plausible that older (re-used construction) wood was used for the construction at the time of use of the farmhouse (*cf.* Traube 1980, 295; Waterson 2003, 45; Janowski 2003, 102). The structural similarity of this outbuilding to outbuildings 20 and 21 may be an additional argument for this. Outbuilding 20 yielded an *Alnus* post that was radiocarbon dated to *c.* 1430-1260 cal BC (GrN-28927: 3080 ± 30 BP; Knippenberg & Jongste 2005, 17) and an oak post from the overlapping outbuilding 21 was dated by dendrochronology to 1374 ± 5 cal BC (estimated felling date; Knippenberg & Jongste 2005, 17). If we compare the date established for outbuilding 21 to the dendrochronological dates for house three, it is clear that this structure was probably erected between 27 and 57 years after the construction of the house.

Two six-post outbuildings were reconstructed directly north of the western end of the farmhouse. An alder post from one of these (fig. I.8, no 18) was radiocarbon dated to *c.* 1440-1260 cal BC (GrN-28933: 3110 ± 30 BP; Knippenberg & Jongste 2005, 17). In this part of the house-site, many other four-post granary-type outbuildings were reconstructed, which cannot all be contemporaneous to either the house or the six post outbuilding labelled no 18. One four-post granary overlaps with the house wall, whereas another cross-cuts the eaves drip gully, implying that it will have been later than the erection of the house. A similarly young age may apply to two four-post outbuildings situated directly in front of the western short side entrance to the house. It should be noted that several of these granary-type outbuildings differ slightly in orientation from the farmhouse and the outbuildings presumably contemporaneous to it. Directly to the south of the eastern farmhouse entrance, another cluster of four overlapping four-post outbuildings is found. No wood had been preserved, but a charred sloe prune (*Prunus spinosa*) from a posthole of outbuilding 32 was radiocarbon dated to *c.* 1430-1260 cal BC (GrA-27191: 3085 ± 35 BP; Knippenberg & Jongste 2005, 17). As context reliably of the sample may be questioned, this date at best does not oppose the assumption that these outbuildings too may have been (successively) contemporaneous to the farmhouse. The same applies to a *Salix* fragment from a posthole of the eight-post outbuilding 10 which was radiocarbon dated to *c.* 1430-1260 cal BC (GrN-28931: 3090 ± 30 BP; Knippenberg & Jongste 2005, 17).

Besides post-built structures, three other features on house-site three yielded datable material. Two of them are interpreted as drinking pools for cattle (fig. I.13, features S50.184 and S67.56). Feature S50.184 actually cross-cuts an older feature, also interpreted as a drinking pool. This explains the irregular shape of the feature in the excavation plan. A willow fragment from about halfway the cylindrical, one meter deep, youngest feature was dated to *c.* 1530-1300 (GrN-28928: 3150 ± 50 BP; Knippenberg & Jongste 2005, 17). The northern drinking pool (S67.56) is interpreted as cross-cutting the northern eaves-drip ditch (Knippenberg & Jongste 2005, 44; 64, *cf.* Arnoldussen 2008, section 5.6). It may, however, also be argued that the shape of this feature respects the location and form of the eaves-drip ditch, and the excavators also argue that the presence of this pit may explain the absence of the second phase of ditch digging documented at the southern side of the house. It is very well possible that when either sand or clay was needed (renewal of the wall plaster? *cf.* Knippenberg & Jongste 2005, 69) or when the draining capacity of the (silted-up) ditches had to be enlarged, a ditch was dug to the south of the house, whereas to the north a drinking pond for animals was created, that was fed by the rainwater coming from the northern roof's watershed. The two larger outlined features attached to S67.56 to the north are areas with hoof-imprints from cattle, strengthening the proposed interpretation as a drinking pool. In the botanical studies undertaken of the fills of these pools, plants indicating wet, trodden watersides dominate (Bakels 2005, 115). If the assumption that this drinking pool did not belong to the initial lay-out of the house-site holds true, the dating of this pit can also inform us on the use-life of this house-site. An alder fragment from the lowermost fill was radiocarbon dated to *c.* 1440-1210 cal BC (GrN-28930: 3090 ± 40 BP; Knippenberg & Jongste 2005, 17). A discarded fragment of a worked oak post could be dated by dendrochronology to *c.* 1345 BC (estimated felling date; Knippenberg & Jongste 2005, 17). This implies that this drinking pool was filled-in between 51 and 76 years after the erection of the farmhouse; twice the lifespan normally assumed for prehistoric farmsteads (Arnoldussen 2008, section 3.4.2).

The final dated feature from this house-site is an oval feature indicated as S50.76. Circular structures on Bronze Age settlement sites usually represent barrows (Arnoldussen 2008, section 8.2.3.3) or drainage ditches around drying or storage structures for cereals (Buurman 1996a) but here no positive indicators of such functions (no grave, no mound body, no botanical remains) were found (Knippenberg & Jongste 2005, 72-73). The charred fragment of willow from the fill dated to *c.* 1410-1190 cal BC (GrA-27174: 3050 ± 35 BP; Knippenberg & Jongste 2005, 17) which leaves open the option to regard it as a part of house-site three.

The fences at this house-site do not clearly indicate the extent of a farmstead. Although most conform in orientation to the residual gully and the house – or run at right angles to them – some display a deviating orientation and a single stake from within the circular feature was dated to the Late Bronze Age (see below). This suggests that not all are contemporaneous to the house. Furthermore, a fence consisting of generally somewhat larger (15 cm diameter) posts placed at 2-2.1 m interval overlaps with outbuilding 19, but might be older as well as younger. The fact that feature S50.184 cross-cuts a single-stake type of fence may indicate that some landscape structuring with fences predated the erection of the farmhouse and its associated outbuildings.

To the west of the A2 motorway, and to the south of the residual gully, a fourth house-site was discovered. Here, a remarkably small (14 m length) farmhouse and three granary-type outbuildings could be reconstructed. Charcoal of an alder tree from posthole S14.3 was radiocarbon dated to c. 1520-1310 cal BC (GrA-27192: 3140 ± 40 BP; Knippenberg & Jongste 2005, 17). The postholes of the outbuildings around this house appear rather small – perhaps too small to support the rather large outbuilding to the north of the house? – in diameter compared to those of outbuildings to the north of the residual gully.

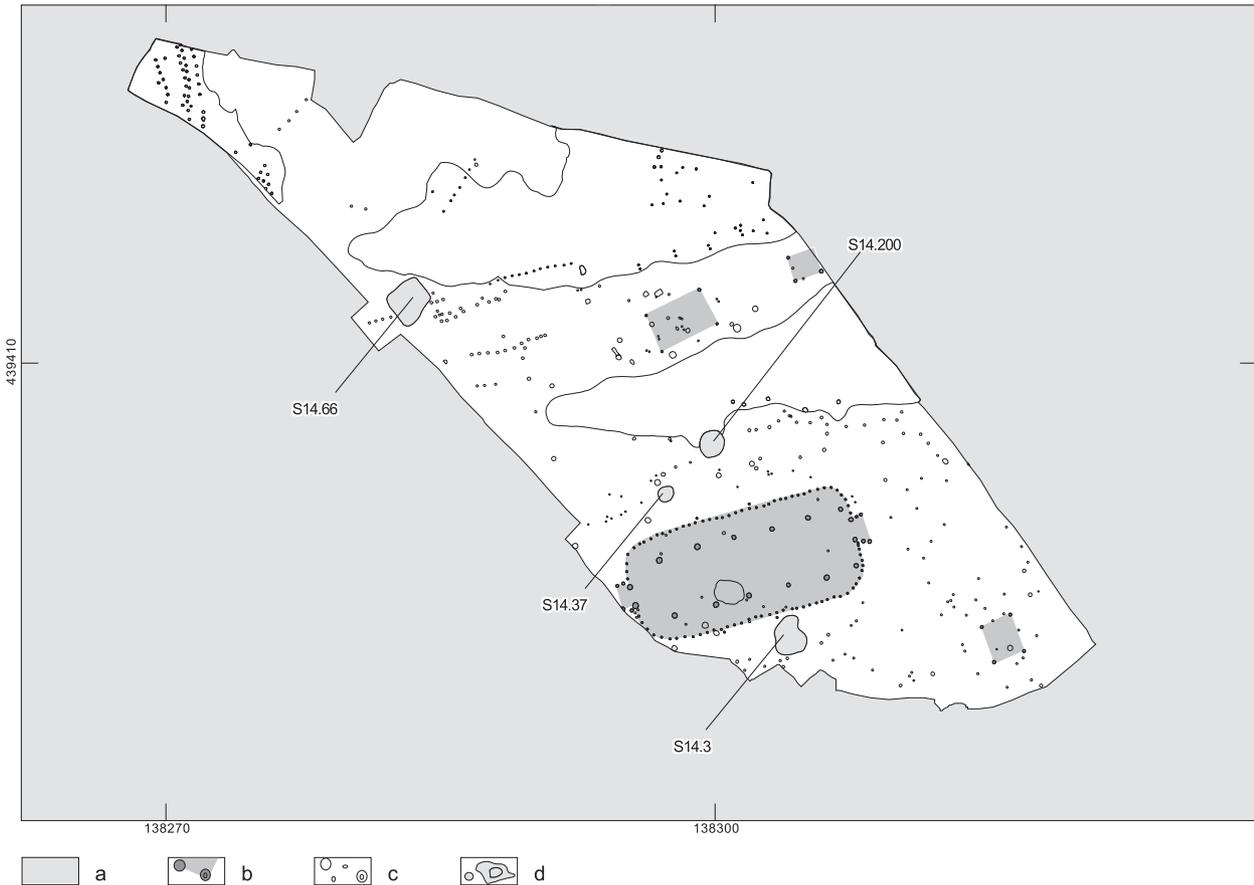


Fig. I.14 House-site four of Zijderveld.

a: not excavated, b: features associated with structures, c: features not associated with structures, d: pits and wells associated with house-site four.

A 1.3 m deep well (fig. I.14, feature S14.66) with indications of a construction for drawing water was found 17 m to the northwest of the house (see Arnoldussen 2003, 29-30; Knippenberg & Jongste 2005, 66). An unworked fragment of alder from within the well was radiocarbon dated to c. 1520-1400 cal BC (KiA-21028: 3174 ± 25 BP; Arnoldussen 2003, 30). This well cross-cuts a single stake type of fence, making it unlikely that both features formed part of a single house-site phase. The pits indicated as S14.37 and S14.3 on fig. I.14 were 50 and 15 cm deep respectively and both contained some finds, but not sufficient to assume a (secondary) function as refuse dumps. Feature S14.200 contained two concentrations of burned clay and some burned bone. However, in the absence of layers of ash, charcoal or a distinctive boundary with indications of burning, the claimed interpretation as a hearth or pit for burning should be refuted (*contra* Knippenberg & Jongste 2005, 67)

In addition to the information on the structure of the four house-sites already referred to above, the Zijderveld excavations offer also a picture of what happened outside them. The landscape outside (if prehistoric people ever felt such a distinction) the house-site appears systematically and extensively parcelled, with systems of fences traceable

APPENDIX I: ZIJDERVELD

over hundreds of meters. Unfortunately, these fences cannot be dated accurately and feature interrelations have shown (see above) that fences have been erected prior, during and after the late 15th early 14th century phase of Bronze Age occupation. One willow stake from a single-stake type of fence placed perpendicular to the direction of the residual gully (S22.69, see fig. I.19 for location) was radiocarbon dated to *c.* 1420-1210 cal BC (GrN-28924: 3060 ± 35 BP; Knippenberg & Jongste 2005, 17). Ditches were also used in structuring the landscape, but they too are difficult to date. The generally small (width 50-100 cm) and straight ditches both cross-cut and are cross-cut by single stake types of fences whose orientation they often conform to. If we assume these ditches to have belonged to the same system as the curvilinear ditch on house-site two that cuts across a post of the house (fig. I.12), the ditches may all be younger than the farmhouses, but certainly do not represent the final phase of landscape structuring.

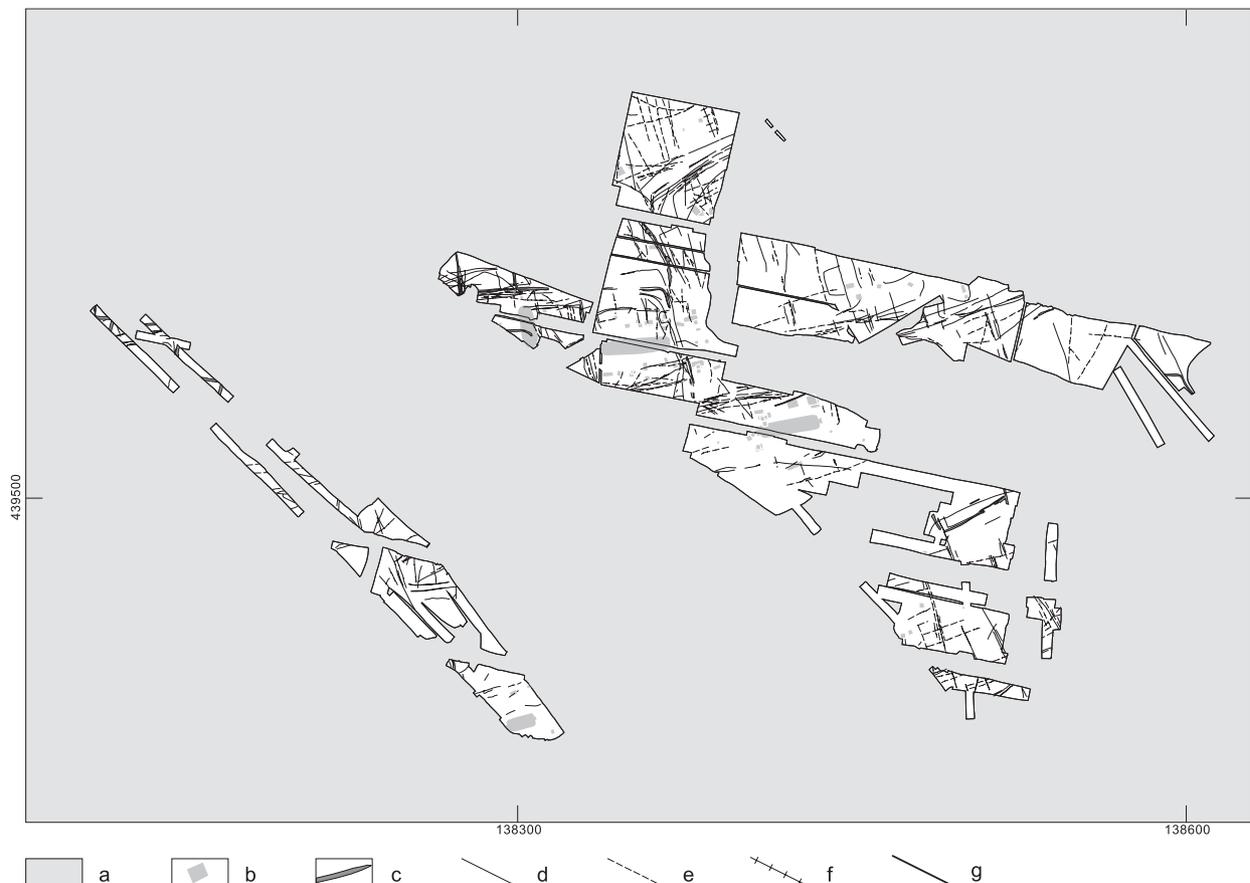


Fig. I.15 Overview of fences and possible Bronze Age ditches at Zijderveld.

a: not excavated, b: structures, c: ditches, d: single-stake type fences, e: double-stake type fences, f: type 1b fence, g: possible palisade.

Outbuildings are also found at considerable distances from the house(-site)s. Both six- and four-post types of outbuildings are represented. They often occur in areas of low feature density (save for traces of fences), suggesting that these areas might be gardens or meadows. The orientation of these outbuildings appears to be more varied than that of those near to the houses. Generally, these outbuildings are not rebuilt and not often overbuilt. The granaries shown on figure I.16 (overleaf, inset B) are an exception, but they may have belonged – because of their location near the excavation limits – to a not yet uncovered Bronze Age house-site. An alder post of the nine-post outbuilding depicted as fig. I.16 A; f, was radiocarbon dated to *c.* 1450-1130 cal BC (GrN-6404: 3065 ± 55 BP; Theunissen & Hulst 1999b, 158).

APPENDIX TO: A LIVING LANDSCAPE. BRONZE AGE SETTLEMENT SITES IN THE DUTCH RIVER AREA

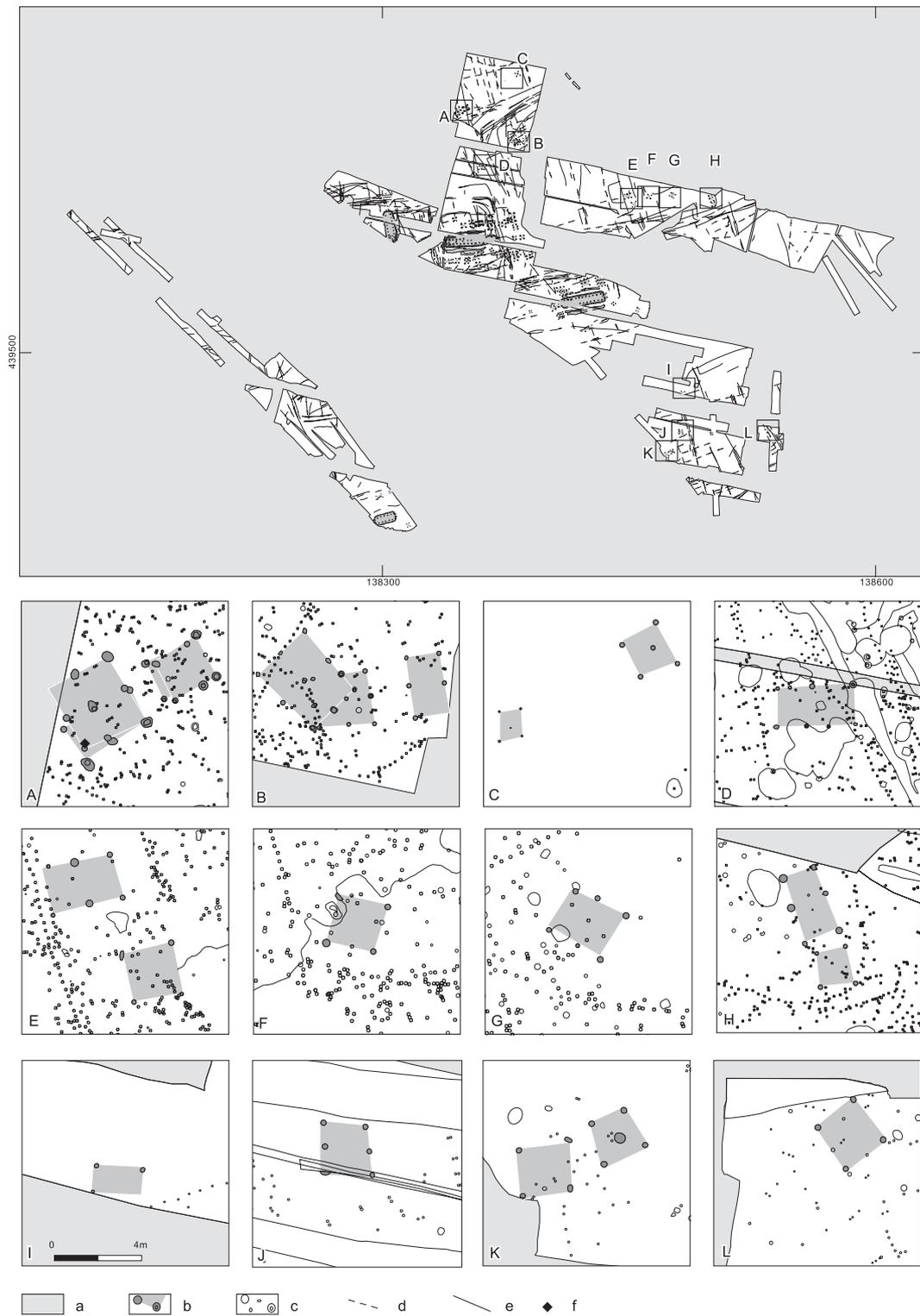


Fig. 1.16 Overview of isolated outbuildings at Zijdeveld (A to L all on same scale, see I).

a: not excavated, b: features associated with structures, c: other features, d: double-stake type fences, e: single-stake type fences, f: radiocarbon dated post.

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Some isolated pits were possibly dug at considerable distance from house(-site)s. Near the centre of the excavation at the (south)west side of the A2 motorway a clustering of pits was discernible (fig. I.17). These pits are generally 7-42 cm deep and – save for some charcoal in S24.13 – empty. The 22 cm deep pit labelled S10.1 discovered under the finds-layer contained some sherds (n = 61, total 112 g), some small pebbles, burned clay and few bones.



Fig. I.17 Overview of pit cluster and dated fence stake (s22.69) at Zijderveld.

a: not excavated, b: minimal extent of preserved finds-layer, c: other features, d: pits and wells.

Nearby, a 92 cm deep well was found (fig. I.17, S19.8), of which a willow fragment was radiocarbon dated to *c.* 1520-1390 cal BC (GrN-28925: 3180 ± 35 BP; Knippenberg & Jongste 2005, 17). This well is assumed to be part of yet another Bronze Age house-site situated outside the excavated area (the presence of a find-rich vegetation horizon in this part of the excavation is used as an additional argument; Knippenberg & Jongste 2005, 31; 127).

The numerous radiocarbon and dendrochronological dates for structures, pits and wells have already been introduced above. In the recovered artefacts, there are no objects that allow for a revision of sharper definition of the occupation phases. The ceramics are sparsely (< 1%) decorated in generic Bronze Age techniques and motifs (Van Beek 2005, 79-80) and flint and stone objects typologically datable to the Bronze Age are absent (Knippenberg 2005).

Evidence for crop cultivation at Zijderveld during the Middle Bronze Age is limited. Both charred and unburned preserved botanical remains were rare (Bakels 2005, 114-115). Two charred fragments of hulled barley (*Hordeum vulgare*), one chaff fragment of emmer wheat (*Triticum dicoccum*) and single *Cerealia* and *Brassica* fragments were recovered from different samples (Knippenberg & Jongste 2005, 148). During the 1960's and 1970's excavations, barley and emmer wheat were also identified (Theunissen & Hulst 1999b, 178). A high peak of *Cerealia*

pollen from the residual gully associated with the Middle Bronze Age phase was identified by De Jong (1970-1971, 80; 83). An identified quern runner stone also suggests cereal processing on the site (Knippenberg 2005, 86-87). In various parts of the site, spade marks were encountered, but they cannot be dated with certainty to the Bronze Age and may be associated with later (Early Iron Age) use of the site (see fig. I.18; Hulst 1967a, 5-6; Arnoldussen 2002, 36). Whereas the spade marks in smaller transects may represent drainage systems, the more extensive spade marks near the Iron Age house might be related to crop cultivation. Animal husbandry, by contrast, is well documented. Hoof imprints of cattle could be identified in various parts of the excavation, and the association of these features with the drinking pool on house-site three has already been mentioned.

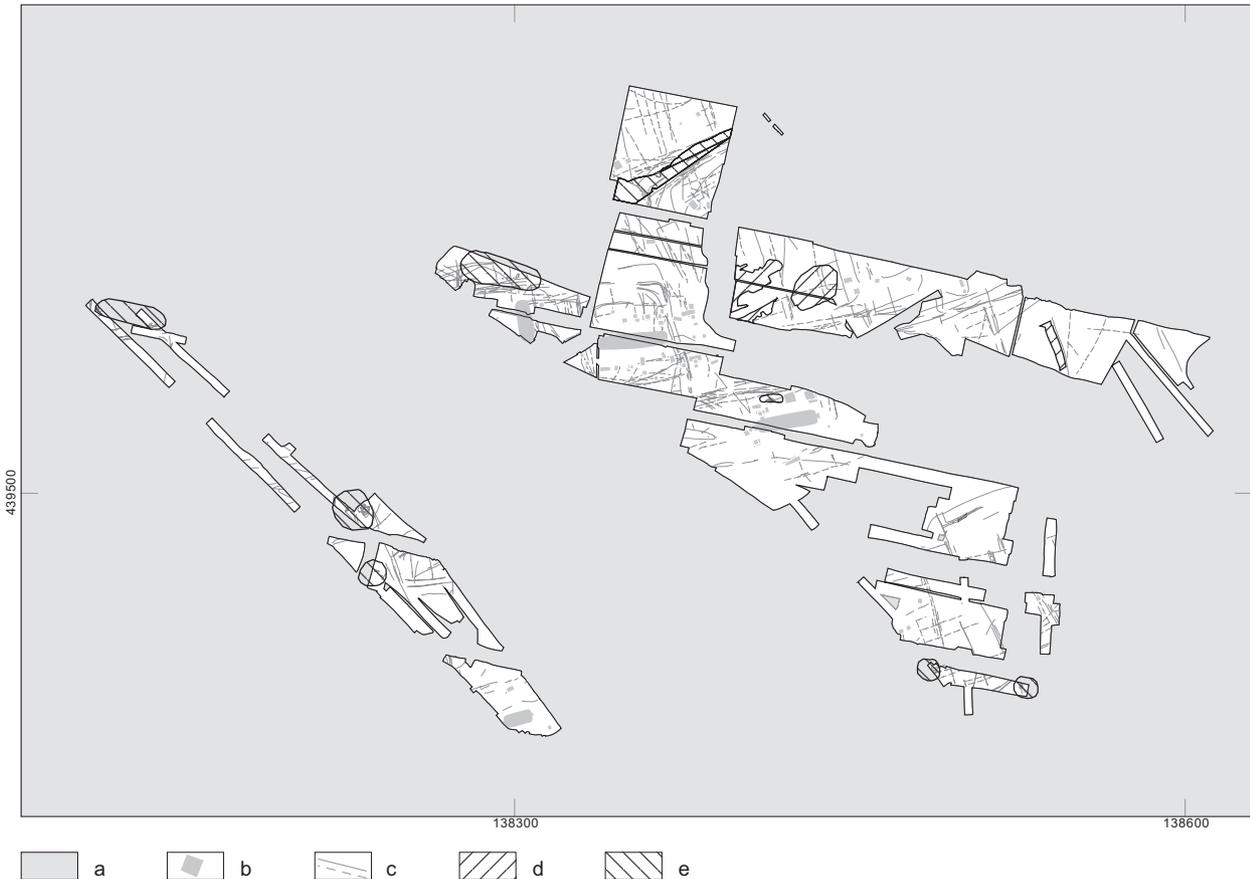


Fig. I.18 Overview of hoof imprints and spade marks at Zijdeveld.

a: not excavated, b: structures, c: fences, d: spade marks (presumably Iron Age), e: hoof-imprints (Bronze or Iron Age).

Bones from domestic animals (as well as a few antler fragments and a beaver tooth) have been recovered from features in various parts of the excavation. Cattle is dominant in number (94 %) and supplemented by small numbers of pig (3%), sheep/goat (2%) and a handful of bones of dogs and horses (Arnoldussen & Fontijn 2006, 299 fig. 8; based on Theunissen 1999, 254; Clason 1999, 39; Cavallo 2005). Phosphate mapping was undertaken within two of the houses, but the indications for functional differences within the house plans are inconclusive (Oonk 2005). Cut marks were identified on some bones of cattle and sheep/goat (Cavallo 2005, 91). Hunting and fishing are thought to have formed only a marginal part – if at all – of the subsistence strategies (Cavallo 2005, 99; Knippenberg & Jongste 2005, 122).

The artefacts recovered hint at the normal ranges of Bronze Age agricultural activities. A possible flint scraper may have been used in hide processing (Knippenberg 2005, 85) and some possible grinding and hammering stones were found (Theunissen & Hulst 1999b, 175; Knippenberg 2005, 86-87). Bone or ceramic artefacts (other than

pottery) are absent. Although no metal axes were recovered, their former presence is vividly illustrated by the tool marks discernible on various preserved post stumps (Vermeeren 2005, 108-111). Several different (types of) axes were used to erect the longhouse of house-site three and the surrounding outbuildings (possibly five different axes; Knippenberg & Jongste 2005, 123), implying that either such large numbers of axes were available to the occupants or that those helping in building the house brought their own axes.

Distribution analyses of the various remains shows that generally find densities are low and that most materials originate from larger features such as ditches, drinking pools, larger pits and some postholes (Knippenberg & Jongste 2005, 28-33). A find-rich vegetation horizon was preserved only in the relatively lower-lying area near trench 10 (see fig. I.17). In other areas, only the lowermost part of the vegetation horizon was found, which had much less material trampled into it. The absence of the (finds-rich) topmost part of the vegetation horizon (the Bronze Age surface layer) may be attributed to the second reactivation of the Zijdeveld residual gully (see below). This may have caused sheet-flow (Chorley, Schumm & Sugden 1984, 260; Collinson 1996, 58) of the topmost part of the surface layer, washing it nearly completely away into the lower-lying areas of the floodbasin (*cf.* Van Zijverden 2002a, 70).

The residual gully may in the earliest phases have inspired the orientation of fences and house-sites. In various parts of the excavations, fences were found that followed and perhaps delimited the residual gully. At the time of the Bronze Age occupation, peat growth had already filled-up the Zijdeveld residual gully as well as the parts reactivated prior to the Middle Bronze Age occupation (Van Zijverden 2003a; Van Beurden *in prep.*). Some of the crevasse gullies that were formed from the Honswijk - Hennisdijk fluvial system may have provided a link to the mayor waterways and if not, the main channels – located at 3.5 and 7 km to the north and east – of these active fluvial systems certainly did. Downstream, the levee deposits of the Zijdeveld system were overgrown with peat or covered with clay (Berendsen & De Jong 2003), but on the higher parts (as well as on the crevasse and levee deposits of the Schoonrewoerd fluvial system nearby) some alder, willow and poplar trees were growing (Theunissen & Hulst 1999b, 175; Bakels 2005; Vermeeren 2005). The presence of hoof-imprints and other plant remains indicate that in various smaller patches well-trodden wetter areas existed (Theunissen & Hulst 1999b, 171-172; Knippenberg & Jongste 2005, 74; De Jong 1970-1971; Bakels 2005; Van Beurden *in prep.*). Larger areas of open water and marshes will have been present in the floodbasin to the north (and to a lesser extent to south) of the settlement site (Van Zijverden 2003a; Van Beurden *in prep.*).

In conclusion, the presence of four house-sites at Zijdeveld during the Middle Bronze Age-B could be established, whereas two more may be expected situated just outside the excavated area. The 2σ ranges of the radiocarbon dates from the house-site west of the A2 motorway is slightly earlier than those to the east. It cannot, however, be ascertained that this house-site was indeed established earlier (*cf.* Knippenberg & Jongste 2005, 127). It is equally well possible that all house-sites were occupied around *c.* 1400-1390 cal BC. If not contemporaneous, the erection of the sequence of house-sites shows a remarkable respect for the pre-existing landscape structuring and already present house-sites. If this was a gradually evolving cultural landscape, the values expressed in this structuring seem not to have differed greatly over time. The presence of a shared (synchronous) or rigidly adhered too (diachronous) notion of how to structure house-sites and their wider environs can be assumed.

Somewhere near the end of the 13th century BC, the Zijdeveld residual gully was again reactivated. This reactivation eroded a humic clay sediment of which the top was dated to *c.* 1690-1410 cal BC (GrN-5220: 3265 ± 60 BP; De Jong 1970-1971, 83). A sample of *Phragmites* peat from the bottom of the reactivated residual gully dated to *c.* 1210-920 cal BC (GrN-5219: 2880 ± 35 BP; De Jong 1970-1971) and another sample was dated to *c.* 1440-1250 cal BC (UtC-13082; 3085 ± 41 BP (terrestrial macro remains); Berendsen & Hoek 2005, 21). As the 2σ intervals are consecutive, we can only state that after *c.* 1410 cal BC, one – or several – reactivations took place, which have occurred between the 14th and 10th century cal BC (*cf.* De Jong 1970-1971; Van Zijverden 2003a; *contra* Berendsen & Hoek 2005, 22). Hulst noticed that in the area where the spade marks were encountered (see fig. I.18, d), they were dug into a silty to sandy layer which was deposited on top of the (Bronze Age) vegetation layer, *i.e.* covering other (Bronze Age) features (Hulst 1967a, 7; 18). Hulst interpreted a shallow gully nearby as the source from which this sediment had been washed (Hulst 1967a, 7). Perhaps these deposits are related to this period of gully reactivation. In any case, the pollen evidence shows a (short?) phase of ‘drowning’ (*i.e.* increased wetter conditions) and decreased human activity near the end of the Middle Bronze Age-B (Berendsen & Hoek 2005, 46).

Late Bronze Age

Like during the preceding periods, the main fluvial arteries actively draining the delta during the Late Bronze Age are situated outside the Zijderveld macro-region; the Houten fluvial system to the north and the Erichem fluvial system to the south (Berendsen & Stouthamer 2001, 209; 199). The two residual gully dates for the Honswijk fluvial system (see above), indicate that from the start of the Late Bronze Age period, no sedimentation from this system took place. For the Hennisdijk fluvial system, despite a residual gully date of *c.* 1370-1050 cal BC (UtC-4642: 2975 ± 35 BP; Berendsen & Stouthamer 2001, 205) activity up to the Iron Age may be assumed (*cf.* Van den Broeke 2001, 164; 166). In any case, either the Honswijk or the Hennisdijk fluvial system caused another reactivation of the Zijderveld residual gully (see above).

Evidence for human presence in the Zijderveld macro-region during the Late Bronze Age is minimal (Archis 49458 (fig. I.8, no 49458) concerns burned bone which is ‘dated’ to the Late Bronze Age-Iron Age). The excavations have not unearthed a single sherd datable to the Late Bronze Age (Theunissen & Hulst 1999b, 172-174; Van Beek 2005, 75-81). Nonetheless, some pits have been tentatively (based on feature interrelations) dated to the Late Bronze Age (Theunissen & Hulst 1999b, 159). A *populus* stake from a fence in the central eastern part of the excavation was dated to *c.* 1260-920 cal BC (GrN-28926, 2890 ± 50 BP; Knippenberg & Jongste 2005, 17, *cf.* Theunissen & Hulst 1999b, 159; GrN-5574: 2665 ± 80 BP). This fence, however, is rather fragmentary and making inferences on the nature of the Late Bronze Age landscape structuring based on this single stake is impossible.

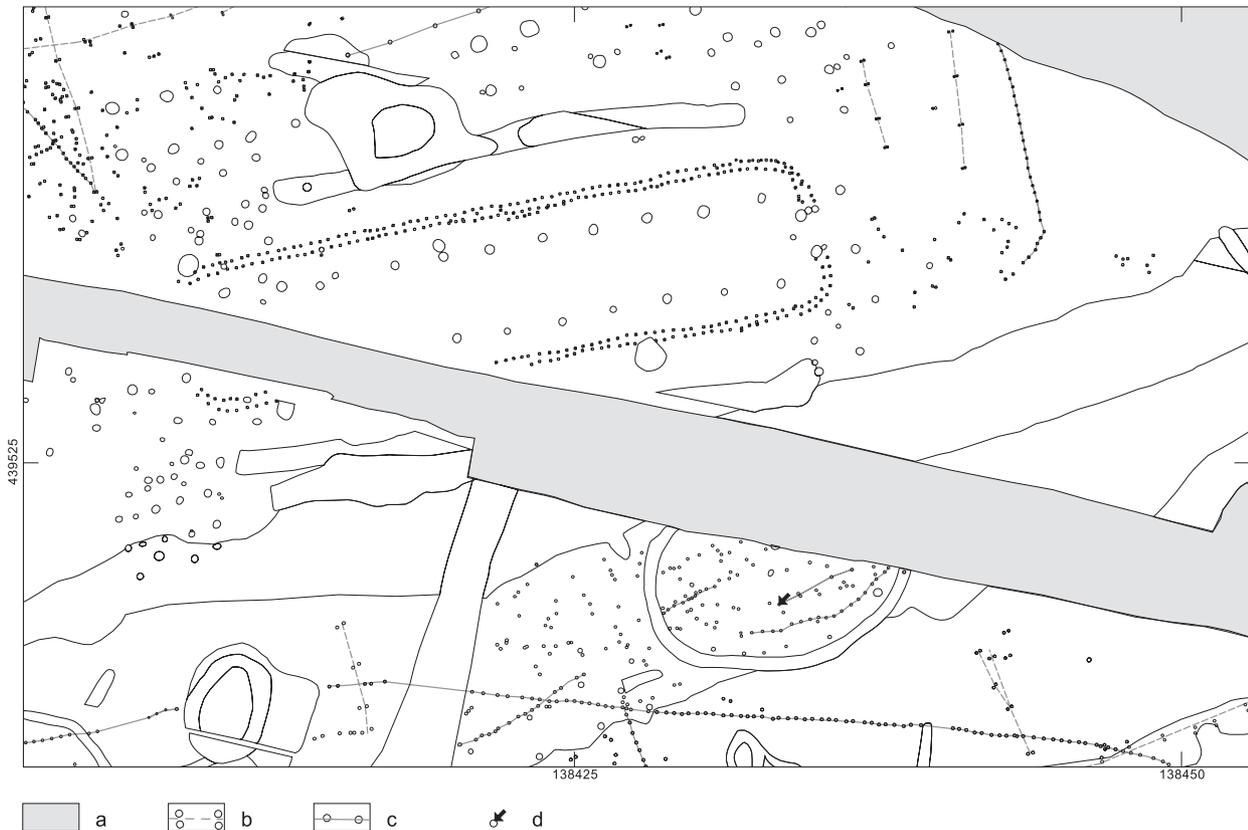


Fig. I.19 Wooden (*Populus*) stake radiocarbon dated to the Late Bronze Age at Zijderveld.
a: not excavated, b: double-stake type fences, c: single-stake type fences, d: radiocarbon dated stake.

Outside the Zijderveld micro-region, Late Bronze Age finds have been recovered as stray finds from rivers (Archis 7971; a Late Bronze Age spearhead) and from test-pits into the Schaik (Louwe Kooijmans 1974, 372, no 93; Archis 24891; Ter Wal 2005a) and the Schoonrewoerd (Louwe Kooijmans 1974, 364-369 nos. 28, 42, 49, 52) fluvial system's

deposits. Consequently, sites datable to this period can reasonably be expected to be discovered in the future on the levee- and crevasse deposits of the relatively higher parts of the Schaik and Schoonrewoerd fluvial systems within the Zijderveld macro-region.

Early Iron Age

During the Early Iron Age, the Buren fluvial system comes into being just to the east of the Zijderveld macro-region (Berendsen & Stouthamer 2001, 196). Possibly, it made use of a Lek precursor to connect downstream to the Hagestein fluvial system (Berendsen & Stouthamer 2001, 196). Within the study area itself, presumably little fluvial sedimentation – other than incidental flooding – took place. Besides human activities and occupation on fluvial deposits (see below) two late Pleistocene-Early Holocene dunes have yielded Iron Age ceramics that are indicative of human presence (fig. I.20 nos. 26096 (De Kok 1965, 122; Louwe Kooijmans 1974, 370 no 79; Archis 26096) and 24892 (De Kok 1965; Louwe Kooijmans 1974b, 371, no 92; Archis 24892).



Fig. I.20 Fluvial systems and find-spots dated to the (Early) Iron Age (filled symbols are certain identifications, outlined symbols uncertain identifications) in the Zijderveld macro-region.

a: active fluvial systems, b: fossil fluvial systems, c: younger fluvial systems, d: aeolian (river) dunes, e: crevasse deposits of unknown age, f: ceramics, g: flint implements, h: botanical remains.

Two settlement sites datable to the Early Iron Age are known; one was uncovered in the Zijderveld excavation (fig. I.20 nos. 26203 and 47290; fig. I.21; Theunissen & Hulst 1999b; Knippenberg & Jongste 2005) and the second is ‘Culemborg - Den Heuvel’ (fig. I.20 no 18; Louwe Kooijmans 1966; Sloos 1988; Arnoldussen & Van Zijverden 2004). Both excavations have yielded ceramics, radiocarbon dated samples and features that are dated to the Early Iron Age, but only at Zijderveld a clear-cut house-plan from this period was uncovered (fig. I.21, but see Arnoldussen & Van Zijverden 2004). Additionally, three radiocarbon dates for this farmhouse and the nearby nine-post outbuilding

indicate occupation during the Early Iron Age (see Theunissen & Hulst 1999b, 159 for a discussion of these radiocarbon dates).



Fig. I.21 Iron Age features at the excavations near the town of Zijdeveld. A: Early Iron Age house, B: Early Iron Age outbuilding, C: Late Iron Age brushwood trackway, D-E: ditch with Iron Age ceramics (after Theunissen & Hulst 1999b and Knippenberg & Jongste 2005).

a: not excavated, b: features and structures dated to the Iron Age, c: older or younger features, d: radiocarbon dated post.

It is very well possible that additional features at the Zijdeveld excavation which are presently dated to the Bronze Age, in reality belonged to the Iron Age phase of occupation, but conclusive evidence is lacking. The ceramics recovered in the 1970's excavation indicates occupation during the seventh century cal BC (Theunissen & Hulst 1999b, 174). A willow handle for a socketed axe may also date to the Early Iron Age (Theunissen & Hulst 1999b, 177). The sherds found during the 2004 excavation could not be dated more precisely other than 'Iron Age' (Van Beek 2005, 80).

The test-pit dug at 'Heicop - Polder Nederheicop' yielded a layer with Iron Age ceramics, on top of a layer with Bronze Age ceramics already referred to above (fig. I.20 no 26098; Louwe Kooijmans 1974, 370 no 82 'Schoonrewoerd - Overboeicop'; Pons 1951; 1961; Archis 26098). Additional coring carried out at the time of the 2004 Zijdeveld excavations also yielded Iron Age ceramics (among which a nail-impressed rim sherd) from the Schoonrewoerd levee deposits (fig. I.20, no 906).

It is clear that both the river dunes and the fossil river deposits in parts of the Zijdeveld macro-region still offered a suitable base to human occupation during this period. Remarkably, this human occupation seems to be confined to the Early Iron Age (but see Archis 26098, where the Iron Age ceramics are dated to the Middle or Late Iron Age) while it was not until the Late Iron Age – with the start of sedimentation by the Redichem and later Lek and Linge rivers – that conditions may have turned unfavourable for human occupation (Berendsen 1982, 185; Törnqvist 1993, 138; Berendsen & Stouthamer 2001, 213-216; 230). Notwithstanding this new fluvial activity, a brushwood trackway at Zijdeveld was radiocarbon dated to the Late Iron Age (fig. I.21, C; Theunissen & Hulst 1999b, 170-171).

II Palaeogeography and occupation history of the Eigenblok macro-region

I INTRODUCTION

The Eigenblok macro-region incorporates the excavations undertaken near the village of Rumpt prior to the construction of the Betuweroute freight railway, as well as a large area of the surrounding delta. In the north of the macro-region, a recent excavation of a Bronze Age settlement site necessitated by the widening of the A2 motorway is also included. Except for the results from these excavations (toponyms 'Eigenblok' and 'Enspijk-A2'), no find-spots indicating the presence of Bronze Age settlements sites are known from within this macro-region. Within the Eigenblok excavations, five Middle Bronze Age(-B) house-sites were (partially) excavated, with test-trenches connecting the various parts. Additional coring that was carried out for the palaeogeographical reconstruction of the environment around the excavation yielded eight more possible Bronze Age house-sites, which were not threatened by railway construction and which were hence not excavated. The Enspijk-A2 excavation partially uncovered three Middle Bronze Age(-B) house-sites.

History of archaeological research

Prior to the last decade, archaeological research in the Eigenblok macro-region has been limited. The Dutch Archaeological Database ARCHIS has records of stray finds (predominantly Late Iron Age, Roman period and mediaeval period finds) from the Eigenblok macro-region that have been found since 1960. They represent finds from fieldwalking campaigns executed both by the State Service for Archaeological Investigations (ROB, now RACM) as well as by amateur archaeologists (*cf.* Archis nos. 2133; 2173; 7465; 22828; 22831; 22834; 22838-22840; 22843; 25124; 43738). In the Eigenblok macro-region, test-pits or extensive excavations of sites were rarely undertaken prior to the start of the Betuweroute investigations (but see Archis 31575). The archaeological studies carried out prior to the widening of the A2 motorway, form the most recent large scale studies in the Eigenblok macro-region (Haarhuis 1998; Berendsen & De Jong 2003; Ter Wal 2004a-b; 2005a-b; Berendsen & Hoek 2005).

The geological context

The macro-region of Eigenblok is situated in a (seemingly) rather straightforward part of the Dutch central river area (fig. II.1). The two best known fluvial systems that drained this area are the Eigenblok and Hooiblok (Hooiblok, Enspijk, Gellicum) anastomosing fluvial systems. The tops of their deposits are situated relatively close to the present-day surface and have consequently been mapped in most detail. For the earlier Holocene fluvial system (Deil), much less is known about its exact location and morphology (*cf.* Asmussen & Exaltus 1993, 14; Asmussen 1994, 27). The fluvial system on which the easternmost sites of Eigenblok are situated, was only discovered by accident during the compilation of a soil compaction map prior to the railway construction (Jongste 2002a, 13).

Analysis of laser-altimetry maps of this area (Van Zijverden & Laan 2005) indicated that additional crevasse branches or fluvial systems are present beside those represented on the palaeogeographical maps of Berendsen and Stouthamer (2001). Based on re-analysis of the available data (Van Zijverden 2004b), an improved map showing the location of the fluvial deposits has been compiled (fig. II.2). As the various crevasse deposits have not been mapped or dated in sufficient detail, they have not been incorporated in the map shown below.

II SOURCE CRITICISM

Coring campaigns (soil mapping)

The first soil maps for the Eigenblok macro-region were published by Vink (1954) and Van der Sluys (1956). These soil-mapping campaigns were not targeted at finding archaeological sites, and the methodology applied (low coring density, limited depth) also partially explains why no sites were discovered in the process (Van der Sluys 1965, 1).

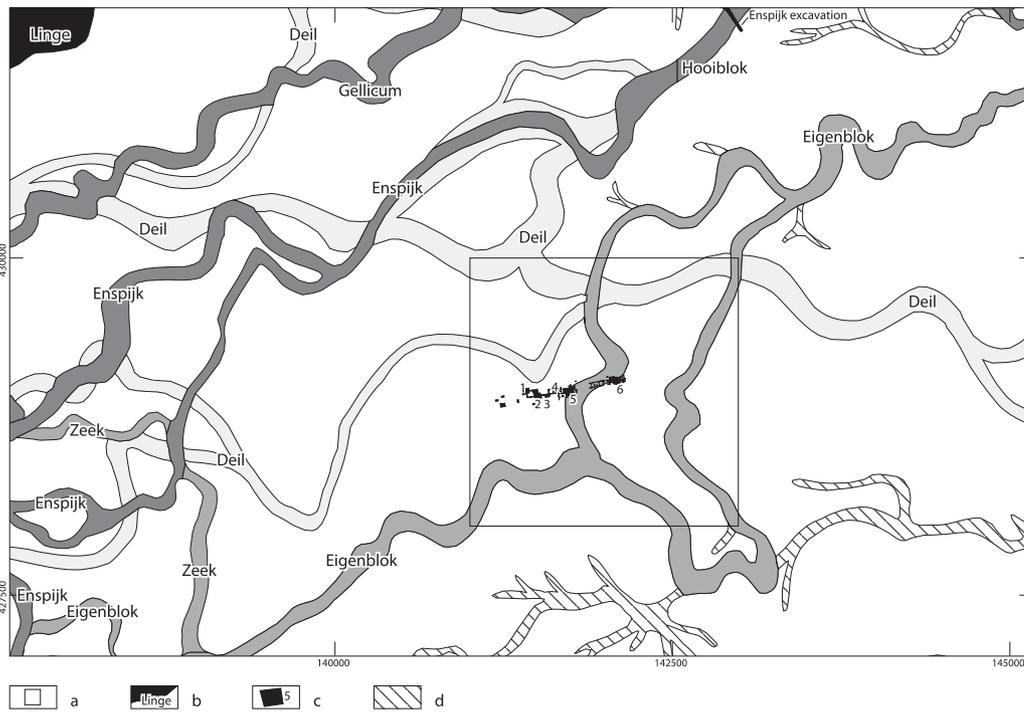


Fig. II.1 Main fluvial systems in the Eigenblok macro-region according to Berendsen & Stouthamer (2001) and Berendsen *et al.* 2001. a: meso-region, b: fluvial systems, c: excavations, d: crevasse deposits.

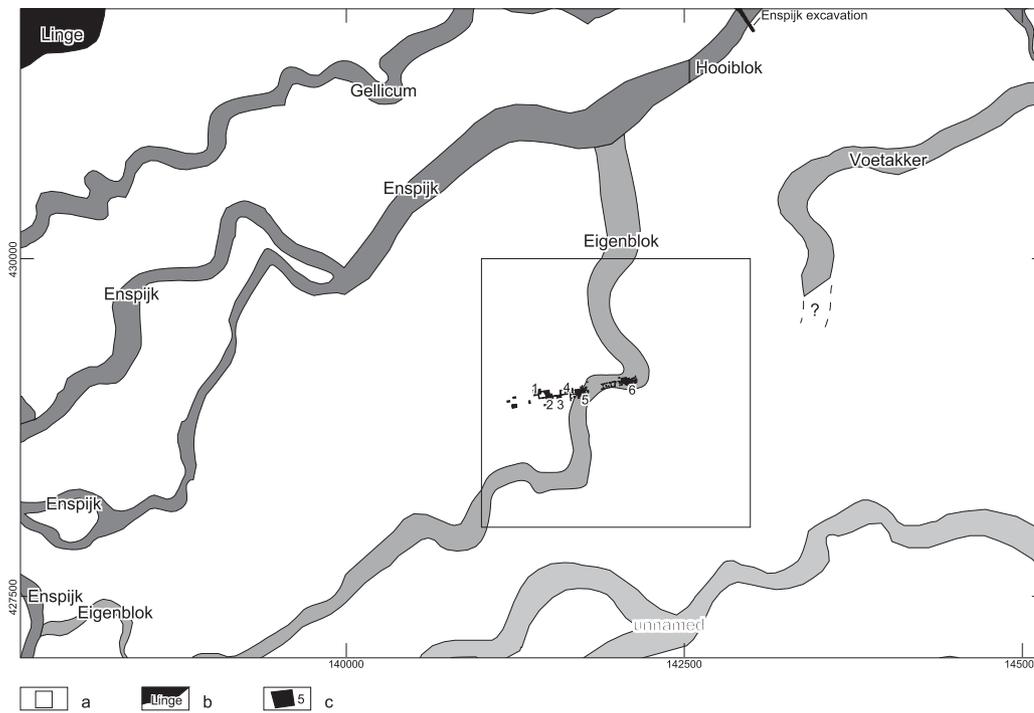


Fig. II.2 Main fluvial systems in the Eigenblok macro-region according to Van Zijverden (2002a) and van Zijverden & Laan (2005). a: meso-region, b: fluvial systems, c: excavations.

APPENDIX II: EIGENBLOK

The mapping of ‘ancient settlement sites’ was one of the (minor) aims of the coring campaigns executed in order to compile the Stiboka (1973) soil map for this area, although the maximum coring depth of 1.2 m meter and low coring density will have caused many sites to have been missed (Stiboka 1973, 12, 140). Nonetheless, as a result of the Stiboka campaigns several sites – mostly Late Iron Age, Roman period and Mediaeval in date – were discovered (Archis nos. 25122, 25123, 25129 and 25130). The methodology applied during the coring campaigns for the geological map of the area (Verbraeck 1984) was also not ideal to locate prehistoric sites (Verbraeck 1984, 231; 233-234).

Fieldwalking and coring by RAAP

During the initial prospective coring by RAAP prior to the Betuweroute construction (1992-1994), the standard methodology of coring in two rows, 30 m apart, with 25 m between corings in a row was applied (fig. II.3, a; Asmussen & Exaltus 1993, 11; 59). Because of the limited depth of the channel belt deposits, it was possible in parts to use a 6 cm diameter auger. This yielded a larger sample volume, so it was decided to increase the distance between corings during the prospective phase at Eigenblok-Oost to 40 m between corings in the rows, which were still 25 m apart (Asmussen & Exaltus 1993, 11; 55). On two plots, called ‘Eigenblok-West’ and ‘Eigenblok-Oost’, a diffuse spread of charcoal – sometimes with ceramics, bones, stones and burned clay – was attested (Asmussen & Exaltus 1993, 55-63; Asmussen 1994, 96-105). These two areas were subjected to additional coring in order to evaluate the extent and quality of the sites (Asmussen 1996, 26-30; 95-96). In total, over 200 corings (with a general maximum depth of 2.5 m; Asmussen 1994, 103; 1996, 9-10) were executed at both plots. Both sites were interpreted as well-preserved prehistoric house-sites and deemed worthy of preservation (Asmussen & Exaltus 1993, 59; 63; Asmussen 1994, 30; Asmussen 1996, 29-30). It is remarkable that some of the corings executed by RAAP at the location of sites one to four yielded archaeological indicators, but as these were thought to represent washed remains in the floodbasin, no map or description of these corings was published (W. van Zijverden, pers. comm., Dec. 2005).

Test-trenches

Both presumed prehistoric house-sites discovered during the coring campaign were subjected to a campaign of test-trenching in 1996 (fig. II.3, b; Jongste 1996; Bulten 1996). Nearly all trenches at Eigenblok - West yielded features (hoof-imprints, fences and postholes) and finds (ceramics, bones and stones) which indicated the presumable nearby presence of a Bronze Age house-site. The finds-layer, a Bronze Age vegetation horizon with some embedded finds, was not eroded by later activities. On the site Eigenblok - Oost, parts of the Bronze Age occupation surface was shown to have been eroded in some test-trenches (Jongste 1996, 15; Van Zijverden 2002a, 66; 70). Yet here as well, most trenches yielded features such as fences, pits and postholes that indicated the possible presence of a (Middle Bronze Age) house-site nearby. Therefore, both Eigenblok - Oost and Eigenblok - West were deemed worthy of preservation, necessitating additional research if these sites were to be disturbed by the Betuweroute freight railway construction (Jongste 1996, 23; Bulten 1996, 26). With hindsight, one may question why no long test-trenches were executed on the plot between sites five and six and to the west of site five. Had this been done, than the house-sites on sites one, two and four could have been recognised already in this phase of the research. On sites five and six, smaller and discontinuous test-trenches sufficed to assess the quality and confirm the interpretation of a prehistoric house-site, but the interpretation of areas as ‘periphery’ or ‘presumably empty’ should have been affirmed by digging test-trenches of maximum length as well.

The Eigenblok excavations

It was decided that the Betuweroute railway trajectory could not be diverted to miss the sites of Eigenblok - West and Eigenblok - Oost (Jongste 2002a, 13) and from 1997 to 1999, extensive excavations were carried out on and near these two sites (fig. II.3, c). During these excavations, additional corings were executed in order to compile palaeogeographical maps of the micro-region (Van Zijverden 2002a, 64-69). Four more possible settlement sites were discovered to the west of Eigenblok - West during these additional coring campaigns. Even further to the west, a number of test-trenches were dug to investigate discolorations – which were suspected to be barrows – visible on an aerial photograph, but they turned out to be mostly relatively empty areas (Jongste 2002a, 9; Hielkema, Prangma & Jongste 2002, 83). As none of the presumed barrow locations yielded a barrow, it was decided to excavate the occupation clusters now known as sites one to four, to a greater extent (P. Jongste, pers. comm., Jan. 2006). These

four sites were characterized by an excellent preservation and were excavated after the completion of the sites Eigenblok - West (site five) and Eigenblok - Oost (site six).



Fig. II.3 Location of RAAP corings, test-trenches and excavation trenches at Eigenblok.

a: RAAP corings, b: test trenches, c: excavation limits.

In total over 7.8 ha were excavated. In five areas, the central parts of Bronze Age house-sites were uncovered, but the prehistoric built-up environment in nearly all parts will have extended beyond the excavation limits. The better visibility of the house-sites during coring campaigns has no doubt contributed to this pattern of larger excavated areas (the house-sites) connected with smaller trenches (the ‘peripheries’).

III OCCUPATION HISTORY AND PALAEOGEOGRAPHICAL DEVELOPMENT

Early and Middle Neolithic

The early Holocene fluvial genesis of the Eigenblok is comparatively ill-known. Recent re-analysis of the digitally available corings for the Eigenblok and De Bogen macro-region (Van Zijverden 2004a) has demonstrated that the mapping of the Early Holocene Deil system by Berendsen and Stouthamer (2001) is too unreliable to be of any use (Van Zijverden 2004a; Van Zijverden & Laan 2005). Nonetheless, various early Holocene fluvial systems are discernible in geological corings and sections based thereon, but the knowledge on their exact course and morphology is limited. The Eigenblok fluvial system itself overlies – and possibly follows parts of – a much older fluvial system. Terrestrial botanical macrofossils underneath the initial Holocene levee deposits 400 m east of the macro-region date the first deposition of sediments on top of the Pleistocene terrace to *c.* 4780-4500 cal BC (UtC-7812: 5788 ±

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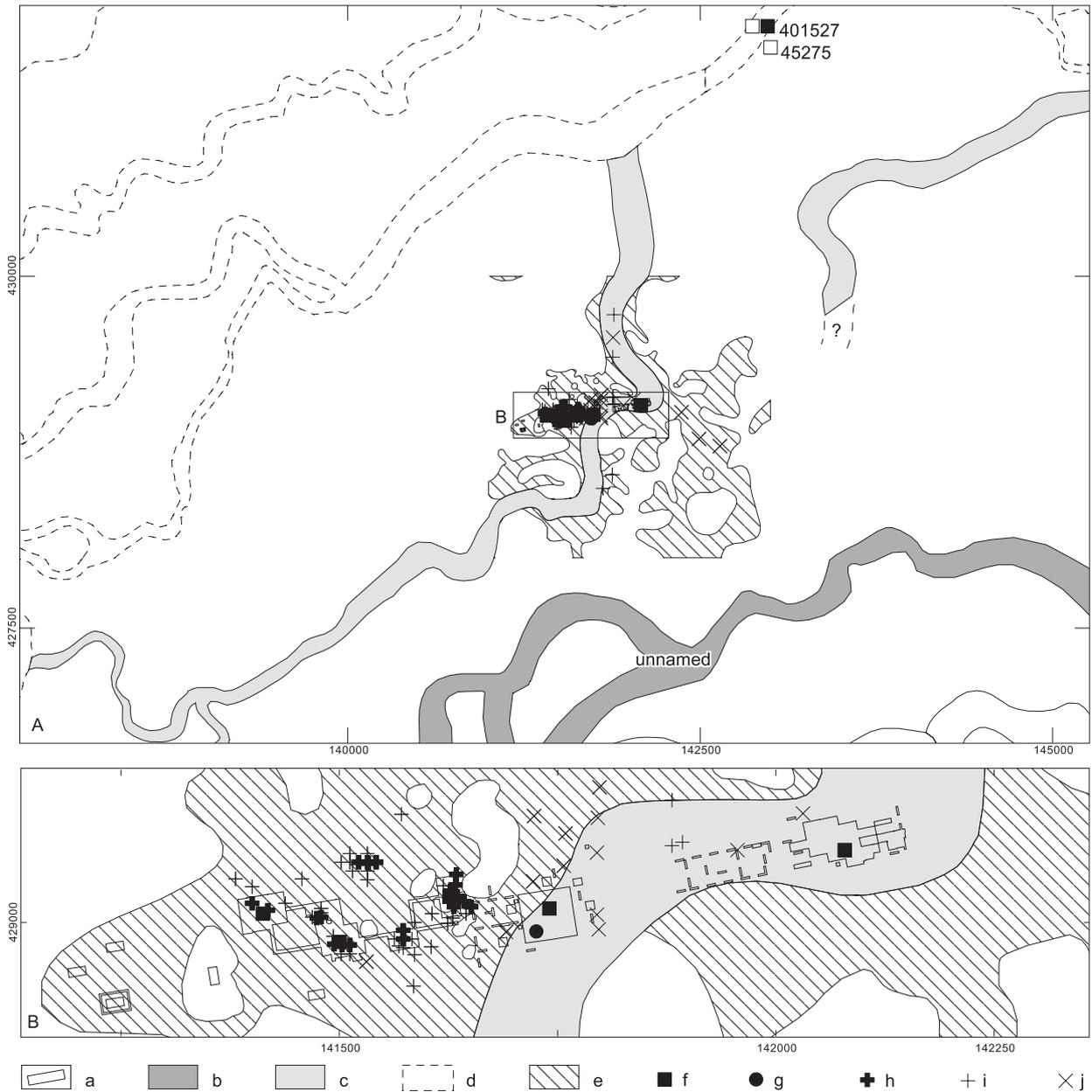


Fig. II.4 Late Neolithic fluvial systems, Late Neolithic find-spots (filled symbols indicate certain identifications, outlined symbols uncertain identifications) and Late Neolithic to Middle Bronze Age-A sites discovered during the additional coring campaigns (g to j). The inset (B) is shown in detail below.

a: excavations, b: possibly active fluvial system, c: fossil fluvial system, d: younger fluvial systems, e: crevasse deposits, f: pottery, g: features, h: possible settlement site core, i: possible settlement site periphery, j: possible fields.

50 BP; Berendsen & Stouthamer 2001, 173; 196). A radiocarbon date for the peat underneath the Eigenblok channel belt deposits indicates a start of sedimentation after *c.* 4450-3950 cal BC (UtC-7867: 5360 ± 120 BP; Berendsen & Stouthamer 2001, 173; 196). Presumably, based on a residual gully date, sedimentation by the Eigenblok system ended between 3340 and 2930 cal BC (GrN-24265: 4450 ± 40 BP; Berendsen & Stouthamer 2001, 199).

No early or middle Neolithic finds are known from the Eigenblok macro-region, although human presence may be suspected on small river dunes and levees. Pollen analysis of the Eigenblok residual gully indicates (limited)

human presence in the landscape during the Middle Neolithic (Brinkkemper *et al.* 2002, 448-449). This scarcity of evidence is best explained by a lack of archaeological research focused on the Neolithic within the macro-region.

Late Neolithic

The Late Neolithic presumably was a period of reasonable fluvial stability. A vegetation horizon formed in the top of the crevasses and levee deposits of the Eigenblok system. Bell Beaker sherds (n = 24) were recovered from all Eigenblok sites except for site three, but most sherds (n = 16) originate from site five. At the Enspijk - A2 excavation (fig II.4, no 401527), one Bell Beaker sherd and another possible Late Neolithic sherd were recovered from the finds-layer (Ter Wal 2005b, 27-28). At another site nearby (fig II.4, no 45275, a vegetation horizon with both sand- and quartz- tempered ceramics was discovered at 0.75 to 1.25 m below surface level (Haarhuis 1998, 19; Archis 45275). Although the ceramics are not very diagnostic, the depth of this finds-layer may indicate a date from the Late Neolithic onward. This site was later (during test-trenching and excavation) grouped with site 401527 (Ter Wal 2004a; 2005b; Archis 45275).

In parts of sites five and six, two occupation levels occurred at separate stratigraphical levels. The intercalating layer of clay could measure up to 30 cm in thickness, while in other areas the two layers were directly superimposed (Jongste 2002a, 33; Hielkema, Prangma & Jongste 2002, 123; 125; 143). The lowermost level is dated from the Middle- to Late Neolithic up to the start of the Middle Bronze Age (Hielkema, Prangma & Jongste 2002, 125). A sample from a charcoal layer in a pit (fig. II.5; s1.227) situated within the ring-ditch of an assumed barrow on site five was dated to c. 2300 to 1750 cal BC (GrN-24100: 3660 ± 80 BP; Jongste 2002a, 35). All the Late Neolithic ceramics, however, originate from the upper (Late Neolithic to) Middle Bronze Age occupation level. No other Late Neolithic finds are known from the wider macro-region.

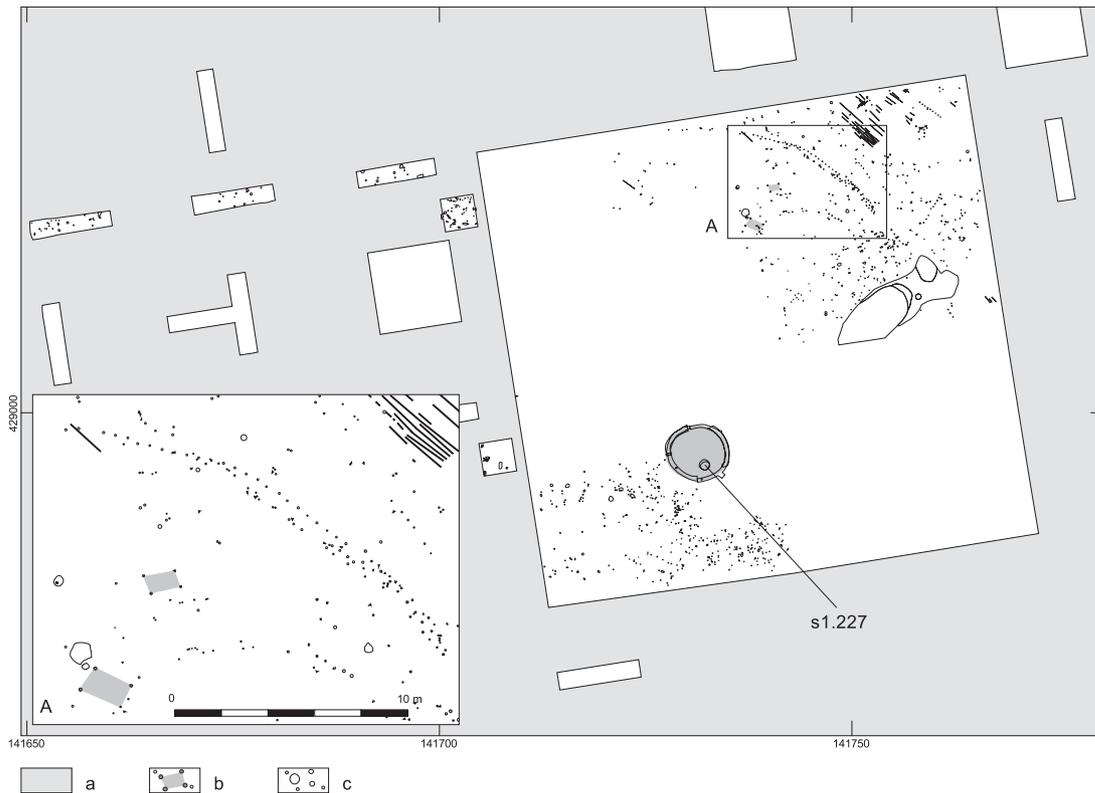


Fig. II.5 Features from the lowermost occupation layer at Eigenblok site 5. The inset (A) shows two granary-type outbuildings, and marks (top right) and various traces of fences.

a: not excavated, b: structures, c: other features.

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Early Bronze Age and Middle Bronze Age-A

In total, no more than 20 potbeaker, ‘Barbed Wire’-stamp decorated and Hilversum-style decorated sherds from the Eigenblok excavations and ten potbeaker sherds and a pierced rim sherd from the Enspijk - A2 excavations (fig II.6, no 401527) are the limited direct evidence for human presence in the Eigenblok macro-region during the Early Bronze Age and Middle Bronze Age-A .

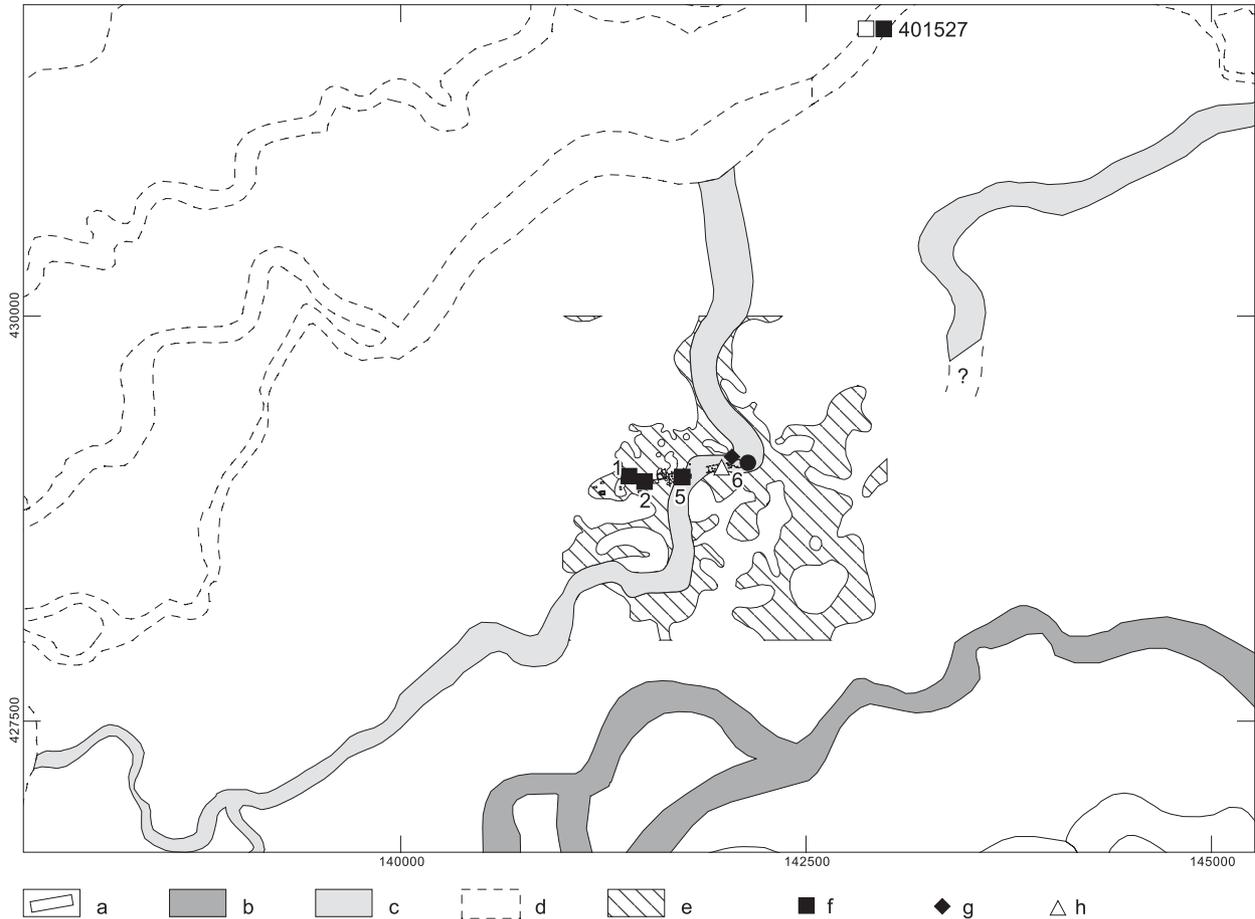


Fig. II.6 Early Bronze Age to Middle Bronze Age-A fluvial systems and Early Bronze Age and Middle Bronze Age-A find-spots (filled symbols indicate certain identifications, outlined symbols uncertain identifications).

a: excavations, b: possibly active fluvial system, c: fossil fluvial system, d: younger fluvial systems, e: crevasse deposits, f: pottery, g: botanical remains, h: weapons.

At the Eigenblok excavations, a sample from a pit on site one that contained bread wheat grains (*Triticum aestivum*) was dated to c. 1940-1690 cal BC (AA-37252: 3500 ± 45 BP; Jongste 2002a, 35). At site six, which is situated on the highest parts of the levee deposits of the Eigenblok channel belt proper, the stratigraphy is limited (fig. II.7). Only in parts of this site were two feature levels encountered, separated by a layer of floodbasin deposits (Hielkema, Prangma & Jongste 2002, 143). Charcoal from underneath the barrow on site six (s75.11; fig. II.7) was dated between 1960 and 1620 cal BC (GrN-24393: 3440 ± 40 BP and GrA-13872: 3430 ± 50 BP; Jongste 2002a, 35). An isolated post (s51.55) and charcoal from a pit (s 66.81) at site six are dated to c. 1610-1420 cal BC (GrN-24386: 3240 ± 25 BP; UtC-8644: 3224 ± 30 BP; Jongste 2002a, 35). This indicates that some activities were undertaken there during the Middle Bronze Age-A, but the nature of these activities remains unclear.

For a bronze dagger recovered from the finds-layer at site six, a date at the end of the Middle Bronze Age-A has been suggested (Hielkema 2002, 337; Jongste 2002a, 38) but as it shows intensive wear, it may have entered the ground much later than during the 16th century BC in which it was most likely produced. (D. Fontijn, pers. comm.)

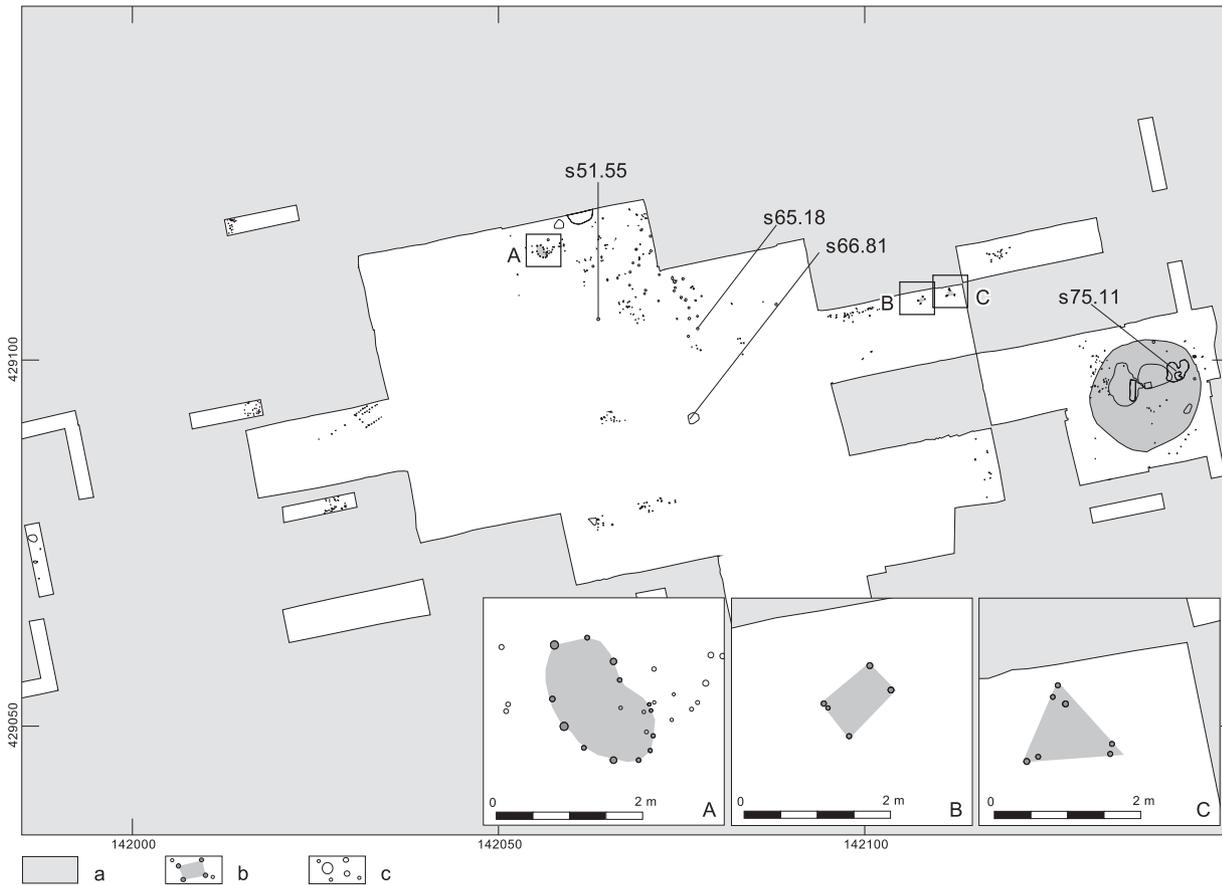


Fig. II.7 Features from the lowermost occupation layer at Eigenblok site 6. The insets (A-C) show three possible ancillary structures. a: not excavated, b: structures, c: other features.

Jan. 2006; *cf.* Jongste 2002b, 625). Despite these indications, the true age of many of the features from the lowermost level at site six may range between the Middle Neolithic and the Middle Bronze Age-A. The few finds (mainly 183 gram uncharacteristic pottery; Hielkema, Prangsa & Jongste 2002, 127; P. Jongste, pers. comm., Feb. 2006) do not aid in dating this occupation period. The modest available evidence prohibits a discussion of the nature and permanence of human presence in the macro-region during the Early- and Middle Bronze Age-A periods.

After fieldwork, a rather tentative structure around a post (s65.18) dated to the Middle Bronze Age-A was reconstructed by the present author and the original excavator (P. Jongste; the post was dated *c.* 1620-1440 cal BC (GrN-24386: 3280 ± 50 BP; Jongste 2002a, 35)). Possibly, this post was part of a post-alignment that may have formed the roof-bearing supports of a two-aisled (house?) plan (fig. II.8, B). While the features were documented in separate excavation levels, their absolute heights and depths indicate that they may have been contemporaneous.

Presumably at, or near, the end of this period, crevasse activity took place within the area of the later Eigenblok excavations. These crevasse deposits eroded much of the underlying vegetation horizon in the higher parts of the landscape (Van Zijverden 2002a, 66; 70). In lower lying areas, floodbasin deposits covered the earlier occupation levels. The fluvial system responsible for the deposition of these crevasses is unknown. The Hamelse (now called Enspijk) fluvial system has been proposed as the responsible system (Van Zijverden 2002a, 71), but this system is thought not to start until the Early Iron Age (Berendsen & Stouthamer 2001, 199; 235). Recently, an older date (*c.* 1850-1700 cal BC) for the start of sedimentation by the Enspijk fluvial system has been proposed (Berendsen & Stouthamer 2005, 19). A sample from the crevasse residual gully indicates that – regardless of which system was responsible – this crevasse ceased to function prior to, or between, *c.* 1920-1680 cal BC (AA-37254: 3475 ± 45 BP; Jongste 2002a, 36).

Middle Bronze Age-B

For the Middle Bronze Age-B in the macro-region, two larger settlement sites have been excavated. These are the already discussed excavations named Eigenblok, and – situated in the north-east part of the macro-region – the Enspijk - A2 excavation, executed in 2004 (fig II.9; no 401527; Ter Wal 2004; 2005b; Archis 45275; 45281; 25281; 401527). Whereas the Eigenblok excavations will be dealt with in more detail, the results from the other excavation will only be summarized here.

Presumably shortly after the formation of the crevasse deposits at Eigenblok as described above, the higher parts of the landscape were used for occupation during the Middle Bronze Age-B. Conditions however got increasingly wet during this period. This is partly due to a low, yet persistent, rise of the groundwater table, but also to shrinkage and subsidence of the (unfounded) parts of the crevasse deposits. On top of the lower lying areas of the crevasses and in the floodbasins, clay was deposited. Macro-remains from this clayey layer were dated to *c.* 1450-1260 cal BC (AA-37254: 3100 ± 40 BP; Jongste 2002a, 36). Despite this continued drowning of the landscape (several millimetres of clay deposited annually; Exaltus 2002, 82) the highest parts were nonetheless used for habitation (Van Zijverden 2002a, 70).

On sites two, four and five, dated construction wood indicates a (re?)start of the occupation between 1520 cal BC at its earliest and 1395 cal BC at its latest (GrN-25342: 3210 ± 25 BP; GrN-23647: 3165 ± 15 BP; GrN-25344: 3160 ± 25 BP respectively; Jongste 2002a, 35; Jongste *in press.*).

At site one, a farmhouse and at least fourteen outbuildings may date to the Middle Bronze Age(-B). The majority of these structures appear to be situated within a system of curvilinear fences (fig. II.10). No radiocarbon dates are available for the house proper, but wooden post-stumps of two outbuildings and a stake from a fence were radiocarbon dated to *c.* 1495-1270 cal BC (S263.102; GrN-25345: 3160 ± 20 BP; S200.173; GrN-25340: 3085 ± 25 BP; S218.455; GrN-25343: 3090 ± 30BP; all Jongste 2002a, 35). To the south-west of the house, a presumed well (s236.406) was identified.

Site two consists of two concentrations of occupation traces that are situated on the higher parts of the crevasse splay deposits (fig. II.11). There is a reasonable correlation between the feature density and the relative height of the crevasse deposits. The north(western) cluster of occupation traces consists of smaller post- and stake-holes in which no individual structures can be recognised. In the even denser south-eastern concentration, however, two ground plans of houses could be partially reconstructed (see Arnoldussen 2008, 116 fig. 4.9, nos. 2-3). The houses overlap and show an identical orientation as well as comparable construction techniques. Wood from a posthole of the older of the two house-phases was dated to *c.* 1495-1395 cal BC (GrN-25344: 3160 ± 25 BP; Jongste 2002a, 35). On the margins of the areas with the highest feature densities, six outbuildings were recognised, but many more are

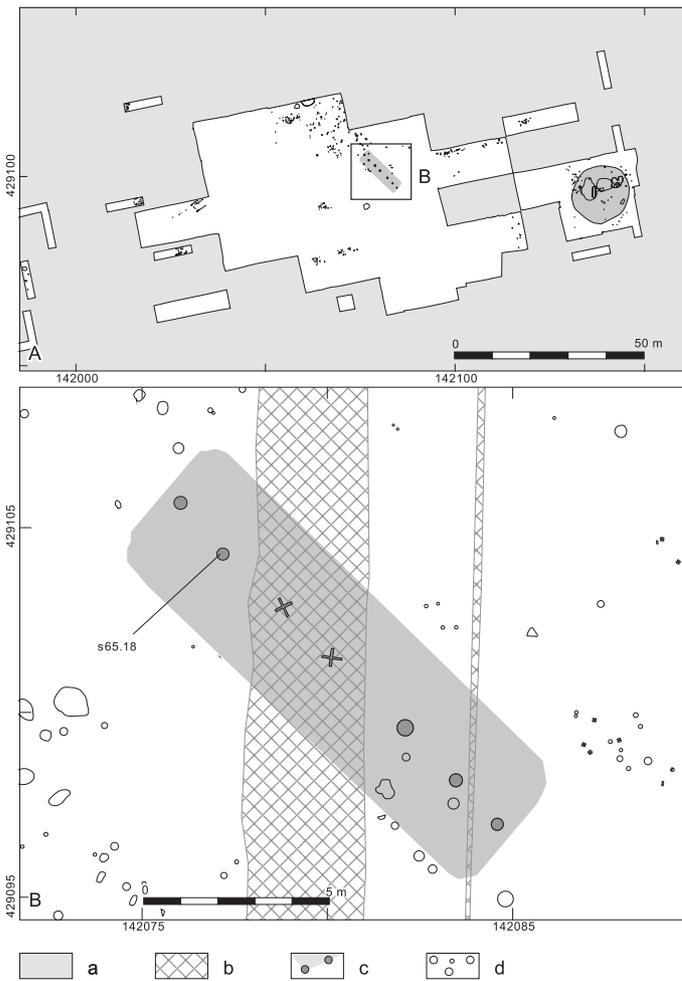


Fig. II.8 Location (A) and detailed view (B) of a tentative Middle Bronze Age-A (house?) structure. The depth of the posts from northwest to southeast is 28, 27, 55, 58 and 23 cm respectively.

a: not excavated, b: recently disturbed, c: features associated to structures, d: other features.

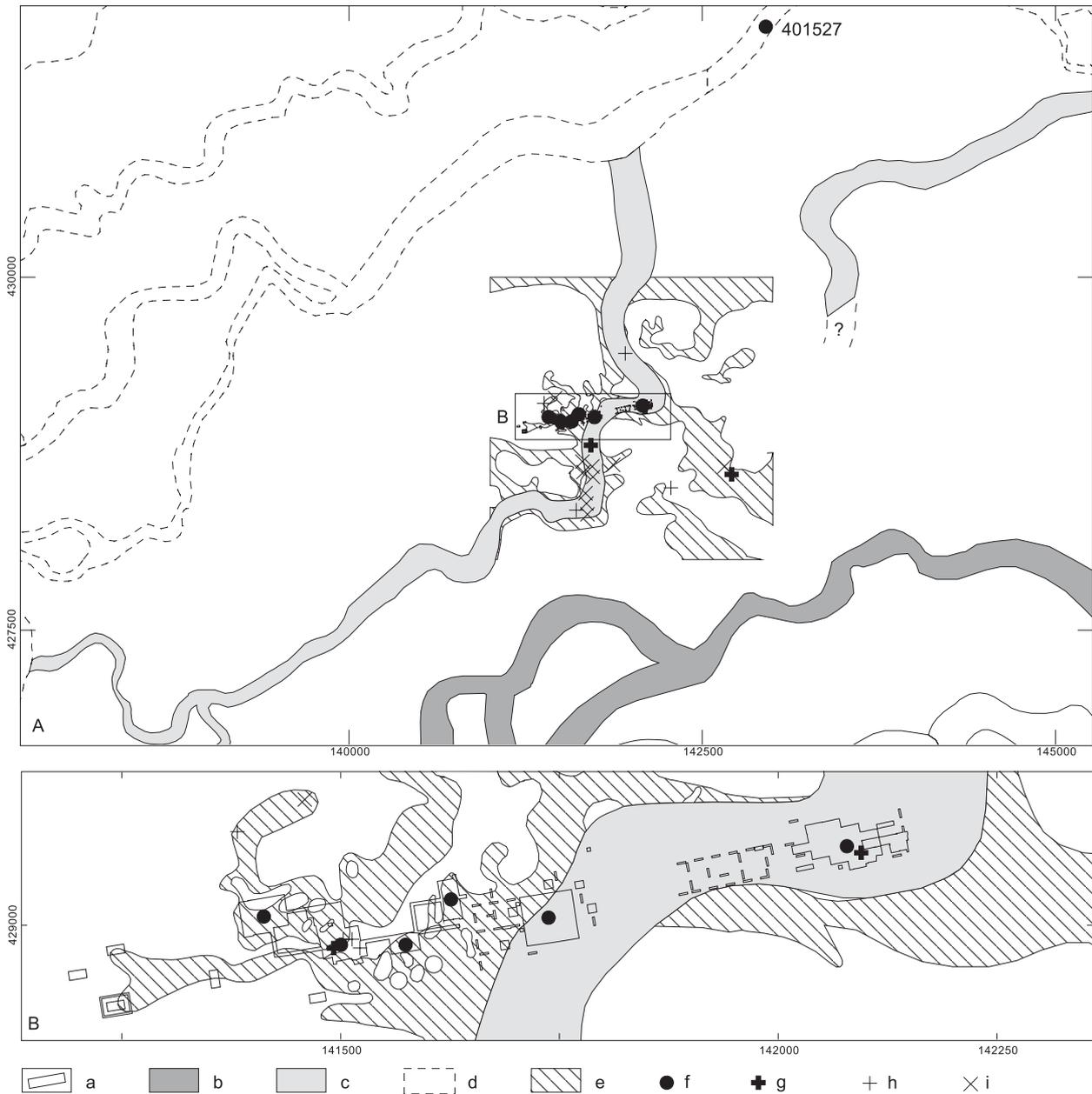


Fig. II.9 Middle Bronze Age-B fluvial systems and Middle Bronze Age-B find-spots (f) and sites discovered during the additional coring campaigns (g to i).

a: excavations, b: possibly active fluvial system, c: fossil fluvial system, d: younger fluvial systems, e: crevasse deposits, f: larger excavations with features and finds, g: possible settlement site core, h: possible settlement site periphery, i: possible fields.

shielded from our view by the swarms of postholes. Directly (c. 12 m) north of the houses, a concentration of cattle hoof-imprints and a well were found. One feature (s224.1) represents an area of burned clay. The various pits give no clues about their original function(s).

The fences often share the orientation of the houses, suggesting that they too may be related to the house-sites. These fences, however, do not seem to gird or confine the direct environs of the farmhouse in a continuous fashion. For the smaller linear fences that cluster near the south-eastern short sides of the houses, a function as cattle driveways (droves) has been suggested (Hielkema, Prangma & Jongste 2002, 93). Some fences may not have been

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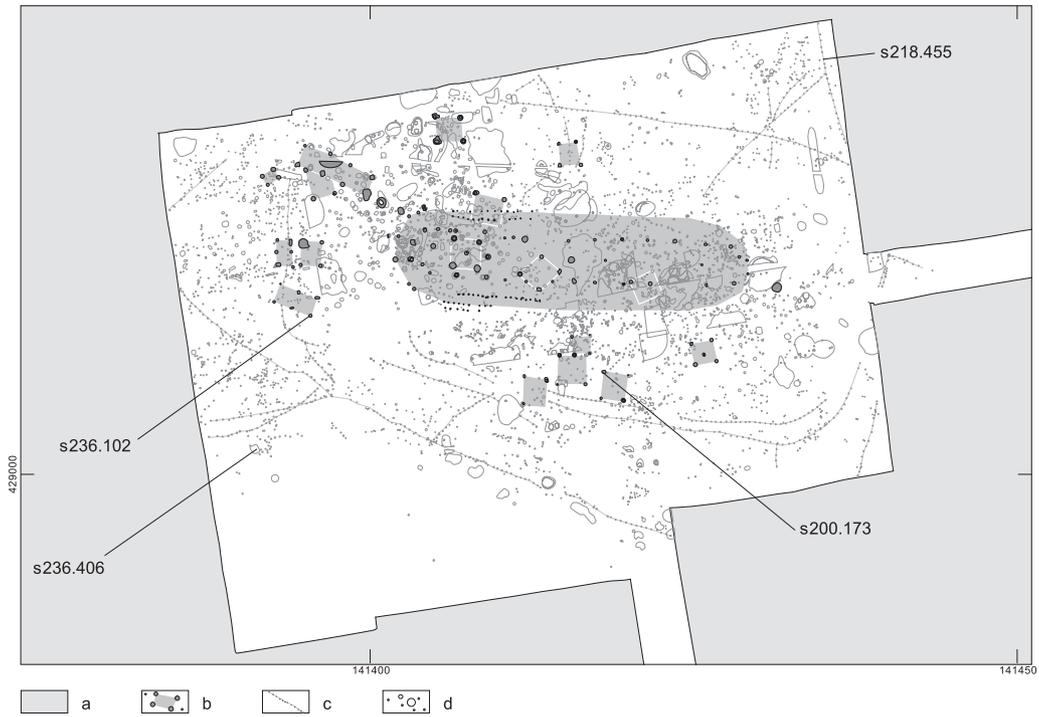


Fig. II.10 Middle Bronze Age(-B) structures on Eigenblok site 1.
a: not excavated, b: structures, c: fences, d: other features.

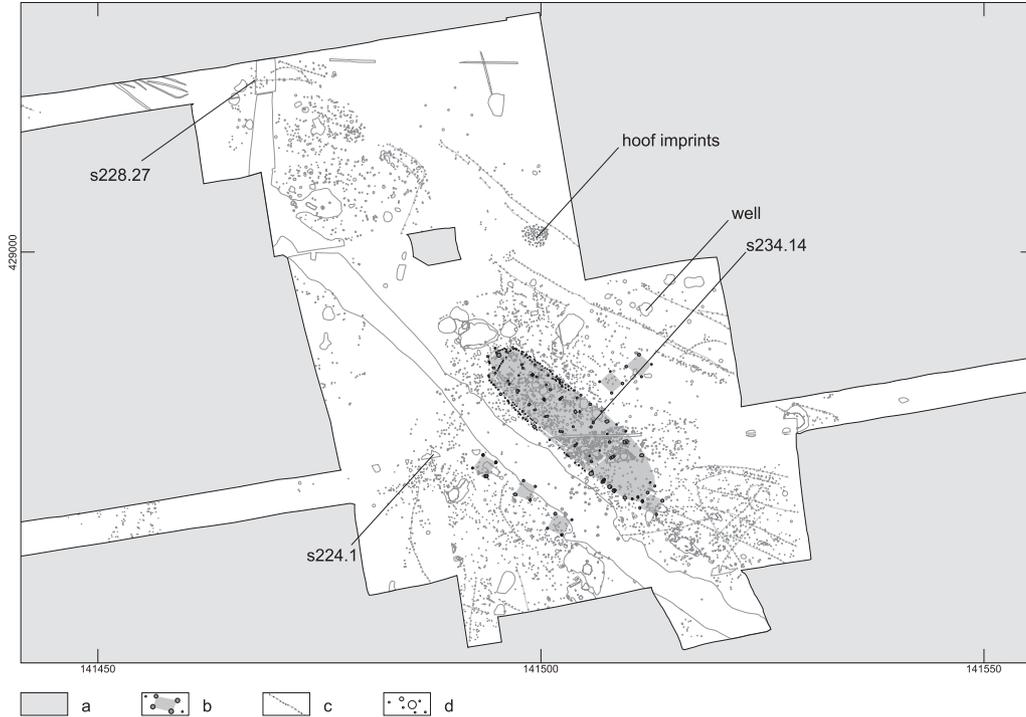


Fig. II.11 Middle Bronze Age(-B) structures on Eigenblok site 2.
a: not excavated, b: structures, c: fences, d: other features.

contemporary to the houses. A stake (s228.27) dated from a fence to the north of the houses indicates a younger Bronze Age phase of use (GrN-25348: 3060 ± 20 BP; Jongste 2002a, 35).

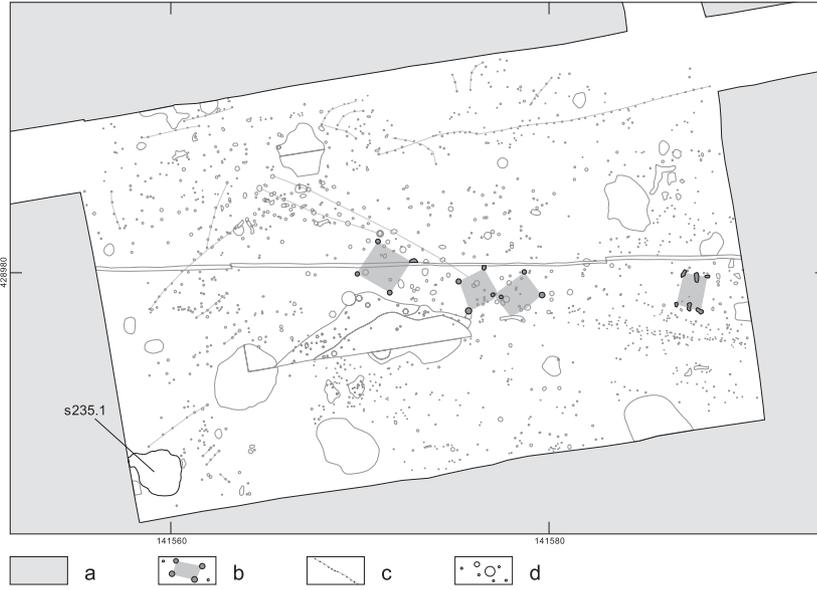


Fig. II.12 Middle Bronze Age(-B) structures on Eigenblok site 3.

a: not excavated, b: structures, c: fences, d: other features.

On site three, only four outbuildings, some fence-lines and two possible rows of larger posts were recognised (fig. II.12). Presumably these structures are situated in the vicinity of a former Bronze Age house-site, possibly directly to the east or south of site three. The six-post outbuilding in the east of the site may have been rebuilt, as is indicated by the figure-of-eight shape of the postholes. In the south-west corner of site three (s235.1) a patch of burned clay was recognised.

At *c.* 75 m to the north-east, another part of a house-site was uncovered at site four (fig. II.13). Due to the presence of a modern drainage ditch, only half of the house was excavated. Wood from one of the roof-bearing posts (s214.69) was dated to *c.* 1520-1425 cal BC (GrN25342: 3210 ± 25 BP; Jongste 2002a, 35). A possible round to oval outbuilding, several stretches of single-stake type fences and a four-post granary-type outbuilding were also found. There is no evidence to suggest that these structures were ever part of the same house-site.

On site five a relatively low feature density allowed the recognition of a considerable number

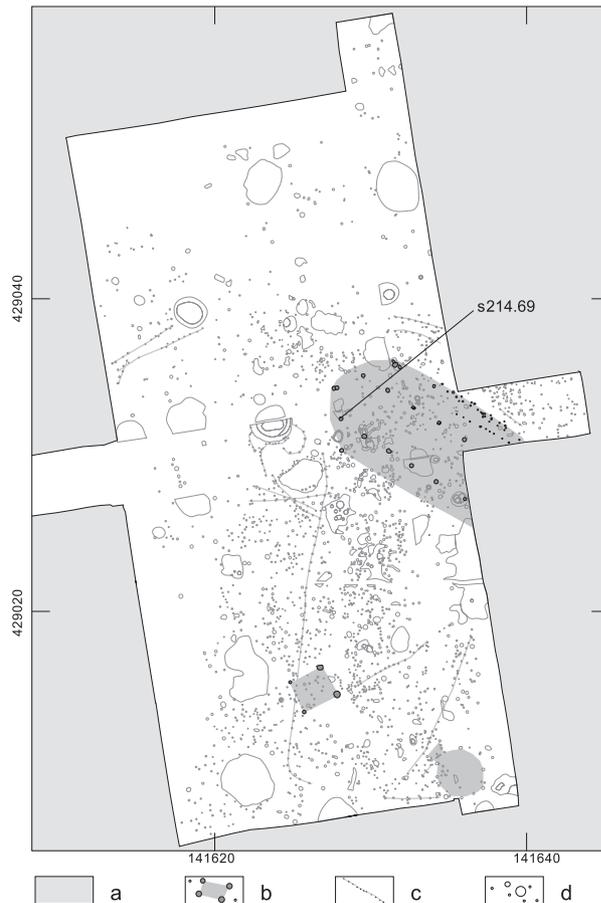


Fig. II.13 Middle Bronze Age(-B) structures on Eigenblok site 4.

a: not excavated, b: structures, c: fences, d: other features.

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of house-site components. The most prominent feature is the three-aisled farmhouse that is situated in the corner of two bundles of double-stake type fences (fig. II.14). To the (south)west, a nine-post and a four post outbuilding are reconstructed. To the south(east) of the farmhouse, two more four-post outbuildings and an irregular possible outbuilding were found. Most of the post stumps of the farmhouse were preserved, and two dated specimens (s10.187 and s12.151) indicate a construction phase around c. 1495-1400 cal BC (GrN-23647: 3165 ± 15 BP and GrN-23646: 3155 ± 15 BP; Jongste 2002a, 35). A charcoal rich feature (s10.146) may represent the location of the former hearth. A sample of the charcoal was dated, but spanned the entire Middle Bronze Age-B in calibrated dates (GrN-24102: 3120 ± 75; Jongste 2002a, 35). Two posts from outbuildings (s 14.97 and s5.314), a post from a possible fence (s16.86) and a stray posts (s.14.158) were all radiocarbon dated to the Middle Bronze Age-B (GrN-23838: 3070 ± 20 BP; GrN-23837: 3060 ± 20 BP; GrN-24385: 3105 ± 20 BP and GrN-24103: 3030 ± 20 BP respectively; Jongste 2002a, 35). As the vegetation horizon on and in which the relicts from the Middle Bronze Age occupation phase were found passes over the possible barrow ring-ditch, a mound body – if ever present – must have been leveled prior to or during the Middle Bronze Age-B habitation phase (Hielkema, Prangma & Jongste 2002, 137). Two pits contained somewhat more finds (total < 1 kg) and may have served as refuse pits (Hielkema, Prangma & Jongste 2002, 139-140). A possible drinking pool for cattle was found in the area with hoof imprints to the east of the fences. In addition, some human footprints had been preserved in the mud (Hielkema, Prangma & Jongste 2002, 141)

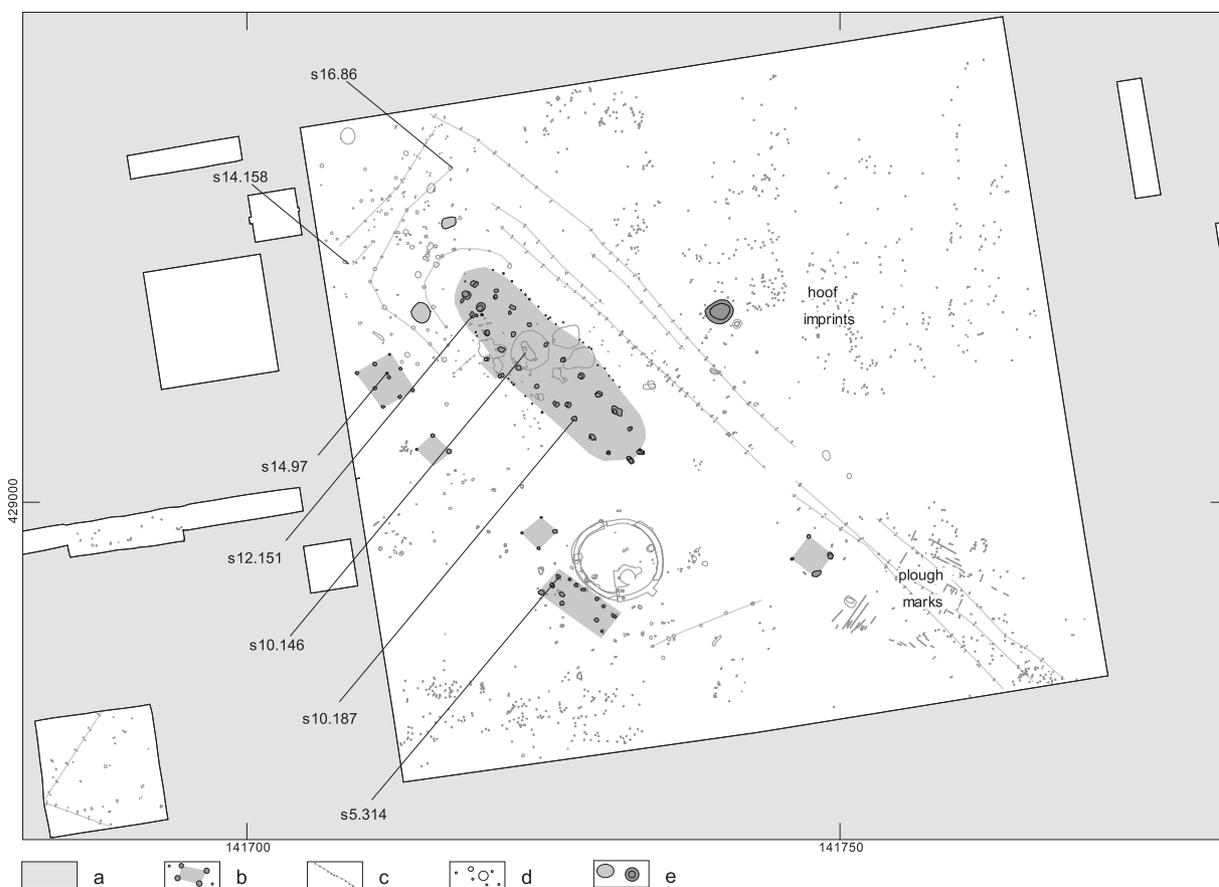


Fig. II.14 Middle Bronze Age(-B) structures on Eigenblok site 5.

a: not excavated, b: structures, c: fences, d: other features, e: possible refuse pits (light fill) and drinking pool (dark fill).

On site six, two possible house-sites have been reconstructed (fig. II.15). The house plans from site six are different from those on sites one, two, four and five. Both reconstructed houses at site six lack the regular, (curvi)linear configuration of the two rows of roof-bearing posts that are evident in the houses of the other house-sites (see

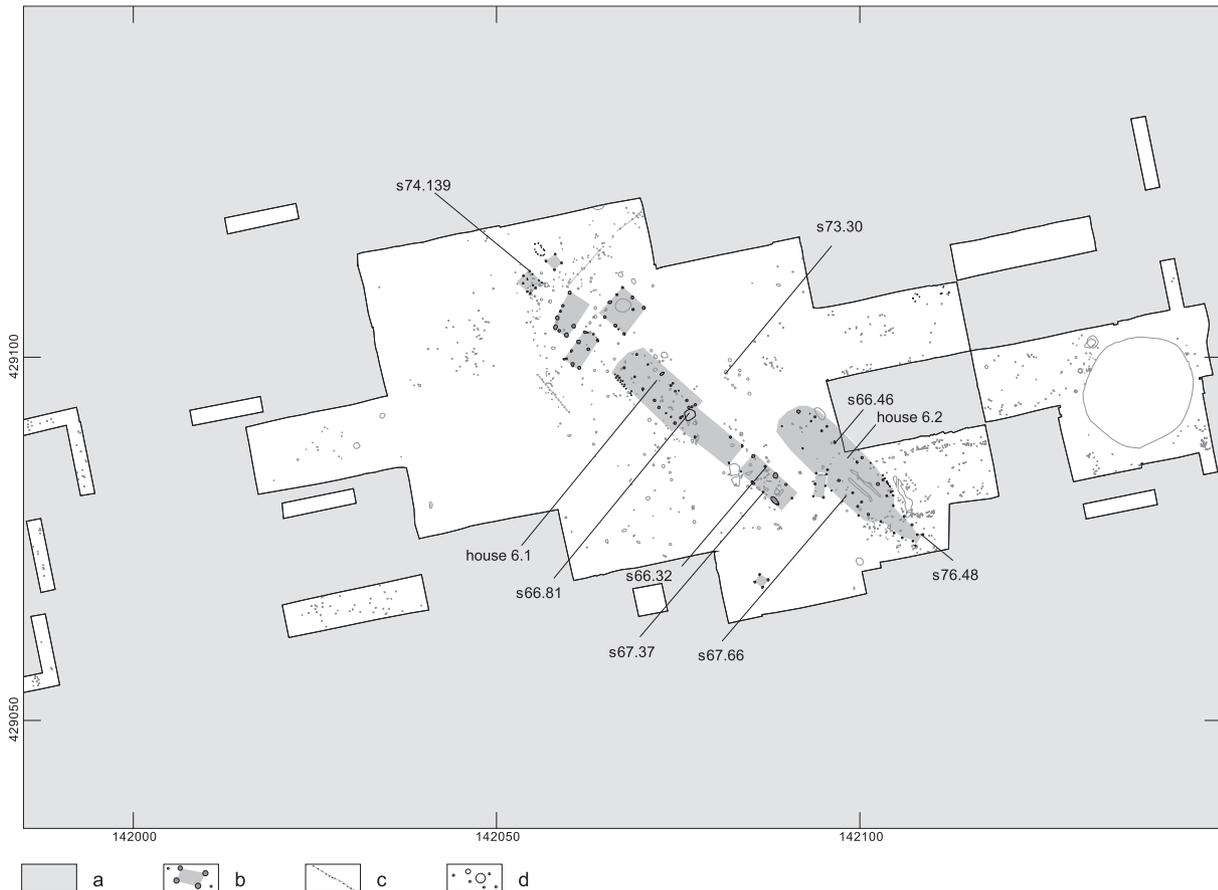


Fig. II.15 Middle Bronze Age(-B) structures on Eigenblok site 6.

a: not excavated, b: structures, c: fences, d: other features.

Arnoldussen 2008, 116 fig. 4.9 nos. 6-7). This particularly applies to house 6.1, where two regular rows of roof-bearing posts of comparable size and depth can hardly be reconstructed. With house 6.2, many posts appear to be absent, even where their absence cannot be explained by being obscured through later ploughing (*cf.* fig. II.16). The find distribution plots do, however, suggest the presence of a house plan on the spot where house 6.1 is reconstructed. The outbuilding directly to the south-east of, and in line with, house 6.1 (outbuilding seven) – perhaps with some post of house 6.1 added – would better concord with the general structural properties known for Bronze Age houses. In any case, the dated posts of house 6.2 (s66.46 and s76.48), those of outbuilding seven (s66.32 and s67.36) and two dated stray posts (s73.30 and s67.66) indicate that various construction activities took place at site six during the Middle Bronze Age-B (GrN-24388: 3115 ± 50 BP; GrN-24104: 3060 ± 30 BP; GrN-24391: 3100 ± 50 BP; GrN-24392: 3040 ± 25 BP; GrN-24837: 3130 ± 20 BP; GrN-24390: 3145 ± 25 BP; Jongste 2002a, 35-36). Charcoal from a pit (s66.81) ‘within’ house 6.1 was dated to *c.* 1610-1420 (UtC-8644: 3224 ± 30 BP; Jongste 2002a, 35).

Several outbuildings are recognised on site six, of which only three can be identified as the four- and six-post types of outbuildings commonly encountered on Bronze Age settlement sites. One post from a square 2.5 by 2.5 m outbuilding (s74.139) was radiocarbon dated to *c.* 1310-945 cal BC (GrN-24106: 2930 ± 50 BP; Jongste 2002a, 36). This radiocarbon date, but also the structural overlap between the six-post outbuilding and house 6.2, indicates that there were multiple phases of use of the site during (and/or after?) the Middle Bronze Age-B.

Ardmarks cross-cut many of the features and structures in the eastern part of site six (fig. II.16). As these ard-scratches pierce through the Middle Bronze Age occupation layer, they must post-date the main phase of occupation. Whether this occurred as direct as years, or as long as centuries after the abandonment of the structures, is not known.

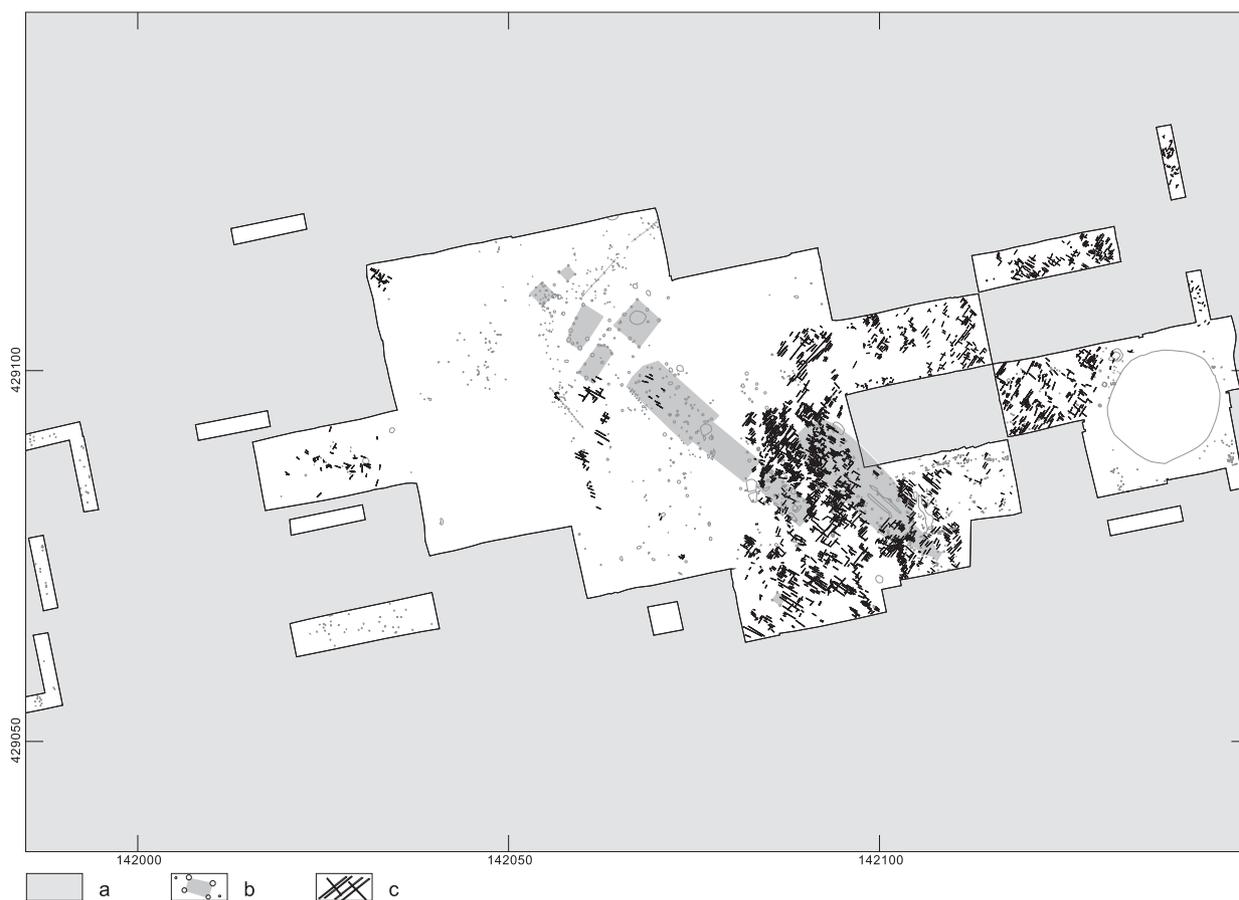


Fig. II.16 Ard marks on Eigenblok site 6.

a: not excavated, b: structures, c: ard marks.

In any case, occupation of the various sites of Eigenblok during the (late?) 15th to early 13th century BC is well documented by the numerous radiocarbon dates available (Jongste 2002a, 35-37; *in press*). The abundant recovered artefacts (over 290 kg of ceramics, 433 worked stones and flints, 17 bronze objects) offer no clues to refine or alter this general dating (Bloo & Schouten 2002; Van Gijssel *et al.* 2002; Hielkema 2002).

During the Middle Bronze Age-B, cattle dominated (80 %) the livestock composition, with sheep/goat and pig both at *c.* 10 % (Van Dijk 2002, 374; 393). Wild species are only in very limited (< 1 %, *n* = 45) numbers present, and some fishing (21 fragments of fish remains) occurred (Van Dijk 2002, 410). These sources of meat were supplemented by plant foods, of which the preserved remains indicate that predominantly barley (*Hordeum vulgare*), some emmer wheat (*Triticum dicoccum*) and millet (*Panicum miliaceum*) were consumed (Brinkkemper *et al.* 2002, 542). Only for barley could it be proven that on-site cultivation took place (*ibid.*). A broad spectrum of wild plant species may also have supplied nutrients, but only remains of hazelnuts (*Coryllus avellana*), sloe (*Prunus spinosa*) and wild turnip (*Brassica rapa*) were recovered.

The artefacts recovered indicate the execution of both agricultural (grinding stones, antler axe or hammer, bronze sickle) and domestic (rubbing stones, abraders, scrapers, bronze and bone awls) tasks. Two fragments of arrow shaft-smoothers and a bronze arrowhead may represent hunting tools, but they could equally well – together with the bronze dagger – relate to interpersonal combat. The data on subsistence and crafts supports the interpretation of the remains reflecting a small-scale, self-sufficient, agraricultural community.

The distribution of features shows a strict correlation to the higher parts of the crevasse and levee micro-topography (Jongste 2002b, 591). The high number of recognised house(-site)s, four in a strip of 340 by 60 m (see fig.

II.17, D) makes one wonder how many more remain hidden in comparable parts of the landscape directly outside the investigated strip.

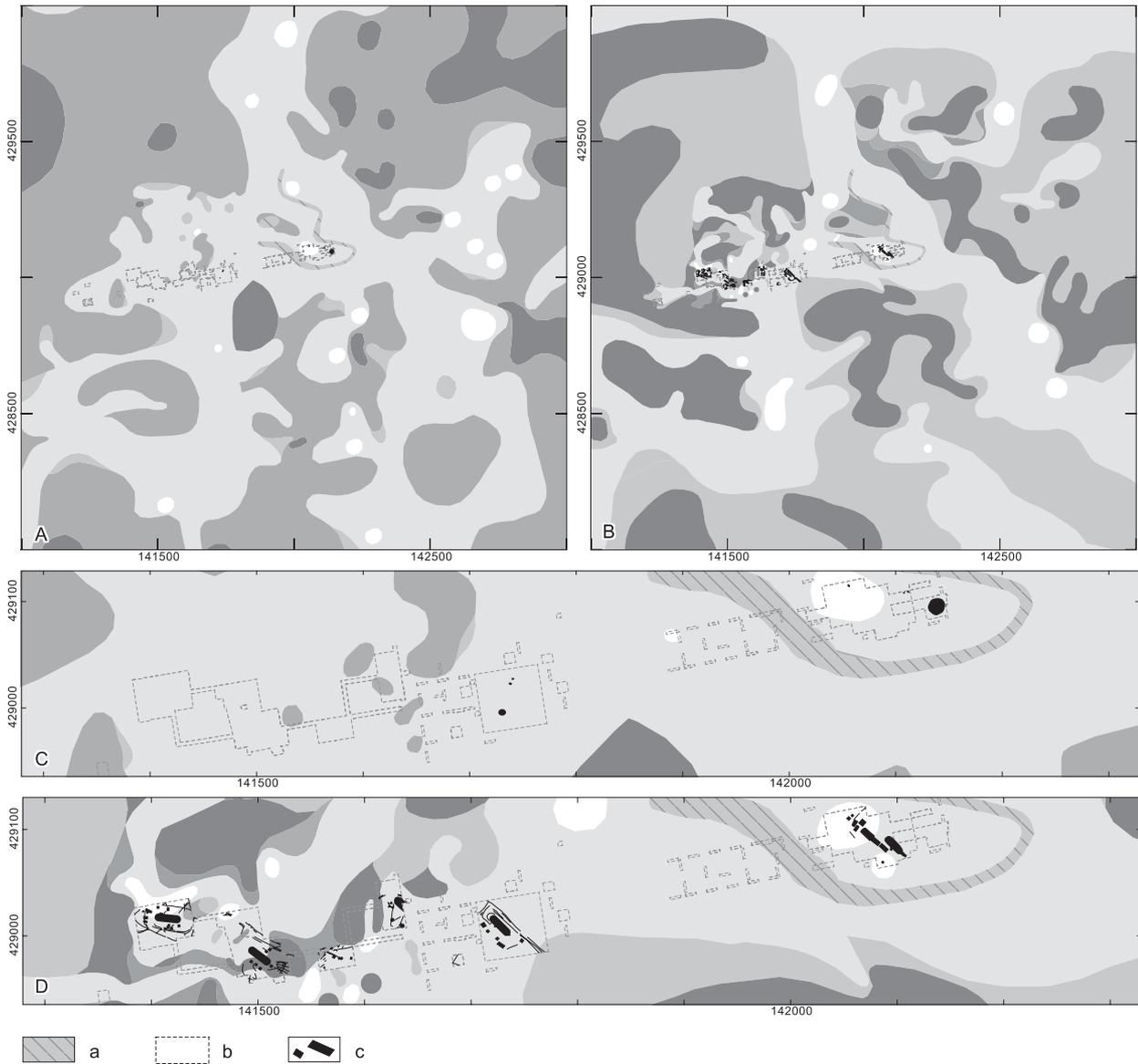


Fig. II.17 Soil-type map and settlement sites structures in the Eigenblok meso-region during the Late Neolithic/Early Bronze Age (A,C) and Middle Bronze Age (C,D). The soil types of the landscape are indicated in tones (Light: dry, sandy, fertile, high, Dark: wet, clayey to peaty, low). C and D are details of A and B.

a: Eigenblok fluvial system's residual gully, b: trenches, c: structures.

At the end of the Middle Bronze Age-B, three new fluvial systems (Est, Bommel and Meteren) come into being to the east of the Eigenblok macro-region. The Est system presumably starts after *c.* 1500-1300 cal BC (UtC-6848: 3124 ± 38 BP; Berendsen & Stouthamer 2001, 200). The start of sedimentation by the Meteren system is derived from that of the Bommel system, whose active phase starts between *c.* 1270 and 1010 cal BC (UtC-6717: 2936 ± 37 BP; Berendsen & Stouthamer 2001, 194). It is assumed that a downstream connection of one of these systems reoccupied the Eigenblok main residual gully, initiating yet another phase of crevasse formation (Van Zijverden 2004a; pers.

APPENDIX II: EIGENBLOK

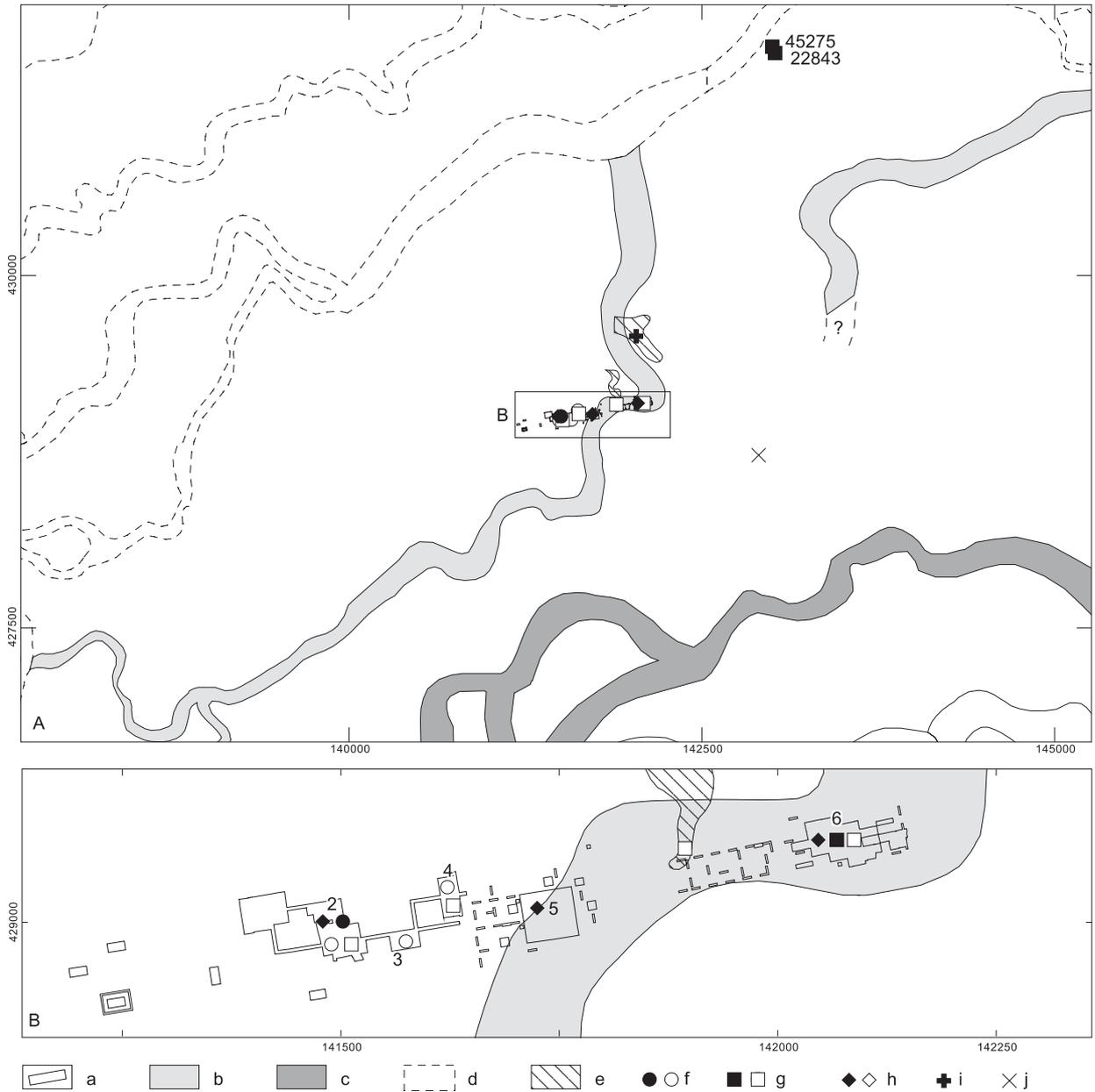


Fig. II.18 Fluvial systems, find-spots (filled symbols indicate certain identifications, open symbols indicate uncertain identifications) and sites discovered during the additional coring campaign (i,j) in the Eigenblok meso-region for the Late Bronze Age and Early Iron Age periods. The inset (B) show a detail of map A.

a: trenches, b: fossil system, c: presumably fossil system, d: younger fluvial systems, e: crevasse deposits, f: features, g: ceramics, h: botanical remains, i: possible settlement site, j: possible agricultural field.

comm., Jan. 2006). A residual gully from this crevasse phase was dated to 1400-1130 cal BC (UtC-8645: 3027 ± 31 BP; Brinkkemper *et al.* 2002, 443-444). As construction activities still took place during the 13th century BC (several radiocarbon dated posts, see above), this crevasse formation presumably took place thereafter, possibly during the 2nd half of the 13th century.

Enspijk

Campaigns of test-treches dug prior to the widening of the A2 motorway led to the discovery of a Middle Bronze Age settlement site near the village of Enspijk. In 2004, a c. 10 to 40 by 240 m long strip of this site was excavated (Ter Wal 2004a; 2005b). In this excavated area the remains of three Bronze Age houses and a number of outbuildings were uncovered (fig. II.19). The houses and outbuildings were situated on the levee deposits of the Enspijk (or Hooiblok, cf. fig. II.1) fluvial system. In addition to the houses and outbuildings, various stretches of fence (of different types) had

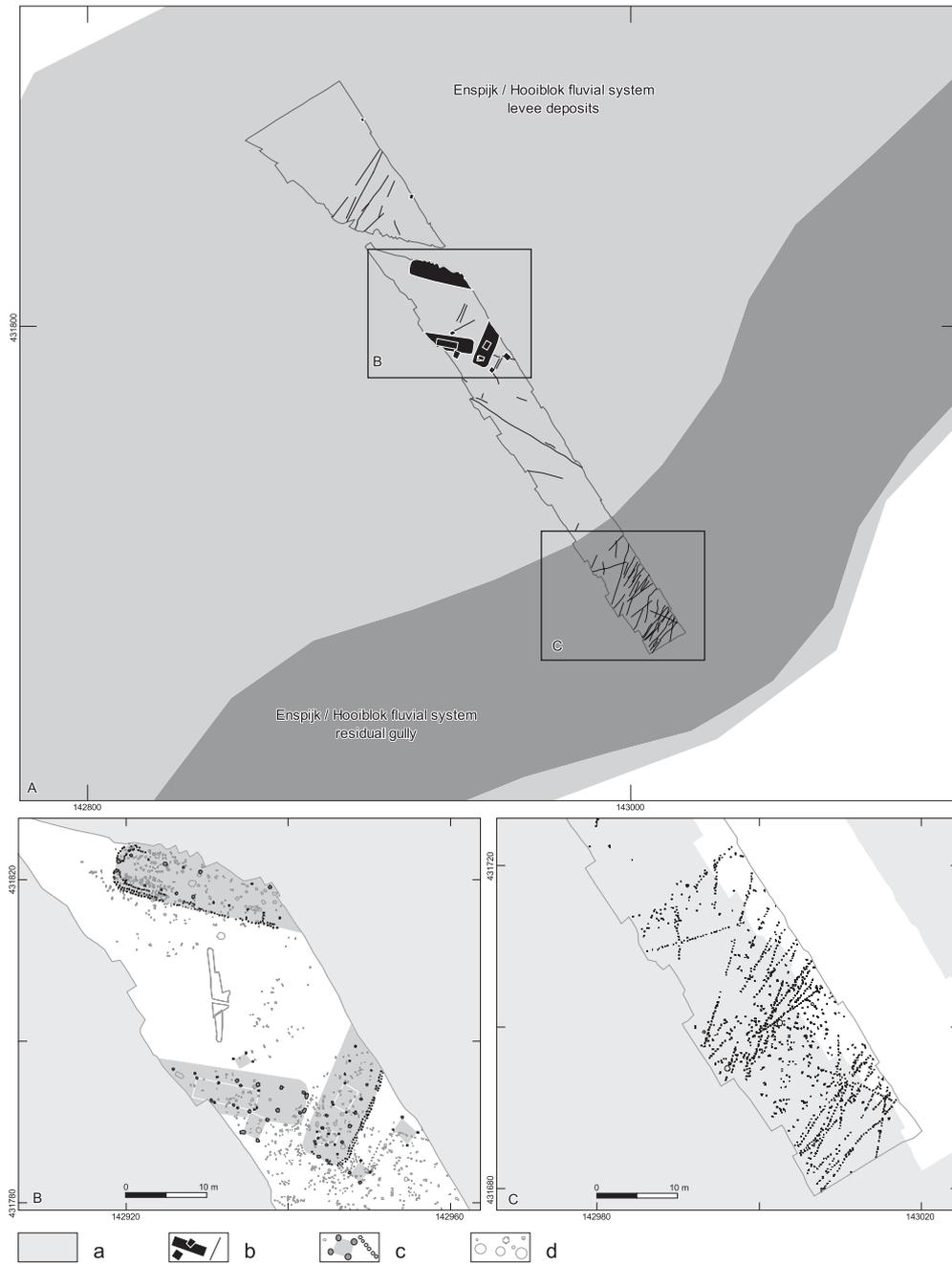


Fig. II.19 Overview (A) of the Middle Bronze Age structures at Enspijk -A2/OP- en afrit Geldermalsen and more detailed views of the houses and outbuildings (B) and fence-lines near the residual gully (C).

a: not excavated, b: structures (houses, outbuildings, fences), c: structures (outbuildings, fences), d: other features.

been preserved. fences consisting of paired stakes (type-2 or double-stake type fences) appear to be more common in the higher, sandy locations, whereas single-stake (type-1a) fences were dominant in the more lower-lying, clayey, areas. Possibly, the latter lined the lower-lying area of the silted-up residual gully. Based on typological classification for the structures recognised and a radiocarbon dated sample from a posthole of a granary-type outbuilding (from which also various sherds of the top part of a vessel were recovered; UtC-13614: 3019 ± 41 BP; Ter Wal 2005b, 24; 32) a Middle Bronze Age-B age is suggested for this site (*cf.* Arnoldussen 2008, 108-111).

Late Bronze Age

It is assumed that during the Late Bronze Age, the inhabitable part of the Eigenblok micro-region became ever more smaller due to the continued ‘drowning’ of the landscape – as a consequence of subsidence and rise of the ground water table – and the deposition of floodbasin deposits (Jongste 2002b: 590; 603; Van Zijverden 2004a). No new emerging fluvial systems during this period are known for the macro-region.

Parts of sites one to five may have been used as pasture, while on site six the already discussed ardmarks testify of a usage as a field, but their dating is unclear (Van Zijverden 2002a, 72). At site six, a post (s74.139) from a small 12-post outbuilding was radiocarbon dated to *c.* 1310-980 cal BC (GrN-24106: 2930 ± 50 BP; Jongste 2002a, 36), suggesting that it could have been erected during the Late Bronze Age (see fig. II.15). Some sherds from site four were dated to the Middle Bronze Age-Late Bronze Age transition (Hielkema, Prangma & Jongste 2002, 123). Three sherds from site six were dated to the Late Bronze Age (Schouten & Bloo 2002, 230; J. Hielkema, 9-6-1998, excavation logbook). A single sherd from a pit on site two, a single sherd from site six and two sherds discovered north of the westernmost part of site six, may date to the Late Bronze Age or Early Iron Age (Jongste 1996, 18; 24; Jongste 2002a, 38; Bloo & Schouten 2002, 265). At sites two, three and four, areas of burned clay were found directly on top of the vegetation horizon, suggesting that they post-date the Middle Bronze Age-B occupation, but their exact age is unknown (Hielkema, Prangma & Jongste 2002, 108; 113; 123). For a pit discovered in a test-trench at site six,

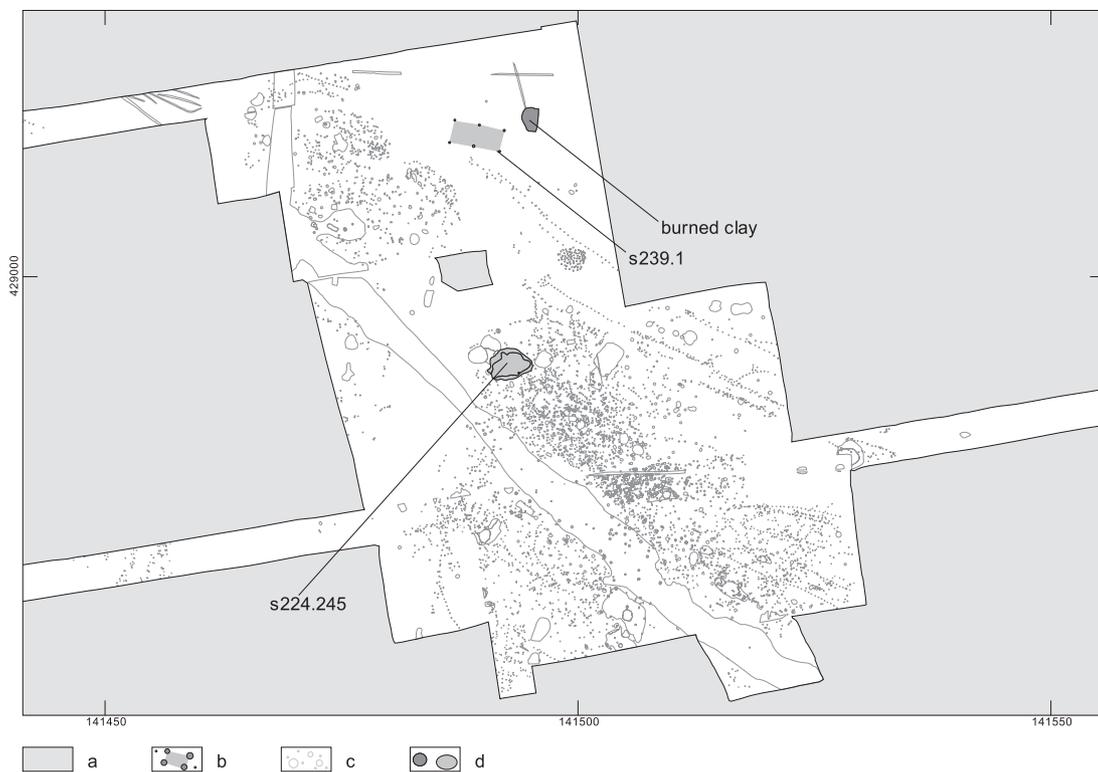


Fig. II.20 Early Iron Age (and/or Late Bronze Age) features at Eigenblok site 2.

a: not excavated, b: structures, c: older features, d: areas of burned clay (dark shading) and pits (light shading).

a Late Bronze Age to Iron Age date was also suggested (Jongste 1996, 21). Despite the limited amount of evidence for Late Bronze Age activities, the indications are nonetheless remarkable as evidence for this period is usually scarce (*cf.* Jongste & Van Zijverden 2007).

Early Iron Age

Somewhere during the first half of the Iron Age, crevasse deposits again formed in the Eigenblok micro-region (fig. II.18). Organic remains from a crevasse residual gully from this phase at site six were dated to *c.* 770-410 cal BC (UtC-8646: 2468 ± 30 BP; Jongste 2002a, 36). At site two (fig. II.20), a post (s239.1) from a six-post outbuilding or platform was dated to *c.* 770-410 cal BC (GrN-25346: 2470 ± 25 BP; Jongste 2002a, 35). In the vicinity, an area of burned clay was found on a stratigraphically higher level than a similar burned area already referred to above (Hielkema, Prangma & Jongste 2002, 108-109). A relatively finds-rich pit (total *c.* 1.1 kg; s224.245) in the centre of site two yielded some Early Iron Age ceramics (but also contained a wooden post radiocarbon dated to the Middle Bronze Age-B (GrN-25346: 3125 ± 30 BP; Jongste 2002a, 35)). Also at site five a wooden post (s34.38) was dated to *c.* 930-550 cal BC (GrN-23835: 2640 ± 60 BP; Jongste 2002a, 35), but here no other indications for use of this site during the Late Bronze Age or Early Iron Age were found. Seven sherds recovered from site six are dated to the Iron Age in general (Jongste 2002a, 38).

In the north of the macro-region, some Early Iron Age sherds were discovered during fieldwalking south of the excavated Middle Bronze Age site known as Enspijk - A2 (fig II.18, no 45275; Ter Wal 2005b, 8; Archis 45275). At the site Enspijk - Klemweg, several Early Iron Age sherds were discovered during fieldwalking (fig. II.18, no 22843; Archis 22843).

The combined evidence for the Late Bronze Age and Early Iron Age suggests that the landscape during these periods will have been more extensive than suggested by the soil-type map (Van Zijverden 2004a). Nevertheless, the overall numbers of find-spots are still relatively modest and do not allow for a precise characterisation of the activities executed at the various locations. It is not until the Late Iron Age and Roman period, that the number of find-spots known from the Eigenblok macro-region increases significantly (*cf.* Archis 22827; 22850; 22839; 25130; 25129; 43158; 43738).

During the sixties and seventies of the former century, a few stray finds were documented (Louwe Kooijmans 1974, 376-377, nos. 127; 134), of which a polished stone axe (see fig. III.1, no 25127 below) and Late Neolithic ceramics (see fig. III.7, no 25052) are noteworthy. Additionally, some known find-spots were checked by L.P. Louwe Kooijmans in preparation of this 1974 thesis (Louwe Kooijmans 1974, 375-376, nos. 125-126, fig. III.1, nos. 25137 & 126).

In 1986, the State Service for Archaeological Investigations (ROB, now RACM) initiated various (c. 35) fieldwalking campaigns in the macro-region which, however, did not yield any pre-Iron Age remains (for details see Archis numbers 2084-2085; 2101; 2106-2107; 2114; 2116-2117; 2120; 2123; 2139; 2141-2145; 2151-2152; 2158-2160; 2180; 2183-2185; 2194-2195; 2201; 2206 and 2211). Fieldwalking in the early nineties by local archaeologists also resulted in the discovery of several (Late) Iron Age to Roman period sites (*e.g.* fig. III.1 / Archis nos. 22827; 22829; 22833).

The first large scale archaeological campaigns in the De Bogen macro-region of relevance to Bronze Age studies, started with the phase of prospective coring preceding the Betuweroute railway construction (Asmussen 1994; 1996, fig. III.5, nos. 145-150; 30122; 32296; 38567-38571; fig. II.1 area a1). Between 1996 and 1997, most of the sites discovered during the phase of prospective research were evaluated through campaigns of test-trenching (Van der Roest 1997; Bulten & Smits 1998b; Jongste & Smits 1998; Spanjer 1998b; Verhelst 2003, fig. III.1, nos. 145-150, 22312, 43267, 307009). The results of this phase led to the selection of three areas for more extensive definitive excavation ('Boog-C Noord'; Schoneveld & Gehasse 2001, 'De Bogen'; Meijlink & Kranendonk 2002; 'Lage Blok'; Milojkovic & Smits 2002). A watching brief executed during the Betuweroute railway construction, also documented some yet unknown find-spots (Schutte 2002a-b; 2003b).

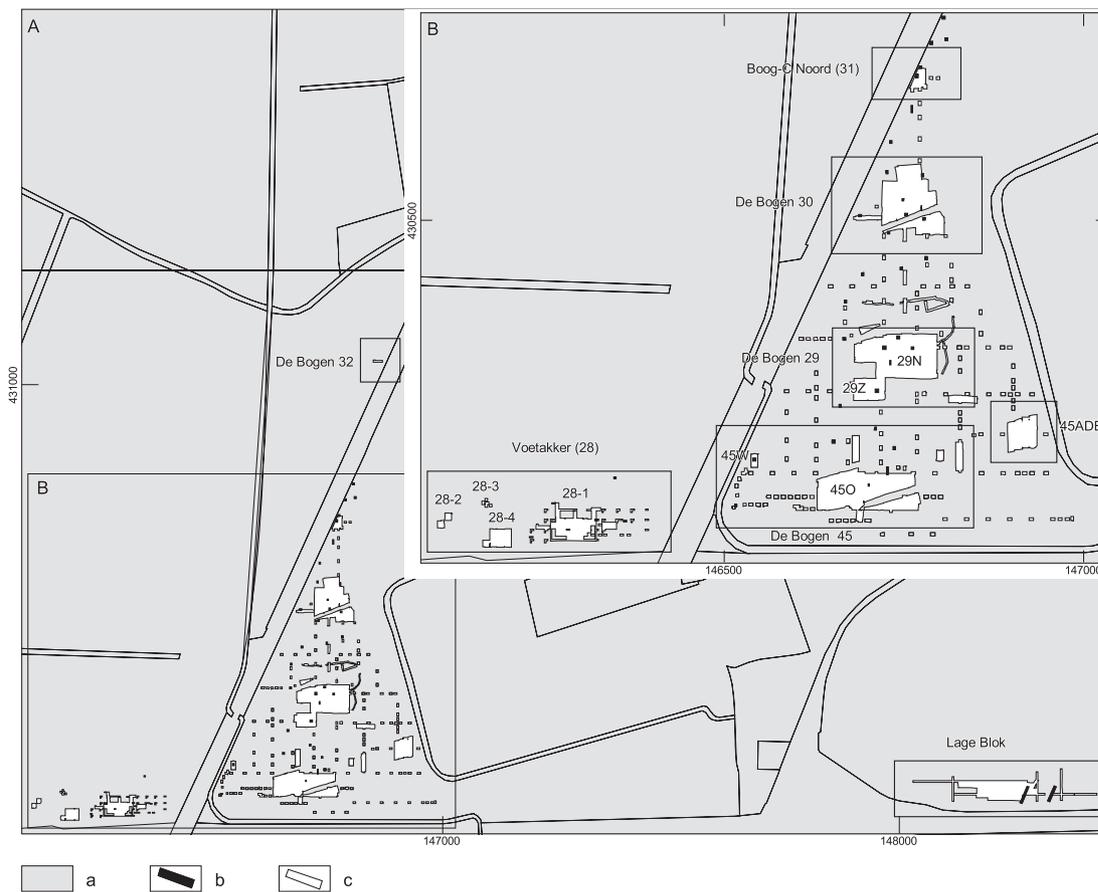


Fig. III.2 Overview of test-pits and excavations in the De Bogen meso-region on a topographical map. Inset B shows the "De Bogen" excavations in more detail.

a: not excavated, b: test-trenches, c: excavation.

APPENDIX III: DE BOGEN

After the completion of the major Betuweroute excavations, expansion of the village of Geldermalsen has since necessitated various generally small-scale (coring and/or test-pitting) campaigns (De Jager 1996; 1999 (fig. III.1, areas a2; a3); De Jager & Heunks 1998 (fig. III.1, areas a2; a3); Lanzig 1999 (fig. III.1, area a3); Bente 2000 (fig. III.1, areas a11; a17); Haarhuis 2000 (fig. III.1, area a17); Hessing & Oudhof 2001 (fig. III.1, area a14); Schutte 2003a (fig. III.1, area a5); Heunks 2002 (fig. III.1, areas a11; a17); Fijma 2003 (fig. III.1, area a12); Bergman & Helmich 2004 (fig. III.1, area a13); Boreel 2004 (fig. III.1, area a16); Baetsen & Van Kerkhove 2005 (fig. III.1, area a6); Bedaux 2005 (fig. III.1, area a15); Brokke 2005a-b (fig. III.1, area a4); Hakvoort 2005 (fig. III.1, area a14); Wullink 2005 (fig. III.1, area a10); Van Kampen & Verhelst 2006 (fig. III.1, area a7), Klooster *et al.* 2005 (fig. III.1 areas a8; a9). At one of the plots threatened by village expansion, ‘Geldermalsen - Hondsgemet’, a large scale (5 ha) excavation of a Late Iron Age and Roman period settlement was conducted in 2005 (Bente 2000; Haarhuis 2000; Heunks 2002; Van Renswoude 2006; fig. III.1, area a17).

no	name	type	reference(s)	remarks
112	Geldermalsen - RAAP 112	Fieldworking & coring	Asmussen 1994, 195	1 Indet. sherd Bronze Age or Iron Age
122	Geldermalsen - Raap 122	Fieldworking & coring	Asmussen 1994, 197	9 Indet. Iron Age sherds found during fieldwalking
126	Geldermalsen - Meteren; Middenblik	Fieldwalking	Louwe Kooijmans 1974, 375-376-126	LIA settlement at 40-100 cm depth,
145	Geldermalsen - Boog-C zuid	Fieldworking & coring	Asmussen 1996, 17; 145-146; Archis 43165; 127654	Possibly two finds-layers, material in corings from 30 to 90 cm depth; Bronze Age & Neolithic sherds
146	Geldermalsen - Boog C Noord	Fieldworking & coring	Asmussen 1996, 17; 61-62; <i>cf.</i> Archis 45646	Slag (misfired ceramics?) and charcoal at 40-80 cm depth below surface
147	Geldermalsen Boog-D zuid	Fieldworking & coring	Asmussen 1996, 17; 63-64; <i>cf.</i> Archis 307006	6 Indet. sherds, 2 ba sherds; 2 Ineo sherds and finds-layer at 50-120 cm
127657 (=148)	Geldermalsen - Spoorbrug Voorvliet	Fieldworking & coring	Asmussen 1996, 17; 65-66; Archis 43168; <i>cf.</i> Archis 127657	One indet. sherd and finds from unknown depth in coring. Possibly late Neolithic in age?
149	Geldermalsen - Knooppunt B	Fieldworking & coring	Asmussen 1996, 65-67; Archis 127658; 307012	Charcoal, bone and burned clay in corings; at unknown (neolithic?) depth
127659 (150)	Geldermalsen Boog-D Noord	Fieldworking & coring	Asmussen 1996, 17; 67-71; Archis 127659 (Spanjer 1998b; Archis 43267)	LIA-ROM period sherds at surface, possible feature layer from Neolithic or Bronze Age period
192	Geldermalsen - Mr Dr Kolffschool	Stray finds	Louwe Kooijmans 1974, 376-132	'native pottery' (Iron Age) collected by W.C. Braat during visit (1939)
25052	Geldermalsen - Hangwaard I	Observation	Hulst 1973, 28; 1975c, 81; Louwe Kooijmans 1974, 376-133a; Archis 25052	VL sherds and sherds with cord impressions and herring-bone motives SGC & AOO LNEO, from drainage ditch profile, possibly washed
903	Meteren - Boomgaard Blom	Stray find, during coring campaign	Van Zijverden 2002b, 47	Single Bronze Age sherd found at the surface during a coring campaign
922	Geldermalsen - Tussen Meteren & Geldermalsen	Stray find	Hulst & van Klaveren 1975, 78; Modderman & Montforts 1991, 145-147; 150	Resharpener diabase axe (LNEOA?, Jutse type K), flint axe-flake and bone from washed context
999	Geldermalsen	Stray find		LBA ; AXTNM?
2106	Est - Bovenblok	Fieldwalking	Archis 2106	Fieldwalking by ROB; 19 sherds EIA ceramics, several ROM, some EME and many LME ceramics

Table III.1 List of find-spots from the De Bogen macro-region (fig. III.1).

APPENDIX TO: A LIVING LANDSCAPE. BRONZE AGE SETTLEMENT SITES IN THE DUTCH RIVER AREA

6979	Erichem - Lingen	Stray find	Archis 6979	Bronze Age sherds and some bone from drainage ditch profile
7180	Geldermalsen - GL7180	Watching brief	Schutte 2003b, 13	Five postholes and indet. ceramics
7181	Geldermalsen - GL7181	Watching Brief	Schutte 2003b, 13	A veg. hor at 30-40 cm, a discolouration and a ditch (all undated)
7187	Geldermalsen - GL7187	Watching brief	Schutte 2003b, 13	Posthole (undated)
7188	Geldermalsen - GL7188	Watching brief	Schutte 2003b, 13	Finds-layer at 50-60 cm
7285	Geldermalsen - GL7285	Watching brief	Schutte 2003b, 13	Sherds (possibly IA) and bone on spoil heap
7678	Geldermalsen - GL7678	Watching brief	Schutte 2003b, 13	Finds-layer with bone and possible IA sherds, unknown depth
22312	Meteren - Geldermalsen	Test-trenches	Verhelst 2003; Asmussen & Exaltus 1993, 46; Archis 22312	LIA-ROM period features and ceramics
22791	Geldermalsen - Middengebied	Stray find (metal-detecting)	Archis 22791	Bronze spearhead; BA,
22827	Deil - Hooiblok	Fieldwalking	Archis 22827	(L)IA to ROM period sherds
22829	Deil - Kijfakker	Fieldwalking	Archis 22829	(L)IA to ROM period sherds
22833	Deil - Kijfakker	Fieldwalking	Archis 22833	(L)IA to ROM period sherds
22842	Meteren - Laageinde	Fieldwalking	De Jager 1996, 11; Archis 22842; 130275	Early Iron Age site with ceramics, bones and stones
25127	Geldermalsen - Uiterwaard van de Linge	Stray find	Louwe Kooijmans 1974, 377-134; Archis 25127	Stone axe (NEO-EBA?) from sandy patch in Linge floodbasin
25137	Geldermalsen	Stray find	Louwe Kooijmans 1974, 375-125; Archis 25137	2 BA sherds, also some LIA-ROM and (post)ME sherds during ploughing of field
30122	Geldermalsen Lage Blok II	Test-trenches & excavation	Van der Roest 1997; Milojkovic & Smits 2002; Archis 30122	Some possible features and several EBA (4) MBA (481) sherds, MIA sherds (EIA according to Archis)
32296	Geldermalsen - Middengebied	Excavation	Hulst & Van Klaveren 1993, 159; 1994; Archis 32296; 7164; pers. comm. J. van Doesburg	LNEO-A; AOO phase features, potbeaker sherds MBA well, EIA, MIA and LIA-ROM period features. Roman period finds described by Stuart are listed as Archis 7164, same coordinates. Two 'Barbed Wire'-stamp decorated sherds according to J. van Doesburg
38567	Meteren - Voetakker	Coring	Archis 38567	Charcoal, stone, bone and ceramics from unknown depth (LNEO-BA?)
38568	Meteren - Voetakker	Coring	Archis 38568	Charcoal from 50 cm depth.
38569	Meteren - Voetakker	Coring	Archis 38569	Finds (stone, burned clay, charcoal, bone) from unknown depth (LNEO-BA?)
38570	Meteren - Voetakker	Coring	Archis 38570	Ceramics, bone & charcoal from unknown depth (LNEO-BA?)
38571	Meteren - Voetakker	Coring	Archis 38571	Sherds, charcoal, stone and bone from unknown depth (LNEO-BA?)
40752	Meteren - Kalenberg	Unknown	Archis 40752	Stone hammer-axe of the 'Epe-type'

Table III.1 (continued) List of find-spots from the De Bogen macro-region (fig. III.1).

APPENDIX III: DE BOGEN

43267	Geldermalsen - Boog D-noord	Test-trenches	Spanjer 1998b; Archis 43267	ROM and E-LME finds in test-trenches
48054	Geldermalsen - Middengebied Zuid	Watching Brief	Schutte 2003a; Archis 48054	1 possible BA sherd, 3 LBA-MIA, MIA features and ceramics, also ME ceramics found during watching brief
130275	Meteren - Kalenberg KAL1-4	Fieldwalking & coring	De Jager 1996, 11; Archis 32924; 22842; 130275	IA, ROM & ME pottery. fieldwalking & coring by raap on site discovered by Verhelst (Archis 22842), test-trench by ROB (Archis 32924)
130276	Meteren - Kalenberg KAL12	Coring campaign	De Jager 1996	PFB sherd and possible NEO flint flake
130277	Meteren - Kalenberg KAL010	Fieldwalking & coring	De Jager 1996, 15; Archis 130277	Four indet. sherds, NEO flint axe-flake (+ rom + me ceramics)
138382	Geldermalsen - Middengebied	Fieldwalking & coring	De Jager & Heunks 1998; Archis 138382	Two flint axe-flakes, flint scraper and arrow fragment, one LBA-EIA sherd and ROM and ME period ceramics
307009	Bogen 28-2, 28-3, 28-4	Excavation	Archis 307009 - 307011; Meijlink & Kranendonk 2002	Archis entry for the Voetakker (28-1 to 28-4) sites

Table III.1 (continued) List of find-spots from the De Bogen macro-region (fig. III.1).

The geological context

The Holocene genesis of the De Bogen macro-region is relatively ill-understood. Due to the thick layer(s) of covering floodbasin sediments and the limited depth of corings in soil-mapping surveys (Vink 1954; Van der Sluys 1956; Stiboka 1973) the fluvial channels active prior to the Iron Age have not been accurately mapped. Recent re-analysis of laser-altimetry data and digital coring archives (Van Zijverden 2004b; Van Zijverden & Laan 2005) has shown that corrections and additions are also necessary for the geological map (Verbraeck 1984), sand-depth map (Berendsen *et al.* 2001) and palaeogeographical map (Berendsen & Stouthamer 2001) compiled for the area, even though these were all compiled with datasets comprising corings of greater (> 2 m) coring depths.

The prospective coring campaigns executed during several phases of the Betuweroute research already pointed out some of the problems. In a few instances, yet unmapped fluvial systems were encountered (*e.g.* the Eigenblok system (Asmussen 1996, 59), unnamed systems in lithogenetic profiles at De Bogen (Van Zijverden 2002b, 66 fig. 2.4, section A-A' system B1 (fig. III.3, u1) and section B-B' system B2 (fig. III.3, u3)) and Lage Blok (Van Zijverden 2002c, 31 fig. 2.5 section B-B' system b1 (fig. III.3, u 4)) while in others, expected systems were absent on the predicted location (*e.g.* the Deil system (Van Zijverden 2004b)).

The dating of the various fluvial systems once active in the De Bogen macro-region is also problematic. For several systems (*e.g.* Esterweg, Voetakker, Enspijk, Gellicum) direct dates are altogether lacking, whereas for others, only direct dates for the start or end of sedimentation are available (*e.g.* Eigenblok, Erichem, Meteren, Hooiblok; Berendsen & Stouthamer 2001; Van Zijverden 2002a-c; 2004b).

Despite the abovementioned coring depth and density related flaws in the available maps for the De Bogen macro-region, the palaeogeographical map compiled by Berendsen and Stouthamer (2001), if supplemented by the crevasses as mapped on the most recent sand-depth (Berendsen *et al.* 2001) and corrected by more recent studies (Van Zijverden 2004b; Van Zijverden & Laan 2005) still provides the best basis for a discussion of the long-term regional evolution of this part of the river area.

All of the De Bogen Bronze Age sites are situated on top of (floodbasin deposits covering) crevasse deposits (Van Zijverden 2002b; 2004b; Ter Wal 2001, 26, the Bronze Age activities at Lage Blok took place on top of channel bed, levee and crevasse deposits (Van Zijverden 2002c, esp. 41)). Although in the subsoil early Holocene channel bed and levee deposits are sometimes encountered, they do not seem to have influenced the landscape morphology in Bronze Age and later periods. The crevasse splay deposits have been deposited throughout the entire Holocene period and particularly at the locations where crevasse splays from different phases overlap, relatively higher areas could form in the wetter floodbasin. The understanding of the phasing and morphology of the individual crevasse

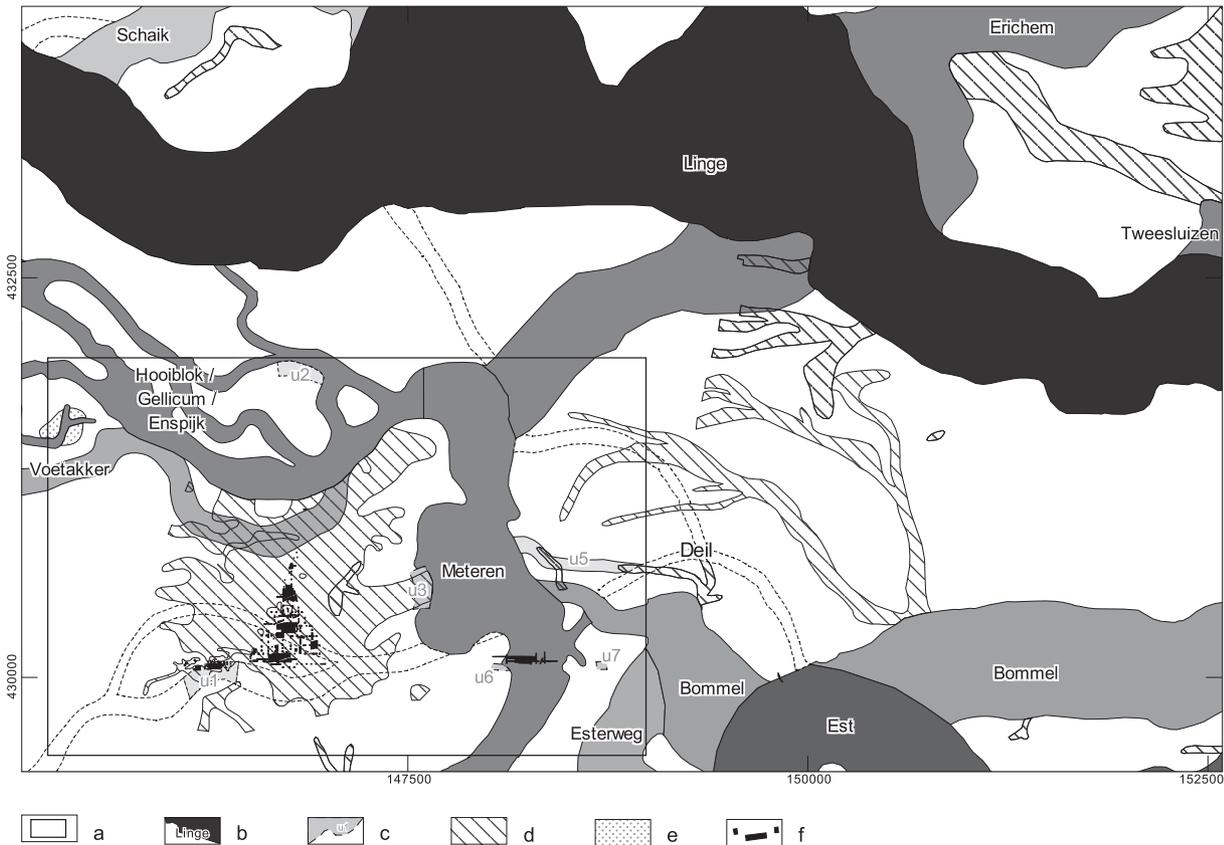


Fig. III.3 Fluvial systems in the De Bogen macro-region (after Berendsen & Stouthamer 2001; Berendsen *et al.* 2001; Van Zijverden 2002b; 2004b; Van Zijverden & Laan 2005).

a: the De Bogen meso-region, b: fluvial system, c: unmapped fluvial systems, d: crevasse deposits, e: possible river dune, f: excavation trenches.

splays is related to the coring (depth and) density. Where large numbers of corings are available and coring depth is sufficient, it is clear that what with less available data is grouped as a single crevasse splay (e.g. crevasse phase 3 (Van Zijverden 2002b, see also below)), was in reality formed during as many as five different events (fig. III.4).

II SOURCE CRITICISM

Coring campaigns (soil mapping)

The various soil-mapping campaigns executed in the De Bogen macro-region were not specifically aimed at, or – due to the low mean coring density and methodology of description – suitable to the discovery of prehistoric sites (Vink 1926, 6-7; Van der Sluys 1956; Stiboka 1973, esp. 12, 140). Despite these limitations, several ‘former habitation sites’ were discovered. They were mostly recognised by their phosphate discolouration and predominantly date from the Late Iron Age to Roman Periods or younger (*cf.* Pijls 1965, 125, 130, 227; Louwe Kooijmans 1974, 375-376, nos. 123, 124, 126). The limited coring depth (generally to 1.2 m maximum) during soil-mapping campaigns also hampered the understanding of the location and age of deeper-lying fossil fluvial systems. The greater coring depth of the corings executed for the compilation of the geological map (2 to 10 m depth; Verbraeck 1984, 231), was beneficial in this sense, but here as well, coring density was generally too low to accurately discover and map the various fluvial systems in the subsoil (up to 10 corings per square kilometre; Verbraeck 1984, 23; 233-234; Van Zijverden 2004b).

APPENDIX III: DE BOGEN

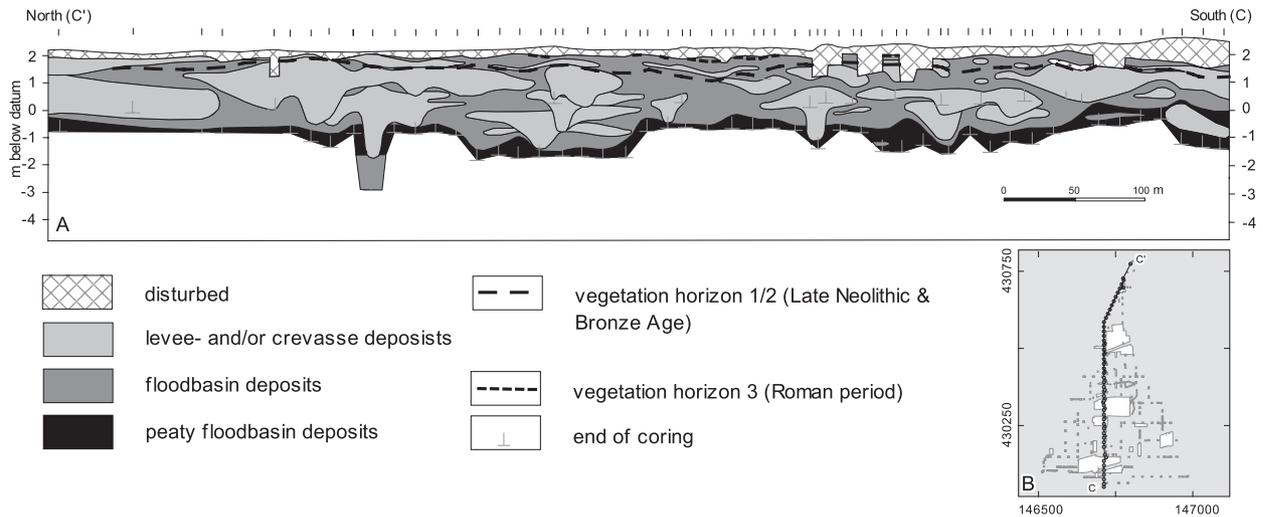


Fig. III.4 Section across sites Boog-C Noord (31), De Bogen 30, 29 and 45 (after Van Zijverden 2004b). The superimposed (stacked) crevasse splay deposits form the basis of the (combined?) Late Neolithic and/or Bronze Age vegetation horizon(s). The location of the section is indicated on inset B.

Fieldwalking and coring by RAAP

Initial prospective archaeology executed by RAAP before the construction of the Betuweroute consisted of desktop studies (Asmussen 1991) and fieldwalking (Asmussen & Exaltus 1993, 13) combined with extensive (Asmussen 1994, 19) and intensive prospective coring campaigns (*ibid.*, 19-20). During the fieldwalking phase, no clear Bronze Age sites were discovered (only at RAAP site 112 a single Bronze or Iron Age sherd was found (Asmussen 1994, 195)). Most sites found during fieldwalking dated to the (Late) Iron Age to Roman Period (sites 59-60; Asmussen 1993, 46; sites 113-123; Asmussen 1994, 194-198) or medieval periods (sites 60 (Asmussen 1993, 46); sites 109-111, 122-123 Asmussen 1994, 194-198, see fig. III.5 below). This indicates that fieldwalking alone is not the best strategy to prospect for Iron Age or older sites in this part of the river area. The sometimes significant depth below the present-day surface of the Bronze Age vegetation horizons at the ‘De Bogen’ sites (generally 40-90 cm, *cf.* Jongste & Smits 1998, 9-10) decreased the chances of material being ploughed to the surface. Furthermore, the dominant agricultural use of the area consists of pastures and orchards, both of which do not rely on regular ploughing and are characterized by a low archaeological visibility during fieldwalking.



Fig. III.5 Sites discovered by Raap and the excavated areas.

a: test-trenches and excavated area, b: Raap catalogue site numbers (based on Asmussen & Exaltus 1993; Asmussen 1994; 1996).

Initially, due to the assumed absence of fossil fluvial systems, no detailed prospective coring was planned on the location of the De Bogen excavations (Asmussen 1996, 59). It was not until the discovery of a yet unmapped meander belt on a soil-compaction map in 1993, and with the publication of the sand-depth map in 1994 (Berendsen, Faessen & Kempen 1994) that it was realised that unmapped systems with potential prehistoric activities associated to them were to be expected (Van Zijverden 2004b, *cf.* Asmussen 1994, 27, 1996, 59). Moreover, parts of the Betuweroute railway trajectory were changed or added over the years, and the area of the De Bogen sites 39-32 and 45O was not part of the railway trajectory prior to November 1995 (Asmussen 1996, 7). For these plots, no separate fieldwalking campaigns were initiated, and intensive coring was directly chosen as the main strategy (Asmussen 1994, 19-20; 1996, 59-67). The coring campaigns yielded some Neolithic sherds, Neolithic to Bronze Age and Bronze Age ceramics from sites 145 and 147, as well as vegetation horizons assigned to these periods on sites 145 to 150 (fig. III.5; Asmussen 1996, 59-62). According to Raap, the geomorphogenetic interpretation for the sites 145 to 150 was a – partially washed or eroded – finds-layer on the flanks of a meander belt (Asmussen 1996, 59-67). Later research (see below, *cf.* fig. III.4) has clearly shown that these were in fact vegetation horizons formed in the top of crevasse and floodbasin deposits. Presumably, the use of greater coring depths (penetrating the entire Holocene sequence) during this phase could have already suggested the interpretation as crevasse deposits at this stage.

In addition, erosion by later crevasse formation had disturbed the vegetation horizon and any embedded finds in several parts of the De Bogen area (Van Zijverden 2002b). This resulted in decapitated soil-profiles, for which it is hard to detect prehistoric occupation in archaeological coring campaigns. Nonetheless, feature preservation may be adequate at such locations. For example, structure 29STA (see fig. III.11, D) was recovered from an area where the entire vegetation horizon and possible finds-layer had been washed away (Van Zijverden 2002b, 87; Hielkema, Brokke & Meijlink 2002, 181-183). This type of erosion (see Arnoldussen 2008, Chapter 2) may result in an underestimation of the assumed extent of the occupied areas.

Despite the discovery of this large number of predominantly prehistoric sites in the De Bogen area through detailed coring, one should keep in mind that of the 21 corings executed at site 28 (De Bogen - Voetakker 28-1, 28-2, 28-3, 28-4, see below) none yielded a single datable find. Nonetheless, several parts of this site supported dense prehistoric occupation (Hielkema, Brokke & Meijlink 2002, 236-288). At the Lage Blok excavation (Raap sites 119, 121-123; Asmussen 1994, 137-143, 197-198) over 480 Bronze Age sherds were recovered (Ufkes 2002b, *cf.* Van der Roest 1997, 16-17; Van Zijverden 2002c, 41) while the presence of Bronze Age occupation was not suspected based on the fieldwalking and corings executed there (Asmussen 1994, 30, 137-143, 197-198).

Test-trenches

Based on the results of the fieldwalking and coring campaigns, test-trenches were proposed as the next step of investigation for Raap sites 119/121 ('Lage Blok') and 145-150 ('De Bogen'; Asmussen 1994, 30; 1996, 14). At the plots in question, test-trenches were dug between 1996 and 1997 (Van der Roest 1997; Bulten & Smits 1998; Jongste & Smits 1998; Spanjer 1998, see also Verhelst 2003). The strategies of test-trenching differed between the various campaigns. At sites where predominantly (Late) Iron Age or Roman period features were expected, large surfaces were opened in a limited number of trenches (Boog-D Noord, Lage Blok, see table III.2 below). At sites where prehistoric finds-layers were suspected, test-pits of limited extent, but of greater depth, were dug (table III.2). As larger areas than those investigated with test-trenches have been disturbed by the railway construction at Boog-D Noord and Lage Blok, one may wonder what types and numbers of older (Bronze Age?) remains have been not been found due to the limited distribution (and small numbers) of the trenches.

The campaign of test-trenching was accompanied by a detailed coring campaign in order to better determine the extent of the settlement sites mapped by Raap (Van Zijverden in: Jongste 1998; Van Zijverden 2004b). As a consequence, the location of the predicted settlement site core areas shifted for some sites (*cf.* Bulten & Smits 1998, 7; Jongste & Smits 1998, 17) and some new sites were mapped (*e.g.* site 45ADB; Van Zijverden in: Jongste 1998, 56). Site 45ADB ('Achter De Bomen') was therefore not subjected to test-trenching, but was to be evaluated together with the excavation of site 45O (see for location fig. III.2). Most of the sites were interpreted as house-sites that reflected a considerable time-depth (Late Neolithic to Bronze Age activities) at a single excavation level (sites 29N, 30, 45W; Jongste & Smits 1998, 39-41, 43). For site 28, the presence of a house-site with a more narrow time depth (Middle Bronze Age-A) was assumed (Bulten & Smits 1998, 22).

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Raap cat no	Name	Raap extent of site (m ²)	Nos. of test-trenches	Area of test-trenches (m ²)	% of (Raap) site investigated	References
119/121	Lage Blok	11000	2	400	3.6	Asmussen 1994, 34; Van der Roest 1997
150	Boog-D Noord (32)	12500	1	80	0.6	Asmussen 1996, 18; Spanjer 1998
145-148	De Bogen (29, 30, 31, 45)	11500	32	447	3.8	Asmussen 1996, 18; Jongste & Smits 1998
159	Voetakker (28)	1200	6	58	4.8	Asmussen 1996, 18; Bulten & Smits 1998

Table III.2 Number and extent of test-trenches for the 'De Bogen' sites.

This was, however, based on the presence of five datable (potbeaker, Barbed Wire-stamp decorated and Hilversum-style decorated) sherds amongst 436 not-diagnostic (potentially later Bronze Age) fragments (Bulten & Smits 1998, 19). Two other sites, sites 29Z and 31, yielded no features but some Late Neolithic and/or Early Bronze Age ceramics and they were interpreted as 'special activity' sites (Jongste & Smits 1998, 25-26, 33, 40). The nature of such sites was not discussed in more detail (see Arnoldussen 2008, Chapter 7) and the interpretation may have been influenced too much by the small size (88 m² in five trenches at 31 and 49 m² in three trenches at 29Z) of the trenches, their position in the relation to the reconstructed former landscape and the small numbers of diagnostic sherds (*cf.* tables II.4-II.5).

It should also be noted at this point that an area of six ha between the easternmost limit of site 45 and the railway fly-over to the east of this area was not accessible for prospective coring by Raap, was consequently not test-trenched and its presumably high archaeological potential has been left unexplored (during the watching brief, several features, a vegetation horizon and some finds were recorded from this area; Schutte 2003b, 13; fig. III.1 nos. 7180-7180, 7187, 7188).

The 'De Bogen' excavations

Of the various locations test-trenched in the De Bogen meso-region, site 32 was not selected for additional research and for Lage Blok it was explicitly decided not to focus on the Bronze Age remains that were present at the level below that of the Middle Iron Age settlement (Milojkovic & Gehasse 2002, 15). The excavations at the De Bogen sites 29, 30 and 45 test-trenched earlier had a phased approach. As a considerable time depth was assumed to be represented at many of the sites, four by four meter and four by six meter trenches were dug in the predicted core areas of the prehistoric sites (Meijlink 2002a, 29-30). They served the specific purpose to look for areas where a more limited time-depth was represented by the remains from the finds-layer (*ibid.*; Meijlink 2002b, 765). Unfortunately, this was rarely the case and therefore the finds-layer has not been intensively investigated outside these first phase four by four meter and four by six meter trenches (Meijlink 2002a, 31; 34; Meijlink 2002b, 764;-765). This implies that the study of all the cultural remains recovered is hampered by the fact that the remains represent a palimpsest of as many as 1500 years of accumulation. Furthermore, these initial trenches in which the finds-layer was thoroughly investigated provide only a *c.* 17.5 % area sample, *i.e.* at 82.5 % of these sites the finds-layer was dug away without additional research or find recovery (5042 m² of initial four by four and four by six meter trenches versus a total surface area of *c.* 2.88 hectares; Meijlink 2002a, 29-32). At sites 31 and 28-1, the finds-layer was completely excavated in meter squares (*c.* 0.32 ha; Schoneveld & Gehasse 2001, 20; Meijlink 2002a, 38) Here too, unfortunately, the time depth need not have been as limited as was assumed (see below).

The large time depth reflected in the finds-layer at De Bogen is coupled by a(n in parts) very high feature density, which complicates the interpretation of the features observed. Especially at sites 28-1 and parts of sites 29 and 30, the feature density is locally problematically high (see table III.3 and below). After completion of the preliminary analyses of the feature plans, only slightly over 3.6 % of the features could be interpreted as being part of a possible prehistoric structure such as a houses or outbuildings. Presumably, this figure is an under-representation as it does not include fences and palisades, but it is doubtful whether including them would more than double this figure.

APPENDIX TO: A LIVING LANDSCAPE. BRONZE AGE SETTLEMENT SITES IN THE DUTCH RIVER AREA

Site	Area (m ²)	Features	Overall mean feature density	Max. feature density(m ²)
28-1	2702	3651	1.35	6.16
28-2	196	167	0.85	1.56
28-3	81	100	1.23	0.84
28-4	841	984	1.17	6.12
29	7939	2718	0.34	3.44
30	5977	3223	0.53	3.96
31	515	56	0.1	0.28
45	4370	2708	0.6	3.32
<i>mean</i>	<i>2827</i>	<i>1700</i>	<i>0.77</i>	

Table III.3 Approximation of the feature density of the larger completely excavated areas of the various De Bogen sites.

The overall strategy at many of the De Bogen excavation was geared towards the uncovering of prehistoric house-sites (Meijlink 2002b, 765; cf. Hielkema, Brokke & Meijlink 2002, 277). The parts were they were expected – based on the finds- and feature densities in the initial trenches – have seen more extensive excavation in continuous trenches. Outside these larger excavated areas, a total area of 0.51 ha has been uncovered in as many as 406 smaller trenches. Although the latter can indeed be used to investigate the distribution and density of the archaeological remains over a wider area (Meijlink 2002a, 29-40), it will be clear that recognizing structures in trenches of modest size is very difficult. Consequently, it may very well be that additional structures have indeed been encountered in the c. 16 % of the surface investigated with these smaller trenches, but that these have not been recognized as such and have consequently not led to more extensive excavation.

The decision taken to more extensively excavate the areas where the higher concentrations of finds and/or features were uncovered, may in a sense have been counterproductive. At these locations – generally the higher parts of the underlying crevasse splay deposits – the many finds recovered cannot be associated with the underlying features, while the density of the features in itself inhibits the recognition of individual structures. For instance, the fact that several claimed Late Neolithic or Early Bronze Age houses were reconstructed from areas with relatively high feature densities, to a certain extent weakens the validity of their interpretation (see below).

Site	a	b	c	d	e	f	g	h	i
Lage Blok	490	4	4	-	-	486	0.8	0.8	-
Bogen 28	3696 (34827)	349	355	6	1216	2030	9.6	1	14.9
Bogen 29-Z	921 (2320)	105	300	195	119	603	32.6	12.9	21.5
Bogen 29-N	2809 (9270)	94	164	70	173	2597	5.8	5.8	7.4
Bogen 30	2753 (10990)	130	371	241	196	2327	13.5	3.4	20.6
Bogen 45W	886 (5302)	15	49	34	42	832	5.5	0.9	25.3
Bogen 45O/G	1395 (9345)	89	105	16	99	1278	7.5	1.1	10.7
Bogen 31	1235 (10910)	694	694	(96)	931	805	56.2	6.3	39.7

Table III.4 Numbers and percentages of Late Neolithic to Middle Bronze Age-A pottery (based on Van der Roest 1997, 16-17; Bulten & Smits 1998, 19; Jongste & Smits 1998, 26-37; Spanjer 1998, 12-13; Ufkes 2001, 35; 2002b, 70; Ufkes & Bloo 2002, 383-386).

a: total number of sherds studied (total number of fragments recovered), b: classified as 'Late Neolithic to Middle Bronze Age-A' with certainty (reinterpretation S. Arnoldussen, excavations only), c: classified as 'Late Neolithic to Middle Bronze Age-A' with certainty (reinterpretation S. Arnoldussen, excavations and test-trenches (b+d)), d: classified as 'Late Neolithic to Middle Bronze Age-A' (test-trenches), e: classified as 'Late Neolithic to Middle Bronze Age-A' (excavations), f: sherds classified as 'indet.' or (Early-Middle)Bronz Age (test-trenches and excavations), g: percentage Late Neolithic-Middle Bronze Age-A pottery as reinterpreted by number (% c of a1), h: percentage Late Neolithic-Middle Bronze Age-A pottery as reinterpreted by number (% c of a2), i: percentage of Late Neolithic to Middle Bronze Age-A as percentage of total in weight (% weight e of total weight (excavations only)).

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<i>Site</i>	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>
Lage Blok	-	-	-	-	-	-	some	-	-	mostly MIA
	-	-	-	-	4	-	486	-	-	mostly MIA
Bogen 28	3871	-	-	3	1	2	436	-	-	-
	2525 (30956)	-	69	40	216	24	273	1321	-	2
Bogen 29-Z	654	-	64	125	6	-	-	459	-	-
	267 (1666)	-	67	22	16	-	3	141	-	4 IA
Bogen 29-N	2481	3	22	37	7	1	-	2411	-	-
	328 (6789)	-	18	27	48	1	31	155	-	-
Bogen 30	2352	1	35	183	19	3	-	2107	-	5 MNEO?
	401 (8638)	-	51	35	43	1	17	203	-	2
Bogen 31	353	-	-	81	15	-	-	257	-	-
	1235 (10910)	-	96	431	166	1	-	548	-	-
Bogen - 45W	844	-	5	25	2	2	-	810	-	-
	42 (4458)	-	1	6	8	-	-	22	-	-
Bogen - 45O	1171	-	3	11	1	1	-	1155	-	-
(45O & 45G)	224(8174)	-	65	17	3	4	23	100	-	2
Bogen 32	572	-	-	-	-	-	-	-	-	all Roman

Table III.5 Numbers of Late Neolithic to Middle Bronze Age-A sherds. Light cells concern the test-trenches, dark cells the excavations (based on Van der Roest 1997, 16-17; Bulten & Smits 1998, 19; Jongste & Smits 1998, 26-37; Spanjer 1998, 12-13; Ufkes 2001, 35; 2002b, 70; Ufkes & Bloo 2002, 383-386).

a: total number of sherds studied (total number of fragments recovered), b: classified as Late Neolithic-A, c: classified as Bell Beaker, d: classified as Potbeaker, e: classified as 'Barbed Wire'-stamp decorated pottery, f: classified as Hilversum-style decorated ceramics, g: classified as Middle Bronze Age, h: classified as 'Indet.' or 'Early-Middle Bronze Age', i: classified as Late Bronze Age, j: classified as 'other' (Middle Neolithic, (Middle) Iron Age and Roman period) ceramics.

The efforts to isolate separate phases of use and activities are furthermore hampered by the general absence of vertical stratigraphy. Only near the southern part of site 28-1 could two stratigraphically separated (pre-Iron Age) levels be encountered within the excavation limits (see below; Van Zijverden 2002b, 66-69). Perhaps the study of isolated periods or activities could have benefited significantly from an approach in which the areas where vertical stratigraphy was present according to the physical-geographical coring campaigns had been specifically targeted. There, feature density may be (very) low, but such locations would allow to better study the variation in material culture between the various periods and would allow the reconstruction of structures from older (Late Neolithic to Middle Bronze Age-A) periods with more credibility.

A final comment to be made is that during the analyses of the excavation results, the various specialists and those responsible for the feature analyses worked simultaneously, yet separately. This could lead to situations where the finds relevant for dating recognized structures, have not been studied as an assemblage – or not at all (*cf.* Hielkema, Brokke & Meijlink 2002, 218-224; 280-281). Unfortunately, no construction wood of houses or outbuildings had been preserved that could be used for direct dating (but see Hänninen & Van Haaster 2002, 725).

Within the various De Bogen excavations, several larger parts of a crevasse landscape that supported Late Neolithic to Middle Bronze Age-A activities – and for the later Middle Bronze Age-B period – occupation have been uncovered. In the areas of moderate to low feature density several reasonably well preserved Bronze Age house-sites – and a funerary location with a remarkable longevity – have been uncovered, and they provide much information on nature and dynamics of Bronze Age settlement sites (see below).

III OCCUPATION HISTORY AND PALAEOGEOGRAPHICAL DEVELOPMENT

Early and Middle Neolithic

The first Holocene fluvial systems active within the De Bogen macro-region are relatively ill-mapped (see above; Van Zijverden 2004b). In a coring 300 m to the south(west) of the macro-region, macro-remains from peat at the base of the Holocene sequence – on top of which the first fluvial sedimentation occurred – were dated to *c.* 4780-4500 cal BC (UtC-7812: 5788 ± 50 BP; Berendsen & Stouthamer 2001, 173). Another date for peat on top of the overbank deposits from the same location (*c.* 4550-3950 cal BC; UtC-7867: 5360 ± 120 BP, *ibid.*) indicates that these fluvial systems were active for several centuries. Presumably, these first systems to deposit their bedload outside the Pleistocene river valleys formed a (dendritic) system of smaller river channels that combined downstream into a larger channel (Van Zijverden 2004b, *cf.* Cohen 2003, 162-163). Two of such channels were encountered in the De Bogen macro-region: one is situated within the presumed location of the Deil channel as constructed by Berendsen and Stouthamer (2001), the other concerns an early phase of (or precursor to) the Voetakkerse fluvial systems (fig. III.6, a).

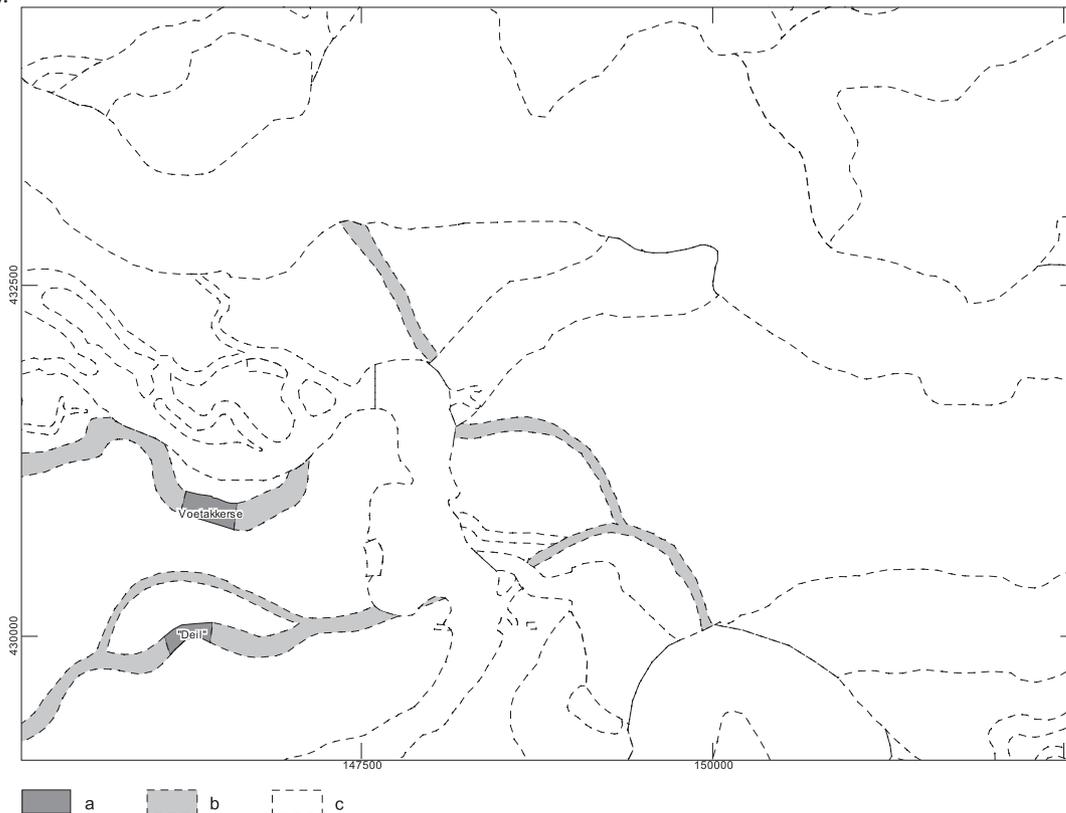


Fig. III.6 Active early Holocene fluvial systems in the De Bogen macro-region.

a: system confirmed by corings, b: system suspected by Berendsen & Stouthamer (2001), c: younger fluvial systems.

No undisputable find-spots of Early Neolithic or older age are known from the De Bogen macro-region (fig. III.7; but see Niekus *et al.* 2002b, 456 on Mesolithic pick-ups at De Bogen). This is most likely a consequence of the greater depth (between 2 and 6 m) of the fluvial systems on top of which such remains may be encountered, the absence (or lack of information on the location) of sizeable river dunes and lack of systematic archaeological enquiries into these periods within the De Bogen macro-region.

Several fluvial systems are thought to have been active during the Middle Neolithic (fig. III.7), but no direct dates on their periods of sedimentation are available. The Esterweg fluvial system is thought to have been active between *c.* 3670/3370 to 2460/2130 cal BC based on assumed relations to other fluvial systems (Berendsen

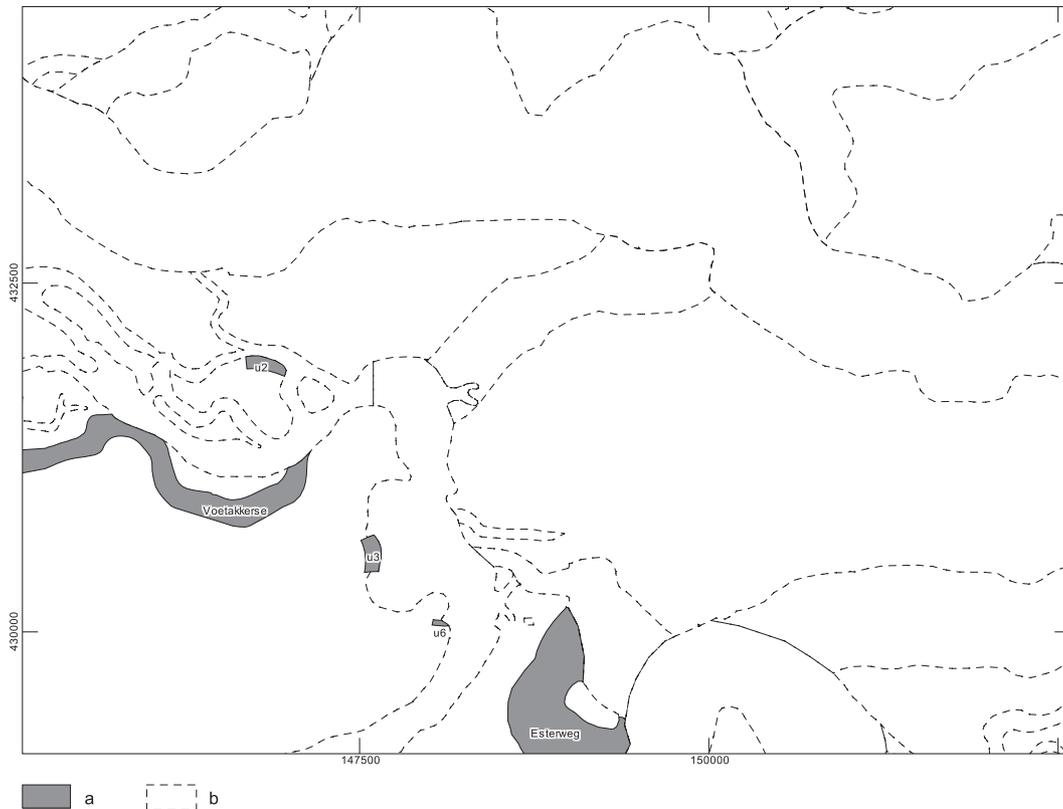


Fig. III.7 First phase of Middle Neolithic fluvial activity in the De Bogen macro-region.
a: active fluvial systems, b: younger fluvial systems.

& Stouthamer 2001, 200; 205; 246). For the Voetakkerse system, a *terminus ante quem* date is provided by dated crevasse residual gullies of the crevasse splay deposits that overlie this system. Two samples from different gullies were combined and dated to *c.* 3520-3100 cal BC (AA-37523: 4600 ± 45 BP; Van Zijverden 2002b, 79-81), indicating that sedimentation by the Voetakkerse system must have ended before the 2nd half of the fourth millennium BC. For the unnamed systems u2, u3 and u6, no direct dates on their period(s) of sedimentation are available.

Later during the Middle Neolithic (fig. III.8) active fluvial systems were again situated at the location of unnamed systems u2 and u3. Possibly, the extensive crevasse splay formation that overlie the Voetakkerse levee and channel-bed deposits, originated either from one or both of these systems. The unnamed systems u2 and u3 can be distinguished from their predecessors by the higher top of their levee and overbank deposits in coring sections, but they too cannot be dated directly (see Van Zijverden 2004b for this section). The system mapped as u7, may represent a part of the Esterweg fluvial system, but could equally well be another, yet unmapped, fluvial system.

Near the end of the Middle Neolithic, the Erichem fluvial system comes into being, but it is unclear which channel (u2 or u3?) formed its downstream connection. Its start of sedimentation is estimated at *c.* 3100-2900 cal BC (UtC-6846: 4376 ± 38 BP; Berendsen & Stouthamer 2001, 199; 248) based on a date for its upstream connection; the Zoelen system. For the end of sedimentation, a direct date from the residual gully is available (UtC-4638: 2420 ± 140 BP; Berendsen & Stouthamer 2001, 199). The Erichem fluvial system thus functioned throughout the entire Late Neolithic and Bronze Age periods. A radiocarbon date for the humic clay in a crevasse residual gully at site 28 indicates that the formation of this (part of the) crevasse splay ended by *c.* 3520-3100 cal BC (AA-37523: 4600 ± 45 BP; Meijlink 2002a, 79; Van Zijverden 2004b).

Finds indisputably datable to the Middle Neolithic are few in the De Bogen macro-region. Some Vlaardingeng period sherds (together with Beaker period sherds) were identified in a drainage ditch profile southwest of the village of Geldermalsen (fig. III.8, no 25052; Hulst 1973; 28 1975c, 81) and five possibly Middle Neolithic sherds were

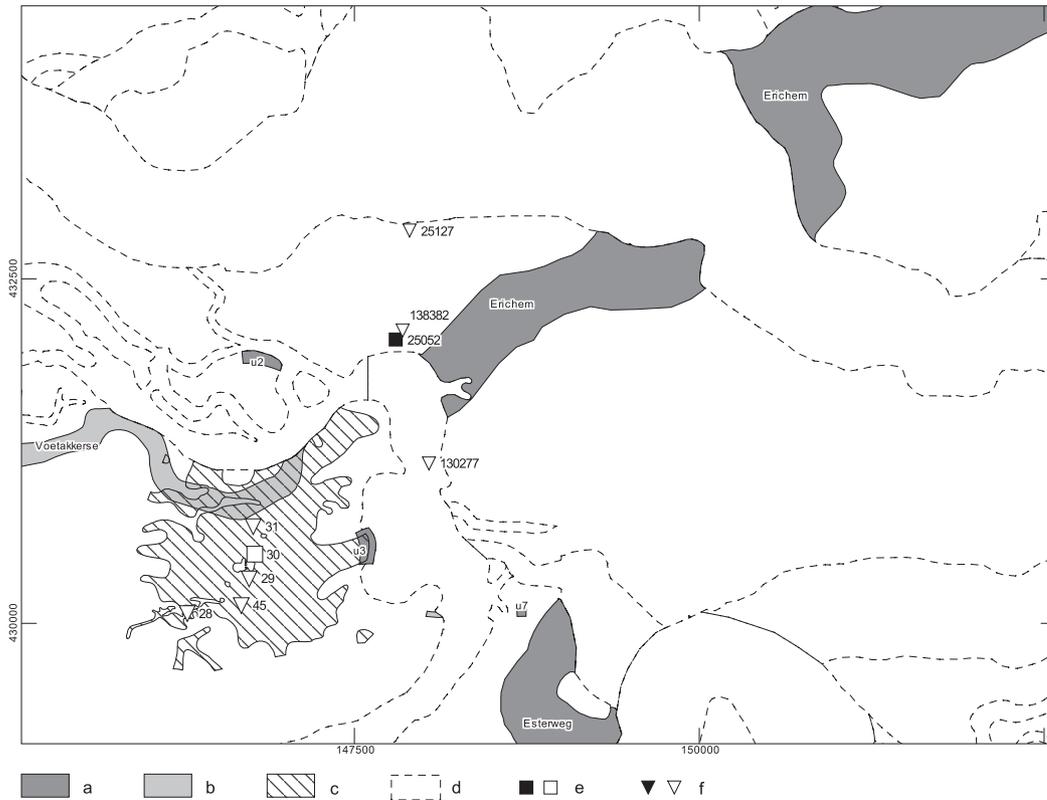


Fig. III.8 Second phase of Middle Neolithic fluvial activity and find-spots (filled symbols are certain identifications, outlined symbols uncertain identifications) in the De Bogen macro-region.

a: active fluvial system, b: fossil fluvial systems, c: crevasse splay deposits, d: younger fluvial systems, e: ceramics, f: flint tools.

identified at De Bogen site 30 (Jongste & Smits 1998, 30-31). In addition, a charcoal sample from a presumably Middle Bronze Age-B house plan proved to be of Middle Neolithic age (AA-37516: 4390 ± 55 BP; Meijlink 2002a, 47; Hielkema, Brokke & Meijlink 2002, 148). A complete flint axe was recovered from a 'sandy patch' near the Linge river (fig. III.8, no 25127; Louwe Kooijmans 1974, 377-134; Archis 25127) but its dating is imprecise. The same applies to the, sometimes reworked, flakes from polished flint axes recovered from Geldermalsen - Middengebied (fig. III.8, no 138382; De Jager & Heunks 1998; Archis 138382), Meteren - Kalenberg KAL010 (fig. III.8 no 130277; De Jager 1996, 15; Archis 130277) and several De Bogen sites (Jongste & Smits 1998, 29, 35; Niekus, Van Gijn & Lammers 2001, 72; Niekus *et al.* 2002b, 435; 437; 441; 444; 455-456). These flakes originated from axes that can be both of Middle or Late Neolithic age.

In conclusion, the nature of human presence during the Early or Middle Neolithic cannot be established beyond doubt. Only in one case could sherds with some degree of certainty be identified as belonging to the Vlaardingen period (Fig III.8, no 25052; Hulst 1975, 81). The various excavations at De Bogen have yielded no conclusive evidence of human activities during these periods. Possibly, the absence of remains from these periods is related to the phase of crevasse formation that occurred prior to 3100 cal BC on top of the Voetakkerse fluvial system. The associated wetter conditions could have been inhibiting human occupation or have eroded the evidence thereof.

Late Neolithic

During the Late Neolithic, few changes in the fluvial drainage system of the De Bogen macro-region seem to have occurred. The Erichem fluvial system continued to function as an active fluvial system, but its downstream connection is not known. Presumably, this would have been system u2, or another channel of the Hooiblok fluvial

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system. In the top of the crevasse splay deposits, as well as in the top of the floodbasin deposits in between, a vegetation horizon could form (Van Zijverden 2002b, 78; 2004b). At several of the De Bogen sites, Late Neolithic finds got incorporated into this vegetation horizon (tables III.4; III.5). The oldest of these finds are fragments of sherds displaying horizontal cord-impressions (three sherds from site 29N and one from site 30; Jongste & Smits 1998, 28; 31). They may have been part of the All Over Ornamented / All Over Corded ware ceramic styles that were current between c. 2600-2400 cal BC (Lanting & Van der Plicht 2002, 79-83). Such sherds could even originate from somewhat older Protruding Foot Beaker vessels, which were current between c. 2900-2600 cal BC (cf. Drenth 2005; Drenth & Hogestijn 2006). Similar ceramics and some flint objects were recovered from a section during the digging of a roadside ditch (fig. III.9, no 25052; Hulst 1973, 28; 1975c, 81; Louwe Kooijmans 1974, 376 - 133a; Archis 25052) and in the excavations executed by the State Service for Archaeological Investigations at the plots known as ‘Geldermalsen-Middegebied’ (fig. III.9, no 32296; Hulst 1993; Hulst, Van Klaveren & De Haan 1994, 72-73; Archis 32296). At the latter site, some lithics and a linear ditch system dated to the Late Neolithic were found as well. The site is interpreted as a settlement site on creek (crevasse?) deposits, which has largely been destroyed by later creek (crevasse?) activity (Hulst, Van Klaveren & De Haan 1994, 72, see also Schutte 2003a). A stone battle axe is thought to have originated from Meteren - Kalenberg (fig. III.9, no 40752) and is dated to the Late Neolithic (Archis 40752; possibly Addink-Samplonius 1968, 233 P2- no 9?). Another stone battle axe was found in washed context between the villages of Geldermalsen and Meteren (fig. III.9, no 922, exact coordinates unclear; Modderman & Monforts 1991; 145-147; 150; Hulst & Van Klaveren 1975, 78) A Late Neolithic age is also listed in Archis for the stone axe already discussed above (fig. III.9, no 25127; Archis 25127), but as no further information is available, here

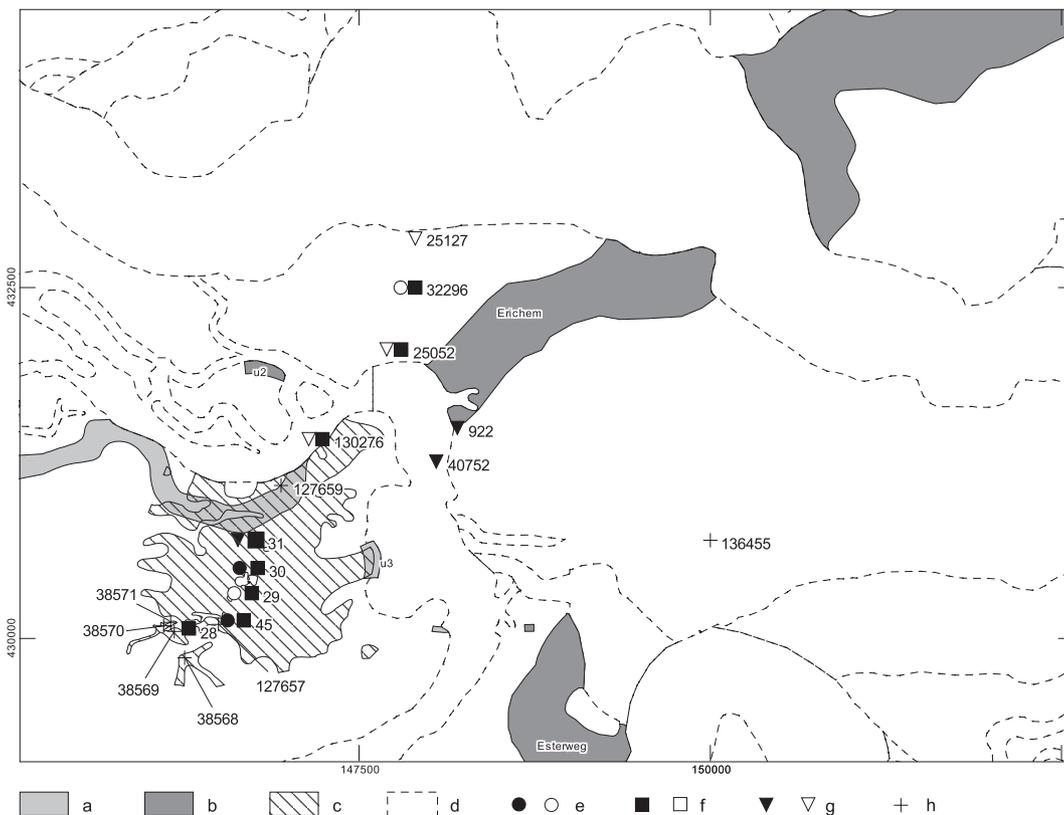


Fig. III.9 Late Neolithic fluvial systems and find-spots from the De Bogen macro-region. Filled symbols represent certain identifications, outlined symbols uncertain identifications. If more than one symbol is listed for a find-spot, the centre of the symbol directly left of the label indicates the correct centre-coordinate.

a: fossil fluvial systems, b: active fluvial system, c: crevasse splay deposits, d: younger fluvial systems e: features, f: ceramics, g: flint tools, h: possible finds-layer.

a generic ‘Neolithic’ age is assumed for this find. A Neolithic flint flake and a sherd from a Protruding Foot beaker were discovered during a coring campaign at Meteren - Kalenberg KAL12 (fig. III.9, no 130276; De Jager 1996, 13; Archis 130276). During various coring campaigns executed in the De Bogen macro-region, finds-layers have been found that are tentatively – predominantly based on depth – dated ‘from the Neolithic onward’ (fig. III.9 nos. 38568-38571, 127657, 127659, 136455; Archis 38568-38571, 127657, 127659, 136455; Van Zijverden 2002b; Asmussen 1996; Heunks 2002). As such, these find-spots cannot be used to analyse the nature of human presence in the area during the Late Neolithic in more detail.

From the De Bogen excavations, no fragments of Protruding Foot Beaker (Single Grave culture period; c. 2900-2600 cal BC) vessels have been found. The bulk of the recognisable Late Neolithic ceramics are vessels decorated in both early (maritime) as well as late (Veluwe) Bell Beaker styles (Ufkes & Bloo 2002, 334, cf. Drenth & Hogestijn 2006 on beaker typology). Nearly all excavated De Bogen sites have yielded over 40 sherds of clear Bell Beaker ceramics (Asmussen 1996, 17; 59-63; 145-146; Jongste & Smits 1998, 25-37; Ufkes 2001, 35; Ufkes & Bloo 2002, 383-386). Sites 29Z (over 133 Bell Beaker sherds), 31 (over 106 Bell Beaker sherds) and 45W (three Bell beaker sherds) are noteworthy exceptions (*ibid.*; tables III.4; III.5). Presumably, several of the flint tanged and barbed-and-tanged arrowheads recovered from sites 28, 29, 31 and 45 (Niekus, Van Gijn & Lammers 2001, 79-82; Niekus *et al.* 2002b, 468; 471; 479) also date to the Late Neolithic, but the typological dating of these arrowheads remains imprecise (*cf.* Cornelissen 1988; Arnoldussen 2000 103, note 252). At the De Bogen site 31, human activity during the Late Neolithic is furthermore indicated by the presence of two plano-convex flint knives, two sandstone arrow-shaft straighteners and a v-perforated jet button (Niekus, Van Gijn & Lammers 2001, 78; 80; Niekus & Huisman 2001, 116; 122; 124).

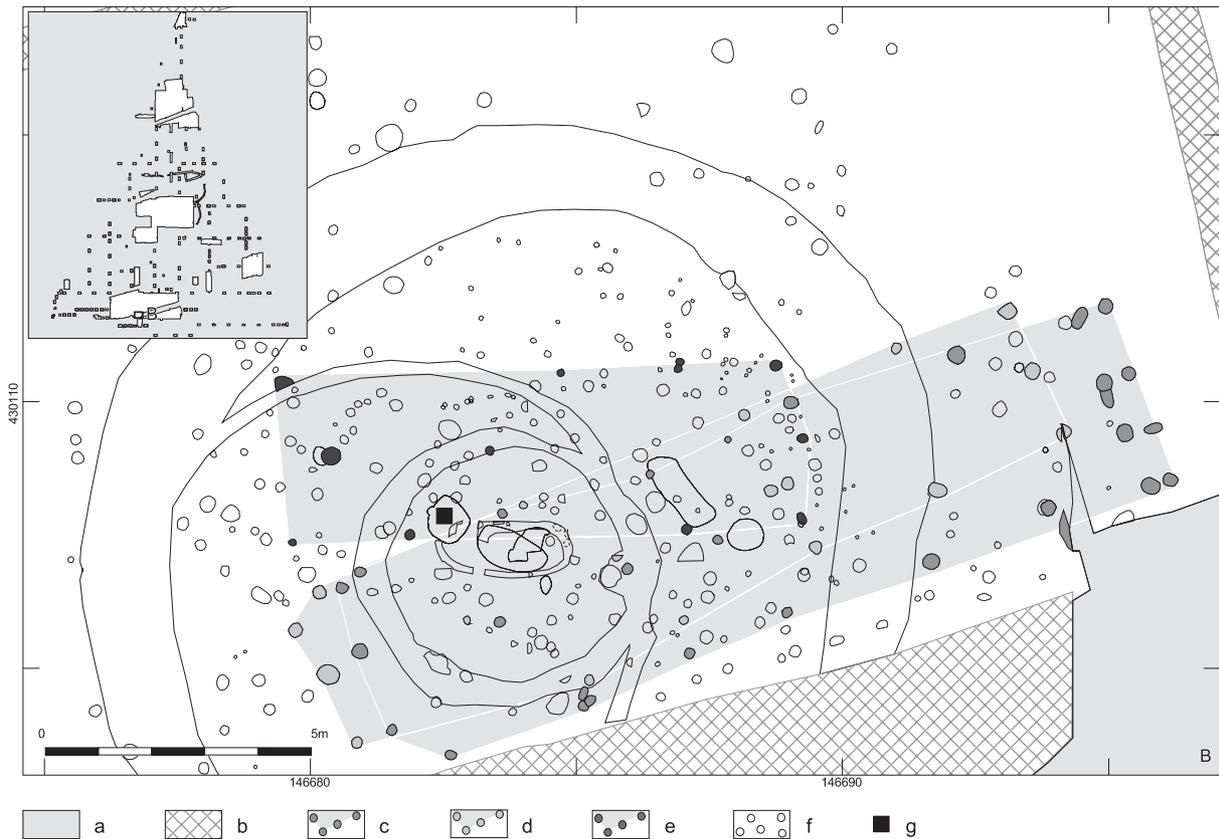


Fig. III.10 Reconstructed claimed Late Neolithic house plans from De Bogen site 45 (after Hielkema, Brokke & Meijlink 2002, 230, fig. 3.28).

a: not excavated, b: recent disturbances, c: features house 45FH, d: features house 45GH, e: features house 45IH, f: other features, g: location of pit with human bones.

Due to the lack of stratigraphy, isolating features or structures datable to the Late Neolithic proved very difficult within the De Bogen excavations (*cf.* Ter Wal 2001, 26; 32; Meijlink 2002b, 763-764). Nonetheless, at De Bogen sites 29, 30 and 45, buildings from these periods were reconstructed. At site 45W, three houses are reconstructed for this time-period (fig. III.10; Hielkema, Brokke & Meijlink 2002, 220-224).

Assessing the validity of the reconstructed houses is difficult. First, it should be stressed that house plans from the final Late Neolithic, or Bell Beaker period, are rare from the Netherlands (*cf.* Hogestijn & Drenth 2000; Drenth & Hogestijn 2001). Consequently, parallels for what domestic buildings looked like during this period in the Netherlands are scarce. This hampers an evaluation of the De Bogen Late Neolithic reconstructed houses. Nonetheless, there are several remarks that can be made. First of all, none of the proposed Late Neolithic houses at site 45 has yielded any Late Neolithic (or other) larger sherds or organic remains that could be dated to this period (tiny ceramic fragments, some bone and botanic remains were recovered from a total of five postholes, but these finds are not dated, studied or mentioned in the publication). Secondly, the three overlapping Late Neolithic house plans from site 45 are found in an area with a generally high feature density.

Presumably, the slight elevation (no more than 20 to 40 cm; Van Zijverden 2002b, 70 fig. 2.6; 85; 86 fig. 2.12) of the subsoil made this area a more attractive habitation area from the Late Neolithic onward, which could explain the high feature density. The three reconstructed houses do not stand out when comparing the feature depths and diameters. Rather, an even spread of both more shallow and deeper features is found (only the presumably Middle Bronze Age house 45BH (see below; fig. III.25) stands out. This higher density of posts complicates the assignment of posts to individual reconstructed buildings. Thirdly, a post assigned to house 45GH cross-cuts a barrow ring-ditch which is thought to date to the Bronze Age (*cf.* Meijlink 2008; Bourgeois & Fontijn *in press*). Finally, the houses were excavated in several trenches, some of which had up to 10 levels. The reconstruction appears to have been based on an overlay of all these different levels. If one, for instance, studies the absolute height at which features attributed to house 45FH became visible and disappeared, a problem occurs; within a single trench some of the postholes attributed the same house were visible at higher levels, thereafter disappeared, whereas the other features did not become visible some levels down.

The problems indicated above – unclear stratigraphical contemporaneity, high feature-density of uniform features, absence of datable material, lack of corroborating parallels elsewhere – suffice to dismiss the validity and dating of the reconstructed Late Neolithic ground plans. This is not to deny that during the Bell Beaker phase of the Late Neolithic, (construction) activities will have occurred near the claimed site of the houses at site 45. Over 56 Bell Beaker sherds were recovered from the finds-layer as well as from some postholes in this area (Ufkes & Bloo 2002, 359; 371; 385). A clear-cut ground plan, however, cannot be reconstructed. A large pit (fig. III.10, g) contained 19 Bell Beaker sherds, bones of cattle, pig and roe deer (total 720 g) and parts of an incomplete human foot (Robb 2002b, 684). Because of its anomalous content, comprising large bones of both domestic and hunted mammals as well as human remains, the contents of the pit are tentatively interpreted as a sacrificial deposit (Hielkema, Brokke & Meijlink 2002, 210; Hänninen & Van Haaster 2002, 726). Charcoal of a willow tree from this pit was dated to *c.* 2110-1880 cal BC (AA-37499: 3665 ± 65 BP; Meijlink 2002a, 47), which corroborates the assumed Late Neolithic (or Early Bronze Age) use of this area.

For the other buildings reconstructed for the Late Neolithic on the De Bogen sites 29 and 30 (fig. III.11), some reservation as to their interpretation is again needed. House 30FH is an undated, rather wide and regular building comprising small and shallow as well as larger and deeper postholes (figs. III.11, B; III.13). The assumed Late Neolithic date is predominantly based on the dimensions and – questionable – analogy to Vlaardingen period houses (*cf.* Verhart 1992), perhaps also on its orientation, which deviates from the Middle Bronze Age houses on this site (albeit that this is not explicitly mentioned; Hielkema, Brokke & Meijlink 2002, 150). Structures 29C and 29A appear to be acceptable structures in terms of consistent feature dimensions and have been reconstructed from areas with a moderate feature-density (fig. III.11, C-D). Both are, unfortunately, not dated directly so that their dating is based solely on the possibility that they could represent two- or one-aisled Late Neolithic structures (*ibid.*, 181-184).

Besides the features grouped into structures discussed above, several isolated features could be radiocarbon dated to the Late Neolithic. A single pit, interpreted as a hearth, at site 45 was radiocarbon dated to *c.* 2460-2140 cal BC (AA-37500: 3830 ± 40 BP; Meijlink 2002a, 47). At site 30 several unlined wells – one of which was dug into a former crevasse gully (Hielkema, Brokke & Meijlink 2002, 164) – were radiocarbon dated to *c.* 2470-2140 and 2140-

1770 cal BC, indicating a Late Neolithic and/or Early Bronze Age age (AA-37517: 3825 ± 50 BP, AA-37519: 3620 ± 55 BP; AA-37520: 3615 ± 40 BP; Meijlink 2002a, 47).

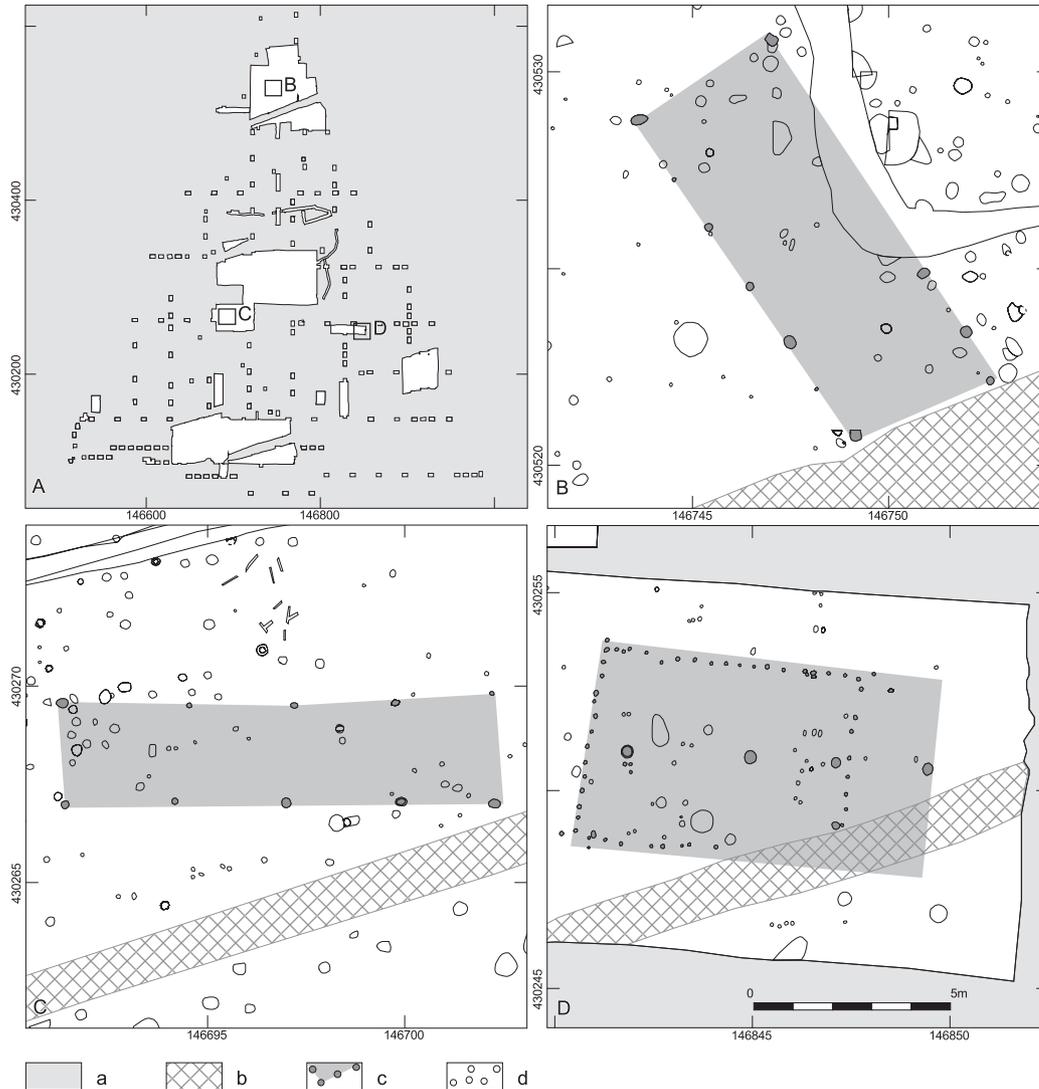


Fig. III.11 Claimed possible Late Neolithic structures at De Bogen sites 29 and 30. Insets B (30FH), C (29STC) and D (29STA) all to the same scale.

a: not excavated, b: recent disturbances, c: features belonging to structures, d: other features.

An overview of the number and location of the features from the De Bogen site that yielded Late Neolithic ceramics will not be offered here (but see Ufkes 2001, 52-53; Ufkes & Bloo 2002, 357-372; Hielkema, Brokke & Meijlink 2002, esp. 163; 185; 187; 190; 229; 237; 247; 270; 273-274). This is because – due to later activity – older ceramics could be – and have been – unintentionally incorporated into younger period features. The distribution of features containing Late Neolithic ceramics is therefore not as informative as it could have been if only Late Neolithic occupation had been present. In any case, the radiocarbon dated features such as wells, pits with charcoal and pits with (human) bones, suggest a domestic use of the various de Bogen sites during the Late Neolithic. Perhaps this usage needs not to have differed significantly from the later (Middle Bronze Age) use of the sites for habitation. It is quite possible that many of the undated postholes belong to a Late Neolithic phase of use, but as these cannot be distinguished by their properties or dated directly, their number and structural coherence escape us. It has, however, been argued that

the proposed reconstructions of Late Neolithic houses and outbuildings unfortunately lack sufficient arguments for them to be added to the still limited corpus of ground plans from this period. Consequently, the question whether the remains recovered could be interpreted as an indication of seasonal, semi-permanent (several months) or year-round occupation also cannot be answered. Again, the palimpsest nature of the sites hampers the interpretation of archaeozoological and botanical data that might give an indication of the permanency of the human presence on the sites during these periods.

Only for site 31, with its low feature density and refitted fragments, was a shorter-term period of human occupation assumed (albeit that it remains completely unclear how long this short period actually was; Schoneveld 2002b, 186-187). The short period of use claimed for this site in the publication, 1950-1900 cal BC, is however speculative and not based on sound data (*cf.* Schoneveld & Gehasse 2001, 21; Schoneveld 2001, 186; reference to Ufkes 2001, 57; ref. to J.N. Lanting (pers. comm.) on radiocarbon dates from elsewhere, also A. Ufkes, pers. comm., May 2006). One should keep in mind that at this site (31), an unrepresentative (decorated and morphologically distinct) sample of the pottery was studied, which means that pottery from younger periods (*i.e.* the Middle Bronze Age) which is generally less diagnostic may be underrepresented. Furthermore, many of the radiocarbon dates that have been dismissed without proper explanation, span into the 17th and 16th centuries cal BC (Schoneveld 2001, 187 note 18). Lastly, the fact that a ‘double stake type’ of fence, which is thought to date predominantly to the Middle Bronze Age (but see Hamburg & Louwe Kooijmans 2006, 53-60) was found at the same level as the features assumed to be Late Neolithic and Early Bronze Age in date, furthermore complicates the interpretation of site 31 as having been used solely during the Late Neolithic or Early Bronze Age.

Various parts of the De Bogen macro-region outside those of the Betuweroute excavations, also seem to have been used during the Late Neolithic. Unfortunately, some of the finds – especially the stone (battle) axes – cannot be dated precisely, originated from unknown contexts or their exact find-spot is not even known. Nonetheless, the observations at Geldermalsen - Middengebied and Geldermalsen - Hangwaard I (fig. III.9, nos. 32296 and 25052) indicate that Late Neolithic occupation is to be expected close by or in the subsoil of the current village of Geldermalsen. Most find-spots for this period now seem to concentrate in the western part of the macro-region. They have predominantly been discovered during large infrastructural and town planning projects of the last decade. This implies that the relative ‘emptiness’ of the eastern part of the De Bogen macro-region during the Late Neolithic may be resolved quickly if archaeological research – tailored to find sites from this period – is executed in the eastern part of the De Bogen macro-region as well.

Early Bronze Age

From the start of the Early Bronze Age onward, the Erichem system is the single fluvial system known to have been active in the De Bogen macro-region (fig. III.12). One of the (precursors to the) Hooiblok channel belt branches will have provided the downstream connection for the Erichem system. Due to the absence of direct dates (see above), it is not known when exactly the Esterweg fluvial became inactive, but the cessation of activity has been estimated at c. 2460-2130 cal BC (Berendsen & Stouthamer 2001, 200).

Although occasionally floodbasin sediments will have been deposited as thin layers on the (lower parts) of the stacked crevasse landscape, dry conditions prevailed in most areas, as is shown by the presence of a ‘single’ Late Neolithic to Middle Bronze Age vegetation horizon. In almost all excavated parts of the De Bogen crevasse splays, Early Bronze Age remains were found. For some of the flint artefacts, such as arrowheads with a concave base and fully retouched plano-convex knives, an Early Bronze Age date may be suggested (Niekus, Van Gijn & Lammers 2001, esp. 80-82; 99; Niekus & Huisman 2001, esp. 131; Niekus *et al.* 2002, esp. 499; Van Gijn, Kars & Lammers-Keijsers 2002, esp. 536) but their typological dating may be imprecise and is in need of supporting absolute dates.

Potbeaker and potbeaker-like ceramics, which can date to the final Late Neolithic as well as to the Early Bronze Age, were also found on nearly all of the De Bogen excavated sites (see tables III.4 and III.5; Ufkes 2001, 35; Ufkes 2002b, 70; Ufkes & Bloo 2002, 385-386). In this study, the presence of barbed wire-stamp decorated pottery has been the main criterion for assigning an Early Bronze Age date. Such sherds have been found in reasonable quantities at sites 28 (28-1 and 28-2), 29N, 30 and 31 (fig. III.12; Ufkes & Bloo 2002, 385-386; Ufkes 2002b, 70).

At several of these sites, tentative ground plans of houses attributed to the Early Bronze Age have been reconstructed (fig. III.13; Hielkema, Brokke & Meijlink 2002, 151-152; 175-179; 256-258; 281-284). The claimed

houses form a diverse group, with little internal correspondence in dimensions and structural properties besides a predominantly two-aisled roof-bearing structure. In addition, most have been reconstructed in areas that display a moderate to high feature density. In figure III.14 it can be observed that feature diameter and depth varies significantly between the posts of a single structure. Furthermore, the depth of the centre-posts – which are thought to be the tallest posts of the structure and to have carried most of the weight of the roof – are often evidently not dug down deeper than the other posts involved in the reconstructions.



Fig. III.12 Early Bronze Age fluvial systems and find-spots from the De Bogen macro-region. Filled symbols represent certain identifications, outlined symbols uncertain identifications. If more than one symbol is listed for a find-spot, the centre of the symbol directly left of the label indicates the correct centre-coordinate.

a: fossil fluvial systems, b: active fluvial system, c: crevasse splay deposits, d: younger fluvial systems, e: features, f: ceramics, g: botanical evidence, h: possible sites discovered during coring campaigns.

Unfortunately, no wooden post stumps had been preserved and no radiocarbon dates are available, which means that the dating of the features of the claimed houses relies solely on the incorporated finds (and typological parallels (but see Hielkema, Brokke & Meijlink 2002, 153 and Arnoldussen 2008, section 5.2.1). From features of three of the claimed houses, in total one potbeaker sherd and three barbed wire-stamp decorated sherds were recovered (Hielkema, Brokke & Meijlink 2002, 152; 179; 282). This indicates that at least some of the features grouped into these structures, date to – or after – the Early Bronze Age.

In conclusion, however, the great variation in size, shape and structure of the proposed Early Bronze Age houses, combined with the generally high feature density in the areas from which they have been reconstructed, the variation in feature depth and diameter and the absence of sufficient datable finds, seriously problemize their interpretation. At best, the regular placement and consistent depth of posts of (parts of) structures 30HH and possibly 28-IDH/EH might be interpreted as displaying a former structural relation, but the dating and exact nature of such assumed structures remains unknown.

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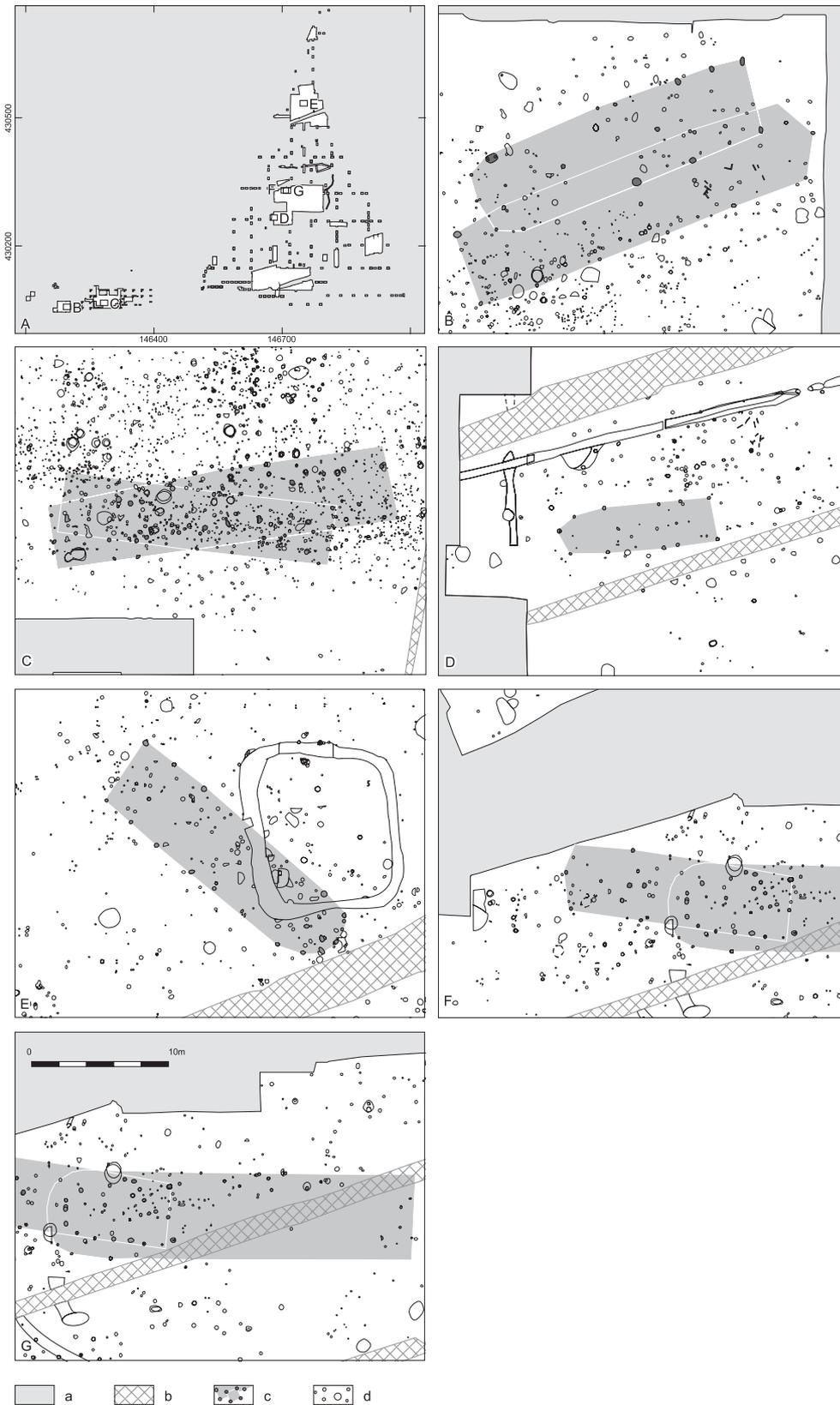


Fig. III.13 Claimed possible Early Bronze Age houses at the 'De Bogen' excavations. Insets B to G are all to the same scale (B: houses 28-4DH (light shade) and 28-4EH (dark shade), C: houses 28-1DH (light shade) and 28-1EH (dark shade), D: house 29-EH, E: house 30HH, F: house 29HH (dark shade), G: house 29DH (light shade).
 a: not excavated, b: recent disturbances, c: features belonging to structures, d: other features.

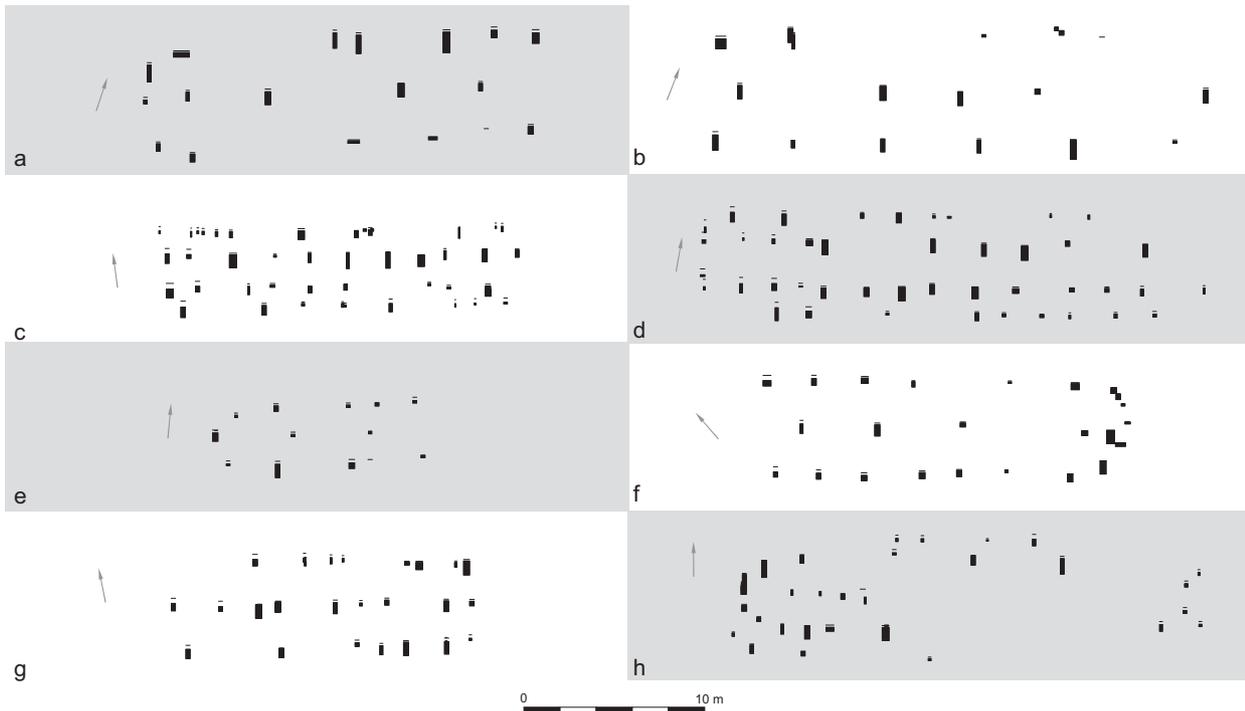


Fig. III.14 Posthole widths and depths for the claimed Early Bronze Age houses at the 'De Bogen' excavations, all to same scale (after Hielkema, Brokke & Meijlink 2002, fig. 3.4h; 3.10e; f; i; 3.38d-e; 3.48c-d).

a: house 28-4EH, b: house 28-4DH, c: house 28-1DH, d: house 28-1EH, e: house 29EH, f: house 30HH, g: house 29HH, h: house 29DH.

Despite this observation, the presence of people during the Early Bronze Age is well-attested at several of the De Bogen excavations. This is also borne out by the radiocarbon dates of cereals from two pits at site 31 (*c.* 2150-1770 cal BC; GrA-14870: 3630 ± 50 BP and GrA-14871: 3580 ± 45 BP; Schoneveld 2001, 187), a date of charcoal incorporated into a posthole of the possibly younger house 30EH (AA-37511: 3510 ± 40 BP; Meijlink 2002a, 47; for house 30EH see fig. III. 31,D) and three dates of organic residue on sherds typologically dated to the Early Bronze Age (UtC-8647: 3574 ± 35 BP; UtC-8778: 3490 ± 50 BP and UtC-8779: 3480 ± 50 BP; Meijlink 2002a, 47; Ufkes & Bloo 2002, 344). Cereals from a posthole of a rectangular outbuilding (45BS), charcoal from house 30AH and charcoal from an oval ditch at site 30 were dated to 3430 ± 45 BP, 3445 ± 50 BP and 3460 ± 40 BP respectively (AA-37498, AA-37515, AA-37514; Meijlink 2002a, 47; Hielkema, Brokke & Meijlink 2002, 145; 159 201) indicating that charring of these samples occurred either during the Early Bronze Age, or during the Middle Bronze Age-A.

Beside these radiocarbon dated features, several others have been dated to the Early Bronze Age by the ceramics they contained. For reasons already outlined above, a full overview of features with Early Bronze Age ceramics will not be provided here (but see Ter Wal 2001, 30; 35; Ufkes 2001, 52-53; Ufkes & Bloo 2002, 357-372; Hielkema, Brokke & Meijlink 2002, esp. 163; 178-179; 239; 203; 264- 267; 282; 287; Meijlink 2002b, 770). Generally, they concern postholes and pits, but also two wells at site 29 (feature 619.17; AA-37520 and 621.32; AA-37519, see above) and a possible refuse pit (feature 16.62, yielding almost 4 kg of finds; amongst others a complete and anatomically intact lower limb of a cow; Hielkema, Brokke & Meijlink 2002, 263 table 3.28; 264) may date to the Early Bronze Age. In addition, a palisade of thick (generally 30 cm diameter) and closely spaced (10-20 cm apart) posts at site 30 yielded one barbed wire-stamp decorated and four possible Bell beaker sherds from three different postholes (Early Bronze Age sherd from feature 601.50; Hielkema, Brokke & Meijlink 2002, 157; B. Meijlink, pers. comm., April 2006; *contra* Hielkema, Brokke & Meijlink 2002, 163). Possibly, the palisade dates to the Early Bronze Age, although its function and meaning are still ill-understood.

It is remarkable that even for the 'De Bogen' sites where relatively abundant Early Bronze Age ceramics were found (*i.e.* sites 29(N), 31, 30 and 28-2; tables III.4 and III.5) few features could be dated to this period and

that structures as well as activity areas were hard to define (Meijlink 2002b, 770). The evidence for Early Bronze Age activities relies mainly on the ceramic and lithic remains that originate predominantly from the excavated parts of the finds-layers. This indicates that the activities undertaken in these centuries do not leave behind as clearly recognisable patterns (e.g. houses, granaries) as those from later centuries. But again, this does not exclude the possibility of (permanent) habitation of parts of the ‘De Bogen’ sites during the Early Bronze Age at all. However, due to erosion (e.g. sheet flow and later crevasse formation) and the palimpsest nature of the site – which has resulted in an in parts moderate to very high feature density – the details of the domestic built-up structures and activity areas largely escape from view.

Outside the ‘De Bogen’ excavations, few other Early Bronze Age find-spots are known from within the macro-region. Two ‘Barbed Wire’-stamp decorated sherds, a stone axe and a large flint nodule were reportedly found by amateur archaeologists at Geldermalsen - Middengebied (fig. III.1, no 22791; J. Van Doesburg, pers. comm., Aug. 2006), but these have not been published. As has been argued above for the Late Neolithic period, this scarcity of finds is presumably solely a consequence of the limited systematic and methodically suitable research carried out in the ‘De Bogen’ macro-region.

Middle Bronze Age-A

The conditions of the natural environment were essentially the same during the Middle Bronze Age-A as they were in the Early Bronze Age (see above). Presumably, the Erichem fluvial system and its unknown downstream connection were still the only active fluvial systems. Besides incidental flooding, no significant fluvial sedimentation did take place within the areas of the excavated ‘De Bogen’ sites (Van Zijverden 2004b). However, near the end of this period, the lowest parts of the landscape around the ‘De Bogen’ excavations saw continued deposition of floodbasin deposits, were still subject to subsidence and witnessed the expansion of the already present alder swamps. These three processes could have decreased the effective area available for agricultural needs and habitation. A sample of humic clay on top of the main (Late Neolithic to Bronze Age) vegetation horizon in a coring c. 60 meter to the south of site 28-1 was dated to c. 1620-1310 cal BC (coring 208; UtC-8780: 3190 ± 60 BP; Van Zijverden 2002b, 79; Meijlink 2002b, 758). As both this layer of humic clay, as well as the thin layer of clay that covers it, cannot be followed from this coring to a point where either one covers the sides or highest part of site 28-1, this date should not be used as a *terminus ante quem* for the occupation of site 28-1 (W. van Zijverden, pers. comm., April 2006; *contra* Van Zijverden 2002b, esp. 89; Hielkema, Brokke & Meijlink 2002, esp. 266-267; Meijlink 2002b, esp. 758; 774). This difference of

interpretation is represented schematically in fig. III.15 (cf. Van Zijverden 2002b, 69 fig. 2.5).

Nonetheless, it is clear that significant ‘drowning’ (leading to a shrinkage of the useable surface area) of site 28-1 (and other equally low lying areas, cf. fig. III.33) must have occurred. A human thigh bone was found on the southern flank of site 28-1 crevasse deposits at c. 5 m from the southernmost excavation limit, on the transition between the crevasse

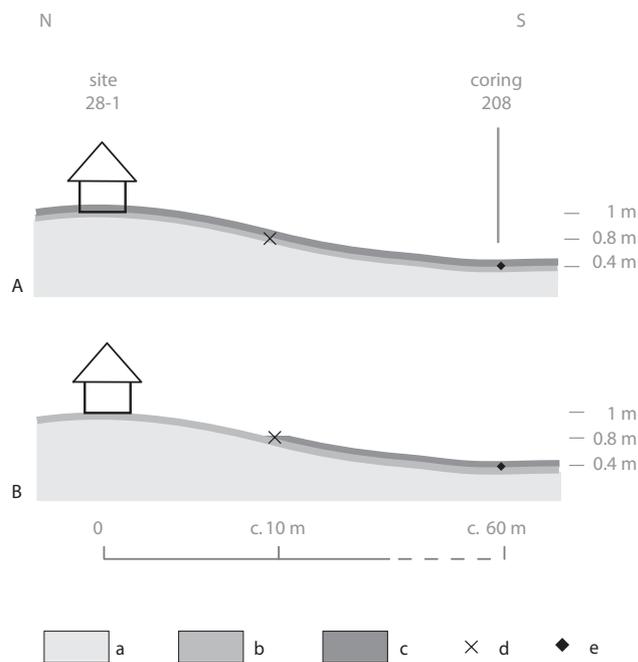


Fig. III.15 Interpretation of the relevance of the peaty clay date south of De Bogen site 28-1. A = Interpretation as forwarded by Van Zijverden 2002b; Meijlink 2002b: Peaty clay covered site 28-1 entirely, site was abandoned around 1500 cal BC. B = Interpretation as forwarded by W. van Zijverden (pers. comm., April 2006); Arnoldussen, this volume): The documented peat growth is limited to the lowest parts of the floodbasin, allowing for continuous occupation of site 28-1 between the Late Neolithic and the (end of?) the Middle Bronze Age-B.

a: stacked crevasse splay deposits, b: vegetation horizon and finds-layer, c: reconstructed extent of peaty clay, d: human thigh bone, e: location of radiocarbon dated sample.

sand and the covering peaty clay (fig. III.15, d; Robb 2002b, 679; 687). Its good state of preservation may indicate that it was covered by the peaty clay within a short time period (within 50 years?; Van Zijverden 2002b, 85). As this bone was not dated, the dating of this possibly rapid expansion of the alder swamps is not known exactly. It may well be that both the human bone and its covering layer of humic clay – which were situated 40 cm above the level of the dated sample in the coring – date from much later during the Middle Bronze Age-B (for Middle Bronze Age-B occupation see below).

Here, it will be assumed that during the Middle Bronze Age-A, most – if not all – of the ‘De Bogen’ sites were still accessible to humans and were indeed used. This is best evidenced for by the typical ‘Hilversum-style’ decorated ceramics that have been recovered – albeit in small numbers – from most of the ‘De Bogen’ excavations (tables III.4; III.5). Unfortunately, the label ‘Hilversum’ (HVS) has been applied to a wide variety of sherds from this excavation, so that it is often unclear whether a sherd identified as ‘HVS’, actually should be classified as ‘Hilversum-style’ decorated pottery *sensu stricto* (in fact, 48% of the pottery classified as ‘HVS’ at the various De Bogen sites is not even decorated at all). This has perhaps in some cases led to an unwanted overestimation of the degree of Middle Bronze Age-A usage of a given site.

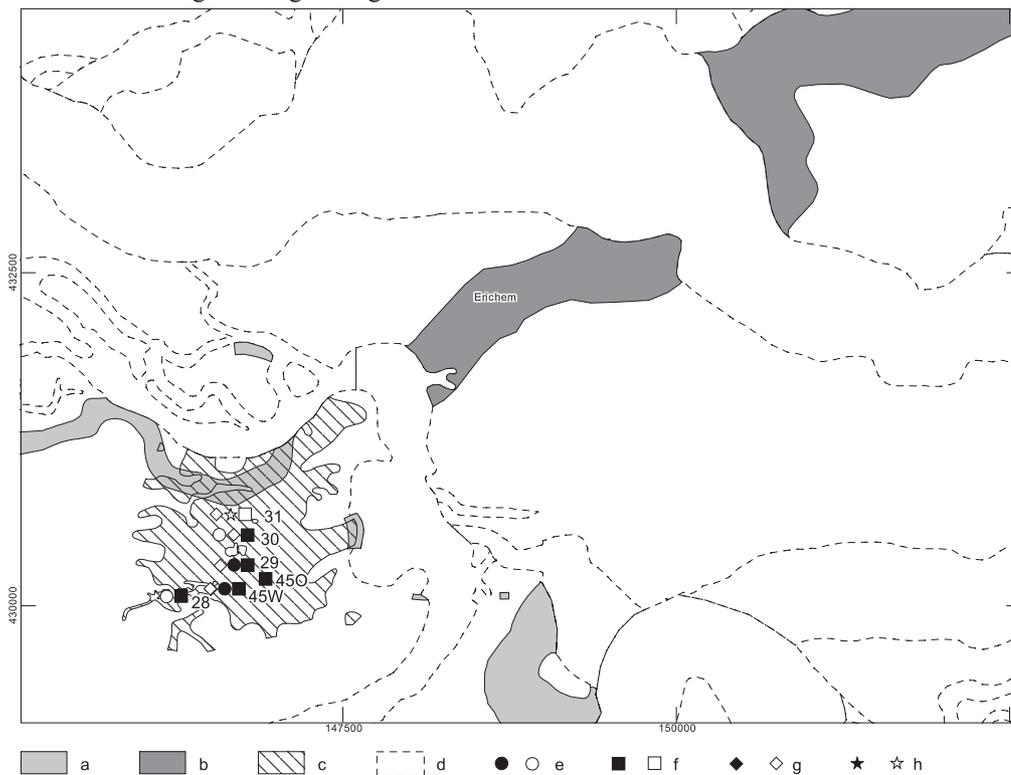


Fig. III.16 Middle Bronze Age-A fluvial systems and find-spots from the De Bogen macro-region. Filled symbols represent certain identifications, outlined symbols uncertain identifications. If more than one symbol is listed for a find-spot, the centre of the symbol directly left of the label indicates the correct centre-coordinate.

a: fossil fluvial systems, b: active fluvial systems, c: crevasse splay deposits, d: younger fluvial systems, e: features, f: ceramics, g: botanical evidence, h: zoological evidence.

Generally, no more than 5 clear Hilversum-style decorated sherds were found on a single ‘De Bogen’ excavation, which means that the 24 sherds from site 28-1 stick out (tables III.4; III.5; Bulten & Smits 1998, 19; Jongste & Smits 1998, 26; 30-31, 36-37; Ufkes 2001, 35; Ufkes & Bloo 2002, 383-386). One should keep in mind, however, that this site was excavated with a slightly different methodology (the entire finds-layer was trowelled through by hand for finds in one meter squares; Meijlink 2002a, 38-39) and that these sherds don’t make up for more than 1 % of the clearly dateable decorated ceramics. Amongst the other excavated remains there, no objects were found that would allow for a dating confined to the Middle Bronze Age-A on a typological grounds.

APPENDIX III: DE BOGEN

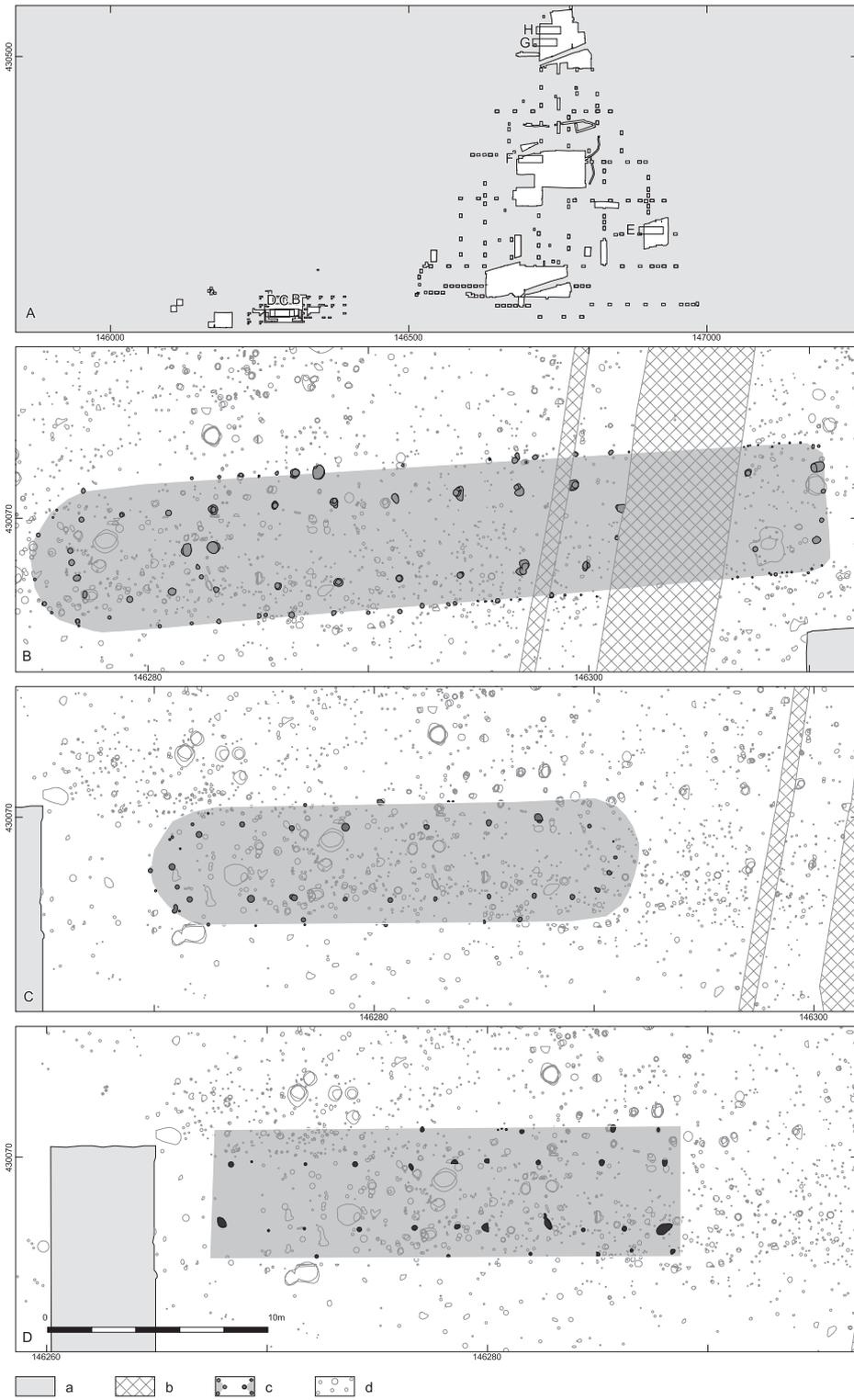


Fig. III.17 Houses claimed to date to the Middle Bronze Age-A at the various De Bogen excavations (A: overview, B: House 28-1AH, C: House 28-1BH, D: House 28-1CH, E: Houses 45DH (large) and 45EH (small), F: House 29IH, G: House 30GH, H: House 30AH).

a: not excavated, b: recent disturbances, c: features associated with structures, d: other features.

APPENDIX TO: A LIVING LANDSCAPE. BRONZE AGE SETTLEMENT SITES IN THE DUTCH RIVER AREA

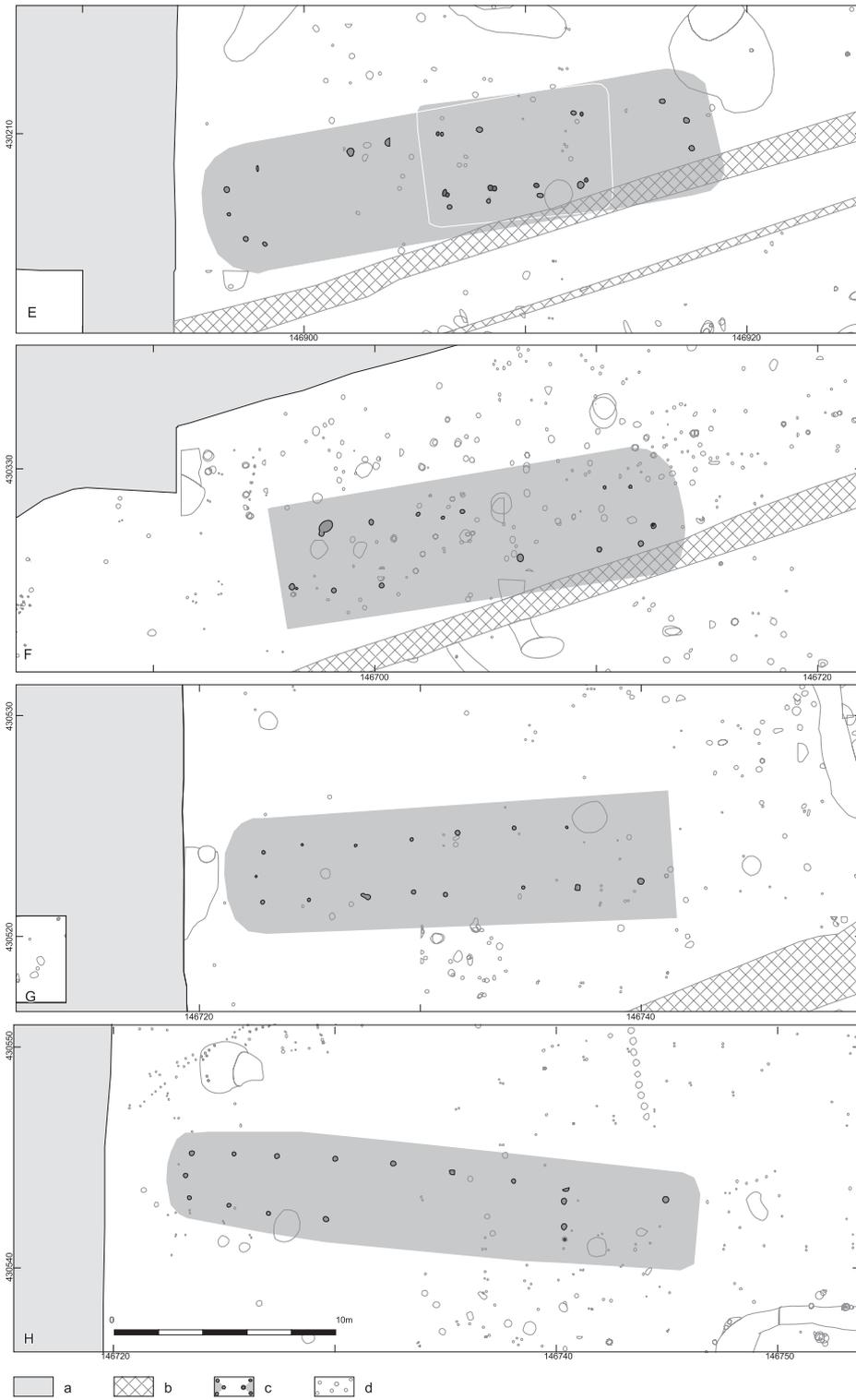


Fig. III.17 (continued) Houses claimed to date to the Middle Bronze Age-A at the various De Bogen excavations (A: overview, B: House 28-1AH, C: House 28-1BH, D: House 28-1CH, E: Houses 45DH (large) and 45EH (small), F: House 29IH, G: House 30GH, H: House 30AH).

a: not excavated, b: recent disturbances, c: features associated with structures, d: other features.

At several of the De Bogen sites, houses are tentatively dated to the Middle Bronze Age-A (fig. III.17, B-H). The dating of house 30AH was based on the calibrated date range of dated charcoal from a central posthole (*c.* 1890-1630 cal BC; AA-37515: 3445 ± 50 BP; Meijlink 2002a, 47) and a ‘Hilversum sherd’ in the posthole of roof-bearing post (Hielkema, Brokke & Meijlink 2002, 145). The latter was undecorated, save for a plain plastic cordon near the pot shoulder. Because of the more shallow depth and the remarkable position of the post from which the radiocarbon sample was obtained (‘closing’ posts are an infrequent phenomenon), the relation between the dated sample and the erection of this house is problematic. Based on the similarities in ground plan, house 30GH was also tentatively dated to the Middle Bronze Age-A. At site 29, a rather irregular structure (29IH) was typologically dated to the Middle Bronze Age, possibly the Middle Bronze Age-A (Hielkema, Brokke & Meijlink 2002, 180; Meijlink 2002b, 774). The arguments for this dating are the fact that the house is situated on the crevasse flank, like those of site 28 (see below) and the fact that it is situated in the vicinity of the claimed Early Bronze Age houses 29DH and 29HH (Meijlink 2002b, *loc. cit.*, but see above). The Middle Bronze Age-A date for house 28-1AH is based on a possible Hilversum-style decorated sherd (plain cordon and paired fingertip impressions) from a posthole and the ideas on the rate of drowning of site 28-1 (see above and Hielkema, Brokke & Meijlink 2002, 252). For structures 45DH and 45EH, also a Middle Bronze Age date (possibly Middle Bronze Age-A) is suggested, but evidence is absent (Hielkema, Brokke & Meijlink 2002, 199-200; Meijlink 2002b, 774).

Weighing the available evidence, it should be concluded that a Middle Bronze Age-A date for these structures cannot be proven, but neither can it be fully excluded. The validity of some of the structures should furthermore be questioned. Houses 28-1BH, 28-1CH and 29IH lack the regularity in posthole diameter, depth and placement that characterizes house 28-1AH (Hielkema, Brokke & Meijlink 2002, 254-255; *cf. op. cit.*, 250). Furthermore, the former have been reconstructed from very dense posthole clutters. House 45EH display a somewhat more regular placement of posts, but here several roof-bearing posts are absent. For four posts, their location near to an excavation trench perimeter may account for their absence (Hielkema, Brokke & Meijlink 2002, 199), but for an equal number of posts it does not. The short dimension of house 45EH might indicate that this is an outbuilding rather than a Bronze Age house. Another possible interpretation could be that the southern row of posts represents the ridge poles of a two-aisled structure. House 30GH also displays a somewhat irregular pattern of posthole placement and depth (Hielkema, Brokke & Meijlink 2002, 151) but the relatively low feature density on that spot and the structural similarities to house 30AH add enough credibility to accept it as a possible house plan. In conclusion, structures 28-1AH and 30AH appear to be acceptable house plans, and structures 30GH and 45DH represent possible house plans. The dating of these four houses is unfortunately problematic. Although a Middle Bronze Age-A date cannot be discarded altogether, their structural dimension and likeness to other ground plans recognised for the Middle Bronze Age-B from this site (see below) does suggest a dating in the Middle Bronze Age-B.

Charred cereals from a posthole of outbuilding 45DS (fig. III.18, B) were radiocarbon dated to *c.* 1880-1620 cal BC (AA-37498: 3430 ± 45 BP; Meijlink 2002a, 47; Hielkema, Brokke & Meijlink 2002, 201). From another (four- or six post; fig. III.18, C) outbuilding a combined sample of cereals and charcoal from a posthole was dated to *c.* 1740-1490 (AA-37496: 3315 ± 45 BP; Meijlink 2002a, 47; Hielkema, Brokke & Meijlink 2002, 201). These samples provide *terminus post quem* dates for the erection of these outbuildings. They may, in other words, date both to the Middle Bronze Age-A as well as to a later (Middle Bronze Age-B) period. The same holds true for an oval (3.5 by 8 m) ditch – possibly surrounded by a fence – of unknown function at site 30 (fig. III.18, D). It contained few finds and a charcoal sample was dated to *c.* 1890-1680 (AA-37514: 3460 ± 40 BP; Meijlink 2002a, 47; Hielkema, Brokke & Meijlink 2002, 150-160).

Besides the structures discussed above, various other features were dated to the Middle Bronze Age-A. They, again, will not be discussed in detail here (see above, but see Hielkema, Brokke & Meijlink 2002, 173; 178; 185; 198-199; 201; 203; 205; 209; 212; 215; 222; 225; 231; 236-237; 245; 252; 254; 264-265; 267-269; Meijlink 2002b, 774-779). Some features deserve further mentioning, because they support the interpretation of Middle Bronze Age-A occupation of some of the De Bogen sites.

A case in point is a well (feature s219.13) in the periphery of site 45W. Charcoal from the bottommost layer was radiocarbon dated to *c.* 1690-1490 cal BC (AA-37490: 3315 ± 40 BP; Meijlink 2002a, 47; Hielkema, Brokke & Meijlink 2002, 204-205). A well at site 29 (s573.172) contained charcoal dated to *c.* 1690-1490 cal BC (AA-37509: 3310 ± 40 BP; Meijlink 2002a, 47), but as this well was situated in a cluster with two wells that yielded remains dated

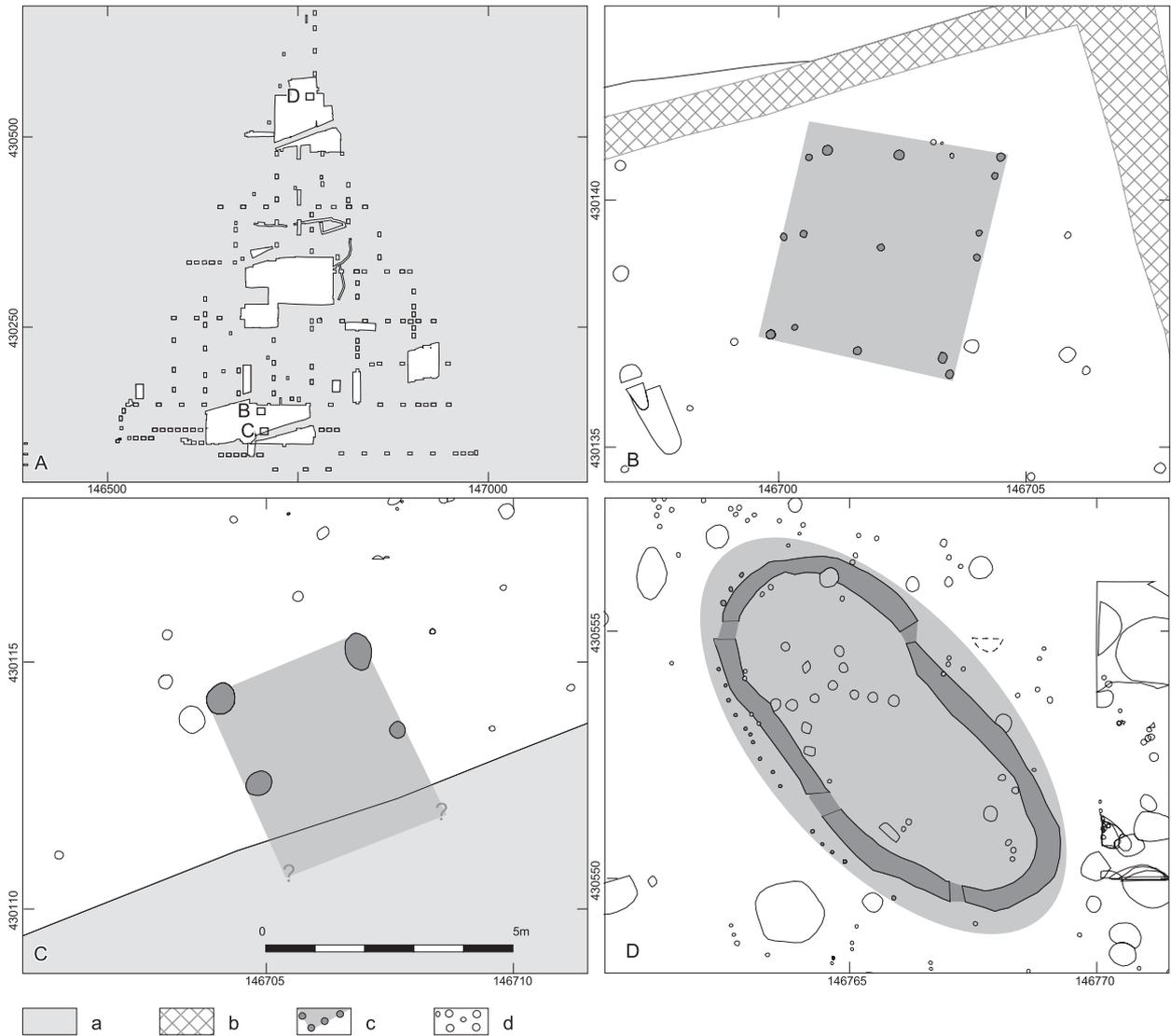


Fig. III.18 Outbuildings claimed to date to the MBA-A at the various De Bogen excavations (A: overview, B: 45BS, C: 45DS, D: oval ditch at site 30, B-D to same scale).

a: not excavated, b: recent disturbances, c: features associated with structures, d: other features.

to the Middle Bronze Age-B (see below; Hielkema, Brokke & Meijlink 2002, 187) it could be that older charcoal has unintentionally been incorporated into the (actually younger) feature. From three pits at site 31, radiocarbon dates on bone and cereals that span the Middle Bronze Age-A are known (GrA-14830: 3400 ± 40 BP, GrA-12296: 3555 ± 110 BP, GrA-14831: 3460 ± 40 BP (all s51.11), GrA-14871: 3580 ± 45 BP and GrA-14833: 3340 ± 40 BP (all s5.6) and GrA-12305: 3330 ± 70 BP (s5.5); Schoneveld 2001, 187). A pit with many fragments of ceramics, stones and burned clay on site 30 (s538.10; total c. 3.2 kg; Hielkema, Brokke & Meijlink 2002, 158) contained a possible Hilversum-style decorated sherd, suggesting a (secondary?) use as a refuse pit during (or after) the Middle Bronze Age-A. A decentred ring ditch of the barrow at site 45 yielded a clear Hilversum-style decorated sherd, which could serve as a *terminus post quem* for this barrow phase in or after the Middle Bronze Age-A. Unfortunately, no central grave belonging to this mound period was found, but this could easily have been disturbed by the youngest (possibly Late Bronze Age) ring-ditch which overlaps the decentred ring-ditch's centre (see fig. III.34). Lastly a number of

features at sites 28-4 (s75.20, a possible hearth and s75.12, a posthole) and site 28-1 (pits s7.5, s25.13, s27.5, s17.37 and s109.5 and postholes s15.14, s15.18, s16.9 (structure 28-1BH), s17.38, s17.79, s24.11, s25.13 and s25.62) contained possible Hilversum-style decorated ceramics. No distinct clustering or structure can be argued for these features. The structures 45BH and 45HH and the outer ring-ditch of the barrow at site 45 also have yielded radiocarbon dates that date to, or span into, the Middle Bronze Age-A, but as they are dated to the end of the Middle Bronze Age-B (Hielkema, Brokke & Meijlink 2002, 197-198; 201; 212; 222-223), they will be discussed below.

In conclusion, it will be clear that various of the De Bogen sites show signs of human activities during the Middle Bronze Age-A. A limited number of clear-cut Hilversum (*sensu stricto*) sherds from various sites and several radiocarbon dates on charcoal and burned cereals are in support of this. The weak correlation of the dated samples or ceramics to the erection of the structures in whose postholes they were recovered, complicates the identification of Middle Bronze Age-A structures. It seems that the presupposed Middle Bronze Age-A date for site 28-1, as was put forward after the campaign of test-trenching (Bulten & Smits 1998, 22), may have overly steered later interpretations. Only 13 true Hilversum-style decorated sherds were recovered from site 28-1 (Hielkema, Brokke & Meijlink 2002, 236-237) and an alternative interpretation for the dated floodbasin peat has been suggested above (fig. III.15). The acceptable house plans currently assigned to the Middle Bronze Age-A are in need of additional arguments to substantiate their dating and may – on typological grounds – also date to the Middle Bronze Age-B (see Arnoldussen 2008, section 5.2). Yet even with these considerations, it is very likely that site 28-1 was used, possibly permanently inhabited, during the Middle Bronze Age-A. It are the details of the built-up environment, however, that due to the palimpsest nature of the site largely escape us. It is furthermore remarkable that at site 45 various radiocarbon dates spanning the Middle Bronze Age-A are available, while only a limited amount of ceramics datable to this period was recovered. Presumably, this site was also used (and occupied?) during the Middle Bronze Age-A, but here too – despite a significantly lower feature density – no houses datable to the Middle Bronze Age-A beyond doubt could be recognised. Possibly, at the end of the Middle Bronze Age-A, the location of the barrow at site 45 saw its first formal barrow phase, of which only a partially preserved ring-ditch remained. Most striking, this probable funerary act took place on the spot that saw the burial of a human foot in a pit during the Late Neolithic period (see above), and which would form the focal point for various additional burials in subsequent centuries (see below; Hielkema, Brokke & Meijlink 2002, 210-211). The absence of find-spots datable to the Middle Bronze Age-A outside the excavated areas proper, is presumably again explainable by the low research intensity.

Middle Bronze Age-B

Considering the physical landscape, the Middle Bronze Age-B initially presented a continuation of the processes of gradual ‘drowning’ and decrease of inhabitable space that started in the preceding periods (Van Zijverden 2002b; 2004b, see also above). The Erichem fluvial system is still active. A relative increase in the rate of floodbasin deposition may be related to the emergence of the Bommel and Est fluvial systems, which presumably reactivated the part of the Meteren fluvial system between the Erichem and the Bommel connections. For the start of sedimentation by the Est fluvial system, a radiocarbon date between *c.* 1500 and 1300 cal BC is available (UtC-6848: 3124 ± 38 BP; Berendsen & Stouthamer 2001, 171). The Bommel system may have started later, as is pointed out by a radiocarbon date between *c.* 1270-1010 cal BC (UtC-6716: 2936 ± 37 BP; *ibid.*). The area lost to gradual ‘drowning’ of the landscape cannot be quantified, but based on the general overlap in feature- and finds-distributions, it seems likely that much of the inhabitable areas of the preceding periods were still useable for habitation during the Middle Bronze Age-B. In addition, for the Middle Bronze Age-B in the De Bogen macro-region there is again some evidence for human presence beyond the excavation extents of the various ‘De Bogen’ sites (fig. III.19). Often, however, the information available for these find-spots does not allow detailed discussion of the nature of the Bronze Age human presence.

At Erichem-Lingen (fig. III.19, no 6979), some Bronze Age (rim)sherds were found in 1979 together with some bone in the profile of a drainage ditch (Archis 6979). A bronze spearhead that could date to either the Middle- or the Late Bronze Age (*cf.* Fontijn 2003, 87; 117) was found by a metal-detectorist at Geldermalsen - Middengebied (fig. III.19, no 22791). Unfortunately, it originates from a layer of reworked soil (Archis 22791). In the centre of the town of Geldermalsen, two Bronze Age sherds were recovered from a test-pit (fig. III.19, no 25137; Louwe Kooijmans 1974, 375 no 125). A possible Bronze Age (or Iron Age) sherd was found during the fieldwalking campaigns prior

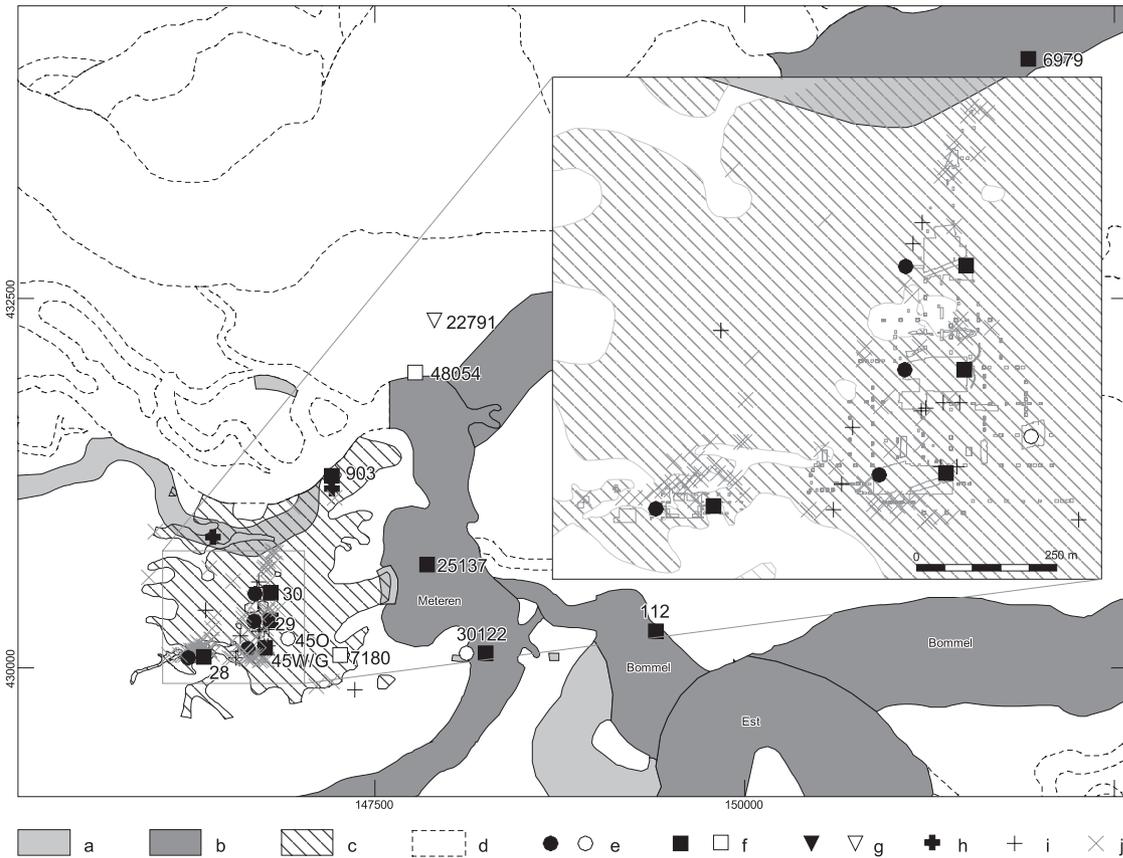


Fig. III.19 Middle Bronze Age-B fluvial systems and find-spots in the De Bogen macro-region. Filled symbols represent certain identifications, outlined symbols uncertain identifications. If more than one symbol is listed for a find-spot, the centre of the symbol directly left of the label indicates the correct centre-coordinate.

a: fossil fluvial systems, b: active fluvial system, c: crevasse splay deposits, d: younger fluvial systems, e: features, f: ceramics, g: tools & weapons, h: centre of presumable settlement site discovered during coring campaigns, i: periphery of presumable settlement site discovered during coring campaigns, j: possible settlement sites discovered during coring campaigns.

to the Betuweroute excavations (fig. III.19, no 112; Asmussen 1994, 195) and another Bronze Age sherd was found at Meteren - Boomgaard Blom during the physical-geographical coring campaign accompanying the Betuweroute excavation (fig. III.19, no 903; Van Zijverden 2002b, 74; pers. comm. May 2006). The watching brief carried out during the actual construction works for the Betuweroute railway yielded several sherds (possibly Iron Age), features and a finds-layer, for which a Bronze Age date may be expected based on their geological position and (similarities and) proximity to the other De Bogen excavated areas (see below), but cannot be proven (fig. III.19, no 7180; Schutte 2003b, 13 nos. 7180-7181; 7187-7188). A watching brief executed during the constructions works for new housing at Geldermalsen - Middengebied yielded a single sherd that could be dated no more precise than 'Bronze Age-Iron Age' (fig. III.19, no 48054; Schutte 2003a, 18).

Several of Betuweroute excavations in the De Bogen macro-region have yielded ample evidence for human activities and occupation during the Middle Bronze Age(-B). Underneath the Middle Iron Age site of Lage Blok (see for location fig. III.2; Milojkovic & Smits 2002) part of a Bronze Age settlement site is to be expected. However, as already various Middle Bronze Age sites were excavated nearby (see below), and as few Bronze Age features were expected because the Bronze Age level was possibly disturbed by the younger crevasse formation, it was explicitly decided not to systematically investigate the Middle Bronze Age levels of this site (Milojkovic & Gehasse 2002, 12-13; 15). Nonetheless, some possible Bronze Age features were discovered (Milojkovic & Gehasse 2002, 12; Van Zijverden 2002c, 40-41; Milojkovic & Krist 2002, 47). In addition, a considerable quantity (481 fragments; 2.7 kg) of Middle Bronze Age ceramics (predominantly from the Iron Age excavation levels and from a crevasse residual gully)

was found (Ufkes 2002b, 70). Presumably, these sherds represent material from a (Middle?) Bronze Age settlement site that has been reworked into the crevasse splay deposits on which the younger Middle Iron Age occupation took place (Van Zijverden 2002c, esp. 35). The exact dating, nature and extent of this Bronze Age settlement site, remains unknown due to the lack of proper investigation.

It has already been argued above that the gradual drowning of the various De Bogen Bronze Age settlements sites may not have completely inhibited human use of De Bogen site 28 during the later Middle Bronze Age. The regular structure of some of the houses reconstructed at site 28 is typologically comparable to those of Middle Bronze Age-B houses (fig. III.20). This, together with the dominance of pottery which cannot be dated more precisely – yet that fits well with the material known from other Middle Bronze Age-B settlement sites – suggests that this site may have been used during the Middle Bronze Age-B. Unfortunately, no radiocarbon dates are available that could support this assumption. Therefore, the possibility that the structures at site 28 indicated below could date to the Middle Bronze Age-B is solely based on the – inherently weak – typochronology of the buildings reconstructed.



Fig. III.20 Overview of the possible Middle Bronze Age(-B) structures at sites 28-3, 28-4 and 28-1 (see inset A for location).

a: not excavated, b: features belonging to structures, c: other features, d: single-stake type of fence, e: double-stake type of fence, f: well, g: cattle hoof imprints, h: possible ard marks.

Not all houses reconstructed at site 28 are of comparable reliability. Houses 28-4FH and 28-4GH are so incomplete and irregular that their validity seems minimal (Hielkema, Brokke & Meijlink 2002, 284-285). Houses 28-4BH and 28-4CH are slightly more credible (fig. III.21, C), but especially the former displays an unsettling variation of posthole diameter and depth (*op. cit.*, 280-281). Furthermore, three posts used in the reconstruction of house 28-4BH are also used in the reconstruction of house 28-4CH. From the latter house plan various finds (among which 5 sherds (48.8 gram) and a stone of over 200 g in weight) were recovered, but these have not been published or studied in detail. It remains possible that at the location of the overlapping houses 28-4BH and 28-4CH a Bronze Age house once stood, but that due to the high feature density no posts can be assigned with any certainty to a particular plan. Essentially, only house 28-1AH, which was recognized already during the fieldwork, presents a clear-cut Bronze Age house plan at site 28 (fig. III.22).

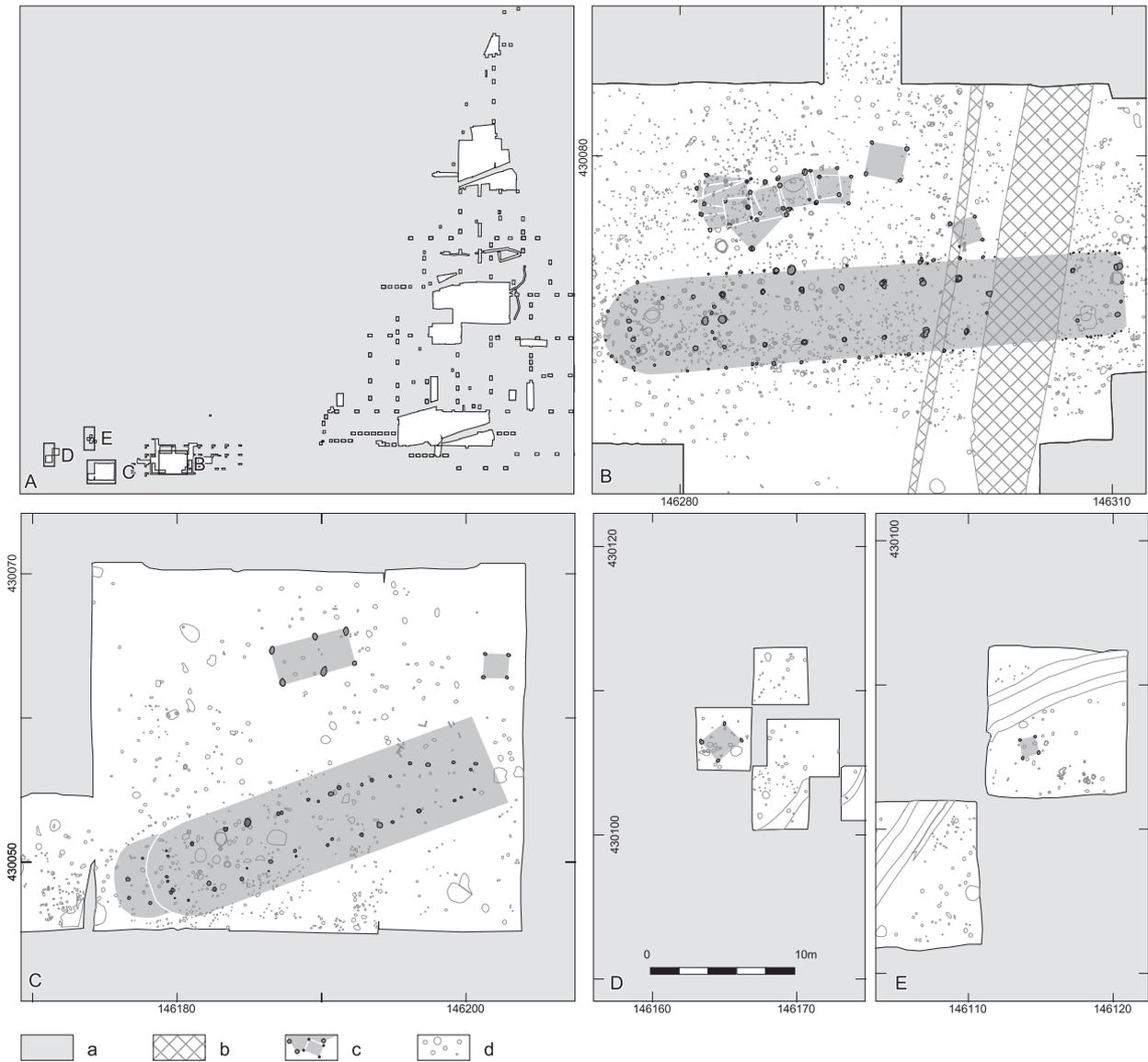


Fig. III.21 Possible Middle Bronze Age(-B?) structures at De Bogen site 28 (A: Overview, B: Site 28-1 with house 28-1AH and outbuildings, C: Site 28-4 with houses 28-HB and 28-4CH (dark fill), D: Site 28-3 with outbuilding, E: Site 28-2 with outbuilding, insets B to E all to the same scale).

a: not excavated, b: recent disturbances, c: features belonging to structures, d: other features.

The roof-bearing structure of house 28-1AH consists of two rows of posts at a remarkably wide (3.5 m) distance (*i.e.* span, *cf.* Arnoldussen 2008, 219 fig. 5.27, B). Given the high feature density in this part, it is unclear whether the variety of posts now assigned to the wall of this house, were ever part of the original construction. In any case they lack consistent placement in relation to the roof-bearing posts and vary significantly in depth and longitudinal distances between the posts. The westernmost three pairs of roof-bearing posts display a smaller spacing (mean 2 m), while the pairs of roof-bearing posts in the central part of the house are spaced at 2.75 m intervals. This may indicate that the three westernmost pairs had been added later-on during the use-life of house 28-1AH (Hielkema, Brokke & Meijlink 2002, 251). The two large postholes in the centre of the house at the spot where the possible western addition links up to the central part, may represent postholes of (temporary?) ridgepoles that allowed alteration of the roof-

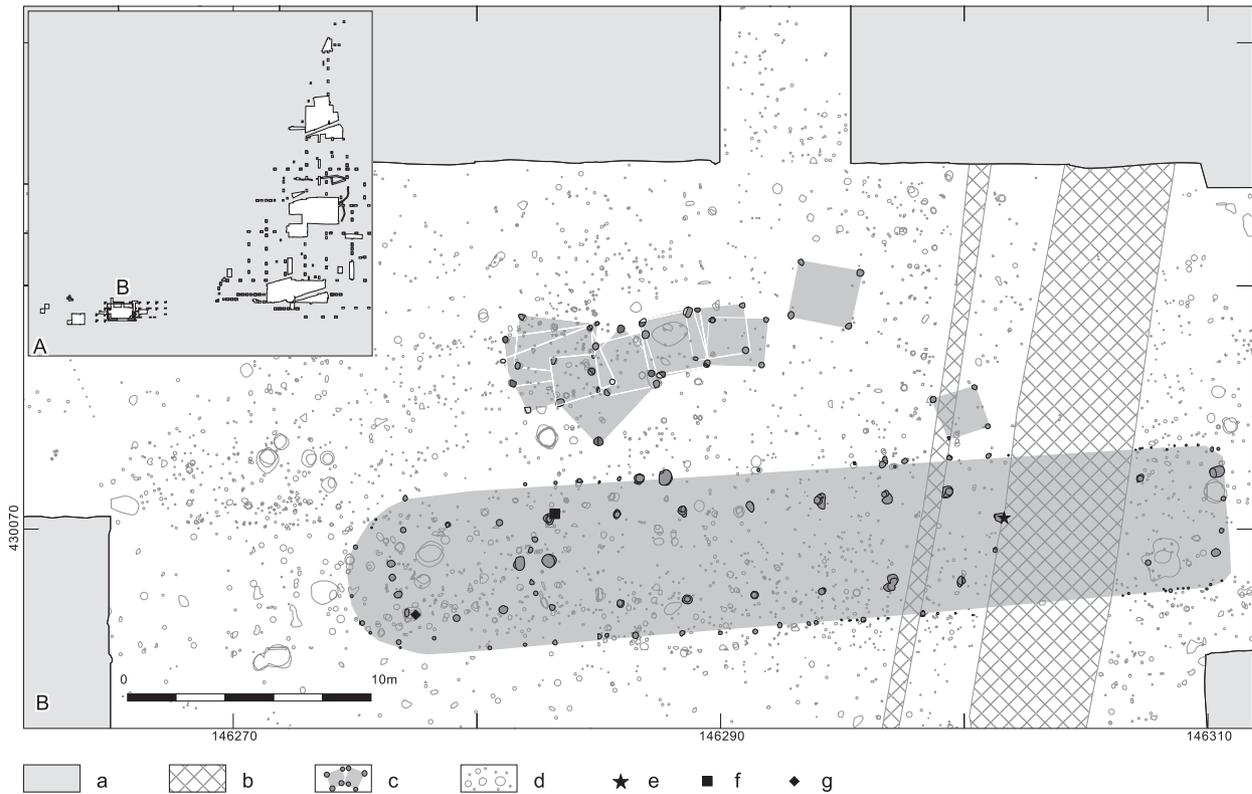


Fig. III.22 House (28-1AH) and outbuildings possibly datable to the Middle Bronze Age-B at De Bogen site 28. For location see inset A. a: not excavated, b: recent disturbances, c: features belonging to structures, d: other features, e: burned remains of a piglet, f: possible Hilversum-style decorated sherd, g: pit with loom-weights.

bearing structure. The extra posts in the centre aisle near the short sides could hint at a rounded shape of the short sides, but again due to the high feature density this is not very convincing. The same applies to the claimed entrances in the northern long and eastern short sides. The easternmost last two pairs of roof-bearing posts are – like the westernmost three – slightly tapering (*i.e.* their span decreases). This could suggest that the house was extended once to the east as well as to the west. Two deep posts near where the house is cross-cut by a recent ditch may in that case represent the original eastern end or entrance. In one of these posts 37 fragments (9.7 g) of a burned neonate piglet were found (fig. III.22, e), which are tentatively interpreted as a foundation offering (*op. cit.*, 252; Van Dijk, Esser & Zeiler 2002, 584). One of the roof-bearing posts (fig. III.22, f) yielded a fragment (16.8 g) of a pot with a plain cordon and paired nail impressions. This could be a Hilversum-style decorated pot, indicating a *terminus post quem* date of this house in or after the Middle Bronze Age-A (Hielkema, Brokke & Meijlink 2002, 252). Directly north of house 28-1AH a cluster of 13 possible outbuildings was found. As direct dates are lacking, it remains unclear whether they (all) functioned contemporaneously to the large farmhouse. In any case, their frequent rebuilding on the same spot indicates a deliberate decision to maintain a prese(n)t ordering of the house-site over several phases.

Site 45 was also occupied during the Middle Bronze Age-B, but at this site there are some radiocarbon dates available to back up the typological arguments. At least three house-sites can be recognized, one of which overlaps in location with a barrow. The occupation took place next to the – by then fully silted-up – residual channel of the crevasse deposits that formed the substrate (*cf.* Van Zijverden 2002b, 64). Besides the farmhouses, a limited number of outbuildings and fences could be recognized (fig. III.23). The double-stake types of fences both occur in curvilinear trajectories – in the centre of site 45 – as well as in vast (over 100 m) straight stretches to the east of the site (fig. III. 23) that are orientated almost north-south.

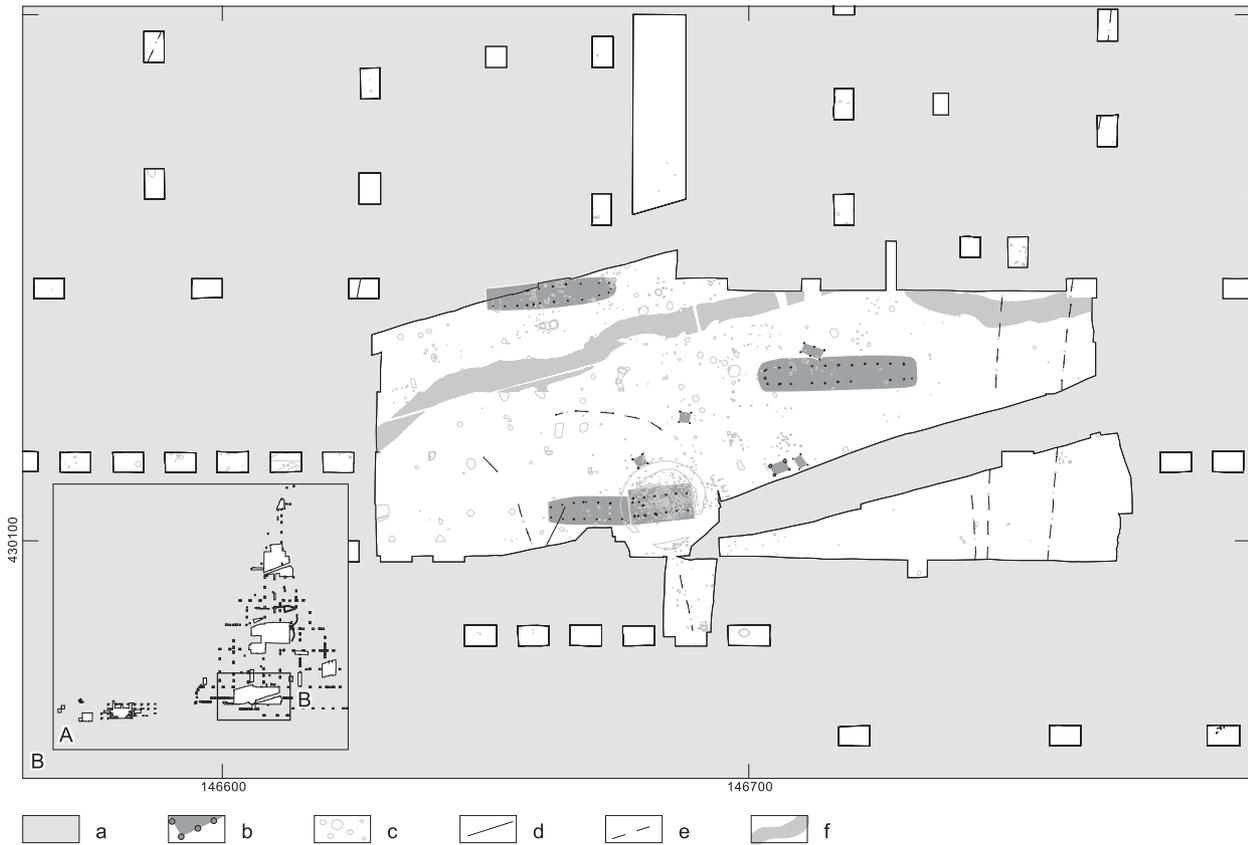


Fig. III.23 Overview of the possible Middle Bronze Age(-B) structures at site 45 (see inset A for location).

a: not excavated, b: features belonging to structures, c: other features, d: single-stake type of fence, e: double-stake type of fence, f: residual crevasse gully.

Due to the presence of a recent drainage ditch, house 45CH (fig. III.24, B) could not be completely excavated. The spacing of the roof-bearing posts varies (from 1.8 to 3.4 m) and southern row of roof-bearing posts shows a curvilinear to bent shape. The span decreases towards the short sides, suggesting that the original roof-bearing structure may have had a cigar- or ovoid shape. The few fragments of bone and burned clay recovered from the postholes do not allow to confirm or pin-point more exactly the assumed Middle Bronze Age date of this house.

House 45AH was already partially recognized during the fieldwork and could be uncovered almost completely (fig. III.24, D), although recent drainage ditches had destroyed the location of several of the roof-bearing posts. A combined sample of cereals and charcoal from a large post in the western short side was dated to *c.* 1530-1380 cal BC (AA-37504: 3185 ± 40 BP; Meijlink 2002a, 47), providing a *terminus post quem* date for the incorporation of the sample into the feature. The association of this posthole to the house is difficult, as ‘closing posts’ in the short side are not a common property of Middle Bronze Age houses in the river area (see Arnoldussen 2008, section 5.2.3). Nonetheless, the low feature density and the fact that house 30AH (possibly also 30BH, 30GH and 28-1AH, *cf.* Berkvens, Brandenburg & Koot 2004, 59; 63; Tol & Schabink 2004, 22) has also yielded a post more or less in the centre of the short side adds some validity to this association. Eight features of this house yielded some ceramics, which could however not be dated typologically. One feature contained broken fragments of a loom-weight (23 pieces, 132 gram), whose presence in the post-pipe suggests that they were deliberately deposited there after the dismantling of the house (fig. III.24, e; Hielkema, Brokke & Meijlink 2002, 197).

In the southern part of site 45, two more structures datable to the Middle Bronze Age-B were found. There, a Middle Bronze Age house plan overlaps with the location of a barrow (fig. III.25). Due to lack of vertical stratigraphy and the comparable fill of the features, the phasing of the various elements is complicated. It has been suggested above

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Fig. III.24 Possible Middle Bronze Age (B?) structures at De Bogen site 45 (A: Overview, B: House CH, C: Houses 45BH and 45HH (dark fill) and outbuildings, D: House 45AH and outbuildings, insets B to D all to the same scale).

a: not excavated, b: recent disturbances, c: features belonging to structures, d: other features, e: fragments of a loom-weight.

that the small, decentralized ring-ditch might date from a preceding (Middle Bronze Age-A) phase. Furthermore, vertical stratigraphy is also limited. Micro-morphological analysis of a mound section could only indicate a 6 cm thick layer of added soil (Exaltus 2002b, 98-100; Hielkema, Brokke & Meijlink 2002, 224-225).

Near the centre of the area bound by the largest ring-ditch, possibly two inhumations were interred during the Middle Bronze Age-B (fig. III.25, inset C). Grave 1 consisted of a possibly male adult, who was buried in an extremely flexed position on his right side (Robb 2002, 680-682). For this inhumation, radiocarbon dates of tooth enamel (GrA-16060: 3300 ± 60 BP; Meijlink 2002a, 47) and bone (apatite; GrA-15453: 3200 ± 60 BP, collagen; GrA-12675: 3130 ± 80 BP; Meijlink 2002a, 47) are available. They yield a wide age range in calibrated years (*c.* 1740-1190 cal BC), but combined suggest interment around the Middle Bronze Age-A/B transition (*i.e.* the 16th century). At 40 cm to the south of this grave, the remains of a baby of under a year of age were found (fig. III.25, inset C; Robb 2002,

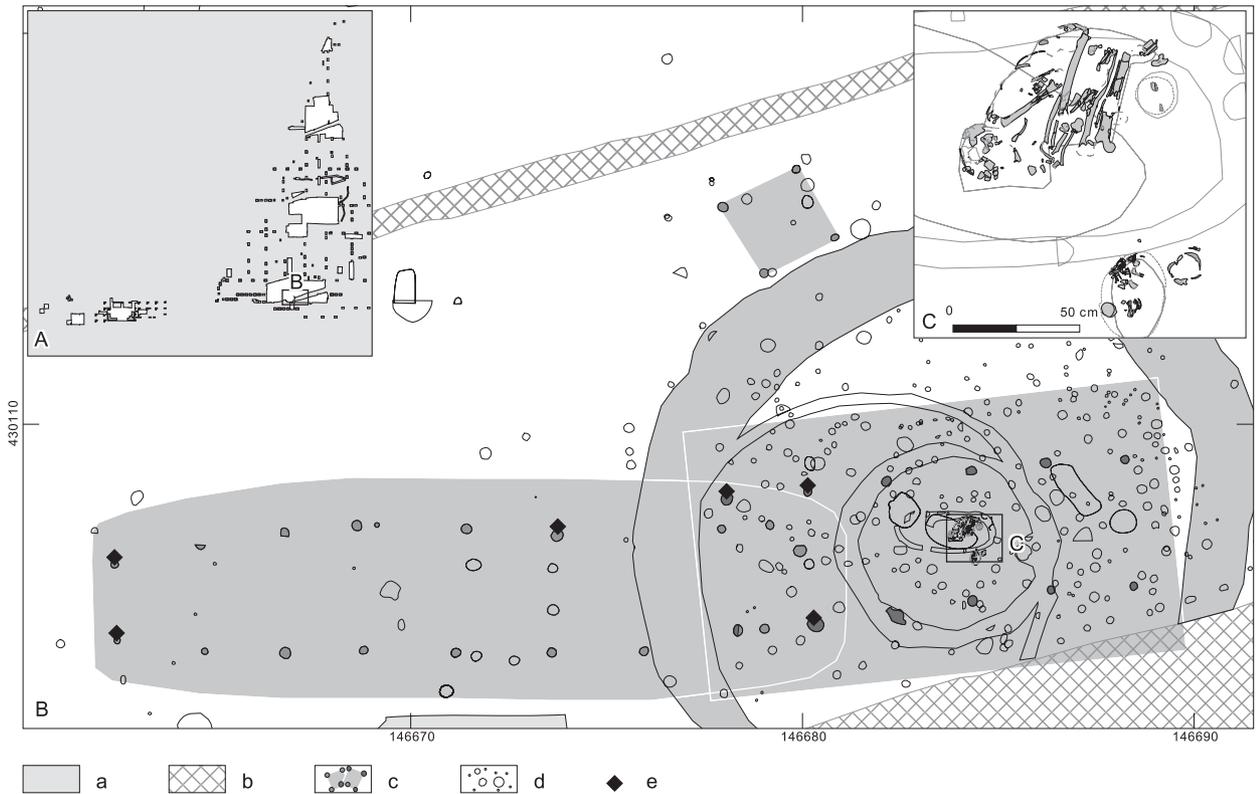


Fig. III.25 Possible Middle Bronze Age-B structures and burials in the south of site 45 (For location see inset A, inset C shows the inhumation graves 1 (top) and 2, house 45BH is indicated by features with a grey fill, house 45HH with features with a dark grey fill).

a: not excavated, b: recent disturbances, c: features belonging to structures, d: other features, e: features with radiocarbon dated cereal samples.

682-683). A radiocarbon sample of bone apatite from this individual dates to *c.* 1530-1310 cal BC (GrA-16510: 3160 ± 50 BP; Meijlink 2002a, 47) which suggests – combined with the location of the grave that suggests a deliberate avoidance of the location of grave 1 – that it may have been a secondary interment from roughly the same period as grave 1. These two graves appear to be centrally located within structure 45HH (fig. III.25, B; Hielkema, Brokke & Meijlink 2002, 222-223). This structure consists of two rows of six relatively deep posts, whose dimensions (spacing and span) are very comparable to that of Middle Bronze Age-B farmhouses. Structure 45HH does not extend beyond the largest ring-ditch. This means that either it could only have been a single post longer on each side – but that these have been obscured by the largest ring-ditch – or, alternatively, that structure 45HH was intended to fit the dimensions of this ring-ditch (or the other way round). It cannot be excluded, however, that both structure 45HH and the largest ring-ditch were contemporaneous to the younger burial 3 (see fig. III.34). In either case, the association of a domestic tradition of architecture and a funerary location (and rite) on the same spot is suggested (Hielkema, Brokke & Meijlink 2002, 223; *cf.* Rasmussen 1993; Svanberg 2005; Bourgeois & Fontijn *in press*). Three features of structure 45HH have yielded cereal samples that were submitted for radiocarbon dating (fig. III.25, e). They give a *terminus post quem* date range for structure 45HH of *c.* 1500-1260 cal BC (AA-37501: 3360 ± 45 BP, AA-37491: 3135 ± 45 BP and AA-37503: 3130 ± 50 BP; Meijlink 2002a, 47), confirming the suspected (early) Middle Bronze Age-B age and allowing for the contemporaneity of this structure to grave 1 and/or 2.

The largest ring ditch may also have belonged to this phase and has obscured parts of house 45BH. This ditch may, but cannot be proven to, have preceded the erection of this house. The features assigned to house 45BH that are within the largest ring-ditch, seem to break the regular placement of the roof-bearing posts of house 45BH and are in one case also involved in the reconstruction of structure 45HH, suggesting that possibly other posts may have formed the easternmost posts of house 45BH. Three postholes of house 45BH have yielded samples of cereals that were radiocarbon dated (fig. III.25, e). These samples indicate that the erection of this building occurred during,

or after, c. 1440-1210 cal BC (AA-37497: 3270 ± 60 BP, AA-37495: 3080 ± 75 BP, AA-37494: 3075 ± 45 BP; Meijlink 2002a, 47). To the east of the main part of site 45, another possible house plan was reconstructed (fig. III.27, D). This house, however, is rather fragmentarily preserved and of somewhat irregular layout and posthole depth, which means that its validity is questionable (Hielkema, Brokke & Meijlink 2002, 199-200).

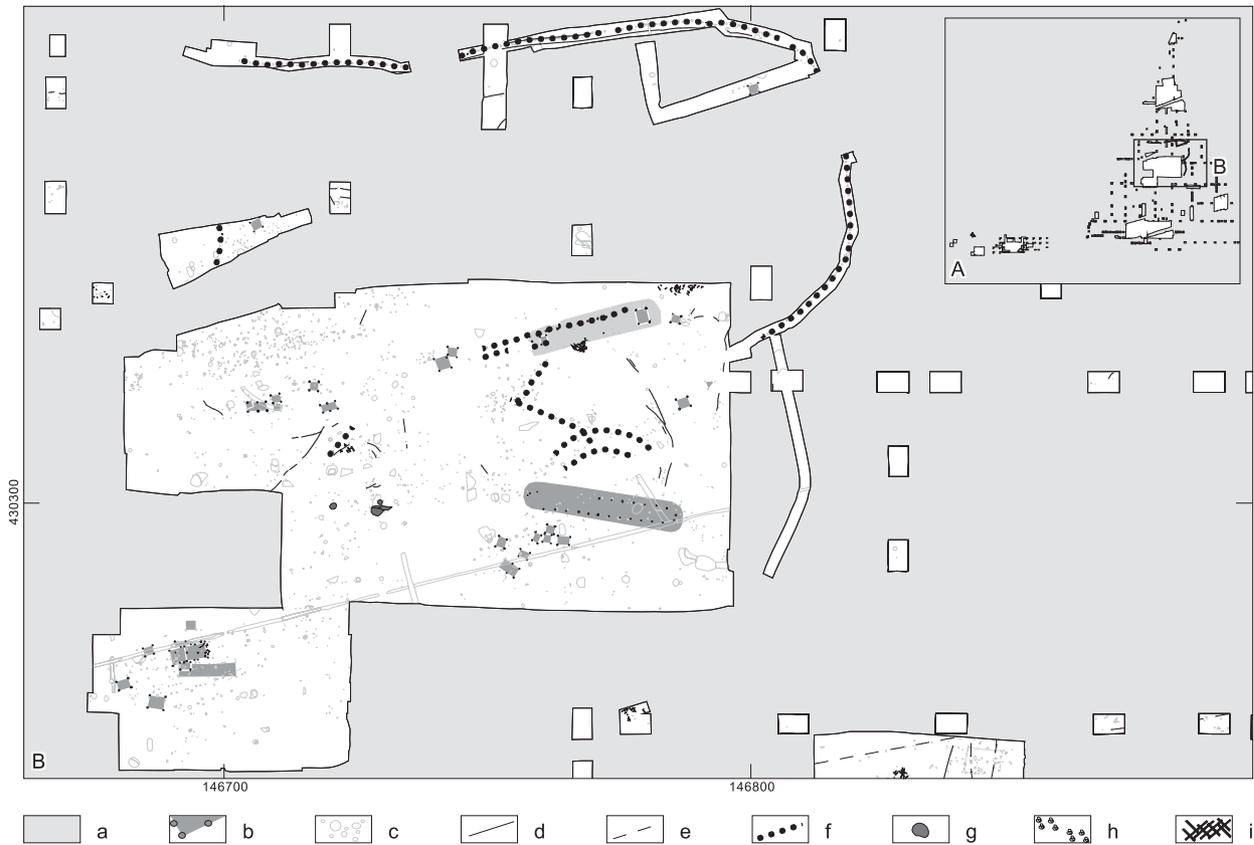


Fig. III.26 Overview of the possible Middle Bronze Age(-B) structures at site 29 (see inset A for location).

a: not excavated, b: features belonging to structures, c: other features, d: single-stake type of fence, e: double-stake type of fence, f: palisades, g: wells, h: cattle hoof-prints, i: possible ard-marks.

At c. 140 m to the northwest of this claimed house, two overlapping house plans were recognized near the southeastern part of site 29 (fig. III.26). These two houses (29B2H and 29B3H, see fig. III.27, B) are orientated along the gradients of the highest parts of the crevasse splay morphology (Hielkema, Brokke & Meijlink 2002, 172-174; cf. Van Zijverden 2002b, 86). Both plans are disturbed by a sub-recent drainage ditch, and the posts assigned to the houses in the publication to the west of this ditch, appear to be situated rather off-mark, suggesting that they perhaps never were part of the house plans in question (Hielkema, Brokke & Meijlink 2002, 172-174). Of the oldest house (phase), 13 sets of roof-bearing posts and a more narrowly spaced entrance portal can reliably be reconstructed. The younger house (phase) also displays such an entrance portal, but here only nine sets of roof-bearing posts could be identified with certainty. One feature of this youngest house contained a decorated rim sherd, while another contained a sherd with a plain cordon (Hielkema, Brokke & Meijlink 2002, 173). Charcoal from the latter feature was dated to c. 1500-1310 cal BC (AA-37506: 3135 ± 45 BP; Meijlink 2002a, 47), providing a *terminus post quem* date for the construction of this house during the Middle Bronze Age-B. To the south of the houses, a number of four- and six-post outbuildings – corresponding roughly in orientation to the houses – were found, which did not overlap each other and for which no dates are available.

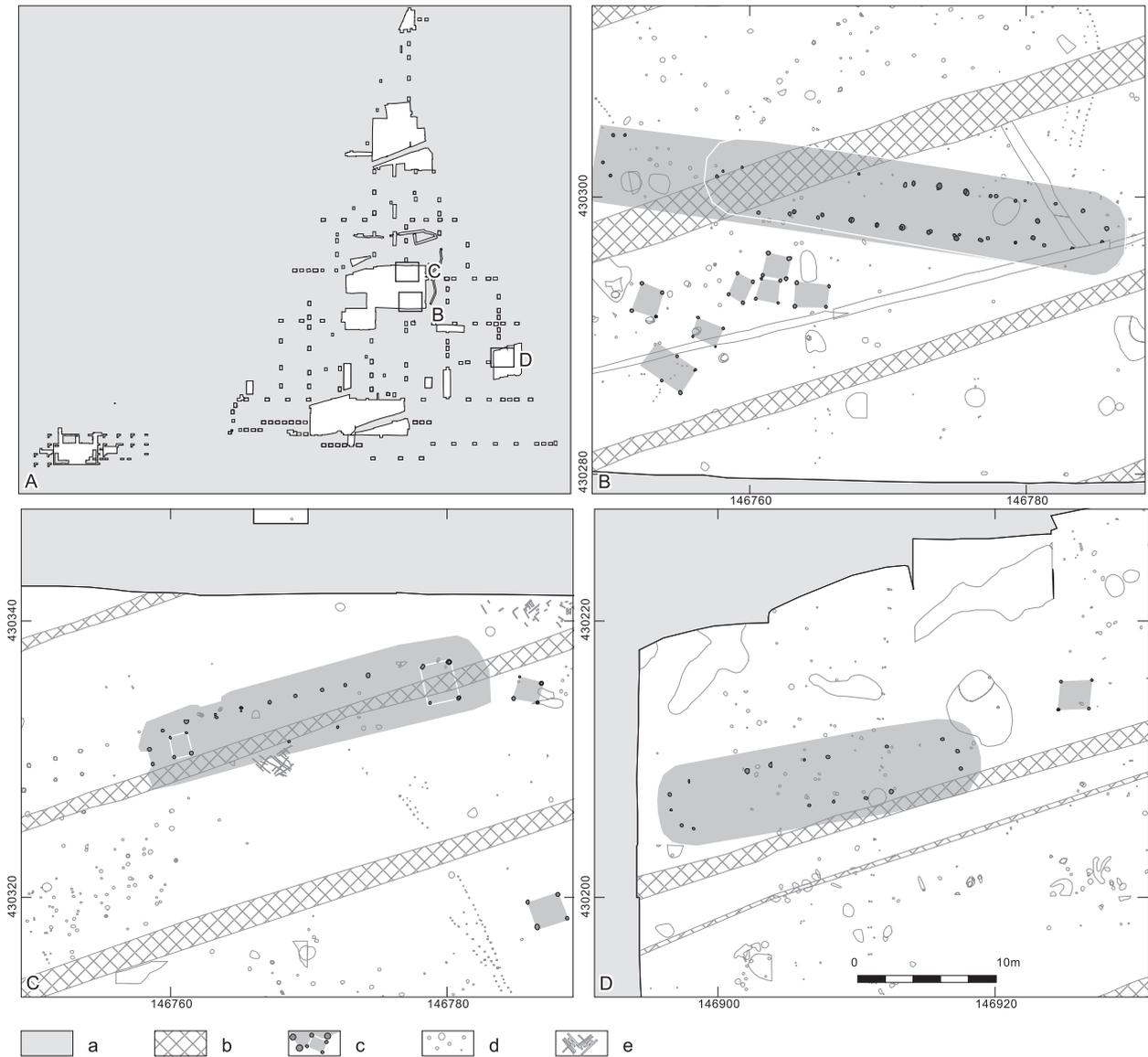


Fig. III.27 Possible Middle Bronze Age(-B?) structures at De Bogen site 29 and 45O (A: Overview, B: Houses 29B2H and 29B3H (dark fill) and outbuildings, C: possible house 29AH, D: possible house 45DH, insets B to D all to the same scale).

a: not excavated, b: recent disturbances, c: features belonging to structures, d: other features, e: possible ard-marks.

At *c.* 30 m to the west of these houses, a cluster of three unlined wells was found from which three samples of charred material and charcoal were dated (fig. III.26, g; Hielkema, Brokke & Meijlink 2002, 187). The radiocarbon dates of the two youngest (see above) range between *c.* 1450-1260 cal BC (AA-37508: 3095 ± 40 BP; AA-37507: 3090 ± 40 BP; Meijlink 2002a, 47). Directly north of the location of these two houses, two curved parallel palisades of substantial posts (postholes 20-30 cm diameter) placed at 2.1 to 2.3 m interval were found, whose function remains enigmatic. The distance between the posts in these curved palisades is similar to the spacing often applied in the placement of roof-bearing posts of Middle Bronze Age-B houses. This becomes an important detail when one looks at house 29 AH (fig. III.27, C) in more detail. At first sight the placement of the posts seems to suggest the presence of a somewhat less regular Middle Bronze Age house plan (Hielkema, Brokke & Meijlink 2002, 171-172). After closer inspection, the sub-recent drainage ditch that cross-cuts the plan cannot account for the observed absence of a large

number of posts from the southern row of roof-bearing posts of the assumed house plan. Furthermore, a series of posts to the west of the northern row of roof-bearing posts has a similar spacing and orientation, but they have been interpreted by the excavators as representing another house (29GH; Hielkema, Brokke & Meijlink 2002, 178). Here, based on the similarity in spacing of the curved palisades to the spacing of posts in ‘houses’ 29AH and 29GH, the options is suggested that the latter posts represent a more a less linear post-alignment, or palisade, instead of a house plan (*cf.* fig. III.26).

It is not clear why on this site such a large number and variety of palisades have been encountered. The main curvilinear palisade, which delimited a large section of the transitional zone towards the lowest part of the crevasse surface to the north of site 29, has in parts seen three phases of development (fig. III.28). The close spacing of the posts might suggest a practical function (such as a livestock enclosure), yet the fact that it does not actually completely enclose a given area, renders this an unlikely option. Unfortunately, no datable finds were recovered from any of the palisade’s postholes, which means that its exact dating remains unknown.

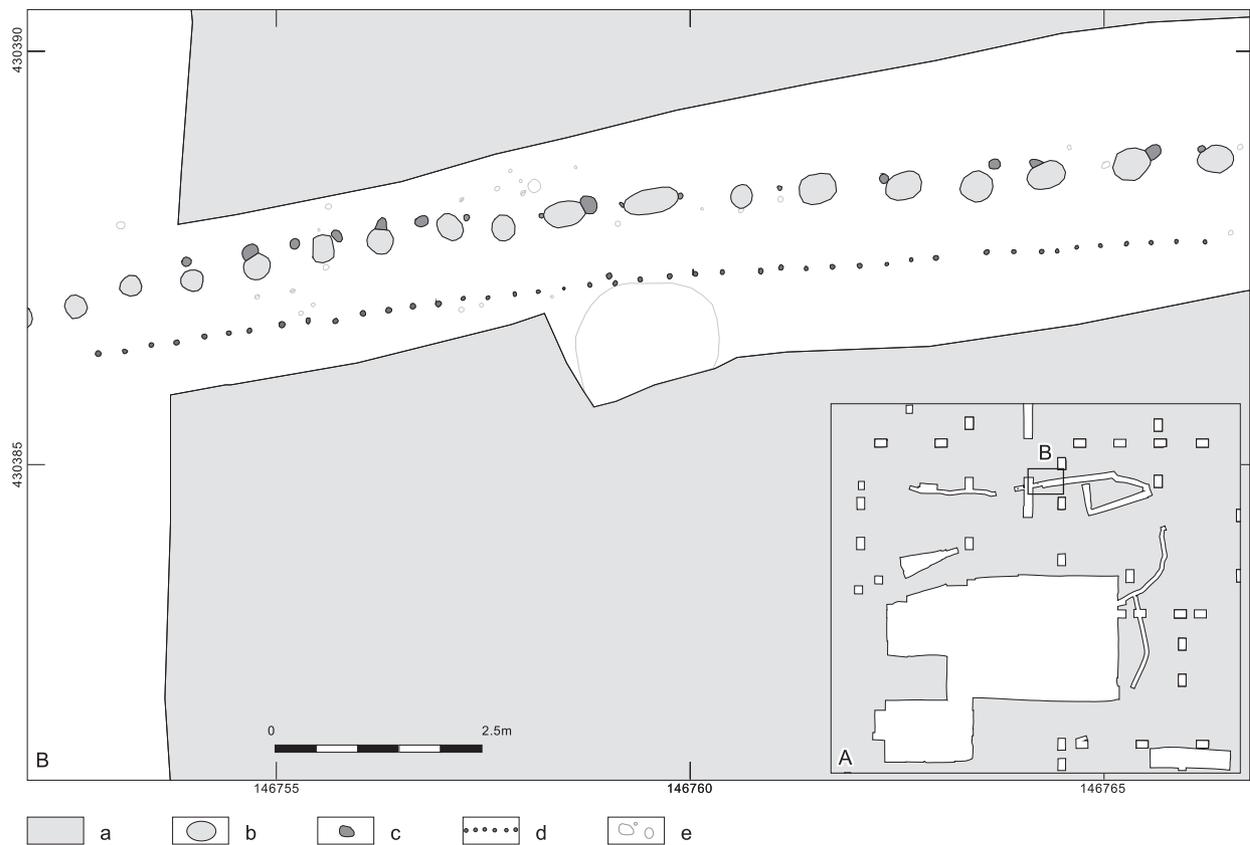


Fig. III.28 Detail of the palisades to the north of site 29 (A: Overview, B: Palisades).

a: not excavated, b: palisade phase, c: palisade phase, d: palisade phase, e: other features.

If the northern parts of ‘houses’ 29AH and 29GH indeed were part of a palisade in prehistory, they conform to a second axis of orientation of structures at this site (fig. III.29, B). Houses 29B2H and 29B3H are orientated ESE-WNW, whereas the discussed palisade, the system of linear ditches near the southern part of site 29 and a large number of outbuildings on this site are orientated WSW-ENE (for the ditches, an Iron Age date is assumed, but this is not based on a direct date; Hielkema, Brokke & Meijlink 2002, 187). This ditch, however, cross-cuts two postholes of house 29B2H (Hielkema, Brokke & Meijlink 2002, 173 fig. 3.10b), indicating that it presumably does post-date the Middle Bronze Age(-B) occupation phase. These systems of orientation indicate at least two distinct phases of settlement site structuring (fig. III.29).

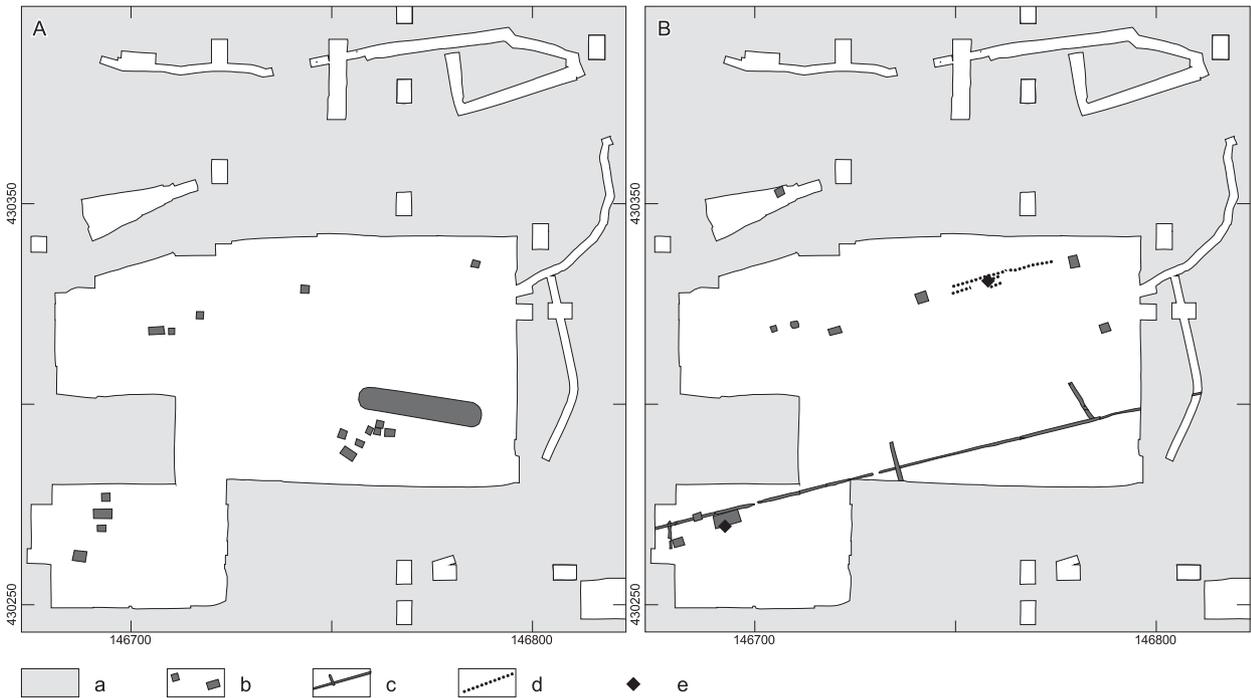


Fig. III.29 Two tentative phases of settlement site structuring at De Bogen site 29.

a: not excavated, b: structures, c: ditches, d: palisades, e: radiocarbon dated features.

It is not completely clear how much time is represented by these two phases, or how much time lapsed in between. From a posthole of the possible palisade (or, alternatively, an entrance post of house 29AH) a charcoal sample was dated to *c.* 1610-1410 cal BC (AA-37505: 3120 ± 40 BP; Meijlink 2002a, 47; Hielkema, Brokke & Meijlink 2002, 170-172). A sample of charred cereals from an eight-post outbuilding (or, alternatively, house 29CH) that is cross-cut by the linear ditches, was radiocarbon dated to *c.* 1390 -1120 cal BC (AA-37510: 3010 ± 40 BP; Meijlink 2002a, 47; Hielkema, Brokke & Meijlink 2002, 174-175). Especially the latter date suggests that this phase should be placed near or at the end of the Middle Bronze Age-B.

It has already been argued above, that two of the houses tentatively dated to the MBA-A at site 30, may very well date to the Middle Bronze Age-B (houses 30AH and 30GH, see fig. III.17, G-H). Together with the house-site more or less in the centre of site 30, a total of three possibly Middle Bronze Age-B house-sites is known (fig. III.30). The central house site is remarkable for the presence of four, overlapping, house plans (fig. III.31, D; fig. III.32).

House 30BH is represented by seven sets of roof-bearing posts and possibly a more closely spaced entrance portal in the south-east (Hielkema, Brokke & Meijlink 2002, 145-146). Charcoal samples from two postholes were dated. These dates provide a *terminus post quem* age of *c.* 1520-1310 cal BC (AA-37512: 3160 ± 40 BP; Meijlink 2002a, 47) and – much younger – *c.* 1270-1000 cal BC (AA-37513: 2915 ± 40 BP; *loc. cit.*). Another posthole of this house yielded a sherd with a knob decorated by grooved lines, which is difficult to date typologically. Of house 30CH, nine pairs of roof-bearing posts could be identified, but this house could originally have been longer. One posthole yielded a decorated sherd, which most likely presents an unintentional incorporation of a Late Neolithic or Early Bronze Age sherd (Hielkema, Brokke & Meijlink 2002, 147). House 30DH consists of seven pairs of roof-bearing posts, of which the eastern half show a more coherent feature diameter and depth. A single radiocarbon date of charcoal from a posthole proved to be of Middle Neolithic Age (see above; Hielkema, Brokke & Meijlink 2002, 148). House 30EH has been reconstructed as a 23 m long house consisting of 12 sets of roof-bearing posts (*op. cit.*, 148-149), but a remarkably shorter spacing (1.5-1.8 m instead of the mean *c.* 2.05 m) between two sets of roof-bearing posts near the middle of the house, may indicate that this house consists of two house phases. A single intersection by a feature of house 30BH suggests that (the east part of) house 30EH predates house 30BH. Charcoal from a posthole



Fig. III.30 Overview of the possible Middle Bronze Age(-B) structures at site 30 (see inset A for location).

a: not excavated, b: features belonging to structures, c: other features, d: single-stake type of fences, e: double-stake type of fences, f: palisades, g: wells, h: cattle hoof imprints, i: possible ard marks.

– also used in the reconstruction of house 30BH – was dated to the Middle Bronze Age-A (AA-37511: 3510 ± 40 BP, see above and Hielkema, Brokke & Meijlink 2002, 149) and provides, together with a Bell Beaker and a potbeaker sherd from other postholes, only a *terminus post quem* date. Based on their structural properties, a Middle Bronze Age-B age is forwarded for all four houses at this house-site (Hielkema, Brokke and Meijlink 2002, 154).

At first glance, these houses might seem to represent quite different structures in terms of size and location, which have been constructed from a dense posthole clutter (fig. III.32, top). A rather different picture emerges, however, if the ground plans are translated and slightly rotated to form a composite overlay (fig. III.32, bottom). It becomes clear that the roof-bearing structure of these four houses is nearly identical. This presupposes that the builders of the younger house(phase)s had intimate knowledge on the orientation and – dimensioning of the – roof-bearing structure of the house's successor(s). It is quite likely that the same household, or at least the same local community, was responsible for the rebuilding of the – what was perceived of as the same – house on the same house-site again and again (Meijlink 2002b, 806).

Charcoal from one of the wells in the northeast part of site 30 was radiocarbon dated to *c.* 1500-1310 cal BC (AA-37518: 3135 ± 40 BP; Meijlink 2002a, 47). It is remarkable that this well was dug into the ground only four meters from the location of two wells that may be of Late Neolithic Age (see above; Hielkema, Brokke & Meijlink 2002, 160-161). Of the various pits investigated at site 30, only a handful contained significant amounts of debris that would allow for an interpretation as refuse pits, and almost none of them can be dated with certainty to the Middle Bronze Age or Middle Bronze Age-B (Hielkema, Brokke & Meijlink 2002, 157-159).

It has already been argued above that it is not altogether clear whether site 31 (Boog - C Noord) was completely uninhabitable during the Middle Bronze Age-B. The type of fence-structure recognised and possibly some of the currently dismissed radiocarbon dates (see above and Schoneveld 2001, 187-188) suggest that the site need not have

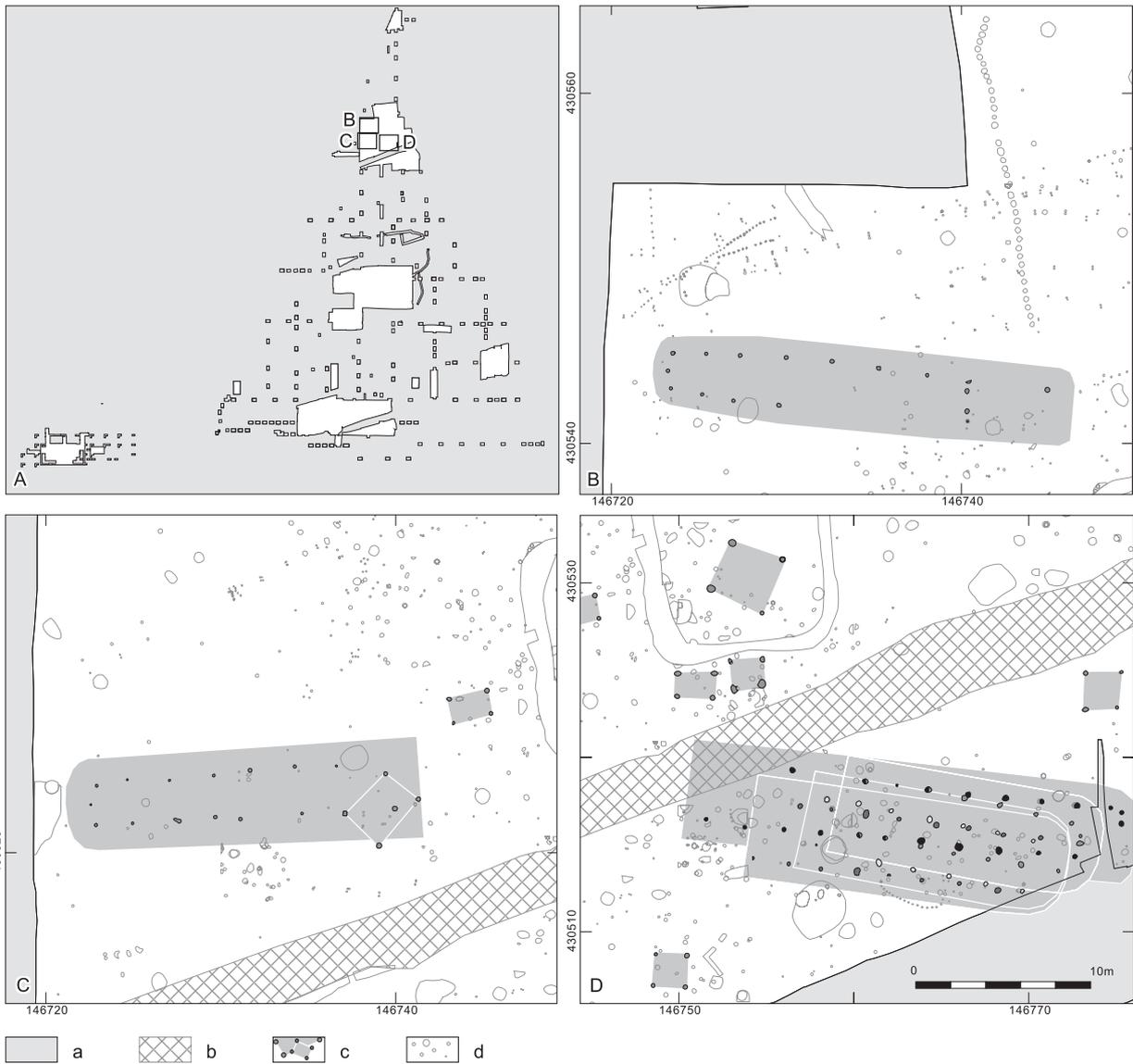


Fig. III.31 Possible Middle Bronze Age(-B?) structures at De Bogen site 30 (A: Overview, B: House 30AH, C: House 30GH, D: Houses 30BH, 30CH, 30DH and 30EH, insets B to D all to the same scale).

a: not excavated, b: recent disturbances, c: features belonging to structures.

been completely void of human activity during the period in question. The use of the plot as a house-site cannot – due to low density of features and lack of recognizable structures – be argued for.

Despite the absence of house-sites dated to the Middle Bronze Age(-B) on site 31, all other sites have yielded rather good evidence for Bronze Age occupation. There, 9-11 house-sites with a total of 13-16 houses can with any certainty be reconstructed (table III.6), but presumably somewhat higher figures may fit better with prehistoric reality.

Unfortunately, the palimpsest nature of the sites, the low numbers of available radiocarbon dates and the absence of direct dates for structures makes it nearly impossible to assess to what extent the undated features belong to this, or any other, phase of use of the sites. Therefore, a discussion of the nature and content of the majority of undated features such as postholes and pits – which in fact may very well partially date to the Middle Bronze Age-B, will not be undertaken here (but see Hielkema, Brokke & Meijlink 2002 for a complete overview).

APPENDIX III: DE BOGEN

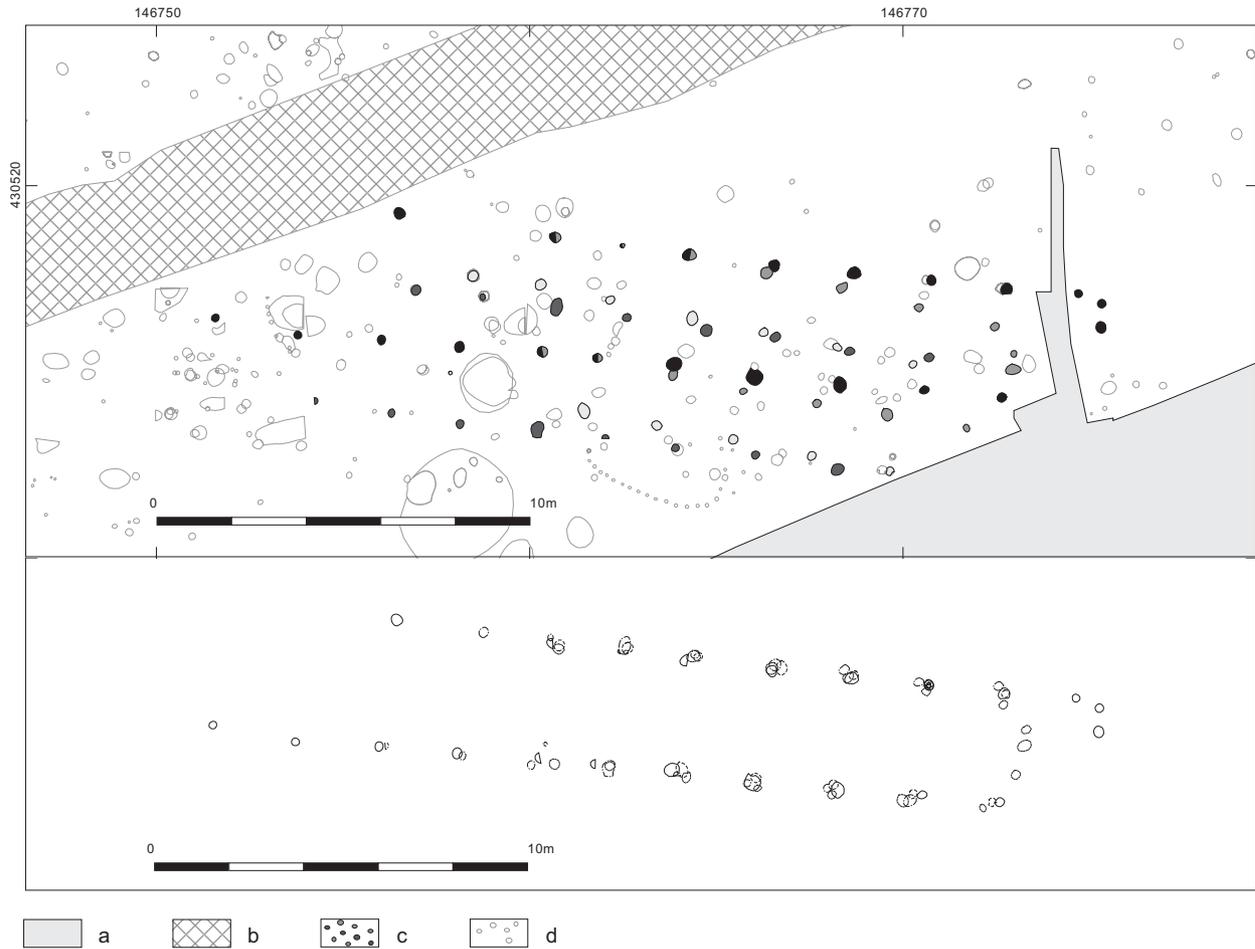


Fig. III.32 Overlay of the four different house phases of the house-site of house 30BH at De Bogen site 30: House 30DH (light grey fill), house 30BH (grey fill), house 30CH (dark grey fill) and house 30EH (black fill). The bottom part shows the above houses rotated and superimposed to show structural similarities (30DH: large dashes, 30BH: small dashes, 30CH: large dashes and dots and 30EH: continuous outline).

Site	Nos. house-sites	Nos. House(phase)s
28-4	1	1-2 ?
28-1	1	> 1 ?
45	3(-4?)	3(-4?)
29	1(-2?)	2(-3?)
30	3	6
31	-	-
Lage Blok	-	-
<i>total</i>	<i>9(-11?)</i>	<i>13(-16?)</i>

Table III.6 Reliably reconstructable Middle Bronze Age house-sites and numbers of house(phase)s for the various De Bogen sites.

Nonetheless, even from the distribution of the certain and possible Middle Bronze Age-B houses, the De Bogen micro-region appears to have been densely settled (fig. III.33). Within the 2.7 ha uncovered in the main excavations, up to eleven Bronze Age house-sites and up to 16 houses could be recognized. An even higher number may have been present, but presumably could not be recognized due to the locally high feature densities (table III.3). Furthermore, it can be assumed that comparable parts of the crevasse and levee landscapes outside the areas threatened by railroad construction – and which were consequently not investigated – were as intensively occupied (*cf.* figs. III.19; III.33). Especially the areas to the east of the main cluster of the De Bogen excavations, where the highest parts of the crevasse splay deposits are found (fig. III.33), may have been a very attractive settlement location in prehistory. The evidence for the Middle Bronze Age-B occupation of all sites shows a reasonably well comparable picture of a regular three-aisledfarmhouse, sometimes flanked by outbuildings nearby and with wells in the direct vicinity (Meijlink 2002b, 780-783). The available dating evidence does not allow a discussion of whether any, or how many, of these house-sites were contemporaneous. From the corresponding orientation of a number of the farmhouses it may be assumed that – if they were not contemporaneous – the main axes of the built-up landscape did not significantly alter (but see fig. III.29 for site 29). In some parts of the De Bogen micro-region, the orientation of the farmhouses appears to be guided by the general morphology of the underlying crevasse splay deposits, but the orientation of the houses in the west of site 30 and possibly at site 28-4 are at angles to the crevasse morphology, which indicates that landscape gradient conforming orientation need not have been of chief importance (*cf.* Arnoldussen 2008, section 6.4.1).

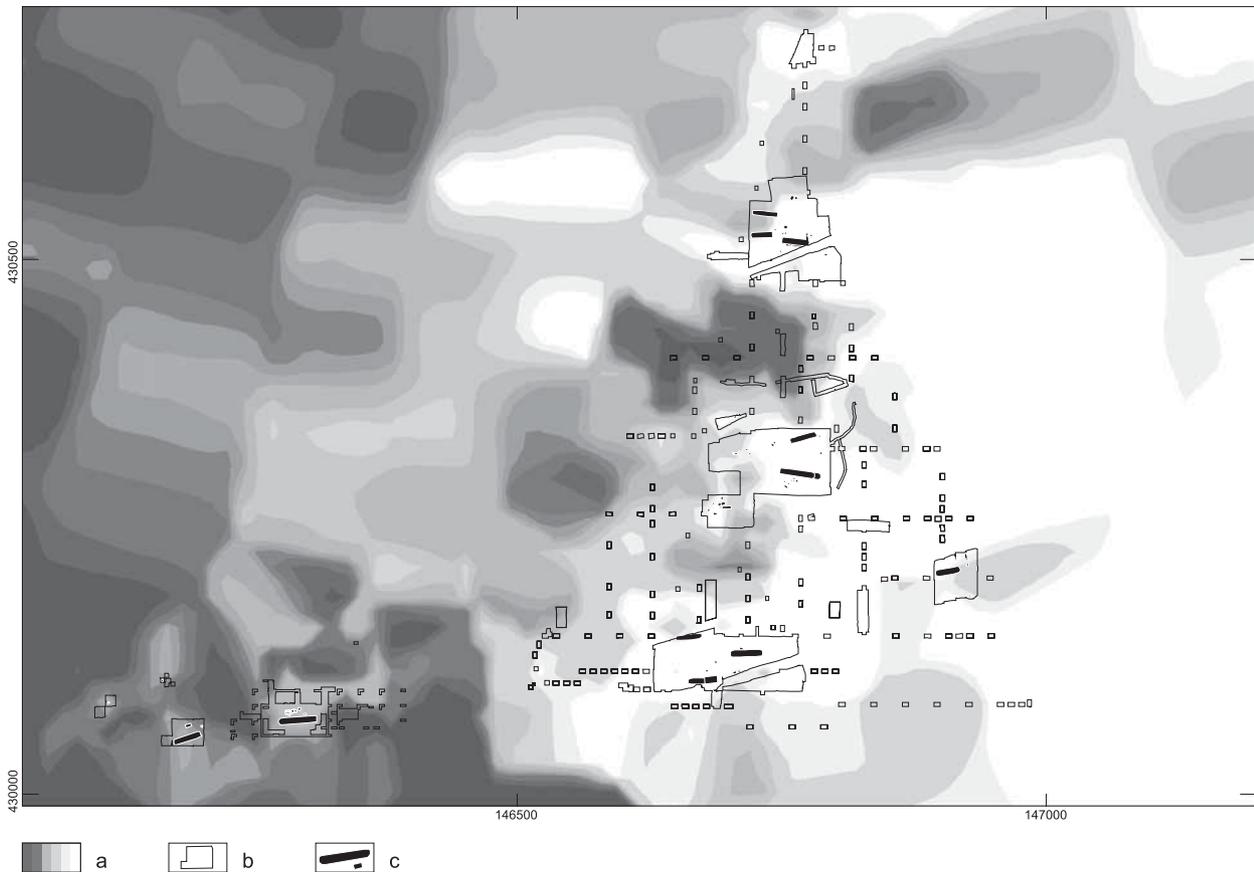


Fig. III.33 Distribution of the certain and possible Middle Bronze Age(-B) house-sites in the De Bogen micro region plotted on the underlying crevasse splay sand-depth (after Van Zijverden 2004b).

a: crevasse splay height (ranging from 0.3 m (dark fill) above to 2.7 m above (white fill) D.O.D., b: excavation trenches, c: structures.

Presumably near the very end of the Middle Bronze Age-B, or even in the Late Bronze Age, another inhumation took place on the barrow location of site 45. Directly on top of the older grave 1, the remains of a 25-35 year old adult (possibly male) lying on its back were found (Robb 2002, 671; 683-684; Hielkema, Brokke & Meijlink 2002, 210). Unfortunately, the inhumation had been considerably damaged by (sub-)recent ploughing. A bronze rapier was found next to the left arm and from the sieved soil from the nearby section fragments of two bronze arrowheads and fragments of bronze ornaments were recovered (Hielkema, Brokke & Meijlink 2002, 210; Butler & Hielkema 2002, 539-541). Two direct (tooth enamel and bio-apatite) radiocarbon dates suggest a dating of this inhumation between c. 1120-810 cal BC (GrA-16058: 2790 ± 60 BP; GrA-15463: 2790 ± 60 BP; Meijlink 2002a, 47). In the original publication, a 14th century BC age is forwarded for the rapier and a dating to 1500-1200 cal BC for the arrowheads (Butler & Hielkema 2002, 540-541), but this grave set might have been current well into the last centuries of the Middle Bronze Age-B (*cf.* Desittere 1968(b), 43; Bourgeois & Fontijn *in press*). The small ring-ditch may have been part of this grave, but definite evidence is lacking (Hielkema, Brokke & Meijlink 2002, 212-213; Meijlink *in press*; Bourgeois & Fontijn *in press*).

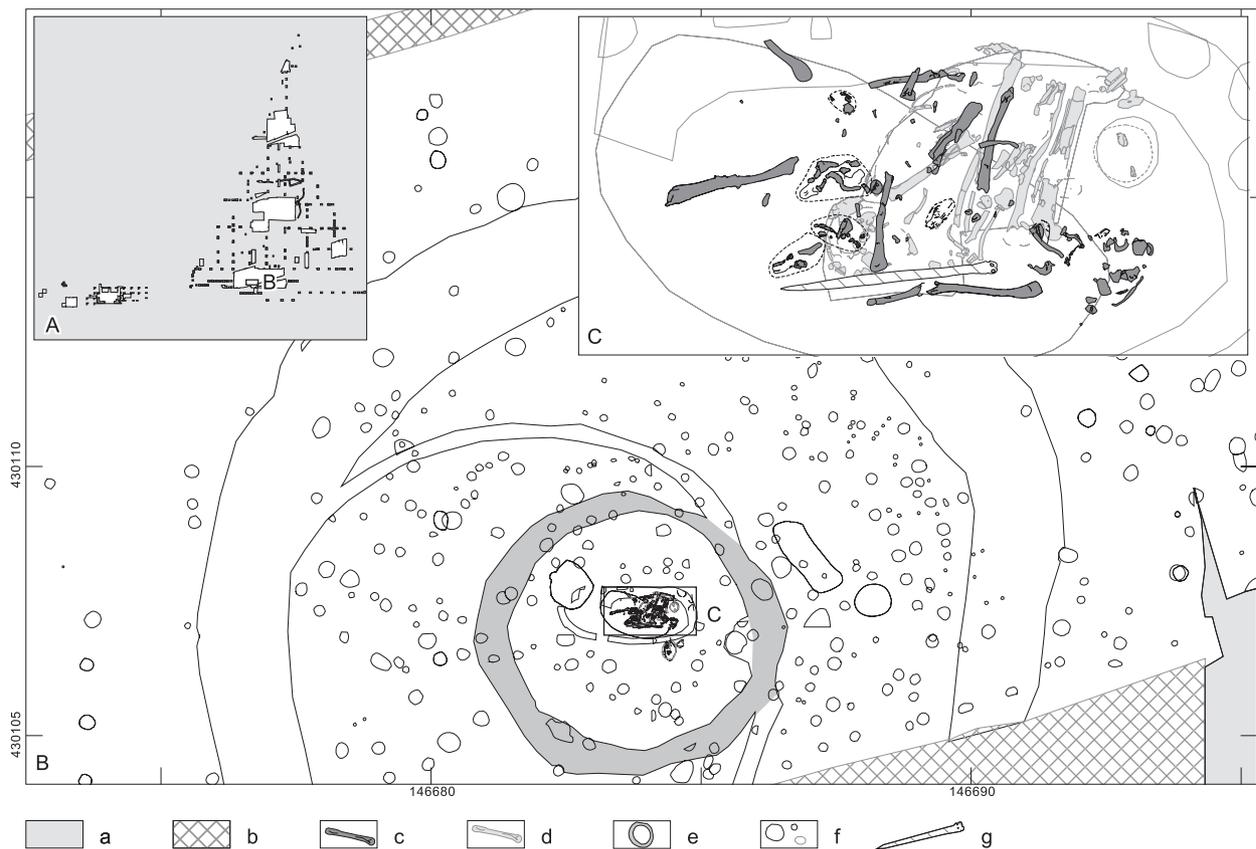


Fig. III.34 Location of grave 3 on De Bogen site 45. Inset A shows the location and inset B shows a detail of the location of grave 3 on top of the older grave 1.

a: not excavated, b: recent disturbances, c: grave 3, d: grave 1, e: possibly contemporaneous ring-ditch, f: other features, g: bronze rapier.

It remains remarkable that if this interment indeed took place during the final centuries of the Middle Bronze Age-B, few other finds or structures unambiguously testify of habitation of the various De Bogen sites during this period (but see dates from house 30BH and structure 29CH (see above); Hielkema, Brokke and Meijlink 2002, 146; 175). Most likely, the technological, morphological and iconographic aspects of ceramic – and other – technologies changed so minimally during the Middle Bronze Age(-B?) as to have gone archeologically undetected here.

The palimpsest character of the De Bogen sites furthermore complicates the assessment of the available information on subsistence strategies and craft activities for the Middle Bronze Age-B, as it is mostly unclear to which period(s) the evidence in question dates. Nonetheless, some statements on the prehistoric activities executed on these sites can still be made. One should however keep in mind that these data may represent a rather imbalanced dataset spanning the Late Neolithic to Middle Bronze Age-B periods. The decision to discuss this data here (as part of the Middle Bronze Age-B section) is for sake of practicality and uniformity, and cannot be taken to imply that the data below solely, or predominantly, relates to this period of use of the sites.

Livestock rearing presumably was a significant subsistence strategy. Although the palimpsest nature of the sites limits the usefulness of the resultant livestock spectra, cattle is usually best represented (mean 63%; Van Dijk, Esser & Zeiler 2002, 559-561; 567; 574; 579; 585; Buitenhuis 2001, 144-145, 147; Arnoldussen & Fontijn 2006, Appendix 2). Pigs and sheep (and possibly goat) take second place (mean both 17%), but at some sites pigs take second place (17-27 % at sites 28-1, 28-3, 29-Z, 29N, 31) whereas ovicaprids rank second at others (6-25 % at sites 30; 38-4; 28-2; 45O; 45W). This suggested twofold distribution can not meaningfully be related to the differences in occurrence of the datable pottery (fig. III.35) to suggest livestock composition changes over time (*cf.* Van Dijk, Esser & Zeiler 2002, 619; Meijlink 2002b, 787), nor to differences in geological setting (fig. III.33).

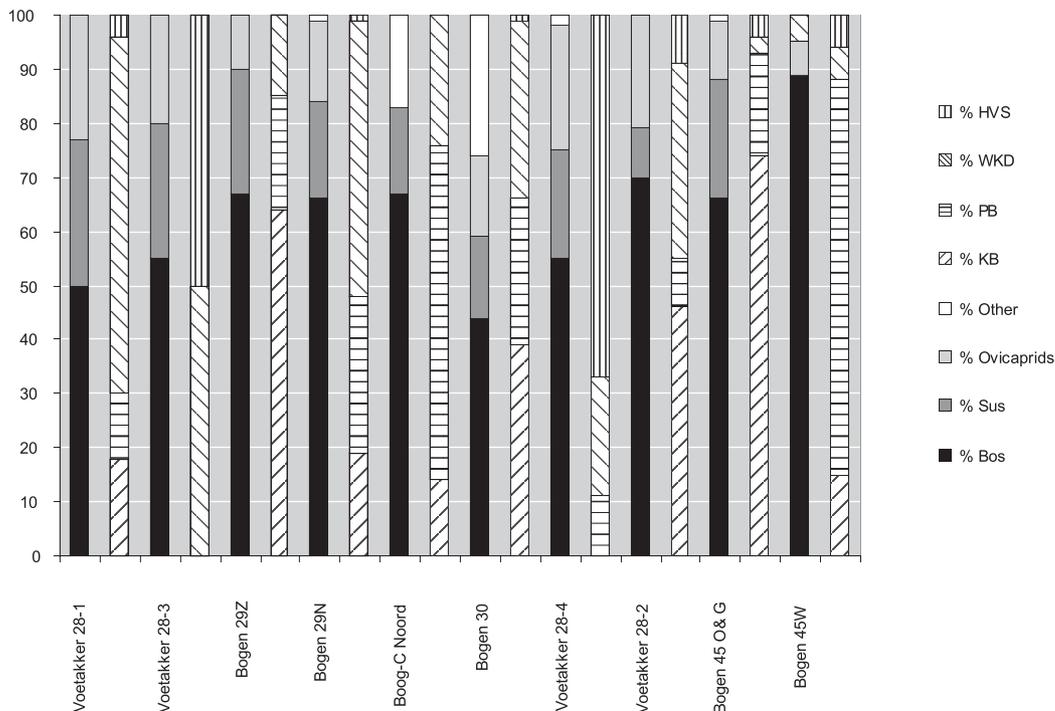


Fig. III.35 Diagram showing the distribution in percentages of the numbers of recognized fragments of *Bos taurus*, *Ovis aries/Capra hircus*, *Sus domesticus* and other (*Equus caballus* and *Canis familiaris*) species and Bell Beaker ('KB'), Potbeaker ('PB'), Barbed Wire-stamp decorated ('WKD') and Hilversum-style decorated ('HVS') sherds for several clusters at De Bogen.

Hunting did take place, as is evidenced for by the fragments of (not shed) red deer antler from several sites (Van Dijk, Esser & Zeiler 2002, 602), wild pig bones and fragments of fur-bearing species such as otter and beaver on a few sites (*ibid.*, p. 579; Buitenhuis 2001, 144-145, 147). A relatively small number of fish bones ($n = c. 187$; Van Dijk, Esser & Zeiler 2002; Buitenhuis 2001) was recovered, but this is presumably related to the methodology applied (Van Dijk, Esser & Zeiler 2002, 602; Buitenhuis 2001, 160). The identifiable species of fishes concern predominantly *Cyprinidae*, eels, pike and roach which indicates the presence of moderately deep (< 2 m) and gently streaming as well as more shallow and still bodies of freshwater (Van Dijk, Esser & Zeiler 2002, 605). Fowling seems to have

been of marginal importance (*cf.* Van Dijk, Esser & Zeiler 2002, 610; Buitenhuis 2001, 160). These faunal resources were supplemented by a variety of cultivated crops and some gathered plants. Study of the botanical macro-remains has shown that predominantly barley and (emmer)wheat were grown (Hänninen & Van Haaster 2002, 710; 734-740). Sloe, raspberry and other berries (*Vaccinium spec.*) could also be identified (Hänninen & Van Haaster 2002, 714). Presumably, these fruits could be gathered from the higher parts of the crevasse landscape, where an open vegetation of predominantly oak, hazel, birch, elm and sloe existed (Hänninen & Van Haaster 2002, 728-729). Towards the wetter parts of the floodbasin, alder and willow trees could be encountered, and various other plants indicate the presence of nutrient-rich, wet grasslands and marshy areas and open water (Hänninen & Van Haaster 2002, 715; 728). Particularly alder could have been quite common and was used for construction wood as well as for firewood (Hänninen & Van Haaster 2002, 725).

Besides food-production proper, various other tasks and crafts were undertaken. A total of 68 fragments of fired clay weights have been preserved (Ufkes & Bloo 2002, 373-375). Several of them are pierced, whereas other show grooves and abrasion traces from having been suspended from ropes. Presumably, they all represent loom-weights and together with the eight burned clay spindle whirls (*opus cit.*, p. 375) indicate local textile production. A pit within house 28-IAH yielded fragments of over ten loom weights (fig. III.22, g; Hielkema, Brokke & Meijlink 2002, 264). Five burned clay beads or buttons (*opus cit.*, p. 376), two bone toggle buttons, fourteen bone awls and a bone needle (Van Dijk, Esser & Zeiler 2002, 588-596) furthermore present indirect evidence for prehistoric cloth(ing and its) production.

Among the flint artefacts recovered, numerous scrapers ($n = c.$ 146; Niekus *et al.* 2002b, 446; 448; 451; 455; 457), several knives ($n = c.$ 21; Niekus *et al.* 2002b, 446; 448; 451; 456; 457), arrowheads ($n = c.$ 20; Niekus *et al.* 2002, 446; 448; 451; 455; 457), drills ($n = c.$ 19; Niekus *et al.* 2002b, 440; 446; 448; 451; 455; 457 as well as some planes ($n = c.$ 4; Niekus *et al.* 2002b, 443-444; 446-447; 449) hint at hide-processing, hunting and wood-working (*cf. opus cit.*, 461; 446; 470; 475; 482-486; 499). Among the other stone tools recovered, hammer- and rubbing stones dominate ($n = c.$ 93; Van Gijn, Kars & Lammers-Keijsers 2002, 505; 524; 526; 528; 530-531), followed by polishing stones ($n = c.$ 77; Van Gijn, Kars & Lammers-Keijsers 2002, 505; 526; 528; 528; 531), grinding stones ($n = c.$ 27; Van Gijn, Kars & Lammers-Keijsers 2002, 505; 526; 528; 531), whetstones ($n = c.$ 6; Van Gijn, Kars & Lammers-Keijsers 2002, 505), anvils ($n = c.$ 4; Van Gijn, Kars & Lammers-Keijsers 2002, 522; 528; 530-531) and fragments of two stone axes (Van Gijn, Kars & Lammers-Keijsers 2002, 505; 531). Use-wear analysis on coarse grained stones is difficult, so for the hammer-, grinding- and polishing stone fragments we predominantly assume a function in craft activities (flattening plant materials, crushing stone temper for pottery; polishing and the shaping of stone and bone artifacts) and/or food production (grinding of cereals and other foodstuffs; Van Gijn, Kars & Lammers-Keijsers 2002, 536). The reported anvils were presumably used for flint knapping (Van Gijn, Kars & Lammers-Keijsers 2002, 532; Van Gijn & Niekus 2001)

The evidence for subsistence strategies and crafts discussed above is very much what is to be expected for the archeological residue of a (Late Neolithic to) Bronze Age settlement site. The available data suggests a rather independent, self-sufficient and fully agrarian local community, that used predominantly locally available resources for their food and tools. Despite this, the presence of Danish *Helgoland* flint and possibly also the presence of amber indicates the incorporation of these communities into far wider spheres of contact (Niekus *et al.* 2002b, 437; Van Gijn, Kars & Lammers-Keijsers 2002, 505; Meijlink 2002b, 790-791).

Late Bronze Age

The Erichem and Est/Bommel fluvial systems remained active during the Late Bronze Age, but became inactive during the Early Iron Age (see below). For the Meteren fluvial system, a cease of sedimentation near the end of the Late Bronze Age is suggested by a residual gully date of *c.* 920-760 cal BC (GrA-16215: 2660 ± 50 BP; Van Zijverden 2002c, 40; Van Zijverden 2004b). Possibly, the cessation of sedimentation by an active system involved a period of relative fluvial instability which involved increased overbank deposition and more intensive crevasse formation (*cf.* Van Dinter & Van Zijverden 2002, 8; Makaske 1998, 34; Stouthamer 2001, 21-22; 27-30). The accompanying crevasse activity caused erosion of many parts of the previous occupation layer and vegetation horizon (Meijlink 2002a, 34-35; Van Zijverden 2002b, 87-88). On several of the De Bogen sites, crevasse splays formed (see fig. III.36, d; Van Zijverden 2002b, 81; Van Zijverden 2004b). In the top of both floodbasin as well as the new crevasse deposits

again a vegetation horizon formed (Van Zijverden 2002b, 78). In the lowest parts of the floodbasin peat developed. A date of *c.* 1010-820 cal BC for the top of the peat deposits at *c.* 60 m to the south of site 28-1 indicates that peat growth in the lowest parts of the floodbasin continued towards the Early Iron Age (UtC-8781: 2764 ± 41 BP; Van Zijverden 2002b, 79).

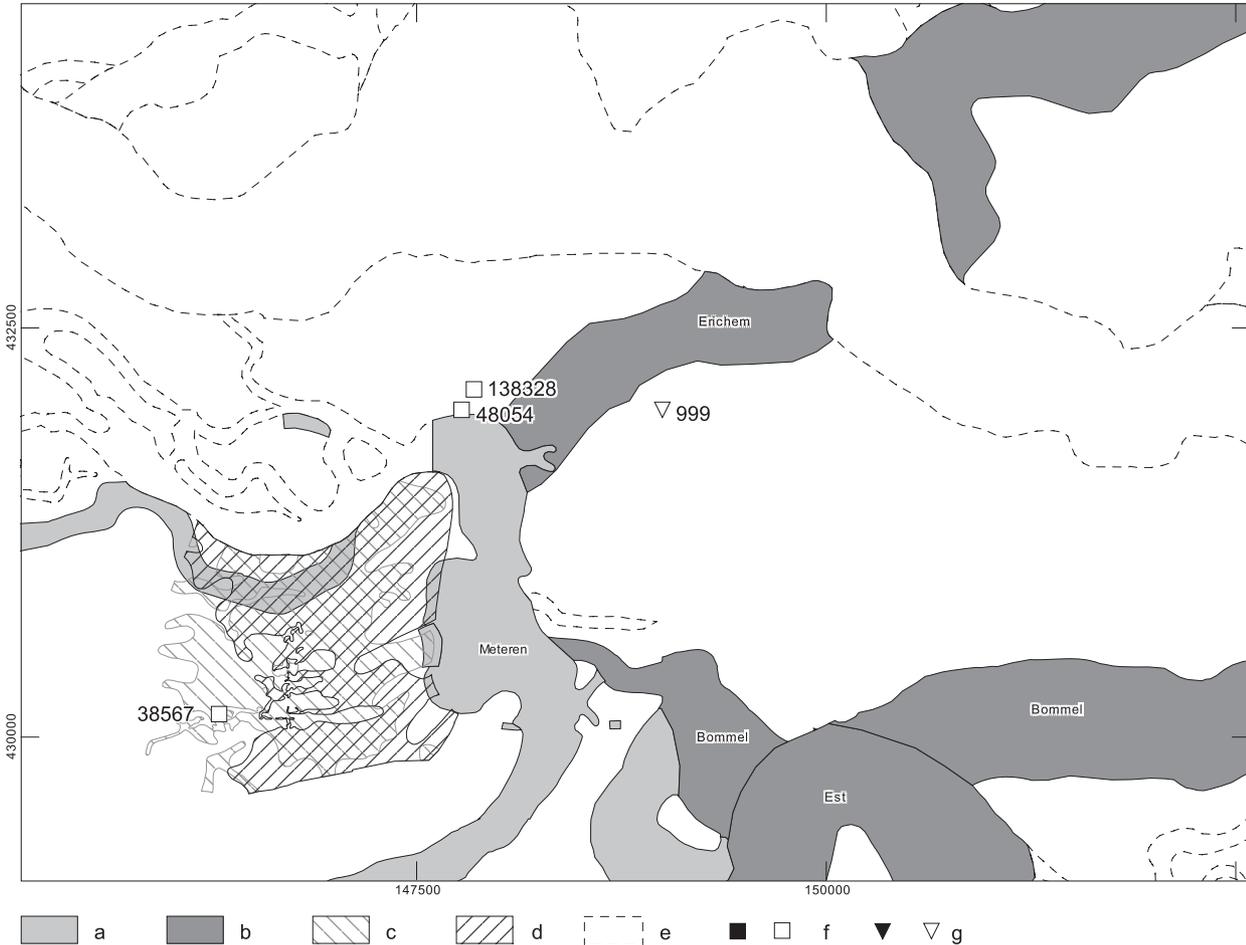


Fig. III.36 Late Bronze Age fluvial systems and find-spots from the De Bogen macro-region. Filled symbols represent certain identifications, outlined symbols uncertain identifications.

a: fossil fluvial systems, b: active fluvial system, c: older crevasse splay deposits, d: new crevasse splay deposits, e: younger fluvial systems, f: pottery, g: tools.

Few reliable find-spots are known for the Late Bronze Age period from the De Bogen macro-region. One socketed axe was allegedly found near the village of Geldermalsen (fig. III.36, no 999) but doubts on its contexts are sufficient as not to adhere much value to this find (Louwe Kooijmans 1974, 364 no 115b; RMO cat. no E1937.7.1; D. Fontijn, pers. comm., May 2007). Of the ceramics recovered during the watching brief executed at Geldermalsen-Middengebied, three sherds were dated as ‘Late Bronze Age to Middle Iron Age’ (fig. III.36, no 48054; Schutte 2003b, 18; Archis 48054). Due to this large chronological uncertainty, again few conclusions can be drawn based on these finds. The same applies to the single ‘Late Bronze Age to Early Iron Age’ sherd recovered during fieldwalking on a plot called Geldermalsen-Midden (fig. III.36, no 138328; De Jager & Heunks 1998, fig. 7; Archis 138328).

Within the De Bogen excavations, a 23 cm thick layer of floodbasin deposits underlies a second vegetation horizon at site 28-1, that yielded only traces of cattle hoof imprints during excavation (*c.* 340 m²; Meijlink 2002a, 37; 40; Van Zijverden 2002b, 69; 81). Presumably, this layer of floodbasin deposits dates to this (Late Bronze Age to Early Iron Age) period of fluvial instability. It is unclear, where the habitation of the people whose cattle caused

the hoof-imprints in the higher vegetation horizon took place. In addition, the exact age of the hoof-imprints and the associated occupation remains unclear. Based on the fact that at a site nearby – which was discovered during the campaigns of prospective coring (fig. III.1, no 38567) – pottery unambiguously originating from the upper finds-layer was classified as ‘Bronze Age’, a dating of this phase to the Middle Bronze Age-B/Late Bronze Age transition or start of the Late Bronze seems most appropriate (W. van Zijverden, pers. comm., March 2006). Possibly, this was the settlement site from which the cattle could have originated that created the hoof-imprints in the the upper layer referred to above. Even more speculative, the occupants of this site could in theory have constructed the inhumation grave with the rapier at the end of the Middle Bronze Age-B (or Late Bronze Age) discussed above.

In any case, the evidence for Late Bronze Age activities within the De Bogen macro-region is much more scarce compared to the preceding periods. This presumably is related to the increased dynamics of the fluvial systems nearby (see above), but will also in no small part have been the result of the poor diagnostic character of much of the archeologically visible remains from this period. Therefore, it remains possible that several parts within the De Bogen macro- and meso-region were in fact occupied during this period.

Early Iron Age

During the Early Iron Age, the Bommel (and presumably also the Est) fluvial systems were no longer active. A residual gully date for the Bommel system indicates a cessation of sedimentation around *c.* 780-410 cal BC (UtC-6745: 2480 ± 60 BP; Berendsen & Stouthamer 2001, 194). This corresponds reasonably well to a date obtained from a crevasse residual gully at the site Lage Blok, that suggests a cease of crevasse activity around *c.* 770-380 cal BC (AA-37521: 2410 ± 70 BP; Van Zijverden 2002c, 40). The Erichem fluvial system may have continued into the Middle



Fig. III.37 Early Iron Age fluvial systems and find-spots from the De Bogen macro-region. Filled symbols represent certain identifications, outlined symbols uncertain identifications.

a: fossil fluvial systems, b: active fluvial system, c: older crevasse splay deposits, d: new crevasse splay deposits, e: younger fluvial systems, f: pottery, g: features.

Iron Age, but the calibrated range for the available residual gully date is rather wide (c. 850-150 cal BC; UtC-4638: 2420 ± 140 BP; Berendsen & Stouthamer 2001, 199). The dated sample is located in the extreme northeasternmost part of the De Bogen macro-region and it cannot be excluded that another (branch of the same main) fluvial system linked up to the Hooiblok/Enspijk/Gellicum system situated downstream of the Erichemse system, as the latter is thought to have been active from c. 800-410 cal BC onwards (based on a starting date for the downstream connection the Spijk system; Berendsen & Stouthamer 2001, 199; 201; 208; 235; UtC-1891: 2510 ± 50 BP; but see also above and Appendix II). For the unnamed possible fluvial system indicated as 'u5', it is not clear whether this represents a well developed crevasse gully or a separate fluvial system, and its association to this phase is based solely on the relative height of its sand-body (Van Zijverden 2004b; W. van Zijverden, pers. comm., Jan 2006).

Various find-spots of Early Iron Age ceramics are known from the De Bogen macro-region. At Meteren - Laageinde (fig. III.37, no 22842) over 230 Early Iron Age sherds were found (Archis 22842). From the same site (yet then labelled Meteren - Kalenberg, fig. III.37, no 130275) fieldwalking and coring by RAAP revealed some more sherds and the location of a possible settlement site (De Jager 1996, 11-13; Archis 32924; 130275). During the excavation of the Roman cemetery of Geldermalsen - Middengebied (fig. III.37, no 32296) a number of pits and ditches datable to the Early- to Middle Iron Age transition were uncovered (Hulst 1994, 72; Archis 32296). A possibly Early Iron Age sherd from Geldermalsen - Midden (fig. III.37, no 138328) has already been discussed above. During a fieldwalking campaign undertaken by the State Service for Archaeological Investigations (ROB, now RACM) at Est - Bovenblok in 1986, Early Iron Age pottery was found (fig. III.37, nos. 2106; Archis 2106). From the excavation Lage Blok, predominantly Middle Iron Age ceramics were recovered, but an Early Iron Age date is suggested for a single sherd (fig. III.37, no 30122; Ufkes 2002b, 80-81; Milojkovic & Smits 2002). The Archis listing for find-spot number 30122 concerns the test-trenches of the site 'Lage Blok' (Van der Roest 1997) that is erroneously dated to the Early Iron Age in Archis. Additionally, several find-spots near to the site Geldermalsen-Rijs en Ooyen are listed in Archis as 'Early Iron Age or Late Iron Age' find-spots, but they are more likely to represent Late Iron Age find-spots (Archis 401918, 401920, 401931, 401937, 401939 and 401941; cf. Verhelst 2003; E. Verhelst, pers. comm., June 2006). Several other sites in the De Bogen macro-region have yielded ceramics that are classified as generic 'Iron Age', so they cannot be used to prove Early Iron Age activities (e.g. Louwe Kooijmans 1974, 376 no 132; Asmussen 1994, 195; 197-198; Schutte 2003b, nos. 7285; 7678; Lanzig 1999; Ufkes & Bloo 2002, 353).

In conclusion, evidence for clear Early Iron Age occupation of the De Bogen macro-region is as yet lacking. Possibly, increased rate and decreased predictability of fluvial sedimentation caused by the cease and start of the various fluvial systems created unfavourable conditions for human habitation during much of the (Late Bronze Age and) Early Iron Age period(s) in the De Bogen regions. It is not until the Middle Iron Age that parts of the De Bogen macro-region (including the micro-region; cf. Hielkema, Brokke & Meijlink 2002, 160; 185; 187; 225; Meijlink 2002b, 810; Milojkovic & Smits 2002) are once again used for occupation and interment (Woltering *et al.* 1998; Hulst 1999; Hielkema, Brokke & Meijlink 2002, 210-211; Gehasse & Leijnse 2002).

IV Palaeogeography and occupation history of the Wijk bij Duurstede macro-region

I INTRODUCTION

The Wijk bij Duurstede macro-region is focused on the eponymous village and a surrounding part of the central river area. The village of Wijk bij Duurstede is archaeologically best known for excavations of its early Mediaeval predecessor ‘Dorestad’ (Van Es 1969; Van Es & Verwers 1978; 1980; 1983; Van Es & Hessing 1994; Dijkstra & Van Renswoude 2005). In the 1960’s, it was decided that that the small village of Wijk bij Duurstede should see extensive expansion in order to stimulate economic development (Van Es 1969, 184). As a part of these extensive town planning projects, several large areas around the village centre were subjected to archaeological investigation. In one of these new housing estates called ‘*De Horden*’, as many as ten Bronze Age house-sites were uncovered in an extensive (14 ha) excavation campaign originally targeted at Roman period occupation (Hessing 1991). Two additional Bronze Age house-sites were uncovered in excavations at the housing-estate known as De Geer. Such large numbers of house-sites offer a valuable insight into the nature of Bronze Age occupation near the northern border of the Dutch central river area.

History of archaeological research

The start of archaeological work around Wijk bij Duurstede is often related to the intensive digging for bones – to be ground into fertilizer – by the people of Wijk bij Duurstede in the period 1838-1842 AD (Van Es 1969, 186-188; Van Es & Verwers 1973, 478, *cf.* Van Dockum 1994, 207-210). During these rather haphazard and intrusive ground works, archaeological artefacts were also recovered (*ibid.*). Consequently, the curator of the National Museum of Antiquities in Leiden, L.J.F. Janssen was contracted to investigate the nature of the site(s) under threat (Van Es & Verwers 1973, 485-487). At that time, the interpretation that the (finds from) Wijk bij Duurstede should be identified with the historically known Early Medieval village Dorestad, had already been suggested (*op. cit.*, 484-485, ref. to Van der Noordaa 1838). After the cease of the bone rush and the publication of Janssen’s conclusions (Janssen 1842a-c; 1843; 1859) it was not until the nineteen-twenties that professional archaeologists once more took an interest in the Wijk bij Duurstede area.

This time, it was J.H. Holwerda – curator at the Leiden National Museum of Antiquities – who undertook the investigations. He, like Janssen, dug quite narrow (a few meters wide; Van Es 1969, 188) trenches in order to determine the extent and lay-out of the Carolingian harbour village between 1923 and 1928 (Holwerda 1924; 1925; 1930a; 1930b, esp. 28). Between 1950 and 1967 the State Service for Archaeological Investigations (ROB, now RACM) conducted a few, small scale, campaigns of test-trenching in and around the village of Wijk bij Duurstede (Van Es 1969, 188). It was not until 1967 that it was decided – forced by rapid town development – to conduct more extensive fieldwork in order to verify Holwerda’s assumptions on the extent and appearance of former Dorestad and to investigate the areas to be disturbed by housing (*ibid.*). Phosphate maps compiled from soil mapping campaign executed by the Wageningen institute for soil-mapping proved useful in outlining presumable former settlement sites (Van Es 1969, 190; *cf.* Van der Voort, Poelman & Van Es 1979). The areas of the harbour and the settlement of Dorestad (fig IV.1, a-b) were predominantly excavated between 1967 and 1977 (Verwers 1994, 234). Between 1971 and 1977, also several trenches were dug near the city centre of the village of Wijk bij Duurstede as well (*ibid.*). Another extensive area at the site of the housing estate ‘De Geer’ was excavated between 1989 and 1994 (Van Es 1994, 231). Here, some relicts of Bronze Age house-sites, but predominantly Middle Iron Age, Roman Period and Early to High Mediaeval settlement site traces were uncovered (*ibid.*; Van Doesburg 1994).

Between 1977 and 1987, the excavations were focused on the development of the housing estate called ‘De Horden’ (Van Haaf 1972; Van Es *et al.* 1978-1980; 1982-1986a-b; 1987-1988; Hessing 1985; 1989; 1991; 1994; Van Tent 1979; 1988; 1992; Hessing & Steenbeek 1990; Steenbeek 1986; 1990; 1994; Lange 1996). In these excavations, remains from the Middle Neolithic (Letterlé 1985) up to the third century AD were uncovered, among which the Bronze Age house-sites relevant to this study (see below, for a brief overview of all periods see Hessing 1994). Unfortunately, they have seen only preliminary publication (Letterlé 1985; Hessing 1991; Laarman 1996), whereas

the Roman period remains have been the subject of more – and more detailed – studies (*cf.* Verwers 1978; Van der Werff 1989; Van der Roest 1990; several contributions in Van Es & Hessing 1994; Vos 2002).



Fig. IV.1 Location of the main Wijk bij Duurstede excavations (generalized outlines).

a: not excavated, b: topography, c: excavations, d: locations of (Middle) Bronze Age house-sites.

The geological context

The Wijk bij Duurstede macro-region borders that of Zijderveld to the north-east. It is situated on the northern boundary of the Rhine-Meuse delta, at the point where the delta widens after having passed the ice-pushed hills that confined the rivers to the north in the east. Due to this location, the channels of the formerly present rivers cut through areas with easily erodible sandy deposits in the subsoil. Consequently, rivers in this part of the delta – more so than the rivers confined by peaty and mineroclastic floodbasin deposits more westerly in the central part – could develop a meandering and sometimes even braided fluvial style (see Arnoldussen 2008, Chapter 2). The presence of meandering rivers is reflected by the wide (700 – 1800 m) channel belts of the various rivers in the Wijk bij Duurstede macro-region. The main fluvial systems once active in the Wijk bij Duurstede macro-region are depicted in figure IV.2).

The remains of the Bronze Age settlement sites of De Horden and De Geer are situated on a layer of floodbasin deposits covering the underlying levee deposits (point bars) of the Werkhoven fluvial system (Hessing & Steenbeek 1990, 13-15). These point bars present locally higher (up to 1.5 m; Kooistra & Steenbeek 1994, 18) and more sandy ridges, which were suitable settlement site locations after the cease of the fluvial system's activity. For the interpretation of the fluvial genesis of the Wijk bij Duurstede macro-region, several geological studies are available (Berendsen 1982; Steenbeek 1990; Hessing & Steenbeek 1990; Stouthamer 2001; Cohen 2003; Van Zijverden 2004a).

APPENDIX IV: WIJK BIJ DUURSTEDEN

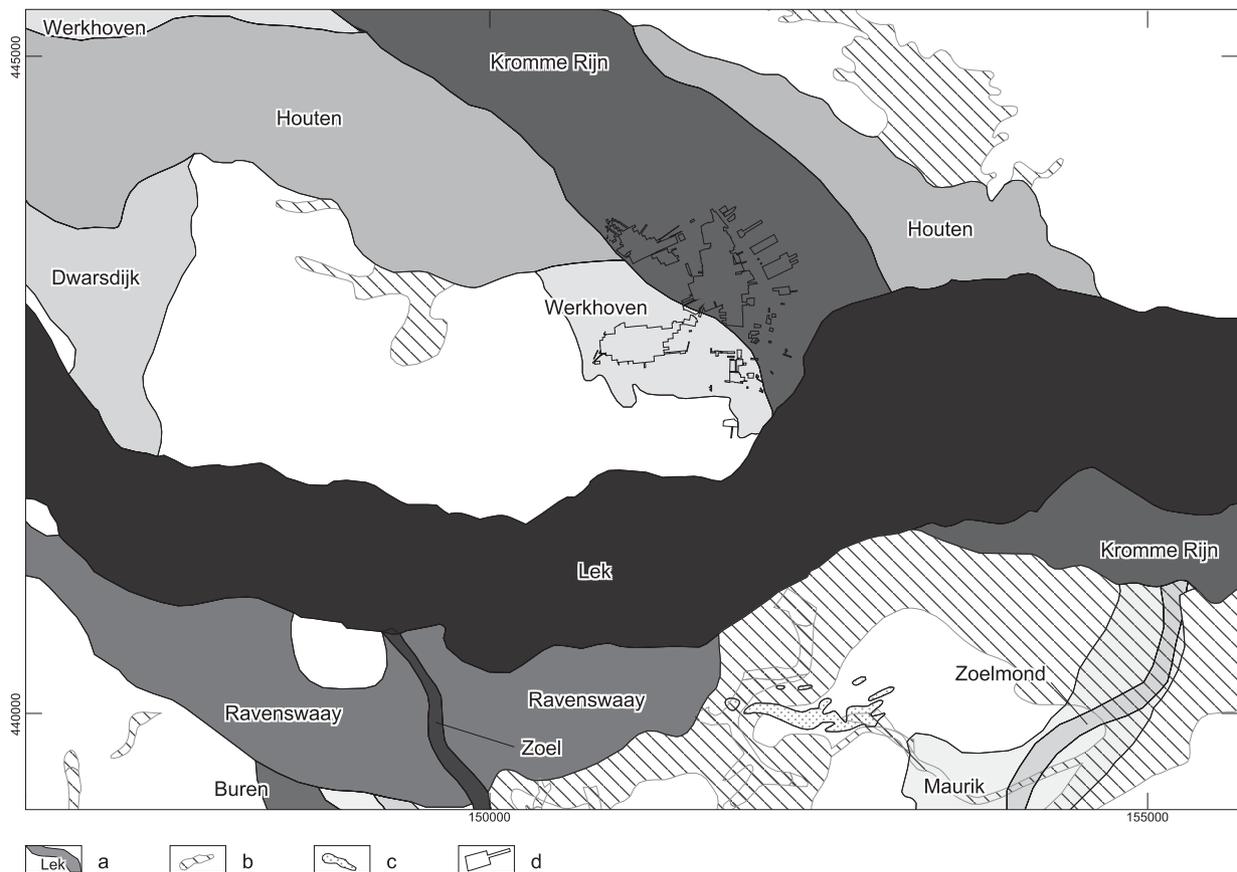


Fig. IV.2 Fluvial systems in the Wijk bij Duurstede macro-region (after Berendsen & Stouthamer 2001; Berendsen *et al.* 2001 and Stouthamer 2001).

a: fluvial systems, b: crevasse deposits, c: river dunes, d: excavated areas.

II SOURCE CRITICISM

Coring campaigns (soil mapping)

The area later known as De Horden was mapped by students of the Institute for Soil Mapping (Stiboka, Wageningen) as early as 1954 (Van Wallenburg & Poelman 1954). During these coring campaigns, soil discolourations caused by phosphate oxides were documented. The coring density was one coring per 4 to 8 hectare and a maximum depth of 1.2 m was used (Stiboka 1973, 12, 140). As the depth for the top of the Werkhoven deposits – and thus the approximate Bronze Age surface level – varies between 1.2 and 2 meter below surface level (*cf.* Hessing & Steenbeek 1990, 13 fig. 3) it is no surprise that no Bronze Age remains were discovered. The phosphate discolourations referred to above, were furthermore predominantly situated in the south-west part of De Horden. Consequently, their distribution does only marginally overlap with that of the main Bronze Age occupation traces (fig. IV.3). The distribution does, however, correspond well to the distribution of Roman period features (*cf.* Hessing & Steenbeek 1990, 20 fig. 9; Hessing 1985, 7; 1994, 227 fig. 185). Clearly, the phosphate mapping does not appear to have been helpful in mapping or predicting the Bronze Age settlement traces here.

Test-pitting, coring and fieldwalking by the ROB

In 1967 the site was visited by the State Service for Archaeological Investigations (ROB, now RACM) together with mr. J. Poelman. During that visit a small test-pit was dug in the centre of the phosphate area, from which some Roman Period sherds were found (Van der Voort, Poelman & Van Es 1979, 435). Based on the initial phosphate

distributions maps provided by Poelman, another soil mapping campaign was undertaken by Van der Haaf in 1972 in order to better define the extent of the phosphate distribution (fig. IV.3, b; Van der Haaf 1972). Based on the above observations, the area of De Horden was regarded as a Roman Period settlement site. In 1977 a fieldwalking campaign was undertaken, which yielded only (sub)recent pottery (Van Es *et al.* 1978, 35, *cf.* Van Es *et al.* 1984b; 1986b).

The 'De Horden' and 'De Geer' excavations

In order to investigate the presence, dating, preservation and extent of possible settlement traces at De Horden, a large (80 by 10 m) east-west test trench was dug in 1977. Near the west end of that trench, Late Iron Age and Roman period features and finds were encountered. From that point onward, trenches of 40 by 20 m wide were dug to systematically investigate these remains (Van Es *et al.* 1978, 35). After the observed features were drawn, they were searched for finds up to a depth of 10-20 cm (Hessing 1985, 19). After this stage, the trenches were dug down again mechanically 10-20 cm and the process was repeated. Up until 1980, trenches were dug down a maximum of four levels (W. Hessing, pers. comm., June 2006, see fig. IV.4) which greatly reduced the chance of discovering Bronze Age remains that are generally situated 50 cm below those of the Later Iron Age and Roman period (*cf.* Hessing 1985, 18 fig. 10; 1989, 380 fig. 9).

That part of a Bronze Age house-site had nonetheless been uncovered by that time (Letterlé 1985, 330), can be explained by the fact that that in the southwest, the westernmost tip of a slightly higher part of the landscape was touched upon on the lowest excavation level (see fig. IV.4, house 11).

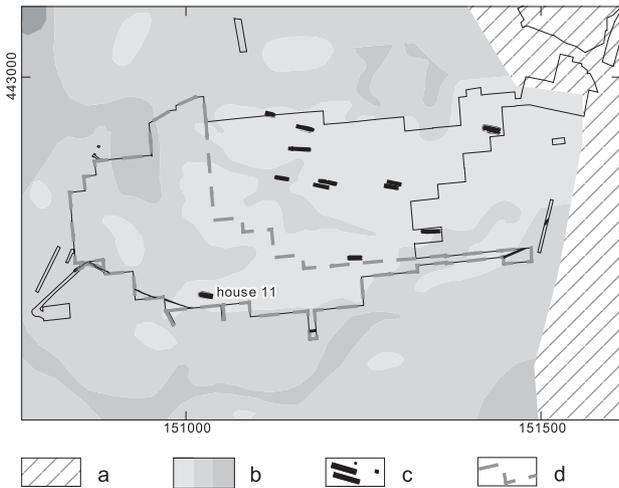


Fig. IV.4 Excavations at De Horden on sand depth map (after Van Zijverden 2004a). The area excavated by 1980 is indicated.

a: no information on sand-depth, b: sand depth (light: 3-4 m above DOD, medium: 3-2 m, darker: below 1 m), c: Bronze Age house-sites, d: area excavated up to 1980 AD.

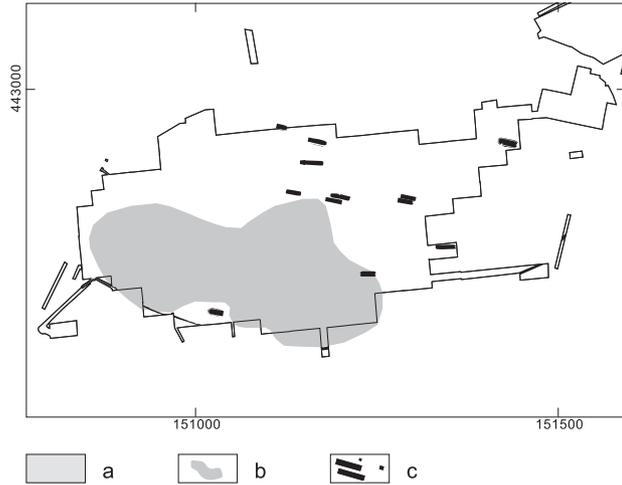


Fig. IV.3 Maximum extent of phosphate discolorations and main Bronze Age settlement traces (after Van der Voort, Poelman & Van Es 1979, 455 fig. 8 and Hessing 1991, 43 fig. 2).

a: not excavated, b: phosphate discolorations, c: Bronze Age house-sites.

The preliminary results for the prehistoric remains uncovered within the De Horden excavations by 1980 were published by Letterlé (1985). With hindsight, his 'funerary enclosure' is better interpreted as part of the house-site ditches around a Bronze Age farmhouse. The two cremations that sparked the funerary interpretation (Letterlé 1985, 330, nos. 515-2-1; 515-2-2), were later radiocarbon dated to the Middle- or Late Iron Age (W. Hessing, pers. comm., June 2006; *cf.* Van Es *et al.* 1979, 41). In addition, some comments should be made on the distribution diagram published by Letterlé (1985, 332 fig. 3). In this figure, the (sometimes also quartz-tempered; *cf.* Hessing 1989, 334-343) Early Iron Age pottery may have been included and consequently have distorted the distribution plot (*ibid.*, *cf.* Letterlé 1985, 332 fig. 3 versus Hessing 1991, 43 fig. 43). Yet, now that the presence of Bronze Age remains was to be expected, the trenches were dug down deeper (generally five to six levels; Hessing 1985, 19). In this fashion, the remaining part of De Horden was excavated.

In the winter of 1983, a large number of small (*c.* 350, maximum one by one meter) test-pits were dug mechanically beyond the then existing excavation extents to further investigate the distribution of settlement traces for all periods (Hessing & Steenbeek 1990, 10). Remarkably, only two test-pits yielded Bronze Age finds. One was later-on excavated and is now known as house(-site) ten (W. Hessing, pers. comm., June 2006). This rather successful discovery should, however, also be seen in light of the nine other house-sites having gone unnoticed (*cf.* Hessing 1994, 230). In addition, yet another coring campaign was undertaken between 1983 and 1985. A total of 320 corings, some up to 7 m deep, were added by Steenbeek to the dataset already gathered by mr. Poelman in 1978 (Hessing & Steenbeek 1990, 9-10; Van der Voort, Poelman & Van Es 1979). These corings served to better understand the settlement sites in their landscape setting and were part of Steenbeek's dissertation on the development of vegetation horizons in the Dutch river area (*ibid.* and Steenbeek 1990, esp. 47-134; 201-214). The last excavation campaigns at De Horden ended in May 1987 (Van Es *et al.* 1988, 41).

From 1989 to 1994, excavations were undertaken at the planned housing estate known as 'De Geer' (Van Es, Lutter & Van Dockum 1990, 48). There, trenches measured 30 by 15 m and were also dug down a limited number of levels (J. van Doesburg, pers. comm., Aug. 2006). In the north-west part, relicts of two Bronze Age house-sites were discovered. They were situated on – mostly eroded – levee deposits at a stratigraphic level below that of the ubiquitous Late Iron Age and younger period features (Van Es *et al.* 1992, 43-44; Van Es *et al.* 1993, 43). Only in the lowermost parts of the former Bronze Age landscape had a vegetation horizon been preserved. In the eastern parts of the De Geer excavations, incidental 'prehistoric' traces could be recognized in the sections but – as at this sites the younger periods of use formed the main topic of interest – no systematic investigations into the (Bronze Age) occupation were undertaken there (Van Es *et al.* 1992, 44). In sections at the location of Bronze Age traces, even older (Neolithic?) traces could be observed at stratigraphically deeper levels (J. van Doesburg, pers. comm., Aug. 2006).

No digitized excavation plans were available for De Horden or De Geer. As it was not necessary for this study to digitize the complete plans, parts of the paper (multi-level, 1 to 500 m scale) plans were digitized and checked with the original field drawings. The outlines of the excavated areas were available as digital maps in the Dutch coordinate systems. Hence, maps with the outline (and the two house-sites from De Geer) are set in the Netherlands coordinate system. As for individual house-sites of De Horden no sufficient accuracy could be achieved, they are not displayed here in relation to the Dutch coordinate system.

III OCCUPATION HISTORY AND PALAEOGEOGRAPHICAL DEVELOPMENT

Early and Middle Neolithic

The fluvial systems known as 'HR-1' and 'HR-2' are the first known Holocene fluvial systems active within the Wijk bij Duurstede area. Their phase of activity is estimated between *c.* 11 to 8.5 kyr BP for HR-1 and between *c.* 8.5 and 7 kyr BP for HR-2 (Cohen 2003, 158). The channel-bed and levee deposits of HR-2 underlie those of the younger Maurik fluvial system (see below). Presumably, several other Early Holocene fluvial systems were present. Figure IV.5 depicts one of the sections drawn for the Wijk bij Duurstede area as part of a recent palaeogeographical study (Van Zijverden 2004a). It shows the existence of at least two yet unmapped and unnamed fluvial systems (fig. IV.5; 'u1', 'u2/u3'). The depth of these systems may indicate that they pre-date the Maurik fluvial system (the sand-depth of the Maurik system is 1.9-2.6 m above D.O.D; Berendsen & Stouthamer 2006 (2001), 41).

For the Maurik fluvial system, several radiocarbon dates – of peat directly underneath the floodbasin deposits attributed to the Maurik system – indicate a start of sedimentation between *c.* 5370 to 4800 cal BC (Cohen 2003, 162-163; Berendsen & Stouthamer 2006 (2001), 41). Presumably, some avulsions from this system did take place. One such possible avulsion was discovered by Steenbeek and labelled the 'Middelweg' fluvial system. This system has not been dated directly or mapped in more detail, but appears to precede the Werkhoven fluvial system (Steenbeek 1990, 57-61, *cf.* Berendsen 1982, 162, the varied sand-depth of the Werkhoven system in fig. IV.5 may also indicate rejuvenation). The Maurik channel-bed deposits were reoccupied by the Zoelmond fluvial system, which may have formed the upstream connection of the Zijderveld fluvial system (see Appendix I). Peat overlying the Maurik levee

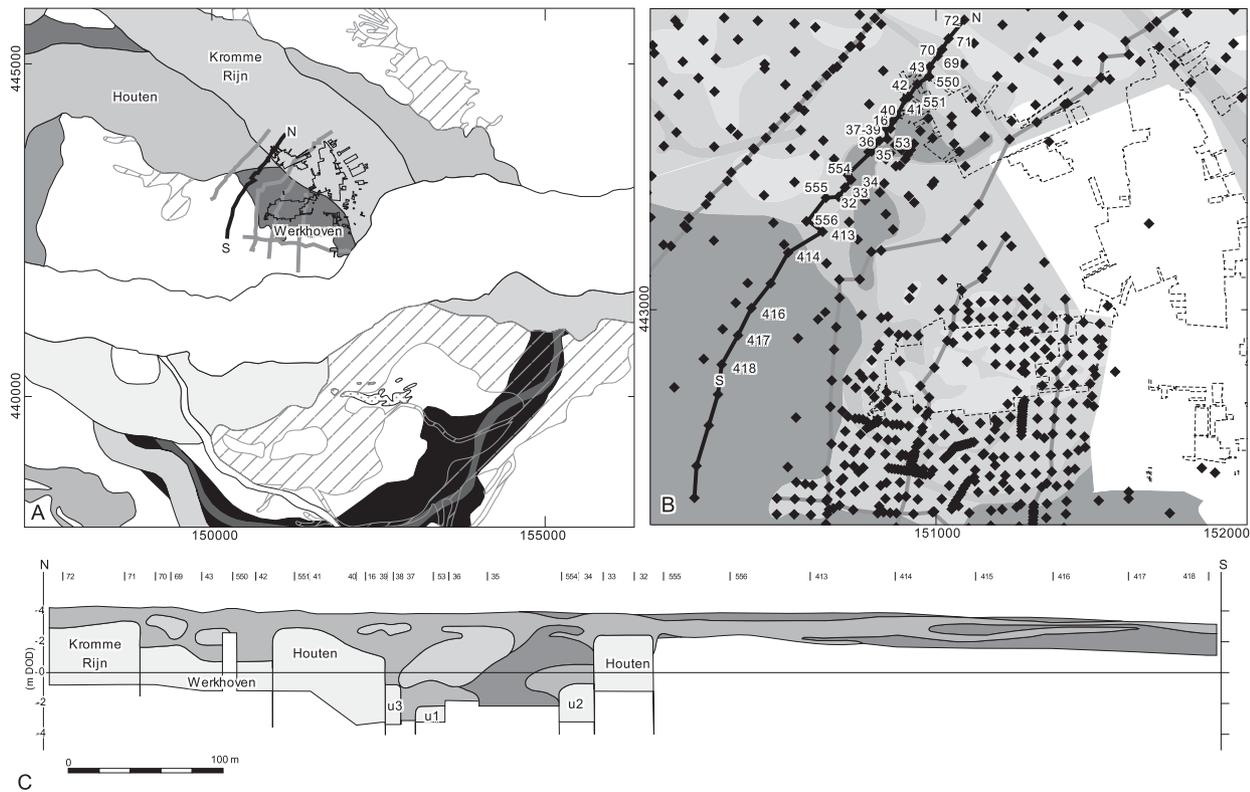


Fig. IV.5 Section of corings in the Wijk bij Duurstede meso-region (A: overview main fluvial systems, section and excavations (after Stouthamer 2001, 135 fig. 5.3a), B: sanddepth map, sections and individual corings (after Van Zijverden 2004a, fig. 4), C: profile (after Van Zijverden 2004a, fig. 4; light shades: channel bed deposits, mid-tones: levee- and crevasse deposits, dark shade: floodbasin deposits).

deposits was radiocarbon dated to *c.* 4220-4050 cal BC and is used both for the cessation of sedimentation by the Maurik system and the start date for Zoelmond sedimentation (GrN-12461: 5350 ± 40 BP; Stouthamer 2001, 170). The Zoelmond rejuvenation presumably lasted until *c.* 3780-3380 cal BC, based on a date of peat on top of crevasse deposits attributed to the Zoelmond system (UtC-10747: 4850 ± 60 BP; Cohen, Gouw & Holten 2003, Van Zijverden 2004a) and the residual gully dates for its downstream connection; the Zijderveld fluvial system (see Appendix I).

The Werkhoven fluvial system possibly also represents an avulsion from the Maurik fluvial system. Radiocarbon dates for peat and botanical macro-fossils indicate that sedimentation by the Werkhoven system started around *c.* 2880-2500 cal BC (e.g. GrN-8705: 4110 ± 40 BP; Berendsen & Stouthamer 2001, 242 or GrN-12164: 4130 ± 40 BP; Steenbeek 1990, 63). An available older date of *c.* 4690-4350 cal BC (Berendsen & Stouthamer 2001, 242) is a *terminus post quem* date that may relate to the initial phase of Werkhoven sedimentation (or its precursor, the Middelweg system). The varied sanddepth of the Werkhoven channel-bed deposits (fig. IV.5) suggest multiple phases of activity by the Werkhoven fluvial system. The Dwarsdijk fluvial system in the west of the Wijk bij Duurstede macro-region is interpreted as an avulsion from the Werkhoven that connected downstream to the Schoonrewoerd fluvial system (see Appendix I; Stouthamer 2001, 32). As direct dates are lacking for the Dwarsdijk system, the start dates for the Schoonrewoerd fluvial system are also applied to this system (*c.* 3500 to 3010 cal BC; Appendix I; Berendsen & Stouthamer 2001, 198).

Finds of Early- and Middle Neolithic age are rare in the Wijk bij Duurstede macro-region, although at two to four km beyond the macro-region proper, find-spots of worked antler and flint tools of presumed Middle Neolithic Age are known (Archis 26792; 22849). At *c.* 700 m north of Wijk bij Duurstede village's centre, a stone axe of possible Middle Neolithic age was found (fig. IV.6, no 12047; Archis 12047). Although the age of a number of flint fragment recovered from a sand-dredging site at Beusichem-Hussen cannot be assessed precisely, they are also listed at this point (fig. IV.6, no 968; Arnoldussen 2000, 36).

APPENDIX IV: WIJK BIJ DUURSTEDE



Fig. IV.6 Early- and Middle Neolithic fluvial systems and find-spots in the Wijk bij Duurstede macro-region (filled symbols indicate certain identifications, outlined symbols indicate unclear identifications).

a: Wijk bij Duurstede excavations, b: active fluvial systems, c: younger fluvial systems, d: flint tools, e: antler tools.

From one of the 1983 test pits to the east of the De Horden excavation, a shafted antler tool, a wild boar shoulder blade and a flint blade were recovered (Van Es *et al.* 1987, 52; Van Es *et al.* 1988, 40; Hessing & Steenbeek 1990, 15; fig. 6; Laarman 1996, 378). All may date to the Middle Neolithic, although an even earlier date cannot be excluded completely (Hessing 1985, 13; Hessing & Steenbeek 1990, 16). The finds are interpreted as having been incorporated into the Werkhoven channel deposits after having been eroded from site nearby (possibly situated on top of the older Middelweg deposits; Hessing & Steenbeek 1990, 16; Steenbeek, Roeleveld & Bohncke 1990, 106).

Within the more extensively excavated area, several flint artefacts – among which blade fragments and scrapers – could date to the Middle- or Late Neolithic based on their position on top of the (Middelweg or) Werkhoven levee deposits (Letterlé 1985, 335-339). The same applies to a fragment of a polished quartzite axe that was also found (*ibid.*). In several sections of the excavation trenches at De Geer, features are visible at a level well (> 30 cm) below that of the Bronze Age (*e.g.* in the south and north sections of trench 799; original documentation). Presumably, they concern middle- or late Neolithic activities, but their exact age remains unknown. Another very weak indication for human activities at De Geer during the (late?) Neolithic is the observation that some wooden stakes recovered from the lining of a depression were possibly worked with stone axes (Van Es *et al.* 1992, 48).

Several factors explain the scarcity of Early- and Middle Neolithic find-spots within the Wijk bij Duurstede macro-region. First, limited archaeological research specifically aimed at the archaeology of these periods has been undertaken. Second, the remains from these periods are generally embedded into deposits beyond the reach of current plough agriculture, which means that few remains get transported to the surface where they could be more easily detected. Third, much of the Wijk bij Duurstede macro-region's surface is covered by wide channel belts of meandering rivers. Such fluvial systems can easily have eroded and reworked underlying (Neolithic) predecessors and the possible archaeological sites thereon.

Late Neolithic

Sedimentation by the Dwarsdijk fluvial system – based on the connection downstream to the Schoonrewoerd fluvial system – ended around *c.* 2460 to 2140 cal BC (Appendix I; Berendsen & Stouthamer 2001, 198). At this time, first sedimentation by the Houten fluvial system also took place. This system re-occupied and eroded much of the Werkhoven deposits (fig. IV.7). A sample of peaty clay underneath the Houten system’s overbank deposits was dated to *c.* 2460-2040 cal BC (GrN-9152: 3795 ± 55 BP; Berendsen & Stouthamer 2001, 209). This date is thus used by Stouthamer (2001, 134) as the end date of the Werkhoven fluvial system. Some parts of the residual gully may have remained waterlogged for quite a while, as is indicated by a radiocarbon dated sample of peat from the residual gully (*c.* 1880-1630 cal BC; GrN-8705: 3430 ± 40 BP; Berendsen & Stouthamer 2001, 242).



Fig. IV.7 Late Neolithic fluvial systems and find-spots in the Wijk bij Duurstede macro-region (filled symbols indicate certain identifications, outlined symbols indicate unclear identifications).

a: Wijk bij Duurstede excavations, b: active fluvial systems, c: fossil fluvial systems, d: younger fluvial systems, e: pottery, f: flint tools, g: features.

Evidence for human activities in the Wijk bij Duurstede macro-region during the Late Neolithic is limited. Some possibly Late Neolithic pottery was recovered from the De Horden excavation (Hessing & Steenbeek 1990, 16, *contra* Steenbeek 1990, 131) but as these sherds have not been depicted it remains unclear to what phase of the Late Neolithic they belong. Late Neolithic features are also mentioned in preliminary reports, but no details on their nature or dating is available (Hessing 1994, 226). Two of the flint arrowheads recovered may date to the Late Neolithic or the Early Bronze Age (Letterlé 1985, 335 fig. 4, nos. 5 and 7). Additionally, two flint barbed-and-tanged arrowheads were recovered from the excavations at De Geer (J. van Doesburg, pers. comm., Aug. 2006) but as they have not been published, they can only tentatively be dated to the Late Neolithic here.

The combined micro-morphological, geological and palaeobotanical analyses by Steenbeek indicated that during the Late Neolithic-B (*c.* 2500-2000 cal BC) parts of the Werkhoven fluvial system’s deposits rose about one meter above the floodbasin and could support habitation (Steenbeek 1990, 131, fig. 251). In the floodbasin to

the south of the Werkhoven channel-bed deposits, at least two vegetation horizons could form (*ibid.*; Helsing & Steenbeek 1990, 25 fig. 12). The top and bottom of the lowermost of these vegetation horizons was radiocarbon dated to between 2950/2300 to 2580/2190 cal BC (GrN-12164: 4130 ± 110 BP and GrN-12162: 3910 ± 70 ; Steenbeek 1990, 67). No Late Neolithic finds are known yet from the wider macro-region beyond the Wijk bij Duurstede excavations. Possibly, the nearly consecutive active phases of the Dwarsdijk, Werkhoven and Houten fluvial systems, did not create favourable conditions for habitation in larger part of the Wijk bij Duurstede macro-region.

Early Bronze Age and Middle Bronze Age-A

During the Early Bronze Age and Middle Bronze Age-A periods, the Houten fluvial system was the single larger fluvial system active within the Wijk bij Duurstede macro-region (fig IV.8). In the southern floodbasin clay was again deposited, but by the end of these periods, yet another vegetation horizon could form (Steenbeek 1990, 131; fig. 2.5.1; Helsing & Steenbeek 1990, 25 fig. 12). The bottom and top of this vegetation horizon were dated to *c.* 2290-1920 and 2020-1690 cal BC respectively (GrN-12159: 3700 ± 60 BP and GrN-12736: 3520 ± 60 BP; Helsing & Steenbeek 1990, 16).



Fig. IV.8 Early Bronze Age and Middle Bronze Age-A fluvial systems and find-spots in the Wijk bij Duurstede macro-region (filled symbols indicate certain identifications, outlined symbols indicate unclear identifications).

a: Wijk bij Duurstede excavations, b: active fluvial systems, c: fossil fluvial systems, d: younger fluvial systems, e: pottery, f: flint tools.

The excavations at De Horden have yielded some lithic and ceramic fragments from the western part of the excavations that may be associated with this phase of reduced fluvial activity around 2000 to 1700 cal BC (Letterlé 1985; Helsing & Steenbeek 1990, 17). The ceramics recovered that are datable to these periods (Letterlé 1985, 341-342) concern sherds decorated in potbeaker tradition (*e.g.* v-shaped paired fingertip impressions, $n = 1$), Barbed-Wire stamp decorated sherds ($n = 2$) and Hilversum-style decorated sherds (*i.e.* vertical or angular motives between shoulder and rim, using (imitations of) cord-impressions, $n = 2$). Among the lithic remains recovered, a flint arrowhead whose barbs extend below – and are chamfered towards – the tang was found. This type is datable to the Early Bronze Age (L.-P. Louwe Kooijmans, pers. comm., May 2004).

According to Hessing (pers. comm., June 2006) most flint items and postholes attributed to these two periods clustered around a depression (residual crevasse channel or swale gully?) in the north-west of the De Horden excavations (fig. IV.9; cf. the dotted area on Letterlé 1985, 332 fig. 3; Hessing & Steenbeek 1990, 17). Possibly, also some activities were carried out in the eastern part of De Horden. A Roman period grave contained a flint scraper and charcoal that was dated to c. 1900-1520 cal BC (GrN-15997: 3420 ± 70 BP; v650.5.004; Van Regteren Altena 1987). Two ‘Barbed Wire’-stamp decorated sherds were found by schoolchildren at De Geer, but their context remains unknown (J. van Doesburg, pers. comm., Aug. 2006). Outside the Wijk bij Duurstede excavations, no Early Bronze Age or Middle Bronze Age-A find-spots are known from within the Wijk bij Duurstede macro-region. Presumably, the explanations offered above for the absence of finds from older periods also apply here.



Fig. IV.9 Sand-depth map with (partial) distribution of flint and depression indicated. a: sand-depth (light: 3-4 m above DOD, medium: 3-2 m, darker: below 1 m), b: flint fragments (largest circles represents over 30 fragments, smallest circle represent one to four fragments), c: depression (after Letterlé 1985, 332 fig. 3), d: extent for which flint distribution was analysed by Letterlé (1985).

By the end of these periods, floodbasin sedimentation by the Houten system again increased and all but the highest areas of the Wijk bij Duurstede meso-region were once more covered by crevasse deposits and clay (Steenbeek 1990, 67; 131; fig. 2.5.1; Hessing & Steenbeek 1990, 25 fig. 12). The floodbasin deposits now extended to on top of the former Werkhoven channel-bed and levee deposits.

Middle Bronze Age-B

In the top of the cover of floodbasin deposits referred to above, a new vegetation horizon again formed (Steenbeek 1990, 67; 131; fig. 2.5.1; Hessing & Steenbeek 1990, 25 fig. 12). Two bulk samples of humic clay from this vegetation horizon were dated to 1430-1050 and 1260-920 cal BC respectively (GrN-12735: 3020 ± 70 BP and GrN-12154: 2890 ± 50 BP; Steenbeek 1990, 67; 70). This suggests that throughout the Middle Bronze Age-B, flooding did not significantly affect vegetation development and that conditions were favourable to human occupants. Throughout the Middle Bronze Age-B, the Houten fluvial system was still the only main active river course in the Wijk bij Duurstede macro-region (fig. IV.10).

For this period, again some possible find-spots are known from outside the excavated areas. During a fieldwalking campaign undertaken by the State Service for Archaeological Investigations (ROB, now RACM) in 1980, a single Bronze Age sherd – in addition to younger period ceramics – was found (fig. IV.10, no 10530; Archis 10530). In 1988, Bronze Age sherds, a flint flake, some stone and bone fragments were discovered at 0.75 to 0.95 m depth in a section of a construction site near Beusichem-Pietersteeg (fig. IV.10, no 16750; Archis 16750). Unfortunately, the sherds cannot be dated more precisely than ‘Bronze Age’ and the nature of the deposits in which they were embedded remains unclear. Although a Middle Bronze Age-B start of sedimentation is considered a possibility for the Ravenswaaij system on which site no 16750 appears to be situated, this would suggest that this site represents activities on an active fluvial system (Berendsen & Stouthamer 2001, 230; the Ravenswaaij is thought to cross-cut the Hennisdijk system; see Appendix I). It is, however, equally well possible that the finds are embedded in (the crevasses or levee deposits of) a yet unknown Ravenswaaij precursor. The geological context of the sherds from Beusichem is also unclear. These sherds could originate from (eroded) crevasse or levee deposits of the Werkhoven



Fig. IV.10 Middle Bronze Age-B fluvial systems and find-spots in the Wijk bij Duurstede macro-region (filled symbols indicate certain identifications, outlined symbols indicate unclear identifications).

a: Wijk bij Duurstede excavations, b: active fluvial systems, c: fossil fluvial systems, d: younger fluvial systems, e: pottery, f: flint tools, g: features, h: bronze tools.

fluvial system, but may equally well be situated on top of (crevasse deposits originating from) the Houten fluvial system. According to the archaeological inventory system Archis maintained by the State Service for Archaeological Investigations (ROB, now RACM) some (?) Bronze Age remains were also uncovered during the excavations of the Early Mediaeval village of Dorestat at the location known as ‘Wijk bij Duurstede - De Heul’ (fig. IV.10, no 29711; Archis 29711). Unfortunately, such finds are not mentioned in the publications quoted for this Archis number, which means that it remains unclear what this find-spot actually represents.

For the excavations known as ‘De Geer’ and ‘De Horden’, a much clearer picture of the Middle Bronze Age-B activities emerges. During the Middle Bronze Age-B a minimum of ten house-sites (eight to ten at De Horden and two at De Geer) will have been constructed in the Wijk bij Duurstede meso-region during the Middle Bronze Age-B. The results from the excavations at De Horden and De Geer will be discussed below.

Excavations at ‘De Horden’

In the parts of De Horden excavated prior to 1980 (see fig. IV.11), some additional Bronze Age house-sites may – due to the methodology applied (see above) – have gone undetected. The higher density of house-sites in the north-east part of the De Horden excavations may also be related to the fact that those areas were the highest parts of the micro-topographic landscape (fig. IV.11; Hessing & Steenbeek 1990, 14-15 figs. 4-5).

House-site one comprises a farmhouse of over 21 m in length and three outbuildings within nine meter distance (fig. IV.11). The placement of the sets of roof-bearing posts of the house appears to be skewed (*i.e.* the line between two opposite roof-bearing posts is not exactly perpendicular to the longitudinal axis of the house). At both short sides, a set of posts with a narrower span (an ‘entrance portal’) may have been present. The one in the ESE

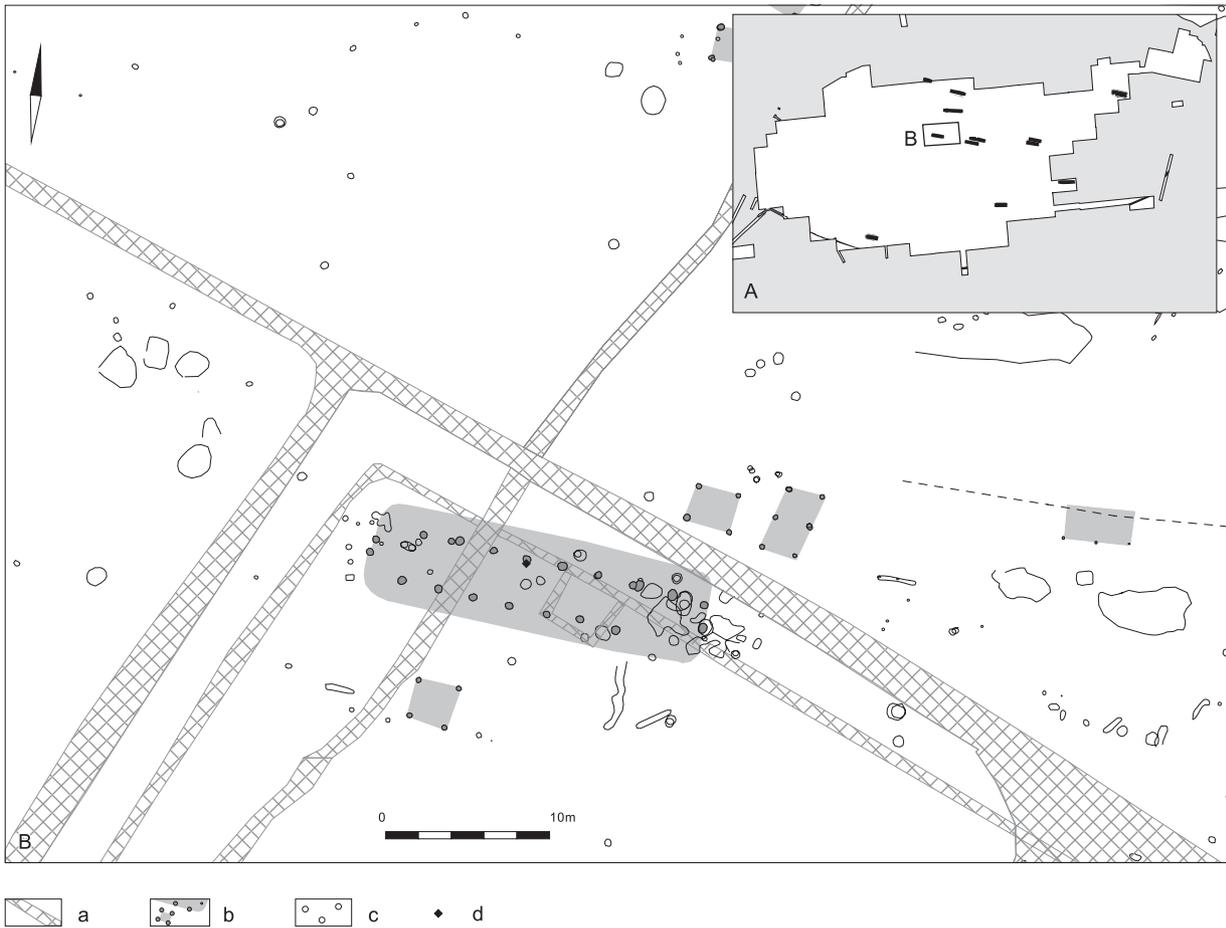


Fig. IV.11 House-site one at Wijk bij Duurstede - De Horden.

a: post-Bronze Age and Roman period ditches, b: Bronze Age structures, c: other features (not necessarily Bronze Age), d: radiocarbon date.

short side is situated off-centre to the farms' central aisle and its interpretation as an entrance may be questioned. No traces of the wall-construction remained. A sample of charcoal from a posthole of house one (fig. IV.11, d) was dated to *c.* 1420-1130 cal BC, indicating that the construction of this house dates to – or after – the Middle Bronze Age-B (GrN-15987: 3035 ± 45 BP; Hessing 1991, 51).

At *c.* 40 m to the northeast of house-site one, a second house-site can be recognized (fig. IV.12). It consists of a long (*c.* 32 m) house plan with a phased construction and several outbuildings. In the eastern short side of house two, an elaborate (double portal) entrance was recognized. In the western short side, no evident entrance portal could be identified. A possible entrance portal may be present at 27.3 m from the eastern short side, but this – if correct – implies that the farm was once extended towards the west. A third possible entrance about midway in the northern long side is suggested by two posts (*c.* 70 cm apart) at one meter distance from the roof-bearing posts.

Presumably, house two consists of at least two building phases. Based on an assumed – more or less – regular placement of the roof-bearing posts, two main phases (2a and 2b; fig. IV.13, nos. 3 and 4) can be identified. These two house phases are very comparable in dimensioning of the house ground plan, location and orientation. This may suggest that the people building the second phase (which might be either phase 2a or 2b), had intimate knowledge on the structural properties of the previous house. Yet, phases 2a and 2b are not identical copies. If one overlays the two phases, no good fit of both the east and west part is achievable (*cf.* fig. IV.13, nos. 5 and 6). This could imply that only parts of the house were replaced one at a time, or that the design was slightly modified, or this could result from errors caused by the fact that the house was documented in two different trenches. In any case, a Bronze Age effort to maintain a certain form of occupation on the exact same spot seems to be reflected.



Fig. IV.12 House-site two at Wijk bij Duurstede - De Horden.

a: post-Bronze Age and Roman period ditches, b: Bronze Age structures (features of house phase 2a have a light fill, features of phase 2b have a dark fill), c: other features (not necessarily Bronze Age), d: possible Bronze Age pits e: radiocarbon dated sample.

At seven meter to the north of house two, a large (2 m diameter) pit was found near a four-post outbuilding. Charcoal from this pit – which also contained some charred barley and pottery – was radiocarbon dated to *c.* 1550-1000 cal BC (GrN-14677: 3060 ± 100 BP; Hessing 1991, 42; 43; 51 esp. fig. 2; *contra* Hessing 1991, 51 note 3).

House-site three is situated *c.* 30 m to the north of house-site two (fig. IV.14). A palisade of 30-40 cm thick post(hole)s placed at 30 cm interval was found on the same location, but was best visible at levels below that of house three. Consequently, it will have been older than house three. The stretches of fence depicted by Hessing (1991, 45 fig. 4) that appear to overlap with the house are stratigraphically younger (original fieldwork documentation). The farmhouse was at least 25 m long and had an elaborate entrance in its eastern short side. In the west part of house three, several additional posts obscure the constructional details of the western short side. To the south a six-post outbuilding and to the north a four-post outbuilding and a cluster of pits were found. The pit in-fills were light in colour and few finds were recovered from them (Hessing 1991, 44).

House-site four is situated more or less centrally within the De Horden excavations and – due to the proximity of house four to house five – will be discussed here combined with house-site five (fig. IV.15). Because of its better preservation, house five will be discussed first. This over 26 m long farmhouse showed entrances in both short sides as well as an entrance in the northern long side. Directly to the north(west), a four-post outbuilding was found. A sample of charcoal from a posthole of this house was allegedly radiocarbon dated to the Middle Bronze Age-B

APPENDIX TO: A LIVING LANDSCAPE. BRONZE AGE SETTLEMENT SITES IN THE DUTCH RIVER AREA

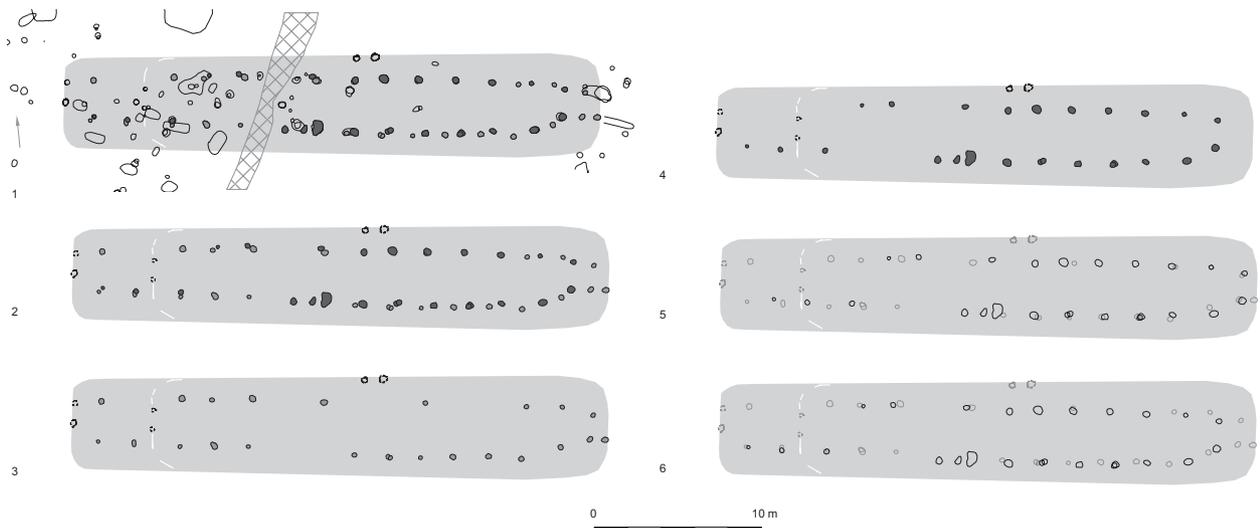


Fig. IV.13 House two; possible construction phases (1: house two and other features, 2: house two (phase a and b isolated), 3: house phase 2a isolated, 4: house phase 2b isolated, 5: house phase 2b (dark lines); overlay with 2a to fit east part, 6: house phase 2b (dark lines); overlay with 2a to fit west part).

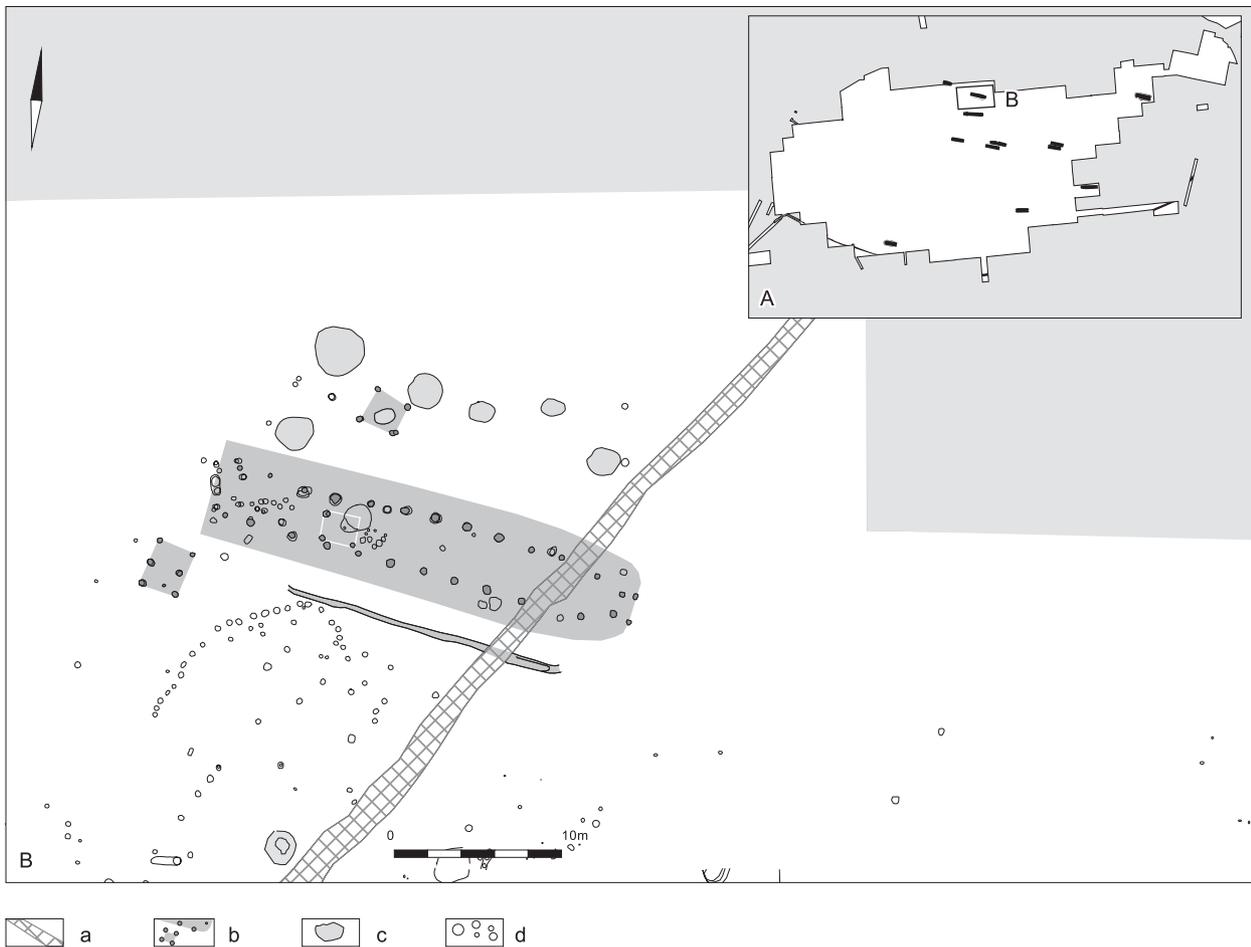


Fig. IV.14 House-site three at Wijk bij Duurstede - De Horden.

a: post-Bronze Age and Roman period ditches, b: Bronze Age structures, c: pits d: other features (not necessarily Bronze Age).

(Hessing 1991, 42; 51; GrN-14677: 3060 ± 100 BP). The sample label and the original radiocarbon sample form, however, indicate that this sample originated from the pit with Bronze Age ceramics in the vicinity of house two (*cf.* Lanting & Van der Plicht 2003, 188, for house-site two see above). In the vicinity (< 22 m) of house five, three to five possible outbuildings could be recognized. House four is situated directly to the southwest of house five. The short distance in between – combined with the assumed low extending roofs – renders it unlikely that houses four and five could have co-existed. Rather, they seem to represent two house-phases on the same location, presumably the same house-site. The fact that within the roof-bearing structures of both houses five and four a possible outbuilding could be recognized, confirms the multi-phased nature of this house-site.

House four is less well preserved than house five, as only the two lines of roof-bearing posts remained. The spacing and span of the roof-bearing structure of house four is comparable to that of house five, yet differs to such an extent that it cannot be inferred that the houses are direct successors of each other. At this house-site, it is possible that after an unknown period of time, the house-site was re-occupied and a comparable farmhouse was built. Unfortunately, the duration of the interval in between as well as the relative sequencing of houses four and five remains unknown.

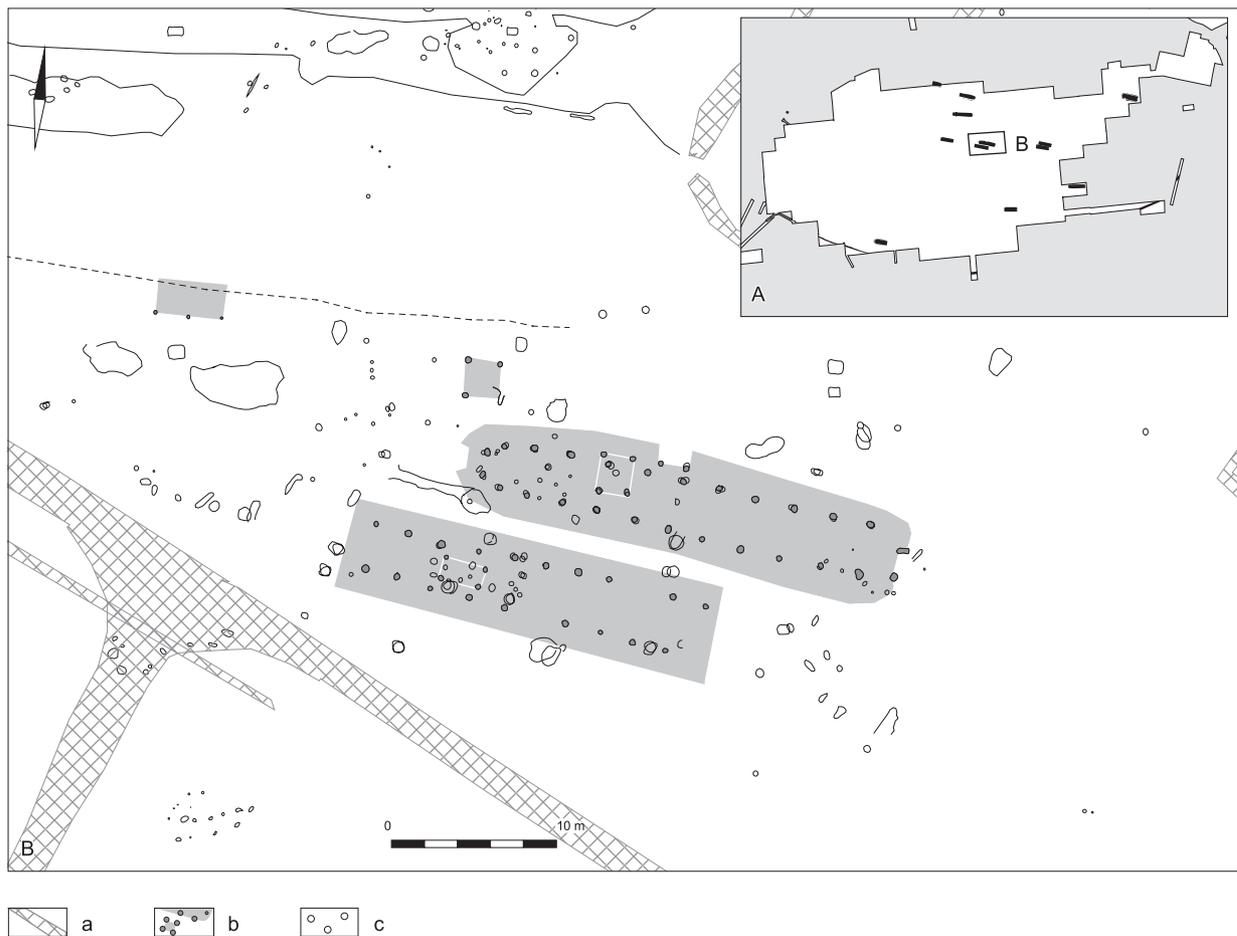


Fig. IV.15 House-sites four/five at Wijk bij Duurstede - De Horden.

a: post-Bronze Age and Roman period ditches, b: Bronze Age structures, c: other features (not necessarily Bronze Age).

A very comparable situation is found *c.* 70 m to the east, where house(-site)s six and seven were encountered. Here again two houses were situated at such a close distance that that contemporaneity seems impossible. Both houses are *c.* 21 m long and have an evident entrance in their eastern short side. Whereas the entrance of house six consisted

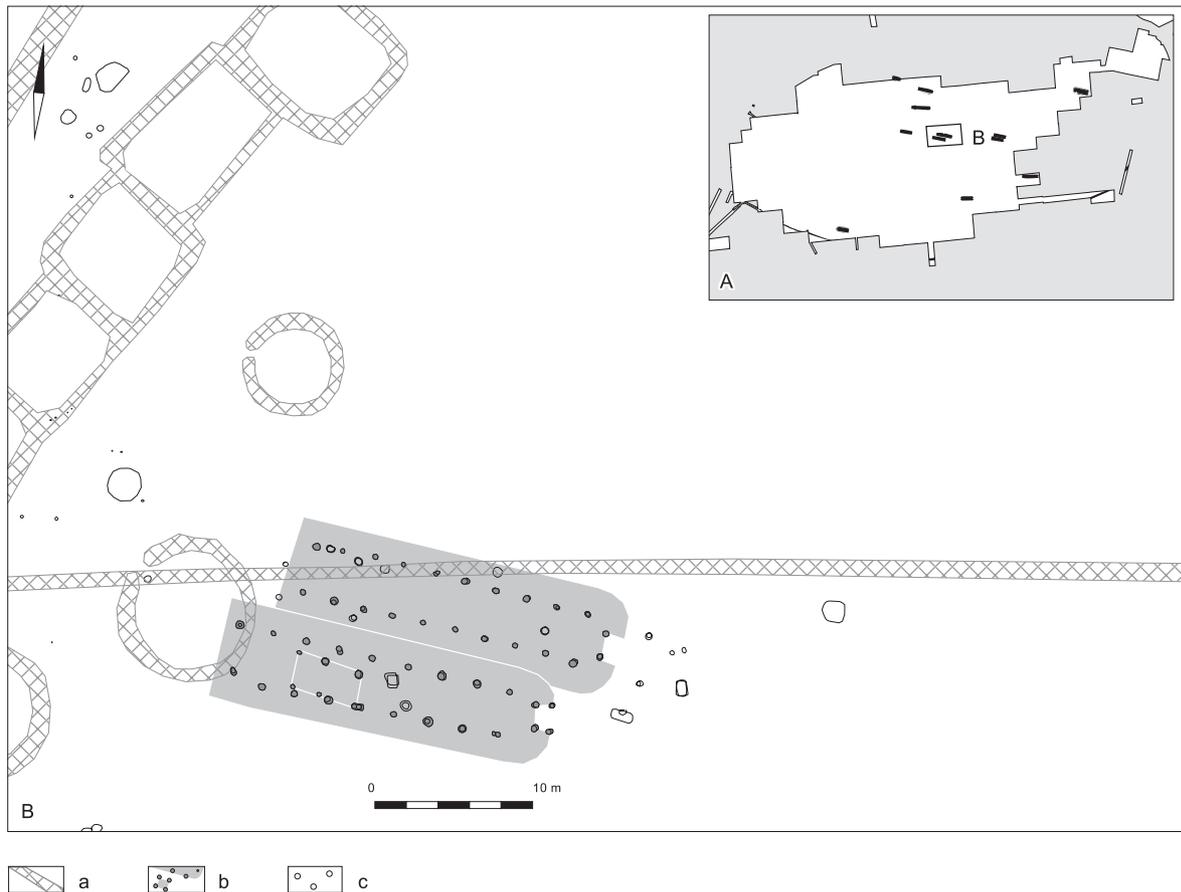


Fig. IV.16 House-sites six (south)/seven (north) at Wijk bij Duurstede - De Horden.

a: post-Bronze Age and Roman period ditches, b: Bronze Age structures, c: other features (not necessarily Bronze Age).

of a doubled entrance portal, only a single entrance portal could be observed for house seven. Both houses show a comparable orientation and configuration of the roof-bearing structure. Even more than with house phases 2a and 2b (see above and fig. IV.17), the houses' structural properties suggest that the same group that built the second house, had knowledge on the structure of the first (see fig. IV.17). Only a single six-post outbuilding can be recognized and is situated within the ground plan of house six. This suggests that – if at all contemporaneous – it is most likely to have been part of the house-site of house seven.

From a posthole of house six or seven, a burned clay object (*c.* 20 cm high and shaped like a truncated pyramid with a slight depression in the truncated surface) was recovered (J. van Doesburg, pers. comm., Aug. 2006). The original function is unclear, but it could have served as a pot- or spit support near the fireplace (Van Es *et al.* 1986c, 45, *cf.* Van den Broeke 2005, 609; Moos 2006; Drenth, Heijmans & Keijsers 2007, 120; 213 fig. 41).

In the northeast corner of the De Horden excavations, house-site eight was uncovered. This is the only house-site in the De Horden excavations where the house is nearly completely girded by a system of ditches (fig. IV.18). Openings in the ditch system, as well as the more narrowly spaced posts, suggest the presence of an entrance in the southern long side and the eastern short side. No outbuildings were found in the vicinity of house eight, but as this house is situated next to the excavation extents, their absence cannot be claimed with certainty.

Presumably, a sample of charcoal from the ditch around house eight was radiocarbon dated to *c.* 1440-1120 cal BC (GrN-15988: 3050 ± 60 BP; Hessing 1991, 51). Although the sample was published as originating from a posthole of house nine (see below), the sample information (trench number and context; ditch) on the original sample form indicates that this sample can represent both an *terminus ante quem* or *terminus post quem* date for the construction of the ditches around house eight (Hessing 1991, 42; Lanting & Van der Plicht 2003, 188; *contra* Hessing 1991,

51). Several soil-samples from the ditch were sieved for botanical remains, but only two yielded some barley grains (Van Es *et al.* 1988, 41).

House-site nine is situated in the southern-central part of De Horden near a possible Bronze Age funerary monument (fig. IV.19). The house was over 22 m in length and had elaborated (doubled portal) entrances in both short sides. A four-post outbuilding was situated within 10 m to the north-west of house nine, whereas a ten-post outbuilding was situated at *c.* 30 m to the west(southwest). Near (or in postholes of) this ten-post construction several Bronze Age sherds and some burned fragment of bone were found (Hessing 1985, fig. 14).

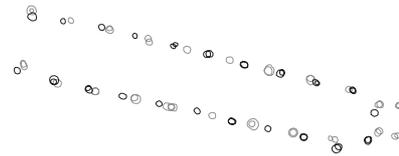
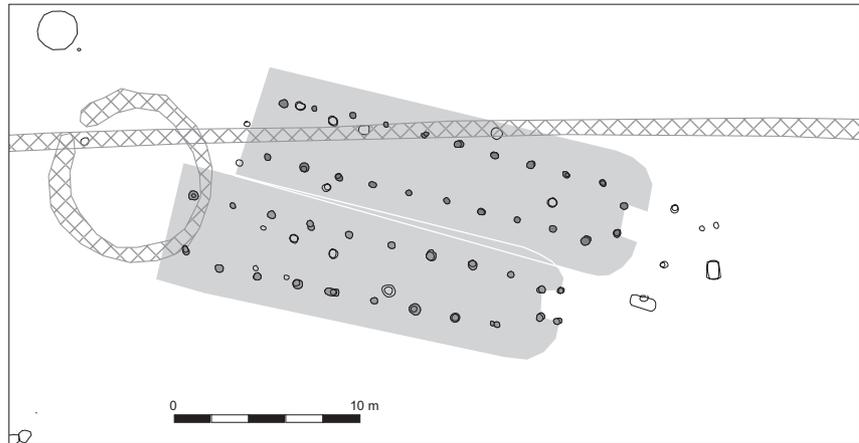


Fig. IV.17 Actual situation (top) and overlay (bottom) of houses 6 (top: light fill, bottom: light outline) and seven to show structural similarities.

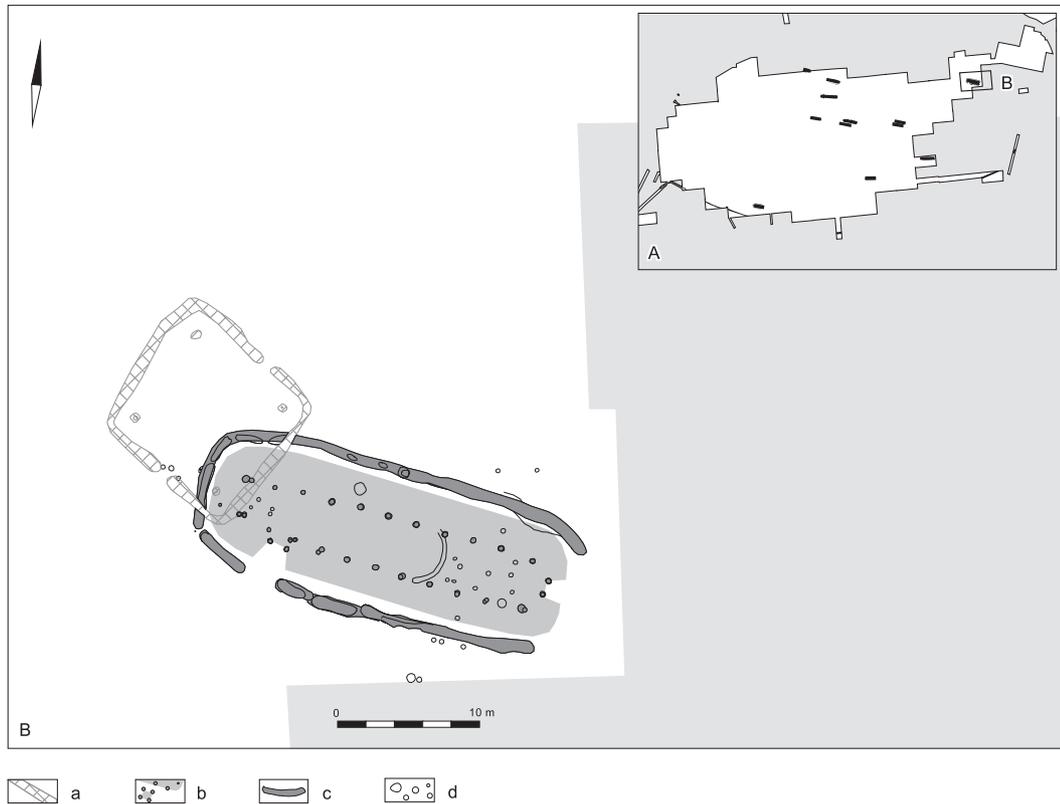


Fig. IV.18 House-site eight at Wijk bij Duurstede - De Horden.

a: Late Iron Age features, b: Bronze Age structures, c: Bronze Age ditches, d: other features (not necessarily Bronze Age).

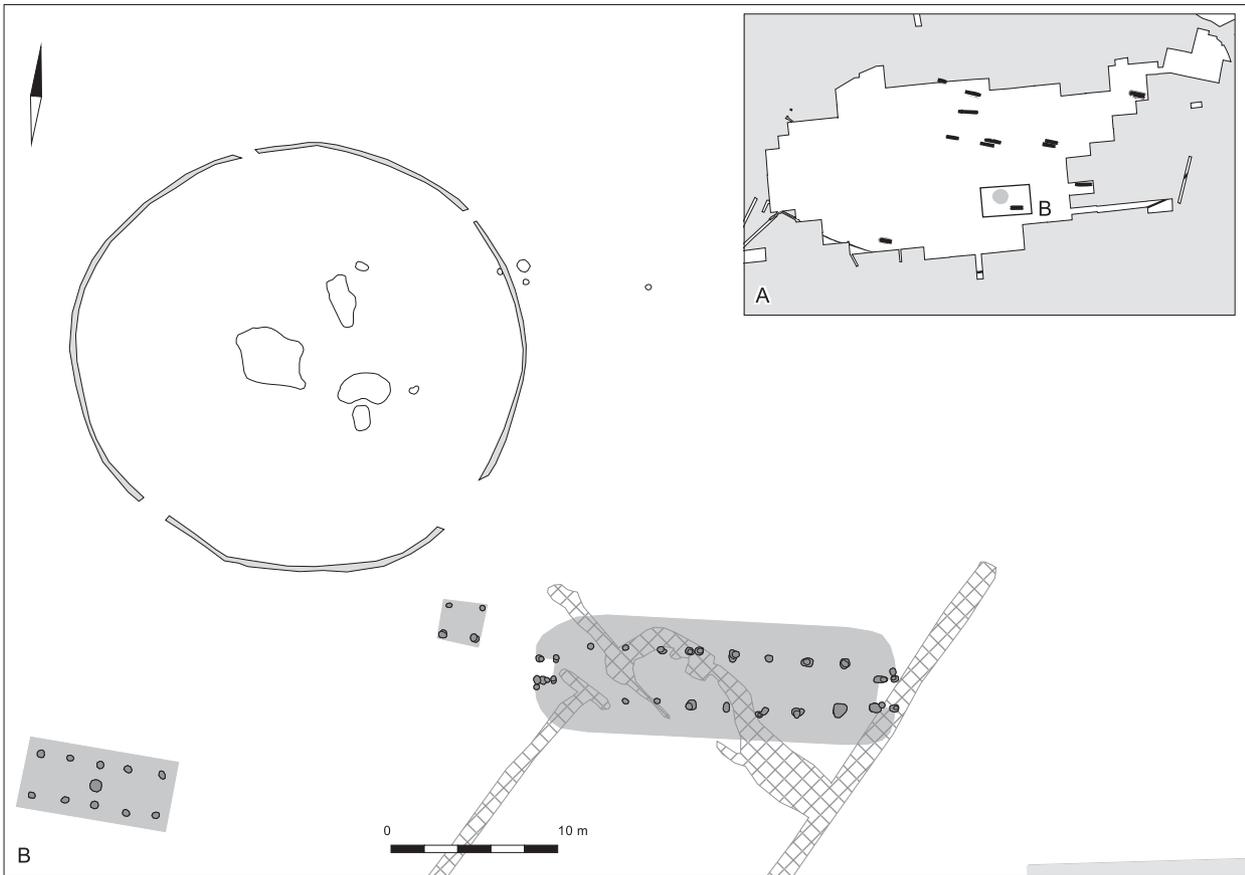


Fig. IV.19 House-site nine at Wijk bij Duurstede - De Horden.

a: post-Bronze Age and Roman period ditches, b: Bronze Age structures, c: possible Bronze Age barrow, d: other features (not necessarily Bronze Age).

The possible funerary monument is represented by a 26 m diameter ring-ditch of 15-45 cm preserved width, for which no interments are known. Therefore, the interpretation as a barrow must remain tentative. The possible funerary monument was situated at the highest part of the micro-topographic landscape and – based on the thicker vegetation horizon within the ring-ditch perimeter – an anthropogenic mound body may be inferred (Hessing 1989, 308-309; fig. 9). Essentially, the dating of this monument relies on a combination of its stratigraphical position (at the level of the Bronze Age vegetation horizon), its size – which is considered to be too large for an urnfield period grave – and the fact that a Bronze Age sherd was recovered from one of the lowermost levels of the vegetation horizon within the ring-ditch perimeter (Hessing 1985, 30; fig. 14; Hessing 1989, 308, note 19).

At c. 200 m to the east of house-site nine, house-site ten was discovered (fig. IV.20). As this house-site was situated next to the excavation limits, it is unclear whether – besides the single four-post outbuilding – any other house-site elements were once present to the north or east of the farmhouse. The 26 m long farmhouse presumably had an elaborate entrance at its eastern short side, possibly combined with a single entrance portal in the west short side.

House-site eleven is much less well preserved (fig. IV.21, B). Besides a possible house(-site) ditch and three postholes, few other traces remained at the location of a presumably over 20 m long Bronze Age farmhouse. For house-site twelve (fig. IV.21, C), only a fragment of a possible house(-site)ditch – whose orientation matches those of the other houses – can be used to postulate the presence of a Bronze Age house-site. This house-site is predominantly situated beyond the northernmost excavation limit.

APPENDIX IV: WIJK BIJ DUURSTED E

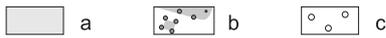
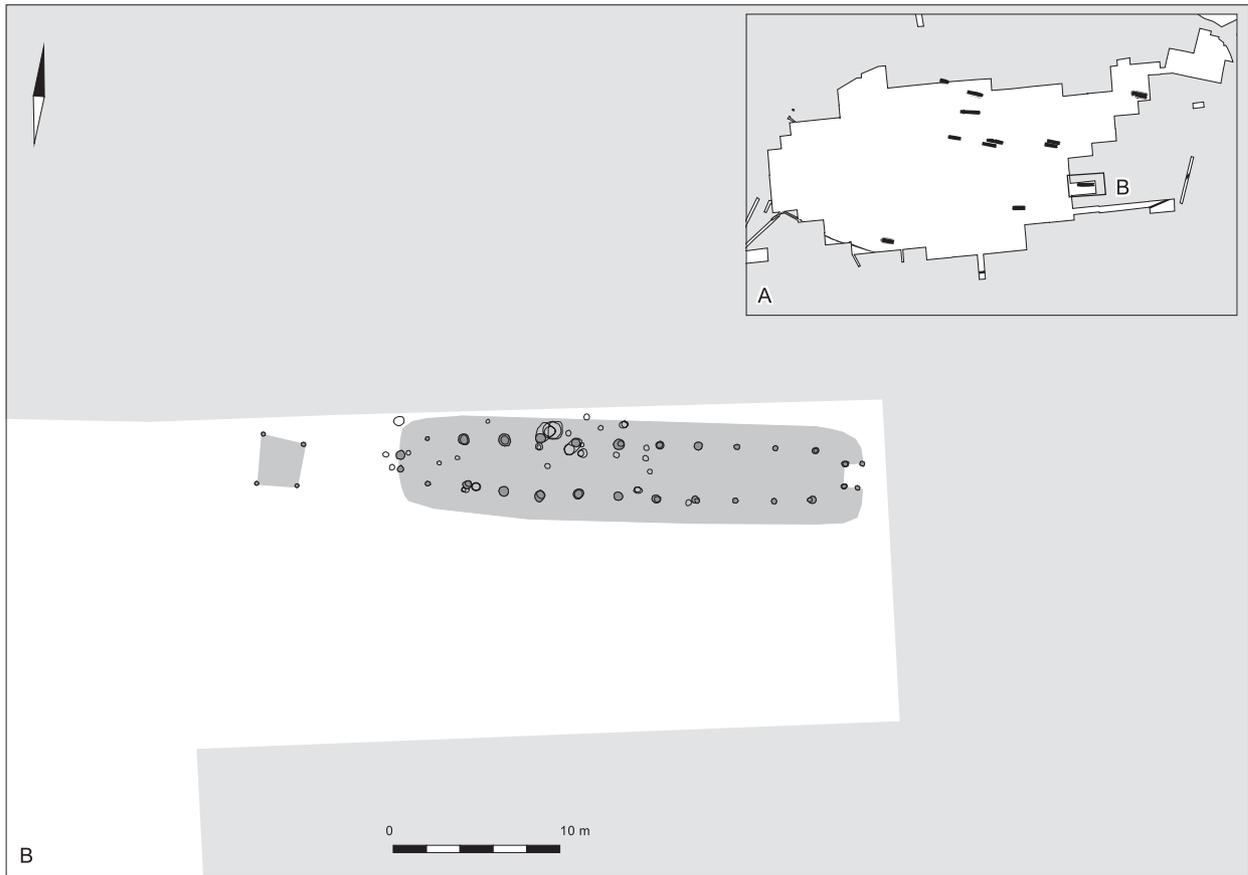


Fig. IV.20 House-site ten at Wijk bij Duurstede - De Horden.
a: not excavated, b: Bronze Age structures, c: other features (not necessarily Bronze Age).

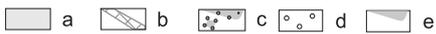
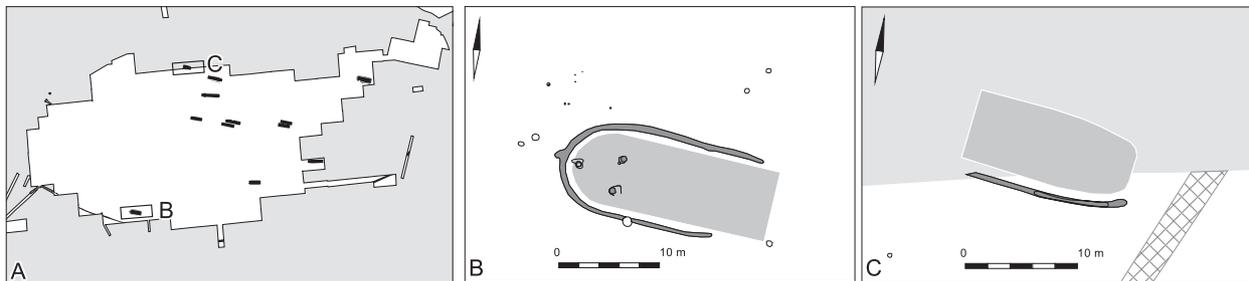


Fig. IV.21 Assumed house-sites eleven (B) and twelve (C) at Wijk bij Duurstede - De Horden.
a: not excavated, b: post Bronze Age (Roman period and recent) ditches, c: Bronze Age structures, d: other features (not necessarily Bronze Age), e: assumed location of Bronze Age farmhouses.

To sum it up, ten reasonably preserved Bronze Age house-sites have been uncovered at the De Horden excavations. In the parts of the excavation where systematic enquiry into the Bronze Age levels took place, six house-sites are found within 60 m from each other. The four other house-sites are situated at 120-200 m from the nearest other house-site. For house-sites one, eight and possibly two, radiocarbon dates indicate a phase of use during the Middle Bronze Age-B. This was also suggested by the (bulk) dates for the associated vegetation horizon (see above; Helsing &

Steenbeek 1990, 17; note 16). Another sample of charcoal from a post within – but not definitely associated to – house two was radiocarbon dated to c. 1440-1290 cal BC (GrN-14678: 3090 ± 30 BP; Hessing 1989, 325). Consequently, it cannot be proven that the various house-sites reflect a ‘wandering farmstead’ system as suggested by the excavator (Hessing 1991, 42-43). Save for the additional house-phases at house-sites two, four/five and six/seven, all could have functioned contemporaneously. The recovered broken quartz and quartz-pebble tempered, thick-walled and barrel-shaped pottery was only sparsely (< 5%) decorated with fingertip- (on rims or cordons) or reed/bone (on rims) impressions and fits the Middle Bronze Age-B date well, but does not allow to refine it (Hessing 1985, 26; 30 fig. 13; Hessing 1991, 42).

For the excavation at De Horden, the moderate feature preservation caused only the deepest features (of predominantly roof-bearing posts of houses and granaries) to have been preserved. They often displayed, nonetheless, a remaining depth of 20 to 40 cm (original fieldwork documentation). The density of occupation traces should be considered limited, even if accounting for the moderate feature preservation. The structure of most houses and surrounding outbuildings is mostly reasonably discernible and clusters with higher feature densities (up to the point of obscuring the layout of houses or house-sites) are absent.

Outbuildings are generally situated within 15 m distance from the farmhouses and conform (parallel or perpendicular to) in orientation to them. A remarkable observation is that with houses three, five and six (possibly also four), four- or six-post outbuildings could be identified within the ground plans of the houses proper. Their diversity in structure and placement renders it unlikely that they should be regarded as structural parts of the farmhouse proper. Rather, their overlapping location suggests that the previous presence of a house was a preferred factor for the later construction of outbuildings (or *vice versa*). Three house-sites had at least two house-phases. At house-site two, the house was presumably (in parts?) replaced on the exact same spot. On house-sites four/five and six/seven, a highly comparable – particularly in the latter case – farmhouse was built some four to seven meters from the previous location. Such rebuilding may be an expression of a desire to prolong a house-site’s life-span while preserving the previous house-site structuring.

Remarkable is the presence of a large (> 170 m long) 1.2 to 4.6 m wide ditch in the extreme south-west of the De Horden excavations. In some parts, stretches of fence lined the ditch (fig. IV.22). Whereas the uncovered ditch segments suggest a curved shape, perhaps inspired by or mimicking the shape of the residual gully or swale to the south of the central and eastern part of the De Horden excavation, the ditch bends distinctly to the south in the west. Although no datable finds were recovered from it, the stratigraphic position indicates that the ditch belongs to a pre-Iron Age phase of occupation (Van Es *et al.* 1980, 51; Hessing 1985, 21; Hessing & Steenbeek 1990, 15 fig.

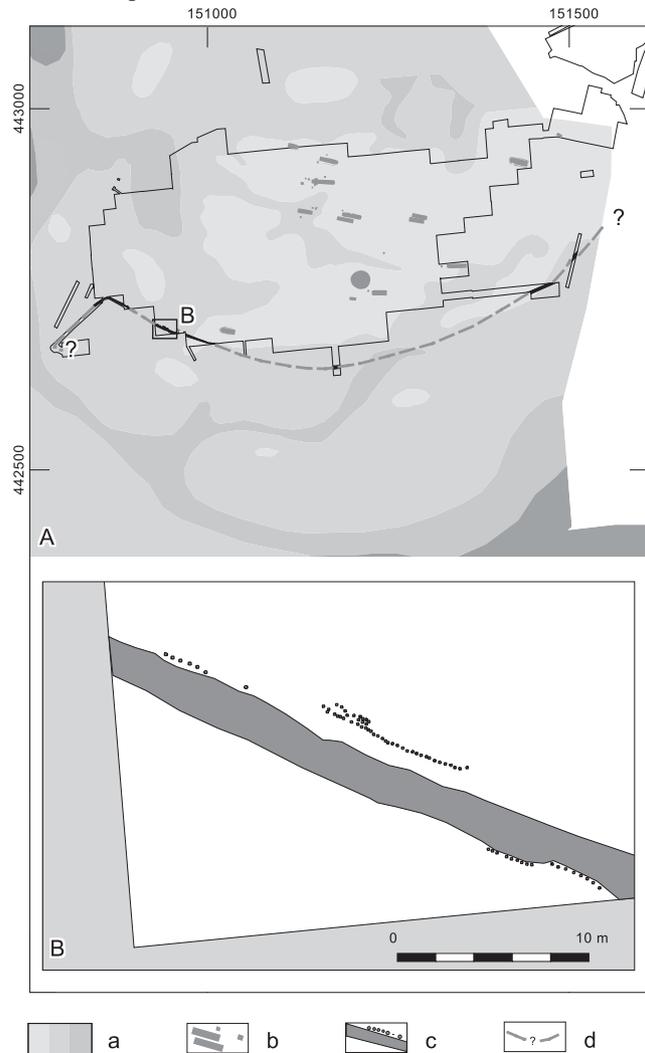


Fig. IV.22 Location and detail of the possible Middle Bronze Age ditch on top of the sand-depth map (after Hessing & Steenbeek 1990, 15 fig. 5; Van Zijverden 2004a).

a: sand-depth map (see fig. IV.4 for legend), b: presumable Middle Bronze Age-B structures, c: ditch and fence lines, d: possible ditch trajectory.

5). Should this ditch belong to the Middle Bronze Age-B phase of activities, it may be the single example from the Dutch river area of a feature that can be interpreted as a Bronze Age settlement site boundary (see Arnoldussen 2008, section 5.6).

The subsistence base of the occupants of the various Middle Bronze Age-B house-sites remains relatively unknown. A bone assemblage of ‘Middle Bronze Age’ (*i.e.* both Middle Bronze Age-A and Middle Bronze Age-B?) age whose context(s) have not been disclosed has been published by Laarman (1996). This livestock spectrum shows a *c.* 80% dominance (in numbers) of cattle bones, followed by sheep or goat (*c.* 8%), pigs (*c.* 6%), with some horse (*c.* 4.5%) and two dog bones (Laarman 1996, 379; table 61). Possibly, incidental hunting still took place as 21 bones and five antler fragments of red-deer and two brown bear metacarpals were also assigned to the Middle Bronze Age period (*op. cit.*, 375; 378; *cf.* Letterlé 1985, 339). The burned fragments of barley already referred to above and a possible Bronze Age grain of wheat are the only documented evidence for cereal consumption and possibly production (Van Es *et al.* 1986a, 34; Van Es *et al.* 1988, 41; Hessing 1991, 44; Letterlé 1985, 333).

Craft activities are also poorly documented. It is unclear to which period the flint tools (and production waste) described by Letterlé (1985, esp. 334) date, but some could be Middle Bronze Age in date. The scrapers could hint of hide-processing (*ibid.*) The function and dating of a piece of worked antler that might have been part of a composite tool (haft?) also remains unknown (*op. cit.*, 339). According to Hessing (*pers. comm.*, June 2006), a Bronze Age flat bronze sheet arrowhead was found at De Horden. Additionally, a possible Middle or Late Bronze Age spearhead was found at De Horden (Drenth 1996, 33; note 3; Fontijn 2003, 354). Perhaps the recovered copper-alloy slag droplet indicates on-site Bronze Age bronze working, but – again – the provenance and exact age of the studied fragments is unclear (Letterlé 1985, 332; 343).

As no wells or clear-cut watering holes are found for the Bronze Age occupation phase(s), it is assumed that fresh water was obtained from the lower-lying parts in the floodbasin to the south of the site (Hessing 1989, 306). This area may have been flooded in winter, but pools of stagnant water remained year-round (Steenbeek 1990, 121; 131). Possibly, the Werkhoven channel’s residual gully located between 70 and 140 m to the south of the excavation extents also still contained water (Hessing 1989, 306). Alternatively or additionally, the active river channel of the Houten fluvial system situated between 250 and 1250 m to the north-east of the now known house-sites could have provided a source of fresh water (as well as providing a fishing spot and communication route). In the floodbasin, the shallow pools are indicated by macro remains of stoneworts (*Chara sp.*), duckweed (*Lemna sp.*), water plantain (*Alisma sp.*) and water mint (*Mentha aquatica*) fruits (Steenbeek, Roeleveld & Bohncke 1990, 108). On the higher parts of the landscape, the areas occupied by sedges, grasses (genii *Cyperaceae* and *Gramineae*) and willow (*Salix*) trees are thought to have expanded (*opus. cit.*, 109). In these areas, some birch (*Betula*), Ash (*Fraxinus*), Elm (*Ulmus*) and oak (*Quercus*) trees will have been present (Steenbeek 1990, fig. 2.2.4 zone PW-11/12).

Possibly, the landscape at De Horden became increasingly wet already during the end of the Middle Bronze Age-B. Two indirect indications may suggest this. The first is the absence of ensuing Late Bronze Age occupation (see below), which may indicate unfavorable habitation conditions. The second indirect indication is the fact that the house(site)s that had eaves-drip or drainage gullies are all situated in the highest parts of the De Horden micro-topography. This could indicate that, even if already situated on the highest parts of the landscape, counter measures against the rising groundwater table were taken by the Bronze Age occupants.

Excavations at ‘De Geer’

At De Geer, two Middle Bronze Age house-sites were recognised (fig. IV.23; Van Es *et al.* 1992, 44-45). Based on the stratigraphy and (sand)depth of the deposits on top of which they were found, it is quite possible that these house-sites were constructed on top of (a thin sediment cover overlying) the Werkhoven deposits like their De Horden counterparts (W. van Zijverden, *pers. comm.*, June 2006, for De Horden see above). Unlike at the De Horden excavations, the feature density was much higher here. It is only by their surrounding ditches that house-sites could be recognised with any certainty. This implies that additional house-sites may have been present and that recognizing outbuildings among the posthole clutters is problematic. Consequently, the validity of the proposed outbuildings is rather limited.

The two house-sites were *c.* 60 m apart and both show a system of ditches around the assumed location of the farmhouse. Applying the current views on the length of roof-bearing posts and the angle of the roof of prehistoric

houses (*cf.* Huijts 1992, 23; 37-53), it seems unlikely that these ditches (with an inside width of 11 m at house-site one) served as eaves drip-gullies (*cf.* Arnoldussen 2008, section 5.6, esp. fig. 5.49). Rather, the ditches will have predominantly served here to drain the farmhouse location.

The system of ditches on house-site one shows an interruption in the long side (but near the short side) that may indicate the location of a farmhouse entrance. Several postholes of one row of roof-bearing posts could be documented, but no indications of the wall construction, other posts or internal organisation have been preserved. The house-site ditch has a small protrusion extending to the west, and to the south of which a concentration of postholes was found.

Presumably, here several granary-type outbuildings were once constructed, whose features now overlap to such an extent as to weaken the validity of the interpretation presented below (fig. IV.23, B). The more isolated single four-post outbuilding to the north of this protruding ditch segment at least supports the assumed presence of such outbuildings. Although the construction of the ditch system may have been predominantly functional, *i.e.* to drain the house-site, it also vividly illustrates that smaller outbuildings 'belonged' to house(-site)s. Their integral protection and delineation through the ditch-system reflects that only together they formed a farm.

House-site two was even less well preserved (fig. IV.24). Here, only a few postholes and the curvilinear shape of the ditch indicated the presence of a house-site. The western short side possibly had an entrance portal, which is a common feature of Bronze Age farms in the river area.

No direct or indirect radiocarbon dates are available for these house-sites. Based on the ceramics recovered a Middle Bronze Age-B (and/or even Late Bronze Age) age is suggested (Van Es *et al.* 1992, 44). The ditches around the farmhouses are comparable to those at Wijk bij Duurstede - De Horden house-site eight (see below). In their vicinity, some postholes and pits could be observed. In the lower lying parts, a Bronze Age vegetation horizon was partially preserved (Van Es *et al.* 1992, 43). In some locations, a lining of willow stakes next to a former gully was documented (Van Es *et al.* 1992, 48, *cf.* fig. IV.22, B).

The farmhouses of Wijk bij Duurstede - De Geer are comparable to those of De Horden and other Bronze Age settlement sites in the Dutch river area. Remarkable is the observation that the numbers of roof-bearing posts preserved for the two houses is very low. Especially for house-site one, the feature density is however reasonably high. An explanation cannot yet be offered, but the option that the houses were erected on small mounds within (and comprising minimally the dugout-soil of) the ditches should be considered. No datable finds were recovered from the postholes of the two houses and no radiocarbon dates are available. Consequently, the house-site from De Geer can

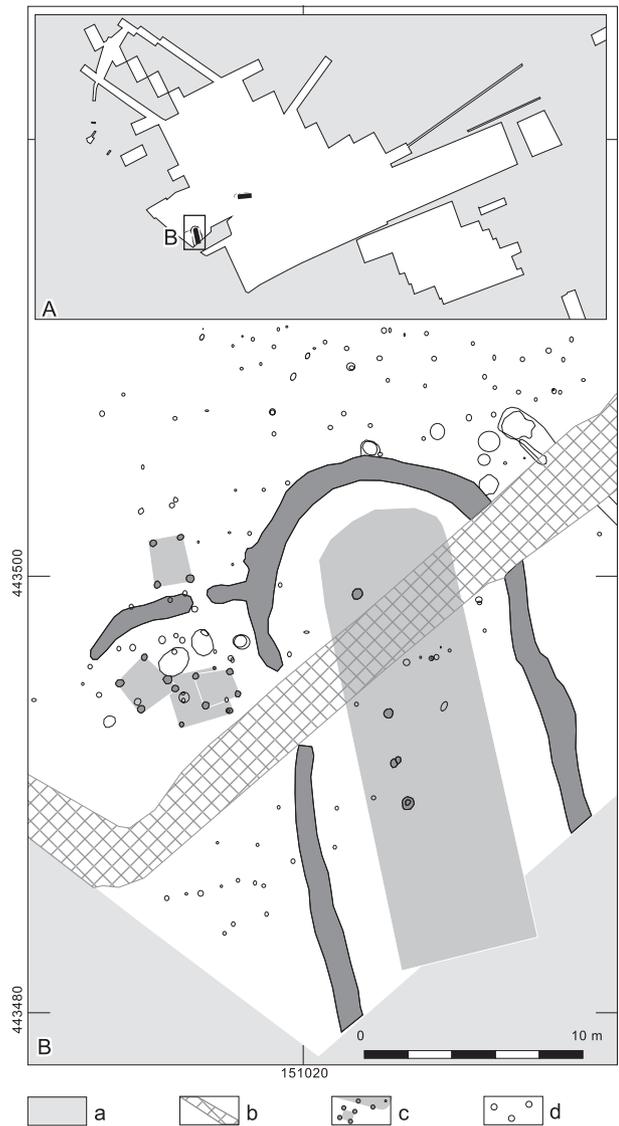


Fig. IV.23 Middle Bronze Age-B house-site one at Wijk bij Duurstede - De Geer. For location see inset A.

a: not excavated, b: recent disturbances, c: features of structures, d: other features.

only be dated typologically to the Middle Bronze Age-B. The ceramics recovered were very infrequently decorated and do not allow to refine this dating (one or two decorated sherds; J. van Doesburg, pers. comm., Aug. 2006).

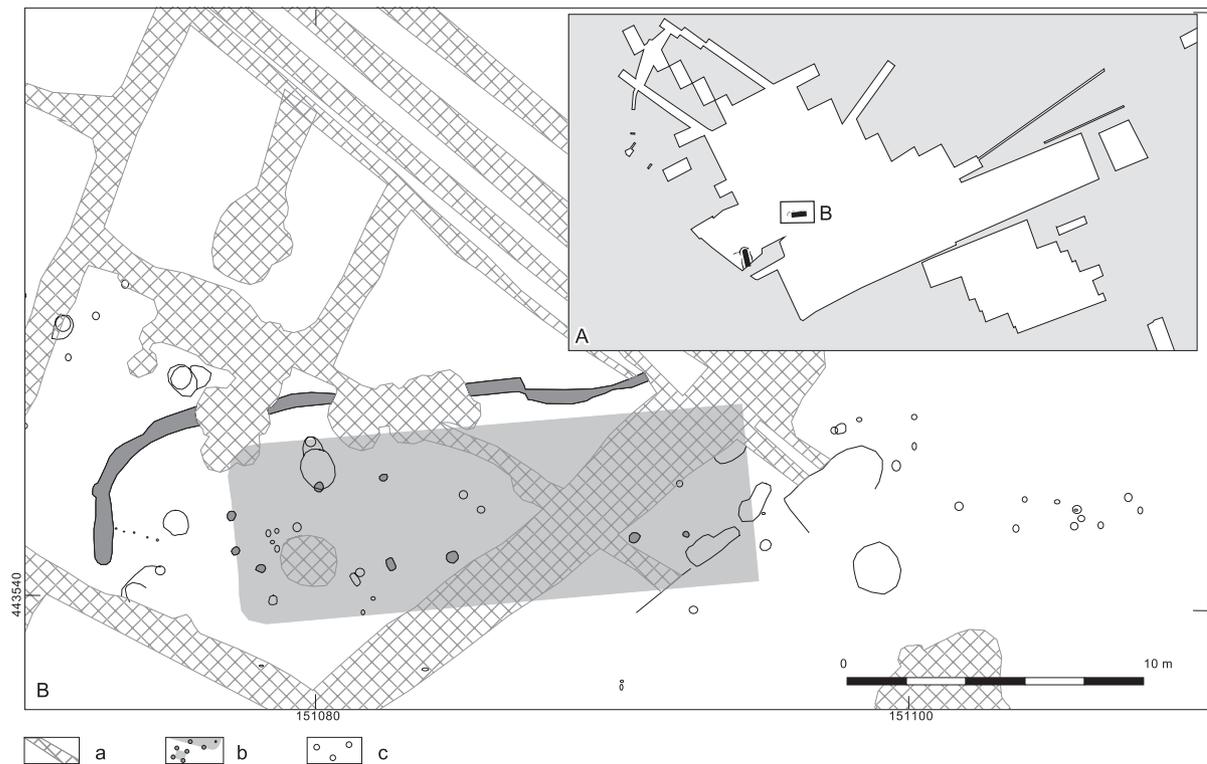


Fig. IV.24 Middle Bronze Age-B house-site two at Wijk bij Duurstede - De Geer. For location see inset A.

a: recent disturbances, b: features of structures, c: other features.

From the recent ploughlayer around the house-sites – into which the prehistoric surface has been incorporated – a number of bronze objects were recovered. They comprise a fragment of a knobbed sickle, a bronze spearhead and a bronze chisel, all datable to the Middle Bronze Age-B or the Late Bronze Age (Drenth 1996, 33, note 3; Fontijn 2003, 334; 354). According to the excavator, some bronze casting droplets may also be Bronze Age in date and for some of the simple bronze pins among the many Roman Period fibulae a possible true Bronze Age date must be kept open (J. van Doesburg, pers. comm., Aug. 2006).

In conclusion, it seems that the Werkhoven levee and channel bed deposits were intensively used for Bronze Age occupation. A house-site at every 70 meter seems no over-estimation of the occupation density. Unfortunately, there are insufficient dates available to prove or disprove the contemporaneity of the various house-sites. Some of the house-sites saw only one phase of use, but at three house-sites the farmhouse was rebuilt. A large ditch with fences could have defined the habitation area to the south. The Houten fluvial system was situated between 250 to 1250 m to the north-east and could be easily accessed from the Bronze Age settlement site. From the absence of Late Bronze Age ceramics (but see below; Van Es *et al.* 1992, 44) and houses, and the presence of drainage ditches at some house-sites at De Horden and De Geer, wetter conditions may be inferred for the end of the Middle Bronze Age-B. Perhaps these wetter conditions made agriculture impossible at the excavated locations and thus ended this habitation phase.

It is very well possible that more intensive crevasse formation and flooding during the avulsion of the Kromme Rijn fluvial system from the Houten fluvial system was – combined with gradual floodbasin water table rise – the cause of such wetter conditions. For the Kromme Rijn channel belt, several *terminus post quem* radiocarbon dates for its start of sedimentation are known (Berendsen & Stouthamer 2001, 212). They point towards a start of sedimentation by the Kromme Rijn fluvial system around or after *c.* 1380-930 cal BC (GrN-4371: 2930 ± 60 BP, GrN-

8706: 3000 ± 35 BP, GrN-9154: 2890 ± 35 BP; Berendsen & Stouthamer 2001, 212). As the Houten fluvial system had a somewhat 'braided' character (*i.e.* with several active threads within a single channel; Berendsen & Stouthamer 2001, 209; Van Zijverden 2004a) some of the channels could have remained waterlogged until the Late Iron Age (GrA-23920: 2230 ± 40 BP (a human skeleton in the residual gully); Van Zijverden 2004a) or even the Roman Period (Berendsen & Stouthamer 2001, 209). Near the village of Vechten, a sample of humic clay from a residual gully of the Houten system was dated to *c.* 810-540 cal BC (GrN-18104: 2560 ± 40 BP; Berendsen & Stouthamer 2001, 209).

Late Bronze Age

Although it has been outlined above that several of the previously active Houten fluvial system's channels may have remained waterlogged during the Late Bronze Age, the Kromme Rijn is the single active main fluvial system in the Wijk bij Duurstede macro-region during the Late Bronze Age (fig. IV.25). Steenbeek estimates that between *c.* 1150 and 950 cal BC extensive crevasse formation (the so-called 'De Horden' deposits; *cf.* Steenbeek 1990, 67-70; 122) covers and – through up to one meter of sedimentation – levels the entire excavated De Horden area (Steenbeek 1990, 92; 188; fig. 2.5.1 zone W12-13; Hessing & Steenbeek 1990, 17-18; 25). This seems to have prevented human occupation within the Wijk bij Duurstede meso-region (Steenbeek 1990, 121-122).

No evident Late Bronze Age find-spots are known from the Wijk bij Duurstede macro-region. A Late Bronze Age socketed bronze axe of the Helmeroth type allegedly originated from the Lek river near Wijk bij Duurstede, but this origin is questioned by Fontijn (fig. IV.25, no 900; Fontijn 2003, 324, for type Helmeroth see Kibbert 1984, 139-141). In one of the preliminary publications of the excavations at De Geer, a Middle Bronze Age to Late Bronze

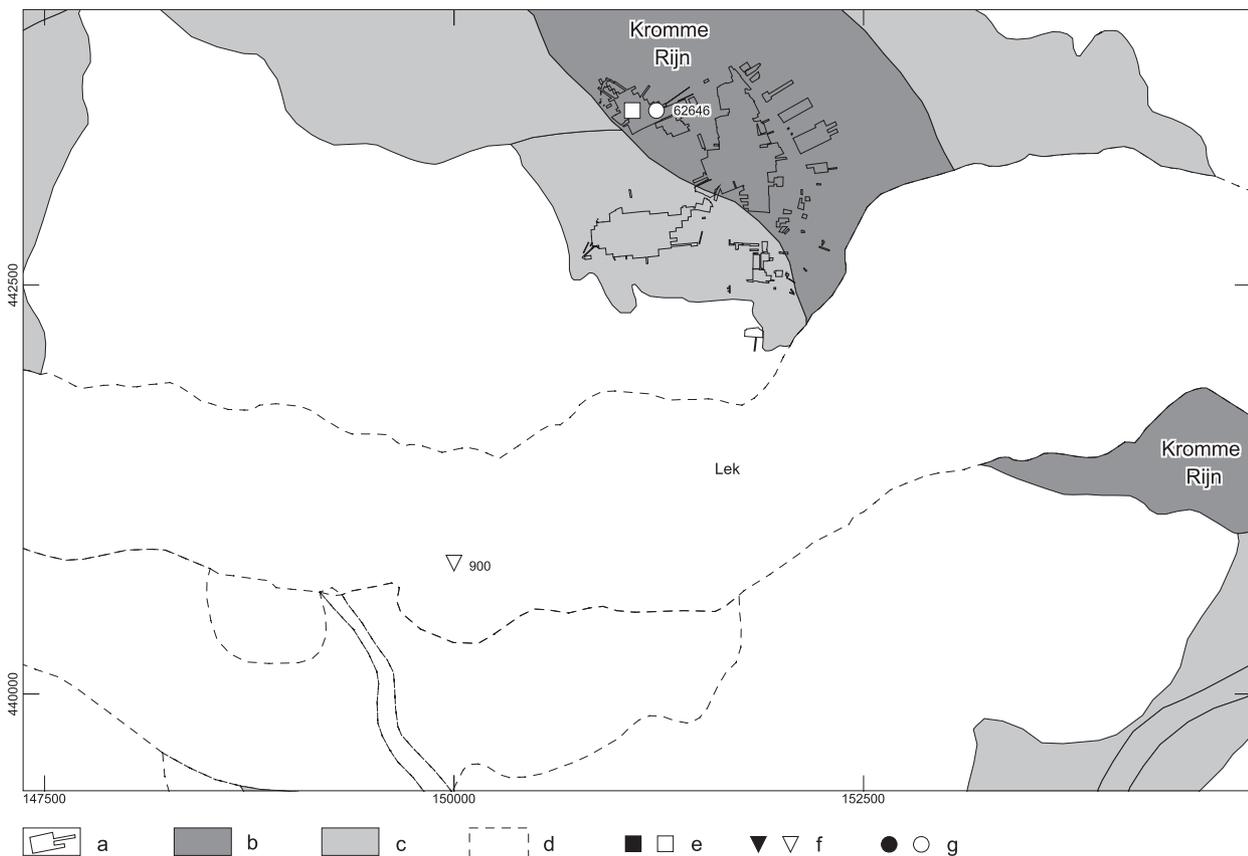


Fig. IV.25 Late Bronze Age fluvial systems and find-spots in the Wijk bij Duurstede macro-region (filled symbols indicate certain identifications, outlined symbols indicate unclear identifications).

a: Wijk bij Duurstede excavations, b: active fluvial systems, c: fossil fluvial systems, d: younger fluvial systems, e: pottery, f: bronze tools, g: features.

Age date for the encountered features and finds is kept open (Van Es *et al.* 1992, 44, fig. IV.25, no 62646). However, based on their stratigraphic position and comparability to the remains at De Horden dated to the Middle Bronze Age-B, in this study these are considered to date the (late) Middle Bronze Age-B, or at least prior to the formation of the so-called ‘De Horden’ crevasse deposits outlined above.

Early Iron Age

Presumably before or during the start of the Early Iron Age, the phase of extensive crevasse formation and regular flooding ended. At De Horden, a new vegetation horizon could form in the top of the ‘De Horden’ deposits (Steenbeek 1990, 70; 118, fig. 2.5.1 zone W13-14). The nearby presence of alder carrs is suggested for this period (Steenbeek, Roeleveld & Bohncke 1990, 109). Later on during the Early Iron Age, even the floodbasin was relatively dry and the water table could have been as low as 75 cm below the top of the De Horden deposits (Steenbeek 1990, 132 (zone W15-16)). Evidently, the still active Kromme Rijn fluvial system caused little floodbasin sedimentation in the De Horden area during this period (fig. IV.26).

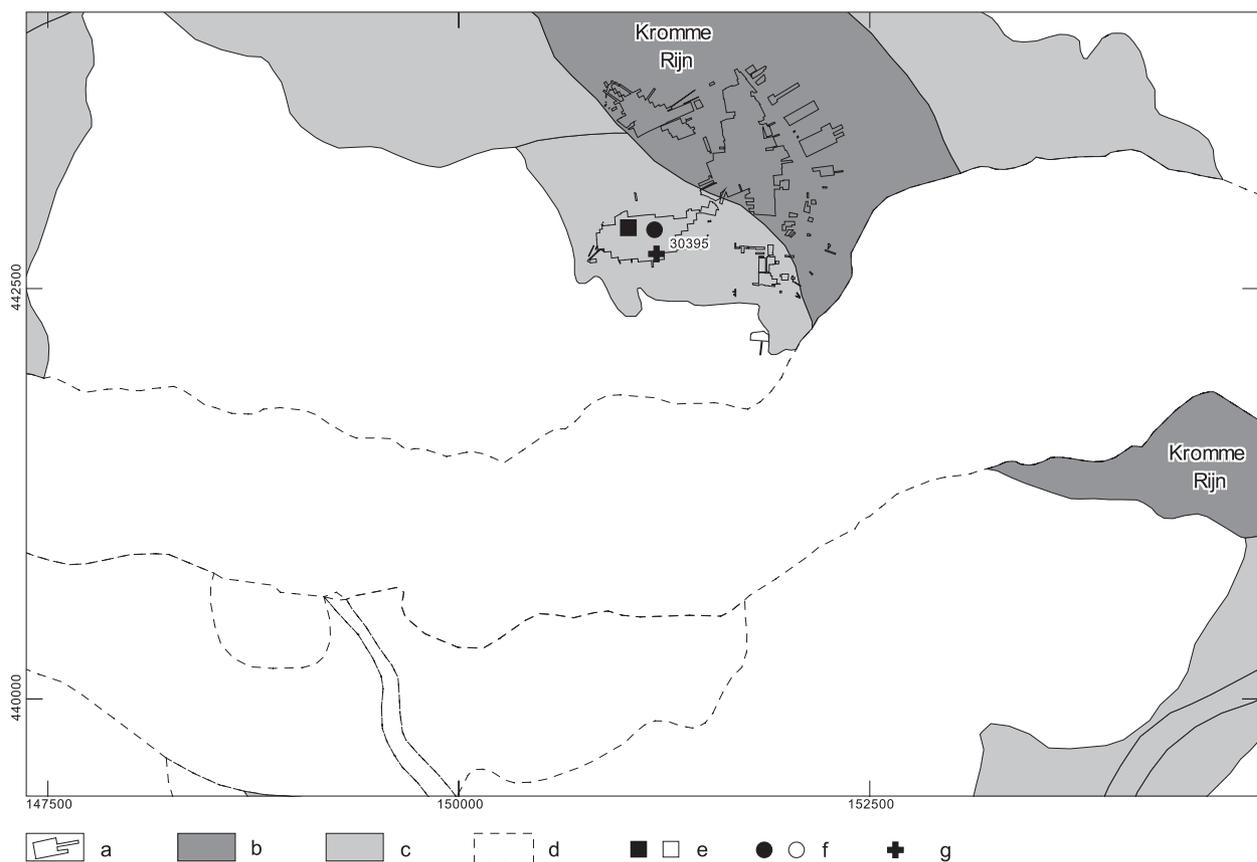


Fig. IV.26 Early Iron Age fluvial systems and find-spots in the Wijk bij Duurstede macro-region (filled symbols indicate certain identifications, outlined symbols indicate unclear identifications).

a: Wijk bij Duurstede excavations, b: active fluvial systems, c: fossil fluvial systems, d: younger fluvial systems, e: pottery, f: features, g: urnfield.

The presence of mineral rich and well-draining crevasse deposits and absence of excessive sedimentation provided an suitable settlement location for Early Iron Age farmers. At De Horden, four houses, some outbuildings and a system of linear ditches are attributed to the Early Iron Age (fig. IV.27; Hessing 1989; Steenbeek 1990, 132; Hessing & Steenbeek 1990, 18-19; Hessing 1991, 46-51). On top of the location of the possible Bronze Age funerary monument,

an urnfield developed. The earliest graves have been dated to the Early Iron Age (*e.g.* GrN-14679: 2500 ± 50 BP; GrN-15989: 2495 ± 35 BP (both charcoal associated with the cremation); Hessing 1989, 325; 1990, 51). Presumably, interment occurred there until the fifth century BC (Hessing 1989, 330).

The roof-bearing structure of the Early Iron Age houses of Wijk bij Duurstede De Horden is comparable to houses of the ‘transitional Hijken’ type described by Huijts for the north-eastern Netherlands (Lanting & Van der Plicht 2003, 166-167; Harsema 2005, 546, *cf.* Huijts 1992, 56-71; Verlinde 1991, 37). With houses of this type, only two rows of roof-bearing posts are found inside the wall. This is different from the Early Iron Age house at Zijderveld (Appendix I, fig. I.21; Hulst 1975b; Theunissen & Hulst 1999b, 163 fig. 4.35) that displayed a roof-bearing structure



Fig. IV.27 Overview (A) of the Early Iron Age habitation and urnfield at Wijk bij Duurstede - De Horden in relation to prior Middle Bronze Age-B occupation traces and two details (B-C).

a: not excavated, b: distribution of Early Iron Age structures, c: distribution of Middle Bronze Age-B structures, d: extent of Early-Middle Iron Age urnfield, e: Early Iron Age ditch system, f: Early Iron Age structures.

which is better comparable to Early Iron Age houses from the southern (and eastern) Netherlands (type 'Ussen -2B'; Schinkel 1998, 190-191, *cf.* Fokkens & Roymans 1991, 93-170; Klomp 2002, 7-10; De Koning & Vaars 2003, 23).

Presumably, again a new phase of more intensive flooding – possibly related to the emergence of the Ravenswaaij and/or Buren fluvial systems (*cf.* Steenbeek 1990, 132; Hessing & Steenbeek 1990, 19-20; Van Zijverden 2004a) – affected the area to the south of the De Horden excavation and possibly ended the Early (to Middle) Iron Age occupation at De Horden (Hessing 1994, 228). Possibly, the occupation shifted to the location of the De Geer excavations, where settlement site traces datable to the Middle and Late Iron Age were documented (Van Es *et al.* 1991, 51; 1994, 43; Van Es 1994, 231-232). The presence of a few Middle and Late Iron Age burials at De Horden shows that the area was still accessible to man, but that it no longer was selected for habitation (Hessing & Steenbeek 1990, 21).

V Palaeogeography and occupation history of the Lienden macro-region

I INTRODUCTION

The Lienden meso-region borders that of Dodewaard (Appendix VI) in the east. Until the construction of the Betuweroute freight railway, few large-scale excavations of prehistoric settlement sites had taken place here. Between 1998 and 2000, a total of 1.7 ha was excavated prior to railroad construction. Both a Middle Iron Age to Roman Period settlement site (Sier & Koot 2001) and a Bronze Age settlement site were uncovered (Schoneveld & Kranendonk 2002). The Roman site, labelled 'Kesteren - De Woerd', had already been intermittently investigated for over 150 years. The Bronze Age habitation had not been a central research theme within the meso-region until the Betuweroute excavations.

History of archaeological research

During the first quarter of the 19th century, the Lienden area received its first systematic archaeological attention. Kesteren was part of the area 'prospected' by the Dutch priest O.G. Heldring, during his strolls through the Betuwe district (Heldring 1838; 1839a, esp. 165-166; 178-182; 1840). Similar strolls were undertaken by the teacher D. Buddingh between 1854 and 1864 (Buddingh 1861; 1865). The efforts by Heldring and Buddingh resulted in knowledge of a series of (early) Medieval, but predominantly Roman period find-spots. In 1881 the curator of the National Museum of Antiquities, W. Pleyte, visited a site near the village of Kesteren known as the '(Hooge) Woerd', where Roman period ceramics, cremation graves and a possible Roman road were discovered (Datema 1974). During subsequent decades, more and more Roman period finds were recovered from this location (*cf.* Heldring 1838, 6; 1840; Heuff 1905; Brenkman 1912; Kalee 1964). The presence of a prehistoric layer – underneath younger layers – in a drainage ditch dug in 1954 at Kesteren - De Woerd, was observed by professor Modderman, who dated the finds from that layer to the Bronze Age (Modderman 1955a, 32). In addition, many more sites were discovered during the combined soil mapping and archaeological coring campaigns executed in the forties of the 20th century (fig. V.1, f; Edelman 1947; Modderman 1949a).

The number of catalogued find-spots furthermore increased with the establishment of two local archaeological groups; the 'Historische Kring Kesteren en Omstreken' in October 1967 and the 'Archeologische Werkgemeenschap Nederland, afdeling West-Betuwe' in May 1968 (De Kleuver & Datema 1968a-b; Hulst 1968a; 1969; 1971a; 1972). In various small-scale campaigns, the State Service for Archaeological Investigations (ROB, now RACM), uncovered Roman period remains from various plots near the centre of the town of Kesteren (Hulst 1968a; 1991b-c; 1995; Hulst & Lutter 1969; Hulst & Noordam 1978; Lauwerier & Hessing 1992).

Fieldwalking and coring campaigns around the planned Betuweroute trajectory were executed by RAAP between 1992 and 1996 (Asmussen 1991; Asmussen & Exaltus 1993, 12-13; Asmussen 1994; 1996). Nine sites were discovered through fieldwalking (RAAP sites 32-40; Asmussen & Exaltus 1993, 34-38), two from studying the State Service for Archaeological Investigation's archives (RAAP sites 74-75; Asmussen & Exaltus 1993, 49) and two by analyzing aerial photographs (RAAP sites 93/99; Asmussen & Exaltus 1993, 52-54). All but RAAP site 39 (= 40) fall within the area subjected to additional coring to better assess the extent, quality and nature of the site (fig. V.3; Asmussen 1994, 32; 57-70). At RAAP sites 37-39 and 75/93, finds-layers with flint, phosphate discolorations and pottery fragments were dated to the Neolithic/Bronze Age period because of their stratigraphic position (Exaltus 1994, 69). Only at site 75 could sherds be dated explicitly to the Bronze Age (Asmussen 1994, 93).

Between 1996 and 1998, test-trenches were executed over a length of 990 m along the planned Betuweroute trajectory. The test-trenched plots are known as sites 14 (west & east; Siemons & Sier 1999b), 15 (Sier & Drenth 1999) and 16 (Siemons & Sier 1999a). All sites yielded finds and finds-layers datable to the Bronze Age. Sites 14E and 15 furthermore evidenced the presence of a deeper (Late Neolithic or Early Bronze Age) vegetation horizon with archaeological material (Siemons & Sier 1999b, 12-13; Sier & Drenth 1999, 10). These remains were interpreted as representing a possible house-site measuring *c.* 20 by 25 m (Sier & Drenth 1999, 21; 25). Whereas sites 14 and 15 yielded Bronze Age features, at site 16 the presence of ubiquitous Roman period features prohibited the deepening

of the trench up to the prehistoric level, explaining the absence of Bronze Age features at this stage (Siemons & Sier 1999a, 13). As all sites (Bronze Age at sites 14 and 15, Roman Period at site 16) were deemed of high quality (Siemons & Sier 1999b, 31; Sier & Drenth 1999, 26; Siemons & Sier 1999b, 19) and as *in situ* preservation was no option, more extensive research was undertaken. Sites 14 and 15 were more extensively investigated in 1998 (Schoneveld & Kranendonk 2002), site 16 was excavated between 1998 and 2000 (Sier & Koot 2001).

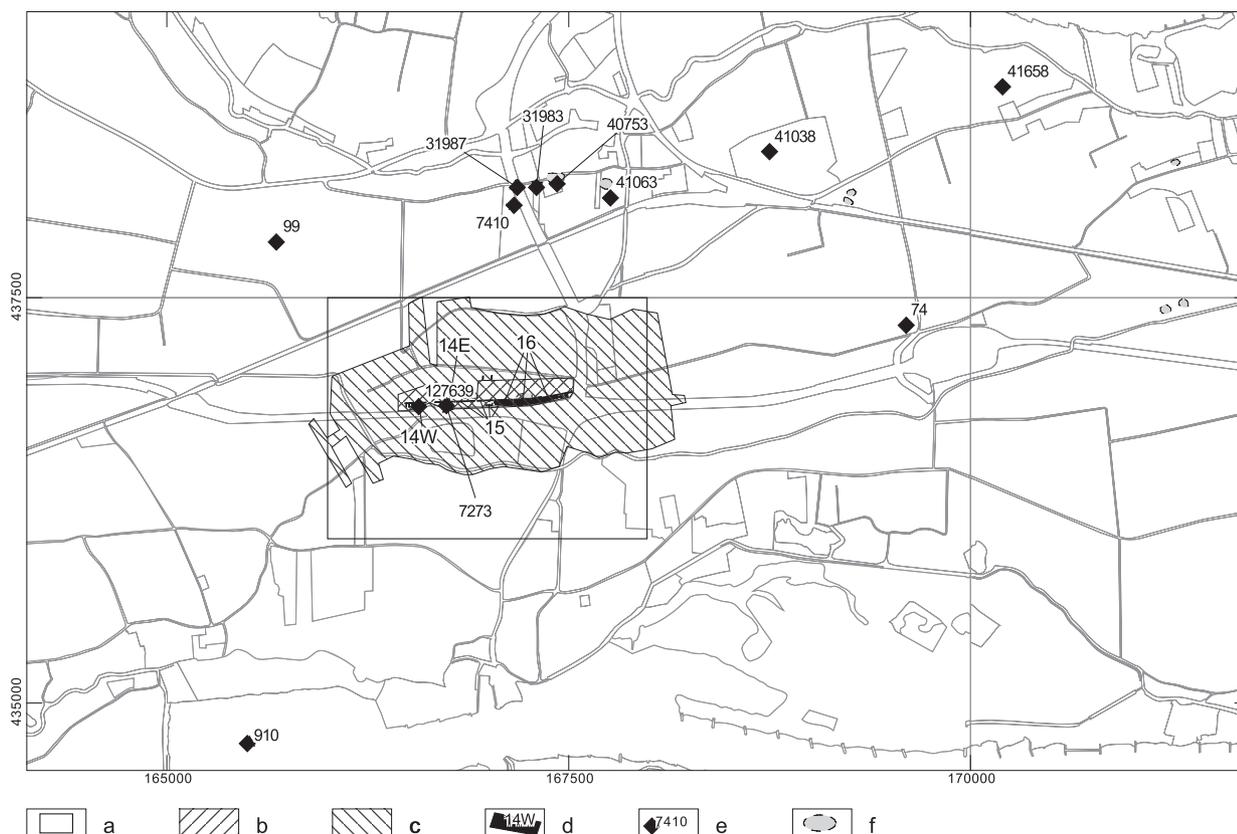


Fig. V.1 Archaeological research in the Lienden macro-region.

a: Lienden meso-region, b: area initially subjected to coring campaign by RAAP, c: area subjected to later palaeogeographical coring campaigns, d: areas subjected to test-trenching and excavation, e: location of find-spots, f: 'ancient settlement soils' according to Havinga (1969; Having & Op 't Hof 1975; 1983).

The geological context

The first systematic enquiries into the geological properties of the region were the soil mapping campaigns published by Egberts (1950) and Havinga & Op 't Hof (1983). Thereafter, the area was mapped between 1971 and 1977 for the geological map published by Verbraeck (1984, 7). Since then, many coring campaigns were executed as part of the fieldwork undertaken by the Department of Physical Geography of the University of Utrecht (*cf.* Berendsen & Stouthamer 2001). Accompanying the Betuweroute excavations, more detailed coring campaigns around the sites were executed (Van Dinter 2001; 2002). The Bronze Age sites from this region are generally situated on top of the stacked levee and crevasse deposits of two main fluvial systems; Kesteren and Westerveld (see fig V.2 for the location of the main fluvial systems). Especially the latter, which is the younger of the two, has – through its crevasse and overbank deposits – predominantly determined the appearance of the micro-topography of the region. After the Bronze Age occupation, crevasse formation related to a reactivation of the Westerveld fluvial system, partially eroded the Bronze Age occupation levels.

APPENDIX V: LIENDEN

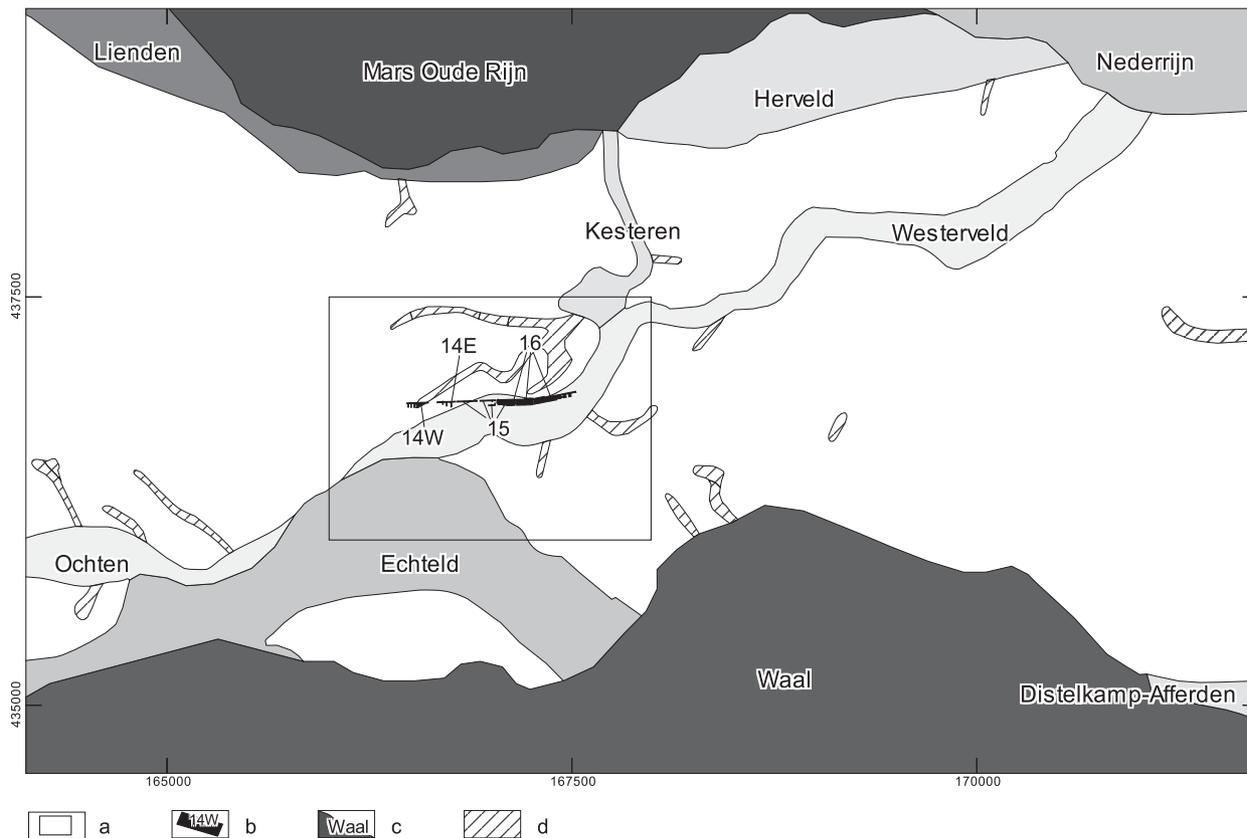


Fig. V.2 Main fluvial systems in the Lienden macro-region.

a: Lienden meso-region, b: areas subjected to test-trenching and excavation, c: fluvial systems (after Berendsen & Stouthamer 2001), d: crevasse splay deposits according to Berendsen, Faessen & Kempen 1994; Berendsen *et al.* 2001.

II SOURCE CRITICISM

Coring campaigns by Egberts and Havinga & Op 't Hof

Series of soil-mapping campaigns allowed the compilation of physiographical maps by Egberts (1950) and Havinga & Op 't Hof (1983). The normal grid density consisted of 9 to 10 corings per hectare to a depth of 1.2 m, supplemented by at least one coring per hectare up to 2.2 m, in order to increase understanding of the general geological structure of region (*cf.* Edelman 1948, 86-87; Edelman *et al.* 1950 7; Egberts 1950, 1; Havinga 1969, 6; Havinga & Op 't Hof 1975, 261; 1983, 1). Evidence for the presence of 'ancient settlements soils' was systematically sought for and documented (Havinga & Op 't Hof 1983, 55-56).

This systematic attention to archaeology, combined with the scale of the fieldwork – mapping entire regions – were undoubtedly beneficial to archaeologists. However, with the density and depth of the majority of the corings, one may expect many sites to have remained undetected. Lastly, the dating of the 'ancient settlement soils' was typically done exclusively by their stratigraphical position.

Fieldwalking and coring campaigns by RAAP

The fieldwalking campaigns by RAAP in the Lienden meso-region yielded no Bronze Age, yet abundant Roman and medieval period remains. Save for three possible Late Iron Age (or Roman Period) sherds from site 41, no prehistoric

pottery was retrieved during fieldwalking near the towns of Kesteren and Lienden (Asmussen & Exaltus 1993, 34-38; Asmussen 1996, 23). Because of the generally greater depth (50-200 cm; cf. Siemons & Sier 1999b, 9) of possible prehistoric remains below the surface, fieldwalking did not prove to be an acceptable technique to prospect for prehistoric sites in this area (cf. Asmussen 1994, 35).

To discover more sites, a coring campaign was executed. The strategy differed on the basis of whether or not a channel-belt was expected. If so, two rows – 50 m apart – with corings every 25 m to a maximum depth of 2.5 m were executed (Asmussen & Exaltus 1993, 108). Where no channel belt was expected, only a single row of corings – with 50 m between individual corings – was used (*ibid.*, for the channel-belts used see Asmussen 1996, Map I). In order to evaluate the quality of the sites already inventoried by RAAP, more detailed coring was executed on the known sites. This entailed two – 20 m offset, individual corings 40 m apart – rows of corings with a maximum depth of 1.25 m (Asmussen 1994, 19; Siemons & Sier 1999b, 8). When archaeological materials were discovered in the corings, the grid was scaled down to a 20 m triangular grid (*ibid.*; Asmussen 1996). In this way, vegetation horizons with archaeological remains that were thought to date (on stratigraphical grounds) to the Neolithic or Bronze Age period were discovered at various sites (fig. V.3; 35-39 75, 93; Asmussen 1994, 61-70; 92-95).

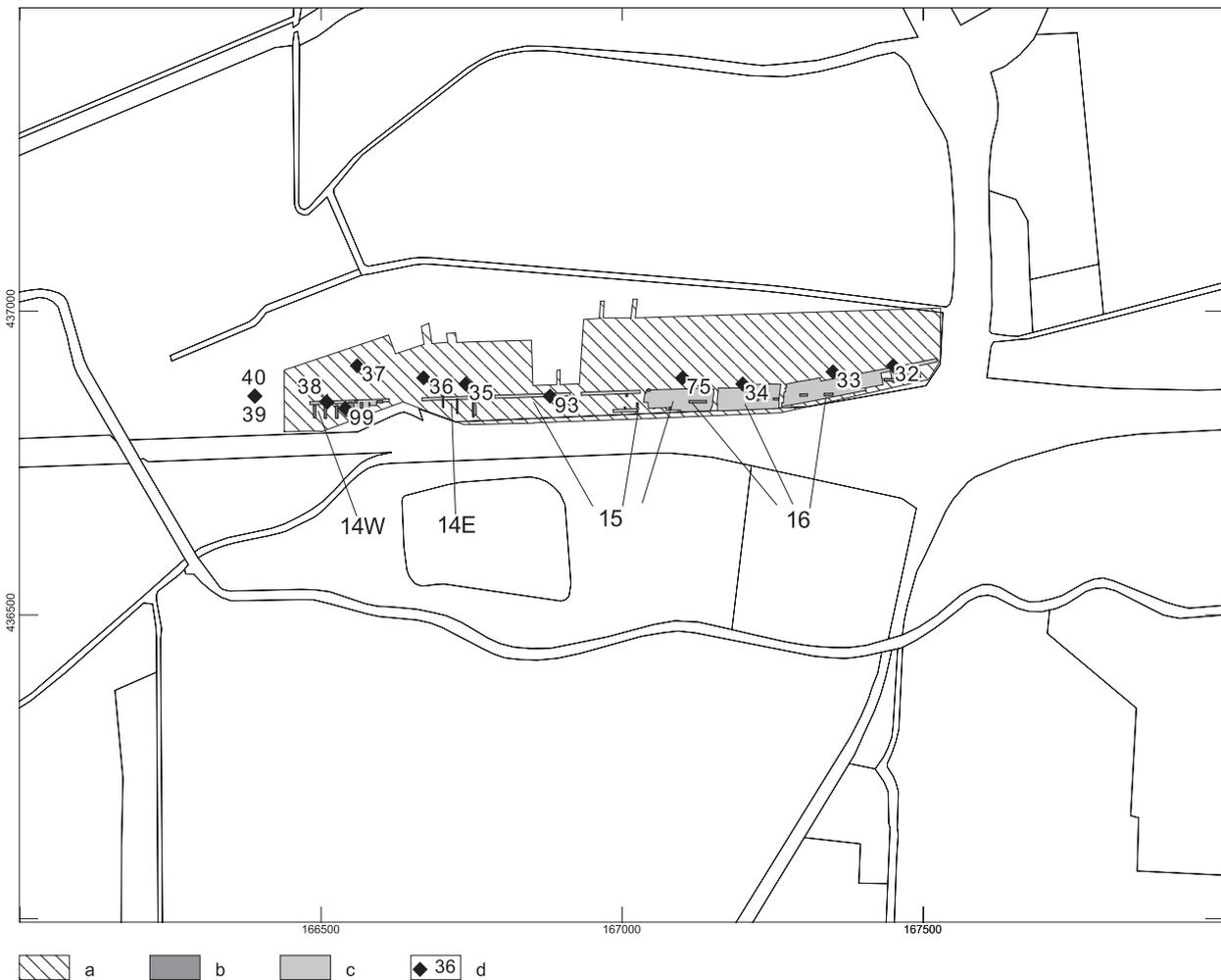


Fig. V.3 Sites indicated by Raap, initial coring area and location of later excavations.

a: area initially subjected to coring campaign by RAAP, b: areas subjected to test-trenching c: areas subjected to excavation, d: location of Raap sites.

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Raap cat no	Fieldwalking	Additional coring	References
32	Y	Y	Asmussen & Exaltus 1993, 34; Asmussen 1994, 57-60
33	Y	Y	Asmussen & Exaltus 1993, 34; Asmussen 1994, 57-60
34	Y	Y	Asmussen & Exaltus 1993, 34; Asmussen 1994, 57-60
35	Y	Y	Asmussen & Exaltus 1993, 35; Asmussen 1994, 61-66; Archis 127576
36	Y	Y	Asmussen & Exaltus 1993, 35; Asmussen 1994, 61-66
37	Y	Y	Asmussen & Exaltus 1993, 36; Asmussen 1994, 66-70
38	Y	Y	Asmussen & Exaltus 1993, 36; Asmussen 1994, 66-70; Archis 127579
39	Y	Y	Asmussen & Exaltus 1993, 36; Asmussen 1994, 66-70
40 (=39)	Y	N	Asmussen & Exaltus 1993, 37
74	N	Y	Asmussen & Exaltus 1993, 49
75	N	Y	Asmussen & Exaltus 1993, 49; Asmussen 1994, 92-95
93	N	Y	Asmussen & Exaltus 1993, 49; Asmussen 1994, 92-95; Archis 34912; 127616; Sier & Schotten 1998
99	N	Y	Asmussen & Exaltus 1993, 54

Table V.I Sites discovered by RAAP in the Lienden meso-area.

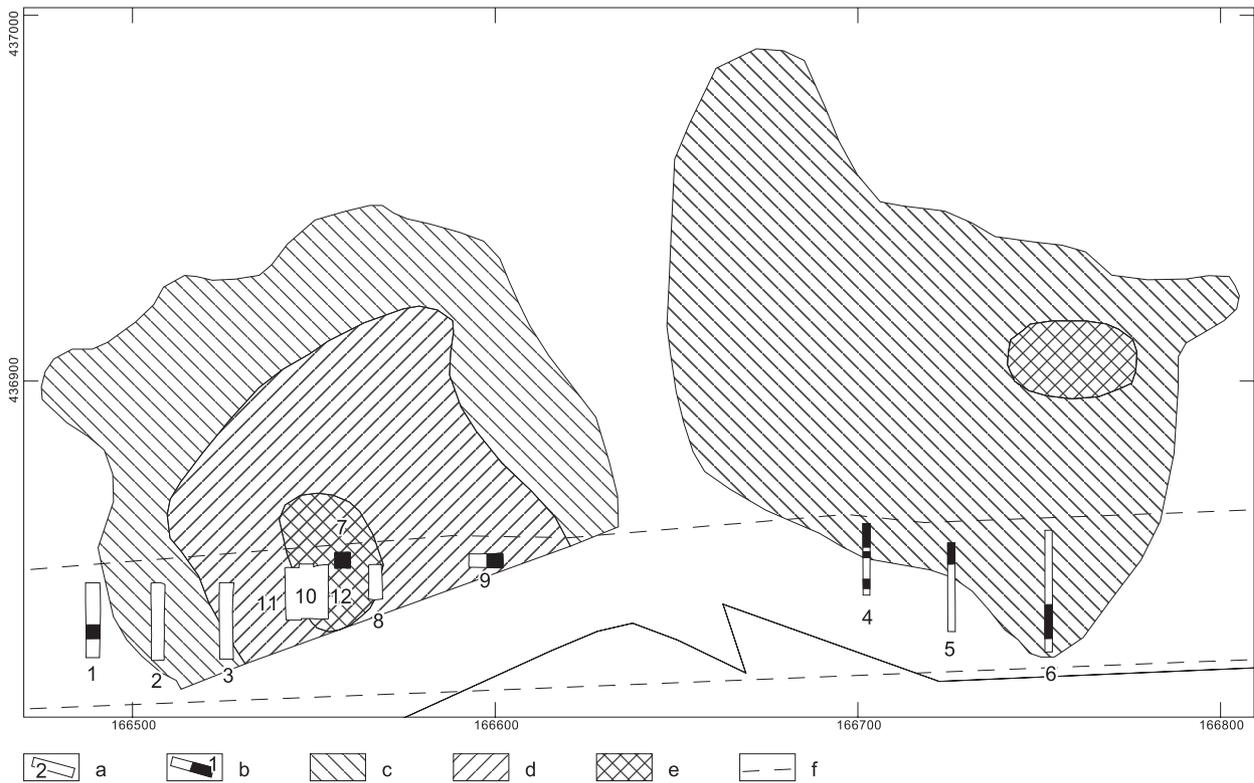


Fig. V.4 Density of archaeological remains according to RAAP coring campaigns and the locations of the railroad trajectory and the test-trenches. Indicated in black are the parts of the trenches that were dug down to the prehistoric level at site 14.

a: test-trenches, b: parts of test-trenches dug down to the prehistoric levels, c: settlement site 'noise' area (boundary zone; incidental indicators), d: settlement site periphery area, e: settlement site core area, f: Betuweroute railway trajectory.

Test-trenches

Between 1996 and 1998, test-trenches were dug to better assess the quality, extent and dating of the sites discovered by the preceding detailed coring campaigns and that were to be disturbed by the definitive Betuweroute railway trajectory (fig. V.4, a-b). It should be noted that the area prospected by RAAP was wider than which was in effect going to be disturbed by construction activities. Therefore, the location of the test-trenches was confined to a smaller

trajectory, often leaving unstudied the densest concentrations of archaeological remains discovered during coring campaigns. Furthermore, the prehistoric level could not be investigated in all trenches.

High groundwater tables, heavy rainfall or the presence of overlying Roman period remains often prohibited lowering of the trench levels (Sier & Drenth 1999, 10; Siemons & Sier 1999a, 10; 1999b, 9-11). Only at site 15 were all trenches dug down to the prehistoric level or levels (Sier & Drenth 1999, 9-10). Effectively, only 224 m² – divided over 13 trenches – of the prehistoric levels were investigated.

Number	Site	Area (m ²)	Trenches	Type of research	References
14	Kesteren Woonwagenkamp (total)	676	12	Test-trenches	Siemons & Sier 1999b
14	Kesteren Woonwagenkamp (prehistoric level)	97	6	Test-trenches	Siemons & Sier 1999b
15	Kesteren Lienden (prehistoric level)	62	6	Test-trenches	Sier & Drenth 1999
16	Kesteren De Woerd (total)	440	6	Test-trenches	Siemons & Sier 1999a
16	Kesteren De Woerd (prehistoric level)	65	1	Test-trenches	Siemons & Sier 1999a
14 & 15	Lienden (Kesteren)	6629	10	Excavation	Schoneveld & Kranendonk 2002
16	De Woerd (Kesteren)	13516	3	Excavation	Sier & Koot 2001

Table V.2 Site numbers, site names, excavated area (m²), numbers of trenches and references.

The reproductions of the trench sections and their finds-distributions often show a peculiar feature; the prehistoric artefact distributions appear to be confined to the humic silty clay underneath the former vegetation horizons, whereas in reality the vegetation horizon had formed in the top of the deposits of humic silty clay with artefacts clustering near the top of these deposits (*cf.* Siemons & Sier 1999a, 11 (fig. 3); 1999b, 13-16 (fig 5-8) versus 37-41). The reproduced sections represent a confusing mix-up of archaeological, lithological and lithogenetical interpretations. The lithological section that was drawn on the basis of additional coring carried out during the test-trenching campaign at site 16 (Siemons & Sier 199a, 27 fig. 16) illustrates that the vegetation horizon which is thought to date to the Middle Bronze Age has been preserved everywhere on the site. Unfortunately, only the eastern part of trench one and the westernmost three meter of trench two were dug down to this level. The fact that no archaeological remains were documented in this layer during the coring campaigns, does not necessarily mean that no archaeological traces or finds are preserved therein. The possibility that Bronze Age remains (especially those other than domestic sites) may continue eastward from site 15 into site 16 could have been better investigated by deepening more test-trenches.

Excavations

The sites 14 (west & east), 15 and 16 were selected for excavation, which was carried out by the ARC (sites 14 & 15, winter of 1999) and ADC (site 16, August 1998- April 2000) excavation compagnies. Some Roman period features were expected to be found in the eastern part of site 15 (bordering site 16), but they were not dealt with in much detail. The Roman period features were drawn in plan and were only occasionally sectioned in order to recover datable finds (Kranendonk & De Voogd 2002, 14). The reverse happened at site 16, where in four trenches (18, 21, 42 & 49, Sier & Mulder 2001, 22) the Bronze Age feature level was uncovered, but the results have not been published (fig. V.5). The Roman period features at site 16 in trenches 10 and 11 were not sectioned, in order to not disturb the Bronze Age layer underneath.

In order to better understand the environmental setting of the prehistoric sites, again additional coring campaigns were executed (fig. V.1, c). A total of 366 corings, with depths between 1.2 and 5.5 metres were analyzed (Van Dinter 2001, 54-55; 2002, 33-35). These corings were used to locate and better define the extents of the prehistoric sites (fig. V.6).

The presence of the (rare) finds-layers that predated the Middle Bronze Age activities was one of the criteria to claim that sites 14 and 15 were worthy of preservation, necessitating excavation (Siemons & Sier 1999b, 31-32; Sier & Drenth 1999, 24-25). However, it was thought – despite opposing claims by the physical geographers (Kranendonk & De Voogd 2002, 18) – that the parts of the sites dating to these periods within the railroad trajectory were sufficiently deep as not to be disturbed by the actual railway construction itself. Thus, the deeper (presumably

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Fig. V.5 Bronze Age remains uncovered at site 16 (Kesteren - De Woerd; Sier & Koot 2001).

a: test-trenches, b: excavation trenches, c: Bronze Age feature level uncovered, d: Bronze Age feature level preserved.

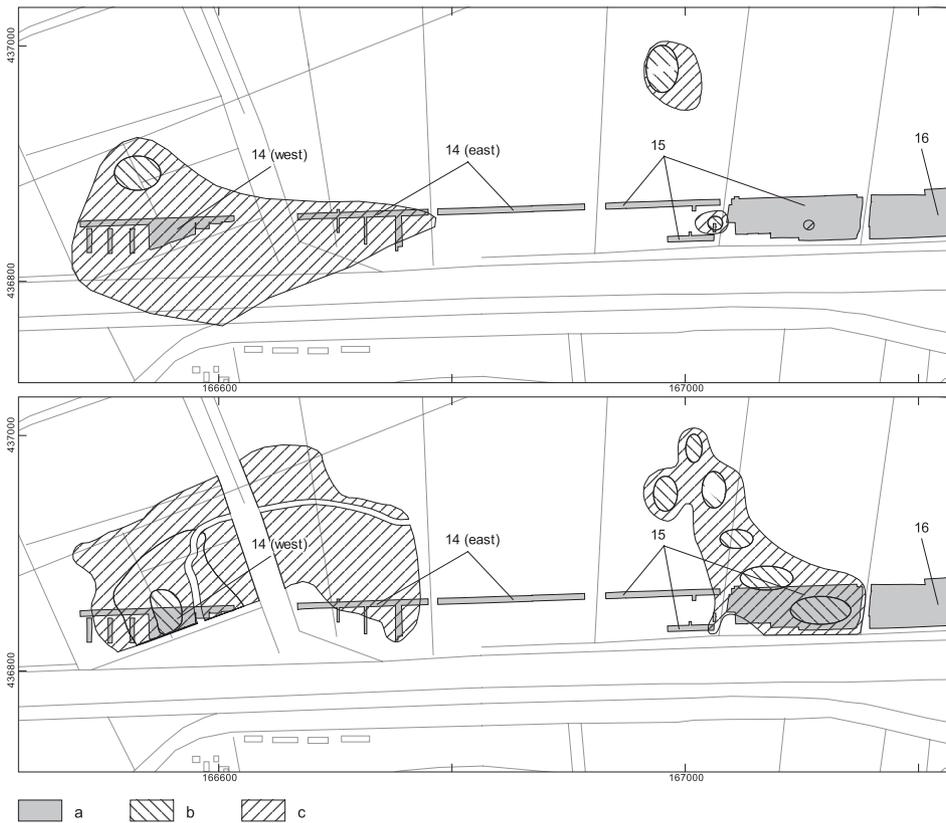


Fig. V.6 Excavated areas, core areas (b) and peripheries (c) of sites as established by coring for the Early Bronze Age (top) and Middle Bronze Age (bottom) at Lienden sites 14 to 16.

a: excavation trenches, b: settlement site periphery areas, c: settlement site core areas.

Late Neolithic to Early Bronze Age) level at sites 14 and 15 has only scarcely been investigated. Unfortunately, no map has been published that indicates which trenches were dug down to the early (Bronze Age) levels.

The Middle Bronze Age occupation levels were studied in detail. The Middle Bronze Age vegetation horizon which contained most finds was excavated in squares measuring 2.5 m by 5 cm in depth, allowing for moderately detailed finds-distribution analyses. Nonetheless, the excavated areas were confined to those areas that were thought to yield the highest concentration of finds and features. This has left areas with lower numbers of features (and finds) unexcavated (*e.g.* the southwest corner of site 14W, entire surface at site 14E and the area between the two test-trenches at site 15 where they meet up with the larger excavation of site 15), which are areas that may have offered a good insight into the layout and structure of the buildings formerly present. Furthermore, many of the structures reconstructed for the Middle Bronze Age occupation phases have few parallels elsewhere. The validity of some of the structures proposed must be seriously doubted (see below).

The Bronze Age levels showed few later human disturbances at site 14 and 15. Only the deepest parts of some Roman period gullies at site 15 penetrated down into the Bronze Age level (Buitenhuis *et al.* 2002, 232-233). However, crevasse formation by younger systems has eroded a considerable part of the Middle Bronze Age surface level. During the Early or Middle Iron Age, a downstream levee-breach of the Echteld fluvial system into the (fossil) residual gully of the neighbouring Westerveld system, induced crevasse formation from the fossil Westerveld levees into the northern floodbasin. This is the crevasse formation on which the Roman period occupation took place (fig. V.7).

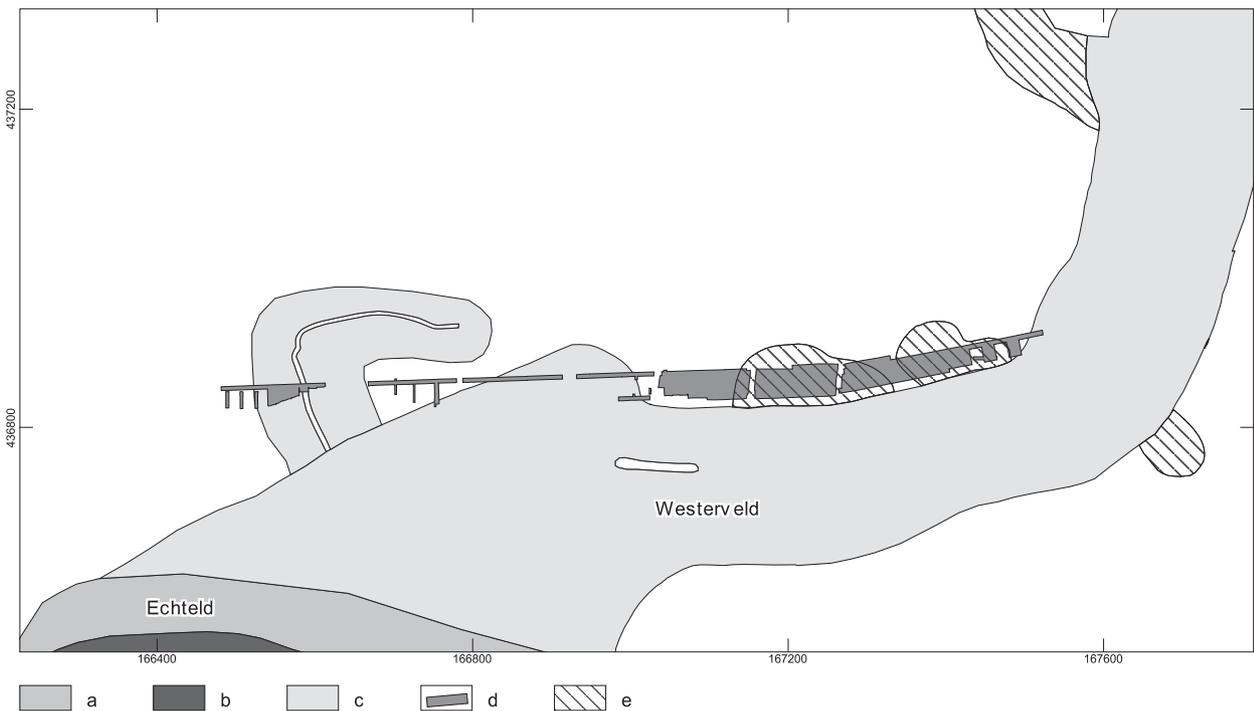


Fig. V.7 The fourth phase of crevasse formation at Lienden sites 14 to 16 (after Van Dinter 2001; 2002; Van Zijverden 2005).

a: levee deposits of the Echteld fluvial system, b: main gully of the Echteld fluvial system, c: Westerveld fluvial system, d: excavation trenches, e: crevasse splay deposits (phase 4).

During the Roman period, presumably during the 1st or 2nd century AD, many deep crevasse gullies formed at site 15 and 16 (fig. V.8), which eroded up to 20% of site 15, often cutting down to the Bronze Age level (Van Dinter 2002, 48).

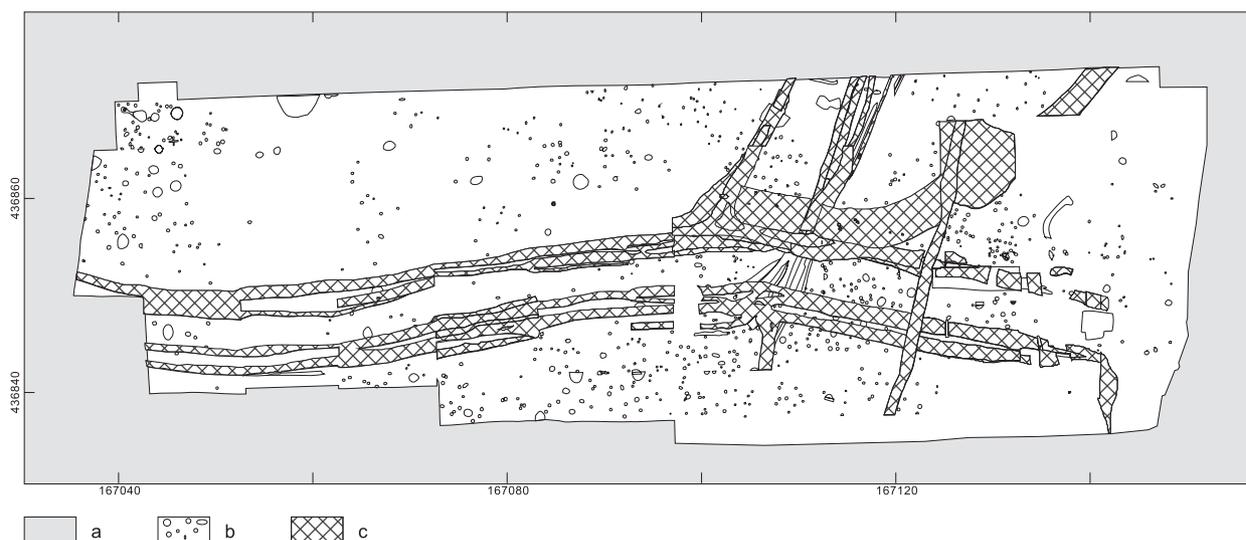


Fig. V.8 Roman period crevasse gullies (phase 5) at Lienden site 15.

a: not excavated, b: excavated area at Lienden site 15 with Bronze Age period features, c: later (phase 5; Roman period) crevasse gullies.

III OCCUPATION HISTORY AND PALAEOGEOGRAPHICAL DEVELOPMENT

Early and Middle Neolithic

The first Holocene fluvial deposits in the region, overlying gravely deposits of Late Pleistocene braided rivers, are the 30-80 cm thick loamy and sandy floodbasin deposits of the first meandering rivers (Van Dinter 2002, 38-39). Presumably, predecessors of the Rhine and Waal (e.g. the Herveld and Distelkamp-Afferden fluvial systems) passed through the north and south of the meso-region, but these fluvial systems have been largely eroded by their successors (fig. V.9). Only a small area of the Herveld channel-belt is left undisturbed in the north (fig V.2, see Appendix VI (Dodewaard) for dating of the Herveld system). During most of the Holocene, only floodbasin sediments were deposited in the central part of the Lienden meso-region. This explains the relative scarcity of finds datable to the Early and Middle Neolithic from this area. Of the single find that *is* datable to this period, a stone axe described as originating “from Kesteren”, it is unclear where exactly it was found (no 41038, Archis 41038 and Holwerda *et al.* 1908). About a kilometre to the west of the study area, presumably related to the presence of the Ommeren channel deposits, Middle Neolithic finds are more common (*cf.* Hulst 1990; Archis 17899; 40497; 7699; 40498).

As direct dates are absent, it is assumed that somewhere in the final fourth or early third millennium BC the Kesteren channel emerged (Van Zijverden 2005; Berendsen & Stouthamer 2001, 211). The channel deposits are remarkably small (± 70 m) for a system in this part of the river area and this suggests that the Kesteren system may have started as a crevasse gully from the Herveld fluvial system to the north of it.

In the southern part of the micro-region, crevasses also formed. Again, there is no direct dating evidence and it is unknown from which fluvial system they originated (Van Zijverden 2005; Van Dinter 2002, 48). Possibly, they originated from a now eroded downstream connection of the Distelkamp-Afferden channel belt (see Appendix VI (Dodewaard) for dating of the Distelkamp-Afferden fluvial system).

Late Neolithic

At the end of the third millennium BC, a new fluvial system (called Westerveld) crosses the Lienden meso-region. Once more, no direct dates are available for this system. The Westerveld channel deposits do appear to be stratigraphically younger than those of the Kesteren fluvial system, and have largely eroded the earlier Neolithic crevasse splays in the southern part of the micro-region Lienden (Van Zijverden 2005; Van Dinter 2002, 40). The best estimate for the start of sedimentation by the Westerveld system forms the dating of the finds from the vegetation horizon on the

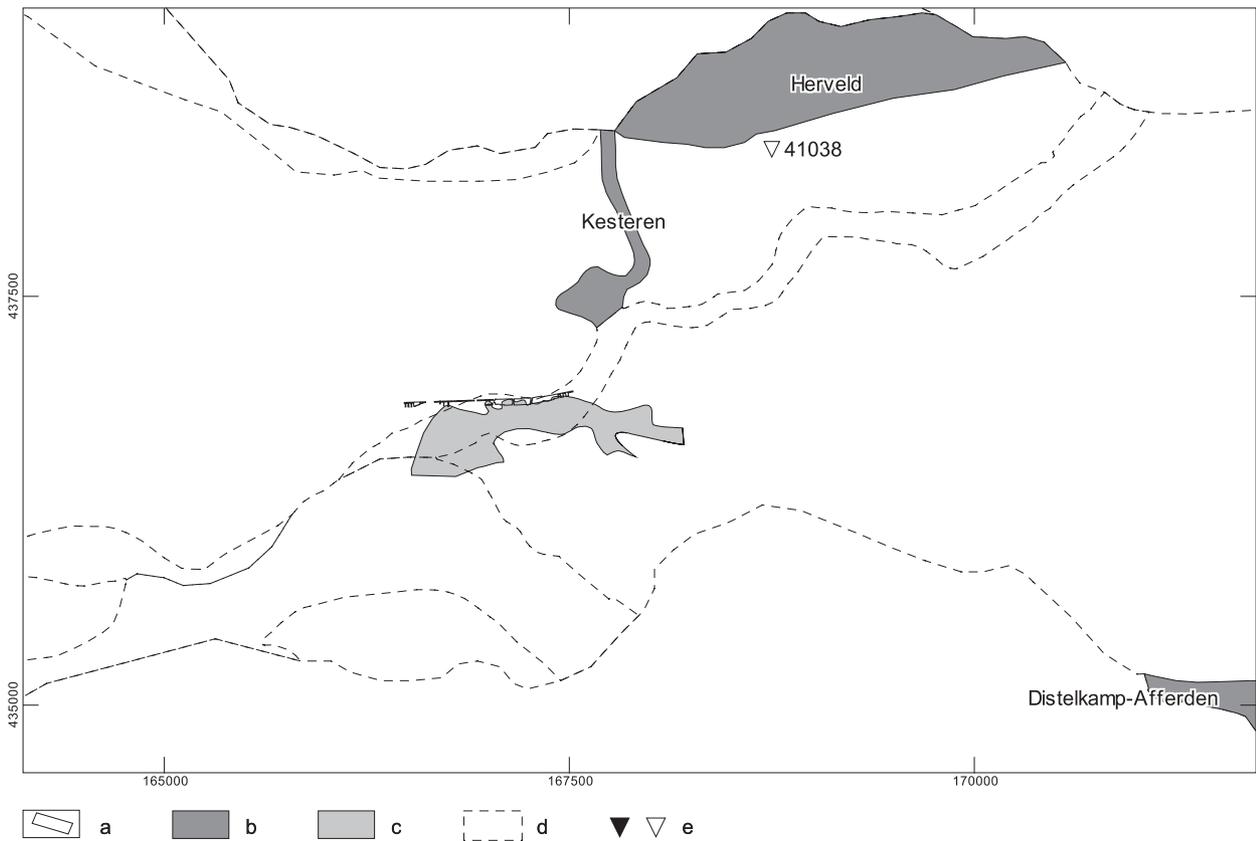


Fig. V.9 Early- to Middle Neolithic fluvial systems and find-spots in the Lienden macro-region (filled symbols indicate certain identifications, outlined symbols indicate unclear identifications).

a: excavation trenches, b: active fluvial systems, c: fossil crevasse splay deposits, d: younger fluvial systems, e: tools.

lowermost associated crevasses uncovered in the test-trenches. Six typologically late (c. 2300-2000 cal BC) Bell Beaker sherds were recovered from the lower (and upper) vegetation horizon of trench four and in the vegetation horizon of trench six on site 14E (Siemons & Sier 1999b, 23-23; 79), suggesting a start date for the Westerveld system before or during the last few centuries of the Late Neolithic-B.

A single posthole was found underneath the Late Neolithic (and/or Early Bronze Age) vegetation horizon in trench 14E-4 (Siemons & Sier 1999b, 19) but it was void of datable materials. From the Middle Bronze Age vegetation horizon in trench 7 at site 14W, a flint arrowhead with concave base was recovered that cannot be dated precisely, but may date to the Late Neolithic (Siemons & Sier 1999b, 28, 79; but see Schoneveld 2002b, 265 where a Middle Bronze Age date is claimed). Of another flint barbed-and-tanged arrowhead, which may be Late Neolithic in date, it cannot be reconstructed where on site 14 it was found (Siemons & Sier 1999b, 28 fig. 25). Three sherds that were recovered during the excavation of site 14 are thought to belong to the Bell Beaker period, but no information on where they were found has been published (Ufkes 2002a, 99; Schoneveld 2002a, 228). Outside the micro-region, a flint arrowhead with a concave base was found together with some worked and unworked flint and stones in a construction site in the centre of the town of Kesteren (fig. V.10, no 40753; Hulst 1969; Archis 40753). Again, the dating of this arrowhead is insecure.

Early Bronze Age and Middle Bronze Age-A

No new fluvial systems came into being in the meso-region during the Early Bronze Age and Middle Bronze Age-A periods, and a vegetation horizon could form in the top of the crevasse deposits by the Westerveld system referred to above. In this vegetation horizon, which also yielded some Late Neolithic ceramics (see above), some 'Barbed Wire'-

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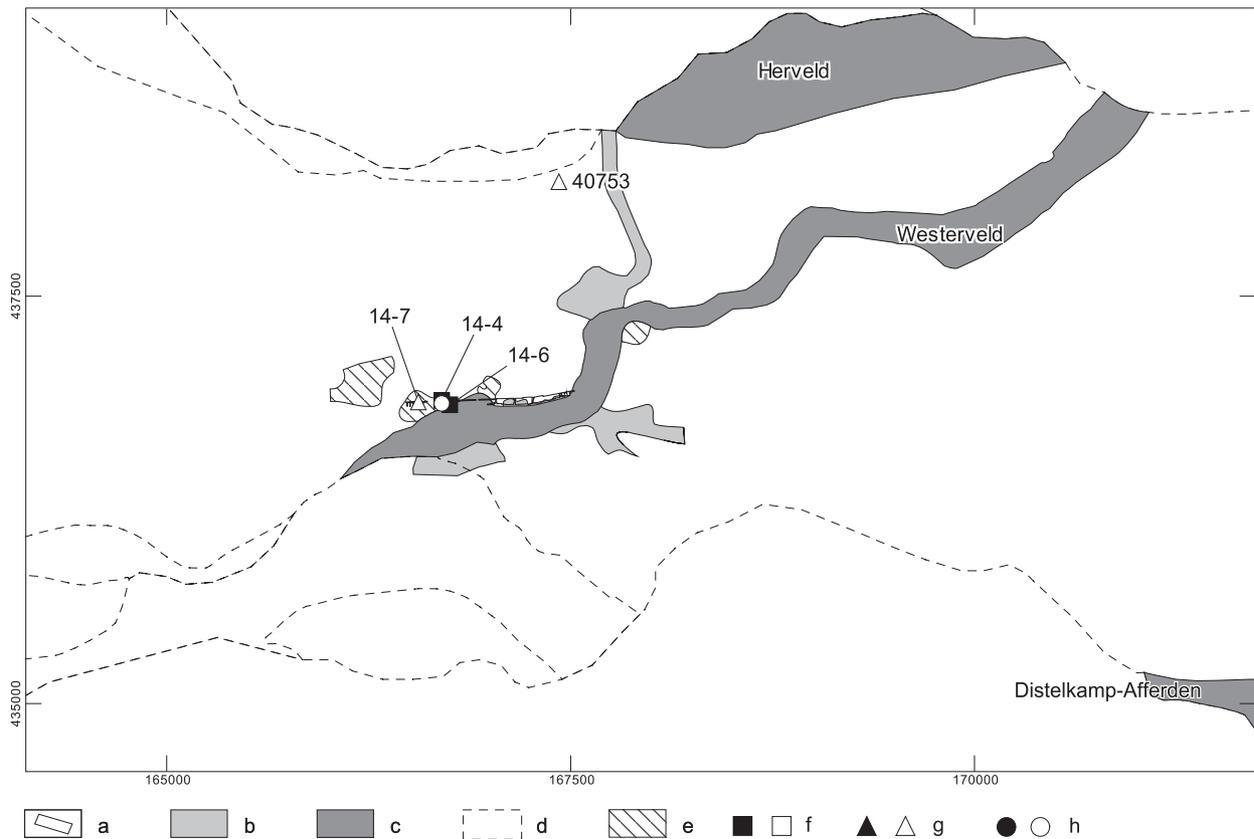


Fig. V.10 Late Neolithic fluvial systems and find-spots in the Lienden macro-region (filled symbols indicate certain identifications, outlined symbols indicate unclear identifications).

a: excavation trenches, b: fossil crevasse splay and levee deposits, c: active fluvial systems, d: younger fluvial systems, e: crevasse splay deposits, f: pottery, g: weapons, h: features.

stamp decorated beaker (BWB) and potbeaker ceramics were found (fig. V.11). Two barbed wire-stamp decorated sherds were found in trench six of site 14E (Siemons & Sier 1999b, 80) and at least five from the lowest vegetation horizon in trench six of site 15 (Sier & Drenth 1999, 14; 17). In both cases these BWB sherds were associated with potbeaker sherds (Siemons & Sier 1999b, 23-24, 79; Sier & Drenth 1999, 17). Both vegetation horizons in trench four of site 14E also yielded potbeaker and possible BWB sherds (lower level eight potbeaker, 12 possible BWB, upper level one potbeaker, lower level 8 potbeaker sherds (Sier & Drenth 1999b, 22; 79)). During the excavation of site 14, two potbeaker fragments and a single BWB sherd were recovered, yet no information on their context was published (Ufkes 2002, 99; Schoneveld 2002a, 228). During the watching brief accompanying the actual Betuweroute construction, a pit with potbeaker ceramics, charcoal and bone was documented (no 7273; Schutte 2003b, 15-16). Unfortunately, potbeaker decorative techniques occur both in the Late Neolithic as well as in the Early Bronze Age, making it impossible to assign any of the potbeaker sherds with certainty to the Early Bronze Age. Outside the micro-region, Early Bronze Age features have been discovered in the (Roman period) excavations by the State Service for Archaeological Investigations (ROB, now RACM) at Kesteren-Nedereindsestraat, but they have not yet been published in full (Hulst 1991c, 46; Hulst 1995; Archis 31983 & 31987).

Clear evidence for pottery displaying Hilversum-style decoration, that could indicate activities during the Middle Bronze Age-A, is absent. Only four sherds – one from the lower level of trench six on site 15, two from the excavation at site 14 – display decorative techniques or pot-morphology reminiscent of Hilversum-style pottery, but the identification is very insecure (Sier & Drenth 1999, 17; Ufkes 2002a, 95-96).

Somewhere at the end of this period, the Westerveld system (once again) had a phase of extensive crevasse formation (fig. V.12; Van Dinter 2002, 50; Van Zijverden 2005). One may speculate that the absence of finds datable

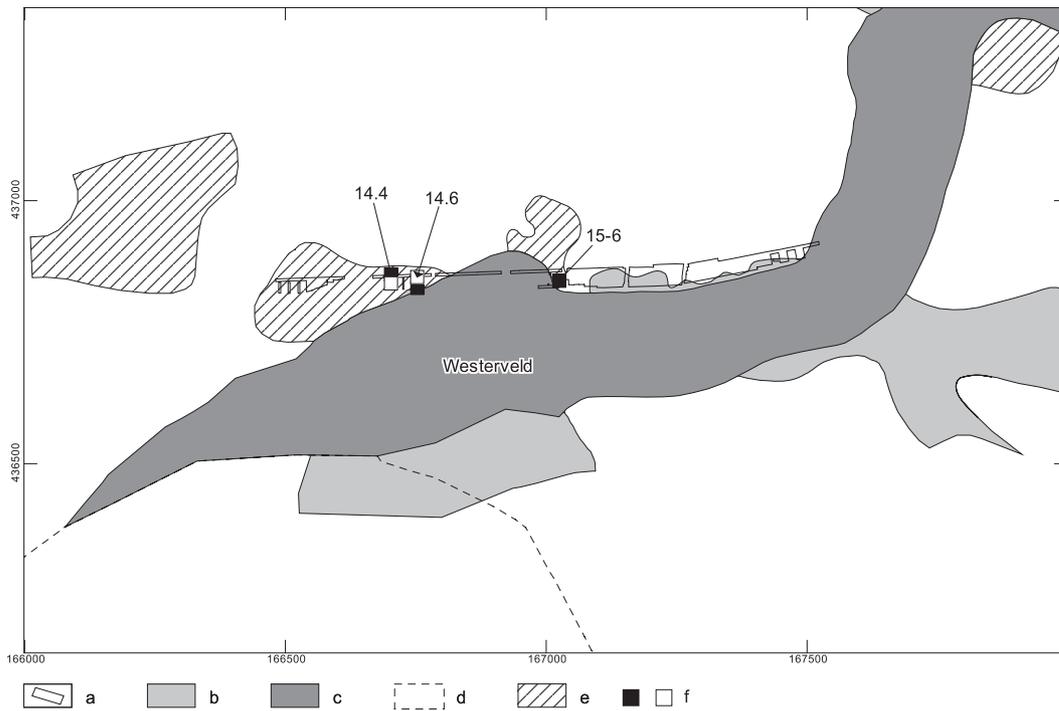


Fig. V.11 Early Bronze Age to Middle Bronze Age-A fluvial systems and find-spots in the Lienden macro-region (filled symbols indicate certain identifications, outlined symbols indicate unclear identifications).

a: excavation trenches, b: fossil crevasse splay and levee deposits, c: active fluvial systems, d: younger fluvial systems, e: crevasse splay deposits, f: pottery.

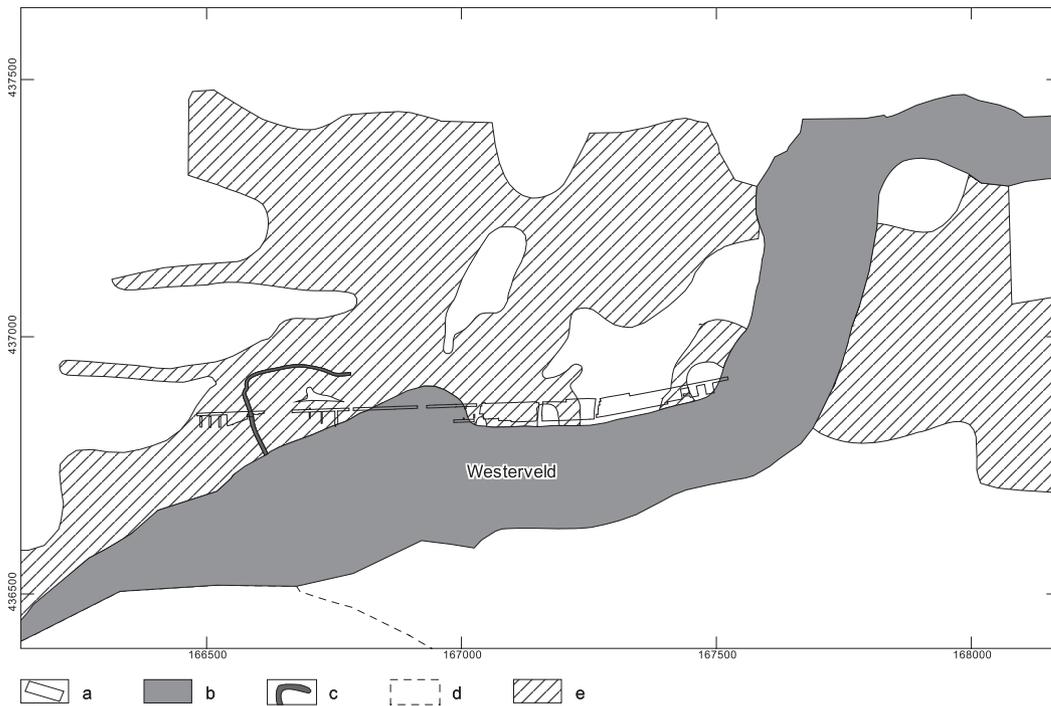


Fig. V.12 Middle Bronze Age(-A?) crevasse formation in the Lienden macro-region.

a: excavation trenches, b: active fluvial systems, c: crevasse residual gully, d: younger fluvial systems, e: crevasse splay deposits.

to the Middle Bronze Age-A could imply that this crevasse formation took place during the Middle Bronze Age-A, but conclusive arguments are lacking. It is, however, clear that the features and finds that can be attributed to the Middle Bronze Age-B (see below), are found associated with the vegetation horizon that had formed in the top of these crevasse deposits.

Middle Bronze Age-B

During the Middle Bronze Age-B crevasse formation had ceased. One of the residual crevasse gullies silted-up during the Bronze Age occupation (as finds and a radiocarbon date (GrA-16183: 3240 ± 70 BP; Van Dinter 2002, 46) from the residual gully indicate), but may have occasionally been flooded. The presumed end of sedimentation by the Westerveld fluvial system around *c.* 1740-1410 cal BC is based on a residual gully date of the upstream connection, the Homoet-Kamp fluvial system (UtC-2607: 3290 ± 70 BP; Berendsen & Stouthamer 2001, 243; Van Zijverden 2005; but see Van Dinter 2002, 50 who assumes a gradual decrease in fluvial activity until a full stop in the Early Iron Age). The water level in the residual crevasse gully will not have exceeded two meter in depth and by the end of the Middle Bronze Age-B occupation, the gully was only 75 cm deep and a vegetation horizon started to form in the former crevasse gully proper (Van Dinter 2002, 45-46). Presumably, the decrease in activity of the Westerveld system favoured occupation in various other parts of the meso-region as well (fig. V.13). A Bronze Age vegetation horizon containing ceramics, flint, stones and bones was discovered in a sewerage trench near Kesteren - Fruitstraat (no 41063, Hulst 1971a; Archis 41063). A Middle Bronze Age-B dagger was recovered from the Waal near IJzendoorn (no 910, Fontijn 2003, 339). Havinga & Op 't Hoff (1975; 1983) discovered seven 'ancient settlement' areas in the north-west of the meso-region, but because no additional research has been carried out, their exact age and nature remains insecure.

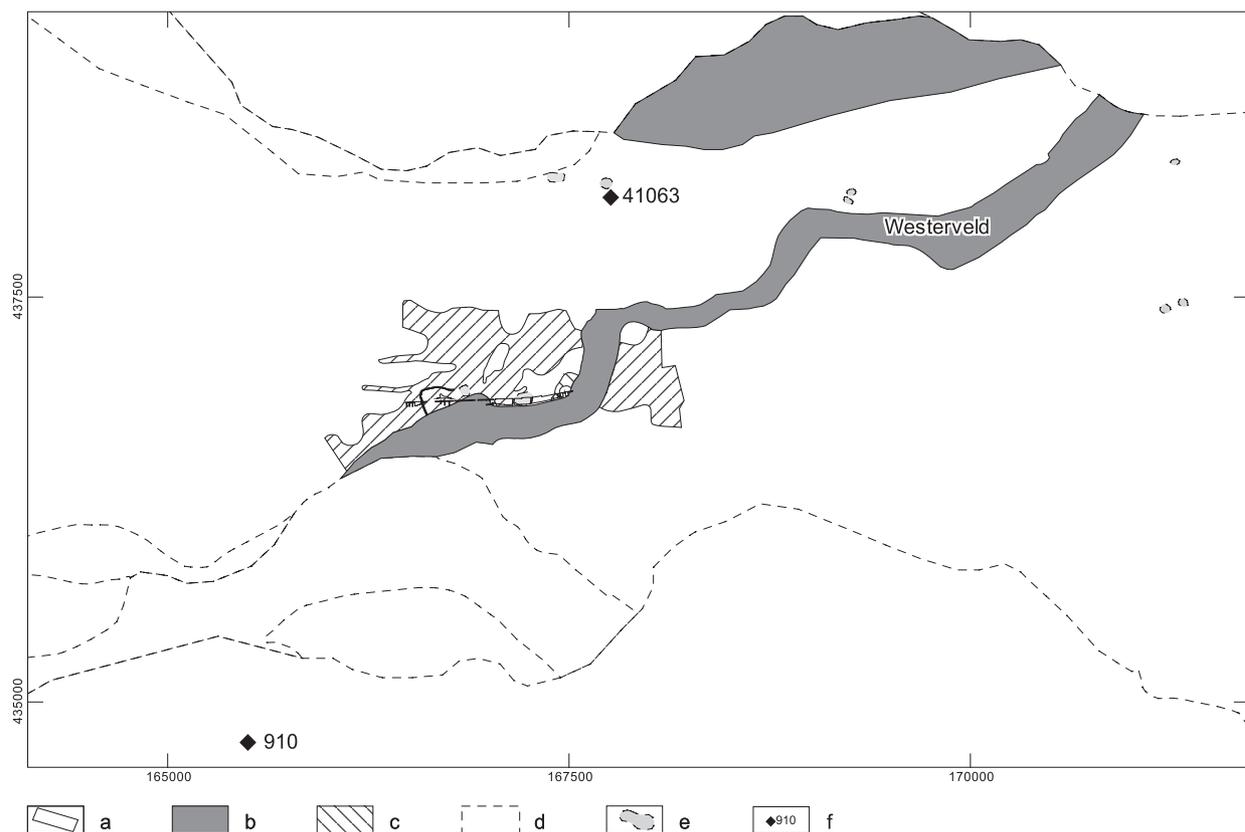


Fig. V.13 Middle Bronze Age-B fluvial systems and find-spots in the Lienden macro-region.

a: excavation trenches, b: active fluvial systems, c: crevasse splay deposits, d: younger fluvial systems, e: 'ancient settlement soils' according to Havinga (1969; Having & Op 't Hof 1975; 1983), f: Middle Bronze Age-B find-spots.

It is only for the part excavated in the Betuweroute railroad trajectory, that more detailed insight into the nature of the Bronze Age occupation of the Lienden area can be gained. Bronze Age settlement traces clustered in two locations, site 14W and the eastern part of site 15, where they were uncovered in more extensive excavation (fig. V.14, B-C).

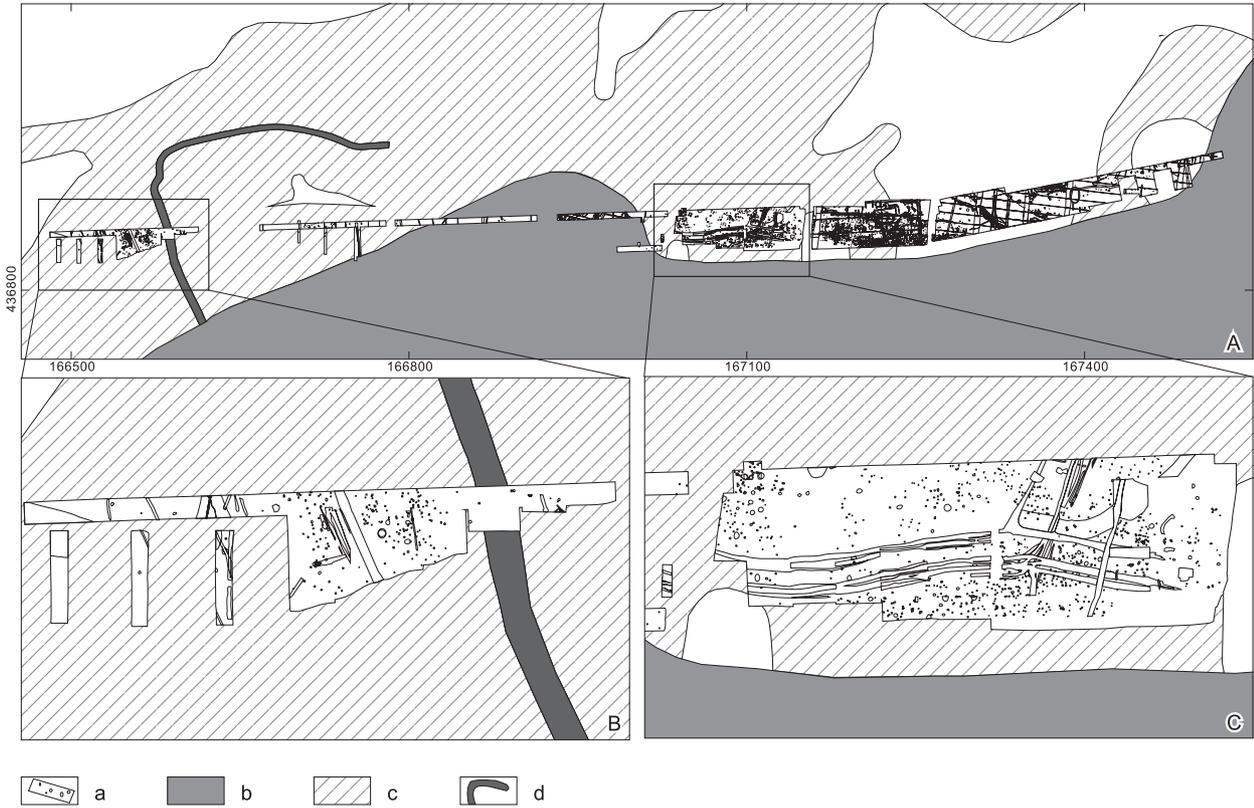


Fig. V.14 Overview (A) and details (B-C) of the all-feature plan for the Bronze Age levels at the Lienden excavations in relation to the underlying fluvial deposits.

a: Bronze Age feature levels in excavation trenches, b: levee deposits of the Westerveld fluvial system, c: crevasse splay deposits, d: crevasse residual gully.

The ground plans of the houses and barns reconstructed from the excavation plans form a very heterogeneous group, with large variation in the placement of posts both within, as well as between the different reconstructed buildings. Often, posts were not recovered where they – if predictable by the regularity of the ground plan – were expected. This absence is rarely accounted for in the publication (*cf.* fig. V.15; V.17), while valid explanations (*e.g.* recent disturbances, eroded by later crevasse activity) may have strengthened the interpretations (De Voogd & Schoneveld 2002). Furthermore, it is unknown which features were grouped into structures during fieldwork, and which ones afterwards. Consequently, the validity of a number of reconstructed buildings must be questioned.

Within the Bronze Age feature cluster at site 14W, the excavators recognised one house plan (D; fig. V.15, no 1) and a possible second one (B; fig. V.15, no 3). The structures indicated as A, C, D' and E were interpreted as barns (figs. V.15; V.16; De Voogd & Schoneveld 2002, 58-59). All but structure D lack the regularity in ground plan that is typical of later (Middle Bronze Age-B) Bronze Age buildings (Arnoldussen 2008, section 5.2.3.4). During fieldwork, a structure was already suspected at the location of structure D (T. Hamburg, pers. comm., Aug. 2005). The structures B' and C may represent the remainder of raised granaries – albeit slightly skewed in ground plan – of which the fact that structure C was reconstructed in an area with low-feature density may add some more strength to the feature association. As for structures A, B, D' and E the posthole-placement is irregular, posts are unexplainably absent, posts of different sizes and depth are grouped into single structures and no adequate parallels are known, sufficient arguments are lacking to maintain an interpretation as reliable structures.

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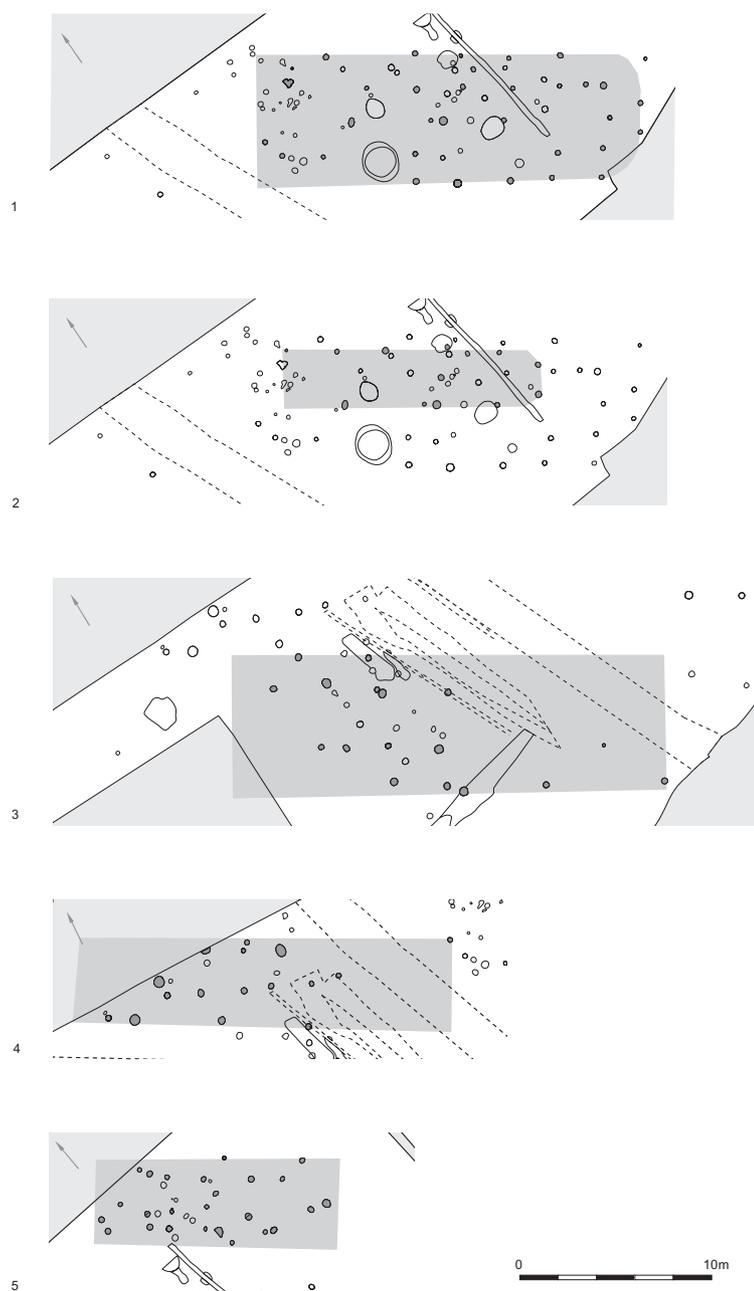


Fig. V.15 Claimed Middle Bronze Age-B structures at Lienden - site 14W(est), all to same scale (1: structure D, 2: structure D', 3: structure B, 4: structure A, 5: structure E).

The dense clutters of features can be used to reconstruct endless other configurations, of which fig. V.16 is an example. Although some feature variables (such as feature dimensions and depth) have been used in drafting this example, it is inherently as weak as the reconstructions published, since the most important observations in grouping features into structures (likeness of features) should have been done during fieldwork. The example's purpose is solely to illustrate the problems – or ease – in reconstructing 'structures' from post-clutters and consequently the interpretations offered in the lower part of fig V.16 are highly tentative.

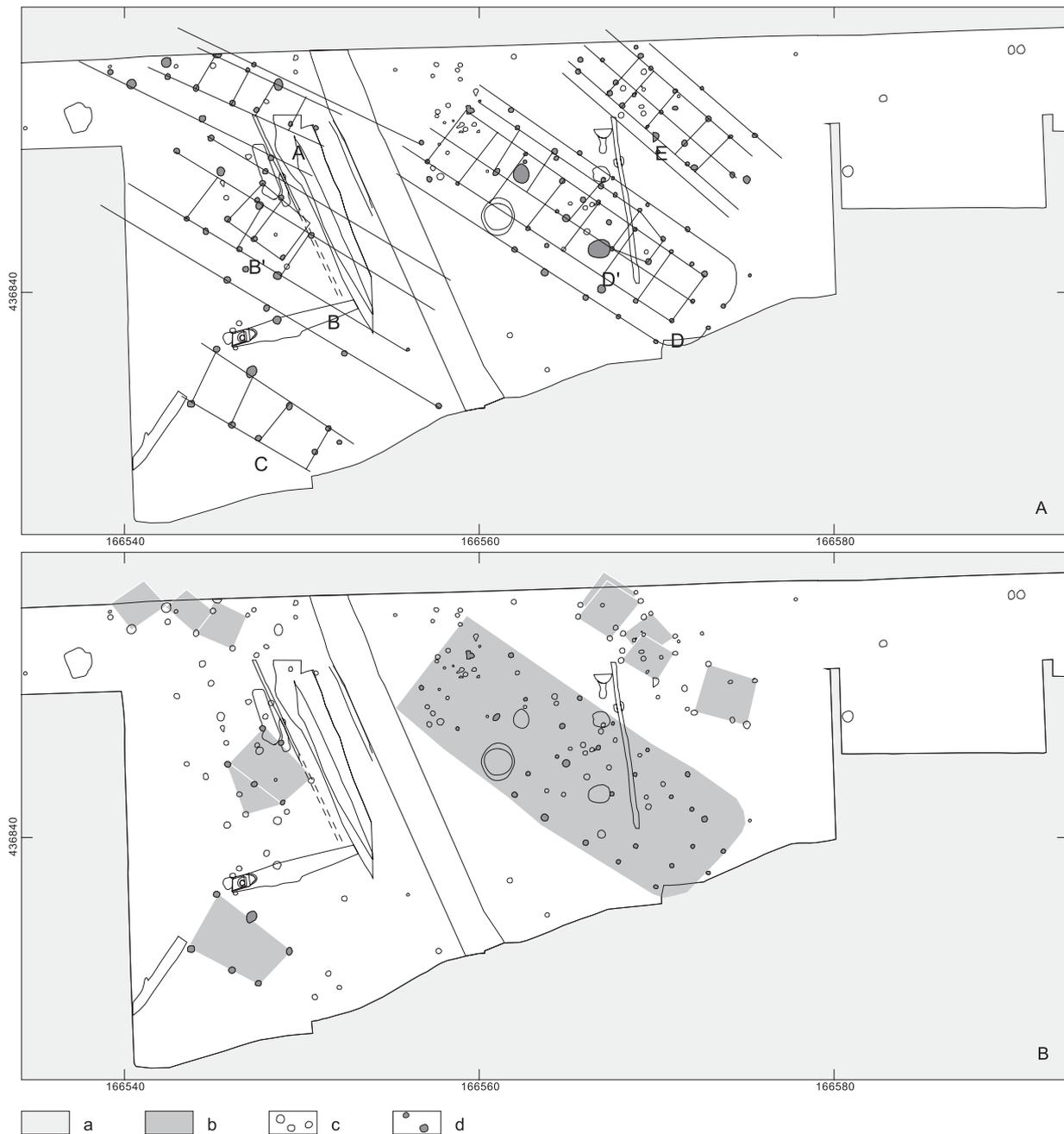


Fig. V.16 Original (A; after Schoneveld & De Voogd 2002) and re-interpretation (B) of the middle Bronze Age-B structures at Lienden - site 14 (West).

a: not excavated, b: reliable and tentative ground plans of structures, c: other features, d: features associated to structures.

A similar exercise has been done for the cluster in the eastern part of site 15. There, a comparable array of peculiar structures had been reconstructed. Of the four claimed house plans (P, C, K and L), the latter two are too incomplete and too a-typical to maintain their interpretation (see fig. V.17). The southern part of structure C display the regularity and dimensions typical of a later (Middle Bronze Age-B) Bronze Age building, but the northern half consists of an irregular grouping of pits and posts (De Voogd & Schoneveld 2002, 62). Possibly, only the southern part of structure

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C was part of a building, although we cannot be sure whether this was a house or an outbuilding. The validity of house P is beyond doubt; this regular ground plan show consistent dimensions and depths of posts, it was found in an area with low feature density and was recognised already during fieldwork (T. Hamburg, pers. comm., July 2005).

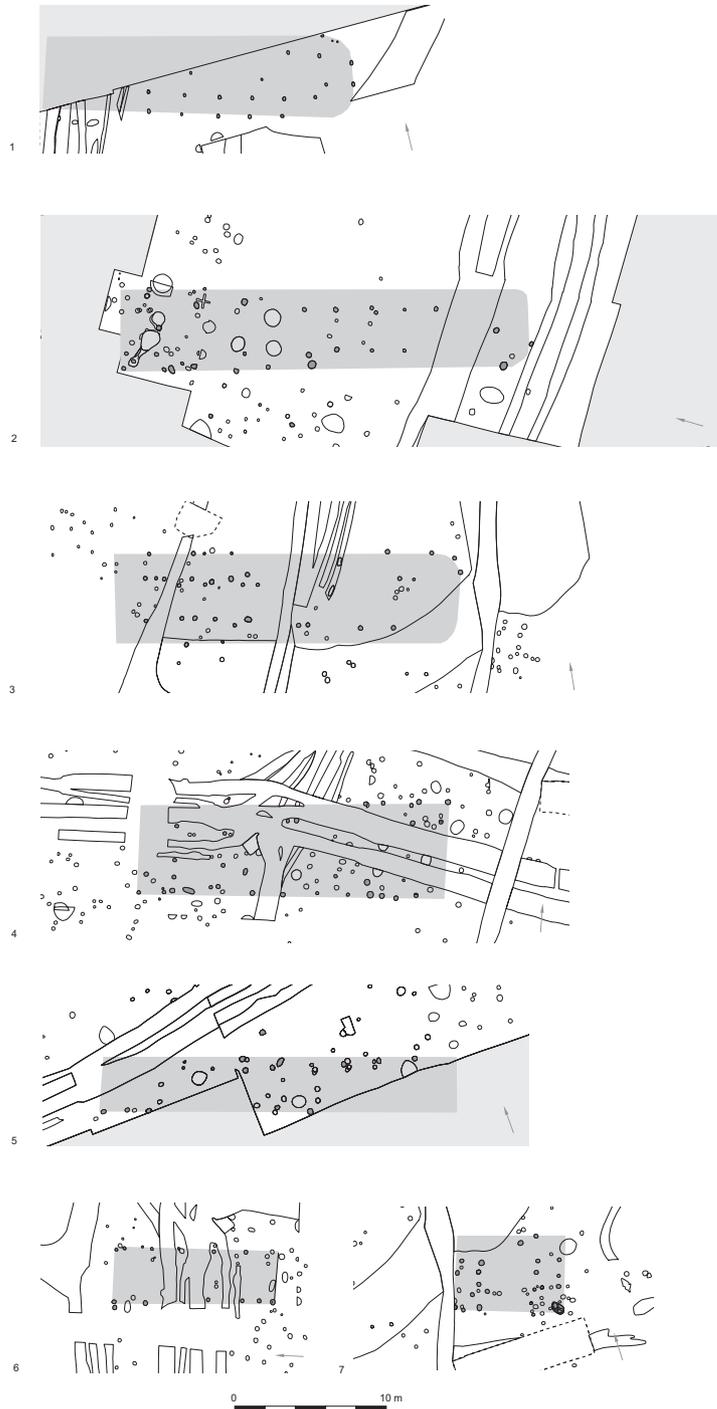


Fig. V.17 Claimed Middle Bronze Age-B structures at Lienden - site 15, all to same scale (1: structure P, 2: structure C, 3: structure K, 4: structure L, 5: structure H, 6: structure L', 7: structure Q).

Of the larger ancillary structures, the validity of the structures L', L and Q is questionable, and particularly for the latter no parallels whatsoever are known. Structure H may have been a barn or a shed, possible even a house, but here the excavation extent hampers definitive interpretation. With the same reservations as with the example from site 14, alternative reconstructions for the dense clusters of features can be made (fig. V.18).



Fig. V.18 Original (A; after Schoneveld & De Voogd 2002) and re-interpretation (B) of the middle Bronze Age-B structures at Lienden - site 15.

a: not excavated, b: reliable and tentative ground plans of structures, c: features associated to structures, d: other features.

Although parts of site 14 and 15 displayed a high feature-density, no cross-cutting of features could be observed (De Voogd & Schoneveld 2002, 56). Based on the numbers of house plans and the radiocarbon dates obtained (fig. V.19), the excavators assume that all features represent about a century of Bronze Age occupation, or three generations, between 1600 and 1500 cal BC (De Voogd & Schoneveld 2002, 57).

Unfortunately, there are no good correlations between the structures and the dates obtained. The association of the dated bone from pit 12.30 – within and – to house D at site 14W is questionable. Most other dates represent animal bones from various pits (Schoneveld 2002b, 252). The 16th century BC is covered by most radiocarbon dates, but 2σ ranges allow for a more prolonged occupation (fig. V.19). The radiocarbon date with the narrowest calibrated range (GrN-25700: 3220 ± 35 BP; Schoneveld 2002b, 252), represents bone from three different pits near structure C at site 15. The bone, stone and ceramic artefacts recovered do not oppose, but neither refines the general (Middle Bronze Age, possibly centered 16th century cal BC) age for the main phase(s?) of use of the site (Buitenhuis 2002, 222; Niekus *et al.* 2002a, 161; Ufkes 2002a, 100).

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A remarkable observation is the presence of several features interpreted as pits that contained large numbers and significant weight (> 500 g) of artefacts. Generally (see Arnoldussen 2008, section 5.7), Middle Bronze Age-B settlement sites in the Dutch river area yield only few pits, that ordinarily contain few (< 200 g) artefacts. The distribution of the pits with more than 500 g (fig. V.20, d) or 1 kg (fig. V.20, e) of finds, shows no evident clustering around recognised structures. Rather, a more or less even spread along the highest part of the micro-topographic landscape (*cf.* fig. V.22, C) may be reflected.

The interpretation of these pits is seriously hampered by the methodology of the ceramics analyses (Ufkes 2002a, 81-82). Devoid of contextual information, only the most diagnostic (*e.g.* decorated sherds, rim-sherds *et cetera*) have been studied. For the pits depicted in fig. V.20,

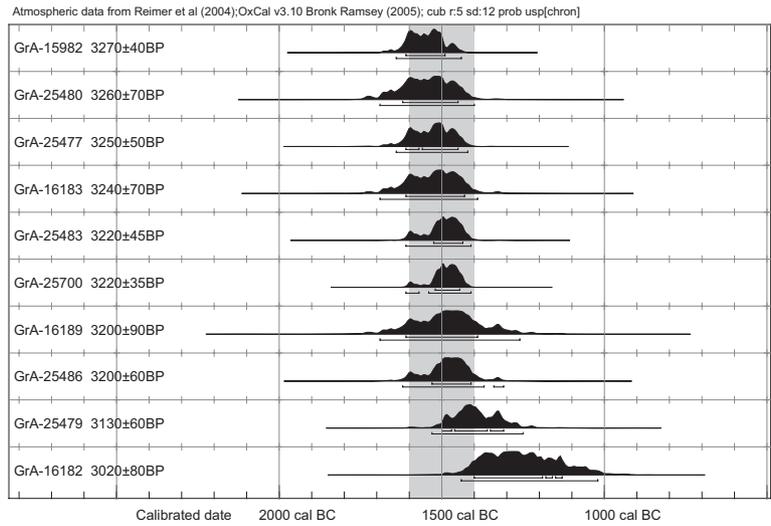


Fig. V.19 Oxcal 3.10 plot for the Middle Bronze Age radiocarbon dated samples from Lienden - Kesteren (after Schoneveld 2002b, 252 table 10.1).



Fig. V.20 Distribution of possible refuse pits at Lienden site 15.

a: not excavated, b: structures, c: other features, d: pit with over 500 g of artefacts, e: pits with over 1 kg of artefacts.

only seven sherds (107.9 g) of an available total of 1989 sherds (weighing 8131 g) have been analyzed. Consequently, it is impossible to assess the fragmentation, number of pot-individuals, traces of secondary burning or any other characteristic of the pottery in these pits. Therefore, the interpretation of a (secondary) function as refuse pits must remain tentative. With a large number of pits, the recovered stone fragments outweigh the ceramics. As the mean weights of the lithics recovered are low (< 9 g) and the numbers high (mean 106 fragments; based on De Voogd & Schoneveld 2002, 76-80), it is assumed that an overrepresentation of the lithic material was caused by the sieving (and detailed study thereafter) of the pit contents, although no mention thereof is made in the chapter on site excavation methodology (Kranendonk & De Voogd 2002). A noteworthy exception is a pit (feature 19.3) situated 10 m to the southeast of house P at site 15, from which an intact grinding stone (413 g), a fragment of a burned rubbing stone, a fragment of a pecking stone and over one kg of (unstudied) ceramics were recovered (Niekus *et al.* 2002a, 155). Also some other pits had interesting finds in their fills. One pit (feature 30.60) contained *c.* 900 grams of burned clay and stones respectively, the pit with feature number 29.3 contained the rear articulated skeleton of a piglet and a complete (with horns) cattle skull was interred in the pit with feature number 23.4 (De Voogd & Schoneveld 2002, 76-80). It is interesting to speculate to what extent these pits – especially the latter – may reflect intentional depositions (*cf.* Arnoldussen 2008, sections 8.2.3.4-8.2.3.5).

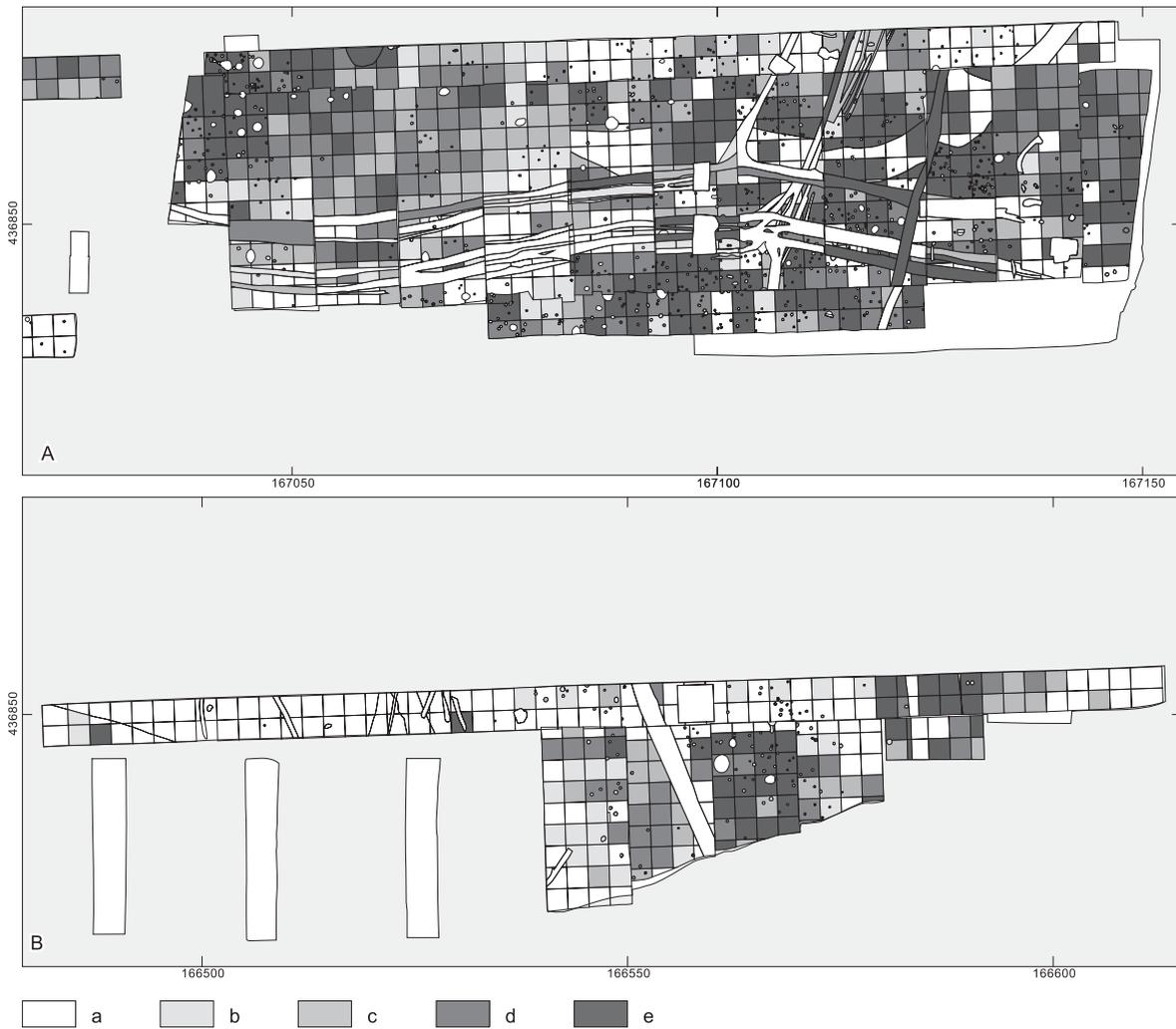


Fig. V.21 Total weight distribution of all artefact categories from the finds-layer.

a: 0 gr/ n.a., b: 0-50 g, c: 50-160 g, d: 160-390 g, e: 390-4820 g.

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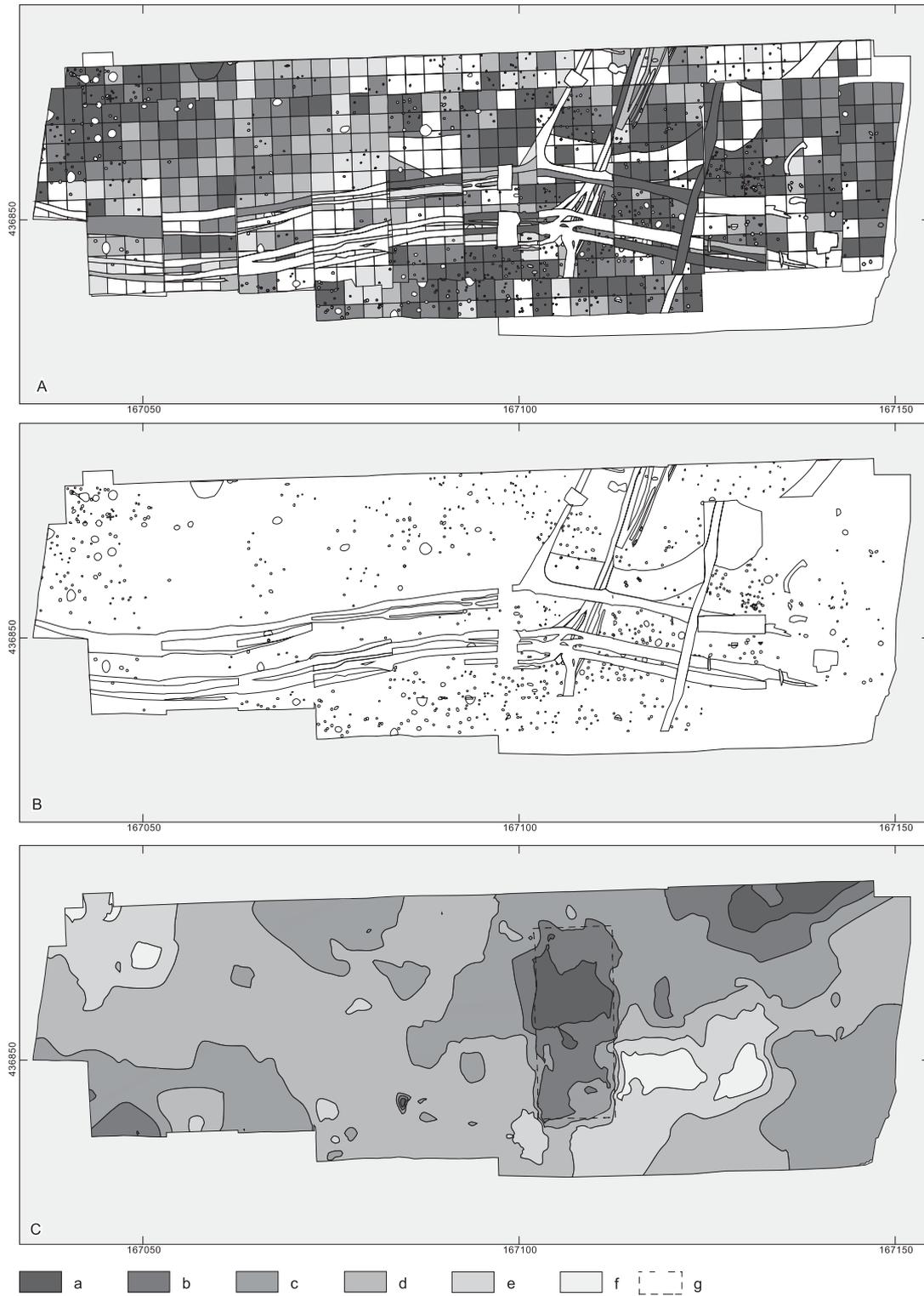


Fig. V.22 Spatial relations between artefact densities in the finds-layer (A), feature density (B) and micro-topography (height in m above D.O.D.; C) at Lienden site 15.

a: 4.7 m, b: 4.8 m, c: 4.9 m, d: 5 m, e: 5.1 m, f: 5.2 m, g: location of excavation trench; presumably measuring errors.

The overall faunal assemblage indicates that husbandry was practised, with 65% cattle – also used for traction and milk – and with sheep (25%) and pig (15%) in smaller numbers (Buitenhuis 2002, 220-221). Some barley (*Hordeum vulgare*) and emmer wheat (*Triticum diccocon*) may have been grown nearby, but horticulture appears to be of slightly less importance than cattle rearing (De Roller, Korf & Mook-Kamps 2002, 177-180). Hunting occurred only sporadically and was targeted at red deer and mid-sized fur-bearing animals such as beaver (*Castor fiber*) and otter (*Lutra lutra*; Buitenhuis 2002, 222). Presumably, the local rivers were fished for eel (*Anguilla anguilla*), *Cyprinidae* species, pike (*Esox lucius*) and some other species (Buitenhuis 2002, 196).

The artefacts recovered fall within the expected range for a small agricultural hamlet and represent domestic refuse. Possibly, two fragments of large pierced clay disks – interpreted as loom weights – hint of textile production (Ufkes 2002a, 106-107). Besides flint and stone tools (strike-a-lights, rubbing- and grinding stones; Niekus *et al.* 2002a) also two antler base axes and cattle *scapulae* that had been transformed into cutting boards were found (Buitenhuis 2002, 212-218).

The artefact distribution in the finds-layer is roughly equal for all categories and clusters around house D at site 14W and in the centre and to the north of structure C at site 15 (fig V.21). It is remarkable that at site 15, the concentrations of materials do not match with the position of reliable structures. Near and within house plan P, there appears to be a relatively clean area, and the highest densities of materials in the west are found north of structure C. Furthermore, no clear structures could be discerned underneath the concentration in the central eastern part of site 15, but here the later crevasse activity could have eroded or obscured structures. Rather, the greatest densities of both artefacts and features appears to correlate to the higher parts of the local micro-topography (De Voogd & Schoneveld 2002, 70; Schoneveld 2002b, 253, see fig. V.22). These observations indicate that while artefact density distribution (plots) do sometimes show (strong; *cf.* Arnoldussen 2008, 331 fig. 6.36) correlation to the locations of (Middle) Bronze Age house-sites, this is by no means a universal property of the latter and can be severely affected by post-depositional processes.

In conclusion, the Lienden excavations have uncovered two parts of what is presumably a much larger landscape used for habitation during the Middle Bronze Age. Neither at site 14, nor at site 15, have the full extents of the inhabitable landscape been uncovered. This is indicated by the finds-distributions and incomplete ground plans of structures along the excavation limits. It may be inferred that at these sites, the chief concentrations of artefacts recovered can range up to 50 m in diameter. These concentrations are related to the highest parts of the micro-topographic landscape and could not in all cases be linked directly to the presence of prehistoric house(-site)s. Although only a short period of use of the site is claimed (De Voogd & Schoneveld 2002, 57), the feature density is often too high to allow for reliable reconstructions of buildings. The two most reliable house plans (site 14 house D, site 15 house P) affirm the presence of two house-sites, but especially the occurrence, orientation and distribution of the ancillary structures hint of the presence of more, less regular or less well preserved, house-sites within or directly outside the excavated areas. Unfortunately, no direct associations between (possible) house structures and the dated radiocarbon samples are available, making it impossible to shed more light on the detailed occupation history of the site during the Middle Bronze Age. The high feature density, in addition, hampers the recognition of distinct house-sites and their constituent elements.

Late Bronze Age and Early Iron Age

Presumably during the Late Bronze Age, the Echteld fluvial system enters the region (fig. V.23). The start of sedimentation is dated to *c.* 1220-790 cal BC (UtC-4640: 2770 ± 90 BP; Berendsen & Stouthamer 2001, 198). Where the Echteld channel incised into the presumably inactive Westerveld channel deposits, reactivation of the Westerveld residual gully and new crevasse formation occurred. This crevasse activity eroded much of the Bronze Age occupation levels and these deposits formed the later Middle Iron Age and Roman period surface level of the site (Van Dinter 2002, 50). Sedimentation by the Echteld system is thought to have ended during the Roman period, presumably in the 2nd century (UtC-4639: 1901 ± 35 BP; Berendsen & Stouthamer 2001, 198; Van Dinter 2002, 48).

Only two find-spots testify of human activities in the micro-region during these two periods. The first (fig. V.23, no 41658) concerns the bronze artefacts that were supposedly found in a Merovingian vessel near Opheusden in 1910 AD (Archis 41658; Ypey 1963; Willems 1985, 98). As it concerns a bronze razor and a pin dated to the Hallstatt A1/A2 period, their association to the vessel should be dismissed (Ypey 1963, 191; Willems 1985, 98). The second

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find datable to the Late Bronze Age-Early Iron Age period is a flint sickle (fig. V.23, no 7140) that was found during the excavations at the site 'Nedereindsestraat' in Kesteren (Archis 7410) where also Early Iron Age features were uncovered (Hulst 1991b-c; 1995; Archis 7410; 31983; 31987). Unfortunately, no publication of the Iron Age features (and artefacts?) is available.

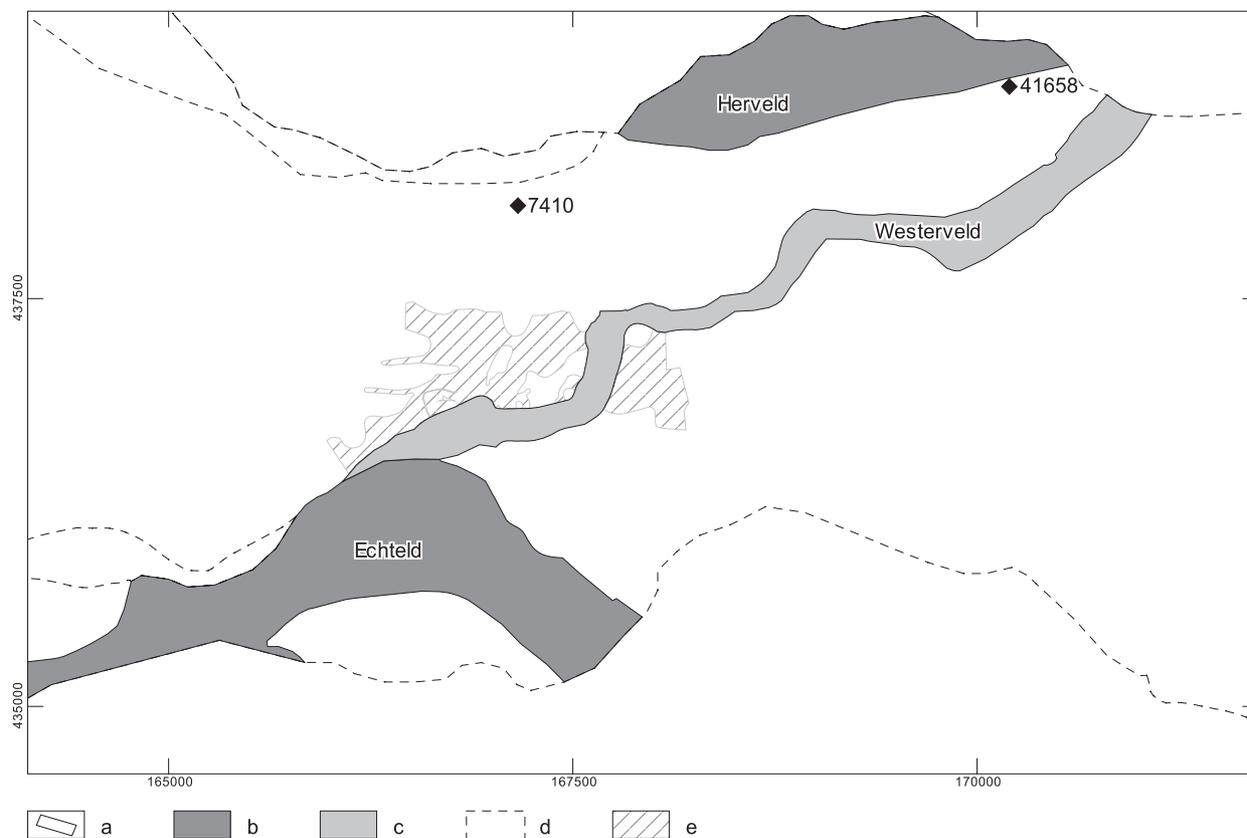


fig. V.23 Late Bronze Age and Early Iron Age fluvial systems and find-spots in the Lienden macro-region (filled symbols indicate certain identifications, outlined symbols indicate unclear identifications).

a: excavation trenches, b: active fluvial systems, c: fossil levee deposits, d: younger fluvial systems, e: fossil crevasse splay deposits, f: find-spots.

Lastly, two sherds from the Roman Period excavation 'Kesteren - De Woerd' have been interpreted as 'possibly Late Bronze Age', but – if the determination is correct – represent the only two finds datable to these periods (Ufkes 2002, 110). It is not until the Middle Iron Age (Sier, Mulder & Koot 2001, 29-30; Siemons 2001, 82-90; Wiepking 2001, 143; 148) that the area uncovered in the Lienden excavations is once more home to prehistoric habitation.

VI Palaeogeography and occupation history of the Dodewaard macro-region

I INTRODUCTION

The area around the village of Dodewaard, is best known to archaeologists through the eponymous site situated 1.7 km to the north-east of the village centre. There, 0.4 hectare was excavated by the State Service for Archaeological Investigations (ROB, now RACM) in 1967, when the provincial road was constructed (Hulst 1967b; 1970; 1991a). The results of this excavation campaign were published more extensively by Hulst and Theunissen in 1999(a). Unfortunately, the corings that were executed by the State Service for Archaeological Investigations in 1968 in order to determine the extent of the site, were never properly archived or published and should be considered lost (Van Zijverden 2003b).

History of archaeological research

One of the oldest publications concerning an archaeological artefact from the Dodewaard macro-region dates to the late 17th century AD (Cuperus 1687). In this publication, a Roman period gravestone which had been walled into the church of the village of Dodewaard was described (Stuart 1986, 21-22 and references in Modderman 1949a). During the first half of the 19th century AD, Otto G. Heldring – the local priest of Hemmen – undertook several walking tours through parts of the *Betuwe*, for which he described the ancient remains and folk tales (Heldring 1838; 1839a-b, see also Buddingh 1861, 18-38; 1865, 52-60). For Dodewaard, a description of the church was incorporated (Heldring 1839a, 118-121).

During soil mapping campaigns to the north of the village of Dodewaard in the nineteen-sixties, several ‘ancient settlement soils’ were mapped within an area measuring up to 1800 hectares. One of them was the later to be excavated Bronze Age settlement site now known as ‘Dodewaard’ (Havinga 1969). Both the Wageningen student who executed the soil-mapping campaigns, as well as professor Modderman of the State Service for Archaeological Investigations dug test-pits at Opheusden, that revealed an over 10 cm thick culture layer with stones and ceramics (Modderman 1960; Archis 41127; 41131; 41133-41135). Additional ‘ancient settlement soils’ in the Dodewaard macro-region were added by new soil mapping campaigns and were published by Havinga and Op ‘t Hof (1975; 1983).

Steenbeek carried out numerous corings in the Dodewaard meso-region in 1984, with the purpose to study the formation processes of vegetation horizons around prehistoric settlement sites (Steenbeek 1990, 135). Consequently, a dense grid of occasionally deep corings was executed in an area of almost 30 hectares directly north of the 1967 excavation (Steenbeek 1990, 138 fig. 3.2.1).

Prior to the construction of the Betuweroute freight railway, additional corings were executed in a 60-80 m wide strip north of the provincial road (Asmussen 1991; 1994; 1996; Asmussen & Exaltus 1993). Following this coring campaign, 13 plots were selected for evaluation through the digging of test-trenches. None of these 13 plots were subjected to more extensive excavation. The results of the watching brief were published in a number of reports (Gehasse 2002a-b; Schutte 2003b). An overview of the location of the different archaeological campaigns is offered by figure VI.1.

The geological context

The various Bronze Age sites investigated near Dodewaard are generally situated on crevasse splay deposits. Establishing the exact distribution and morphology of these crevasse splays is highly complicated, which caused large differences between the various geological and geographical maps that are available for the area (Van Zijverden 2003b, references to Egberts 1950; Havinga 1969; Havinga & Op ‘t Hof 1975; 1983; Verbraeck 1984; Berendsen, Faessen & Kempen 1994; Berendsen *et al.* 2001; Berendsen & Stouthamer 2001). To assign particular crevasse deposits to single fluvial systems is often difficult. The fluvial systems most relevant to the palaeogeographical development of the Dodewaard micro-region are depicted below (fig. VI.2).

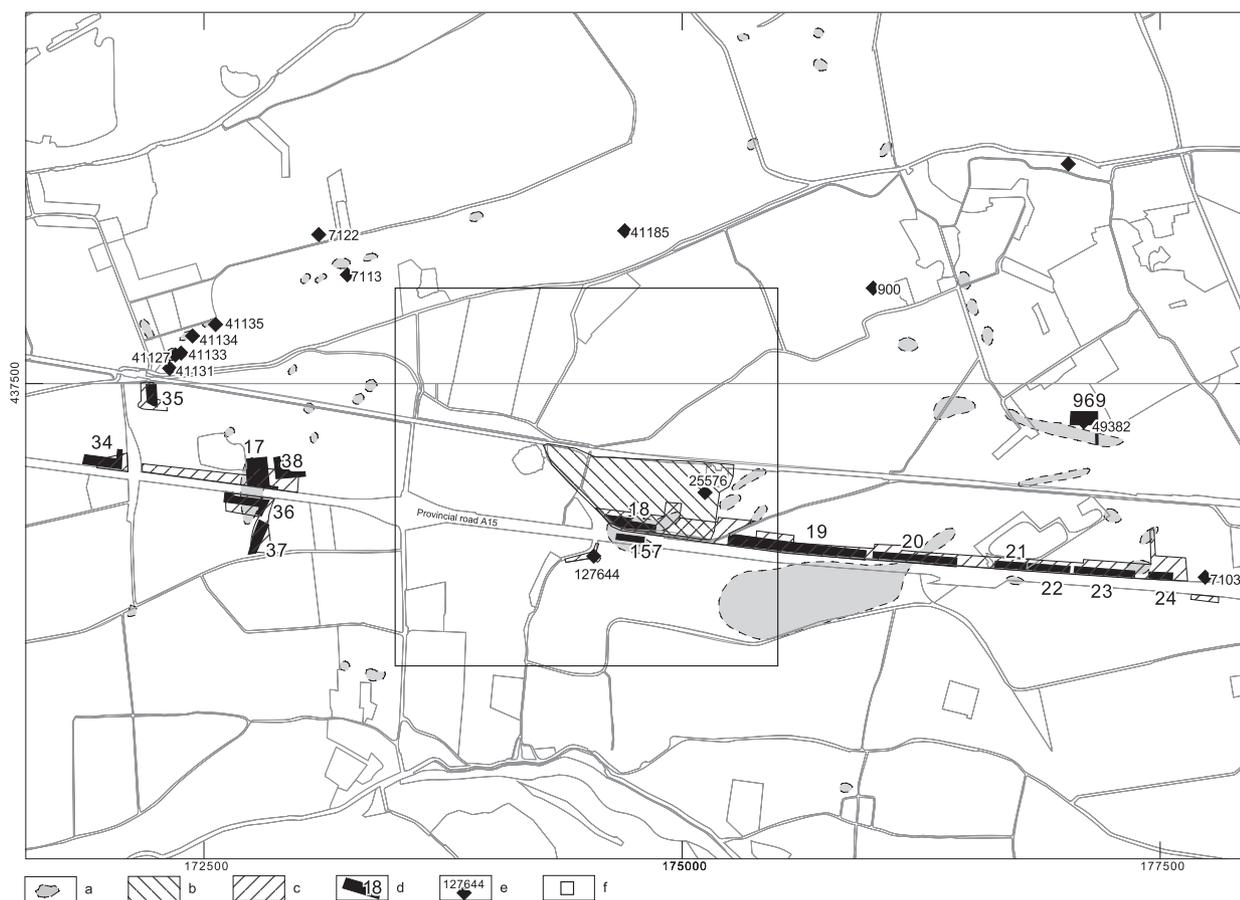


Fig. VI.1 Overview of the archaeological research in the Dodewaard macro-region on a topographic map.

a: sites detected by Havinga (1969), b: research area of Steenbeek (1990), c: additional coring campaigns by Raap, d: Betuweroute sites selected for test-trenches, e: Archis find-spots, f: location of meso-region.

II SOURCE CRITICISM

Coring campaigns by Havinga & Op 't Hof

The physiographical maps published by Havinga (1969) and Op 't Hof (Havinga & Op 't Hof 1975; 1983) were based on various soil-mapping campaigns. Generally, the dataset comprised areas with 9 to 10 corings per hectare to a depth of 1.2 m, which were supplemented by at least one coring per hectare up to a depth of 2.2 m in order to get a better insight into the geological structure of the aggregate sediments (Havinga 1969, 6; Havinga & Op 't Hof 1975, 261; 1983, 1). The presence or absence of remains of ancient settlements was one of the parameters described for each coring (Havinga 1969, 6; 27; Havinga & Op 't Hof 1983, 55-56).

The merits of the physiographical studies by Havinga & op 't Hof clearly lie in the fact that these are landscape scale studies, explicitly focussing on mapping the complex fluvial morphology of channel deposits as well as levee and overbank deposits, whilst keeping an eye out for indicators of ancient settlement remains. Nonetheless, it should be stressed that with densities varying between 1 to 10 corings per hectare, smaller 'ancient' settlement sites (*cf.* Havinga 1969, 29) and especially those whose remains are situated below 1.2 m of depth may have gone undetected. Lastly, the dating attributed to the various sites is often based solely on stratigraphical depth of the vegetation horizons and may need to be refined or altered through additional research.

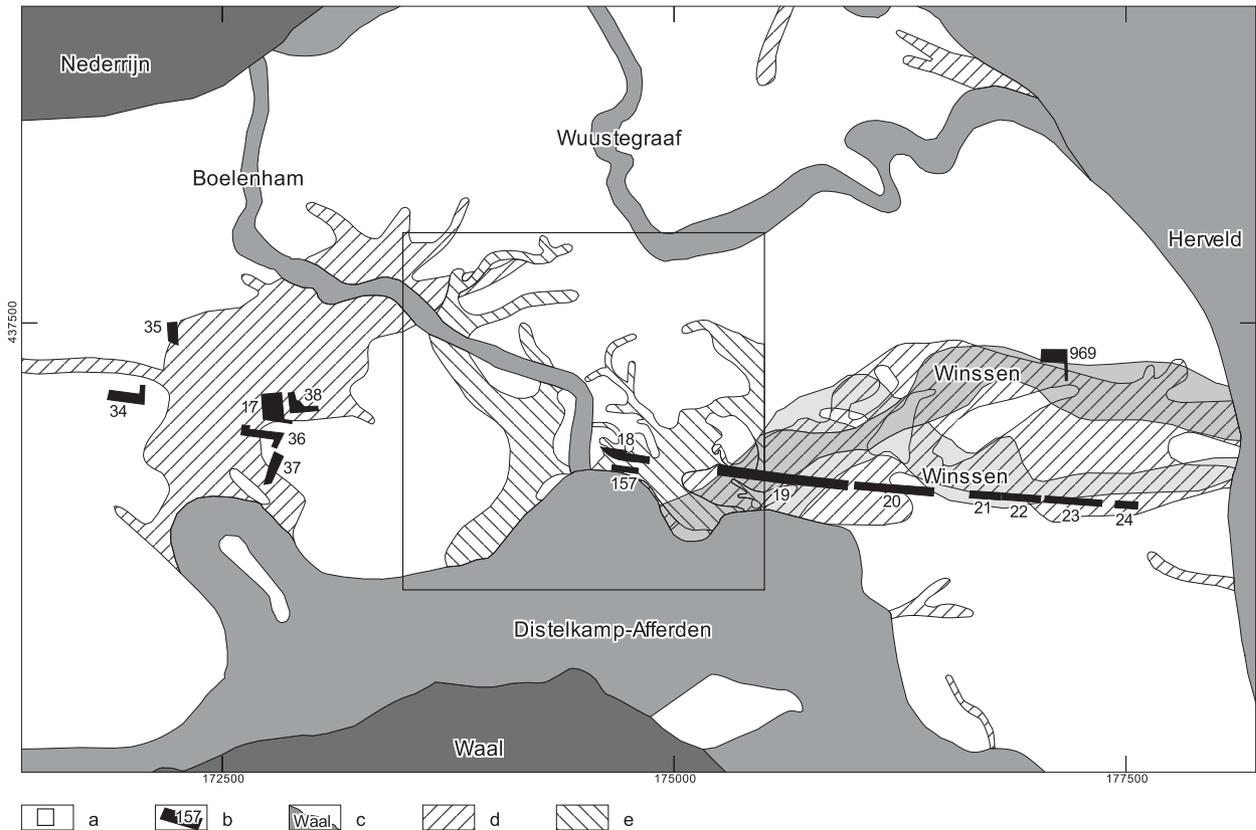


Fig. VI.2 Main fluvial systems within the Dodewaard macro-region (after Berendsen & Stouthamer 2001; Berendsen, Faessen & Kempen 1994; Berendsen *et al.* 2001; Van Zijverden 2003b).

a: meso-region, b: Betuweroute test-trench areas, c: fluvial systems, d: crevasse splay deposits based on Berendsen, Faessen & Kempen 1994; Berendsen *et al.* 2001, e: crevasse splay deposits based on Van Zijverden 2003b.

Excavation 'Dodewaard'

In 1967 the excavation of a 29 m wide and 145 m long section of the A15 provincial road was carried out by the State Service for Archaeological Investigations (Hulst 1967b; 1970; 1971; 1991; Theunissen & Hulst 1999a). With the topsoil stripped by the contractor, the archaeologists scraped down through the vegetation horizon onto the layer where features were visible. Unfortunately, the finds thus recovered were recorded by trench. These trenches show much variation in size, hampering the interpretation of the distribution of the recovered finds (Theunissen & Hulst 1999a, 149). Despite the fact that no sieving took place, abundant ceramics, stones, flint fragments and bones were recovered (Theunissen & Hulst 1999a, 148-155).

Whereas the contexts of the Late Neolithic ceramics found are published (Theunissen & Hulst 1999a, 150), no information is available on which features contained Bronze Age ceramics. The excavation plans make clear that – based on the presence of stake holes – the feature-preservation was moderate to good. As no information on the micro-topography is available, it is difficult to interpret the differences in feature density. Moreover, only limited information on the local geology of the excavated areas has been published. For example, there is no information about possible additional finds-layers at greater depths. Lastly, interpreting the results of this excavation is complicated by the fact that the excavation limits were confined to the 29 m wide stretch of planned road, which means that only a small part of a much wider settlement site area could be investigated.

Steenbeek coring campaign

In 1984, Steenbeek executed 160 corings in the fields directly north of the area excavated by the State Service for

Archaeological Investigations. Generally, the corings were between 60 to 100 m apart, although in some parts corings were spaced very closely in order to draw up detailed sections. The mean depth of these corings is 3.85 m, with only five corings under two meter. Although the overall general distances between corings seems inapt to map out the complex morphology (Weerts & Bierkens 1996), this is compensated for by the regular distribution and considerable depth of the corings. Furthermore, the execution of detailed transects of corings and the integrated application of radiocarbon dating, micro-morphological studies and palynological studies created a uniquely coherent dataset (Steenbeek 1990, esp. 135-200).

Fieldwalking and coring campaigns by RAAP

The methodology behind the coring campaigns carried out by RAAP prior to the Betuweroute railway construction, was tailored to the (expected) local geology. Specific strategies for detecting buried river dunes and for mapping fossil river systems were applied to the corresponding parts of the landscape where such phenomena were expected (Asmussen & Exaltus 1993, 9-13). Consequently, the methodology was variable and to a large degree dictated by the state of geological knowledge and quality of the available maps. Often, the location of fluvial deposits did not correspond to that of available maps, or alternatively, unmapped fluvial systems were found (*cf.* Asmussen & Exaltus 1993, 14).

For research areas situated east of the town of Geldermalsen, based on the generally less thick layers of covering sediments and consequently greater chance of sites being ploughed to the surface, fieldwalking was opted for as the initial strategy for detecting sites (Asmussen & Exaltus 1993, 12). The fieldwalking results show that most sites discovered by fieldwalking dated to the Roman Period or Early- to High Middle Ages (Asmussen & Exaltus 1993, 22-54). Fieldwalking along this part of the Betuweroute trajectory has yielded some – often inconclusive – evidence for Bronze Age activities on five sites (RAAP nos. 7, 18, 29, 30 and 41; Asmussen & Exaltus 1993, 23-38). It may therefore be questioned whether fieldwalking is an adequate method to discover (later) prehistoric sites in this area (*cf.* Asmussen 1994, 35).

To discover more sites, a coring campaign was executed. The strategy differed based on whether or not a channel-belt was expected. If so, two transects (50 m apart) of corings at every 25 m, down to a maximum depth of 2.5 m were executed (Asmussen & Exaltus 1993, 108). Where no channel-belt was expected, only a single row of corings – with 50 m between corings – was used (*ibid.*, for the channel-belts used see Asmussen 1996, Map I). In order to evaluate the quality of the sites already inventoried by RAAP, more detailed coring was executed on the known sites. This entailed two – 20 m offset, 40 m apart – transects of corings with a maximum depth of 1.25 m (Asmussen 1994, 19). When archaeological materials were discovered in the corings, the grid was scaled down to a 20 m triangular grid (*ibid.*; Asmussen 1996). An even more extensive coring campaign was executed at a selected number of find-spots thus discovered. Those in the vicinity of Dodewaard which were dated to the Late Neolithic or Bronze Age are listed in table VI.1.

Raap cat no	x-coord	y-coord	Fieldwalking	Additional coring	References
29	174760	436770	Y	Y	Asmussen & Exaltus 1993, 33; Asmussen 1994, 50-56
30	175350	436880	Y	Y	Asmussen & Exaltus 1993, 33; Asmussen 1994, 50-57
71	176760	436680	N	Y	Asmussen & Exaltus 1993, 48; Asmussen 1994, 149-153
72	175460	436680	N	Y	Asmussen & Exaltus 1993, 48; Asmussen 1994, 88-91
73	175220	436710	N	Y	Asmussen & Exaltus 1993, 48-49; Asmussen 1994, 88-91
83	174750	436800	N	Y	Asmussen & Exaltus 1993, 48
124	176125	436590	N	Y	Asmussen 1994, 144-148
125	176125	436590	N	Y	Asmussen 1994, 144-148
126	176650	436560	N	Y	Asmussen 1994, 149-153
127	177130	436525	N	Y	Asmussen 1994, 154-156
128	177230	436520	N	Y	Asmussen 1994, 154-158
129	176860	436550	N	Y	Asmussen 1994, 159-160

Table VI.1. Late Neolithic and/or Bronze Age sites investigated by RAAP in the meso-region Dodewaard.

APPENDIX VI: DODEWAARD

Test-trenches

In the years 1997 and 1998, the planned trajectory of the Betuweroute freight railway north of Dodewaard was subjected to various campaigns of test-trenches (Bulten 1997; 1998a-c; Bulten & Smits 1998a; Jongste 1997a-b; 1998; Jongste & Ten Anscher 1998; Sier & Smits 1998; Spanjer 1998a; Ten Anscher & Van der Roest 1997). These locations were selected on the basis of the results of the fieldwalking and coring campaigns by RAAP (Asmussen & Exaltus 1993; Asmussen 1994; 1996). The general location of these clusters of trenches is depicted on figure VI.1 (fig.VI.1, d), but unlike the excavated area (no 157), they have not been excavated in their entirety (*cf.* fig. VI.3).

The plot above shows the distribution of the trenches on Betuweroute site 18, known as ‘Dodewaard - Veedijk-West’ (fig. VI.3; Bulten 1998c). Only small segments – not surpassing a total of 216 m² – of the area wherein a finds-layer was attested during coring campaigns (Theunissen & Hulst 1999a, 138, fig. 4.7) were excavated. This also holds true for the other Betuweroute sites depicted on fig. VI.1 (fig. VI.1, d, *cf.* table VI.2)

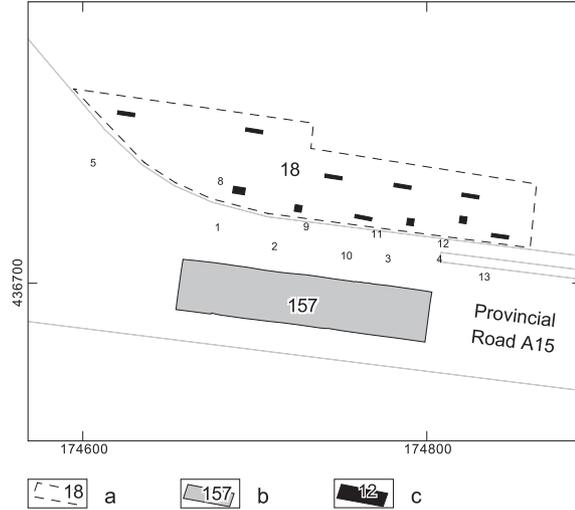


Fig. VI.3 Location and extent of the various excavations at Dodewaard - Veedijk West.

a: excavation by the State Service for Archaeological Investigations (Theunissen & Hulst 1999a), b: area of the Betuweroute test-trenches, c: actual extent and number of Betuweroute test-trenches on Dodewaard site 18.

Site no	Site name	Area (m ²)	Trenches	References
34	Dodewaard Peyenkampse Veldweg	140	11	Bulten 1998b
35	Dodewaard Dalwagen-Noord	240	3	Spanjer 1998a
17	Dodewaard Plas van Schouls	84	5	Bulten 1998a
38	Dodewaard Viaduct Dalwagen-Noord	124	7	Bulten 1998a
36	Dodewaard Viaduct Dalwagen-Zuid	118	8	Sier & Smits 1998
37	Dodewaard Dalwagen-Zuid	112	7	Sier & Smits 1998
18	Dodewaard Veedijk-West	216	11	Bulten 1998c
19	Dodewaard Veedijk-Oost	360	18	Bulten 1997
20	Dodewaard Valburg Hiensche Veld	282	15	Jongste 1997b
21	Valburg Zettensche Veld-West	267	15	Ten Anscher & Van der Roest 1997
22	Valburg Zettensche Plas	124	8	Jongste & Ten Anscher 1998
23	Valburg Zettensche Veld-Oost	104	6	Jongste 1998
24	Valburg De Vergulde Bodem-Zuid	186	9	Bulten & Smits 1998a

Table VI.2 Sites, names, excavated area (m²), numbers of trenches and references.

As a consequence, while more information on the distribution of archaeological remains is gained from excavating small trenches (with often large distances in between), interpreting the interrelations of the archaeological remains recovered, as well as the interrelation between the various archaeological remains and the wider landscape is much harder. This has sometimes led to what may be called an archaeological variety of tunnel vision, reconstruction different ‘sites’ for overlapping artefact distribution within a small area (*cf.* Ten Anscher & Van der Roest 1997, 16 fig. 9), where an interpretation of the distribution as small windows into a wider (palimpsest) ‘veil’ of artefacts might be equally valid. All of the campaigns of test-trenches of these Betuweroute sites have been published in full, with considerable attention being paid to the various categories of finds, the physical state of preservation and their local geology.

Site number 969, Valburg Zetten-West (fig. VI.1, no 969), is not part of the Betuweroute excavation program. This site was investigated prior to the construction of a new residential area west to the village of Zetten in 1997 (Peters 1999). Apart from this difference in project origin, and the slightly larger excavated area (3 trenches, amounting up to 884 m²) this project compares well to those of the Betuweroute in methodology and type of publication.

The position within the geological landscape is often different for the various trenches within their larger sites. This explains why sometimes only a few or a single test-trench yielded features, whereas on other sites sometimes all yielded finds. Extrapolation of the results from individual trenches to sites in general is used below for reason of comprehensiveness, but it should be kept in mind that this belies the evident innate complexity and compartmentalisation of the landscape known to have existed.

III OCCUPATION HISTORY AND PALAEOGEOGRAPHICAL DEVELOPMENT

Early and Middle Neolithic

The lowermost fluvial strata in the study area were deposited during the end of the Pleistocene (Kreftenheye Formation) and start of the Holocene (Wijchen member deposits; De Mulder *et al.* 2003, 331). To distinguish between the upper clayey part of the Kreftenheye deposits and the Holocene floodbasin deposits is often difficult (Steenbeek 1990, 143-145). Some floodbasin sedimentation took place in the lower parts of the landscape during the mid- and younger Atlantic period, presumably by an (unknown) fluvial system situated in north of the study area (Steenbeek 1990, 189).

The Winssen channel-belt is the first meandering river whose deposits extend beyond the former early Holocene stream valleys (Berendsen & Stouthamer 2001, 245; called Veedijk deposits by Steenbeek (1990, 145-151)). Deposits by the Winssen system can be found in the southeast corner of the Dodewaard macro-region. It is assumed that the Winssen fluvial system knew two main phases of activity (Berendsen & Stouthamer 2001, 245). Sedimentation by the first phase presumably started between *c.* 5480-5320 cal BC and ended by *c.* 5300-5040 cal BC (Van Zijverden 2003b). This start date is based on a radiocarbon dated sample of peat underneath the Winssen system's overbank deposits (GrN-16044: 6430 ± 45 BP; Berendsen & Stouthamer 2001, 245). The end date is based on a radiocarbon dated vegetation horizon on top of the first phase deposits near Deest (Van Zijverden 2003b; reference to Hoek *in prep.*). Sedimentation by the second phase ceased around *c.* 3980-3780 cal BC. This younger end date is based on a sample of humic clay from the Winssen fluvial system's residual gully near the village of Ewijk (GrN-11290: 5105 ± 40 BP; Berendsen & Stouthamer 2001, 245).

The Herveld fluvial system is located in the east of the macro-region Dodewaard. This meandering system presumably starts at last around *c.* 3650-3370 cal BC (based on a dated sample of peaty clay underneath the overbank deposits (GrN-7269: 4755 ± 60 BP; Berendsen & Stouthamer 2001, 205)). It is characterized by an unusual longevity, as sedimentation ceases only around *c.* 410-170 cal BC. The end of sedimentation is derived from a radiocarbon dated sample of botanical macro-fossils from the residual gully date of its upstream connection the Ressen fluvial system (UtC-7810: 2260 ± 60 BP; Berendsen & Stouthamer 2001, 205-206; Van Zijverden 2003b). From the Herveld system, crevasse deposits enter the floodbasin area to the west, facilitated by the presence of the more sandy levee and channel deposits of the Winssen fluvial system that are present in the subsoil (*cf.* Steenbeek 1990, 193; 199).

A radiocarbon dated sample of clayey peat directly underneath the Distelkamp-Afferden deposits indicates that from about 3520-3360 cal BC this system becomes active (GrN-11554: 4660 ± 30 BP; Berendsen & Stouthamer 2001, 196-197; Van Zijverden 2003b). Once again, the more sandy levee and crevasse deposits of both the Winssen and Herveld systems facilitated the formation of crevasses by the meandering Distelkamp-Afferden system. Based on a date of charcoal on top of these crevasse deposits, crevasse splay formation dates at least from *c.* 3090-2890 cal BC (UtC-3108: 4360 ± 40 BP; Asmussen 1994, 47). The end of sedimentation by the Distelkamp-Afferden system is dated to *c.* 1150-410 cal BC based on two radiocarbon dated samples of botanical macro-fossils from the residual gully (GrN-11557: 2600 ± 80 BP and GrN-11552: 2710 ± 80 BP; Berendsen & Stouthamer 2001, 197; Van Zijverden 2003b).

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There are few indications for human activities at the start of the Neolithic in the macro-region. At 1.6 km east-northeast of the micro region a *Breitkeil* was found (fig. VI.4, no 32145; Archis 32145). These perforated adzes are type-artefacts for the period between 4900 and 4400 BC (Raemaekers 1999, 103).

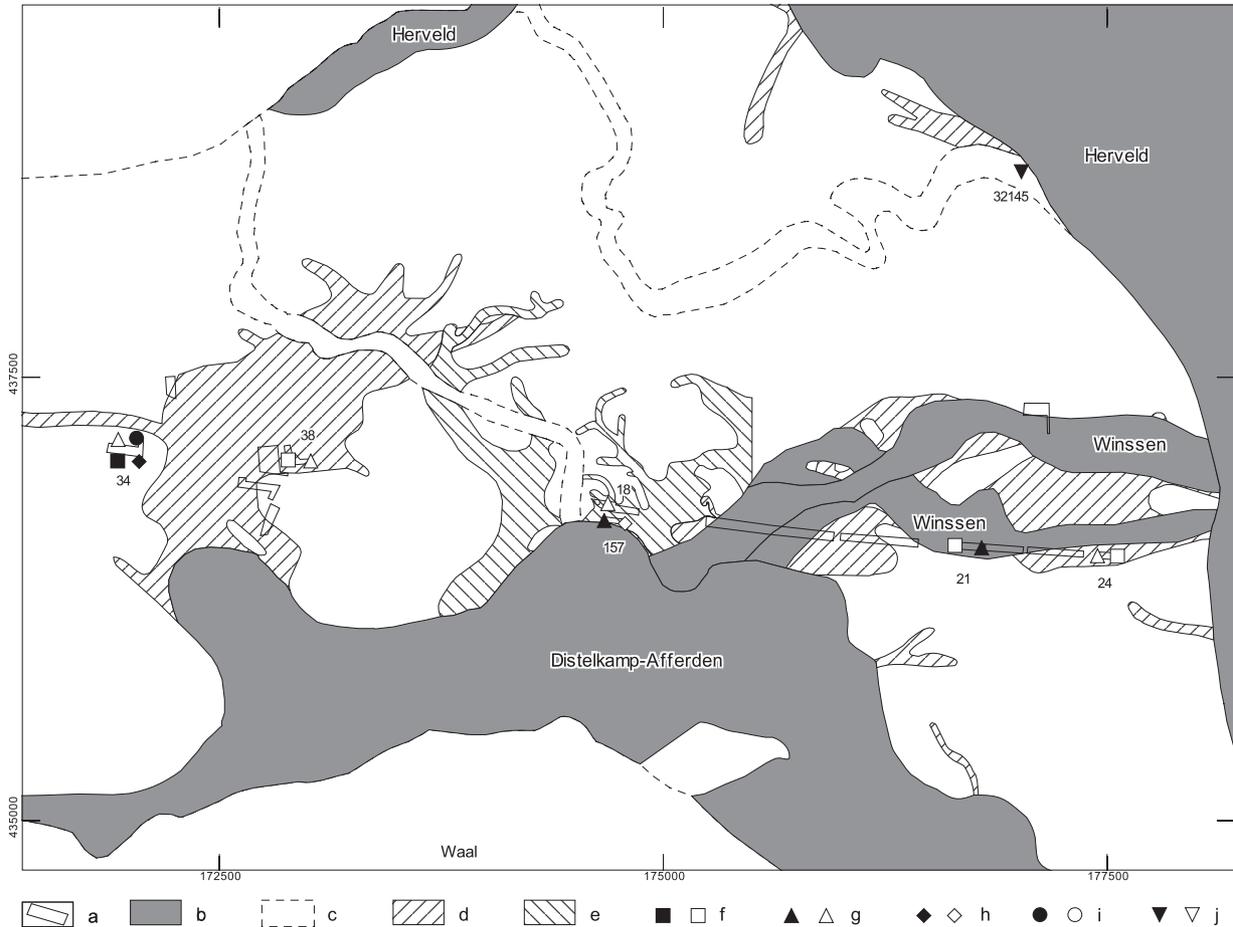


Fig. VI.4 Main fluvial systems and find-spots dated to the Middle Neolithic in the Dodewaard macro-region (filled symbols indicate certain identifications, outlined symbols uncertain identifications).

a: areas of Betuweroute test-trenches, b: active fluvial systems, c: younger fluvial systems, d: crevasse deposits based on Berendsen, Faessen & Kempen 1994; Berendsen *et al.* 2001, e: crevasse deposits based on Van Zijverden 2003b, f: pottery, g: weapons, h: botanical remains, i: features, j: tools.

For the start of the Middle Neolithic, evidence of human activities in the macro-region is more widespread. At site 24, a retouched blade, a transverse arrowhead and four sherds are dated to the Middle Neolithic (fig. VI.4, no 24; Bulten & Smits 1998a, 12-13). They were found in a clayey layer associated with predominantly later Neolithic (Bell Beaker period) finds. Underneath this clayey layer were crevasse deposits, some of which had eroded into the Pleistocene subsoil (Van Zijverden in: Bulten & Smits 1998a, 21-25). At site 21 a total of 15 sherds, a transverse arrowhead and a polished flint axe – used as a core – were dated to the Middle Neolithic (fig. VI.4, no 21; Ten Anscher & Van der Roest 1997, 14-15). They too were found embedded in a clayey layer on top of levee deposits that contained predominantly younger (Bell Beaker and Early Bronze Age period) finds (Van der Beek in: Ten Anscher & Van der Roest 1997, 23-24). The excavation by the State Service for Archaeological Investigations (fig. VI.4, no 157) also yielded some Middle Neolithic flints, that were recovered outside the highest densities of Bronze Age finds. These finds comprise two leaf-shaped arrowheads, a pointed blade and two chips from polished flint axes (Theunissen & Hulst 1999a, 139; 153-154). Evidence for human occupation nearby, presumably between 3500-3300 cal BC but possibly earlier, is

also evidenced by the palynological data (Steenbeek 1990, 192; 199). The test-trenched site 18 only yielded a single polished flint axe fragment, as well as four (presumably Bronze Age) sherds for which a Neolithic date could not be excluded (fig. VI.4, no 18; Bulten 1998c, 18-20). These sherds were incorporated in a finds-layer with predominantly Bronze Age and some Late Neolithic finds, that was situated on top of the highest parts of an undulating landscape created by stacked crevasse deposits (Van Dinter in: Bulten 1998c, 29-34). At site 38, two sherds and several chips from polished flint axes can perhaps be dated to the Middle Neolithic (fig. VI.4, no 38; Bulten 1998a, 24-25). These finds were recovered from a finds-layer within a vegetation horizon that had formed in somewhat sandy clay. The underlying deposits were classified as crevasse deposits, some of which had cut into the underlying early Holocene or Pleistocene deposits (Van Zijverden in: Bulten 1998a, 37-42). The other materials recovered from this layer point towards a dating of the finds-layer in the second half of the Middle Bronze Age up to the Late Bronze Age. Site 34 is the only site that yielded a feature that could be dated to the Middle Neolithic (fig. VI.4, no 34; Bulten 1998b, 16). This circa one meter wide ditch contained charred grains of Emmer wheat (*Triticum dicoccum*), nearly 400 grams of Middle Neolithic pottery, as well as flint flakes. In the finds-layer that overlies this ditch, more Middle Neolithic ceramics, a pointed blade, fragments of polished flint axes and a possible transverse arrowhead were found (Bulten 1998b, 16-20). Although there was some debate on whether the finds recovered were washed from their original location (Bulten 1998b, 10-11), the interpretation of a re-worked, possibly washed, finds-scatter is preferred over that of an *in-situ* finds-layer. This finds-scatter occurs intercalated in a series of stacked crevasse deposits (Van Zijverden in: Bulten 1998b, 16-20).

It is clear that evidence for Middle Neolithic activities in the meso-region Dodewaard is well documented. The exact nature of these activities, as well as their exact place in the physical landscape, however remains highly elusive. Only in one instance, on site 34, was a feature datable to the Middle Neolithic present. All other sites seem to represent situations wherein older material has become incorporated into the finds-layers of younger period sites. All finds originate from – sometimes younger, washed or eroded – find-scatters that have formed in (stacked) crevasse splay deposits. The exact morphology and extent of these crevasses – formed and reworked by both the Herveld and Distelkamp-Afferden fluvial systems – that may have supported Middle Neolithic activities is unknown, as they have nearly continuously been reworked by younger phases of crevasse formation on the same spot. This has resulted in the extensive crevasse-complex – *i.e.* a composite crevasse splay – as indicated on fig VI.4. Consequently, it is not possible to study in more detail the relationships between sites and the landscape for this period. Nonetheless, the botanical evidence illustrates that habitation from this period is to be expected.

Late Neolithic

Artefacts or features dating to the start of the Late Neolithic, the period of the Protruding Foot Beaker and All Over Ornamented beaker wares, are absent. On site 34, one flint artefact is classified as a pseudo-*Grand-Pressigny* dagger fragment (Bulten 1998b, 18-19) but this may equally well be interpreted as a Middle Neolithic pointed blade. The reason for the scarcity of relicts from this period is not known. Possibly, the more intense crevasse formation which occurs at the start of a fluvial system (Stouthamer 2001, 21-22; Van Dinter & Van Zijverden 2002, 8) – in this case by both the Distelkamp-Afferden and Herveld fluvial systems – complicated human occupation of nearby parts of the landscape. Palaeobotanical and micromorphological evidence for this period indicates generally shallow aquatic conditions and some sediment influx is attested (Steenbeek 1990, 190-191; D-9/10).

In any case, it is clear that during the later Bell Beaker period human activity is widespread. Finds and features have been found on several sites. The Distelkamp-Afferden and Herveld fluvial systems (see above) are still active during the Late Neolithic, but no specific information is available on the exact position of levee- or crevasse deposits formed during the Late Neolithic.

At site 20 a single possible potbeaker sherd was found, but a Late Bronze Age date for this sherd is not completely dismissed (fig. VI.5, no 20; Jongste 1997b, 13-14). Another single potbeaker sherd, with a suggested dating to the Late Neolithic or Early Bronze Age was recovered from site 37 (fig. VI.5, no 37; Sier & Smits 1998, 20-21). Site 7103 was discovered during the Betuweroute watching brief and concerns five pits, one of which contained burned bone and Bell Beaker as well as Potbeaker sherds (fig. VI.5, no 7103; Schutte 2003b, 16).

At site 18 nine (pot)beaker sherds and a single Bell Beaker sherd were discovered (fig. VI.5, no 18; Bulten 1998c, 18-19). They formed a minority among the predominantly Middle Bronze Age ceramics that were recovered

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from the finds-layer. This layer had formed in the stacked crevasse splay deposits (Van Dinter in: Bulten 1998c, 29-34). At site 19 a single Bell Beaker sherd, with some bones, stones and two fragments of amber ornaments, was recovered from a vegetation horizon in floodbasin deposits, and these finds most likely represent washed material (fig. VI.5, no 19; Bulten 1997, 13-15; Van Zijverden in: Bulten 1997, 20-22). Over 100 sherds of Pot- and Bell Beakers were recovered from the clayey layer that was deposited on top of levee deposits on site 21 (fig. VI.5, no 21; Ten Anscher & Van der Roest 1997, 14-16; Van der Beek in: Ten Anscher & Van der Roest 1997, 23-24). Four Bell Beaker sherds were found in the vegetation horizon that had formed in floodbasin deposits at site 22, but these sherds unfortunately got lost during processing of the finds (fig. VI.5, no 22; Jongste & Ten Anscher 1998, 14-15; Van Zijverden in: Jongste & Ten Anscher 1998, 23-27). At site 969, some Bell Beaker sherds were found mixed with Middle Bronze Age finds in the clay directly overlying crevasse deposits (fig. VI.5, no 969; Peters 1999, 16-17; 19). A barbed-and-tanged flint arrowhead may also date to the Late Neolithic (Peters 1999, 19). A watching brief carried out during the construction of a sewerage system direct adjacent to this site, recorded a few more Bell Beaker sherds, that were found in a clayey finds-layer on top of sandy crevasse deposits (Müller 2001, 6). A damaged stone axe was recovered from the spoil-heaps during the same campaign and may also be Late Neolithic in date (*ibid.*). At site 34, nine Bell Beaker sherds were recovered from the finds-layer that was found stratigraphically separated above the older Middle Neolithic level (see above, Bulten 1998b, 12; 16-20; fig. VI.5, no 34). Underneath and overlying both layers are crevasse splay deposits (Van Zijverden in: Bulten 1998b, 25-28). All other finds of bone, stone and clay artefacts from this upper finds-layer – including 124 undecorated sherds, but excluding the pseudo-*Grand-Pressigny* dagger fragment referred to above – are thought to date to the Late Neolithic as well.

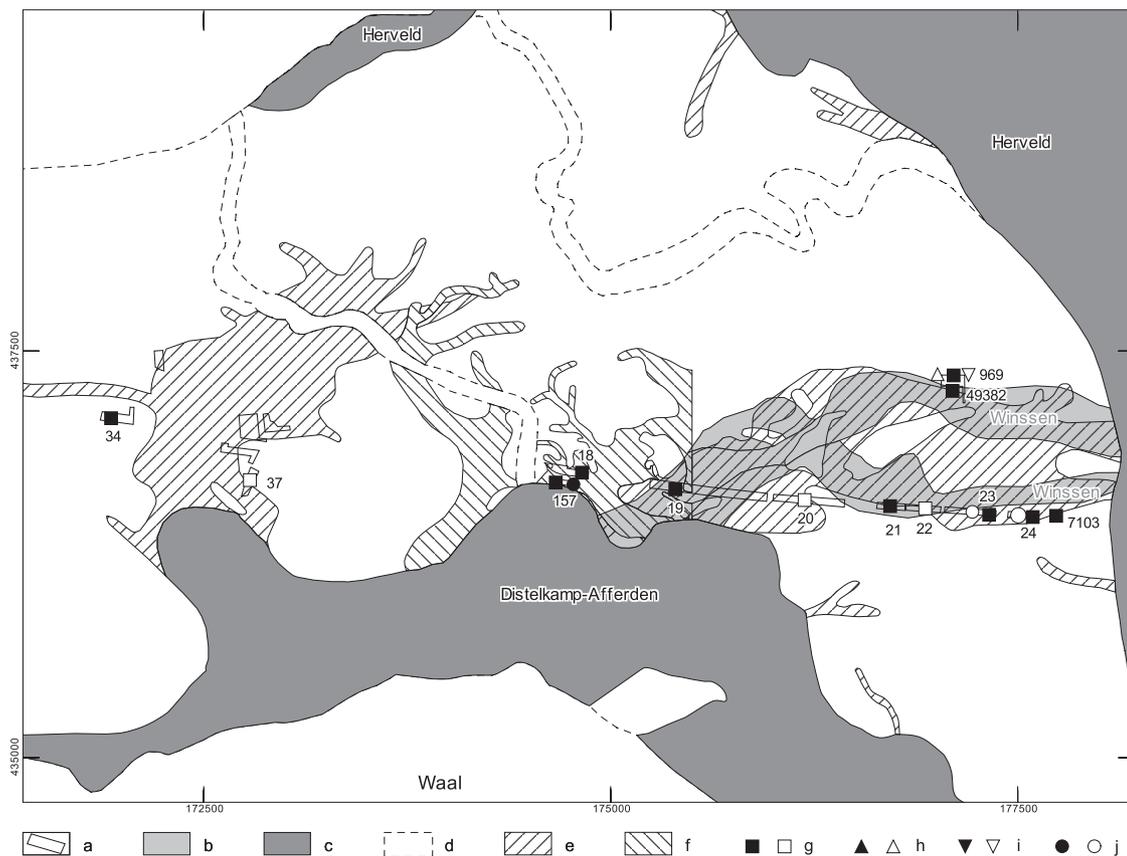


Fig. VI.5 Main fluvial systems and find-spots dated to the Late Neolithic in the Dodewaard macro-region (filled symbols indicate certain identifications, outlined symbols uncertain identifications).

a: areas of Betuweroute test-trenches, b: fossil fluvial systems, c: active fluvial systems, d: younger fluvial systems, e: crevasse deposits based on Berendsen, Faessen & Kempen 1994; Berendsen *et al.* 2001, f: crevasse deposits based on Van Zijverden 2003b, g: pottery, h: weapons, i: tools, j: features.

The Dodewaard excavation (fig. VI.5, no 157) has also yielded Bell Beaker ceramics. Of the 648 sherds recovered there (c. 5 kg), c. 80% is undecorated (Theunissen & Hulst 1999a, 150). The finds were recovered from the finds-layer, a tree-throw hole, an elongated feature (possibly a residual gully), a charcoal concentration and a pit (Theunissen & Hulst 1999a, 140; 150). Charcoal from the latter was radiocarbon dated to c. 2200-1950 cal BC (GrN-5934: 3690 ± 35 BP; Lanting & Mook 1977, 120-121). Set aside the radiocarbon dated charcoal concentration, the majority of the Late Neolithic ceramics at the Dodewaard excavation appears to originate from secondary contexts. It is, however, very well possible that features from this period are present on the site, but that they were predominately small (postholes) that did not function as efficient artefact-traps and that they have been (erroneously) assigned to the Bronze Age occupation phase. As the finds-layer was formed on top of crevasse deposits (Hulst 1991a, 56, references to Havinga 1969 and Steenbeek 1990, 130-200; Theunissen & Hulst 1999a, 137) for which it was not checked whether any older occupation levels were present at greater depths, it cannot be excluded that underneath the excavated area an older Late Neolithic level may have been present that was not investigated.

Features attributed to the Late Neolithic were furthermore found on sites 23 and 24. At both sites the dating is based on the association between the finds from the finds-layer and the few and not sectioned underlying features. At site 23, Bell- and Pot Beaker ceramics, as well as flint and stone artefacts were recovered from the finds-layer, which had formed in floodbasin deposits directly on top of crevasse splay deposits (Van Zijverden in: Jongste 1998, 21-25). No younger archaeological materials were encountered. At site 24, a posthole and a possible hearth were found underneath the clayey finds-layer, which had formed on top of crevasse deposits (Bulten & Smits 1998a, 12-13; Van Zijverden in: Bulten & Smits 1998a, 21-25).

Generally, the Late Neolithic remains recovered are incorporated into younger period contexts. Only at sites 23 and 24 did later activities appear to be absent. Features were only encountered on sites 23, 24 and 157 and remain hard to interpret. Nonetheless, these features at least point out that some constructional activities took place here on floodbasin deposits situated on top of crevasse splay deposits, as well as on crevasse splay deposits proper. It is at this point impossible to tell whether the Herveld or the Distelkamp-Afferden fluvial system created these crevasse deposits. Whichever may be the case, it is evident that activities – possibly occupation – took place within 1.5 km of an active fluvial system.

Early Bronze Age and Middle Bronze Age-A

Two distinct types of pottery decoration emerge during the Early Bronze Age and start of the Middle Bronze Age respectively. The first is decoration with ‘Barbed Wire’ stamps, made by winding cord around a narrow central axle and pressing this into the still plastic clay prior to firing of the vessel (Modderman 1955b; Lanting 1973). Pots decorated in such a manner – Barbed Wire-stamp decorated beakers – date mostly to the Early Bronze Age (but see Arnoldussen 2008, section 7.2.3.1, note 69). The second decorative tradition concerns (pseudo-)cord-impressions between the pot shoulder and rim, inner-rim decoration and horse-shoe handles, known as ‘Hilversum’-style decoration (Glasbergen

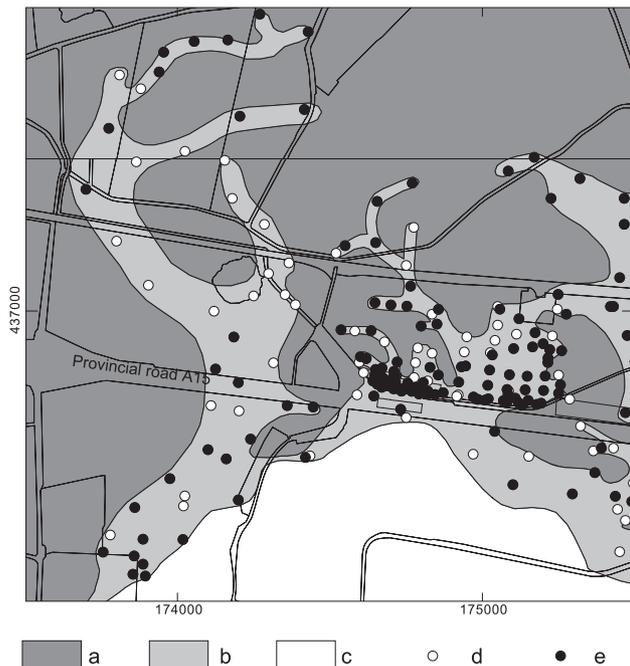


Fig. VI.6 Palaeogeographical map of the Dodewaard meso-region around 2000 cal BC (after Van Zijverden 2003b and Steenbeek 1990).

a: floodbasin deposits, b: levee- and/or crevasse deposits, c: levee- on channel bed deposits, d: top crevasse deposits below ground water level according to Steenbeek (1990), e: top crevasse deposits above ground water level according to Steenbeek (1990).

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1954; Theunissen 1999, 202-207). Dates for Hilversum-style decorated ceramics cluster around the Middle Bronze Age-A (Theunissen 1999, 203; 205; Arnoldussen 2008, table 5.1; 178 note 40). As before, the Distelkamp-Afferden and Herveld fluvial systems are still active. By combining the data from all available useable corings with the water level curve as compiled by Steenbeek (1990, 194-198), we can determine which points on the crevasse-complex are suitable for human exploitation (Van Zijverden 2003b). This has been done for the meso-region Dodewaard, measuring two by two square kilometres (fig. VI.6, cf. figs. VI.8; VI.13).

Two possible find-spots of Barbed Wire-stamp decorated ceramics are known outside the micro region. The excavation report from site 969 attributes some of the ceramics from trench two to the Barbed Wire beaker period, yet no detailed information on the relevant arguments is available (fig. VI.7, no 969; Peters 1999, 17; 19). At site 21, identification of the Early Bronze Age pottery was unproblematic; the presence of Barbed Wire-stamps, perforated rims and small bases indicate use of the site during the Early Bronze Age period (fig. VI.7, no 21; Ten Anscher & Van der Roest 1997, 14-16). Nonetheless, the 11 sherds displaying such traits form a minority in comparison to the more abundant Bell Beaker ceramics recovered from this finds-layer (*supra*). This small number of Early Bronze Age finds, as well as the absence of features on this site, makes it hard to interpret these sherds as reflecting particular human activities. Within the micro-region, the only two Barbed Wire-stamp decorated sherds were excavated in trench three on site 18 (fig. VI.7, no 18; Bulten 1998c, 19). Based on the palaeogeographical map for the period around 2000 cal BC (fig. VI.6), site 18 is entirely situated within the dry part of the landscape, but as close by as at 50 m to the north-east of trench three, aquatic floodbasins could be encountered (Van Zijverden 2003b; Van Dinter in: Bulten 1998c, 29-34).

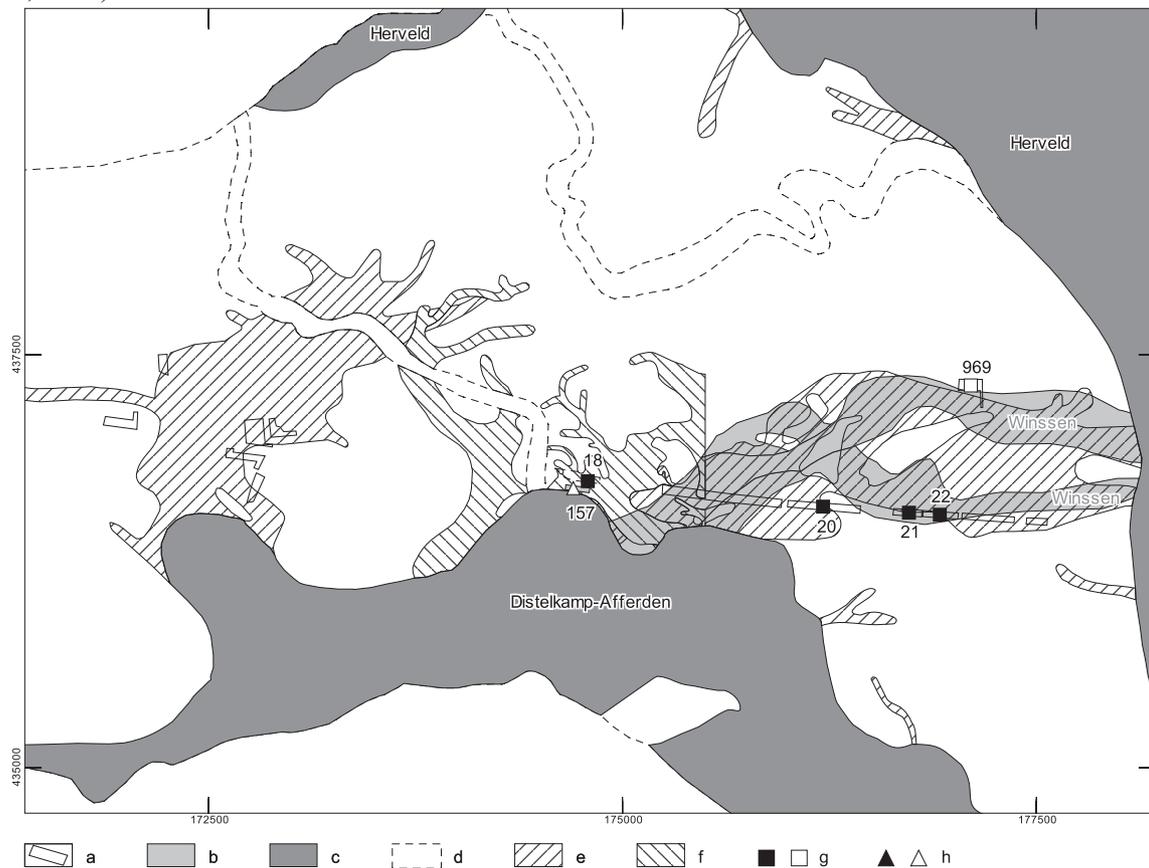


Fig. VI.7 Main fluvial systems and find-spots dated to the Early Bronze Age or Middle Bronze Age-A in the Dodewaard macro-region (filled symbols indicate certain identifications, outlined symbols uncertain identifications).

a: areas of Betuweroute test-trenches, b: fossil fluvial systems, c: active fluvial systems, d: younger fluvial systems, e: crevasse deposits based on Berendsen, Faessen & Kempen 1994; Berendsen *et al.* 2001, f: crevasse deposits based on Van Zijverden 2003b, g: pottery, h: weapons.

It is remarkable that while conditions were probably favourable to occupation during the Early Bronze Age according to the palaeogeographical map, no clear-cut remains datable to this period were recovered during the large-scale excavation of site 157 (fig. VI.7, no 157). Two finds indirectly hint of activities – possibly in the vicinity? – of site 157 during the Early Bronze Age. The first concerns the calibrated range which spans into the Early Bronze Age for the radiocarbon dated sample of (unspecified) charcoal from a posthole of house 1b (c. 1880-1620 cal BC; GrN-5935: 3430 ± 35 BP; Lanting & Mook 1977, 120-121; Theunissen 1999, 139; Lanting & Van der Plicht 2003, 160). The second is a flint arrowhead with concave base that is typologically dated to the Early Bronze Age (Theunissen & Hulst 1999a, 154), but that has a height/width ratio that is more indicative of those known from 16th century BC *Sögel* graves (cf. Butler 1969, 107-110; 1986; 1987; Laux 1971, taf. 1-2; 6; Wegner 1996, 307; 309). Even more confusing is the fact that it was found in the pit containing the Bell Beaker ceramics (Theunissen & Hulst 1999a, 140).

For the Middle Bronze Age-A period, no remains are known from site 157, although at the nearby site 18 a single cord-impressed Hilversum-style decorated sherd was found (Bulten 1998c, 19). Outside the micro-region, Hilversum-style decorated ceramics were encountered on sites 20, 22 and 969. A single cord-impressed sherd was found on site 20. This sherd originated from a finds-layer that was embedded in crevasse deposits and which contained predominantly (Middle?) Bronze Age ceramics (fig. VI.7, no 20; Jongste 1997b, 13; Van Zijverden in: Jongste 1997b, 27-31). At some places a finds-scatter was encountered at a few decimeter depths from this upper finds-layer, which is thought to represent either an accumulation of washed finds or *in-situ* off-site activities (Jongste 1997b, 24). Some heavily weathered quartz-tempered ceramics were recovered from this lower finds-scatter, but could not be dated. However, it seems not at all impossible that the single Hilversum-style decorated sherd, as well as the single possible Late Neolithic sherd (see above) represent finds that have unintentionally become incorporated into the higher level. Three cord-impressed Hilversum-style decorated sherds were found in the clayey vegetation horizon overlying crevasse deposits at site 22 (fig. VI.7, no 22; Jongste & Ten Anscher 1998, 14-15; Van Zijverden in: Jongste & Ten Anscher 1998, 23-27). Based on the ceramic spectrum of the recovered sherds, a Middle Bronze Age date is proposed for this site (Jongste & Ten Anscher 1998, 20). The cord-decorated sherd referred to in the excavation report of site 969 (Peters 1999, 17) is not depicted, so this may either be a second reference to the sherd classified as Barbed Wire Beaker later on (Peters 1999, 19) or a second individual. As the ceramics have not been depicted nor published in full, this is impossible to tell.

To sum it up, it seems that the activities taking place in the Dodewaard macro-region during the Early Bronze Age and Middle Bronze Age-A are even more elusive than those of the preceding period. No sites with features or high numbers of finds datable to these two periods have been encountered. This seems remarkable in light of Steenbeek's (1990, 190-191; 193) conclusion that as early as 1980 cal BC until 1650 cal BC a phase of decreased sedimentation occurred. Although the conditions in the lower parts of the floodbasin were generally still aquatic, some alder carr was present and the highest parts of the crevasse deposits showed occasional aeration (Steenbeek 1990, 174; 185; 193). Consequently, it is very tempting to look toward methodological aspects in order to explain the absence of 'true domestic' or settlement sites from these periods. It may be the case that settlement sites from this period were preferably located in parts of the landscape not yet investigated (the levees proper?), or that we fail to recognize settlement sites from this period (Arnoldussen 2008, sections 5.2.2; 7.2.4, cf. Brück 1999), or that settlement sites may by change be situated just outside the investigated area or, lastly, may never have been present in the micro-region in the first place.

Middle Bronze Age-B

The main phase of activity of several of the sites investigated in the meso-region Dodewaard can be dated to the Middle Bronze Age. As few categories of material culture (except some types of bronze artefacts) can be securely dated typologically to the Middle Bronze Age-B – and with often absent radiocarbon dates – most sites are assigned to the Middle Bronze Age-B period based on the absence or scarcity of Middle Bronze Age-A finds.

Fluvial activity by the Distelkamp-Afferden fluvial system presumably came to a near complete stop during this period (see above), but initially limited fluvial activity occurred in the floodbasin. Despite this sedimentation in the lower lying parts of the floodbasin, the higher areas were largely unaffected (Steenbeek 1990, 174; 185; 193). The alder carr which had formed in the floodbasin may have drowned as can be reconstructed from the decrease in *Alnus* pollen (Steenbeek 1990, 185). Pollen of *Compositae*, *Chenopodiaceae*, *Artemisia* and *Cruciferae* may point to

human occupation on the higher parts of the landscape (the Distelkamp-Afferden levees), but may also reflect natural re-colonisation of the dry parts of the landscape (Steenbeek 1990, 185; Van Beurden *in prep.*). At the end of the Middle Bronze Age-B, sedimentation in the floodbasin must have been very limited. The alder carr was restored and peaty or strongly humic clay was deposited in the floodbasins (Steenbeek 1990, 194).

Stray finds from the Middle Bronze Age in the macro-region Dodewaard comprise a mid-winged bronze axe from Hemmen (fig. VI.9, no 900; Fontijn 2003, 321) and two bronze sickles associated with Middle Bronze Age ceramics from Opheusden - De Brien (fig. VI.9 no 7113; Modderman & Montforts 1991, 149; Archis 7069; 7113). The bronze sickles could date to the final two centuries of the Middle Bronze Age-B or the first of the Late Bronze Age (Fontijn 2003, 117; 322). Additionally, presumable Middle Bronze Age ceramics and some stones were recovered from a (more than 10 cm thick) finds-layer uncovered in several test-pit dug by Modderman on the sites discovered by Havinga near Opheusden - Nijlandseweg (fig. VI.9, no 41127; 41131; 41133-41135; Modderman 1960; Archis 41127). A finds-layer with bones and Bronze Age ceramics was observed by Havinga during the construction of a new drainage ditch at Zetten - Veedijk (fig. VI.9 no 25576; Archis 25576). A ditch at Opheusden - De Doos also yielded Bronze Age ceramics (fig. VI.9 no 7122; Archis 7122). A quartz-tempered sherd was found in a coring at Dodewaard - Kerkstraat (fig. VI.9 no 127644; Asmussen 1996, 39). These finds cannot be dated with certainty to the Middle Bronze Age-B but are nonetheless introduced here. The sites detected and attributed to the Bronze Age by Havinga (1969; Havinga & Op 't Hof 1975; 1983) can neither be dated more exactly but have been depicted on fig. VI.9 as well, in order to complement the other data and to offer some insights into the possible minimal settlement site density (fig. VI.9, g).

Various Middle Bronze Age-B sites in the meso-region have been subjected to test-excavations. Two Bronze Age sherds were recovered from a clayey vegetation horizon at site 35 (Spanjer 1998, 11; Van Dinter in: Spanjer 1998a, 19-25). A third sherd could not be dated more precisely and may also date to the Late Neolithic (Spanjer 1998a, 11). Sites 36 and 37 have both yielded fragments of bones, stones and ceramics and features which are all dated to the Middle Bronze Age (Sier & Smits 1998). The finds originated from both a clayey vegetation horizon that had formed on top of crevasse deposits, as well as in the top of the crevasse deposits proper (Sier & Smits 1998, 17; 22; Van Dinter & Van Zijverden in: Sier & Smits 1998, 29-36). Part of a structure, possibly an ancillary building or granary, was uncovered in trench 3 on site 37 (Sier & Smits 1998, 20). Based on the small number of ceramics, a Middle Bronze Age-B date was suggested, but could not be proven (Sier & Smits 1998, 23). The nearby sites 17 and 38 have yielded comparable results. Here as well a vegetation horizon had formed in the clay overlying crevasse deposits (Bulten 1998a, 13; 20; Van Zijverden in: Bulten 1998a, 37-43). From this vegetation horizon stones, bones and abundant Middle Bronze Age ceramics were recovered (Bulten 1998a, 18-20; 22-29; 31). A bronze sickle and rivet and two pierced stone pendants represent the more remarkable finds. These four sites (17, 36, 37 and 38) are interpreted as representing parts of the vicinity of Bronze Age settlement sites (Sier & Smits 1998, 23; Bulten 1998a, 31). Ceramics from the 'advanced' (*i.e.* later) Middle Bronze Age as well as features were discovered in the test-trenches at site 969 (Peters 1999, 16-19). The finds, including stones and bones, were recovered from the top of crevasse splay deposits, as well as from the lowest 20 cm of the covering layer of clay (Peters 1999, 16). The features

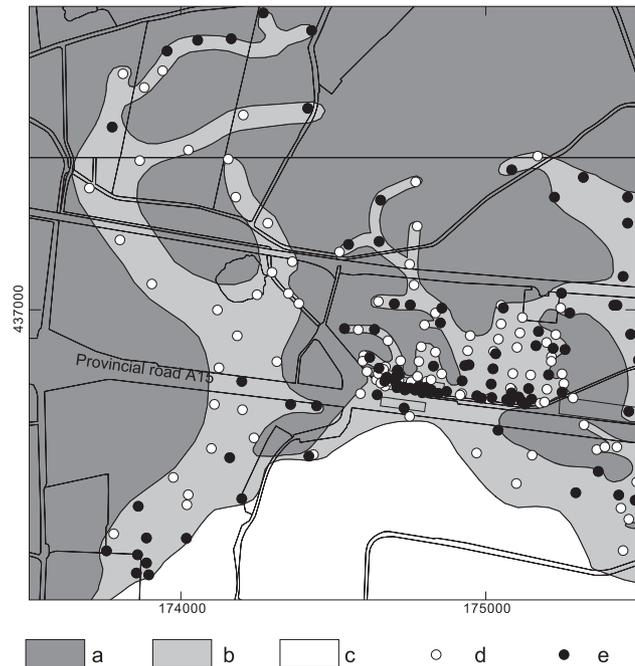


Fig. VI.8 Palaeogeographical map of the Dodewaard meso-region around 1500 cal BC (after Van Zijverden 2003b and Steenbeek 1990).

a: floodbasin deposits, b: levee- and/or crevasse deposits, c: levee-on channel bed deposits, d: top crevasse deposits below ground water level according to Steenbeek (1990), e: top crevasse deposits above ground water level according to Steenbeek (1990).

were not interpreted as being part of a structure, although they are assumed to be part of a Bronze Age settlement site (Peters 1999, 20). At site 22, based on the presence of often fragmented or burned ceramics, bones and stones in the vegetation horizon that had formed in floodbasin deposits – and implicitly on the near absence of features? – the site is interpreted as a ‘special activity site’ dated to the ‘Middle Bronze Age’ (Jongste & Ten Anscher 1998, 14-15; 20; Van Zijverden in: Jongste & Ten Anscher 1998, 23-27, but see Arnoldussen 2008, section 7.3). A few Hilversum-style decorated sherds also originated from this layer (see above), which means that the attribution to the Middle Bronze Age-B is tentative. The bones, stones and ceramics from the finds-layer in the crevasse deposits at site 20 are dated to the Middle Bronze Age-B (Jongste 1997b, 13; Van Zijverden in: Jongste 1997b, 27-31). For a bronze dagger that was recovered from the finds-layer in trench 2, a more general date to the Middle Bronze Age is forwarded (Jongste 1997b, 14 fig. 6, but possibly a dating to the period *Bronze Final I* is more accurate (D. Fontijn, pers. comm., Aug. 2006)). Based on the absence of features, this site is considered to represent the periphery of two Middle Bronze Age settlement sites situated to the north and south of the area investigated (Jongste 1997b, 22).

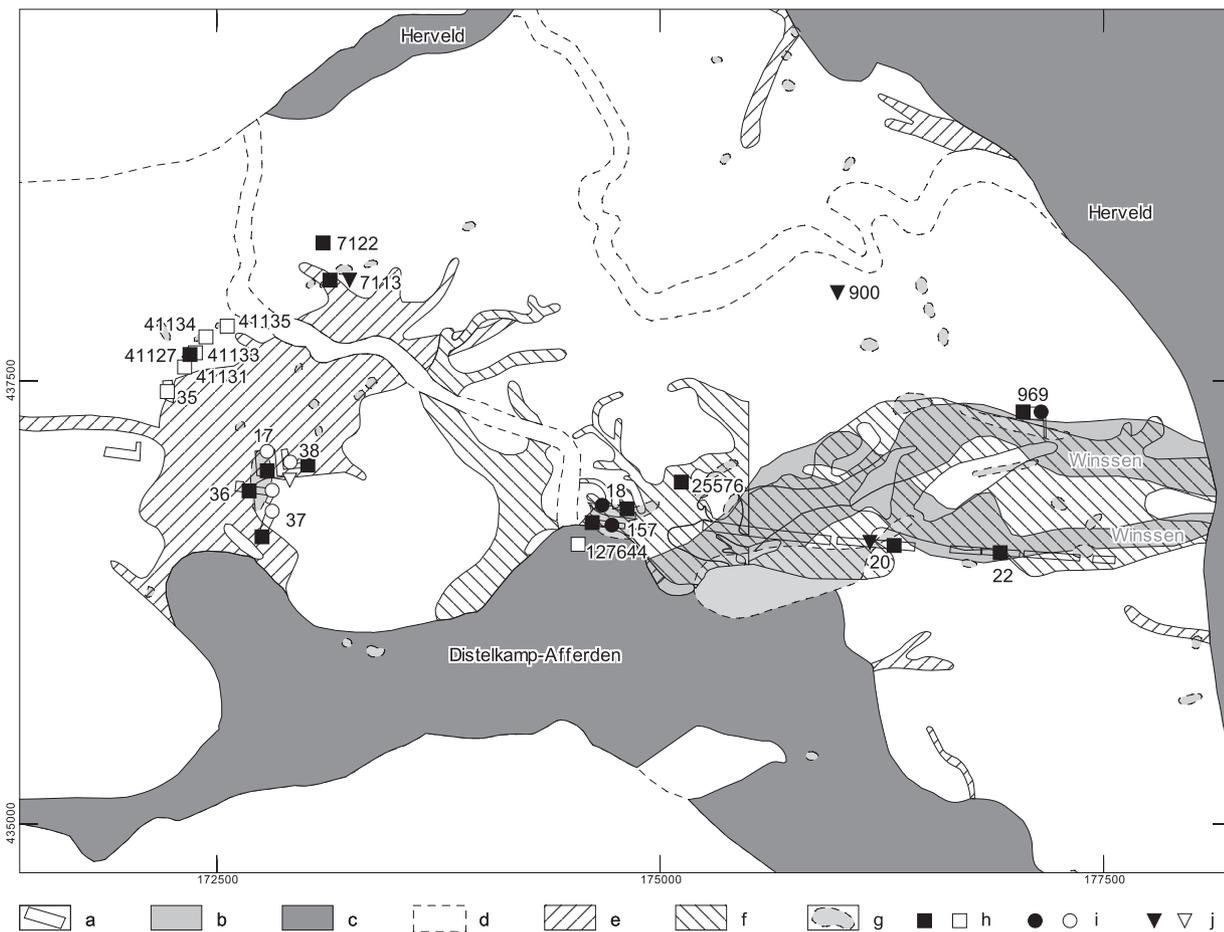


Fig. VI.9 Main fluvial systems and find-spots dated to the Middle Bronze Age-B in the Dodewaard macro-region (filled symbols indicate certain identifications, outlined symbols uncertain identifications).

a: areas of Betuweroute test-trenches, b: fossil fluvial systems, c: active fluvial systems, d: younger fluvial systems, e: crevasse deposits based on Berendsen, Faessen & Kempen 1994; Berendsen *et al.* 2001, f: crevasse deposits based on Van Zijverden 2003b, g: ‘ancient settlement soils’ according to Havinga (1969; Havinga & Op ‘t Hof 1975; 1983), h: pottery, i: features, j: bronze tools.

Within the micro-region, relicts from the Middle Bronze Age-B have been investigated at sites 18 and 157. Only trench one at site 18 yielded features; both small features such as postholes as well as a large pit (Bulten 1998c, 15-18). The other trenches at site 18 did yield stones, bones and ceramics from a finds-layer which formed the lower part

of a clayey vegetation horizon on top of crevasse splay deposits (Bulten 1998c, 17; Van Dinter in: Bulten 1998c, 29-34). Over 750 sherds can be dated to the Middle Bronze Age-B (Bulten 1998c, 18) The distribution of these finds shows two distinct concentrations (Bulten 1998c, 25). These concentrations and the features from trench 1 are interpreted as belonging to settlement site 157, located 45 m to the south (Bulten 1998c, 23).

The Middle Bronze Age-B finds from the Dodewaard excavation have been published by Hulst (Hulst 1967b; 1970; 1971; 1991) and Theunissen and Hulst (1999a), so only a brief summary will be presented here. Two house-sites dating to the Middle Bronze Age(-B) were uncovered (fig. VI.10).

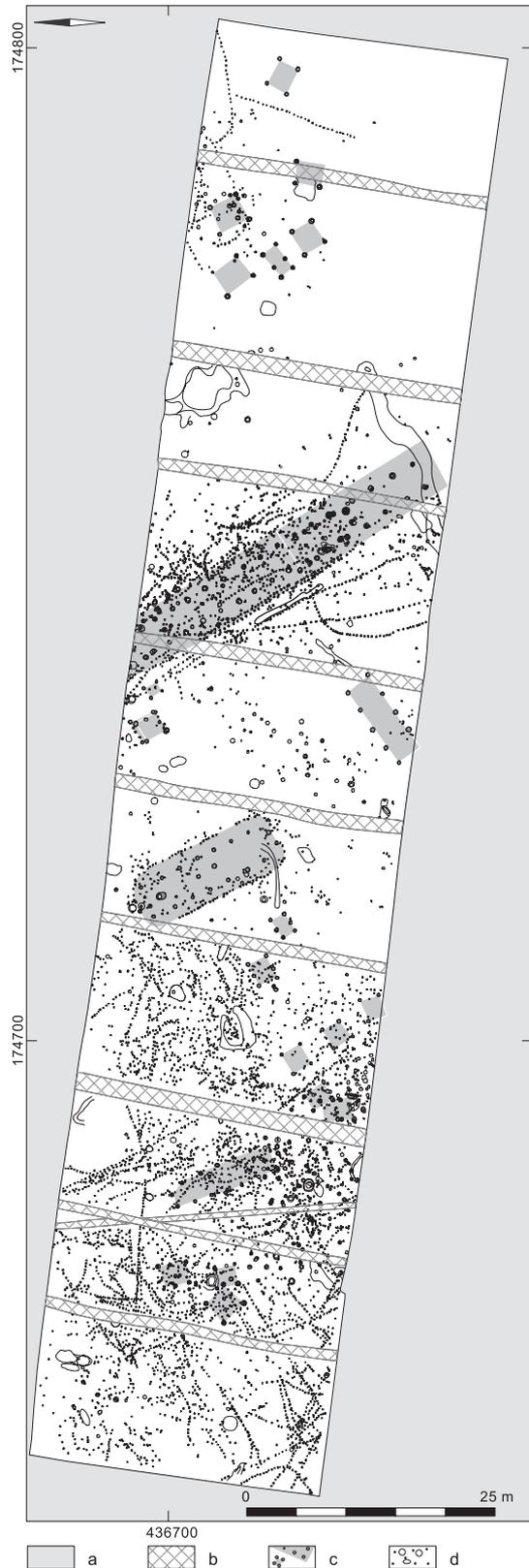
The easternmost house-site comprises at least two overlapping house plans (fig. VI.11, overleaf). Various posts of the northernmost phase (1b) seem to have been doubled, indicating repairs. Two fences are interpreted as possible cattle droves (Theunissen & Hulst 1999a, 141; 148). The westernmost house-site represents a single house-phase. In the absence of hearths, stalls and unambiguous finds, there is no reliable evidence for the specific functions of parts of the house plans.

Two larger ancillary buildings have been reconstructed, whose orientation appears to correspond to that of the houses or is perpendicular to that. At some distance from the houses several four- and six-post outbuildings are found. Besides these more or less clear structures, the excavation plan is littered with postholes and stakes that occasionally can be grouped into longer sections of fences.

Evidence for crop cultivation is absent. Indicators such as ard-marks or botanical remains have not been found. This is largely a result of the applied methodology (Theunissen & Hulst 1999a, 154). Even in the pollen spectra evidence for crop-cultivation, or human presence in general, is minimal (Steenbeek 1990, 185-186; Van Beurden *in prep.*). A pollen sample from the higher parts of the Distelkamp-Afferden deposits yielded indicators of human presence and possibly meadows (grasses (*Graminae*), members of the daisy family (*Compositae*), plaintain (*Plantago*), dock species (*Rumex*), knotweed (*Polygonum aviculare*) and members of the carnation family (*Caryophyllaceae*) were found; Steenbeek 1990, 188). For the lower lying parts of the floodbasin the pollen evidence suggests an expansion of the alder carr in the floodbasin. Alder (*Alnus*) pollen dominates, but is supplemented by narrowleaf cattail (*Typha angustifolia*), bur-reed (*Sparganium*), sedges

Fig. VI.10 Overview of all features and (Middle) Bronze Age structures at Dodewaard site 157 (after Theunissen & Hulst 1999a, 138 fig. 4.7).

a: not excavated, b: recent disturbances, c: features associated with structures, d: other features.



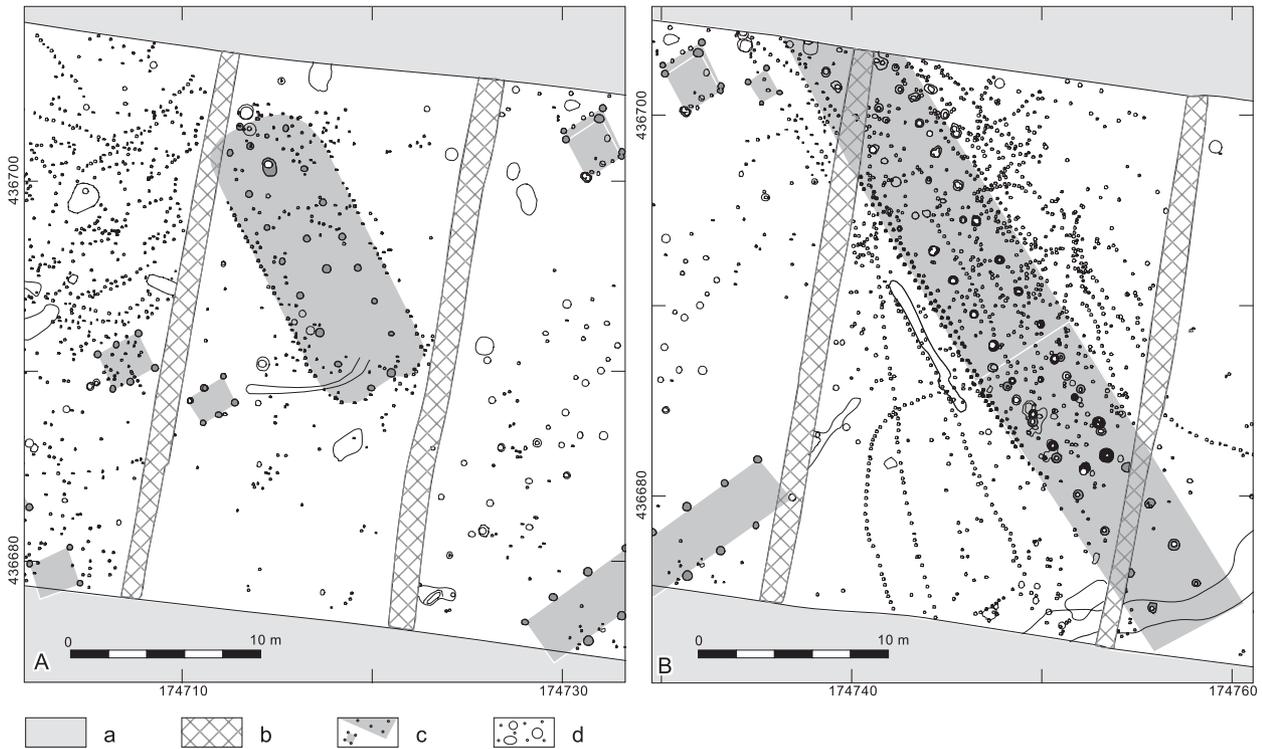


Fig. VI.11 House-site two (A) and one (B) at Dodewaard site 157 (for location see fig. VI.10; after Theunissen & Hulst 1999a, 138 fig. 4.7).
a: not excavated, b: recent disturbances, c: features associated with structures, d: other features.

(*Cyperaceae*), water crowfoot (*Ranunculus(Batrachium)*) and European water plantain (*Alisma*), indicating high but relatively stable groundwater table levels in the floodbasin (Steenbeek 1990, 186; 200).

Husbandry certainly took place, as is evident from the recovered faunal assemblages (Clason 1977; 1999). Cattle represent the most-recovered species, followed by near equal numbers of pig and sheep/goats (Clason 1999, 37; table 1). The four (fragments of) spindle whorls indicate the processing of wool (Theunissen & Hulst 1999a, 152; 190).

The two houses are thought to have been contemporaneous and have been claimed to date to the Middle Bronze Age - A (Theunissen & Hulst 1999a, 156). This assumed age is a result of the radiocarbon dating of unspecified charcoal from a posthole of house phase 1b (*c.* 1880-1620 cal BC; GrN-5935: 3430 ± 35 BP; Lanting & Mook 1977, 120-121; Theunissen 1999, 139; Lanting & Van der Plicht 2003, 160). The association between the sample and the phenomenon desired to be dated – occupancy of the house – is however weak. The absence of Hilversum-style decorated sherds and generally low percentages of decorated ceramics do furthermore complicate the suggested date. The three-aisled house plan of phase 1a from Dodewaard is fairly straightforward and regular. It has been argued elsewhere (Arnoldussen 2008, section 5.2.3) that most of such houses date between *c.* 3150 ± 50 to 3050 ± 50 BP, *i.e.* roughly around 1500-1100 cal BC (*cf.* Arnoldussen & Fontijn 2006). At this point, a dating to the Middle Bronze Age-B of the main phase of use of this site seems most likely.

Concluding, it seems that occupation of the meso-region Dodewaard was wide-spread during the Middle Bronze Age. Only where more extensive excavation has been carried out, was it possible to date these activities to the Middle Bronze Age-B, or to determine the exact nature of these activities. At site 157, two house-sites were uncovered, whereas in the test-trenches on sites 969, 17 and 36-38 the periphery of prehistoric settlement sites was uncovered. All sites are situated on – stacked – crevasse splay deposits, for which it is impossible to determine whether they originated from the Distelkamp-Afferden or the Herveld fluvial system. Whereas the former cannot be proven to have been active during the Middle Bronze Age-B, the latter certainly was. The density of known sites appears very unrepresentative. Predominantly locations with good chances of being detected through corings,

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such as undisturbed vegetation horizons and flanks of crevasse deposits, have seen more extensive archaeological research in the form of test-trenches. Large scale systematic coring as done by Havinga may offer some insight into the distribution and density of prehistoric settlements in this area, although still sites will have been missed (see source criticism above). The density of ‘ancient settlement soils’ as mapped by Havinga translates as 1.46 sites per sq km or 2 % of the surface area.

The fluvial dynamics within the Dodewaard macro-region during this period are relatively stable, but within the micro-region, some shrinkage of the inhabitable area is noticeable that however does not affect the area of sites 18 and 157 (fig. VI.8).

Late Bronze Age

During the Late Bronze Age two new fluvial systems, called Wuustegraaf and Boelenham, become active in the meso-region Dodewaard. The exact start of sedimentation of both systems is not known. Levee and crevasse formation by these two systems eroded parts of the earlier landscape. The Wuustegraaf fluvial system is not dated directly at all; Berendsen and Stouthamer (2001, 245-246) estimate that deposition by this system took place between 2800 and 2400 years BP (c. 1000-400 cal BC). The single site known on this system listed in Archis (fig. VI.12, no 41185; Archis 41185) is erroneously dated to the Bronze Age, as it represents a site classified as a ‘Batavian-Roman period culture layer’ on Havinga’s 1969 Map (Map 1, D3/4). Late Iron Age and Roman period sites on top of the Wuustegraaf deposits are known (Willems 1985, 99-100 sites 62, 66-67).

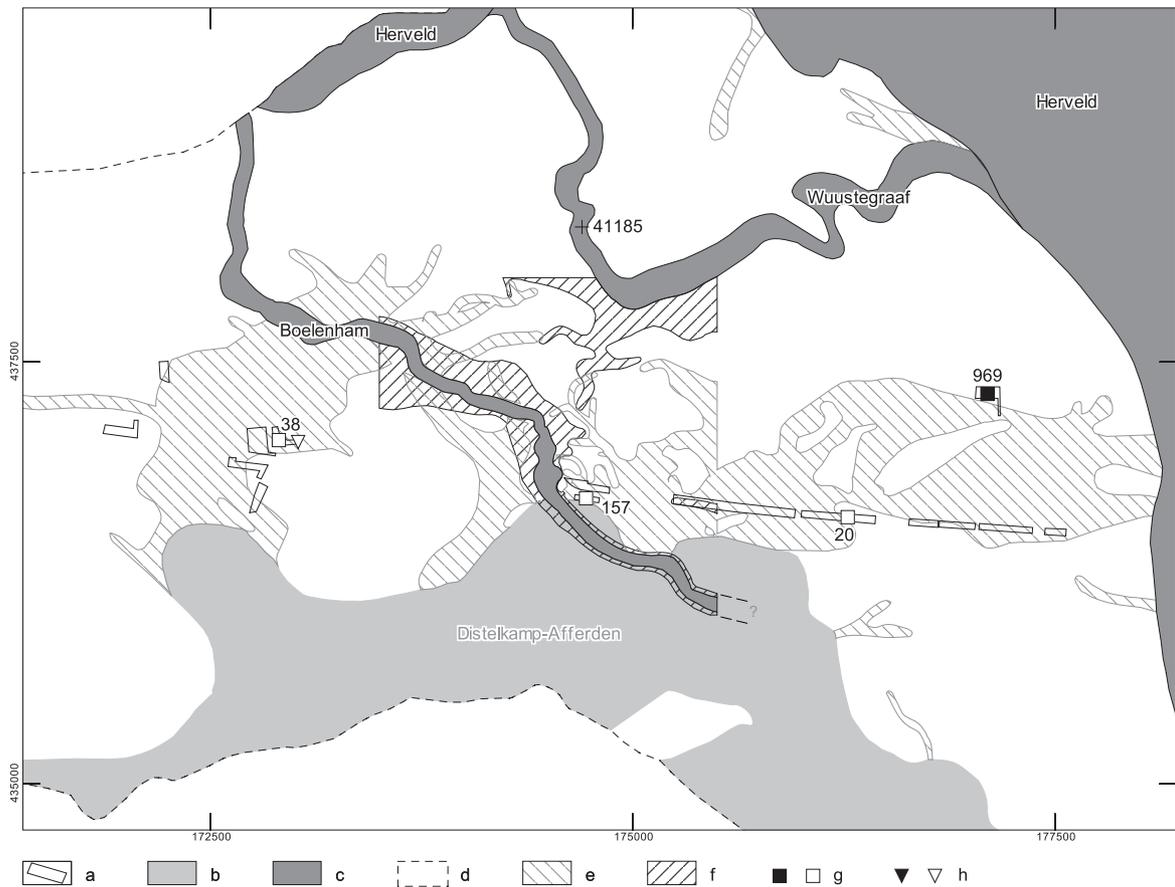


Fig. VI.12 Main fluvial systems and find-spots dated to the Late Bronze Age in the Dodewaard macro-region (filled symbols indicate certain identifications, outlined symbols uncertain identifications).

a: areas of Betuweroute test-trenches, b: fossil fluvial systems, c: active fluvial systems, d: younger fluvial systems, e: older crevasse deposits (based on Berendsen, Faessen & Kempen 1994; Berendsen *et al.* 2001; Van Zijverden 2003b), f: levee- and/or crevasse deposits by the Wuustegraaf or Boelenham system (after van Zijverden 2003b), g: pottery, h: bronze tools, i: other find-spots.

The start of sedimentation by the Boelenham fluvial system is known indirectly through two dated samples of (unspecified) macro-remains from the clay underneath the overbank deposits. These two dates suggest that sedimentation may have started after 920-760 cal BC (GrN-11552: 2710 ± 80 BP and GrN-11557: 2600 ± 80 BP; Steenbeek 1990, 233; 237). The Boelenham fluvial system started as a crevasse from the Herveld system, which later on got connected downstream to the northern section of the Herveld system (Steenbeek 1990, 155; Van Zijverden 2003b). Iron Age or Roman period pottery was found in a coring on its levees, and finds from the Late Iron Age are known on top of the Boelenham deposits (Asmussen 1996, 39-41; Willems 1985, sites 52-53; 1984 Map I). Steenbeek's analysis showed that during the Late Bronze Age water-levels in the floodbasin varied more than in the previous period, and that while some parts of the floodbasin occasionally fell dry, alder carr once again drowned in other parts (Steenbeek 1990, 175; 186; 194).

Only a few find-spots have yielded evidence for activities in the region during the Late Bronze Age and evidence is often inconclusive. A Late Bronze Age date has been suggested for a few ($n < 17$) thin-walled sherds with varied temper at site 38 (fig. VI.12, no 38; Bulten 1998a, 24-25). A bronze rivet may also date to this period (Bulten 1998a, 28). These items were found mixed with predominantly Middle Bronze Age finds in a vegetation horizon, which had formed in the clay overlying crevasse deposits (Bulten 1998a, 13; 20; Van Zijverden in: Bulten 1998a, 37-43). At site 20, a single decorated sherd may be dated to the Late Bronze Age, although a Late Neolithic date is favoured in the publication (fig. VI.12, no 20; Jongste 1997b, 13-14). According to P. van den Broeke, Late Bronze Age ceramics were also part of the ceramic assemblage of site 157, although these sherds have never been published as such (fig. VI.12, no 157; P. van den Broeke, pers. comm., Sept. 2003). At site 969, ceramics from the upper clayey finds-layer in trench three comprise chamotte-tempered and smoothed sherds decorated with nail impressed pseudo-cordons and continuous nail-impressions (Peters 1999, 15; 19) that may very well date to the Late Bronze Age.



Fig. VI.13 Palaeogeographical map of the Dodewaard meso-region around 1000 cal BC (after Van Zijverden 2003b and Steenbeek 1990).

a: floodbasin deposits, b: levee- and/or crevasse deposits, c: levee- on channel bed deposits, d: top crevasse deposits below ground water level according to Steenbeek (1990), e: top crevasse deposits above ground water level according to Steenbeek (1990).

It is clear that within the micro-region more or most of the north-western crevasse deposits became uninhabitable (fig VI.13). The southern and central part, in which site 157 is situated, is largely unaffected. The two other find-spots of Late Bronze Age ceramics, sites 38 and 696, are situated at 800-900 m distance from the active Boelenham and Herveld systems respectively. The relative scarcity of sites from this period does apply to a region beyond the meso-region Dodewaard, and has been interpreted as a result of a major phase of reformation of the fluvial structures of the Rhine-Meuse delta (Jongste & Van Zijverden 2007; *cf.* Arnoldussen 2008, section 7.4.2).

Early Iron Age

During the Early Iron Age, sedimentation by the Herveld, Boelenham and Wuustegraaf fluvial systems continued. The increased fluvial activity that already started in the previous period, continued during this period (Steenbeek 1990, 180; 186; 188-194). At this time, sediment is deposited on the former Distelkamp-Afferden deposits, rendering them unsuitable for occupation (Steenbeek 1990, 194; Van Zijverden 2003b). No clear settlement sites datable to this period are known from the meso-region. The nearest reference to a possible settlement site dating to this period is Kesteren - Nedereindsestraat, but this date is uncertain (Archis 31983, see Appendix V, fig. V.23, no 7410). Only on distribution maps from the Middle Iron Age onward do we once again find possible settlement sites within the meso-region (*e.g.* Willems 1985; 1984; Archis 6879, 7149, 7456, 41058, 41065, 44527).

References

- Addink-Samplonius, M., 1968, Neolithische stenen strijdhamers uit Midden-Nederland, *Helinium* 8, 209-240.
- Anscher, T.J. ten & J. van der Roest, 1997, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute vindplaats 21: Valburg Zettense Veld - West*, Amersfoort (Rapportage Archeologische Monumentenzorg 12).
- Arnoldussen, S., 2000, *Covered with Clay. Man and Landscape during the Late Neolithic up to the Middle Bronze Age in the Dutch central river area*, Leiden (Unpublished MA thesis).
- Arnoldussen, S., 2003, *Aanvullend archeologisch onderzoek van de randzone van een nederzetting uit de midden-bronstijd te Zijderveld*, Leiden (Archol Rapport 23).
- Arnoldussen, S. & W.K. van Zijverden, 2004, Culemborg- Den Heuvel. Bronze Age remains and Iron Age settlement traces next to a break-through channel in the Schoonrewoerd stream ridge, *Lunula: Archaeologia Protohistorica* 12, 59-71.
- Arnoldussen, S. & D.R. Fontijn, 2006, Towards familiar landscapes? On the nature and origins of Bronze Age landscapes in the Netherlands, *Proceedings of the Prehistoric Society* 72, 289-317.
- Arnoldussen, S., 2008, *A Living Landscape: Bronze Age settlement sites in the Dutch river area (2000-800 BC)*, Leiden (PhD thesis).
- Asmussen, P.S.G., 1991, *Archeologische Begeleiding Betuweroute. Deel A: Vaststellen minst schadelijke tracé*, Amsterdam (RAAP-Rapport 59).
- Asmussen, P.S.G. & R.P. Exaltus, 1993, *Archeologische Begeleiding Betuweroute, Deel B: Inventarisatie & Deel C: (gedeeltelijk) Waardering*, Amsterdam (RAAP-Rapport 76).
- Asmussen, P.S.G., 1994, *Archeologische Begeleiding Betuweroute, Deel C: Waardering van de vindplaatsen*, Amsterdam (RAAP-Rapport 86).
- Asmussen, P.S.G., 1996, *Archeologische Begeleiding Betuweroute; Aanvullende archeologische kartering en waardering*, Amsterdam (RAAP-Rapport 196).
- Baetsen, S. & J. van Kerkhove, 2005, *Bureauonderzoek en Inventariserend Veldonderzoek Herman Kuijkstraat 46-48*, Amsterdam (Zuidnederlandse Archeologische Notities 38).
- Bakels, C.C., 2005, Botanie, het onderzoek van zaden en vruchten, in: S. Knippenberg & P.F.B. Jongste (eds), *Terug naar Zijderveld. Archeologische opgravingen van een bronstijdnederzetting langs de A2*, Leiden (Archol Rapport 36), 114-116.
- Bedeaux, D., 2005, *Plangebied Provincialeweg Oost te Deil, gemeente Geldermalsen, archeologisch vooronderzoek: een inventariserend veldonderzoek*, Leiden (RAAP-notitie 1044).
- Beek, R. van, 2005, Aardewerk, in: S. Knippenberg & P.F.B. Jongste (eds), *Terug naar Zijderveld. Archeologische opgravingen van een bronstijdnederzetting langs de A2*, Leiden (Archol Rapport 36), 75-80.
- Bente, D.A., 2000, *Plangebied Hondsgemet-bedrijventerrein en Randweg, gemeente Geldermalsen: een aanvullende archeologische inventarisatie (AAI-1)*, Amsterdam (RAAP-Rapport 575).
- Benthem, A. van & L. Smit, 2004, *Zijderveld locatie Boomgaard en Elfhont, gemeente Vianan. Bureauonderzoek en booronderzoek (IVO)*, Amersfoort (ADC Rapport 304).
- Berendsen, H.J.A., 1982, *De genese van het landschap in het zuiden van de provincie Utrecht: een fysisch-geografische studie*, Utrecht (Utrechtse geografische studies 25).
- Berendsen, H.J.A., E.L.J.H. Faessen & H.F.J. Kempen, 1994, *Zand in banen - zanddiepte-attentie kaarten van het Gelders rivieren gebied*, Arnhem.
- Berendsen, H.J.A. & E. Stouthamer, 2001, *Palaeogeographical development of the Rhine-Meuse delta, The Netherlands*, Assen.
- Berendsen, H.J.A., E.L.J.H. Faessen, A.W. Hesselink & H.F.J. Kempen, 2001, *Zand in banen - zanddiepte-kaarten van het Gelderse rivierengebied, met inbegrip van de uiterwaarden*, Arnhem.
- Berendsen, H.J.A. & R. de Jong, 2003, *Fysisch-geografisch vooronderzoek met betrekking tot de verbreding van de A2*, Amsterdam (ICG Rapport 03-02).
- Berendsen, H.J.A. & W.Z. Hoek, 2005, *Eindrappport van het fysisch-geografisch onderzoek in het kader van de verbreding van de A2*, Utrecht (ICG Rapport 05-1).
- Bergman, W.A. & C. Helmich, 2004, *Inventariserend veldonderzoek (IVO) Mierlingsestraat te Erichem*, Zelhem.
- Berkvens, R., C. Brandenburgh & C.W. Koot, 2004, Bewoningsporen uit de periode Laat-Neolithicum - Midden-Bronstijd (2850-1100 v.Chr.), in: C.W. Koot & R. Berkvens (eds), *Bredase akkers eeuwenoud. 4000 jaar bewoningsgeschiedenis op de rand van zand en klei (ErfgoedStudies Breda 1)*, Breda (Rapportage Archeologische Monumentenzorg 102), 55-77.

APPENDICES TO: A LIVING LANDSCAPE. BRONZE AGE SETTLEMENT SITES IN THE DUTCH RIVER AREA

- Beurden, L. van, *in prep.* (2008), *Vegetatie en ontwikkelingen in het rivierengebied in de Bronstijd*, Zaandam (BIAxiaal 331).
- Bloo, S.B.C. & W. Schouten, 2002, Aardewerk, in: P.F.B. Jongste & G.J. van Wijngaarden (eds), *Archeologie in de Betuweroute: Het Erfgoed van Eigenblok. Bewoningssporen uit de Bronstijd te Geldermalsen*, Amersfoort (Rapportage Archeologische Monumentenzorg 86), 217-277.
- Boer, Th. A. de & L.J. Pons, 1960, Bodem en grasland in de Vijfheerenlanden, *Verslagen van Landbouwkundige Onderzoekingen* 66.6, 1-72.
- Boreel, G.L., 2004, *Bureauonderzoek Meteren De Plantage*, Amsterdam (Zuidnederlandse Archeologische Notities 11).
- Bourgeois, Q.P.J. & D.R. Fontijn, *in press* (2008), Bronze Age houses and barrows in the Low Countries, in: S. Arnoldussen & H. Fokkens (eds), *Bronze Age settlements in the Low Countries*, Oxford, 41-57.
- Brenkman, G.J., 1912, De opgravingen te Kesteren in 1909 en 1910, *Gelre* 15, 593-609.
- Brinkkemper, O., H. van Haaster, P. van Rijn & C. Vermeeren, 2002, Archeobotanie, in: P.F.B. Jongste & G.J. van Wijngaarden (eds), *Archeologie in de Betuweroute: Het Erfgoed van Eigenblok. Bewoningssporen uit de Bronstijd te Geldermalsen*, Amersfoort (Rapportage Archeologische Monumentenzorg 86), 439-557.
- Broeke, P.W. van den, 2001, The inconspicuous continuation of bronze deposition in Dutch wet contexts after the Early Iron Age, in: W.H. Metz, B.L. van Beek & H. Steegstra (eds), *Patina. Essays presented to Jay Jordan Butler on the occasion of his 80th birthday*, Groningen/Amsterdam, 161-168.
- Broeke, P.W. van den, 2005, Blacksmiths and potters. Material culture and technology, in: L.P. Louwe Kooijmans, P.W. van den Broeke, H. Fokkens & A.L. van Gijn (eds), *The prehistory of the Netherlands (II)*, Amsterdam, 603-625.
- Brokke, A.J., 2005a, *Geldermalsen middengebied sectie G: bureau onderzoek*, Amersfoort (ADC-Rapport 343).
- Brokke, A.J., 2005b, *Geldermalsen middengebied sectie G: een inventariserend veldonderzoek in de vorm van boringen*, Amersfoort (ADC-Rapport 397).
- Bronk Ramsey, C., 2005, *OxCal Program v 3.10* (<http://www.rlaha.ox.ac.uk/oxcal/oxcal.htm>), Oxford.
- Brück, J., 1999, What's in a settlement? Domestic practice and residential mobility in Early Bronze Age southern England, in: J. Brück & M. Goodman (eds), *Making Places in the Prehistoric World: themes in settlement archaeology*, London, 52-75.
- Buddingh, D., 1861, *Wandelingen door de Betuwe, ter opsporing van Germaansch-Bataafsche, vooral van Romeinsche oudheden (1854-1860)*, Tiel.
- Buddingh, D., 1865, *Nieuwe wandelingen door de Betuwe ter opsporing van Germaansch-Bataafsche, vooral van Romeinsche oudheden*, Tiel.
- Buitenhuis, H., 2001, Archeozoölogie, in: J. Schoneveld & E.F. Gehasse (eds), *Archeologie in de Betuweroute: Boog C-Noord, een vindplaats bij Meteren op de overgang van Neolithicum naar Bronstijd*, Amersfoort (Rapportage Archeologische Monumentenzorg 84), 141-168.
- Buitenhuis, H., M.J.L.Th. Niekus, G.J. de Roller, I-L. M. Stuijts, C. Tulp, A. Ufkes & J.B. de Voogd, 2002, De Romeinse tijd, in: J. Schoneveld & P. Kranendonk (eds), *Archeologie in de Betuweroute: Drie erven uit de Midden-Bronstijd bij Lienden*, Amersfoort (Rapportage Archeologische Monumentenzorg 89), 231-249.
- Buitenhuis, H., 2002, Archeozoölogie, in: J. Schoneveld & P. Kranendonk (eds), *Archeologie in de Betuweroute: Drie erven uit de Midden-Bronstijd bij Lienden*, Amersfoort (Rapportage Archeologische Monumentenzorg 89), 191-226.
- Bulten, E.E.B., 1996, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute (AAO 7). Geldermalsen Eigenblok-West*, Amersfoort (Rapportage Archeologische Monumentenzorg 8).
- Bulten, E.E.B., 1997, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 19: Dodewaard / Veedijk-Oost*, Amersfoort (Rapportage Archeologische Monumentenzorg 17).
- Bulten, E.E.B., 1998a, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 17 & 38: Dodewaard / Plas van Schouls en Viaduct Dalwagen-Noord*, Amersfoort (Rapportage Archeologische Monumentenzorg 28).
- Bulten, E.E.B. & E. Smits, 1998a, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 24: Valburg De Vergulde Bodem-Zuid*, Amersfoort (Rapportage Archeologische Monumentenzorg 18).
- Bulten, E.E.B. & E. Smits, 1998b, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 28, Geldermalsen / Knooppunt B-Voetakker*, Amersfoort (Rapportage Archeologische Monumentenzorg 29).
- Bulten, E.E.B., 1998b, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 34: Dodewaard / Peyenkampse Veldweg*, Amersfoort (Rapportage Archeologische Monumentenzorg 30).
- Bulten, E.E.B., 1998c, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 18: Dodewaard / Veedijk-West*, Amersfoort (Rapportage Archeologische Monumentenzorg 33).

REFERENCES

- Butler, J.J., 1969, *Nederland in de Bronstijd*, Bussum (Fibulareeks 31).
- Butler, J.J., 1986, Drouwen: end of a 'Nordic' rainbow?, *Palaeohistoria* 28, 133-168.
- Butler, J.J., 1987, Drouwen: Het einde van de Noordse regenboog?, *Nieuwe Drentse Volksalmanak* 104, 103-150.
- Butler, J.J. & J.B. Hielkema, 2002, Metaal, in: B.H.F.M. Meijlink & P. Kranendonk (eds), *Archeologie in de Betuweroute: Boeren, erven, graven. De Boerengemeenschap van De Bogen bij Meteren (2450-1250 v. Chr.)*, Amersfoort (Rapportage Archeologische Monumentenzorg 87), 539-546.
- Cavallo, C., 2005, Archeozoologisch onderzoek, in: S. Knippenberg & P.F.B. Jongste (eds), *Terug naar Zijderveld. Archeologische opgravingen van een bronstijdnederzetting langs de A2*, Leiden (Archol Rapport 36), 88-99.
- Chorley, R.J., S.A. Schumm & D.E. Sugden, 1984, *Geomorphology*, London.
- Clason, A.T., 1977, *Jacht en veeteelt van prehistorie tot middeleeuwen*, Haarlem.
- Clason, A.T., 1999, What's new in the Bronze Age? The Livestock and Gamebag of the Bronze Age Farmers in the Western and Central Netherlands, in: H. Sarfatij, W.J.H. Verwers & P.J. Woltering (eds), *In Discussion with the Past. Archaeological studies presented to W.A. van Es*, Zwolle, 35-40.
- Cohen, K.M., 2003, *Differential subsidence within a coastal prism. Late-Glacial - Holocene tectonics in the Rhine-Meuse delta, The Netherlands*, Utrecht (PhD Thesis) (Netherlands Geographical Studies 316).
- Cohen, K.M., M.J.P. Gouw & J.P. Holten, 2005, Fluvio-deltaic floodbasin deposits recording differential subsidence within a coastal prism (central Rhine-Meuse delta, the Netherlands), in: M.D. Blum, S.B. Marriott & S.F. Leclair (eds), *Fluvial Sedimentology VII*, (International Association of Sedimentologists. Special Publication 35), 295-320.
- Collinson, J.D., 1996, Alluvial sediments, in: H.G. Reading (eds), *Sedimentary environments : processes, facies, and stratigraphy*, Oxford, 37-82.
- Cornelissen, E., 1988, A study of flint arrowheads of the provinces of Brabant and Limburg (Belgium), *Helinium* 28.2, 192-222.
- Cuperus, G., 1687, *Harpocrates et Monumenta Antiqua; Trajecti ad Rhenum, apud Franciscum Halma Acad. Typogr.*, Amsterdam.
- Datema, A., 1974, Voor u bijeengegaard, *Tabula Batavorum* 1974.14, 25-28.
- Desittere, M., 1968a, *De urnenveldencultuur in het gebied tussen Neder-Rijn en Noordzee (periodes Ha A en B). A. Tekst*, Brugge (Dissertationes Archaeologicae Gandenses 11).
- Desittere, M., 1968b, *De urnenveldencultuur in het gebied tussen Neder-Rijn en Noordzee (periodes Ha A en B). B. Afbeeldingen*, Brugge (Dissertationes Archaeologicae Gandenses 11).
- Deunhouwer, P., 1986, *Ottoland-Oosteind. Een grondsporen-aardewerkanalyse van een in 1969 opgegraven nederzetting in de Alblasserwaard, met bewoningssporen uit het Laat-Neolithicum en de Bronstijd*, Leiden (unpublished MA Thesis).
- Dijk, J. van, 2002, Archeozoölogie, in: P.F.B. Jongste & G.J. van Wijngaarden (eds), *Archeologie in de Betuweroute: Het Erfgoed van Eigenblok. Bewoningssporen uit de Bronstijd te Geldermalsen*, Amersfoort (Rapportage Archeologische Monumentenzorg 86), 351-438.
- Dijk, J. van, E. Esser & J.T. Zeiler, 2002, Archeozoölogie, in: B.H.F.M. Meijlink & P. Kranendonk (eds), *Archeologie in de Betuweroute: Boeren, erven, graven. De Boerengemeenschap van De Bogen bij Meteren (2450-1250 v. Chr.)*, Amersfoort (Rapportage Archeologische Monumentenzorg 87), 547-666.
- Dijkstra, J. & J. van Renswoude, 2005, *Inventariserend veldonderzoek (IVO-3) op het voormalig Veilingterrein aan de Zandweg te Wijk bij Duurstede*, Amersfoort (ADC Rapport 421).
- Dinter, M. van, 2001, Fysische geografie, in: M.M. Sier & C.W. Koot (eds), *Archeologie in de Betuweroute. Kesteren-De Woerd: bewoningssporen uit de IJzertijd en de Romeinse tijd*, Amersfoort (Rapportage Archeologische Monumentenzorg 82), 51-82.
- Dinter, M. van & W.K. van Zijverden, 2002, Crevasses, een ondergewaardeerd landschapstype, *ADC - Info* 2002-1, 4-19.
- Dinter, M. van, 2002, Fysische geografie, in: J. Schoneveld & P. Kranendonk (eds), *Archeologie in de Betuweroute: Drie erven uit de Midden-Bronstijd bij Lienden*, Amersfoort (Rapportage Archeologische Monumentenzorg 89), 27-52.
- Dockum, S.G. van, 1994, De wortels van het Kromme-Rijnproject, in: W.A. van Es & W.A.M. Hessing (eds), *Romeinen, Friezen en Franken in het hart van Nederland. Van Traiectum tot Dorestad 50 v. C. - 900 n. C.*, Utrecht / Amersfoort, 206-211.
- Doesburg, J. van, 1994, Wijk bij Duurstede - Centrum, in: W.A. van Es & W.A.M. Hessing (eds), *Romeinen, Friezen en Franken in het hart van Nederland. Van Traiectum tot Dorestad 50 v. C. - 900 n. C.*, Utrecht / Amersfoort, 239-241.
- Drenth, E., 1996, Over de herkomst van bronzen bijlen en beitels in bronstijd-graven in Nederland, in: E.M. Theunissen (eds), *Onderzoek naar bronstijdgrafheuvels in Nederland en Vlaanderen*, Leiden, 33-38.

APPENDICES TO: A LIVING LANDSCAPE. BRONZE AGE SETTLEMENT SITES IN THE DUTCH RIVER AREA

- Drenth, E. & J.W.H. Hogestijn, 2001, The Bell Beaker Culture in the Netherlands: the state of research in 1998, in: F. Nicolis (eds), *Bell Beakers today. Pottery, people, culture, symbols in prehistoric Europe. Proceedings of the International Colloquium, Riva del Garda (Trento, Italy), 11-16 May 1998. Volume I*, Trento, 309-332.
- Drenth, E. & W.J.H. Hogestijn, 2006, Bekers voor Bakker. Nieuwe ideeën over de oorsprong en ontwikkeling van klokbekers in Nederland, in: J.H.F. Bloemers (eds), *Tussen D26 en P14: Jan Albert Bakker 65 jaar*, Amsterdam, 33-146.
- Drenth, E., H. Heijmans & D. Keijers, 2007, Van Mesolithicum tot en met IJzertijd. Sporen uit de prehistorie te Ittervoort - industrieterrein Santfort, fase 3, gem. Leudal (Li.), in: H. Heijmans, E. Drenth, D. Keijers & J. Schreurs (eds), *Archeologisch Onderzoek te Ittervoort. Oude bedrijvigheid op het industrieterrein Santfort ontsloten*, Ittervoort, 99-237.
- Edelman, C.H., 1947, *Over de bodemgesteldheid van Midden Nederland*, Utrecht.
- Edelman, C.H., 1948 (1945), De bodemkartering in Nederland, *Boor en Spade* 1, 78-113.
- Egberts, H., 1950, *De bodemgesteldheid van de Betuwe*, Wageningen (Verslagen van landbouwkundige onderzoeken der rijkslandbouwproefstations 56.19).
- Es, W.A. van, 1969, Excavations at Dorestad; a Pre-preliminary Report: 1967-1968, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 19, 183-207.
- Es, W.A. van & W.J.H. Verwers, 1973, Het beenderdelven te Wijk bij Duurstede in de winter van 1841/42, in: W.A. van Es, A.V.M. Hubrecht & P. Stuart (eds), *Archeologie en historie; opgedragen aan H. Brunsting bij zijn zeventigste verjaardag*, Bussum, 477-494.
- Es, W.A. van & W.J.H. Verwers, 1978, Themanummer Dorestad, *Spiegel Historiae* 13.4, 193-334.
- Es, W.A. van, W.J.H. Verwers, W.J. van Tent, R.E. Lutter, C. van Duijn & C.M. Blommesteijn, 1978, Bewoning uit de IJzertijd en de Romeinse tijd in het uitbreidingsplan De Horden, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1977, 35-36.
- Es, W.A. van, W.J.H. Verwers, R.E. Lutter, C.M. Blommesteijn & L.Th. Lehmann, 1979, Wijk bij Duurstede, uitbreidingsplan De Horden: bewoning uit de Bronstijd, IJzertijd en Romeinse Tijd, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1978, 41-42.
- Es, W.A. van & W.J.H. Verwers, 1980, *Excavations at Dorestad I, the Harbour: Hoogstraat I*, Amersfoort (Nederlandse Oudheden 9).
- Es, W.A. van, W.J.H. Verwers, R.E. Lutter & C.M. Blommesteijn, 1980, Wijk bij Duurstede, gem. Wijk bij Duurstede (U). Bewoning uit de Bronstijd, IJzertijd en Romeinse Tijd, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1979, 51-53.
- Es, W.A. van, W.J.H. Verwers, R.E. Lutter, F. van Kregten & C.M. Blommesteijn, 1982, Wijk bij Duurstede, gem. Wijk bij Duurstede (U). Opgraving De Horden (putten 560-81): nederzettingen uit de Bronstijd, IJzertijd en Romeinse Tijd, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1980, 37.
- Es, W.A. van & W.J.H. Verwers, 1983, Ausgrabungen in Dorestad, in: Anonymous (eds), *Duisburg und die Wikinger, 11000 Jahre Duisburg 883-1983. Begleitheft zur Ausstellung 16. Januar bis 10. April 1983, Niederrheinisches museum der Stadt Duisburg*, Duisburg, 37-46.
- Es, W.A. van, W.J.H. Verwers, R.E. Lutter, F. van Kregten & C.M. Blommesteijn, 1983, Wijk bij Duurstede, gem. Wijk bij Duurstede. Opgraving De Horden (putten 579-92): nederzettingen uit Bronstijd, IJzertijd en Romeinse Tijd. Bewoning uit de Bronstijd, IJzertijd en Romeinse Tijd, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1983, 35-37.
- Es, W.A. van, W.J.H. Verwers, R.E. Lutter & C.M. Blommesteijn, 1984, Wijk bij Duurstede, gem. Wijk bij Duurstede. Opgraving De Horden (putten 593-608), nederzettingen uit Bronstijd, IJzertijd en Romeinse tijd, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1982, 35-37.
- Es, W.A. van, W.J.H. Verwers, C.M. Blommesteijn, W.A.M. Hessing, R.E. Lutter & A.G. Jong, 1985, Wijk bij Duurstede, gem. Wijk bij Duurstede. Opgraving De Horden (putten 609-618, 620, 621, 624): Nederzettingen uit Bronstijd, IJzertijd en Romeinse tijd, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1983, 34-36.
- Es, W.A. van, W.J.H. Verwers, W.A.M. Hessing, A.G. Jong & W. Sniijders, 1986a, Wijk bij Duurstede, gem. Wijk bij Duurstede. Opgraving De Horden (putten 622, 623, 625-628, 630-638, 647-652, 659, 661, 665): nederzettingen uit Bronstijd, IJzertijd en Romeinse tijd, grafvelden uit de Vroege IJzertijd en de Romeinse Tijd, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1984, 33-34.
- Es, W.A. van, W.J.H. Verwers, W.A.M. Hessing, A.G. Jong & W. Sniijders, 1986b, Wijk bij Duurstede, gem. Wijk bij Duurstede. Opgraving De Horden (putten 660, 662, 664, 668, 684, 694): Nederzettingen uit de Bronstijd, de IJzertijd en de Romeinse tijd, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1985, 45-46.

REFERENCES

- Es, W.A. van, W.J.H. Verwers, W.A.M. Hessing & R.E. Lutter, 1987, Wijk bij Duurstede, gem. Wijk bij Duurstede. Opgraving De Horden (putten 663, 666, 667, 669-692, 680, 681, 683, 687, 696, 701, 749-751): Nederzettingen en grafvelden uit de Bronstijd, de IJzertijd en de Romeinse Tijd, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1986, 51-52.
- Es, W.A. van, W.J.H. Verwers, W.J. van Tent, W.A.M. Hessing & R.E. Lutter, 1988, Wijk bij Duurstede, gem. Wijk bij Duurstede. Opgraving De Horden (putten 687, 697, 702-704, 720, 721); Nederzettingen en grafvelden uit de Bronstijd, de IJzertijd en de Romeinse Tijd, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1987, 40-41.
- Es, W.A. van, R.E. Lutter & S.G. van Dockum, 1990, Wijk bij Duurstede De Geer (putten 755-767), gem. Wijk bij Duurstede, Romeinse Tijd, Vroege Middeleeuwen, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1989, 48-50.
- Es, W.A. van, S.G. van Dockum, J. van Doesburg, L.I. Kooistra, R.E. Lutter, J. van der Roest & C.E. Vermeeren, 1991, Wijk bij Duurstede De Geer (putten 767-781), bewoningssporen IJzertijd, Romeinse Tijd, Vroege Middeleeuwen, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1990, 50-54.
- Es, W.A. van, S.G. van Dockum, J. van Doesburg, L.I. Kooistra, M. van Loon, R.E. Lutter, J. van der Roest & C.E. Vermeeren, 1992, Wijk bij Duurstede De Geer (putten 781-806), bewoningssporen Bronstijd, IJzertijd, Romeinse Tijd, Vroege Middeleeuwen, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1991, 42-48.
- Es, W.A. van, S.G. van Dockum, J. van Doesburg, K. Hänninen, L.I. Kooistra, M. van Loon, R.E. Lutter, J. van der Roest & C.E. Vermeeren, 1993, Wijk bij Duurstede De Geer (putten 816-834), bewoningssporen Bronstijd, IJzertijd, Romeinse Tijd, Vroege en Late Middeleeuwen, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1992, 42-45.
- Es, W.A. van & W.A.M. Hessing (eds), 1994, *Romeinen, Friezen en Franken in het hart van Nederland. Van Traiectum tot Dorestad 50 v. C. - 900 n. C.*, Utrecht / Amersfoort.
- Es, W.A. van, 1994, Wijk bij Duurstede - De Geer, in: W.A. van Es & W.A.M. Hessing (eds), *Romeinen, Friezen en Franken in het hart van Nederland. Van Traiectum tot Dorestad 50 v. C. - 900 n. C.*, Utrecht / Amersfoort, 231-238.
- Fijma, P., 2003, *Archeologisch onderzoek rondweg Est, gemeente Neerijnen inventariserend veldonderzoek*, Assen.
- Fontijn, D.R., 2003, *Sacrificial Landscapes. Cultural biographies of persons, objects and 'natural' places in the Bronze Age of the southern Netherlands, c. 2300-600 BC*, Leiden (PhD Thesis) (Analecta Praehistorica Leidensia 33/34).
- Gehasse, E. & K. Leijnse, 2002, A Middle Bronze Age cremation burial near Est, The Netherlands, *Lunula: Archaeologia Protohistorica* 2002, 59-62.
- Gehasse, E.F. (ed.), 2002a, *Archeologische Tracébegeleiding Betuweroute. Provincierapport Zuid-Holland*, Amersfoort.
- Gehasse, E.F. (ed.), 2002b, *Archeologische Tracébegeleiding Betuweroute. Provincierapport Gelderland*, Amersfoort.
- Gijn, A.L. van & M.J.L.Th. Niekus, 2001, Bronze Age Settlement Flint from the Netherlands: the Cinderella of Lithic Research, in: W.H. Metz, B.L. van Beek & H. Steegstra (eds), *Patina. Essays presented to Jay Jordan Butler on the occasion of his 80th birthday*, Groningen/Amsterdam, 305-320.
- Gijn, A.L. van, E.A.K. Kars & Y.M.J. Lammers-Keijsers, 2002, Natuursteen, in: B.H.F.M. Meijlink & P. Kranendonk (eds), *Archeologie in de Betuweroute: Boeren, erven, graven. De Boerengemeenschap van De Bogen bij Meteren (2450-1250 v. Chr.)*, Amersfoort (Rapportage Archeologische Monumentenzorg 87), 501-537.
- Gijssels, K. van, J. Schreurs, J. Kolen, E.A.K. Kars, S. Verneau, P. van der Kroft & A.L. van Gijn, 2002, Steen, in: P.F.B. Jongste & G.J. van Wijngaarden (eds), *Archeologie in de Betuweroute: Het Erfgoed van Eigenblok. Bewoningssporen uit de Bronstijd te Geldermalsen*, Amersfoort (Rapportage Archeologische Monumentenzorg 86), 279-323.
- Glasbergen, W., 1954, *Barrow excavations in the Eight Beatitudes, the Bronze Age cemetery between Toterfout - Halve Mijl, North Brabant*, Groningen (PhD thesis) (Palaeohistoria 2).
- Haaff, G. van, 1972, *Vooronderzoek van De Horden te Wijk bij Duurstede*, Amersfoort (unpublished report).
- Haarhuis, H.F.A., 1998, *Verbreiding A2 Everdingen-Deil: Een archeologische kartering*, Amsterdam (RAAP-Rapport 378).
- Haarhuis, H.F.A., 2000, *Plangebied Hondsgemet, gemeente Geldermalsen; voorstudie t.b.v. een Aanvullende Archeologische Inventarisatie (AAI) en der m.e.r. Randweg*, Amsterdam (RAAP-briefverslag 2000-77/MW).
- Hakvoort, S., 2005, *Verslag inventariserend booronderzoek fietscrossbaan te Geldermalsen Meersteeg*, Amsterdam (Zuidnederlandse Archeologische Notities 39).
- Halbertsma, H., 1964, Heicop, *Archeologisch Nieuws in het Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond* 17.11, 310-311.
- Hamburg, T.D. & L.P. Louwe Kooijmans, 2006, Features, in: L.P. Louwe Kooijmans & P.F.B. Jongste (eds), *Schipluiden. A neolithic settlement on the Dutch North Sea coast (c. 3500 BC)*, Leiden (Analecta Praehistorica Leidensia 37-38), 39-67.

APPENDICES TO: A LIVING LANDSCAPE. BRONZE AGE SETTLEMENT SITES IN THE DUTCH RIVER AREA

- Harsema, O.H., 2005, Farms amongst Celtic fields. Settlements on the northern sands, in: L.P. Louwe Kooijmans, P.W. van den Broeke, H. Fokkens & A.L. van Gijn (eds), *The prehistory of the Netherlands (II)*, Amsterdam, 543-555.
- Havinga, H.J.A., 1969, A physiographic analysis of a part of te Betuwe, a Dutch river clay area, *Mededelingen Landbouwhogeschool Wageningen* 69.3, 3-47.
- Havinga, H.J.A. & A. Op 't Hof, 1975, De Neder-Betuwe, opbouw en ontstaan van een jong rivierkleigebied, *Koninklijk Nederlands Aardwetenschappelijk Genootschap, Geografisch Tijdschrift, Nieuwe Reeks* 9, 261-277.
- Havinga, H.J.A. & A. Op 't Hof, 1983, Physiography and formation of the holocene floodplain along the lower course of the Rhine in the Netherlands, *Mededelingen Landbouwhogeschool Wageningen* 83.8, 1-73.
- Hänninen, K. & H. van Haaster, 2002, Archeobotanie, in: B.H.F.M. Meijlink & P. Kranendonk (eds), *Archeologie in de Betuweroute: Boeren, erven, graven. De Boerengemeenschap van De Bogen bij Meteren (2450-1250 v. Chr.)*, Amersfoort (Rapportage Archeologische Monumentenzorg 87), 689-752.
- Heldring, O.G., 1836, De Romeinsche grafsteen te Dodewaard, *Geldersche Volksalmanak* 1836, 22-27.
- Heldring, O.G., 1838, *Wandelingen ter opsporing van Bataafsche en Romeinsche Oudheden, Legenden, enz.*, Amsterdam.
- Heldring, O.G., 1839a, *Wandelingen ter opsporing van Bataafsche en Romeinsche Oudheden, Legenden, enz. Tweede deel*, Amsterdam.
- Heldring, O.G., 1839b, De Woert, de heuvel en het hofke onder Dodewaard en Hien, *Geldersche Volksalmanak* 1839, 97.
- Heldring, O.G., 1840, De Woerd, enz. te Kesteren in de Neder-Betuwe, in: I.A. Nijhoff (eds), *Bijdragen voor vaderlandsche geschiedenis en oudheidkunde*, Arnhem 2), 208.
- Hessing, W.A.M., 1985, *Wijk bij Duurstede - De Horden. Het urnenveld*, Leiden.
- Hessing, W.A.M., 1989, Wijk bij Duurstede 'De Horden': Besiedlung und Bestattungen aus der frühen Eisenzeit, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1989 (39), 297-344.
- Hessing, W.A.M. & R. Steenbeek, 1990, Landscape and habitation history of 'De Horden' at Wijk bij Duurstede: an overview, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 40, 9-28.
- Hessing, W.A.M., 1991, Bewoningssporen uit de midden-bronstijd en de vroege ijzertijd op 'De Horden' te Wijk bij Duurstede, in: H. Fokkens & N. Roymans (eds), *Nederzettingen uit de bronstijd en de vroege ijzertijd in de Lage Landen*, Amersfoort (Nederlandse Archeologische Rapporten 13), 41-52.
- Hessing, W.A.M., 1994, Wijk bij Duurstede - De Horden, in: W.A. van Es & W.A.M. Hessing (eds), *Romeinen, Friezen en Franken in het hart van Nederland. Van Traiectum tot Dorestad 50 v. C. - 900 n. C.*, Utrecht / Amersfoort, 226-230.
- Hessing, W.A.M. & J.-W.M. Oudhof, 2001, *Quick-scan archeologie; percelen aan de Meersteeg in Geldermalsen (kad. B 339)*, Bunschoten (Vestigia-rapport 16).
- Heuff, J.A., 1905, Opgravingen op de Hooge Woerd te Kesteren 1904-1905, *Gelre* 8, 33-42.
- Heunks, E., 2002, *Bedrijvenpark Medel: terrein Daalderop en omgeving, Gemeente Echteld-Tiel. Een inventariserend archeologisch veldonderzoek (kartering en waardering)*, Amsterdam (RAAP-Rapport 773).
- Hielkema, J.B., N.M. Prangma & P.F.B. Jongste, 2002, Sporen en structuren, in: P.F.B. Jongste & G.J. van Wijngaarden (eds), *Archeologie in de Betuweroute: Het Erfgoed van Eigenblok. Bewoningssporen uit de Bronstijd te Geldermalsen*, Amersfoort (Rapportage Archeologische Monumentenzorg 86), 83-216.
- Hielkema, J.B., A.J. Brokke & B.H.F.M. Meijlink, 2002, Sporen en structuren, in: B.H.F.M. Meijlink & P. Kranendonk (eds), *Archeologie in de Betuweroute: Boeren, erven, graven. De Boerengemeenschap van De Bogen bij Meteren (2450-1250 v. Chr.)*, Amersfoort (Rapportage Archeologische Monumentenzorg 87), 137-291.
- Hielkema, J.B., 2002, Metaal, in: P.F.B. Jongste & G.J. van Wijngaarden (eds), *Archeologie in de Betuweroute: Het Erfgoed van Eigenblok. Bewoningssporen uit de Bronstijd te Geldermalsen*, Amersfoort (Rapportage Archeologische Monumentenzorg 86), 325-338.
- Hoek, W.Z., *in prep.*, *Fysisch geografisch onderzoek in Deest aan het Water*, Utrecht.
- Hogestijn, J.W.H. & E. Drenth, 2000, The TRB culture 'house-plan' of Slootdorp-Bouwlust and other known 'house-plans' from the Dutch Middle and Late Neolithic: a review, in: R. Kelm (eds), *Vom Pfostenloch zum Steinzeithaus. Archäologische Forschung und Rekonstruktion jungsteinzeitlicher Haus- und Siedlungsbefunde im nordwestlichen Mitteleuropa*, Heide, 126-154.
- Holwerda, J.H., M.A. Evelein & N.J. Krom, 1908, *Catalogus van het Rijksmuseum van Oudheden te Leiden, Afdeling Praehistorie en Nederlandsche Oudheden*, Leiden.
- Holwerda, J.H., 1924, De Franken in Nederland, *Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden te Leiden Nieuwe Reeks* 5, 34-46.

REFERENCES

- Holwerda, J.H., 1925, Nederland Eerste Koopstad (Dorestad), *Het Haags Maandblad* Nov. 1925, 1-15.
- Holwerda, J.H., 1930a, Opgravingen van Dorestad, *Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden te Leiden Nieuwe Reeks* 11, 32-96.
- Holwerda, J.H., 1930b, *Dorestad en onze vroegste Middeleeuwen*, Leiden.
- Huijts, C.S.T.J., 1992, *De voor-historische boerderijbouw in Drenthe; reconstructiemodellen van 1300 vóór tot 1300 na Chr.*, Arnhem.
- Huis in 't Veld, J.Y., 2004, *Sporen uit de Vroege Bronstijd en Romeinse Tijd te Culemborg. Een archeologische opgraving van 'vindplaats B' te Lanxmeer, Culemborg, gemeente Culemborg (Gld.)*, Groningen (ARC Rapport 97).
- Hulst, R.S., 1965a, Zijderveld, gem. Everdingen, *Archeologisch Nieuws in het Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond* 64, 107, 138.
- Hulst, R.S., 1965b, *Een oudheidkundig onderzoek naar een nederzetting uit de Bronstijd te Zijderveld, gem. Everdingen, prov. Zuid-Holland*, Amsterdam (Unpublished report).
- Hulst, R.S., 1966, Zijderveld, gem. Everdingen, *Archeologisch Nieuws in het Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond* 65, 93.
- Hulst, R.S., 1967a, *Een oudheidkundig onderzoek naar een nederzetting uit de Bronstijd te Zijderveld, gem. Everdingen, prov. Zuid-Holland*, Amsterdam (unpublished MA thesis, IPP Amsterdam).
- Hulst, R.S., 1967b, Hien, gem. Dodewaard, *Archeologisch Nieuws in het Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond* 66, 102.
- Hulst, R.S., 1968, Kesteren, *Archeologisch Nieuws in het Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond* 1968.5, 62-64.
- Hulst, R.S., 1969, Kesteren, *Archeologisch Nieuws in het Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond* 1969.1, 5.
- Hulst, R.S. & R.E. Lutter, 1969, Kesteren, gem. Kesteren (Gld.). Nederzetting uit de Romeinse Tijd, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1968, 10-11.
- Hulst, R.S., 1970, Archeologische Kroniek van Gelderland 1966-1967, *Bijdragen en Mededelingen der vereniging 'Gelre'* 64, 26-48.
- Hulst, R.S., 1971, Kesteren, *Archeologisch Nieuws in het Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond* 1971.2, 36-37.
- Hulst, R.S., 1972, Vondstberichten, *Mededelingen van de Historische Kring Kesteren en Omstreken* 4.1, 8-9.
- Hulst, R.S., 1973, Geldermalsen, *Archeologisch Nieuws in het Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond* 1973.3, 28.
- Hulst, R.S. & H.W. van Klaveren, 1975, Geldermalsen, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1974, 78.
- Hulst, R.S., 1975a (1973), A contribution to the study of Bronze Age and Iron Age house-plans: Zijderveld, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 23 (1973), 103-107.
- Hulst, R.S., 1975b, Nederzettingen uit de midden-bronstijd en de ijzertijd te Zijderveld, 1400-1000, 700-200 v. Chr., in: L.P. Louwe Kooijmans (eds), *Tentoonstellingscatalogus RMOL*, Leiden, 21-23.
- Hulst, R.S., 1975c, Geldermalsen, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1973, 81.
- Hulst, R.S. & J.W. Noordam, 1978, Kesteren, gem. Kesteren (Gld.). Nederzetting Romeinse Tijd, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1977, 32.
- Hulst, R.S., 1991, Nederzettingen uit de midden-bronstijd in het rivierengebied: Zijderveld en Dodewaard, in: H. Fokkens & N. Roymans (eds), *Nederzettingen uit de bronstijd en de vroege ijzertijd in de Lage Landen*, Amersfoort (Nederlandse Archeologische Rapporten 13), 53-60.
- Hulst, R.S., 1991a, Nederzettingen uit de midden-bronstijd in het rivierengebied: Zijderveld en Dodewaard, in: H. Fokkens & N. Roymans (eds), *Nederzettingen uit de bronstijd en de vroege ijzertijd in de Lage Landen*, Amersfoort (Nederlandse Archeologische Rapporten 13), 53-60.
- Hulst, R.S., 1991b, Opgraving Kesteren, 1977, 1984, 1988, 1990, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1990, 44-46.
- Hulst, R.S., 1991c, Kesteren-Nedereindsestraat 2, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1990, 45-46.
- Hulst, R.S. & H.W. van Klaveren, 1993, Geldermalsen, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1992, 159.

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- Hulst, R.S., H.W. van Klaveren & M.J.H. de Haan, 1994, Geldermalsen Middengebied, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1993, 72-73.
- Hulst, R.S., 1995, Kesteren, Nedereindsestraat, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1994, 155-156.
- Hulst, R.S., 1999, Geldermalsen: an Early La Tène Cemetery - Diffusion or Convergence, in: H. Sarfatij, W.J.H. Verwers & P.J. Woltering (eds), *In Discussion with the Past. Archaeological studies presented to W.A. van Es*, Zwolle, 41-49.
- Jager, D.H. de, 1996, *Gemeente Geldermalsen bestemmingsplangebied Kalenberg: archeologisch onderzoek*, Amsterdam (RAAP-Rapport 148).
- Jager, D.H. de & E. Heunks, 1999, *Bouwproject Geldermalsen-Midden, gemeente Geldermalsen: een archeologische inventarisatie en kartering*, Amsterdam (RAAP-Rapport 374).
- Jager, D.H. de, 1999, *Terrein Leeuwenstein, gemeente Geldermalsen. Een aanvullende archeologische inventarisatie: kartering (AAI-1)*, Amsterdam (RAAP-Rapport 447).
- Janowski, M., 2003, Who's in charge around here? Struggle for leadership in a changing world among the Kelabit of Sarawak, in: S. Sparkes & S. Howell (eds), *The House in Southeast Asia: a changing social, economic and political domain*, London, 95-113.
- Janssen, L.J.F., 1842a, Oudheidkundige aantekeningen over de opdelvingen te Wijk bij Duurstede, *Oudheidkundige Mededelingen* 1, 1-72.
- Janssen, L.J.F., 1842b, *Interim-verslag van de oudheidkundige ontgravingen te Wijk bij Duurstede*, (Staatscourant 28-11-1842).
- Janssen, L.J.F., 1842c, *Interim-verslag van de oudheidkundige ontgravingen te Wijk bij Duurstede*, (Staatscourant 31-12-1842).
- Janssen, L.J.F., 1843, Over de opdelvingen te Wijk bij Duurstede op laste der Hooge Regering verrigt, in de maanden November en December van het jaar 1842, *Oudheidkundige Mededelingen* 2, 73-209.
- Janssen, L.J.F., 1859, Frankisch kerkhof; lijken, werktuigen, versierselen, opgegraven bij Wijk bij Duurstede (Dorestat), *Oudheidkundige verhandelingen en mededeelingen* 3, 28-46.
- Jong, J. de, 1970-1971, Pollen and C14 Analysis of Holocene Deposits in Zijderveld and Environs, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 20-21, 75-88.
- Jongste, P.F.B., 1996, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute (AAO 8). Geldermalsen Eigenblok-Oost*, Amersfoort (Rapportage Archeologische Monumentenzorg 5).
- Jongste, P.F.B., 1997a, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vpl. 13: Echteld / Kleine Meer*, Amersfoort (Rapportage Archeologische Monumentenzorg 15).
- Jongste, P.F.B., 1997b, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 20: Dodewaard/Valburg Hiensche Veld*, Amersfoort (Rapportage Archeologische Monumentenzorg 16).
- Jongste, P.F.B. & E. Smits, 1998, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 29-31 en 45*, Amersfoort (Rapportage Archeologische Monumentenzorg 35).
- Jongste, P.F.B., 1998, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 23: Valburg Zettense Veld - Oost*, Amersfoort (Rapportage Archeologische Monumentenzorg 20).
- Jongste, P.F.B. & T.J. ten Anscher, 1998, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 22: Valburg / Zettensche Plas*, Amersfoort (Rapportage Archeologische Monumentenzorg 19).
- Jongste, P.F.B., 2002a, Inleiding, in: P.F.B. Jongste & G.J. van Wijngaarden (eds), *Archeologie in de Betuweroute: Het Erfgoed van Eigenblok. Bewoningssporen uit de Bronstijd te Geldermalsen*, Amersfoort (Rapportage Archeologische Monumentenzorg 86), 9-43.
- Jongste, P.F.B., 2002b, Synthese, in: P.F.B. Jongste & G.J. van Wijngaarden (eds), *Archeologie in de Betuweroute: Het Erfgoed van Eigenblok. Bewoningssporen uit de Bronstijd te Geldermalsen*, Amersfoort (Rapportage Archeologische Monumentenzorg 86), 589-630.
- Jongste, P.F.B. & W.K. van Zijverden, 2007, The "Late Bronze Age problem" in the Rhine-Meuse delta (The Netherlands). Changes in climate or human interference in the hinterland?, in: H. Richard, C. Mordant & M. Magny (eds), *Environnements et cultures à l'âge du Bronze en Europe occidentale*, Paris, 343-355.
- Kalee, C., 1964, Inheemse en Romeinse vondsten uit de Neder-Betuwe, *Westerheem* 13.3, 75-80.
- Kampen, J.C.G. van & E.M.P. Verhelst, 2006, *Bureauonderzoek en Inventariserend Veldonderzoek Herman Kuijckstraat 28-32*, Amsterdam (Zuidnederlandse Archeologische Notities 56).
- Kibbert, K., 1984, *Die Äxte und Beile im mittleren West-deutschland II*, Munchen (Prähistorische Bronzefunde IX: 13).

REFERENCES

- Klasens, A., 1973 (1975), Rijksmuseum van Oudheden, in: A. Klasens (eds), *Nederlandse rijksmusea*, Den Haag 95), 372-380.
- Kleuver, J.A.E. de & A. Datema, 1968a, "Midden- en West-Betuwe" van de Archeologische Werkgemeenschap voor Nederland, *Mededelingen van de Historische Kring Kesteren en Omstreken* 1.3, 3.
- Kleuver, J.A.E. de & A. Datema, 1968b, Jaaroverzicht van de Historische Kring Kesteren en Omstreken van 25-10-1967 tot 10-9-1968, *Mededelingen van de Historische Kring Kesteren en Omstreken* 1.4, 5.
- Klomp, M., 2003, *Windesheim. Overzicht opgravingen Windesheim 1987-2003*, Zwolle.
- Klooster, B., A.A.G. Emaus, C. Helmich & H. Kremer, 2005, *Inventariserend veldonderzoek d.m.v. boringen, Stationslocatie te Geldermalsen*, Zelhem (Synthegra-Rapport 2004-120).
- Knippenberg, S. & P.F.B. Jongste (eds), 2005, *Terug naar Zijderveld. Archeologische opgravingen van een bronstijdnederzetting langs de A2*, Leiden (Archol Rapport 36).
- Knippenberg, S., 2005, Vuursteen en natuursteen, in: S. Knippenberg & P.F.B. Jongste (eds), *Terug naar Zijderveld. Archeologische opgravingen van een bronstijdnederzetting langs de A2*, Leiden (Archol Rapport 36), 81-87.
- Knippenberg, S., *in prep.*, *Wederom even terug in Zijderveld. (provisional title)*, Leiden (Archol Rapport 86).
- Kok, H.A. de, 1965, De prehistorie van de Alblasserwaard en de Vijfheerenlanden, *Westerheem* 14.5, 119-123.
- Koning, J. de & J.P.L. Vaars, 2003, *Archeologische opgravingen te Rosmalen. Nederzettingssporen uit Neolithicum, Bronstijd, Vroege IJzertijd en Midden IJzertijd in de noordelijke Maasvallei, Zaandijk* (HOLLANDIA reeks 3).
- Kooistra, L.I. & R. Steenbeek, 1994, Het landschap en zijn mogelijkheden, in: W.A. van Es & W.A.M. Hessing (eds), *Romeinen, Friezen en Franken in het hart van Nederland. Van Traiectum tot Dorestad 50 v. C. - 900 n. C.*, Utrecht / Amersfoort, 14-21.
- Koorevaar, T., 1998, *Archeologisch onderzoek in de woonheuvel "De Hoogt" aan de Zijderveldselaan 24 te Zijderveld*, Dordecht.
- Kranendonk, P. & J.B. de Voogd, 2002, Inleiding, in: J. Schoneveld & P. Kranendonk (eds), *Archeologie in de Betuweroute: Drie erven uit de Midden-Bronstijd bij Lienden*, Amersfoort (Rapportage Archeologische Monumentenzorg 89), 9-26.
- Laarman, F.J., 1996, Zoological material of the Bronze Age, Iron Age and Roman Period from Wijk bij Duurstede-De Horden, in: L.I. Kooistra (eds), *Borderland Farming. Possibilities and limitations of farming in the Roman Period and Early Middle Ages between the Rhine and the Meuse*, Assen (PhD Thesis), 369-380.
- Lange, A.G., 1996, Wijk bij Duurstede: De Horden, in: A.G. Lange (eds), *Archeologische kroniek van de provincie Utrecht over de jaren 1988-1989*, Utrecht, 80-81.
- Lanting, J.N., 1973, Laat-Neolithicum en Vroege Bronstijd in Nederland en N.W.-Duitsland: continue ontwikkelingen, *Palaeohistoria* 15, 215-317.
- Lanting, J.N. & W.G. Mook, 1977, *The pre- and protohistory of the Netherlands in terms of radiocarbon dates*, Groningen.
- Lanting, J.N. & J. van der Plicht, 2002 (1999/2000), De ¹⁴C chronologie van de Nederlandse Pre- en Protohistorie III: Neolithicum, *Palaeohistoria* 41/42, 1-110.
- Lanting, J.N. & J. van der Plicht, 2003 (2001/2002), De ¹⁴C chronologie van de Nederlandse Pre- en Protohistorie IV: Bronstijd en Vroege IJzertijd, *Palaeohistoria* 43/44, 117-261.
- Lanzig, J.J., 1999, *Archeologisch onderzoek te Geldermalsen 'Park Leeuwenstein'*, Bunschoten (ADC rapport 13).
- Lauwerier, R.C.G.M. & W.A.M. Hessing, 1992, Men, horses and the Miss Blanche effect: Roman horse burials in a cemetery at Kesteren, the Netherlands, *Helinium* 33, 78-109.
- Laux, F., 1971, *Die Bronzezeit in der Lüneburgerheide*, Hildesheim (Veröffentlichungen der urgeschichtlichen Sammlungen des Landesmuseums zu Hannover 18).
- Letterlé, F., 1985 (1981), Traces d'occupation de la civilisation de Hilversum á Wijk bij Duurstede (province d'Utrecht), *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1981 (31), 329-346.
- Louwe Kooijmans, L.P., 1966, Culemborg, *Archeologisch Nieuws in het Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond* 65, 61-62.
- Louwe Kooijmans, L.P., 1974, *The Rhine/Meuse Delta; four studies on its prehistoric occupation and Holocene geology*, Leiden (Oudheidkundige Mededelingen van het Rijksmuseum voor Oudheden 53-54).
- Makaske, B., 1998, *Anastomosing rivers - Forms, processes and sediments*, Utrecht (PhD Thesis) (Netherlands Geographical Studies 249).
- Makaske, B., 2007, Middle Holocene avulsion-belt deposits in the central Rhine-Meuse delta, The Netherlands, *Journal of Sedimentary Research* 77, 110-123.
- Meijlink, B.H.F.M. & P. Kranendonk (eds), 2002, *Archeologie in de Betuweroute: Boeren, erven, graven. De Boerengemeenschap van De Bogen bij Meteren (2450-1250 v. Chr.)*, Amersfoort (Rapportage Archeologische Monumentenzorg 87).

APPENDICES TO: A LIVING LANDSCAPE. BRONZE AGE SETTLEMENT SITES IN THE DUTCH RIVER AREA

- Meijlink, B.H.F.M., 2002a, Inleiding, in: B.H.F.M. Meijlink & P. Kranendonk (eds), *Archeologie in de Betuweroute: Boeren, erven, graven. De Boerengemeenschap van De Bogen bij Meteren (2450-1250 v. Chr.)*, Amersfoort (Rapportage Archeologische Monumentenzorg 87), 11-54.
- Meijlink, B.H.F.M., 2002b, Synthese, in: B.H.F.M. Meijlink & P. Kranendonk (eds), *Archeologie in de Betuweroute: Boeren, erven, graven. De Boerengemeenschap van De Bogen bij Meteren (2450-1250 v. Chr.)*, Amersfoort 87), 753-812.
- Meijlink, B.H.F.M., *in press* (2008), The Bronze Age cultural landscape of De Bogen, in: S. Arnoldussen & H. Fokkens (eds), *Bronze Age settlement sites in the Low Countries*, Oxford, 137-150.
- Milojkovic, J. & E. Smits, 2002, *Archeologie in de Betuweroute: Lage Blok. Een nederzettingsterrein uit de Midden-IJzertijd bij Meteren (gemeente Geldermalsen)*, Amersfoort (Rapportage Archeologische Monumentenzorg 90).
- Milojkovic, J. & E.F. Gehasse, 2002, Inleiding, in: J. Milojkovic & E. Smits (eds), *Archeologie in de Betuweroute: Lage Blok. Een nederzettingsterrein uit de Midden-IJzertijd bij Meteren (gemeente Geldermalsen)*, Amersfoort (Rapportage Archeologische Monumentenzorg 90), 9-20.
- Milojkovic, J. & J. Krist, 2002, Sporen en structuren, in: J. Milojkovic & E. Smits (eds), *Archeologie in de Betuweroute: Lage Blok. Een nederzettingsterrein uit de Midden-IJzertijd bij Meteren (gemeente Geldermalsen)*, Amersfoort (Rapportage Archeologische Monumentenzorg 90), 47-68.
- Modderman, P.J.R., 1949, Het oudheidkundig onderzoek van de oude woongronden in de Over- en Neder-Betuwe, *Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden te Leiden* 30, 66-93.
- Modderman, P.J.R., 1955a, De bewoonbaarheid van het rivierkleigebied in de loop der eeuwen, *Tijdschrift van het Koninklijk Nederlands Aardrijkskundig Genootschap, Tweede Reeks* 72, 30-38.
- Modderman, P.J.R., 1955b, Laat bekeeraardewerk met indrukken van een wikkeldraadstempel, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 6, 32-43.
- Modderman, P.J.R., 1960, Opheusden, *Archeologisch Nieuws in het Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond* 13, 267.
- Modderman, P.J.R. & M.J.G.Th. Montforts, 1991, Archeologische kroniek van Gelderland, 1970-1984, *Bijdragen en Mededelingen van de Vereniging Gelre* 82, 143-188.
- Moos, U., 2006, Fuerböcke?, in: H. Meller (eds), *Archäologie XXL. Archäologie an der B 6n im Landkreis Quedlinburg. Sonderband, Halle 4*), 149-150.
- Mulder, E.F.J. de, M.C. Geluk, I.L. Ritsema, W.E. Westerhoff & T.E. Wong, 2003, *De ondergrond van Nederland*, Groningen.
- Müller, A., 2001, *Woningbouwlocatie 't Rieshout te Zetten, Gemeente Overbetuwe, Archeologische Begeleiding rioolsleuven*, Amsterdam (RAAP-briefrapport 2001-2475RT).
- Niekus, M.J.L.Th., A.L. van Gijn & Y. Lammers, 2001, Vuursteen, in: J. Schoneveld & E.F. Gehasse (eds), *Archeologie in de Betuweroute: Boog C-Noord, een vindplaats bij Meteren op de overgang van Neolithicum naar Bronstijd*, Amersfoort (Rapportage Archeologische Monumentenzorg 84), 59-103.
- Niekus, M.J.L.Th. & H. Huisman, 2001, Natuursteen, in: J. Schoneveld & E.F. Gehasse (eds), *Archeologie in de Betuweroute: Boog C-Noord, een vindplaats bij Meteren op de overgang van Neolithicum naar Bronstijd*, Amersfoort (Rapportage Archeologische Monumentenzorg 84), 103-133.
- Niekus, M.J.L.Th., H. Huisman, A.L. van Gijn & Y. Lammers, 2002a, Steen, in: J. Schoneveld & P. Kranendonk (eds), *Archeologie in de Betuweroute: Drie erven uit de Midden-Bronstijd bij Lienden*, Amersfoort (Rapportage Archeologische Monumentenzorg 89), 115-163.
- Niekus, M.J.L.Th., A.L. van Gijn, Y.M.J. Lammers-Keijsers & J. Schreurs, 2002b, Vuursteen, in: B.H.F.M. Meijlink & P. Kranendonk (eds), *Archeologie in de Betuweroute: Boeren, erven, graven. De Boerengemeenschap van De Bogen bij Meteren (2450-1250 v. Chr.)*, Amersfoort (Rapportage Archeologische Monumentenzorg 87), 427-500.
- Noordaa, S.H. van der, 1838, Geschied- en penningkundige aanmerkingen, naar aanleiding van eenige hier te lande gevondene munten, *Tijdschrift voor Algemeene Munt- en Penningkunde* 1, 763-858.
- Odé, O. & A. Haartsen, 1997, *Gemeente Culemborg; cultuurhistorische effectrapportage plangebied Parijsch*, Amsterdam (RAAP-Rapport 243).
- Odé, O. & A. Haartsen, 1998, *Gemeente Culemborg; cultuurhistorische effectrapportage plangebied Lanxmeer*, Amsterdam (RAAP-Rapport 284).
- Oonk, S., 2005, Geochemische prospectie, in: S. Knippenberg & P.F.B. Jongste (eds), *Terug naar Zijderveld. Archeologische opgravingen van een bronstijdnederzetting langs de A2*, Leiden (Archol Rapport 36), 117-121.

REFERENCES

- Peters, F.J.C., 1999, *Aanvullend Archeologisch Onderzoek van de vindplaatsen uit de Bronstijd. Valburg Zetten-West*, Amersfoort (Rapportages Archeologische Monumentenzorg 69).
- Pijls, F.W.G., 1965, *De bodem van Nederland: toelichting bij de bodemkaart van Nederland, schaal 1:200000, samengesteld door de Stichting voor Bodemkartering*, Wageningen.
- Pons, L.J., 1951, *De bodemgesteldheid van de Vijfheerenlanden*, Wageningen (Stiboka Rapport 272).
- Pons, L.J., 1961, Vijfheerenlanden: oudheidkundige vondsten en bodemgesteldheid, *Westerheem* 10.1/2, 1-5.
- Raemaekers, D.C.M., 1999, *The meaning of the Swifterbant Culture for the process of neolithization in the western part of the North European Plain (4900-3400 BC)*, Leiden (PhD Thesis) (Archaeological Studies Leiden University 3).
- Rasmussen, M., 1993, Gravhøje og bopladser. En foreløbig undersøgelse af lokalisering og sammenhænge, in: L. Larsson (eds), *Bronsålderns gravhøjer*, Lund (Lunds Universitets Historiska Museet och Arkeologiska Institution Report Series 48, 171-185).
- Regteren Altena, J.F. van, 1987, *1337/vRA/Avw (brief aan prof. W.G. Mook, in archief CIO, Groningen)*, Groningen.
- Reimer, P., M.G.L. Baillie, E. Bard, A. Bayliss, J.W. Beck, C. Bertrand, P.G. Blackwell, C.E. Buck, G. Burr, K.B. Cutler, P.E. Damon, R.L. Edwards, R.G. Fairbanks, M. Friedrich, T.P. Guilderson, K.A. Hughen, B. Kromer, F.G. McCormac, S. Manning, C. Bronk Ramsey, R.W. Reimer, S. Remmele, J. Southon, R., M. Stuiver, S. Talamo, F.W. Taylor, J. van der Plicht & C.E. Weyhenmeyer, 2004, INTCAL04 terrestrial radiocarbon age calibration, 0-26 cal kyr BP, *Radiocarbon* 46, 1029-1058.
- Renswoude, J. van, 2006, *Inventariserend veldonderzoek (IVO) proefsleuven te Geldermalsen-Hondsgemet*, Amsterdam (Zuidnederlandse Archeologische Notities 19).
- Rijn, P. van, 2001, Hout, in: M.M. Sier (eds), *Borsele, een opgraving in het veen; bewoningssporen uit de Romeinse tijd*, Bunschoten (ADC Rapport 76), 51-56.
- Rijn, P. van, 2003, Hout, in: M.M. Sier (eds), *Ellewoutsdijk in de Romeinse tijd*, Bunschoten (ADC Rapport 200), 104-138.
- Robb, J.E., 2002, Fysische antropologie, in: B.H.F.M. Meijlink & P. Kranendonk (eds), *Archeologie in de Betuweroute: Boeren, erven, graven. De Boerengemeenschap van De Bogen bij Meteren (2450-1250 v. Chr.)*, Amersfoort (Rapportage Archeologische Monumentenzorg 87), 667-688.
- Roest, J. van der, 1990, Die Römischen Fibeln von 'De Horden', *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1988 (38), 141-202.
- Roest, J. van der, 1997, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute (AAO 9)*, Amersfoort (Rapportage Archeologische Monumentenzorg 9).
- Roller, G.J. de, G. Korf & E. Mook-Kamps, 2002, Archeobotanie, in: J. Schoneveld & P. Kranendonk (eds), *Archeologie in de Betuweroute: Drie erven uit de Midden-Bronstijd bij Lienden*, Amersfoort (Rapportage Archeologische Monumentenzorg 89), 165-190.
- Roymans, N. & H. Fokkens, 1991, Een overzicht van veertig jaar nederzittingsonderzoek in de Lage Landen, in: H. Fokkens & N. Roymans (eds), *Nederzettingen uit de bronstijd en de vroege ijzertijd in de Lage Landen*, Amersfoort (Nederlandse Archeologische Rapporten 13), 1-19.
- Schinkel, C., 1998, Unsettled settlement, occupation remains from the Bronze Age and the Iron Age at Oss-Ussen. The 1976-1986 excavations, *Analecta Prehistorica Leidensia* 30, 5-306.
- Schoneveld, J. & E.F. Gehasse (eds), 2001, *Archeologie in de Betuweroute: Boog C-Noord, een vindplaats bij Meteren op de overgang van Neolithicum naar Bronstijd*, Amersfoort (Rapportage Archeologische Monumentenzorg 84).
- Schoneveld, J., 2001, Synthese, in: J. Schoneveld & E.F. Gehasse (eds), *Archeologie in de Betuweroute: Boog C-Noord, een vindplaats bij Meteren op de overgang van Neolithicum naar Bronstijd*, Amersfoort (Rapportage Archeologische Monumentenzorg 84), 181-194.
- Schoneveld, J. & P. Kranendonk (eds), 2002, *Archeologie in de Betuweroute: Drie erven uit de Midden-Bronstijd bij Lienden*, Amersfoort (Rapportage Archeologische Monumentenzorg 89).
- Schoneveld, J., 2002a, Laat-Neolithicum en Vroege Bronstijd, in: J. Schoneveld & P. Kranendonk (eds), *Archeologie in de Betuweroute: Drie erven uit de Midden-Bronstijd bij Lienden*, Amersfoort (Rapportage Archeologische Monumentenzorg 89), 227-230.
- Schoneveld, J., 2002b, Synthese, in: J. Schoneveld & P. Kranendonk (eds), *Archeologie in de Betuweroute: Drie erven uit de Midden-Bronstijd bij Lienden*, Amersfoort (Rapportage Archeologische Monumentenzorg 89), 251-270.
- Schrijer, E., 2003a, *Aanvullend archeologisch onderzoek i.v.m. de verbreding van de rijksweg A2: vindplaatsen 10/11*, Bunschoten (ADC Rapport 212).

APPENDICES TO: A LIVING LANDSCAPE. BRONZE AGE SETTLEMENT SITES IN THE DUTCH RIVER AREA

- Schrijer, E., 2003b, *Aanvullend archeologisch onderzoek i.v.m. de verbreding van de Rijksweg A2 : vindplaatsen 6, 7 en 9*, Bunschoten (ADC Rapport 214).
- Schutte, A., 2002a, *Archeologische begeleiding in het tracé van de Betuweroute tracétraject BR3/02*, Bunschoten (ADC rapportage tracébegeleiding Betuweroute 8).
- Schutte, A., 2002b, *Archeologische begeleiding in het tracé van de Betuweroute tracétraject BR3/02b*, ADC (ADC rapportage tracébegeleiding Betuweroute 9).
- Schutte, A., 2003a, *Rapport Geldermalsen, Middengebied-Zuid*, Bunschoten (ADC rapport 160).
- Schutte, A., 2003b, *Archeologische begeleiding in het tracé van de Betuweroute. Het passief begeleide gebied van Gelderland*, Bunschoten (ADC Rapportage Tracébegeleiding Betuweroute 19).
- Schutte, A.H., 2005, *Inventariserend veldonderzoek waarderende fase (IVO-3) in verband met de verbreding van de Rijksweg A2: vindplaats 3*, Amersfoort (ADC Rapport 361).
- Siemons, H.-A.R. & M.M. Sier, 1999a, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 16: Kesteren / De Woerd*, Amersfoort (Rapportage Archeologische Monumentenzorg 38).
- Siemons, H.-A.R. & M.M. Sier, 1999b, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 14: Kesteren / Woonwagenkamp*, Amersfoort (Rapportage Archeologische Monumentenzorg 39).
- Siemons, H.-A.R., 2001, Sporen en structuren, in: M.M. Sier & C.W. Koot (eds), *Archeologie in de Betuweroute. Kesteren-De Woerd: bewoningssporen uit de IJzertijd en de Romeinse tijd*, Amersfoort (Rapportage Archeologische Monumentenzorg 82), 83-112.
- Sier, M.M. & J. Schotten, 1998, *Aanvullend archeologisch onderzoek in het tracé van de Betuweroute, vindplaats 27 Elst/Merm*, Amersfoort (Rapportage Archeologische Monumentenzorg 23).
- Sier, M.M. & E. Smits, 1998, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 36/37: Dodewaard / Viaduct Dalwagen-Zuid en Dalwagen-Zuid*, Amersfoort (Rapportage Archeologische Monumentenzorg 34).
- Sier, M.M. & E. Drenth, 1999, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 15: Kesteren / Lienden*, Amersfoort (Rapportage Archeologische Monumentenzorg 36).
- Sier, M.M. & C.W. Koot, 2001, *Archeologie in de Betuweroute. Kesteren-De Woerd: bewoningssporen uit de IJzertijd en de Romeinse tijd*, Amersfoort (Rapportage Archeologische Monumentenzorg 82).
- Sier, M.M., N.F. Mulder & C.W. Koot, 2001, Chronologie en fasering, in: M.M. Sier & C.W. Koot (eds), *Archeologie in de Betuweroute. Kesteren-De Woerd: bewoningssporen uit de IJzertijd en de Romeinse tijd*, Amersfoort (Rapportage Archeologische Monumentenzorg 82), 29-50.
- Sier, M.M. & N.F. Mulder, 2001, Inleiding, in: M.M. Sier & C.W. Koot (eds), *Archeologie in de Betuweroute. Kesteren-De Woerd: bewoningssporen uit de IJzertijd en de Romeinse tijd*, Amersfoort (Rapportage Archeologische Monumentenzorg 82), 9-28.
- Sloos, A., 1988, *Culemborg-Den Heuvel. Een ijzertijdnederzetting in het rivierkleigebied*, Leiden (unpublished MA Thesis).
- Sluys, P. van der, 1956, *Rapport betreffende de bodemgesteldheid van Tielerwaard-West*, Wageningen (unpublished internal report) (Stiboka report 436).
- Spanjer, M., 1998a, *Aanvullend Archeologisch Onderzoek in het tracé van de Betuweroute, vindplaats 35: Dodewaard / Dalwagen - Noord*, Amersfoort (Rapportage Archeologische Monumentenzorg 21).
- Spanjer, M., 1998b, *Aanvullend archeologisch onderzoek in het tracé van de Betuweroute, vindplaats 32 : Geldermalsen/Boog D-Noord*, Amersfoort (Rapportages archeologische monumentenzorg 24).
- Steenbeek, R., 1986, Vegetatie-horizonten in het gebied van de opgraving 'De Horden', *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek 1984*, 37.
- Steenbeek, R., 1990, *On the balance between wet and dry: vegetation horizon development and prehistoric occupation; a palaeoecological-micromorphological study in the Dutch river area*, Amsterdam (PhD Thesis).
- Steenbeek, R., W. Roeleveld & S.J.P. Bohncke, 1990, Palaeobotanical analysis of sections WbD271 and WbDD313 in the Holocene fluvial deposits near Wijk bij Duurstede (The Netherlands), in: R. Steenbeek (eds), *On the balance between wet and dry: vegetation horizon development and prehistoric occupation; a palaeoecological-micromorphological study in the Dutch river area*, Amsterdam (PhD Thesis), 102-114.
- Steenbeek, R., 1994, Fosfaatkartering in het Kromme-Rijngebied, in: W.A. van Es & W.A.M. Hessing (eds), *Romeinen, Friezen en Franken in het hart van Nederland. Van Traiectum tot Dorestad 50 v. C. - 900 n. C.*, Utrecht / Amersfoort, 122-125.
- Stiboka, 1973, *Bodemkaart van Nederland: schaal 1:50.000. Toelichting bij de kaartbladen 39 West Rhenen en 39 Oost Rhenen*, Wageningen.

REFERENCES

- Stouthamer, E., 2001, *Holocene avulsions in the Rhine-Meuse delta, The Netherlands*, Utrecht (PhD Thesis) (Nederlandse Geografische Studies 283).
- Stuart, P., 1968, Romeinse grafvondsten uit Geldermalsen in het Rijksmuseum van Oudheden te Leiden, *Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden te Leiden* 49, 61-82.
- Svanberg, F., 2005, House Symbolism in Aristocratic Death Rituals of the Bronze Age, in: T. Artelius & F. Svanberg (eds), *Dealing with the Dead. Archaeological Perspectives on Prehistoric Scandinavian Burial Ritual*, Ödeshög, 73-98.
- Tent, W.J. van, 1979, Wijk bij Duurstede, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1978, 118-119.
- Tent, W.J. van, 1988, Wijk bij Duurstede, in: W.J. van Tent (eds), *Archeologische kroniek van de provincie Utrecht over de jaren 1980-1984*, Utrecht, 34-46.
- Tent, W.J. van, 1992, Wijk bij Duurstede, in: W.J. van Tent (eds), *Archeologische kroniek van de provincie Utrecht over de jaren 1985-1987*, Utrecht, 22-27.
- Tent, W.J. van, 1996, Wijk bij Duurstede: Dorestad, in: W.J. van Tent (eds), *Archeologische kroniek van de provincie Utrecht over de jaren 1970-1979*, Utrecht, 80-84.
- Thanos, C., 1995, *Een late bekernerzetting in het Hollands veengebied. Een intersite-analyse van de late beker- en bronstijd bewoning te Molenaarsgraaf, Ottoland-Kromme Elleboog en Ottoland-Oosteind in de provincie Zuid-Holland*, Leiden (unpublished MA thesis).
- Theunissen, E.M., 1999, *Midden-bronstijdsamenlevingen in het zuiden van de Lage Landen. Een evaluatie van het begrip 'Hilversum-cultuur'*, Leiden (PhD. thesis).
- Theunissen, E.M. & R.S. Hulst, 1999a, De opgraving te Dodewaard, in: E.M. Theunissen (eds), *Midden-bronstijdsamenlevingen in het zuiden van de Lage Landen. Een evaluatie van het begrip 'Hilversum-cultuur'*, Leiden (PhD. thesis), 137-156.
- Theunissen, E.M. & R.S. Hulst, 1999b, De opgraving te Zijderveld, in: E.M. Theunissen (eds), *Midden-bronstijdsamenlevingen in het zuiden van de Lage Landen. Een evaluatie van het begrip 'Hilversum-cultuur'*, Leiden (PhD. thesis), 156- 180.
- Tol, A. & M. Schabink, 2004, *Opgravingen op vindplaatsen uit de Bronstijd, IJzertijd, Romeinse tijd en Volle Middeleeuwen op het Hoogveld te Sittard*, Amsterdam (Zuidnederlandse Archeologische Rapporten 14).
- Törnqvist, T.E., 1993, *Fluvial sedimentary geology and chronology of the Holocene Rhine-Meuse delta, The Netherlands*, Utrecht (PhD Thesis).
- Törnqvist, T.E. & G.J. van Dijk, 1993, Optimizing sampling strategy for radiocarbon dating of Holocene fluvial systems in a vertically aggrading setting, *Boreas* 22, 203-219.
- Traube, E., 1980, Mambai Rituals of Black and White, in: J.J. Fox (eds), *The Flow of Life: Essays on Eastern Indonesia*, Cambridge, 290-314.
- Ufkes, A., 2001, Aardewerk, in: J. Schoneveld & E.F. Gehasse (eds), *Archeologie in de Betuweroute: Boog C-Noord, een vindplaats bij Meteren op de overgang van Neolithicum naar Bronstijd*, Amersfoort (Rapportage Archeologische Monumentenzorg 84), 33-57.
- Ufkes, A. & S. Bloo, 2002, Aardewerk, in: B.H.F.M. Meijlink & P. Kranendonk (eds), *Archeologie in de Betuweroute: Boeren, erven, graven. De Boerengemeenschap van De Bogen bij Meteren (2450-1250 v. Chr.)*, Amersfoort (Rapportage Archeologische Monumentenzorg 87), 317-426.
- Ufkes, A., 2002a, Aardewerk, in: J. Schoneveld & P. Kranendonk (eds), *Archeologie in de Betuweroute: Drie erven uit de Midden-Bronstijd bij Lienden*, Amersfoort (Rapportage Archeologische Monumentenzorg 89), 81-114.
- Ufkes, A., 2002b, Aardewerk, in: J. Milojkovic & E. Smits (eds), *Archeologie in de Betuweroute: Lage Blok. Een nederzettingsterrein uit de Midden-IJzertijd bij Meteren (gemeente Geldermalsen)*, Amersfoort 90), 69-103.
- Verbraeck, A., 1970, *Toelichtingen bij de Geologische kaart van Nederland 1: 50.000, Blad Gorinchem I Oost (380)*, Haarlem.
- Verbraeck, A., 1984, *Toelichtingen bij de Geologische kaart van Nederland 1: 50.000, Blad Tiel West (39 W) en Blad Tiel Oost (39O)*, Haarlem.
- Verhart, L.B.M., 1992, Settling or trekking? The late neolithic house plans of Haamstede-Brabers and their counterparts, *Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden te Leiden* 72, 73-99.
- Verhelst, E.M.P., 2003, *Aanvullend archeologisch onderzoek in het tracé van de Betuweroute, vindplaats 52, Geldermalsen / Rijs en Ooyen*, Amersfoort (Rapportages Archeologische Monumentenzorg 43).
- Verlinde, A.D., 1991, Huizen uit de bronstijd en de vroege ijzertijd te Colmschate, in: H. Fokkens & N. Roymans (eds), *Nederzettingen uit de bronstijd en de vroege ijzertijd in de Lage Landen*, Amersfoort (Nederlandse Archeologische Rapporten 13), 31-40.

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- Vermeeren, C., 2005, Hout, in: S. Knippenberg & P.F.B. Jongste (eds), *Terug naar Zijderveld. Archeologische opgravingen van een bronstijdnederzetting langs de A2*, Leiden (Archol Rapport 36), 99-111.
- Verwers, W.J.H., 1978, Roman period Settlement Traces and Cemetery at Wijk bij Duurstede, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1975 (25), 93-132.
- Verwers, W.J.H., 1994, Wijk bij Duurstede - Dorestad, in: W.A. van Es & W.A.M. Hessing (eds), *Romeinen, Friezen en Franken in het hart van Nederland. Van Traiectum tot Dorestad 50 v. C. - 900 n. C.*, Utrecht / Amersfoort, 234-238.
- Vink, T., 1926, *De Lekstreek, een aardrijkskundige verkenning van een bewoond deltagebied*, Amsterdam (PhD Thesis).
- Vink, T., 1954, *De rivierstreek*, Baarn.
- Voogd, J.B. de & J. Schoneveld, 2002, Sporen en structuren, in: J. Schoneveld & P. Kranendonk (eds), *Archeologie in de Betuweroute: Drie erven uit de Midden-Bronstijd bij Lienden*, Amersfoort (Rapportage Archeologische Monumentenzorg 89), 53-80.
- Voort, W.J.M. van der, J.N.B. Poelman & W.A. van Es, 1979, Wijk bij Duurstede, De Horden: geologische Erkundung und Phosphatenuntersuchung im Rhamen einer Ausgrabung; vorläufiger Bericht (1977-8), *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek.*, 433-458.
- Vos, W.K., 2002, *De inheems-Romeinse huisplattegronden van De Horden te Wijk bij Duurstede*, Amersfoort (Rapportage Archeologische Monumentenzorg 96).
- Wal, A. ter, 2001, Sporen en structuren, in: J. Schoneveld & E.F. Gehasse (eds), *Archeologie in de Betuweroute: Boog C-Noord, een vindplaats bij Meteren op de overgang van Neolithicum naar Bronstijd*, Amersfoort (Rapportage Archeologische Monumentenzorg 84), 23-32.
- Wal, A. ter, 2004a, *Verbreding A2 Everdingen-Deil, vindplaats 1 en 2. Aanvullend Archeologisch Onderzoek*, 's-Hertogenbosch (BAAC Rapport 03.154).
- Wal, A. ter, 2004b, *A2 vindplaatsen 4 en 5. Aanvullend Archeologisch Onderzoek.*, 's-Hertogenbosch (BAAC-rapport 03.155).
- Wal, A. ter, 2005a, *Verbreding A2 Everdingen-Deil, vindplaats 6-7: Definitief Archeologisch Onderzoek*, 's-Hertogenbosch (BAAC-rapport 04.180).
- Wal, A. ter, 2005b, *Verbreding A2 Everdingen-Deil, vindplaats 2: definitief archeologisch onderzoek*, 's-Hertogenbosch (BAAC-rapport 04.182).
- Wallenburg, C. van & J.N.B. Poelman, 1954, *Verslag van de bodemkartering in het Kromme Rijngebied*, Wageningen (unpublished report).
- Waterson, R., 2003, The immortality of the house in Tana Toraja, in: S. Sparkes & S. Howell (eds), *The House in Southeast Asia: a changing social, economic and political domain*, London, 34-52.
- Weerts, H.J.T., 1996, *Complex confining layers. Architecture and hydraulic properties of Holocene and Late Weichselian deposits in the fluvial Rhine-Meuse delta, The Netherlands*, Utrecht (PhD Thesis).
- Weerts, H.J.T. & M.F.P. Bierkens, 1996, Geostatistical analysis of overbank deposits of anastomosing and meandering paleo-rivers, Rhine-Meuse delta, The Netherlands, *Sedimentary Geology* 85, 221-232.
- Wegner, G. (ed.), 1996, *Leben-Glauben-Sterben vor 3000 Jahren. Bronzezeit in Niedersachsen. Eine niedersächsische Ausstellung zur Bronzezeit-Kampagne des Europarates*, Oldenburg.
- Werff, J.H. van der, 1989, Roman Amphoras at 'De Horden' (Wijk bij Duurstede), *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1987 (37), 153-172.
- Wiepking, C.G., 2001, Aardewerk, in: M.M. Sier & C.W. Koot (eds), *Archeologie in de Betuweroute. Kesteren-De Woerd: bewoningssporen uit de IJzertijd en de Romeinse tijd*, Amersfoort 82), 113-170.
- Willems, W.J.H., 1984, Romans and Batavians. A regional study in the Dutch eastern river area II, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 34, 39-331.
- Willems, W.J.H., 1985 (1981), Romans and Batavians. A regional study in the Dutch eastern river area I, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 31, 7-217.
- Woltering, P.J., Z. van der Beek, G.R. Tak, M. Barwasser & F.J.G. van der Heijden, 1998, Geldermalsen, Meteren, *Jaarverslag van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 1995-1996, 238-240.
- Wullink, A.J., 2005, *Een archeologisch inventariserend veldonderzoek (IVO) door middel van bureau- en booronderzoek, op het terrein van de fruitveiling aan de Deilseweg te Geldermalsen, gemeente Geldermalsen*, Geldermalsen (ARC-rapport 2005-108).
- Ypey, J., 1963, Merkwaardige vondsten uit Opheusden, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 12/13, 187-192.

REFERENCES

- Zijverden, W.K. van, 2002a, Fysische geografie, in: P.F.B. Jongste & G.J. van Wijngaarden (eds), *Archeologie in de Betuweroute: Het Erfgoed van Eigenblok. Bewoningssporen uit de Bronstijd te Geldermalsen*, Amersfoort (Rapportage Archeologische Monumentenzorg 86), 45-82.
- Zijverden, W.K. van, 2002b, Fysische geografie, in: B.H.F.M. Meijlink & P. Kranendonk (eds), *Archeologie in de Betuweroute: Boeren, erven, graven. De Boerengemeenschap van De Bogen bij Meteren (2450-1250 v. Chr.)*, Amersfoort (Rapportage Archeologische Monumentenzorg 87), 55-135.
- Zijverden, W.K. van, 2002c, Fysische geografie, in: J. Milojkovic & E. Smits (eds), *Archeologie in de Betuweroute: Lage Blok. Een nederzettingsterrein uit de Midden-IJzertijd bij Meteren (gemeente Geldermalsen)*, Amersfoort (Rapportage Archeologische Monumentenzorg 90), 21-45.
- Zijverden, W.K. van, 2003a, *De ontwikkeling van het landschap in de omgeving van de vindplaats Zijderveld*, Leiden (unpublished report).
- Zijverden, W.K. van, 2003b, *Living in a dynamic (cultural) landscape. De ontwikkeling van het landschap in de omgeving van de vindplaats Dodewaard*, Leiden (unpublished report).
- Zijverden, W.K. van, 2004a, *The Landscape of "De Horden" at Wijk bij Duurstede revisited*, Leiden (unpublished report).
- Zijverden, W.K. van, 2004b, *Het landschap van Eigenblok en De Bogen in een nieuw perspectief*, Leiden (unpublished report).
- Zijverden, W.K. van, 2005, *Het landschap van de vindplaats Lienden opnieuw gezien*, Leiden (unpublished report).
- Zijverden, W.K. van & W.N.H Laan, 2005, Landscape reconstructions and predictive modeling in archaeological research, using a LIDAR based DEM and digital boring databases, (unpublished article on a) presentation held at: *Archäologie und Computer. Workshop 7*, Wien (2003).

APPENDICES TO A LIVING LANDSCAPE

This publication contains the six main appendices to the PhD thesis 'A Living Landscape. Bronze Age settlement sites in the Dutch river area (c. 2000-800 BC)' by Stijn Arnoldussen which was published by Sidestone Press in 2008. That study entails an analysis of the nature (*i.e.* the constituent components) and dynamics (*i.e.* diachronic approaches to settlement dynamics) of Bronze Age settlement sites in the Dutch river area. It aims to integrate and synthesize interpretations of Bronze Age settlements based on a number of large-scale excavations in the Dutch river area.

The discussion of the archaeological and geological research histories for these investigated sites, as well as more detailed source criticism and long-term overviews of the occupation histories of six (c. 30 km²) macro-regions around them, could – for sake of conciseness – not be incorporated into the main study's text. However, such discussions contain critical information necessary to correctly interpret the results of these excavations and to evaluate their representativeness. Therefore, it was decided to make this information available separately in this publication.

While these texts are primarily appendices to the PhD study referred to above, they can be read separately by those who are particularly interested in the results – thus far published nearly exclusively in Dutch – of the excavations at Zijderveld, Rumpt - Eigenblok, Wijk bij Duurstede, Meteren - De Bogen, Lienden - Kesteren or Dodewaard. In addition, the appendices provide a recent overview of the palaeogeographical development and occupation history of six large macro-regions in the Dutch river area. This information may be of relevance to those studying other sites within these macro-regions for the period under study (c. 2000-800 BC).

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