McDONALD INSTITUTE MONOGRAPHS

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Mark Knight and Matt Brudenell

CAU Must Farm/Flag Fen Basin *Depth & Time* Series — Volume I

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By Mark Knight and Matt Brudenell

With contributions by
Grahame Appleby, Manuel Arroyo-Kalin, Rachel Ballantyne, Michael Bamforth, Lawrence Billington, Steve Boreham, Natasha Dodwell, Roger Doonan, Charles French, Kevin Hayward, Peter Hommel, Donald Horne, Mark Noel, Peter Northover, Tracey Pierre, Vida Rajkovača, Iona Robinson Zeki, Rob Scaife, Maisie Taylor, Sean Taylor, Simon Timberlake, Anne de Vareilles and Penelope Walton Rogers

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On the cover: *Bradley Fen 2001 (excavating the watering hole F.866).*

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Figures

Tables

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Charly French, Paul Middleton, Francis Pryor, Rob Scaife and Maisie Taylor were frequent visitors, bringing experience and encouragement in equal measure. Their generosity of ideas contributed greatly to the understandings presented here — all excavations should be afforded such wise counsel. In similar vein, conversations with Jo Brück, Christopher Evans, Kasia Gdaniec, David Gibson, David Hall, JD Hill, Gavin Lucas, Lesley McFadyen, Richard Mortimer, Stuart Needham, Roderick Regan and Ben Robinson kept us on our interpretive toes. That we had found a site worth explicating was made apparent by the number of requests to publish its plan (Richard Bradley, Mike Parker Pearson and David Yates) or to analyse its artefactual or environmental assemblages. Material gleaned from King's Dyke and Bradley Fen furnished parts of more than one PhD (Matthew Brudenell and Rob Law) along with several MPhil and undergraduate dissertations (Grahame Appleby, Manuel Arroyo-Kalin, Emma Beadsmoore, Tracey Pierre and Sean Taylor). We are grateful to those who expressed an interest and helped put our work into a much wider context.

An opportunity to think and read was extended to Mark Knight by the McDonald Institute for Archaeological Research. During time as Field Archaeologist in Residence in 2011 he was allowed to combine a bit of *field* with a bit of *theory*. This volume, or at least a large chunk of its theoretical input and product, represents an outcome of that time well appreciated and hopefully well spent. The main body of this text was completed in 2013, and was revised following comment in 2015 and 2018.

Finds were processed by Norma Challands, Jason Hawkes, Leonie Hicks, Gwladys Monteil and Sharon Webb. The graphics in this volume were produced by Andrew Hall with the assistance of Marcus Abbot, Michael Court, Vicki Herring, Donald Horne, Iain Forbes and Jane Matthews. Chloe Watson drew the log ladder and mallet. Studio photography was undertaken by Dave Webb, while onsite photography was undertaken by members of the excavation team. The text was edited by Iona Robinson Zeki, who tackled style in tandem with content, her interventions being astute as well as necessary.

Special thanks are extended to Mark Edmonds and Francis Healy for reading (so thoroughly) and commenting (so cogently) on this monograph. In line with a major theme of this book, we gained from their depth. We also accept that we still have a great deal to learn about radiocarbon dating, especially if we

want to employ it as a sensitive instrument. The monograph was proofread and indexed by Vicki Harley.

The monograph describes the core prehistoric archaeology of King's Dyke and Bradley Fen and is an expression of many peoples hard work in the field as well as in the library, lab and office. The excavation teams were as follows:

King's Dyke 1998: Marc Berger, Craig Cessford, Duncan Garrow, Cassian Hall & Mark Knight.

King's Dyke 1999: Marcus Abbott, Joe Abrams, Mary Alexander, Nicholas Armour, Rachel Ballantyne, Emma Beadsmoore, Andy Clarke, Anwen Cooper, Bob Davis, Duncan Garrow, Andrew Hall, Dave Hall, Jon Hall, Candy Hatherley, Mark Knight, Lesley McFadyen, Richard Mortimer, Ricky Patten, Martin Redding & Beccy Scott.

Bradley Fen 2001: Marcus Abbott, Rachel Ballantyne, Emma Beadsmoore, David Beresford-Jones, David Brown, Matthew Brudenell, Simon Burney, Craig Cessford, Norma Challands, Philip Church, Andy Clarke, Jason Clarke, Chantal Conneller, Bob Davis, Paul Donohue, Natasha Dodwell, Andy Fergerson, Duncan Garrow, Susanne Hakenbeck, Andrew Hall, Candy Hatherley, Teresa Hawtin, Charlie Kitchin, Mark Knight, Mary Leighton, Jane Matthews, Lesley McFadyen, Mary Nugent, Ricky Patten, Richard Purves, Martin Redding, Neil Redfern, Christina Robinson, Beccy Scott, Mark Spalding, Fraser Sturt, Richard Turnbull, Roland Wessling, Steven Williams & Felicity Woor.

Bradley Fen 2004: Ben Bishop, Emma Beadsmoore, Grahame Appleby, Matthew Collins, Donald Horne, Mark Knight, Iain Morley, Martin Oakes, Laura Preston, Tim Vickers, Ellen Simmons, Chris Swaysland & Steven Williams.

Being in the field at King's Dyke and Bradley Fen was a process of sustaining a close engagement with context and circumstance. Much of the time we did this surrounded by the roar, exhausts and dust of heavy plant as it uncovered the ground in front of us or removed the ground behind us. The process was fairly rapid and there was a sense of things being done at a pace. Throughout, however, we tried to stay contextual and we achieved this largely by talking through our individual features, putting into words *cuts*, *fills*, *layers* and *finds*. Friday afternoons (invariably after chips) frequently involved walking around the site discussing each other's postholes, pits, ditches and deposits. In this manner, we were able articulate and correlate different features and begin to recompose sites and landscapes. These grounded conversations occurred at the top of the contour, at King's Dyke, and continued all the way to the bottom of the contour, at Bradley Fen. As we moved down, the depth and complexity of sediment increased and our postholes, pits, ditches and deposits became progressively better preserved. In these sunken spaces, upcast banks and mounds endured. Buried soil, silt and peat horizons intervened between things. All of these details amplified our comprehension or, what we called at the time, our 'confidence in context' – in this we came to be immersed.

Summary

The King's Dyke (1995–1999) and Bradley Fen (2000–2004) excavations occurred within the brick pits of the Fenland town of Whittlesey, Cambridgeshire. The investigations straddled the south-eastern contours of the Flag Fen Basin, a small peat-filled embayment located between the East-Midland city of Peterborough and the western limits of the 'island' of Whittlesey. Renowned principally for its Bronze Age and Iron Age discoveries at sites such as Fengate and Flag Fen, the Flag Fen Basin also marked the point where the prehistoric River Nene debouched into the greater Fenland Basin.

In keeping with the earlier findings, the core archaeology of King's Dyke and Bradley Fen was also Bronze Age and Iron Age. A henge, two round barrows, an early fieldsystem, bronze metalwork deposition and patterns of sustained settlement along with metalworking evidence helped produce a plan similar in its configuration to that first revealed at Fengate. In addition, unambiguous evidence of earlier second millennium BC settlement was identified together with large watering holes and the first burnt stone mounds to be found along Fenland's western edge.

The early fieldsystem, defined by linear ditches and banks, was constructed within a landscape preconfigured with monuments and burnt mounds. Genuine settlement structures included three of Early Bronze Age date, one Late Bronze Age, ten Early Iron Age and three Middle Iron Age. Despite the existence of Middle Bronze Age wells, bone dumps and domestic pottery assemblages no contemporary structures were recognised. Later Bronze Age metalwork, including single spears and a weapon hoard, was deposited in indirect association with the earlier land divisions and consistently within ground that was becoming increasingly wet. By the early Middle Iron Age, much of the fieldsystem had been subsumed beneath peat whilst, above the peat, settlement features transgressed its still visible boundaries.

Combined, the King's Dyke and Bradley Fen excavations established a near continuous transect across the Flag Fen Basin's south-eastern gradient – the former exposing its very top, the latter its top, middle and base. The different elevations yielded different archaeologies and in doing so revealed a subtle correspondence between altitude and age. The summit of the gradient contained Roman as well as prehistoric features, whereas the mid-point contained nothing later than the early Middle Iron Age, and the base, nothing later than the very beginnings of the Middle Bronze Age. At the same time, there was a palpable relationship between altitude and preservation. A shallow plough soil was all that protected the most elevated parts. The very base of the gradient however, retained a buried soil as well as silt and peat horizons contemporary with prehistoric occupation and which preserved surfaces, banks and mounds that were not present higher up. The same deposits also facilitated the preservation of organic remains such as wooden barriers, log ladders and a fragment of a logboat.

The large-scale exposure of the base of the Flag Fen Basin at Bradley Fen uncovered a sub-peat or pre-basin landscape. A landscape composed of dryland settlement features related to an earlier terrestrial topography associated with the now buried floodplain of the adjacent River Nene. Above all, the revelation of sub-fen occupation helped position the Flag Fen Basin in time as well as space. It showed that the increasingly wet conditions which led to its formation as a small fen embayment transpired at the end of the Early Bronze Age. In the same way, the new found situation dissolved any sense of an all-enduring and all-defining fen-edge and instead fostered a more fluid understanding of the contemporary environmental circumstances. In this particular landscape setting wetland sediment *displaced* settlement as much as it *defined* it – the process was dynamic and ongoing.

…simultaneity is mere appearance, surface, spectacle. Go deeper. Do not be afraid to disturb this surface, to set its limpidity in motion. (Lefebvre & Régulier 2004, 80)

Chapter 4

Fieldsystem, settlement and metalwork

A remarkable attribute of the Bradley Fen investigations was the impression that the site was made-up of many levels, each as spectacular as the next. This chapter describes such a change, which saw the implementation of a coaxial fieldsystem, its settlement and the deposition of a large number of bronze weapons. As component parts, these features resonate with key facets of the opposing Fengate shoreline (Pryor 1991; 2001) and, as such, the two landscapes stand as close counterparts. The similarities and the differences between the two set the framework for this chapter.

By comparison, the chronology of this chapter is considerably shorter than the last, in that it covers less than half a millennium – *c*. 1500 to 1100 cal BC. Most significantly, its time scale is commensurate with the emergence of the Flag Fen Basin as a tangible landscape feature and, where previously occupation was aligned in relation to a river, it was now beginning to be oriented in relation to a small fenland embayment. The conditions that created the Flag Fen Basin were progressive. As a consequence, features that had been constructed partially in response to its ever expanding development were eventually subsumed beneath it. For example, relatively shortly after its construction, low-lying elements of the fieldsystem disappeared below the advancing peat. In fact, the visible superposition of *the grid* corresponded so closely with the changing environmental conditions that it might even be suggested that the two things were interconnected, with the apparent extensification of agriculture (Bradley in Evans 2009c, 266) potentially hastening the nearby saturation (Van de Noort 2004, 168).

In this chapter, the relationship between dryland and wetland is particularly prominent, as is the relationship between fieldsystems, settlement and metalwork. Whereas the fieldsystem was something that truly straddled the shifting dryland/wetland divide, settlement and metalwork perpetuated the distinction. This chapter looks at how things such as fieldsystems, peat growth and metalwork deposition interrelated and what the relative imposition of these things might tell us about life in the later Bronze Age.

Putting back the fieldsystem

The previous chapter described a prehistory devoid of an overarching grid. In presenting the evidence of earlier occupations, it was essential to 'lift off' the fieldsystem in order to truly appreciate pattern. For this chapter, however, it is imperative that we put the fieldsystem back. In doing so, it is critical that we locate the fieldsystem accurately both temporally and spatially. Fortunately, in this landscape, the construction of the first land divisions coincided with conditions contributory to continuous peat growth. The relationship was unequivocal. As peat development engulfed one set of features (those described in Chapter 3), it established a 'fresh' backdrop for another (those described here). Peat intervened between things and as a result it accentuated sequence.

The manner in which we 'put the fieldsystem back' is also important, as we must decide whether this should be done all at once or incrementally. Simultaneously, it is important to keep in mind that its linear *boundaries* are in fact just the enduring outlines of otherwise intangible *plots* of land; without the presence of the former it would be all but impossible to recognize the presence of the latter. From this we might ask, which came first, plots or boundaries?

We can make an attempt to answer these and other questions by returning to the beginning of the previous chapter and our consideration of Barrett's theories about long and short fallow systems of tenure (1994, 143). As he suggested, systems of cultivation or animal husbandry have never been contingent on the building of permanent boundaries, especially as agriculture was practised long before the construction of fieldsystems. Following on from this argument, could it be that formal land division was the very last thing to happen in the making of fields? And that the digging of ditches and the raising of banks was actually about *holding on* to something already in the landscape (cf. Johnston 2005, 18), as opposed to *setting out* something completely new? When understood like this, formalized field boundaries could be seen as enunciating a process of land fossilization rather than of simple agricultural innovation; an architecture that projects backwards as much as it projects forwards (cf. Fleming 1985). Such a comprehension may be less about fundamental changes in farming practice, or even novel kinds of land management, and more about bolstering some kind of unconditional claim over particular 'areas of ground surface' (Barrett 1994, 94). If this is the case, the institution of more or less ineradicable divisions marked a transformation in boundary practice *not* farming practice. It was a system of dealing with land already freighted with connections between people, farming, land use and inhabitation.

David Yates presents second millennium BC fieldsystems the opposite way around and argues for innovation over fossilization. Accordingly, he projects these same *grids* into a bright new future of ever-escalating wealth that materialized itself in a metalwork boom (Yates 2007, 135). This is his agricultural revolution (2001, 65). Yates' model also proposes a *triangle of production* which envisages fieldsystems, metalwork and large ringworks as integral components of the same economic scheme. For him, the systematic division of land can be equated to a whole new kind of labour (land and labour being the same thing). For this interpretation to work, however, it is fundamental that fieldsystems, metalwork and ringworks occurred almost simultaneously. These things must share the same political and geographical spheres otherwise the model falls apart. The argument is one of timing, as much as orientation and, ultimately, comes down to demonstrating that the three points of this triangle of production happened as closely in time as they did in space.

With these interpretive ideas in mind, this chapter tackles head-on the relationship between fieldsystems, settlement and metalwork as excavated at Bradley Fen and King's Dyke. It incorporates evidence from the rest of the Flag Fen Basin and its immediate environs and attempts for the very first time to produce a detailed contextual understanding of fieldsystems, settlement and metalwork for this landscape. Integral to the construction of this understanding are the investigations of the Must Farm post-alignment (Gibson et al. 2010) as well as the newly discovered ringwork at Horsey Hill (Gibson & Knight 2009).

A small group of radiocarbon dates connected with the inception of the fieldsystem, the duration of associated settlement and the deposition of metalwork suggests an unequivocal chronological break between the establishment of field boundaries and the burial of bronzes, with the settlement features bridging the intervening gap. The same order of things also revealed itself stratigraphically in that one of the settlement features abutted part of the fieldsystem, whilst the bronzes were deposited only after a large part of the fieldsystem had been submerged beneath the advancing peat. In keeping with rest of the book, this chapter presents these things in order of occurrence. As before, the chapter opens by establishing the wider landscape setting as well as its topographical and environmental texture.

Topographies and environments *c.* 1500–1100 cal BC

The lower contour deposit sequence demonstrates that the transition from river valley to fen embayment occurred sometime around the sixteenth century BC, when saturation levels, at or about ordnance datum, reached a level at which sustained waterlogged conditions ensued. The ever-increasing water-table extended beyond the confines of the river corridor and started to inundate the low-lying plain that separated the 'shorelines' of mainland Peterborough and the island of Whittlesey. The subtle contours of the plain ensured that the transformation was comparatively rapid and its impact was made all the more impressive because these new environmental conditions effectively severed the land bridge that once connected the two land masses. At the same time, the main channel of the previously tidal River Nene migrated southwards incising a new course below King's Delph; its former course being fossilized in the form of a large meandering roddon caught within the confines of the deep sediments south of the now wet plain.

The Flag Fen Basin c. *1500 cal BC – the emerging fen embayment*

It is now appropriate to write about the Flag Fen Basin as an actual historical-geographical setting as opposed to an abstract area of study or as a place where a collection of well-known Bronze Age sites are located. The development or emergence of this small fen embayment was diachronic and absolutely contingent on metamorphosing environmental conditions which led to a terrestrial space being made sodden (Fig. 4.1). By 1500 cal BC, the ground below 0.50m OD was covered by peat and the land mass of Whittlesey became an island. The formerly dry plain was fast disappearing, although crucially, in terms of the early stages of the Flag Fen Basin, an elongated spit of land remained above the initial inundation.

Figure 4.1. *Flood map* c.*1500 cal* BC *(0.50m OD) – 1300 cal* BC *(1.00m OD).*

The spit extended south-eastwards out from the Fengate shoreline and stretched as far the westernmost margins of the Bradley Fen embayment. Its eastern end was bifurcated into two parallel promontories; its maximum elevation attained 1.0m OD.

The flatness of the central plain is reflected in the swiftness of its inundation: its subtle contours were soon covered by a thin horizon of peat. During dry seasons these formative peatlands would have remained accessible even though the deeper and therefore progressively wetter zones, such as the Bradley Fen embayment, would have become more and more difficult to traverse. The contrast between different zones would have created a patchwork of varyingly waterlogged environments (Fig. 4.2).

By 1300 cal BC, the whole of the central plain had disappeared beneath the peat. The Flag Fen Basin had expanded up to the 1.0m OD contour and for sites such as Fengate and Bradley Fen it was only now that the designation *fen-edge* became truly accurate. In fact, the transformation was so absolute that, at the scale of our Flag Fen Basin window, the 1300 cal BC map presents approximately 50% dryland and 50% wetland.

At Northey, Scaife shows that the earlier reed swamp sequence was superseded by the first fen peat deposits dated to 1530–1260 cal BC (2001, 367). Overall, his pollen analysis depicted the basin as dry land that became 'progressively waterlogged from the centre outwards' (ibid.) and, as a record of landscape change, the profiles illustrated a dynamic interrelationship or correspondence between altitude, environment and time. As far as the Flag Fen Basin was concerned, this outward movement was a dynamic that had its greatest force towards the very end of the Early Bronze Age (*c*. 1500 cal BC), as the onset of fen peat deposits and more or less permanently saturated ground compelled those that preferred things dry to migrate towards its margins like ripples in a pond. In accordance with the pollen record, this chapter concentrates on the paludification of the Flag Fen Basin and the progressive distancing of 'terrestrial species' from the centre of the embayment.

According to Scaife, the outward expansion of the fen basin can also be interpreted from the fluctuating pollen values of alder (*Alnus*). For him, the variable pollen counts can be taken as compelling evidence of a shifting alder carr fringe. Above the carr, the well-drained edges of the basin continued to be zones of clearance and mixed agriculture with cereals and dryland herbs persisting (Scaife 2001, 381). Perhaps significantly, given the character of the features being imprinted upon this landscape, the overriding palynological pattern in terms of agricultural practice appears to be one of broad continuity rather than significant change.

From these descriptions, it is possible to construct a basin-shaped landscape made up of a series of successively displaced environments. Like the rise of the water-table, the trajectory of displacement was predominantly upward, as an apparently fixed agricultural practice simply stayed ahead of the deluge. Alternatively, the earlier patchwork of pastoral and arable agriculture might actually reflect different topographical settings, for example pastoral farming on low ground, arable cultivation on high ground. In this model, the inexorable upward trajectory might involve one kind of agricultural practice displacing another.

As before, the challenge is to situate our feature-sets in these fluctuating spaces and describe how they interrelated. At the same time, it is important that we attend to the speed of things, especially in relation to the landscapes that went before. If the previous chapter described a space that was essentially *smooth*, in that it was stretched out and open, this chapter describes a kind of *striated* space, a place where land was visibly parcelled out and, to all intents and purposes, in the process of being contracted and closed. Here we follow Deleuze & Guattari's use of the terms *smooth* and *striated* and their comprehension of nomadic and

Figure 4.2. *Changing textures – Middle Bronze Age.*

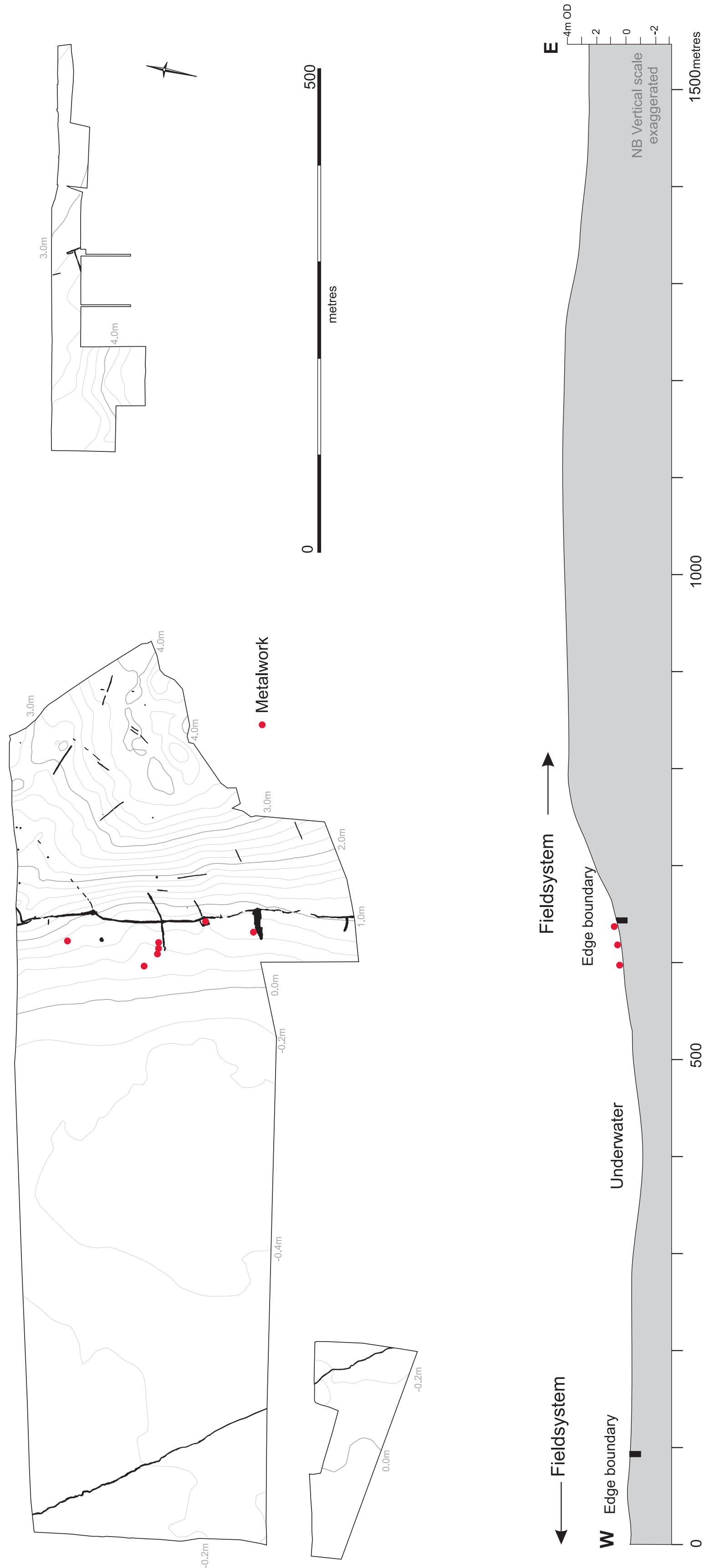


Figure 4.3. *Fieldsystem landscape – Bradley Fen and King's Dyke excavation areas with schematic transect.*

sedentary trajectories, which argues that the use of space and, in particular, *how people moved* differed fundamentally between the two ways of *being in the world* (1986; Cresswell 2006, 49). This is not necessarily an argument for a fundamental change in the way people lived at or about 1500 cal BC but a suggestion that the imposition of an overarching grid might have had an impact beyond its original design. Again it is an issue of extent and here we explore the effects on movement and mobility precipitated by the construction of endless vertical barriers across formally open ground (Fig. 4.3).

The coaxial fieldsystem

To achieve an understanding of the duration and extent of the Bradley Fen fieldsystem, it is essential first to appreciate its scale. Whereas previously individual features, such as a round barrow or a burnt mound, were found at a scale that could be fully comprehended within the confines of the excavation, the fieldsystem was always greater than the site. Pryor's Fengate and Northey investigations demonstrated that the margins of the Flag Fen Basin were similarly enclosed (Pryor 2001; Pryor & Bamforth 2010), whilst work at Tanholt Farm (Patten 2009), Pode Hole (Daniel 2009), Briggs Farm (Pickstone & Mortimer 2011), West Deeping (Murrell 2010) and Langtoft (Hutton 2008a; 2008b) indicate that equivalent systems continued well beyond the limits of the embayment. Current knowledge suggests that the second millennium BC fieldsystems were present across most, if not all, of the western fen-edge and can also be traced far up the adjoining river valleys of the Welland, Nene, Ouse and Cam (Yates 2007, 83–100). In our search for a limit to the true extent or distribution of Bronze Age land enclosure our perspective must therefore be at least at a scale equivalent to that of the western fen-edge and its feeder rivers.

With this viewpoint in mind it becomes obvious that the Bradley Fen fieldsystem represents only a very small part of a much larger landscape phenomenon. Nevertheless its form is different enough from the other adjacent systems to suggest patterns of localized variability. For example, for the most part Bradley Fen is different to Fengate and, in some ways, a lot less spectacular. Absent are the distinctive droveways, double-ditched boundaries and regular paddocks or stockades – the hallmarks of the Fengate system. Instead, the system comprised a simple series of parallel boundaries that delineated long linear field-strips aligned diagonally across the edge of the island (Fig. 4.3). Apart from the main island-edge boundary, the ditches were much smaller and more fragmentary than at Fengate, so much so that parts of the system seemed hardly marked out at all. Yet what the Bradley Fen system lacks in appearance it more than makes up for in detail. The site has attributes that investigations of other fieldsystems, including Fengate, have yet to reveal. For the first time, a fen-edge coaxial fieldsystem has been traced to its real edge and appreciably below 1m OD. Rather than being situated in the midst of the fields, the site straddled the system's actual terminus. As a result, it is possible to describe all of its principal components rather than just surviving parts.

The Bradley Fen fieldsystem was made up of a series of linear ditches occasionally accompanied by preserved up-cast banks. The main foci of enclosure were the western slopes of Whittlesey 'island' whilst the eastern margins of the Bradley Fen embayment was delineated by a single continuous land division. The King's Dyke investigations contained a couple of short linear ditches which may also belong to the same system.

As well as the preservation of fragments of bank, the Bradley Fen system incorporated unambiguous evidence of concerted boundary maintenance including episodes of re-cutting. Perhaps most significantly, however, the best preserved elements of enclosure also provided tangible evidence of wooden fence-lines preceding the ditch and bank boundaries. Articulating the relationship between comparatively delicate lines of stakes and the considerably more durable linear earthworks represents a key point when it comes to comprehending the instigation and development of fields both in and around the Flag Fen Basin. Part of this comes down to preservation, especially as evidence for earlier, organic or 'wet' land divisions only survived in low-lying, sub-1m OD zones where the ground was fully waterlogged soon after the boundaries had been erected and has remained so ever since.

The difference in preservation helps to explain the ill-defined character of the higher parts of the fieldsystem, which survived as little more than short stubs of ditches with shallow profiles. It also suggests that the earthwork element of the fieldsystem represents an enduring manifestation of much more delicate, or insubstantial, antecedents. This pattern implies that in studying these things it might be better to consider fields and field boundaries as divisible entities: a system of fields and a system of boundaries (with the latter articulating the former). Accordingly, the next section begins by describing the pattern of fields (their dimensions etc.) followed by a description of the various boundaries (fence-lines, ditches and banks). This might at first appear to be back to front, as without the concrete divisions the fields would not have been visible. The switch in order, however, places the emphasis on plots of land above the kind of boundary employed to define them. It also allows the fieldsystem to develop rather than be presented as an accomplished fact.

Fields (Bradley Fen)

Combined, the fields formed a series of narrow parallel strips aligned predominantly northeast–southwest, whilst the western end of the main section revealed an abrupt change in direction with a single band of rectangular fields aligned north–south (Fig. 4.4). Many of the parallel strips were also sub-divided into individual blocks. Consequently the field dimensions varied (Table 4.1; Fig. 4.5), although significantly there was a degree of regularity in the width of the strips (Fig. 4.6). The widest measured around 60m and the narrowest just below 30m, suggesting a potential pattern of 'full' and 'half' divisions. The greatest variability occurred amongst the field blocks themselves with the largest field measuring up to 160m in length (Field 11) and the smallest 34m (Field 4; Fig. 4.7). The irregular patchwork quality of the parallel strips was contrasted by the relative uniformity of the north–south band of fields, with the three measurable blocks equalling between 90–115m in length (Fields 17–19).

The meeting of the two different field alignments was awkward, to such a degree that it appeared to reveal one set of fields (north–south) truncating another

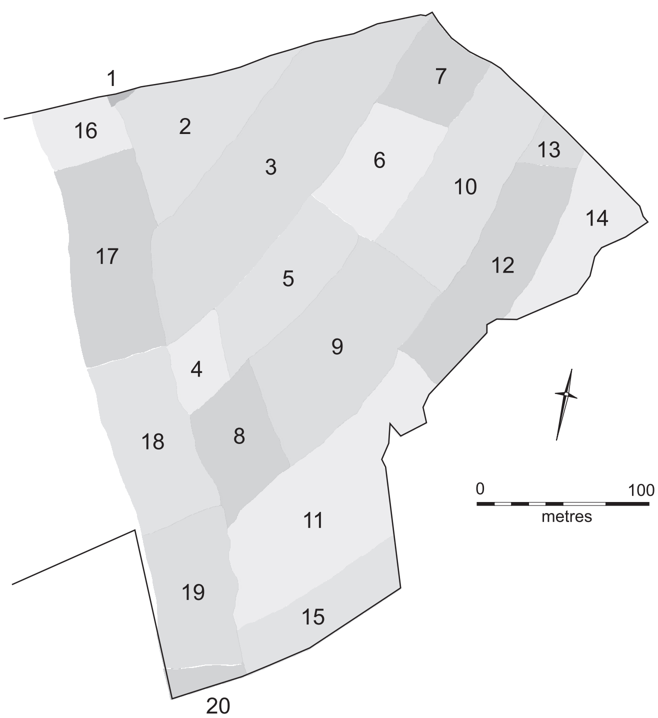


Figure 4.4. *A system of fields (incorporating field numbers).*

Table 4.1. *Field dimensions ('complete' dimensions in bold).*

Field	Length (m)	Width (m)	Area (m²)	Hectares
1	18	6	108	0.01
2	135	**62**	8370	0.84
3	242	**55**	13310	1.33
4	**34**	**36**	**1224**	**0.12**
5	**100**	**36**	**3600**	**0.36**
6	**70**	**45**	**3150**	**0.32**
7	60	**45**	2700	0.27
8	**50**	**60**	**3000**	**0.30**
9	**115**	**60**	**6900**	**0.69**
10	120	**45**	5400	0.54
11	**160**	**65**	**10400**	**1.04**
12	**135**	**35**	**4725**	**0.47**
13	32	**30**	960	0.09
14	108	45	4860	0.49
15	105	27	2835	0.28
16	34	**27**	918	0.09
17	**115**	**25**	**2875**	**0.29**
18	**96**	**25**	**2400**	**0.24**
19	**92**	**25**	**2300**	**0.23**
20	8	**25**	200	0.02

(northeast–southwest). Crucially, this awkward switch in alignment coincided with the increasingly wet margins of the Bradley Fen embayment and could therefore represent a straightforward artefact of the shifting edge of the embayment. The spatial juxtaposition of the different alignments made it look as if the end of the system was folded back on itself, either as a direct response to, or in anticipation of, the encroaching fen. As will be demonstrated, the impact of this encroachment was even more apparent in the evolved morphology of the field boundaries.

'Wet' boundaries

The system of field boundaries was made up of more than one phase and in places involved makeshift fence-lines replaced by lasting ditch and bank divisions which in turn witnessed episodes of localized refinement or enhancement. This layered development or pattern of augmentation was best expressed by the boundaries located either side of the Bradley Fen Embayment and in particular by the uninterrupted land division located along its western margins. As the lowest and deepest placed boundary, it was inundated very early on in its establishment and accordingly contained waterlogged components of an earlier manifestation within its final form.

Fence-line

The boundary (F.1306) that delineated the western margins of the Bradley Fen Embayment originated as a simple stake-built fence-line or 'dead-hedge' (Fig. 4.8).

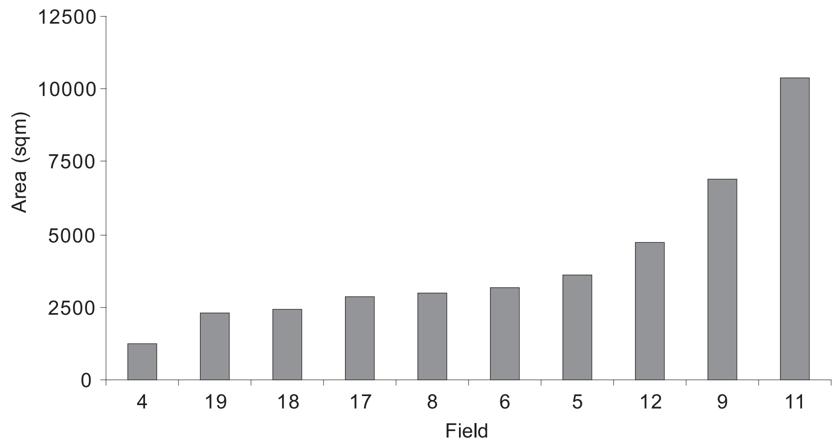


Figure 4.5. *Field sizes by area.*

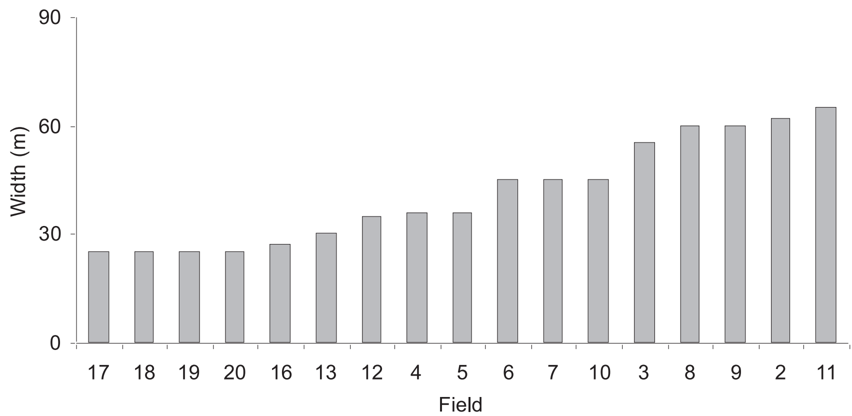


Figure 4.6. *Field widths.*

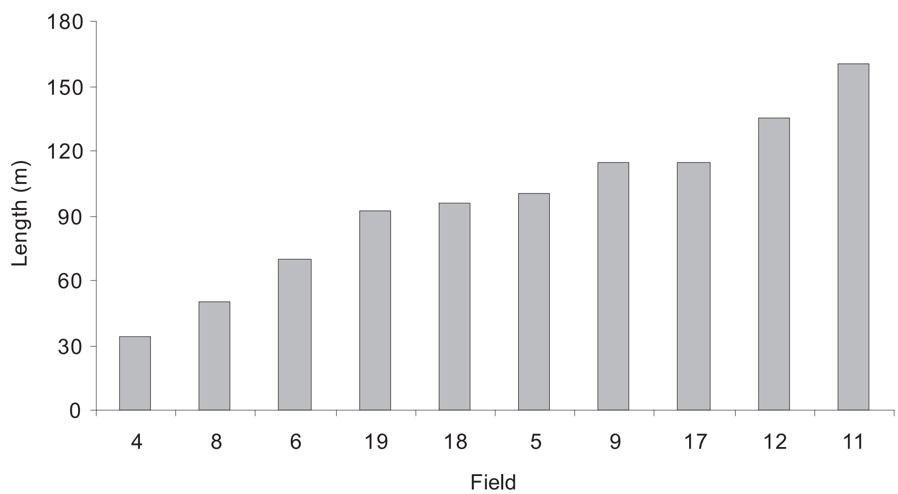


Figure 4.7. *Field lengths.*

In its primary manifestation, this land division involved an interrupted line of 98 small wooden stakes (diameter: 90–120mm), extending over a distance of 141.66m and oriented northwest–southeast. The uprights, which had been erected after the first few centimetres of peat growth, had simple pencil-like points and endured as a series of short groups or strands of up to 9.96m in length. The strands were separated by gaps of anywhere between 2.17m and 13.71m whilst the smallest gap between individual uprights was 0.09m. Many

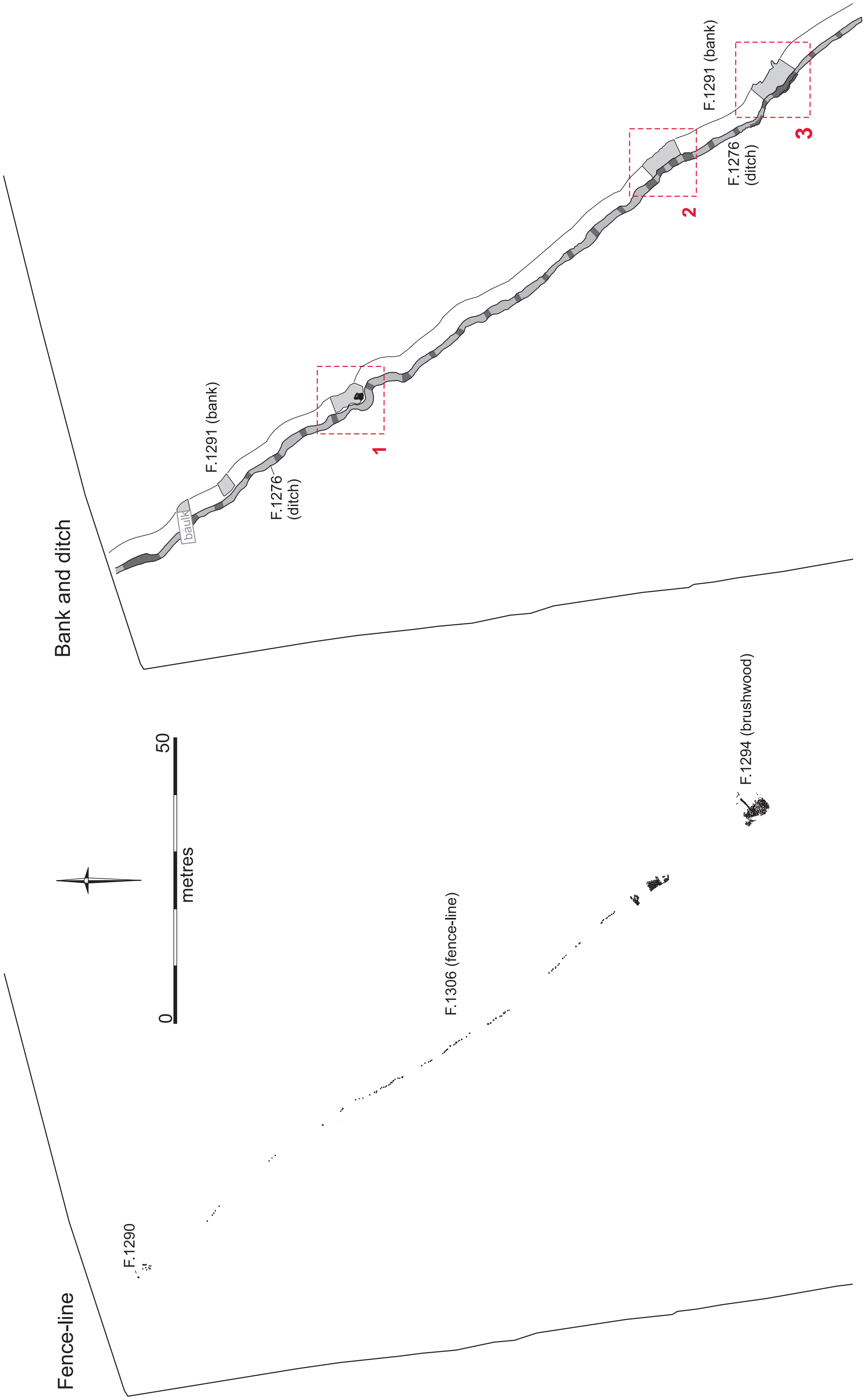


Figure 4.8. *'Wet' boundary: stake-built fence-line or 'dead-hedge' F.1306 and the subsequent bank and ditch (F.1291 & F.1276).*

of the shorter breaks in the alignment appeared to be genuine as they occurred beneath preserved sections of the later up-cast bank whereas the more extended breaks appeared to represent truncated stretches. The stakes varied greatly in depth (0.05-0.25m) with some barely penetrating the underlying palaeosol. One of the uprights provided a radiocarbon date of 1620–1390 cal BC (Table 1.1).

Accompanying the alignment was an equally long, flattened heap of brushwood which entwined the groups of uprights and also post-dated the first few centimetres of peat growth. The heap was preserved beneath the succeeding up-cast bank and comprised a jumble of woody detritus including lengths of cut roundwood, pieces of bark and tree roots. A direct stratigraphic relationship between the uprights and brushwood demonstrated that the two things were contemporary and suggests that the jumble of brushwood may once have formed part of a crudely fashioned barrier or woven dead-hedge. Rooted saplings along with small coppiced stools were identified during the excavation of the brushwood and it would appear that elements of the dead-hedge had returned to life. Whatever its original character, its preservation was contingent on its context – it was wet when the boundary was constructed and it became increasingly wet afterwards.

Bank and ditch

The fence-line or dead-hedge was superseded by the building of a continuous ditch (F.1276) and bank (F.1291). The new construction followed the same alignment as the old, although its various subtle twists and bends deviated slightly from the original (Fig. 4.8). In fact, the serpentine character of the new boundary compared to the sinuousness of the old was such that its superimposition was made all the more apparent. As with the organic fence-line, the ditch and bank were exceptionally well preserved and as a consequence maintained a sharpness and level of detail not normally observed. The ditch was situated on the western side and maintained a consistent U-shaped profile along its entire length (0.70–0.95m in width and 0.30–0.35m in depth). The up-cast bank varied in height (0.02–0.30m) and breadth (1.84–3.15m) and was in places severely disrupted by intrusive tree roots. The bank had a flattened, convex profile and was made of material derived directly from the cutting of the ditch (a mixture of gravel, sand, pale yellow or orange silty-clay, redeposited grey-brown buried soil and redeposited peat). In section, the mix of up-cast material had a distinctive marbled appearance indicative of soils deposited when wet. The uppermost surface of the bank was compacted or trampled in a manner which suggests it had been utilized as a narrow, elevated causeway (Fig. 4.9). Towards the northernmost end of the bank, a preserved tree-stump had been incorporated into its make-up, indicating that the tree was still standing when the bank was constructed (Fig. 4.10). A sharp kink in the ditch corresponded with the location of the tree stump as if it too had been cut around the obstruction. From this, we could surmise that other twists and bends in the course of the boundary were related to similar obstacles.

In areas where the natural was particularly clay-rich, the outside edge of the ditch was poached as though it had been encroached upon by animals (Fig. 4.11). Sections of the base of the ditch were similarly affected and on one occasion the inside edge revealed a preserved single cloven hoofprint pointing upwards. The infill sequence was asymmetric and involved spills of bank erosion deposits along its inside and bands of dark green-brown organic waterborne silts along its outside. Pieces of waterlogged roundwood and twigs were recovered from the basal silts, whilst snail shells were present throughout. The nature of the principal fills suggests that the ditch was frequently full of water and acted as a kind of linear waterhole for cattle. Beyond the wood, the only artefacts to be recovered from the ditch were a single duck bone and a residual flake of a Langdale axe.

Peat, waterlogging, wet up-cast bank material and an inundated ditch represent successive attributes of a boundary *built* and *maintained* within an increasingly saturated environment. The boundaries located higher up the contour did not share these attributes in that they were built and at least primarily maintained within a comparatively dry environment where the conditions conducive to peat growth occurred after they had been erected. An examination of these boundaries follows Michael Bamforth's wood report and Rob Scaife's pollen analysis of the buried soil and peat sequence situated beneath and besides the bank and ditch.

Figure 4.9. *Photograph of excavated bank and ditch with underlying remains of earlier fence-line.*

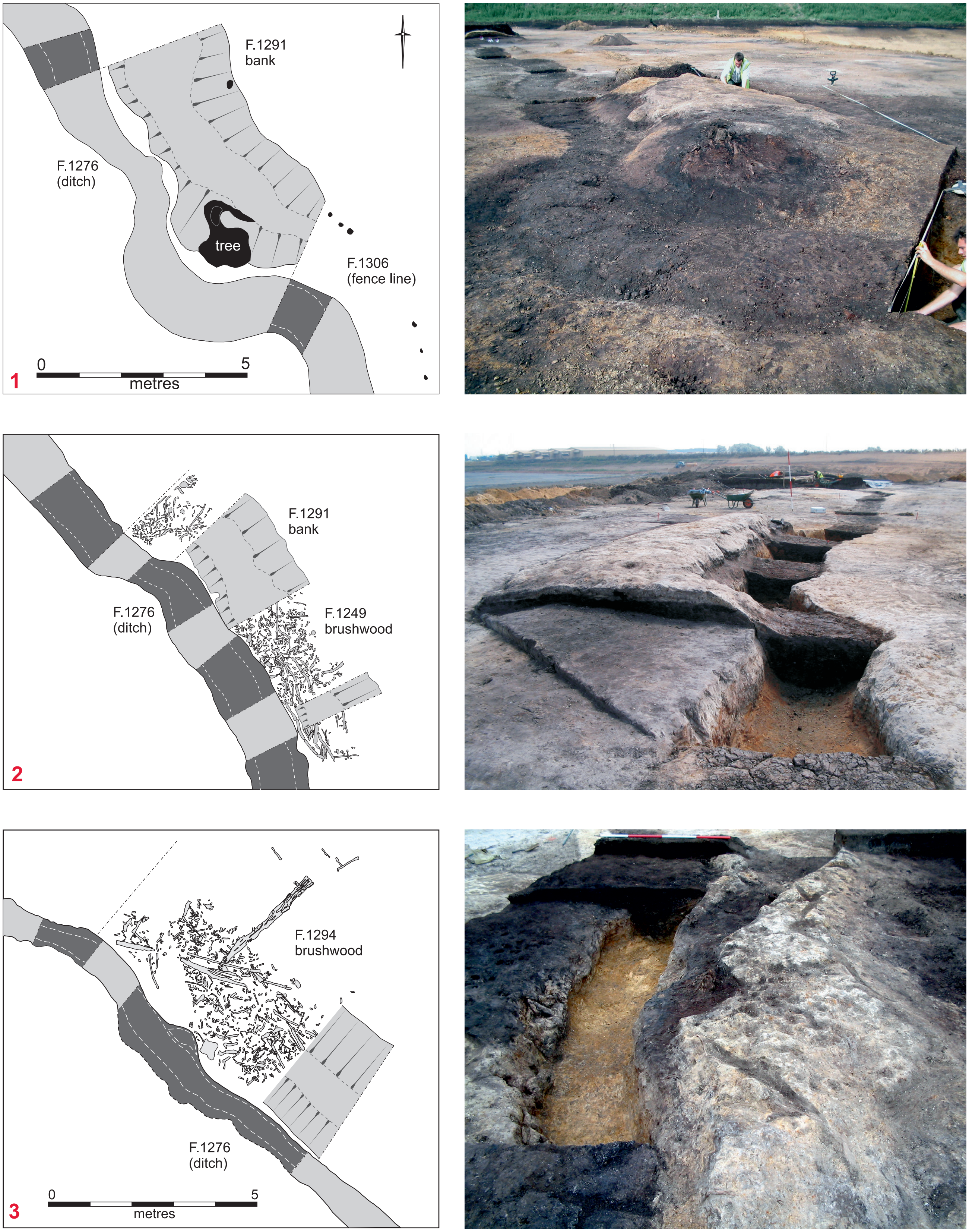


Figure 4.10. *Plans of bank and ditch feature (×3 details).*

Figure 4.11. *Photographs of effects of animal poaching on the sides of the ditch.*

Fence-line and woodworking debris (Michael Bamforth)
Wood was preserved in two key contexts: beneath the up-cast bank (F.1291; Figs 4.9 & 4.10) and within the bank's adjoining ditch (F.1276; Fig. 4.11). The material found beneath the bank comprised a single fence-line constructed of relatively light vertical stakes along with a linear spread of horizontal 'brushwood' and woodworking debris. The wood within the ditch consisted of broadly similar brushwood and woodworking debris to that seen under the bank. The extent of preserved wood matched the extent of the bank or ditch it was found beneath or within and represented a 'protected' sample of what must have been a much larger spread. However, the line of stakes was discrete to the line of the later bank and a large amount of the wood found intertwined around the uprights may have once been integral to the fence-line. In straightforward stratigraphical terms, the wood beneath the bank pre-existed the wood within the ditch and it is therefore possible to separate the material into two distinct contexts: 1) the remains of a wooden fence-line and general woodworking debris contemporary with the fence-line and 2) general woodworking debris contemporary with the early stages of the ditch. This wood report is divided accordingly, although there were strong similarities between the two contexts. No microscopic species identification was undertaken. Oak (*Quercus* sp.) was identified where possible from macroscopic features.

1 Wood associated with the fence-line

A total of eight driven stakes were recovered from the fence-line for detailed recording. One stake was in moderate condition, with the remainder in poor condition (Tables 4.2 & 4.3). Several cases of radial shrinkage and breakage were noted. Woodworking evidence was not always visible or clear. Only one stake was identified as oak. The stakes varied in length from 240 to 500mm. Several of the stakes had trimmed ends. Five of the stakes were roundwood, with two items displaying evidence of coppicing. The roundwood stakes varied in diameter between 45 and 105mm. The remaining three stakes were classified as timber debris, two of which were radially aligned and one of which was aligned across the grain. Breadths varied between 44 and 125mm and thickness between 25 and 75mm.

The apparent lack of uniformity within the stake assemblage suggests the feature was constructed from material to hand, with no particular selection of a certain type of wood and, consequently, the fenward fence-line would have had a somewhat ad hoc appearance.

Sections of the fence-line were surrounded by accumulations of horizontal brushwood, much of which was twisted between uprights. Two 'control' slots were hand excavated across the brushwood spread from which a total of 34 items were selected for detailed recording. A single item (3%) was not scored for condition (Table 4.2). The majority of the assemblage was in moderate condition (65%), 21% in poor condition and 12% in good

Table 4.2. *Fence-line-associated and ditch-associated wood condition scores*

Condition	Score	Wood associated with fence-line				Wood associated with ditch F.1276		Total assemblage	
		Upright stakes		Horizontal brushwood beneath bank					
		Frequency	% of assemblage	Frequency	% of assemblage	Frequency	% of assemblage	Frequency	% of assemblage
Unscored	-	0	0	1	3	6	7	7	6
Non-viable	0	0	0	0	0	0	0	0	0
Very poor	1	0	0	0	0	0	0	0	0
Poor	2	7	88	7	21	9	11	23	18
Moderate	3	1	12	22	65	41	49	64	51
Good	4	0	0	4	12	28	33	32	25
Excellent	5	0	0	0	0	0	0	0	0
	Total	**8**	**100**	**34**	**100**	**84**	**100**	**126**	**100**

Table 4.3. *Upright stakes from fence-line.*

Feature	Wood type	Woodworking evidence	Conversion	Coppicing evidence	Damage	Bark (B)/ Sapwood (S)/ Heartwood (H)	Length (mm)	Max breadth (mm)	Max thickness (mm)	Diameter long axis (mm)	Diameter short axis (mm)	Diameter (mm)
1293	Timber debris	-	Radial (1/4)	-	Both ends missing	SH	350	45	25	-	-	-
1300	Round-wood	-	-	-	-	BSH	251	-	-	-	-	45
1301	Round-wood	1 end trimmed from 4 directions to tapered point	-	-	One end missing	SH	260	-	-	86	64	-
1302	Round-wood	1 end trimmed from 4 directions to tapered point	-	-	Very fragmented	SH	300	-	-	-	-	105
1303	Timber debris	1 end trimmed from 3 directions	Radial (1/2)	Heel point	One end broken	SH	430	125	75	-	-	-
1304	Round-wood	Distal end trimmed and split to tapered point	-	Straight rod with curve and flair	-	BSH	500	-	-	73	66	-
1305	Round-wood	-	-	-	Extreme radial shrinkage	BSH	410	-	-	-	-	45
1306	Timber debris	Split fades to point; sq cross-section; *Quercus sp.*	x-grain	-	-	H	240	44	38	-	-	-

condition. This represents an assemblage in moderate condition, with woodworking evidence likely to be visible, although not always clear. Debris was the most common category of material (65%). Roundwood (24%), root (6%) and tree (6%) were also present (Table 4.4). No artefacts or material classed as timber were recovered from this context.

Debris

The debris consisted of several sub-groups, comprising woodchips (36%), timber debris (32%), bark (23%) and roundwood debris (9%) (Table 4.5).

Woodchips: Eight items were categorized as woodchips, two of which were identified as oak. Four were radially aligned, one of which was trimmed at both ends from one direction. They varied in length between 60 and 260mm, in breadth between 45 and 85mm and in thickness from 3 to 40mm. Three of the wood chips were tangentially aligned slabs – layers of bark with sapwood adhering to the inside, indicative of bark removal (Taylor 2001). They measured 230 × 30 × 22mm, 240 × 80 × 30mm and 380 × 31 × 20mm. There was a single cross-grained woodchip measuring 95 × 46 × 10mm. Woodchips are a direct product of woodworking. However, as these woodchips are very unlikely to have been produced by the production of the

Table 4.4. *Categories of material recovered in association with fence-line and from ditch F.1276.*

Context	Category	Frequency oak	Frequency non-oak	Total frequency	% of assemblage
Wood associated with fence-line (horizontal)	Root	0	2	2	6
	Roundwood	0	8	8	24
	Tree	0	2	2	6
	Debris	3	19	22	65
	Total	**3**	**31**	**34**	**100**
Wood associated with ditch	Root	1	2	3	4
	Roundwood	5	22	27	32
	Debris	31	23	54	64
	Total	**37**	**47**	**84**	**100**

Table 4.5. *Categories of debris recovered in association with fence-line and from ditch F.1276.*

Context	Category	Frequency oak	Frequency non-oak	Total frequency	% of assemblage
Wood associated with fence-line (horizontal)	Bark	0	5	5	23
	Roundwood debris	0	2	2	9
	Timber debris	1	6	7	32
	Woodchip	2	6	8	36
	Total	**3**	**19**	**22**	**100**
Wood associated with ditch	Bark	0	15	15	28
	Roundwood debris	1	2	3	6
	Timber debris	14	1	15	28
	Woodchip	16	5	21	39
	Total	**31**	**23**	**54**	**100**

stakes of the fence-line, it seems likely that this material represented general woodworking debris contemporary with the fence-line.

Timber debris: Seven items of timber debris were recovered. Two of the items were long and thin, with a square cross-section, the split sides of which were aligned in both the radial and the tangential planes. The items measured 216 × 46 × 42mm and 560 × 22 × 12mm. These items may represent debris from wood splitting, in the form of the long, square 'streamers' that often run between two separated surfaces during splitting. Of the remaining four items, one was identified as oak and all were radially aligned. The material varied between 140 and 500mm in length, 30 and 50mm in breadth and 15 and 27mm in thickness. Items classed as timber debris represent broken timbers or 'off cuts' associated with the production of timbers. The timber debris recovered from this context seems to be related to the splitting and subsequent reduction of predominantly non-oak timbers. It is unlikely that this material was a by-product of the sharpening of the stakes of the fence-line. Therefore, it seems likely that this material is again detritus associated with woodworking contemporary with the fence-line.

Bark: The five items of bark were of little interest as it was not possible to identify them to species and they showed no evidence of woodworking. Although their presence could represent deliberate bark removal, it is equally likely that they represent naturally accumulated debris. The largest piece measures 90 × 41 × 18mm, the smallest piece 50 × 40 × 13mm.

Roundwood debris: Two pieces were recovered, neither of which has been identified to species. A radially half split item measured 54 × 52 × 27mm, a radially ¼ split item measured 250 × 25 × 22mm.

Roundwood

Eight items of roundwood were recovered, none of which were identified to species. Four had their bark intact and four did not. Three of the items had morphological traits indicative of coppicing (Rackham 1977). Only one item had any evidence of woodworking, in the form of two side branches that had been trimmed away. The material varied in length from 50 to 230mm, with the majority (14 items, 74%) falling between 100 and 199mm. The material varied in diameter from 3 to 64mm, with three of the items between 10 and 19mm in diameter.

Where roundwood showed the effects of compression from the weight of deposits above, in the form of an oval cross-section (the longer axis being in the horizontal plane, the shorter in the vertical) the maximum and minimum diameters were recorded. By dividing the longer axis by the shorter axis, the extent of compression can be described, with a '1' representing a round item and higher numbers representing items which have suffered a greater compression. A score of '2' would result if the long axis was twice the length of the short axis. 12.5% of the items score a '1', having suffered no compression. 12.5% are moderately compressed, scoring between 1.01 and 1.25 and 75% are very compressed, with a score greater than 1.26.

The lack of woodworking and relatively low prevalence of morphological traits indicative of coppicing suggests this material represents gathered detritus, perhaps with no particular selection taking place.

Roots

Two roots were recovered, neither of which were growing *in situ* and neither of which have been identified to species. One item measures 72 × 41 × 21mm and the other 47 × 29 × 17mm. It seems likely that the roots represent detritus gathered and placed with the other material around the fence-line.

2 Wood associated with the ditch

The material forming the brushwood layer associated with the fence-line and deposited in the ditch was a mixture of coppiced small diameter roundwood, roots and woodworking debris. It seems likely that whatever material was available to hand was collected and brought to the fence-line to be used in the construction of an ad hoc boundary.

All the wood encountered during the excavation of ditch F.1276 was recorded. In total, 84 items were recovered. Almost half the material (49%) was in moderate condition, 33% good and 11% poor (Table 4.2). The remaining 7% was not scored for condition. This represents a relatively well-preserved assemblage, with woodworking evidence likely to be clear or very clear throughout the majority of the assemblage. The material was spread throughout the infill of the ditch. The majority of the material recovered from the ditch was classified as debris (64%). Roundwood (32%) and root (4%) were also present (Table 4.4). No artefacts or material classed as timber were recovered from the ditch. With the notable exception of the two trees, the ditch assemblage has a markedly similar make-up in terms of the wood categories present to the brushwood assemblage recovered from beneath the bank.

Debris

The debris consisted of several sub-groups, comprising woodchips (39%), bark (28%), timber debris (28%) and roundwood debris (6%) (Table 4.5).

Woodchips: Twenty-one items were categorized as woodchips, with 15 identified as oak. All were formed of heartwood only, and 13 were radially aligned. They varied in length between 50 and 150mm, in breadth between 21 and 100mm and in thickness between 4 and 39mm. Five were tangentially aligned; one was trimmed at one end from one direction. They varied in length between 55 and 179mm, in breadth between 31 and 51mm and in thickness between 9 and 22mm. Three of the woodchips were cross-grained; one of which was trimmed at one end from one direction. They varied in length between 80 and 150mm, in breadth between 30 and 54mm and in thickness between 8 and 21mm. Woodchips are a direct product of woodworking and, as such, this material may represent woodworking in the vicinity.

Bark: The 15 items of bark were of little interest as it was not possible to identify them to species and they showed no evidence of woodworking. Although their presence could represent deliberate bark removal, it is equally likely that they represent naturally accumulated debris. The largest piece measures 200 × 100 × 10mm, the smallest piece 40 × 35 × 8mm. Much of the bark is larger and thicker than would normally be expected, suggesting it was derived from large logs and had not been subjected to much disturbance, which would have caused it to break up into smaller pieces. This does raise the possibility that the bark was deliberately deposited in the ditch.

Timber debris: The 15 items of timber debris have, with the exception of a single item, all been identified as oak. With the exception of two items that also have sapwood present, the items consist of heartwood only. There is an interesting group of seven long, thin items with a square/rectangular cross-section, the split faces of which are aligned in the radial and the tangential plane. The length of these items varied between 80 and 300mm, the breadth between 30 and 51mm and the thickness between 16 and 42mm. Three of the items have been trimmed at one end from one direction. This group may represent debris from wood splitting, as described above.

One of the items may be a piece of a broken joint. This tangentially modified radial ¼ split measures 440 × 130 × 95mm. One edge is recessed by a depth of 45mm for a length of 270mm. This recessed section may represent a section of broken mortise or halving lap (Milne 1994). One of the pieces of timber debris is an oak burr, consisting of sapwood and heartwood. Multiple faces of the item display multiple facets, suggesting tool strikes from multiple directions. The burr measures 160 × 75 × 68mm. It seems likely that this burr was trimmed away from a larger timber and discarded, to make it easier to work the parent timber. The remaining items are a variety of conversions, one cross-grained, one boxed ½ split, two radially aligned items and two tangentially aligned items. A single item has been trimmed at one end from two directions and a single item at one end from one direction. They vary in length from 72 to 410mm, in breadth from 22 to 119mm and in thickness from 13 to 69mm.

Items classed as timber debris represent broken timbers or ‘off cuts’ associated with the production of timbers. As such, this material may represent woodworking in the vicinity or may be derived from the fence-line.

Roundwood debris: Of the three items of roundwood debris, one was identified as oak. Two of the items had their bark intact. The items varied in length between 80 and 169mm and were all derived from roundwood with an original diameter of <50mm. Two items had been trimmed at one end from one direction. All were split, one tangentially aligned and the remainder radially half split.

Roundwood

A total of 27 items classified as roundwood were recovered, five of which have been identified as oak. All but three of the items had their bark intact. This is of some interest as it suggests that the material has not been heavily disturbed – a process that would have been expected to result in more of the items being stripped of their bark. The items vary in length from 65 to 800mm, with the majority (52%) being between 100 and 199mm, 19% between 200 and 299mm and 15% between 0 and 99mm. Diameters range from 10 to 105mm, with the majority (21 items, 78%) spread between 10 and 59mm. In terms of compression, 30% of the items score ‘1’, having suffered no compression, 52% are moderately compressed, scoring between 1.01–1.25, and 18% are very compressed, scoring greater than 1.26. The only other evidence of taphonomy is a single item that has rotted away at its proximal end in antiquity.

Although the diameters of the material fall within the bounds of those recorded from prehistoric coppice (*c*. 10–60mm (Taylor 2003)), there is little evidence to suggest that the material was the result of coppicing. Indeed, only five items (18%) were noted to have morphological evidence suggestive of coppicing. Indeed, six items were recorded as appearing like branch or brushwood material. It seems very unlikely that the roundwood recovered from the ditch was, as an assemblage, the result of any form of coppicing. There is limited evidence for woodworking. There are five items where tool facets show trimming; four items having been trimmed at one end from one direction and one item trimmed at both ends from one direction. A single item had a partial tool mark measuring 51:8mm. The roundwood is likely to have been derived from brushwood or similar.

Roots

It was not clear whether any of the three items classed as root were growing *in situ* in the ditch or whether they instead represented accumulated debris. No woodworking evidence was recorded from any of the items. One example has been tentatively identified as oak and forms the junction of three stems, measuring 120mm long with a diameter of 44 × 40mm. The other two roots were in moderate and poor condition. The former had a length of 200mm and diameter of 35mm, the latter a length of 235mm and a diameter of 40 × 31mm.

'Wet' boundary pollen (Rob Scaife)
Pollen was recovered from a series of sediment sample columns associated the fence-line or dead-hedge as well as the ensuing bank and ditch boundary feature (P1–P4). Pollen diagrams have been constructed for four sections (Fig. 4.12); these included the sediments underlying the fence-line (P3), a profile through the organic fills of the sinuous ditch (P2) and adjacent buried soil (P1). The buried soil (P4) away from the boundary feature, which was generally present throughout the eastern area of the investigation, was also examined as a comparison to the profiles obtained directly associated with its alignment.

The samples (1–2ml volume) were processed using standard techniques for the extraction of the sub-fossil pollen and spores (Moore & Webb 1978; Moore et al. 1991). Pollen counts of up to 500 grains of dryland taxa per level were made. Pollen diagrams have been plotted using *Tilia* and *Tilia* Graph (Figs 4.13, 4.14, 4.15 & 4.16), with the percentages used calculated as follows:

Sum = % total dryland pollen (tdlp)

Marsh/aquatic = % tdlp + sum of marsh/aquatics (incl. *Alnus* and *Salix*)

Spores = % tdlp + sum of spores

Misc. = % tdlp + sum of misc. taxa

Alder has been excluded from the pollen sum because of its high pollen productivity and its on, or near, site growth which tends to distort the percentage representation of other taxa within the pollen sum (Janssen 1969). Consequently, the percentages of alder have been incorporated within the fen/marsh group of which it is botanically a part. As willow (*Salix*) may be associated with this fen carr taxon/habitat, this was also been included in this calculation. Taxonomy, in general, follows that of Moore & Webb (1978) modified according to Bennett et al. (1994) for pollen types and Stace (1992) for plant descriptions.

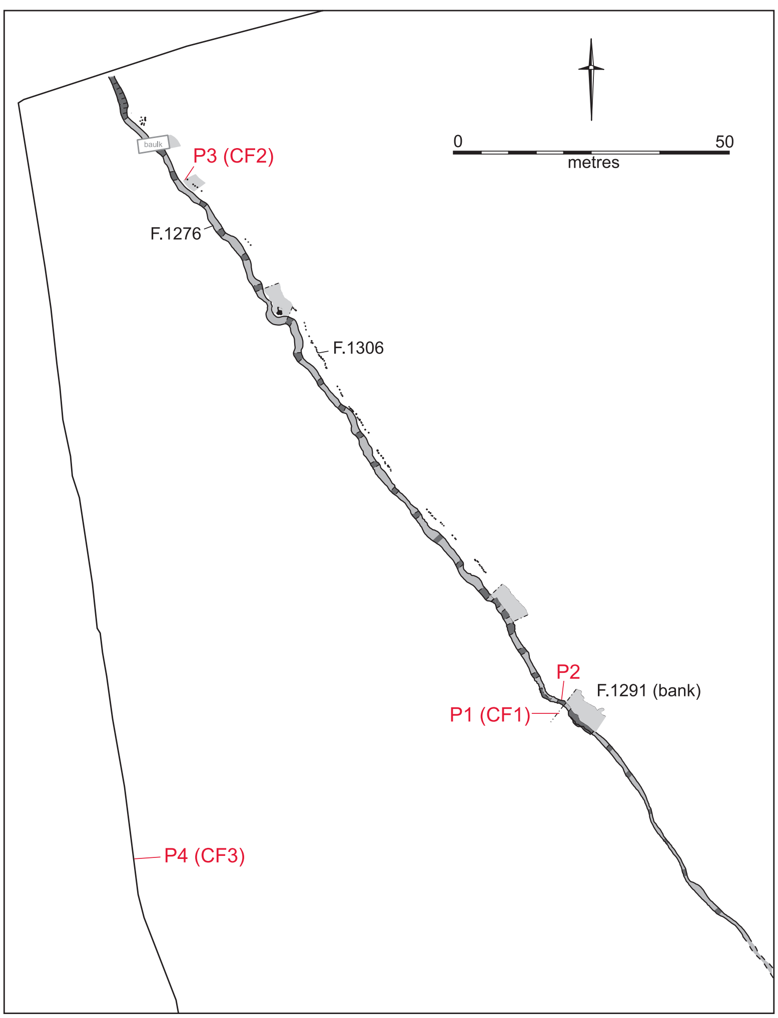


Figure 4.12. *Location of pollen profiles relative to the bank and ditch feature.*

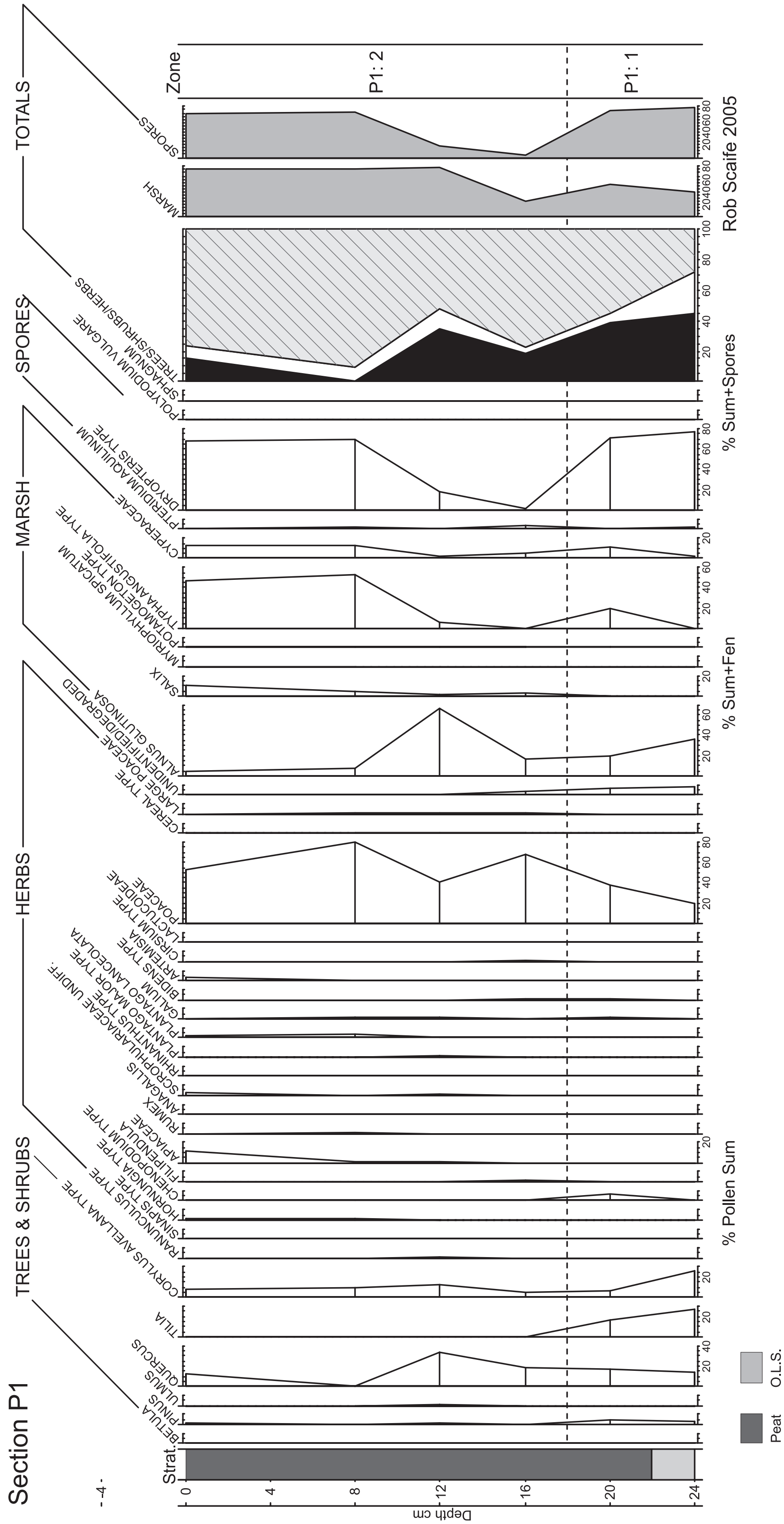


Figure 4.13. *Pollen diagram 1.*

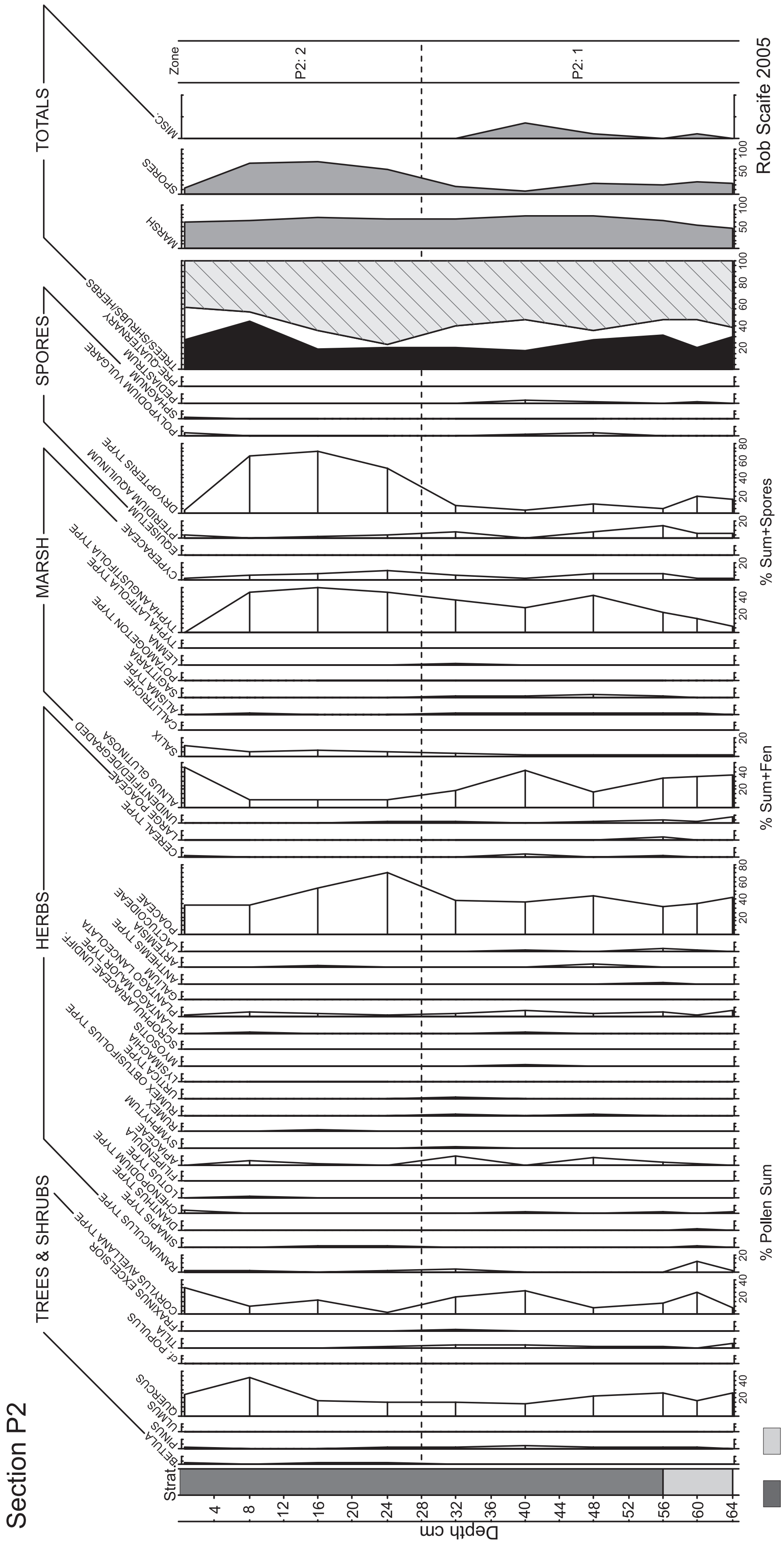


Figure 4.14. *Pollen diagram 2.*

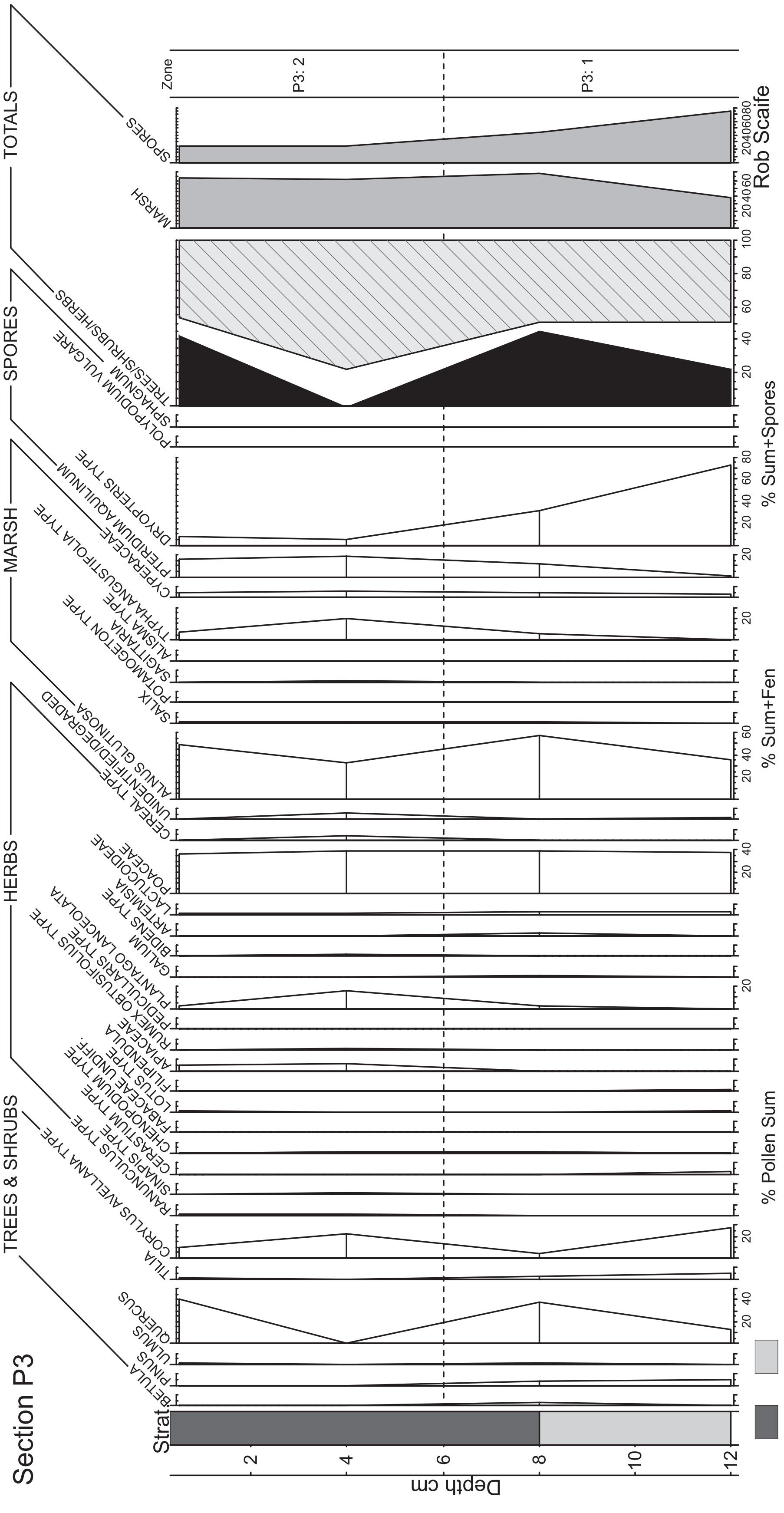


Figure 4.15. *Pollen diagram 3.*

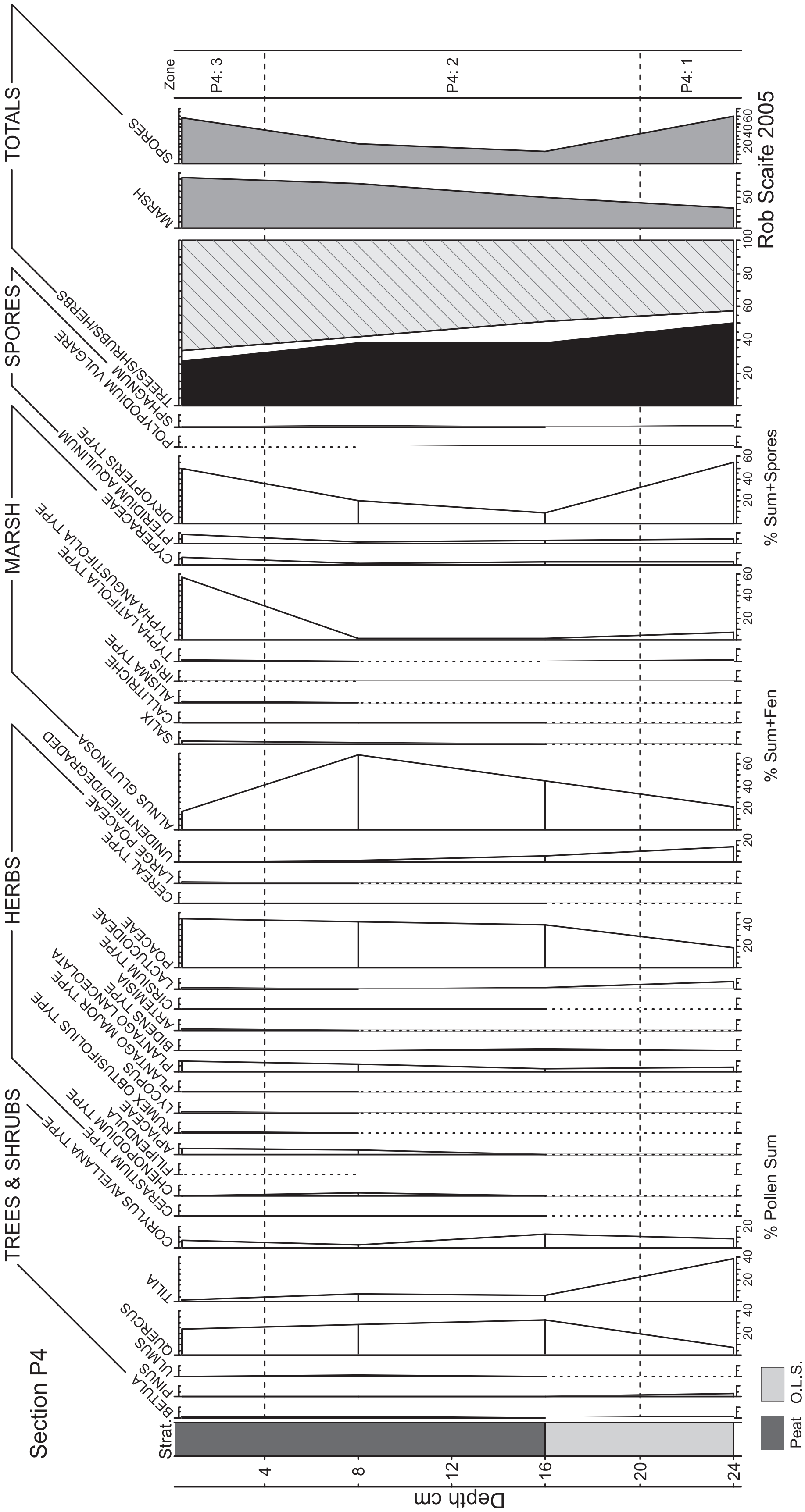


Figure 4.16. *Pollen diagram 4.*

The ditch and adjacent soil profile (Profile P1 and P2)
Profile P1 (Figs 4.13 & 4.17) spanned the detrital fen peat (0–21cm) which overlay a thin, grey, poorly developed, leached brown earth soil (21–27cm) which formed the prehistoric land surface. Below this was a buff-coloured subsoil overlying Pleistocene gravel.

The profile was in very close proximity to that from the ditch (Profile P2) but was taken beyond any obvious disturbance caused by the feature. The pollen and spores contained clearly show the character of the vegetation prior to woodland clearance and agriculture and the subsequent inundation and accretion of peat. Two principal pollen zones have been recognized which reflect these environmental changes:

Zone P1:1 (24–18cm): The old land surface and buried soil is distinguished by lime *(Tilia*; to 27%) which is absent in subsequent levels. This is associated with other trees including oak (*Quercus;* 15–20%) and hazel (*Corylus avellana* type), especially in the lowest level (27%). There are few herbs with only grasses (Poaceae) of note (increasing from 20–35%). Alder (*Alnus)* with some bur reed and/or reed mace (*Typha angustifolia* type) and sedges (Cyperaceae) dominate the fen/marsh taxa. There are very substantial numbers of monolete (*Dryopteris* type) fern spores.

Zone P1:2 (18–0cm): Tilia, present in the lowest levels, is absent in these more organic sediments. *Quercus* (36%) and *Alnus* (57%) initially expand to their highest values and subsequently decline whilst grasses (Poaceae; to 80%), willow (*Salix*; to 10%), lesser reedmace (*Typha angustifolia* type; 58%) and sedges (Cyperaceae) become more important. There is a general increase in the diversity of herb types that include ribwort plantain (*Plantago lanceolata*) and cereal type. In the upper peat there are occasional aquatic taxa.

Profile P2 (Figs 4.14 & 4.17) relates to the field boundary ditch, which contained a substantial thickness of humic sediment that had accumulated under wet conditions. Two overlapping column profiles were obtained. There was a total of 0.5m of black detrital fen peat containing silt that overlay a lower humic sand and the underlying Pleistocene gravels. A total of 10 samples were analysed which extend to the top of the lower minerogenic layers.

From the palynology, two principal zones have been recognized. These are characterized from the base of the ditch fill upwards as follows:

Zone P2:1 (64–28cm): This zone is differentiated by greater numbers of *Alnus glutinosa* (40%) than in the overlying levels. Other trees and shrubs are dominated by *Quercus* (30–35%) with *Corylus avellana* type (to 37%). Of note are the slightly higher (6%) values of *Tilia* in the lowest minerogenic layer. Poaceae (40–45%) dominate the herbs along with umbellifers (Apiaceae; 5–6%), *Plantago lanceolata* (5–6%) and other types. Fen taxa include sedges (Cyperaceae; *c*. 20%), lesser reedmace (*Typha angustifolia* type; to 47%), arrowhead (*Sagittaria*) and water plantain (*Alisma* type).

Zone P2:2 (28–0cm): Alder (*Alnus*) of zone 1 is markedly reduced. Grasses (Poaceae) become more important (to 70%) along with a very substantial peak in monolete fern spores. Trees and shrubs remain with oak (*Quercus*) and hazel (*Corylus avellana*), although the small numbers of lime (*Tilia*) in the lower zone are absent here. Fen taxa remain dominant with sedges (Cyperaceae; 10–15%) and lesser reedmace (*Typha angustifolia*; 48%) remaining important. Willow (*Salix*) is consistently present.

Below the fence-line (Profile P3)
Profile P3 (Figs 4.15 & 4.17) relates to a monolith of 30cm taken from the sediments underlying the fence-line. The stratigraphy comprised 0–8cm of detrital peat/fence-line underlain by grey-black (detrital organic) humic sand which overlay the basal Pleistocene yellow sandy-gravel.

Four pollen samples have been examined which span the upper peat and underlying humic sand of the old land surface. There are some evident stratigraphical changes in the palynology. These largely relate to the change from mineral sediment to the overlying detrital, organic peat and associated changes in on-site vegetation and pollen taphonomy. Two pollen zones have been recognized and are characterized from the base of the profile upwards as follows:

Zone P3:1 (12–6cm): The lower humic sand/old land surface. Trees and shrubs are dominated by oak (*Quercus*; peak to 45%) with hazel (*Corylus avellana* type) and alder (*Alnus*; to 60%). There are also small, but slightly greater numbers of lime (*Tilia*) in this zone. Fern spores (*Dryopteris* type) are abundant (75%) in the lowest level examined.

Zone P3:2 (96–0cm): In this upper zone, oak (*Quercus*), hazel (*Corylus avellana* type) and alder (*Alnus*) remain largely unchanged. Lime (*Tilia*) is, however, reduced. Herbs remain dominated by Poaceae but with expansions of ribwort plantain (*Plantago lanceolata*; 18%), Apiaceae (6%), cereal type and other herb taxa that occur more sporadically. Fen herb types become more important with *Typha angustifolia* type and occasional arrowhead (*Sagittaria*), water plantain (*Alisma* type) and pondweed (*Potamogeton* type). Willow (*Salix*) is consistently present. The high values of monolete fern spores in the lower land surface are progressively reduced to relatively low levels.

The old land surface and overlying fen peat (Profile P4)
Profile P4 (Fig. 4.16) spans a section from the western perimeter of the site where the prehistoric land surface (underlying the peat) was well developed and preserved. Here, there was a typical sequence of detrital fen peat (0–16cm) overlying a poorly developed, dark grey, brown earth soil (16–23cm) developed in a yellow-grey gleyed sub-soil (23–29cm).

Four pollen samples were examined to establish the vegetation characteristics of the old land surface and subsequent changes brought about by waterlogging and the creation of fen peat. These changes are reflected in the pollen assemblages and three distinct zones may be delimited:

Zone P4:1 (24–18cm): This single sample from the old land surface is characterized by high values of (degraded) *Tilia* (38%). Other trees and shrubs comprise small numbers of oak (*Quercus*; 6%) and hazel (*Corylus avellana* type; 7%). Alder (*Alnus*) is present (23%). Herbs (43% of total) include grasses (Poaceae; 23%), dandelion types (Lactucoideae; 4%) and ribwort plantain (*Plantago lanceolata*; 3%). Monolete fern spores are significant (55%) and along with Lactucoideae and unidentified/degraded grains are indicative of differential preservation in favour of more robust pollen types.

Zone P4:2 (18–4cm): Detrital fen peat. Lime (*Tilia*) of the preceding zone declines to only small values (2–3%) whilst oak (*Quercus*; 38%) and alder (*Alnus*; to 70%) become important. Herbs also become more diverse with expansion of grasses (Poaceae; to 45%). Ribwort plantain (*Plantago lanceolata*; to 8%) and occasional cereal pollen are present.

Zone P4:3 (4–0cm); The upper peat. In this single upper-most sample, there is a marked expansion of bur reed and/or reed mace (*Typha angustifolia* type; 58%) which is also associated with other fen taxa which include water starwort (*Callitriche*), *Alisma* type, *Iris* and greater reed mace (*Typha latifolia*). willow (*Salix*) also expands slightly.

Figure 4.17. *Pollen sample process. Profile P1 and P2 (top); Profile P3 (bottom).*

Dry boundaries – the main fieldsystem

The higher, dry boundaries comprised a series of linear ditches occasionally accompanied by upstanding banks. The visibility or preservation of the boundaries was dependent upon their elevation with the lowest-lying divisions being considerably better preserved than the highest. Consequently, the system had a truncated or partially erased appearance with the low, western half being fully articulated and the high, eastern half almost totally effaced (Fig. 4.18). The articulated western half included complete boundaries made up of continuous ditches sometimes accompanied by banks whereas the effaced eastern half was reduced to barely discernible ditch stubs. Fortunately, the pattern preserved within the lower half helped reconstruct the pattern of the upper half (Fig. 4.19).

The gridded ditch-system was made up of four key components: upslope *coaxials* (oriented northeast–southwest), the embayment-edge or *terminal boundar*ies (north–south or northwest–southeast), short *cross-boundaries* (northwest–southeast) and equally short *fenward projections* (east–west; Table 4.6). The coaxials were oriented northeast–southwest and formed a series of parallel boundaries aligned diagonally up the slope of the western end of Whittlesey 'island'. As its title suggests, the terminal boundary formed the principal end division of the system and formerly comprised a string of north–south aligned ditches which were on at least two occasions contiguous with the adjacent coaxials. If the coaxials were terrain oblivious, then the terminal boundary was the opposite, as it virtually followed the 1m OD contour. A larger, single ditch cut or replaced the original segmented ditch configuration and by doing so formed an almost continuous division (Fig. 4.20). Several cross-boundaries were laid-out perpendicular to the coaxials and as such represented an uncomplicated arrangement of sub-divisions, whilst the fenward projections performed a similar role across the narrow strip of ground on the embayment-side of the line demarcated by the terminal boundary.

Table 4.6. *Fieldsystem feature dimensions.*

	Widths (m)	Av. Width (m)	Depths (m)	Av. Depth (m)
Terminal Boundary	0.40–2.25	1.08	0.19–0.58	0.35
Coaxials	0.20–1.10	0.51	0.13–0.42	0.26
Cross boundaries	0.50–1.05	0.64	0.06–0.53	0.24
Fenward projections	0.90–4.50	2.00	0.08–0.70	0.36

The contiguous relationship between the coaxial and terminal configurations showed the two components to be contemporary and, in effect, cardinal to the system. In contrast, the sub-divisions (the cross-boundaries and fenward projections) consistently exhibited a secondary or supplementary relationship to the main arrangement. In turn, the refashioning of the terminal boundary post-dated the establishment of the fenward projections and appeared to represent a deliberate, if belated, accentuation or reinforcement of the system's edge or 'cut-off' between fields and advancing fen. Its spatial-temporal proximity to the changing environment is made all the more apparent by the peat that infilled a large part of its profile. At the same time, its supplementary relationship was made even more obvious by its unerring adherence to the kinks and bends of the earlier alignment. The terminal boundary was pivotal both in outlining the ends of individual field strips and in its delineation of the increasingly wet embayment edge. It could even be suggested that in its original form(s) the terminal boundary was about defining individual fields whereas in its final form it was about defining the edge of the embayment, the switch in focus being made evident by it being the only boundary to receive such concerted attention.

The frequency of short intersections or gaps between adjoining boundaries indicates that the ditches were once accompanied by up-cast banks. Such a suggestion was substantiated by the survival of a low standing bank along the western side of the re-cut terminal boundary. Further evidence of the former presence of banks was provided by two small surviving sections of closely spaced parallel ditches which may have once flanked upstanding earthworks. Similarly, later episodes of metalwork deposition appeared to respect the location of a boundary's earthwork as opposed to its ditch.

The vast majority of gaps or breaks within individual boundaries were caused through truncation and cannot be considered as real openings. However, at least two genuine entranceways were identified and these included an opening across the eastern end of one of the coaxial boundaries (Ditch C; Fig. 4.21) and an opening across the northern end of the terminal boundary (Ditch A; Fig. 4.20). The first of these occurred within a stretch of ditch that was heavily truncated but which coincided precisely with a discrete patch of metalling. The metalling comprised redeposited gravels and river pebbles that had been compacted within an irregular-shaped hollow presumably created by frequent use of the entryway. The second survived within an un-truncated section of ditch and presented itself as

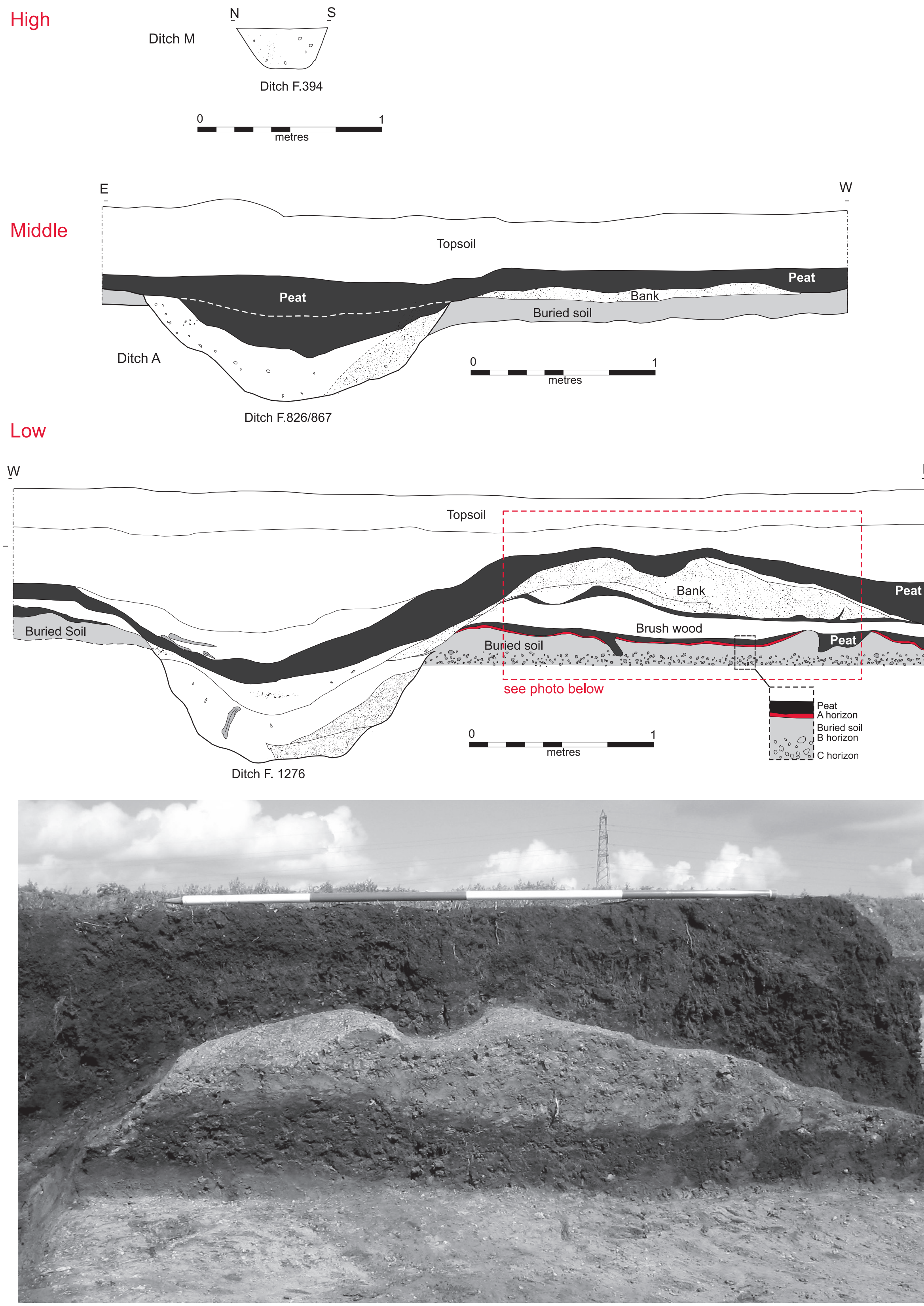


Figure 4.18. *Issues of preservation – high, middle and low boundary forms.*

Figure 4.19. *Plan of main fieldsystem with associated settlement features (ditched boundaries delineated alphabetically).*

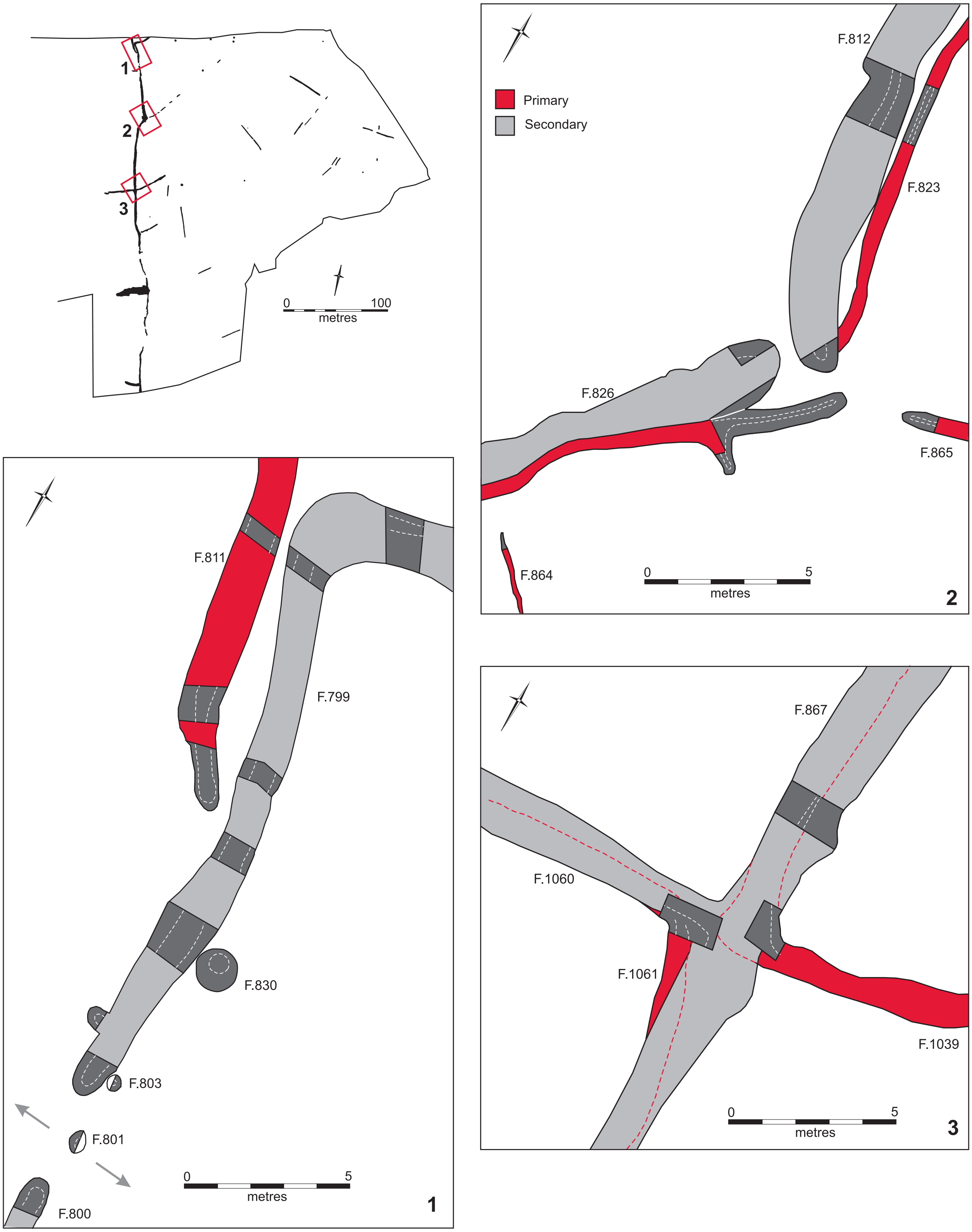


Figure 4.20. *Plan of key junctions.*

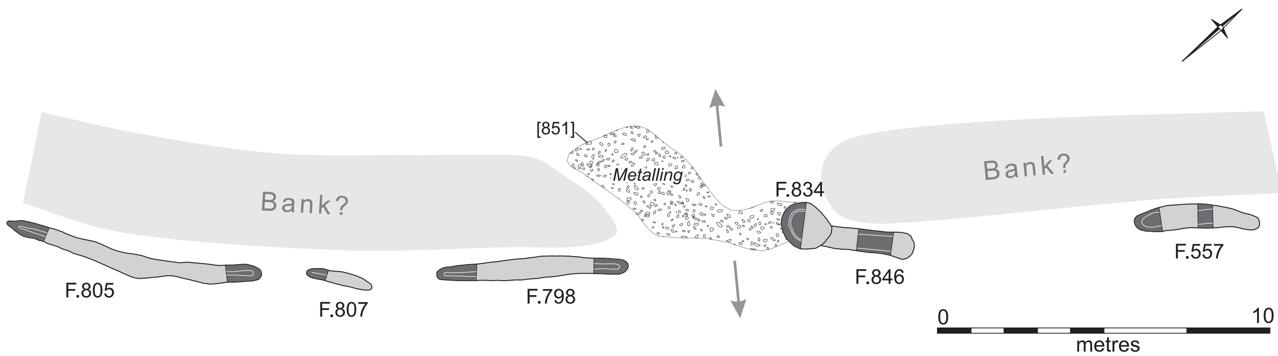


Figure 4.21. *Gateway – opening in Ditch C with metalled surface.*

a 3.06m wide opening between two ditch terminals. Significantly, this entranceway appears to have persisted throughout the different manifestations of the terminal boundary.

Settlement traces

This section details seven features that were coterminous with the inception and duration of the fieldsystem. It incorporates pits and postholes that post-date the Collared Urn related occupation but pre-date the Late Bronze Age or Post-Deverel-Rimbury associated settlement phase. The features fit within a relatively short chronology of approximately 400 years (*c.* 1500–1100 cal BC) and collectively represent the discernible remains of activities that were commensurate with the currency of the ditched system of fields. The saturation of the lower contours had a major impact on the distribution of these particular features in that there was a significant reduction in the 'surface available for settlement' compared to the preceding periods. Whereas previously the low zone was mostly dry, it was now mostly wet. The increased level of saturation was made apparent by the waterlogging of the terminal boundary and by the absence of other post-peat features below the 0.50m contour. Accelerated peat growth determined a marked shift upwards and it was only the dry parts of the system (above 1m OD) that were suitable for sustained settlement.

The evidence of this settlement was slight and comprised a small collection of sub-circular shafts or wells along with occasional large oval-shaped hollows or pits (Fig. 4.19; Tables 4.7 & 4.8). In pronounced contrast with the preceding (and following) periods, no structures were recognized and whereas previously settlement was concentrated or focused in particular areas it now appeared to be spread across an area equivalent to the (dry) fields. A number of pre-fieldsystem features, such as two of the large waterholes associated with the earlier burnt mounds (Burnt Mound 1 and Burnt Mound 2), also showed evidence of being modified or re-cut at the same time as the establishment of the ditched boundaries.

The shafts shared similar bell-shaped outlines as well as silt-rich basal fills; both characteristics being indicative of features which had initially been kept open and were of a sufficient depth to enable access to the localized water-table (Fig. 4.22). The connection with water was also illustrated by the occurrence of waterlogging. The shafts had undercut or eroded basal profiles as well as marked weathering cone-shaped upper profiles. By contrast, the unweathered profiles of the oval-shaped hollows had an appearance of features that had been dug and backfilled in reasonably quick succession. Large faunal assemblages were recovered from both sets of features, whilst fragments of Deverel-Rimbury pottery came from most. The shaft F.830 was exceptional in that it contained a fully articulated adult human skeleton buried beneath the semi-articulated remains of a fox. Peat was absent from all but the lowest-lying of this feature group and, as with the equivalent low-lying field ditches, when peat was present it only ever occurred at the very top of these features. Further up the edge and away from

Table 4.7. *Hollow F.991 – dimensions and find quantities.*

Hollow	Dimension (m)	Depth (m)	Faunal (g)	Pottery (g)
F.991	1.80 × 0.98	0.14	10560	255

Table 4.8. *Middle Bronze Age shaft features –dimensions and find quantities.*

'Shaft'	Diameter (m)	Depth (m)	Faunal (g)	Pottery (g)
F.34	1.40	1.20	10479	44
F.391	1.30	1.05	7387	35
F.544	1.29	1.06	13150	626
F.830	1.10	1.20	354	-
F.879	1.02	0.99	-	-
F.1062	1.30	0.95	-	-

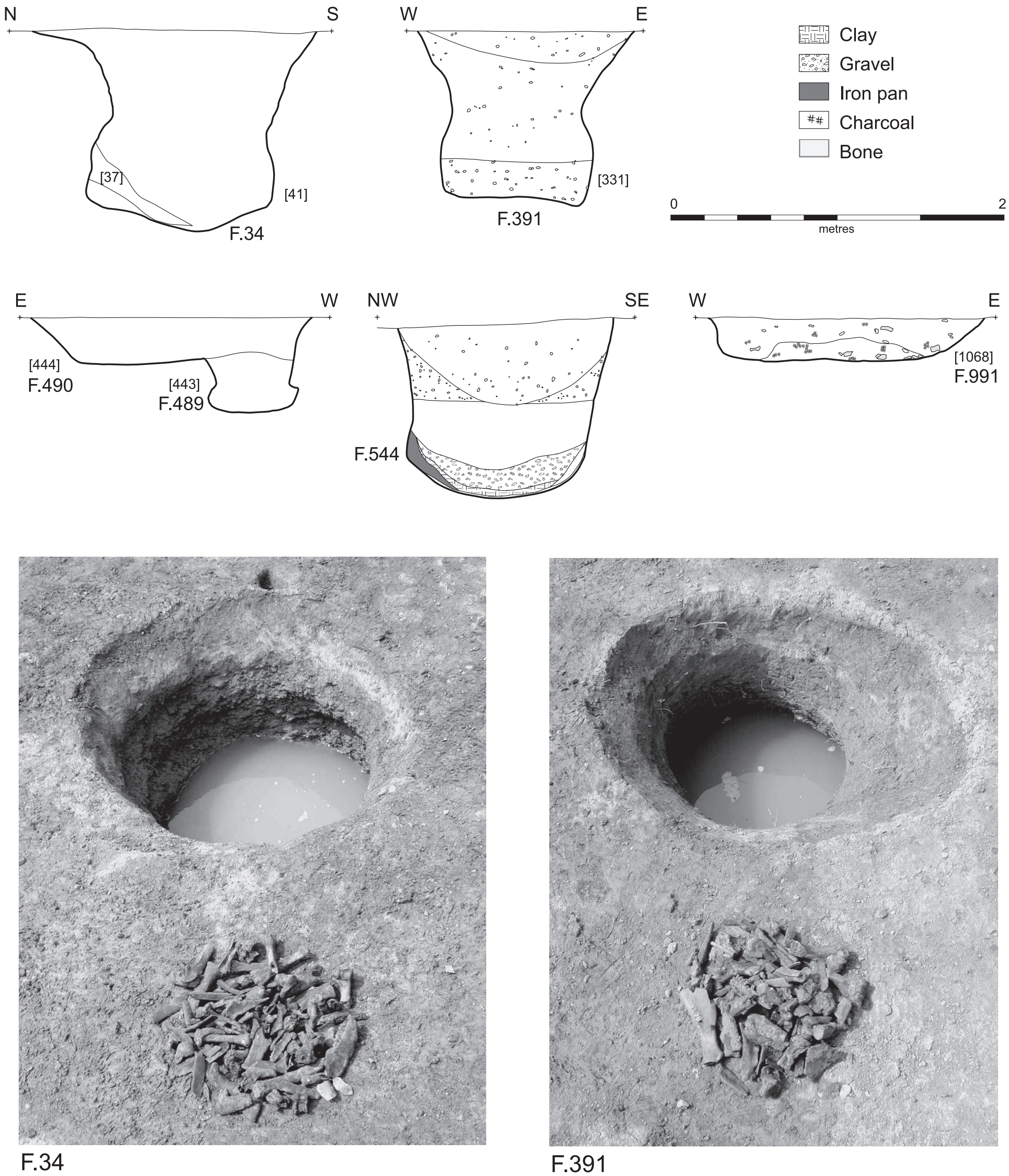


Figure 4.22. *Sections and photographs of key settlement features.*

the ensuing peat, the same pits were characterized by their pale grey sandy-silt capping fills.

If the distinctive bell-shaped profiles of the shafts represented attributes of features that had been kept open to facilitate continued access to water, the dumps of animal bone in F.391 and F.544 or, as with F.830, the insertion of a human body (Figs 4.23 and 4.24), represented attributes of features that were being brought intentionally and somewhat dramatically to an end. Tellingly, the slow build-up of water-lain silts that had accumulated prior to the introduction of dumps of bone survived in obvious contrast with the rapid backfills that followed; successive layers made up of sterile gravels or redeposited buried soil constituted the uppermost fills. Sherds of pottery were found alongside the bone but also within the later deposits.

For example, the shaft F.830 was sub-circular in plan (diameter: 1.10m; depth: 1.20m) with a profile made up of three parts: a weathering cone, a vertical shaft (diameter: 0.69m) and an eroded/undercut base (diameter 0.87m). It contained six different infilling episodes that began with a slow-forming silt deposit (mid-grey silt with occasional small stones) which occupied the bottom third of the feature. Inserted into the basal fill was a fully articulated human skeleton of an adult female that had, judging by its position, been thrown in head first. The lowest parts of the body were the hands and these were clenched with the palms facing upwards. The wrists were crossed (as if bound) and both arms were folded tightly under the body so as to obscure them when the skeleton was viewed from above. The skull faced downwards and had been twisted sideways. It was jammed against the northern edge of the hole, forcing it hard onto the right shoulder. The spine and rib-cage ran diagonally up the centre of the pit supporting the pelvic bones upwards towards the surface. Both legs were folded with the knees together pointing downwards whilst the lower legs were pressed against the southern edge of the pit. The highest points of the skeleton were the feet and these were turned inwards and pressed against the edge of the pit. The preservation of the skeleton was very good and the bone had a dark brown appearance with occasional patches of iron staining. A small piece of woven fabric was found attached to the left femur. Covering the body was a thin spread of organic material which had entered the pit from the eastern edge. In turn the organic deposit was capped by a backfill dump of grey-brown silty-loam which contained a single cattle bone. The upper most fill of the pit contained the remains of a semi-articulated fox skeleton (oriented so its head pointed southwards) which in turn was covered with a 0.18m thick deposit of pale grey sandy-silt that resembled the adjacent buried soil horizon. The pit's weathered profile and slow-forming basal fill demonstrated that the feature had had an extended history as a watering-hole or well prior to the insertion of the body.

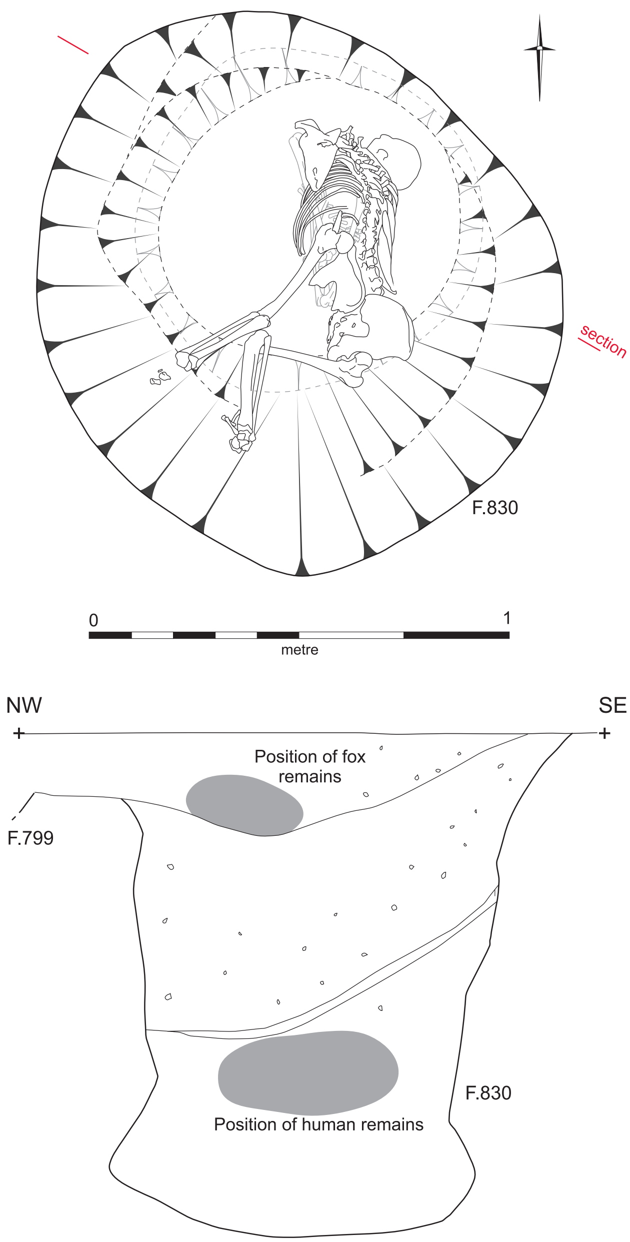


Figure 4.23. *Detailed plan and section of shaft F.830.*

Skeleton [853] F.830 – older middle adult female, ht. 1.63m (5′4″) (Natasha Dodwell)

The bones are in excellent condition although they are stained a dark brown\black colour and there are grey concretions on some of the surfaces. Slight marginal lipping was recorded around the joints of the distal femora, the right humerus head and the right proximal ulna. Changes characteristic of osteoarthritis were observed on right articulating processes of T3–5 and on L5 and the sacral body. Striated new bone, characteristic of a non-specific infection was recorded on the proximal third of the right fibula shaft. Deep pits (15 × 15 × 7mm deep) were recorded on the ventral aspect of the bodies of each pubis. These and the pronounced pubic tubercles are possible indicators of parity status. A non-metric trait was recorded in the spine: non-union of the left transverse process and the posterior arch of the atlas (i.e. an open transverse foramen).

8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
np	\	6	5	4	\	\	1	1	2	3	4	5	6	7	np

The dentine is exposed on the anterior dentition. A piece of possible textile (a loose, open weave) was identified on the anterior of the proximal 1/3rd of the left femur.

Textile on skeleton in well F.830 (Penelope Walton Rogers)

There are two patches of textile adhering to the front of the left femur, one 45 × 18mm and the other 15 × 10mm. The textile is poorly preserved, but can be identified tentatively as tabby (plain weave)

Figure 4.24. *Detailed photographs of shaft F.830 (articulated body, 'bound' hands and details of femur (including 'textile').*

and more certainly as having S-spun yarn in warp and weft and 8 × 7 threads per square cm. Examination of the fibre by transmitted-light microscopy indicated that most of the fibres had decayed beyond identification, but at the core of one thread there were some plant fibres resembling flax, identifiable from the smooth fibre profile, the occasional 'joints' and the fine central lumen.

The tabby weave structure has been in use continuously since the Bronze Age and therefore offers no evidence for dating, but the S-spun yarn in a linen (flax) textile is more unusual and may be diagnostic. Some 45 textiles dated to the Bronze Age have been recovered from mainland Britain and, where the weave is identifiable, it is always tabby (Henshall 1950, 133–37, 158; Henshall 1964; Bender Jørgensen 1992, 116–18, 197–98). Those in wool are woven from Z × Z yarn, while linens are more usually made from plied yarn, either Z-plied or S-plied. The S-plied linens mostly have a northerly distribution and the Z-plied southerly, although there is considerable overlap between the two. The Z-plied threads of the southerly type are twisted together from a pair of S-spun yarns, which demonstrates that S-spinning of flax was practised in the southern half of Britain in the Bronze Age. By the Iron Age, Z-spinning was more usual for linen and a single piece of textile woven with S-spun yarn in warp and weft on an Iron Age sword from Guernsey (Wild in Cunliffe 1996, 109) may represent a throw-back to Bronze Age technology. After the Iron Age, Z-spinning remained standard for British linens into the post-medieval period and any rare examples of S-spun linens, such as the example wrapping some Roman coins from Woodcock Hall, Norfolk (Walton and Crowfoot 1988), are generally regarded as imports from the Mediterranean world. Thus, the S-spun yarn in a linen (flax) textile from Bradley Fen would support an attribution to the Bronze Age or Early Iron Age.

The lowest-lying shafts, F.879 and F.1062, did not contain dumps of bone or fragments of pottery, nor did they display signs of being intentionally backfilled. Both features were positioned within partially silted-up waterholes adjacent to the burnt mounds and as such appear to represent renewed attempts at obtaining water from spots that had been previously exploited for the same purpose. Notably, both shafts were sunk deeper than the earlier attempts and both had eroded outlines indicative of features that had been kept open. Their relatively deep and consequently more or less permanently saturated location was demonstrated by the presence of pieces of worked waterlogged wood within uninterrupted sequences of similarly waterlogged silt-rich fills. The mouth of shaft F.879 was protected by an impressive wattle cordon or hurdle (F.892) which encircled its position and was presumably constructed to prevent untended access by animals (Fig. 4.25 (see also Fig. 3.27)). The fence-work appeared to have stood to a height of about 0.50m and comprised a sub-circular ring (2.35 × 2.10m) of small uprights with bevelled tops bracing a series of interwoven branches. Much of the wattling had collapsed leaving the area around the uprights strewn with broken wattles. Lying alongside the wattle barrier was a log ladder which appeared to be a little oversized for the shaft. The other low-lying shaft, F.1062, did not have such protection, but it did yield a section of another log ladder as well as the stump of a tree. The ladder lay horizontal at the base of the feature whereas the stump was inverted and all but filled the entire pit. Despite their respective proximities to burnt stone mounds neither contained burnt stones.

Wattle cordon F.892 (Maisie Taylor)

The wattle structure, F.892, which encircled waterhole F.879, consisted of an oval of 12 verticals (2.40 × 1.95m) interwoven with the remains of multiple lengths of roundwood wattle. Other 'debris' was located amongst the roundwood including trimmings and off-cuts, as well as part of a log ladder and a fragment of a wooden mallet (Fig. 4.26).

The wattle verticals were oak heartwood, fairly roughly split and trimmed up. All were worked to a taper and driven in to a considerable depth, as indicated by the surviving lengths: 920mm, 640+mm, 850mm and 370+mm. The four sampled posts were quite substantial at ground level: 71 × 45mm, 70 × 60mm, 90 × 60mm and 65 × 55mm. They were not manufactured to precisely the same size and shape and could even be the debris from some other large timber working. Although there was not a great deal of debris associated with the structure, most of it could have derived from its construction, including the uprights, suggesting that the verticals were either made or were finished on site. The roundwood, most of which was derived from the wattle, measured between 20 and 40mm in diameter. The ideal diameter for wattle is between 15 and 50mm (Forestry Commission 1956, 33), which means that, if these pieces are typical, the structure was slightly light-weight.

The framework of the wattle's verticals, if somewhat uneven, would have been very strong and would have lasted for a considerable number of seasons: function was obviously more important than looks. The choice of oak heartwood, together with the substantial size and deep fixing of the posts, all suggest that the framework was meant to be permanent. The verticals may have been designed to take a continuous fence, but could also have supported a series of wattle panels. Whichever it was, if it was of any height, it would have needed an access point. This would most likely be a section of the fence which was removable: a separate panel

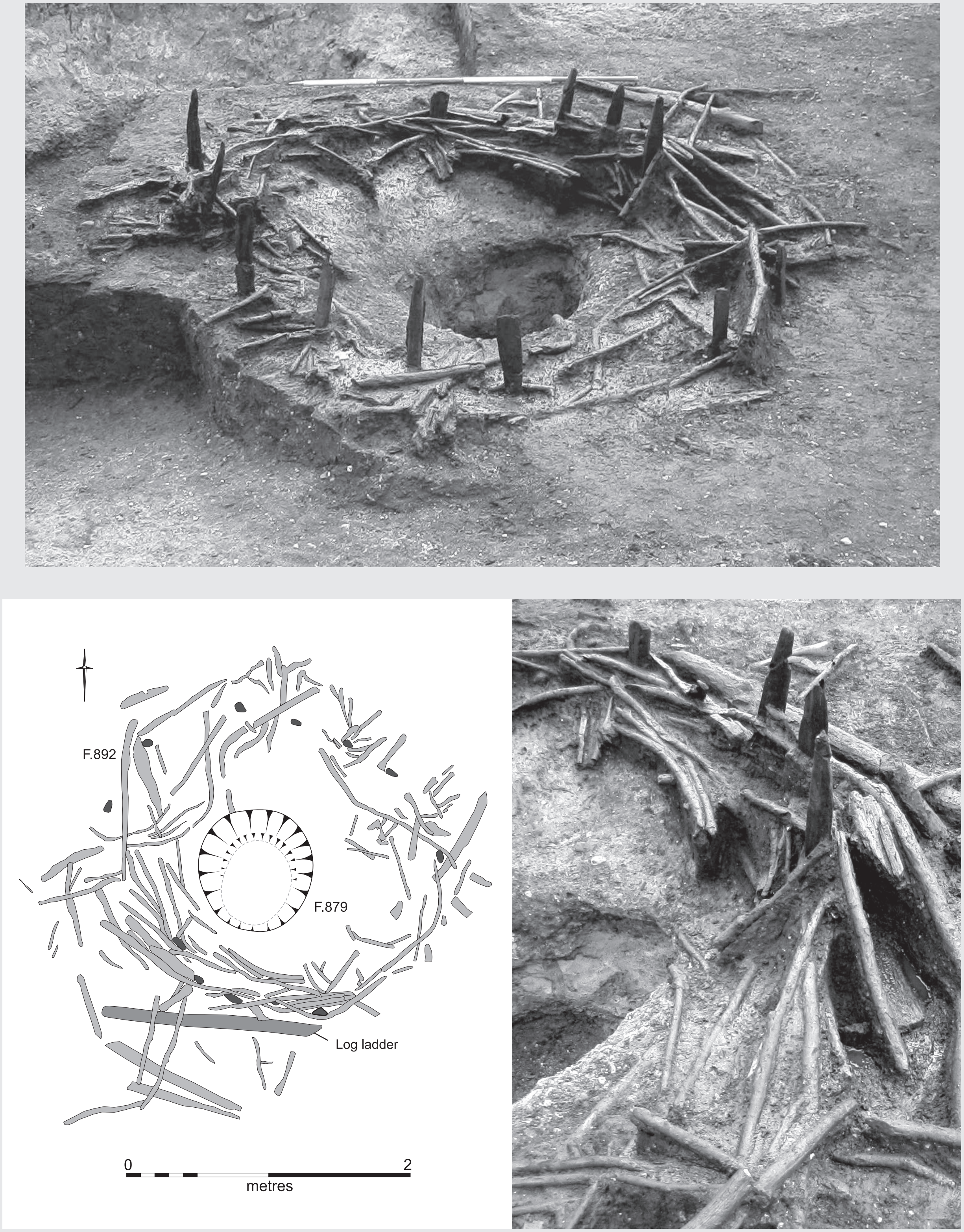


Figure 4.25. *Plan and photographs of shaft F.879 and wattle cordon F.892.*

or hurdle. If the verticals were chosen for durability and strength and were expected to last quite some time, the wattle work would need replacing every few seasons. The wattle hurdles at Flag Fen last seven years but are put in a sheltered store when not in use. A fence subjected to all kinds of wear and weather would not last as long (James Beatty pers. comm.). Roundwood used for weaving wattle fences or hurdles is usually derived from coppicing. Most of the material here, which has direct evidence for coppicing, appears to be discards and trimmings, i.e. short lengths. This may be an indication of repair and replacement rather than foundational construction.

Log ladder and mallet head or 'beetle' (Maisie Taylor)

Log ladder: The ladder was 1645mm in length, quite slender, with a diameter of only 86–89mm and a fork at the bottom end (Fig. 4.26). It had four steps cut into the log, the depth of which varied between 25 and 31mm. The bottom step was deeper at 45mm, but even so they were all very shallow.

The slender form and the fork at the bottom end, makes this ladder of unusual design. The bottoms of most log ladders are blunt, often utilizing the felled end, which could be rammed or wedged into soft ground. The light weight, plus the forked end, would make it quick and easy to get the ladder into a pit and made stable. Although the relatively sharp ends of the fork might sink in more than a large blunt base, they would also be easier to free after use, as they would build up less suction. The fork, however, would be more susceptible to rot and, indeed, the ends of this fork were heavily rotted. The shallowness of the ladder's steps would have made its use quite precarious, as only a small part of the foot would be on the step. The steps were

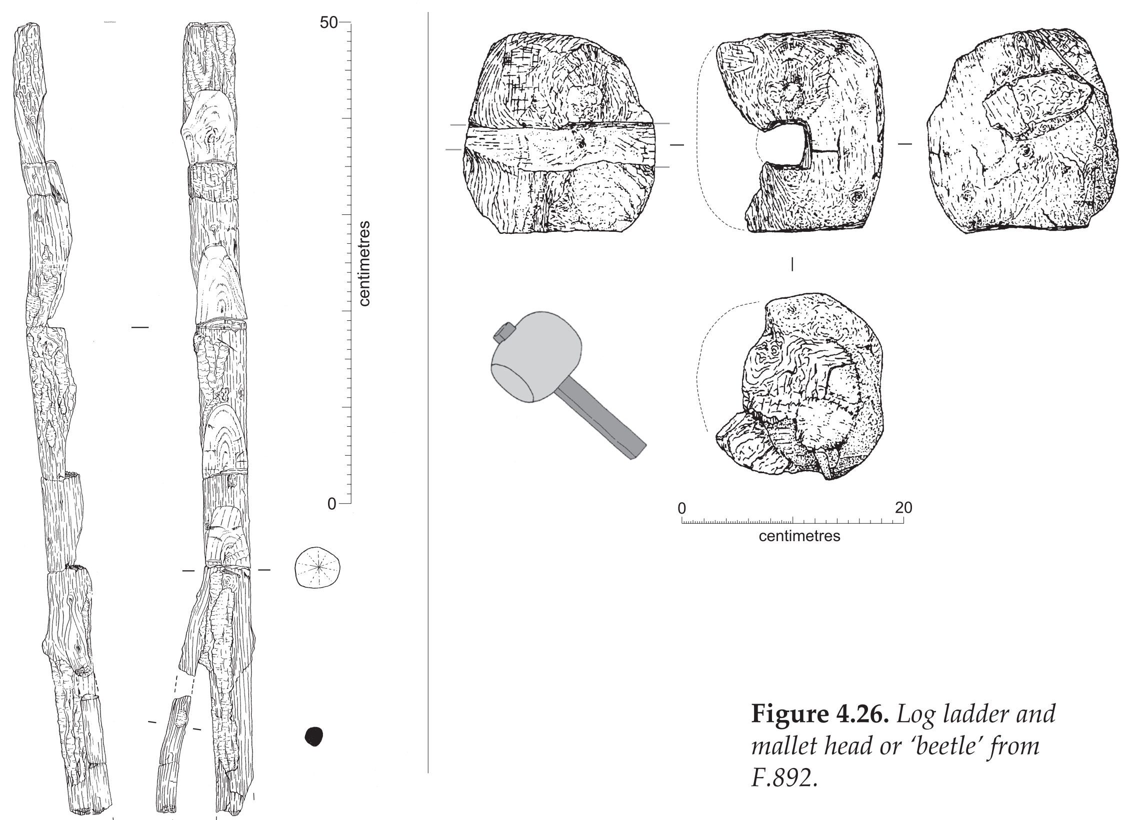


Figure 4.26. *Log ladder and mallet head or 'beetle' from F.892.*

also angled in such a way that they ladder would have to be used at, or near, the perpendicular. It would certainly have been difficult to stand on a step for any length of time. The combination of the light weight, the forked bottom, ease of maneuverability but difficulty of use, suggests that this ladder was not designed to be left permanently in place. Maybe it should be seen as more of a portable step-ladder than a fixed access.

Mallet: The object measured 185mm in length and had a diameter of approximately 180mm. The striking-face of the mallet was sub-circular in shape and measured 110 × 100mm. A square-shaped perforation (40mm × 40mm) or handle hole pierced its centre, although only three of its four sides survived as the head had fractured at this point.

'Beetles' are a type of wooden mallet designed for driving fence posts. This particular beetle was quite small (Fig. 4.26), although the use of burr wood, with its dense, knotty grain, indicates that it was intended to take repeated hard impact and it certainly appears used and worn. Also, it was not a rough, ad hoc kind of implement but carefully carved with a symmetrical, slightly rounded shape. It was sophisticated and therefore likely to be part of the tool kit of an experienced hand rather than something made for casual use. The key attribute for post driving would probably be the length of the handle (which has not survived). Beetles or mallets for post driving need long handles (Edlin 1973, fig. 27) and although the length of the handle of this mallet will remain unknown, its hole is large enough to take a substantial handle.

Middle Bronze Age or Deverel-Rimbury pottery (Mark Knight)

A total of 169 identifiable pieces of Deverel-Rimbury pottery were recovered from 15 contexts (or 11 features; Table 4.9). The sherds were consistently thick-walled and mostly shell-rich, although a vessel from F.604 had grog as its main opening material and F.460 contained a large chunk of rim (*c.* 40cm in diameter) made abrasive by an abundance of sharp quartz inclusions. Another common attribute was that the sherds came from large bucket-shaped forms with predominantly rounded or flattened rims (F.1157 produced a single out-turned example).

Decoration comprised fingertip impressions around the lip or along the edge of the rim in F.239, F.391 and F.544, diagonal incisions or cabling around the lip in F.460 and fingertip impressions around a raised cordon in F.544 and F.991. A lug fragment was recovered from F.1157. Perforations occurred on sherds from F.544 and F.604. The perforations in F.544 were made pre-firing and did not fully pierce the pot's walls suggesting that these were another kind of decoration, whereas the holes in F.604 were made after the pot had been made and did pierce through the pot and were perhaps associated with repair or as a means of fastening. The grog inclusions within the fabric of the vessel from F.604 were large and, in one particular instance, survived as a small rim fragment from a previous vessel.

Table 4.9. *Deverel-Rimbury pottery*

Feature	Context	Number	Weight (g)	Fabric
239	147, 148, 149	9	136	6, 18
309	238	2	92	8
322	250	9	82	8
327	256	4	7	6
328	257	1	5	6
391	B/C	3	35	6, 18
460	411	10	207	Q
544	500, 503	19	622	14
604	563	40	505	27
991	1068A	12	255	6
1157	1271B	60	624	6
Total	**15**	**169**	**2570**	**6**

Middle Bronze Age 'foodways' (Vida Rajkovača)

The Middle Bronze Age faunal assemblage was recovered from 15 contexts associated with 9 features (Table 4.10), all of which were pits or waterholes. Of the nine features, three features in particular accounted for *c.* 74% (by NISP) of the assemblage (F.34, F.544 and F.991). F.991 produced the largest quantity of the bone material, amounting to 256 assessable fragments and representing *c.* 36% of the entire Middle Bronze Age faunal record.

This type of environmental 'signature' is noticeably different from those of both earlier and later phases of occupation of the site. Looking at the preceding Early Bronze Age assemblage, the zooarchaeological record is quantitatively slim. Features excavated across the relatively broad settlement swathe, henge and structures, all generated a remarkably small faunal assemblage made up of highly fragmented (from settlement and

Table 4.10. *Total animal bone fragment count and weight for Middle Bronze Age features*

Feature	Fragment count	Weight (g)
34	146	4702
239	103	1853
391	65	7387
394	1	200
544	119	13150
548	1	1
810	5	318
816	5	193
991	256	10560
Total	**701**	**38364**

Table 4.11. *Number of specimens identified to species (or NISP) and MNI count for Middle Bronze Age contexts. The abbreviation n.f.i. denotes that a specimen was or could not be further identified.*

Taxon	NISP	NISP %	MNI
Cow	426	*87.5*	17
Ovicaprid	17	*3.5*	3
Sheep	1	*0.2*	1
Pig	40	*8.2*	5
Dog	1	*0.2*	1
Red deer	2	*0.4*	1
Sub-total to species	**487**	***100***	-
Cow-sized	153	-	-
Sheep-sized	55	-	-
Mammal n.f.i.	6	-	-
Total	**701**	**-**	**-**

the henge) and calcined bone (from the structure). Admittedly, this limited evidence precludes in-depth discussions about animal–human relations, yet it does say a great deal about the waste management of the Early Bronze Age community. Differing to the greatest possible extent and almost entirely made up of large bone dumps from pits and waterholes, the succeeding Middle Bronze Age assemblage was substantial and incredibly well preserved. As will become clear from subsequent chapters, the practices involving animal use and bone deposition were set to change again, resulting in the well-preserved sheep-dominated Late Bronze Age-Early Iron Age assemblage characterized by the articulated lamb deposits found in structures.

The assemblage totalled 701 (38,364g) assessable fragments, 668 of which were possible to assign to element (95%) and a further 487 to species (69%). Cattle accounted for more than a half of the assemblage and for *c.* 87% of the identified species (Table 4.11), with both methods of quantification (NISP and MNI) showing clear predominance of cattle. Pig and sheep were also identified, in considerably smaller numbers. Dog and red deer were also present, with one and two specimens respectively.

Preservation of the bone ranged from quite good to quite poor. F.34, F.391 and F.544 all provided an excellent preservational environment due to their waterlogged nature. Unfortunately, the well-like conditions and the changing water-table levels resulted in heavy iron-rich concretions adhering to the surface of the bone, unsurprisingly affecting the identification of species and the analyses of the age and butchery evidence. However, the near complete state of a lot of the elements allowed for the majority of specimens to be identified to species. The majority of bone did not show any signs of weathering, exfoliation and abrasion. The remarkably low incidence of gnawing marks (three specimens or *c.* 0.5% of the assemblage) is indicative of the quick deposition of the material.

Butchery marks were observed on 69 (*c.* 10%) specimens, 50 of which were identified as cow and further 12 as cattle-sized fragments. The remainder of the butchered assemblage was composed of sheep, pig or sheep-sized unidentifiable fragments. This is likely to be due to the fact that larger cow carcasses require more processing than sheep to obtain manageable portions for cooking or preserving. Cow bones were more commonly chopped than those of sheep or pig, perhaps reflecting the greater force required in butchering larger animals. Heavy cuts at the muscle attachments were used to detach ligaments and sinew when disarticulating bones and muscle. Similarities were noted between the location of the cut marks on cattle bones and those on sheep and pig bones, suggesting that they were processed and consumed in a similar manner.

Cattle

The dominant cattle cohort totalled 426 specimens or 87.5% of the identified species count. When MNI count is taken into consideration, the preponderance of cattle is emphasized even more. No fewer than 17 cows were deposited in these large bone 'dumps', pits and waterholes. Analysis of body part representation has shown that all parts of the beef carcass were equally represented, although with a slight over-representation of mandibles, loose teeth and tooth fragments, indicating the processing and consumption of complete individuals on site. Cattle were particularly abundant in three large 'bone dumps': F.34 (NISP=99; MNI=4); F.544 (NISP=87; MNI=4) and F.991 (NISP=141; MNI=6).

Butchery marks were noted on 50 (*c.* 12% of the cohort) cattle specimens, mainly implying disarticulation, meat or marrow removal. Limb bones were chopped mid-shaft and not further processed. The different parts of the skeleton all seemed to have been processed in a uniform fashion. In other words, all humeri and tibiae demonstrated slight charring, implying that the bones were heated and then smashed open to pour the liquid marrow out. Unlike the fore and hind limb bones, all of the cattle metapodials were vertically split, with the blow being delivered axially by a

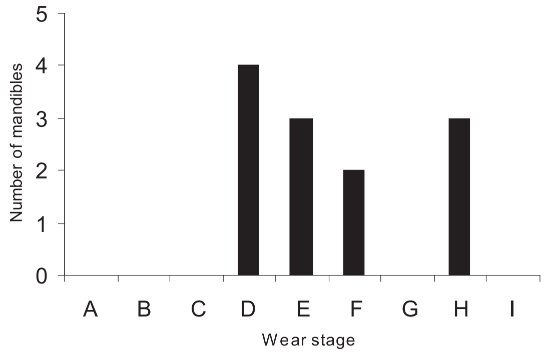


Figure 4.27. *Mandibular tooth wear for cattle.*

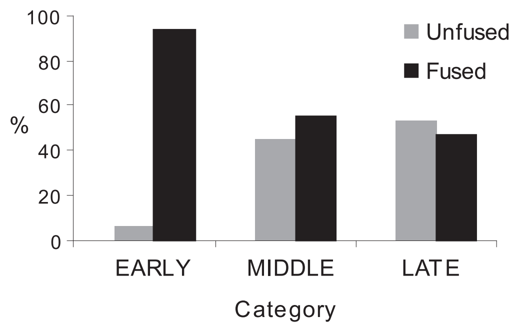


Figure 4.28. *Epiphyseal fusion data for cattle.*

blade starting between the distal condyles. A number of vertebrae also showed signs of butchery. The majority of these had an axial chop through the centre of the bone in the cranio-caudal direction used to separate portions of a carcass. All butchered cattle pelves were cut in a similar fashion, with chop marks being noted on the acetabulum. Cattle mandibles were another element which showed a relatively uniform butchery pattern – the removal of the coronoid and a chop on the diastema. In addition to the butchery, a cattle ulna found in F.34 appears to have been worked into a point or a gauge. The olecranon is missing, but part of the proximal articulation is present with the distal epiphysis being sharpened, showing striations and a slight polish to it.

The data obtained from mandibular toothwear were quantitatively inadequate for building a kill-off profile; however, based on 12 mandibles, there appears to be a peak around stages D and E (Fig. 4.27). There are a few mandibles assigned to an old adult, hinting at animals being kept for secondary products until later stages in their life.

Table 4.12. *Cattle: Number and percentage of fused epiphyses for Middle Bronze Age (Bradley Fen) (O'Connor 1988) F = number of fused/fusing epiphyses; U = unfused diaphyses and %F = percentage of fused/fusing epiphyses.*

Fusion category	F	U	%F
Early	48	3	94
Middle	21	17	55
Late	18	20	47

The fusion count for cattle produced more information which could warrant developing the kill-off profile. Age estimations based on epiphyseal fusion (Table 4.12; Fig. 4.28) indicates that only 2% were <16 months of age, 51% were +16 months–<28 months; 33% were +28 months–<3.5 years and 14% were +3.5 years. It appears that the cull was of cattle at or near their maximum body size, representing the most efficient point of killing for meat.

Biometrical data were available from two metacarpals, two metatarsals and two radii which produced the size-range between 105 and 119cm.

There are several examples of pathology and non-metrical traits observed in this sub-set. One of the complete cattle metacarpals demonstrated signs of *osteochondritis dissecans* represented by lesions on the joint surfaces of the proximal articulation. These lesions result from the herniation of small portions of the joint cartilage through the articular surface of the bone, giving rise to punched-out lesions. It is thought that these are the result of sudden physical stress or trauma to the joint (Dobney et al. 1996, 38). In addition, two examples of non-metrical traits were recorded: two cattle mandibles have exhibited a variation in the appearance of the mental foramen and the reduction of the hypoconulid (posterior cusp of the third molar).

Pig

Pork clearly contributed to people's diet on this site but the low numbers of pig bones indicate that the economic contribution of pigs was substantially less than that of cattle. Pigs could have been of some use in arable agriculture for turning and fertilizing heavy soils, but the capacity for pigs to destroy plant crops means that they would have been herded away from arable fields (Serjeantson 1996, 222). The pig cohort accounted for 40 assessable specimens representing a minimum of five animals on site and corresponding to *c.* 8% of the identified species. Both meat and non-meat bearing elements were represented in the assemblage. It was only possible to age four specimens, all of which were mandibles, which suggests slaughter during the second year. Butchery marks were almost absent on pig elements with the exception of a femur with several fine cut marks consistent with meat removal. Three large bone 'dumps', F.34, F.544 and F.991, contributed the majority of the pig cohort recorded in this assemblage.

Ovicaprids

Although generally one of the most commonly exploited species in domestic assemblages of prehistoric date, sheep/goat were relatively rare in the Bradley Fen faunal record. As few as 18 assessable specimens were identified as sheep/goat or sheep, representing *c.* 4% of the identified species. The distribution of body elements demonstrated a slight under-representation of mandibular, tooth elements, as well as phalanges. The paucity of ovicaprid remains hinders further interpretation of this species' economic significance and use.

Other species

Dog was the least well represented of the domestic species – positively identified based on a tibia found in F.991. As for wild species, this sub-set has proved to be almost completely dominated by livestock species. Red deer was the only wild species recorded, identified by a patella (F.991) and antler fragments (F.544).

Discussion

Recovered from a total of nine wells and waterholes, with its substantial and overwhelming cattle cohort, the Middle Bronze Age faunal record from Bradley Fen at first glance appears to be rather typical for the period. To fully interpret the activities leading to the accumulation of these bone deposits, we will start by

Table 4.13. *The 'normalized' percentages for the three main 'food species' from comparative sites.*

Site	Sample size (NISP)	Cow%	Ovicaprid%	Pig%
West Deeping (Rajkovača 2010)	384	57	37	6
Langtoft (Rajkovača 2008a & b)	219	70	22	8
Tanholt Farm (Rajkovača 2009)	69	71	16	13
Pode Hole (Rackham 2009)	180	79	14	7
Briggs Farm (Faine 2011)	123	80	14	6
Bradley Fen (this volume)	487	88	4	8

looking into how the traits of the assemblage fit with known regional practices. The decision on which sites to use in this comparison was based on looking for the closest possible parallels in terms of the pottery dating, the character of occupation and bone deposition.

Placing the assemblage in its regional context showed that the findings mirror the patterns recorded elsewhere in the area, if we were to look at the ratio of species only (Table 4.13). What is not so obvious from the table above is that the majority of accumulated bone (corresponding to a vast amount of meat) effectively came from three features (F.34, F.544 and F.991). The skeletal element count showed the presence of beef joints of high meat value, or rather that all parts of the beef carcasses were processed on site, which was not the case with ovicaprids or pigs. Although biometrical data were available from only a small number of specimens due to the degree of butchery and carcass processing, it appears that both male and female individuals were present as well as animals of all ages. Thus butchery does not seem to have followed a set strategy in relation to stock management and it looks as though animals were slaughtered as the need for meat arose. Even if we choose to take a 'rough' MNI count for the assemblage as a whole, no fewer than 17 cows amounts to a considerable amount of meat. In an attempt to give a general estimate, following Lyman's (dated, yet straightforward) calculations (1979) and disregarding the differences in sex and size, the remains of the 17 cows from Bradley Fen would have amounted to between 4240 and 6477kg of meat. To emphasize this even further, the evidently quick deposition of the bone implies that the meat was consumed and the waste disposed of in one episode. This impressive fact can only lead to a question about the population size and the character of occupation, a theme which deserves to be explored further and which cannot simply be investigated through patterns observed in faunal material.

Plant remains (Anne de Vareilles & Rachel Ballantyne)

Nine waterlogged Middle Bronze Age samples were analysed. Three from the deep, sinuous boundary ditch (Ditch R), four from along the main terminal boundary (Ditch A) including one from adjacent well F.830, one from the terminal of a coaxial (Ditch D)and one from well F.34.

The three samples from Ditch R revealed very similar plant assemblages, both in terms of quantity and preservation status. Decayed wood fragments are prevalent in all samples. Alder was the only tree species identified, from seeds and cones. The dominant waterlogged seed species are crowfoot (*Ranunculus* Subg. Batrachium), meadow-rue (*Thalictrum* sp.) and water plantain (*Alisma plantago-aquatica*), all of which grow in wet ground and shallow water. The same habitat is also represented by fewer seeds of water-dock (*Rumex hydrolapathum*), fine-leaved water dropwort (*Oenanthe aquatica*) and marsh pennywort (*Hydrocotyle vulgaris*). The ditch appears to have been waterlogged, with arrowhead (*Sagittaria sagittifolia*), freshwater snails, algae, duckweeds (*Lemna* spp.) and pondweeds (*Potamogeton* spp.) living within it. *Cristatella mucedo* statoblasts (a freshwater invertebrate) provide further evidence that the ditch base contained still or gently flowing, clear water. Although signs of a drier landscape are seen in the occasional seeds of docks, brambles and sloe, the area around the ditch appears to have consisted of fen and alder carr. A marked rise in ground-water levels may therefore be inferred from earlier periods (see pit F.1278, also at *c*. 0m OD).

Whereas the lower fills of the main terminal boundary ditch (Ditch A) were waterlogged, the sample from Ditch D contained no waterlogged or carbonized plant remains other than a little charcoal. The same dominant species indicative of wet soils seen in Ditch R were found in Ditch A, but they occurred in lower numbers: crowfoot, meadow-rue and water plantain, marsh pennywort, fine-leaved water dropwort and spiked water-milfoil (*Myriophyllum spicatum*). There was very little variation between the samples from the terminal boundary, which show a continuous, unchanging landscape. The ground surface was slightly drier with elder (*Sambucus nigra*), brambles (*Rubus* sp.), orache, hawthorn (*Crataegus monogyna*) and ground ivy (*Glechoma hederacea*) symptomatic of open scrub more than arable fields, although the same species may also be indicative of also hedgerows.

Shaft, or well, F.34 contained a molluscan assemblage and a very small amount of charred and possibly waterlogged plant remains. Charred fragments of hazelnut (*Corylus avellana*) and one fragment of hawthorn stone were present with a moderate amount of small charcoal. Hazelnuts are a common find on British pre-historic settlements and represent an important food source (Greig). Uncharred seeds of elder also occurred in some quantity and may represent the remains of a once waterlogged assemblage – these seeds are more resistant to desiccation than many other taxa.

The accompanying molluscan assemblage included aquatic and sub-aquatic species, most notably common bithynia (*Bithynia tentaculata*; represented primarily by the opercula rather than shells) and juvenile great ramshorn snails (*Planorbarius corneus*). Both these taxa are associated with lowland freshwater bodies, great ramshorn snails being particularly associated with sluggish or stagnant conditions (Pfleger 1990). The assemblage suggests that this feature was flooded during the formation of the basal fill, which would be consistent with the interpretation of a well.

The sample with the most intriguing data came from well F.830, taken just above an inverted inhumation. A small segment of the organic spread that partially covered the body was analysed and found to be a dense mat of nettles and/or grasses with numerous ripe nettle seeds. Although mature nettles could suggest that the body was interred in late summer/autumn, there is an unclear temporal relationship between the inhumation and overlying sediments. Nettles are common, invasive plants of disturbed nutrient-enriched land, in addition to being a food and as a fibre crop. The preparation of nettle fibres requires retting (steeping in water for days), which should be considered as a possibility for these remains. Additionally, stinging nettle seeds were abundant throughout the context, and the plant probably grew prolifically in the vicinity of the well. Waterlogged seeds of common chickweed (*Stellaria media*), knotgrass (*Polygonum* sp.), docks (*Rumex* spp.) and black nightshade (*Solanum nigrum*) are additional signs of disturbed, nutrient-enriched land. The only hydrophilic plant found is spiked water-milfoil that could have grown within the well. Occasional charcoal suggests burning activities occurred in the general area.

Lithics (Lawrence Billington)

Fieldsystem

Extensive excavation of cut features making up the fieldsystem produced only 27 worked flints from 18 features, ranging from one to four flints per feature (Table 4.14). This low density of flint suggests that the assemblage consists of pieces inadvertently incorporated into the fills of the features as they filled up. Most of this assemblage, including a blade core from F.846, blades and narrow flakes from F.367, F.400, F.812 and F.846 and a rejuvenation flake from F.377, is residual Mesolithic and Neolithic material comparable to the worked flint from surface deposits across the site. Only a few pieces show technological traits consistent with the Early to Middle Bronze Age date expected for the fieldsystem's construction and use. Several flakes, including two examples from F.1000 and a multiple platform core from F.400, demonstrate the unstructured working commonly associated with later flint working and may be broadly contemporary with the fieldsystem. The denticulated flake from F.799 is a tool type commonly encountered in later prehistoric (Middle Bronze Age to Iron Age) lithic assemblages.

Table 4.14 *Fieldsystem lithics.*

	Fieldsystem linears																		
Feature	**367**	**377**	**386**	**400**	**462**	**799**	**811**	**812**	**816**	**846**	**867**	**938**	**1000**	**1028**	**1060**	**1061**	**1070**	**1083**	**Total**
Chip	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Chunk	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Flake	1	1	1	-	1	-	1	1	1	-	-	1	3	1	1	1	1	1	17
Narrow flake	-	-	-	1	-	-	-	1	-	1	-	-	-	-	-	-	-	-	3
Blade/let	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Rejuvenation flake	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Blade core	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
Flake core	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
End scraper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Denticulate	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Total worked flint	2	2	1	2	1	1	1	2	1	2	1	1	4	1	1	1	1	2	**27**

Table 4.15. *Flint assemblages from Middle Bronze Age features.*

	34	239	322	474	490	528	544	-
Feature	**Pit/well**	**Pit**	**Linear**	**Pit**	**Pit**	**Pit**	**Pit**	**Total**
Chip	-	-	-	1	-	-	1	**2**
Chunk	-	-	-	-	-	-	1	**1**
Flake	1	3	1	1	2	-	3	**11**
Blade/bladelet	1	-	-	-	-	-	-	**1**
Irregular core	-	1	-	-	-	-	-	**1**
Misc. scraper	-	-	-	-	-	1	-	**1**
Total Worked	**2**	**4**	**1**	**1**	**2**	**1**	**5**	**17**
Burnt unworked flint (wt g)	-	4 (125)	-	-	-	-		**4 (125)**

Settlement

Seventeen worked flints were recovered from seven Middle Bronze Age features (Table 4.15). The assemblage consists almost exclusively of undiagnostic flake based debitage. The expedient nature of some of the material including an irregular core from F.239 might suggest a date broadly contemporary with the features. Other pieces are likely to represent residual material, including a fine Mesolithic/earlier Neolithic blade from F.34 and a flake with a neatly faceted platform from F.544. Although some of this material may reflect Middle Bronze Age flintwork, it is clear that very little flint was deposited compared to the quantities of animal bone and pottery recovered from these features. This might suggest that the working and use of flint was no longer a habitual part of settlement activities or that the organization of its production, use and deposition was differentiated from the other residues of domestic activity. These potential changes in the use and deposition of worked flint coincide with the well documented transformation in lithic technology from the Middle Bronze Age onwards, which sees a marked decline in the use of flint and the disappearance of many formal tool types (Ford et al. 1984; Edmonds 1995).

Metalwork

So far in this chapter, we have described the implementation of a system of ditched field boundaries and the effect this had on the division of land and its settlement. At the time when the boundaries were being constructed, large tracts of land were being lost beneath the encroaching fen and settlement was compelled to move further and further upwards. The lowest-lying element of the fieldsystem was built on top of the developing peat whilst the rest of its boundaries were constructed above or away from its initial formation. In due course, other low-lying components of the fieldsystem were similarly inundated and to such an extent that only its upstanding field-banks remained visible. The deposition of pieces of metalwork coincided with the latter part of this wetland progression; only when the lower sections of the fieldsystem had been *engulfed* were bronze weapons deposited. At Bradley Fen, the fieldsystem/metalwork association was contingent on such circumstances and the time-transgressive or diachronic character of the peat development showed that the relationship was as much chronological as it was contextual. Only now was it deemed appropriate to carry out these practices. The temporal dimension to the arrival of large amounts of metalwork into this landscape was most emphatically illustrated by the absence of deposition along the lower parts of the fieldsystem which were inundated much earlier.

This section describes the widespread deposition of bronzes along a particular stretch of the submerged margins of the fieldsystem (Fig. 4.29). In some ways the metalwork is pivotal in the history of this landscape in that its chronology encompasses the final stages of the Middle Bronze Age and the beginning of the Late Bronze Age. By this point the fieldsystem was a long established feature and if anything its *tenurial jurisdiction* was on the decline. Completely new kinds of landscape-scale constructions were supplanting the old as the first major timber alignments were erected across the Flag Fen embayment. For the first time, strategies were being conceived for reclaiming the submerged spaces of the basin and accordingly the prevailing trajectory of settlement was no longer exclusively upward. This reversal in settlement trajectory was, it seems, accompanied by large numbers of bronze objects made-up predominantly of swords and spears.

A metal-detector survey of the lower contours produced 26 bronzes. The distribution of metalwork was restricted to a narrow strip of peat between the 1.00m and 0.40m contours and incorporated a single hoard of 20 pieces as well as six individual spears. All of the metalwork was found in the peat and consistently above the first few centimetres of accretion. The hoard (F.786) comprised parts of at least three swords, nine

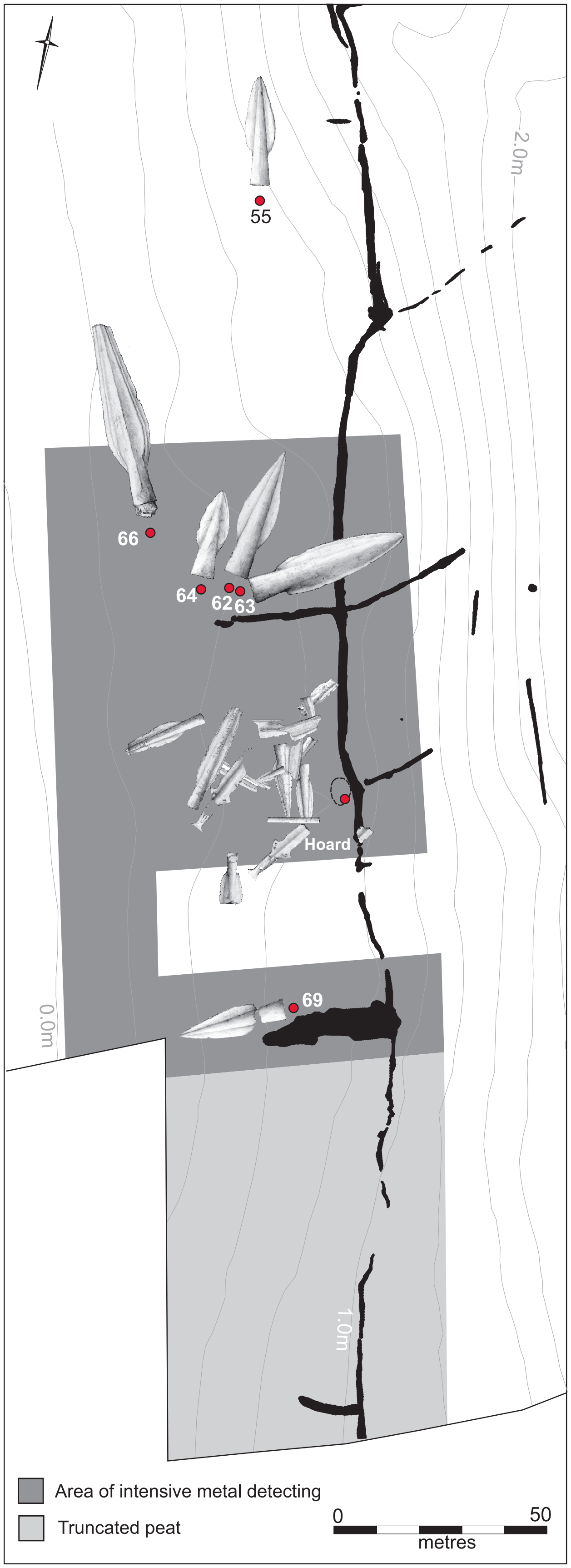


Figure 4.29. *Distribution of metalwork (hoard and spears).*

complete or semi-complete spears, three fragments of a broken chape and two broken ferrules. Collectively, the hoard had the appearance of a group of objects that had been used and destroyed, whereas the individual spears were, by comparison, more or less pristine. Five out of the six spears were complete, whereas the hoard contained only two whole forms out of twenty.

The pattern or distribution of metalwork (hoard and single spears) corresponded closely to the configuration of the lower parts of the fieldsystem. Four out of the six spears were deposited parallel to fenward projecting boundaries whilst the hoard was buried alongside the main terminal division and exactly opposite to major junction. A distance of at least 25m separated the single spears from the terminal boundary whilst the furthest was located 50m away from the terminal boundary.

The spears

The spears occurred in three groups, two as isolated pieces, SF 55 and SF 69, and four as a rough line, SF 62, SF 63, SF 64 and SF 66. The isolated SF 55 was found on its side pointing northwards, whereas SF 69 was flat and pointed to the west. The group of four shared broadly similar orientations, northwest (SF 64), north (SF 66), northeast (SF 62) and east (SF 63) and together formed a 'fanned' distribution stretching over a distance of approximately 25m. Spear SF 62 was found semi-upright as if stuck point-first in the ground whilst the rest were found either lying flat or on their sides (Fig. 4.30). Of the line of four spears, three (SF 62, SF 63 and SF 64) were closely spaced and aligned more or less parallel to the northern edge of the fenward Middle Bronze Age field boundary Ditch O. Situated about 6m to the north, all four projectiles were found pointing away from the boundary as if they had been tossed or thrown from the boundary's upstanding bank. Stratigraphically, the peat horizon in which the spears were found capped the adjacent ditches but abutted their accompanying banks.

Remnants of casting seams were present on the single spears and some of the edges were still sharp (Fig. 4.31). Occasional small nicks and dents on the blades of the spears indicated 'use' but only one of the single spears (SF 66) displayed a level of damage anywhere near equivalent to that present on most of the hoard bronzes. Preserved wooden haft fragments were present in two of the six spears (SF 63 and SF 66). The haft in SF 63 survived only within the socket of

Figure 4.30. *Photograph of spears in situ (SF 63 and SF 62, plus close-up of upright spear SF 62).*

the spear whereas the haft fragment in SF 66 extended a couple of centimetres beyond the lip of the socket and had a splintered or frayed appearance as if the remainder of the shaft had been snapped-off prior to deposition. The tip of spear SF 66 was also missing and its broken end was also slightly bent. Spear SF 64 was poorly preserved and survived as two pieces, blade and half of the socket, the other half of the socket being absent. In contrast with the hoard pieces, the damage or poor state of SF 64 appeared to be post-depositional.

The hoard

The hoard (F.786) comprised a jumble of 20 bronzes strewn within a space no larger than 1.60 × 1.30m (Fig. 4.32). It comprised three broken swords (surviving as hilts and shoulders), three sword blade fragments, three pieces of a long tongue chape, nine complete or semi-complete spears and two ferrules.

The hoard was deposited in the peat immediately next to the main terminal boundary (Ditch A) and almost exactly opposite a T-junction in the fieldsystem (Ditch E). Its position corresponded to the southern end of a small mound of buried soil preserved beneath the peat and as a consequence the hoard was elevated several centimetres above its surrounding surface (Fig. 4.33). Two large saddle querns were found at the northern end of the same peat covered mound, whilst three fragments of human skull were located a few metres to the west.

The bulk of the hoard objects displayed extensive damage and, as well as being broken-up, the pieces were also bent, severely notched, gashed, perforated, dented, burred and burnt (Fig. 4.34). Small nicks and dents were also present on the blades of some of the hoard weapons but these use-wear indicators were consistently overshadowed by the severity of the later damage. The casting seams, prevalent on the single spears, were much less evident on the hoard pieces and none of the seven surviving spear sockets contained haft fragments. The burning of the pieces was to some extent an unseen dynamic in that it was metallographic evidence which confirmed that at least five of the hoard pieces (three spears, a sword and a ferrule) had been exposed to fire prior to deposition (Northover below).

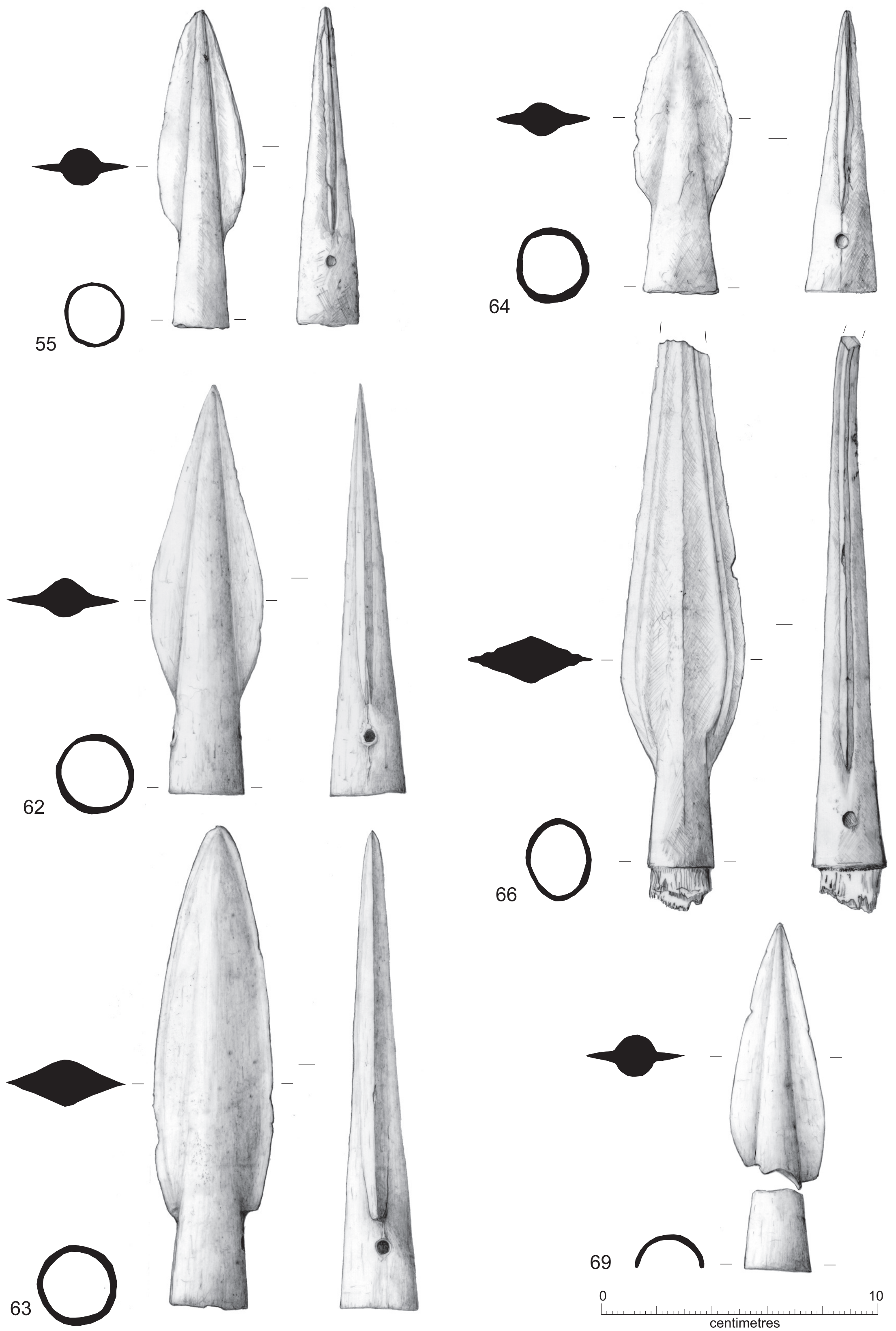


Figure 4.31. *'Single' spears.*

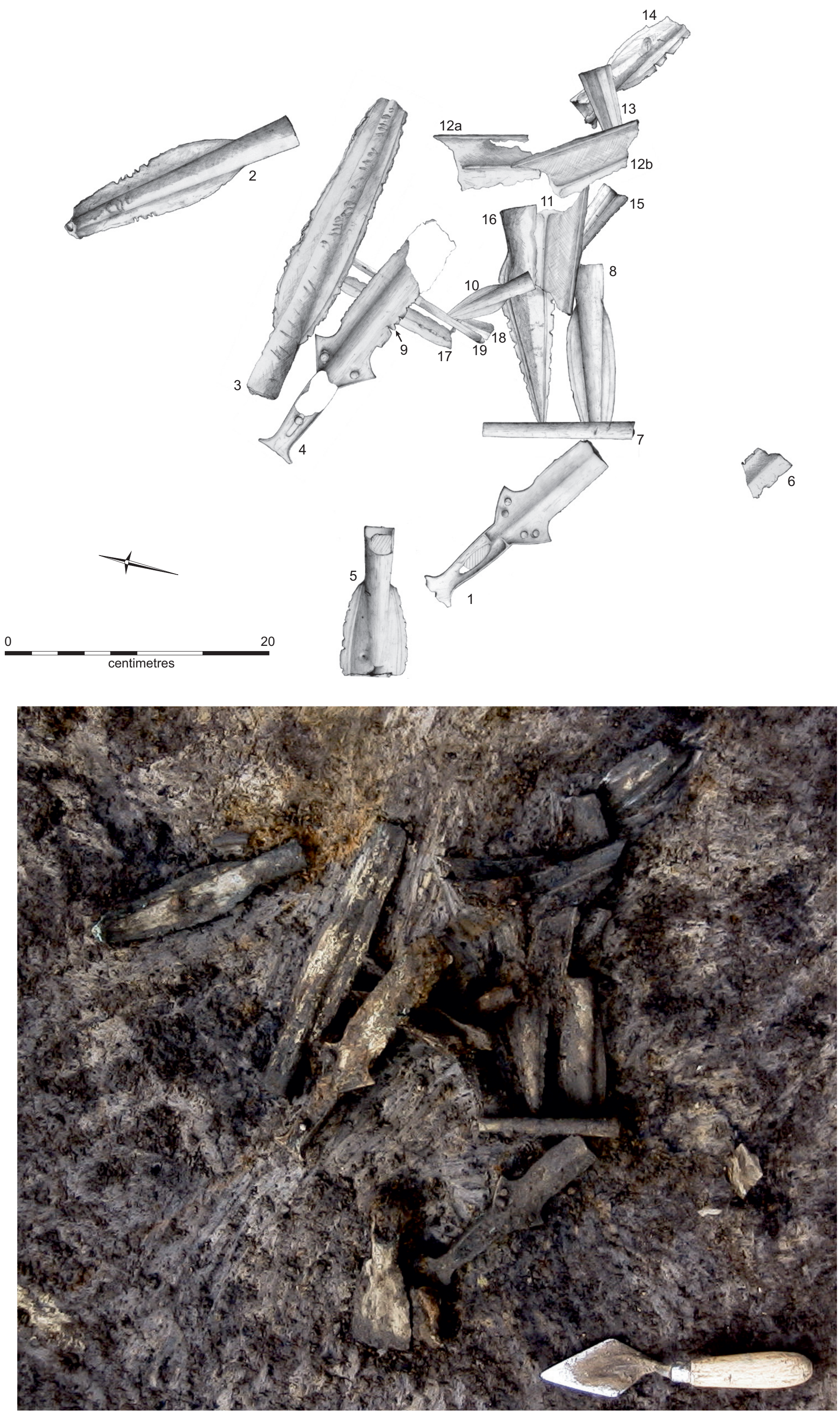
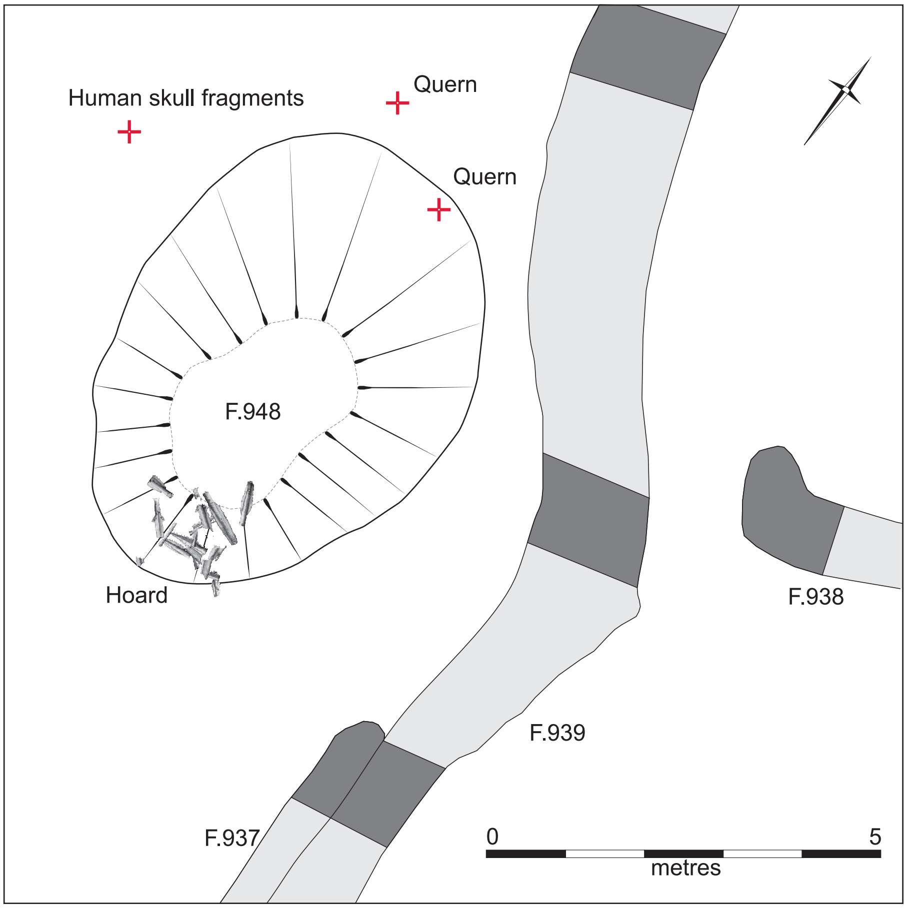


Figure 4.32. *Plan and photograph of the hoard.*



Peat (6)
I
Hoard – querns – fragments of human skull (5)
I
First peat (4)
I
Water lain sandy silt (3)
I
Fieldsystem ditches (2)
I
Small mound of buried soil pockmarked with hoof-prints and surrounded by a 'metalled surface' (1)

Deposition sequence

Figure 4.33. *Plan of hoard location and deposition sequence.*

There was no evidence of *in situ* burning and the wet context the hoard was found in would appear to demonstrate that the burning of bronzes had occurred elsewhere. The orientation of the objects appeared to be random, although groups of the larger items shared similar alignments (northeast–southwest, north–south or east–west) as if they had once been part of a tight bundle. There was no sense of items being carefully placed or of individual pieces being deposited one at a time. If anything, the pattern of objects seemed to indicate a single dump of bronzes, perhaps held collectively in a sack or wrapped in a cloth. A single loose bronze rivet of the type found connected to all three of the sword hilts was found 1m to the south of the hoard.

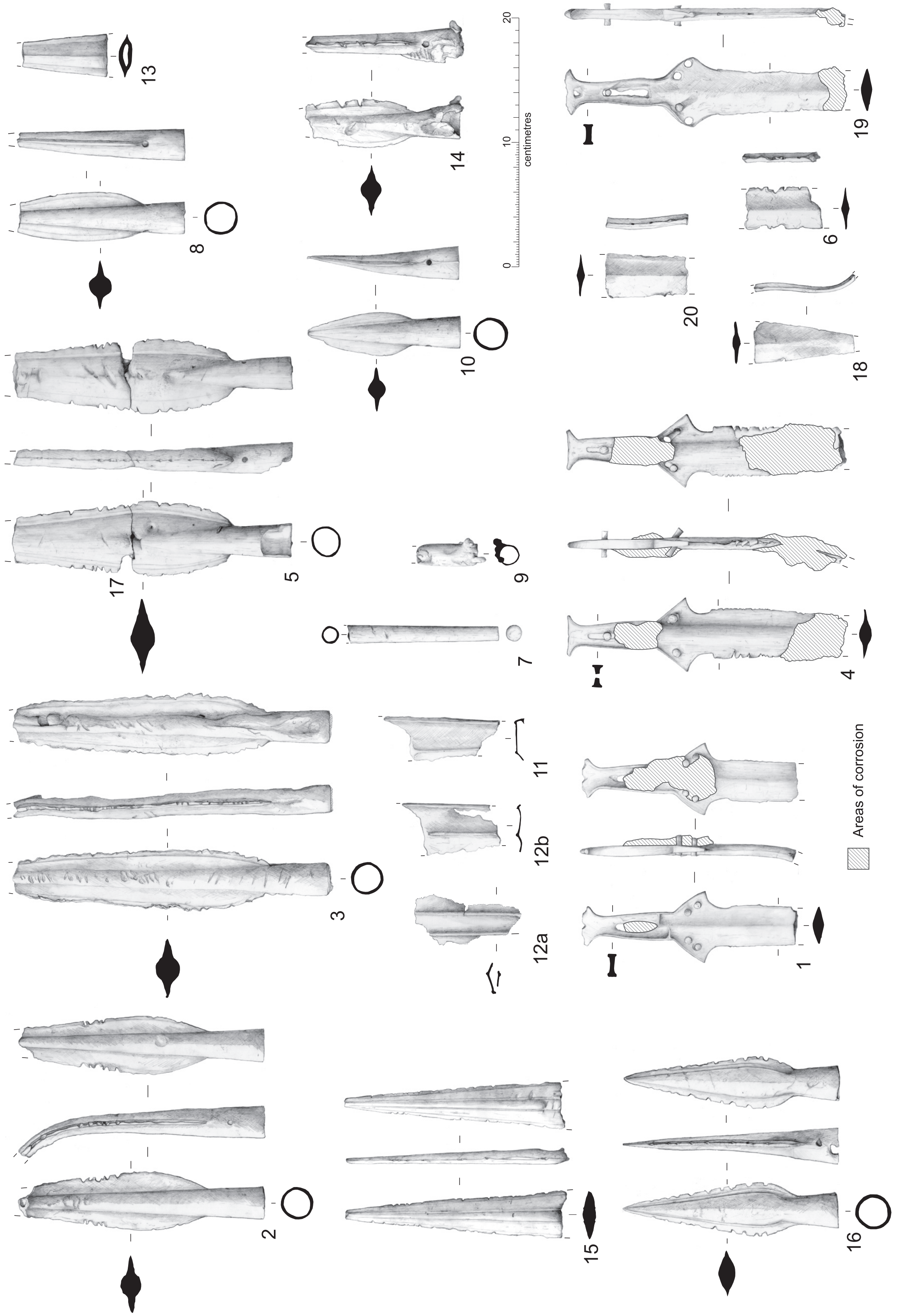


Figure 4.34. *The hoard.*

Bradley Fen metalwork – patterns of deposition

The period between the establishment of the fields and the deposition of bronzes was equivalent to the time it took for the lower fields to be 'lost' to the encroaching fen. Three radiocarbon determinations demonstrated a later Bronze Age chronology for the Bradley Fen metalwork (Table 4.16). The dates were obtained from the peat horizon immediately beneath the hoard, peat from inside one of the hoard spears (HD 3) and a haft fragment from inside one of the single spears (SF 66). The hoard dates were practically identical (1280–1010 & 1310–1040 cal BC respectively) whereas the single spear generated a potential chronological offset of approximately one hundred years (1190–930 cal BC).

The bronze weapons occurred along the saturated lower margins with an equivalent spatial regularity to that of the burnt mounds, waterholes or fenward land divisions and, as with these earlier features, the uniformity of spacing between pieces of metalwork suggests a pattern of deposition that continued well beyond the limits of the site. The scale of the Bradley Fen investigations enabled the recovery of multiple metalwork deposits but also revealed the spaces between them. In terms of understanding past practice, the magnitude and uniformity of metalwork deposition was made visible as much by the metalwork-free spaces as it was by the actual number of bronzes. The pattern of six spears, for example, gave the impression that similar acts of deposition happened with similar frequency all the way around the edge of the Flag Fen Basin. If the configuration of metalwork deposition here is representative of the rest of the landscape, there is every reason to believe that further bronzes will be found at intervals of about 90–100m and somewhere between the 0.40–1.00m OD contours. Conceivably there were hundreds, if not thousands, of pieces of later Bronze Age metalwork deposited around the edges of the embayment.

All of the bronzes from Bradley Fen were found in the peat. Without exception, every piece was elevated from the 'dry' pre-peat landscape by about two or three centimetres of the dark organic accretion. This relationship was crucial in that it demonstrated that the metalwork was deposited only after the onset of peat formation along this part of the Flag Fen basin. It also illustrated an important stratigraphic distinction between the metalwork and the peat-sealed burnt mounds, waterholes and field ditches. Even though these features shared the same *space* as the metalwork, they were manifestly of a completely different *time*. Features such as the burnt mounds and their primary waterholes may have still been visible as waterlogged earthworks but they were not contemporary features. The relationship with the fieldsystem was slightly different and, although the fenward field ditches had silted-up long before the onset of the peat, there was convincing evidence to suggest that the accompanying field banks were still visible when the metalwork was being deposited. Throughout, there was a close spatial relationship between the metalwork and the field boundaries and the connection was perhaps best exemplified by the line of three spears deposited along the northern side of the central land division (Ditch O). The alignment of spears seemed to mimic the alignment of the boundary (see detailed plan Fig. 4.29) and, at the very least, utilized the land division as a reference or orientation in the landscape. Similarly, although buried in isolation, the southernmost spear was also deposited beside a boundary, whilst the hoard was buried at a major junction. The fieldsystem represented a frame of reference for metalwork deposition. If nothing else, this relationship demonstrates that at the time when metalwork was being deposited the boundaries were still visible and, very probably, still 'active'.

In plan, the configuration of single spears appeared to be distinct from the hoard and this distinction may be indicative of different kinds of practice. One particular spear (SF 62) was discovered lodged point-first into the peat as if it had just found its target and all of the single spears had the look of 'active weapons' (Fig. 4.30). This impression of depositional immediacy contrasts with the 'old metal' of the hoard, which comprised an assortment of acquired or accrued objects that had mostly seen better days. Disposed of in a tumbled heap, the hoard presented a very different scene from the spear sticking in the peat (Fig. 4.32).

Taken as a whole, the impression was that the hoard contained weapons and fragments of weapons that each had an extended use-life prior to deposition and that the breaking-up and burning of some of the pieces indicated purposeful acts of destruction unlike anything seen on metalwork elsewhere in the Flag Fen Basin (cf. Coombs 1992; Pryor 2001). For instance, the hoard contained the handle and lower blade sections of three broken-up swords, all of which were bent at the point of fracture suggesting that they had been forcefully broken in-half, as opposed to being damaged in normal use. Evidence of the breaking up of objects was confined to the large weapons (i.e. swords and

Table 4.16. *Metalwork radiocarbon dates.*

Context	Beta	Conventional age	2 Sigma Calibration
Hoard Spear (HD 3)	205535	2970 ± 40 BP	1310–1040 cal BC
Peat beneath hoard	205536	2940 ± 40 BP	1280–1010 cal BC
Single Spear (SF 66)	205534	2880 ± 40 BP	1190–930 cal BC

large spears) and appeared to be an attribute indicative of a need to make things smaller and therefore easier to 'hoard'. Perhaps the 'container' that was used to gather these pieces was also the determinant of object size, since the majority of the pieces were far too large to fit in a contemporary crucible

Metalwork catalogue (Grahame Appleby)

This section presents a catalogue of 26 pieces of later Bronze Age metalwork from Bradley Fen; the *single spears* (SFs 55, 62, 63, 64, 66 & 69 (Fig. 4.31)) and the *hoard* (numbered HD 1–20 (Figs 4.35, 4.36, 4.37, 4.38 & 4.39)). The catalogue incorporates descriptions, dimensions and type-classification, as well as the results of metal analysis carried out by Peter Northover. The catalogue precedes a full report on the analysis and metallography of the Bronze Age metalwork.

Single spears:

SF 55 Spearhead <1232> (Fig. 4.31, no. 55)
Description: The spearhead has a brown-green patina with occasional white and bright green specks. The surface has minor concretions and pitting. The socket has very minor damage, with two rivet holes (one blocked). The extreme tip is missing, probably due to corrosion. One blade edge is 'rolled,' with the other edge slightly dented. The blades are sharp. The preservation condition is very good.

Dimensions: Maximum width 32mm; maximum length 114mm; weight 55g

Classification: This is a complete leaf-shaped pegged-socketed spearhead similar in form and date to SF 62, SF 64, HD 8 and HD 10. The finishing was to a high standard with no evidence of casting seams observed on the socket. The blades do not appear to have been bevelled.

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.01	0.02	0.14	89.05	0.01	0.23	0.03	10.02	0.03

Bi	Pb	Au	Cd	S	Al	Si	Mn
0.01	0.05	0.05	0.00	0.33	0.00	0.01	0.00

SF 62 Spearhead <1228> (Fig. 4.31, no. 62)
Description: The spearhead has a brown-green patina with occasional white and bright green specks. The surface has major concretions and mineralized plant matter attached. The socket metal thickness is greater compared to the other spearheads from the site and possibly contains mineralized remains of a haft. Casting seams are present on the socket with one rivet possibly *in situ*. There is an even layer of corrosion on one blade towards the socket. Where the blades are exposed these are bevelled and sharp, with minor loss of metal due to corrosion. The spearhead is slightly bowed along its longitudinal axis. The overall preservation state is good.

Classification: A complete leaf-shaped pegged-socketed spearhead with bevelled blades and circular cross-section. The blades have been finished to a high standard, but less attention has been applied to the socket. There is a slight asymmetry in plan view, but this does not appear to be the result of differential sharpening. Similar in form and date to SF 55, SF 64, HD 8 and HD 10.

Dimensions: Maximum width 39mm; maximum length 146mm; weight 113g

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.01	0.04	0.28	89.09	0.00	0.50	0.61	7.90	0.14

Bi	Pb	Au	Cd	S	Al	Si	Mn
0.01	1.34	0.01	0.01	0.05	0.00	0.00	0.01

SF 63 Spearhead <1230> (Fig. 4.31, no. 63)
Description: The spearhead has a brown patina with occasional copper mineralization. The surface has some minor concretion on the main body, but this is more prominent on the socket. The socket is robust and of a similar thickness to SF 62. A substantial portion of an ash wood haft was preserved *in situ* with surviving evidence of a rivet hole. The blades are bevelled and sharpened, with small nicks and dents. There is no clear break between the mid-rib and the wings of the spearhead. The preservation condition is very good.

Dimensions: Maximum width 43mm; maximum length 175mm; weight 145g

Classification: A complete hollow-blade leaf-shaped pegged-socketed spearhead. Unlike the other examples described here, the cross-section is even and the blades are squared at the base, where they join the socket. It has been suggested this form is the forerunner to the Broadward Complex barbed spearheads (*c.* 900–700 BC (Burgess et al. 1972)) and represents an intermediate stage between these later forms and hollow-blade varieties such as HD 5>. No rivets were found *in situ*, despite the presence of the haft. Finishing was to a high standard with no evidence of casting seams observed on the socket. However, part of the casting process evidently failed due to the presence of a casting sprue/flash in the corner of one wing at the blade-socket junction. This example dates to the Wilburton phase (ibid.).

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.04	0.02	0.32	76.37	0.02	0.87	1.94	13.86	0.38

Bi	Pb	Au	Cd	S	Al	Si	Mn
0.01	5.81	0.00	0.00	0.19	0.01	0.16	0.00

SF 64 Spearhead and socket fragments <1227> (Fig. 4.31, no. 64)
Description: The spearhead and fragments have a brown-green patina with occasional white specks and some copper mineralization. There are concretions on the base of the wings and socket fragments. The spearhead is broken transversely above the socket resulting in partial loss of the base to one wing. (The socket fragmented during recovery due to its preservation state.) A rivet appears to be *in situ* in one of the larger socket pieces. The blades are sharp with one significant nick on one side. The preservation condition is poor to reasonable.

Dimensions: Maximum width 39mm; maximum length 132mm (including socket); weight 55g

Classification: This is a substantially complete leaf-shaped pegged-socketed spearhead similar in form and date to SF 55, SF 62, HD 8 and HD 10. The finishing appears to have been to a high standard as evident by the sharpness of the surviving parts of the blades.

SF 66 Spearhead <1226> (Fig. 4.31, no. 66)
Description: The spearhead has a green to brown patina with some copper mineralization. The surface has residual peat and mud present and traces of leaf patterns. The socket is undamaged

with possible rivets *in situ* and a substantial piece of wooden haft, protruding up to 14mm beyond the socket. The mid-rib, wings and blades are relatively undamaged with several minor nicks and one large 'scoop' on one edge. The blades are sharp with very little corrosion. The tip is missing, with an irregular angled transverse break and the end is distorted in profile. The overall preservation condition is very good.

Dimensions: Maximum width 45mm; maximum length 188mm; weight 168g

Classification: Similar to other hollow-blade spearheads found at Bradley Fen, this is an almost complete example of this variety. Although the socket is circular in profile, the spearhead has an overall lozenge-shape cross-section. The spearhead shows no traces of the casting process, indicative of a high standard of finishing. A similar example from the Wilburton hoard has been dated to 1260–930 cal BC (OxA-5035: 2890±45 BP) (Needham et al. 1997, 72).

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.01	0.04	0.33	85.79	0.00	0.63	0.95	9.29	0.35
Bi	Pb	Au	Cd	S	Al	Si	Mn	
0.01	2.50	0.05	0.00	0.03	0.00	0.01	0.01	

SF 69 Spearhead <1231> (Fig. 4.31, no. 69)
Description: The spearhead has a mid-brown patina with occasional white and green specks. The surface has residual peat and mud present with concretions, creating a rough surface. The socket is undamaged with two rivet holes and one rivet *in situ*. A casting seam is clearly visible on one side of the socket. The mid-rib is obscured by the concretions, but the wings are relatively undamaged. The blades have several nicks and dents with some burrs. The overall preservation condition is good.

Dimensions: Maximum width 34mm; maximum length 101mm; weight 71g

Classification: This is a small complete leaf-shaped pegged-socketed spearhead. Classified as a 'dumpy' type, due to its 'squat' appearance, it is contemporaneous to the Wilburton-Ewart Park phases of the Late Bronze Age (Coombs 1975).

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.06	0.01	0.09	87.05	0.01	0.16	0.23	10.84	0.05
Bi	Pb	Au	Cd	S	Al	Si	Mn	
0.01	1.23	0.05	0.00	0.19	0.00	0.02	0.00	

The hoard:

HD 1 Sword fragment <1206> (Fig. 4.35, no. 1)
Description: The fragment has a pale brown-green patina with darker green patches towards the terminal. Both blade edges have very minor dents and very small nicks. The blade portion of the fragment is bent. The majority of the blade is missing with a clean transverse break 50mm below the ricasso (i.e. the unsharpened length of blade). Both the shoulder and ricasso appear undamaged with four rivets *in situ*. On one side, the shoulder, rivets and hilt are severely concreted with recent copper mineralization. The bottom edge of this concretion is convex and even, indicating a high possibility for preservation of an organic hilt. The hilt is flanged with a rivet slot, hilt ribs on one side and 'fish-tail' terminal. The preservation condition is very good.

Dimensions: Length 179mm; terminal 31mm; hilt maximum width 24mm; shoulder 56mm; ricasso 30mm; maximum blade width 32.7mm; weight 205g

Classification: This sword displays affinity to the Wilburton complex swords as classified by Burgess & Colquhoun (1988). The hilt slot, concave shoulders, four rivets, small ricasso and fish-tail terminal suggest this example is a Wilburton class B sword (ibid., 43).

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.00	0.04	0.27	80.13	0.00	0.44	0.68	7.19	0.23
Bi	Pb	Au	Cd	S	Al	Si	Mn	
0.02	10.74	0.01	0.00	0.23	0.00	0.01	0.00	

HD 2 Spearhead <1207> (Fig. 4.35, no. 2)
Description: The spearhead has a pale brown-green patina. Both wings are severely notched, with evident metal loss and distortion and 'curling' of the metal forming burrs. The tip of the spearhead is missing and the spear is distorted along its central axis about three-quarters along its length. On one side there are several rectangular-like indentations on the central mid-rib towards the tip. There are minor concretions, peat and mud on both sides with slight bronze disease at the break. Overall preservation is good.

Dimensions: Maximum width 48mm; maximum length 195mm; weight 227g

Classification: This is a leaf-shaped peg-socketed spearhead. In cross-section the socket is circular, whilst the mid-rib is hexagonal. Both blades are bevelled and sharp where undamaged. The socket is perforated with two rivet holes. There are no apparent casting seams on the socket or at the base of the blades. This suggests the spear was completed to a high standard prior to use and final deposition. It is contemporaneous to material recovered from the Wilburton Hoard (Evans 1884).

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.02	0.03	0.19	85.68	0.01	0.42	0.59	9.33	0.17
Bi	Pb	Au	Cd	S	Al	Si	Mn	
0.03	3.01	0.01	0.00	0.49	0.00	0.01	0.00	

HD 3 Spearhead <1208> (Fig. 4.36, no. 3)
Description: The spearhead has a brown-green patina with patches of sandy-yellow, especially on the more damaged side. The socket and mid-rib is severely dented and distorted. The socket is perforated and this may extend along the mid-rib, forming a distinct longitudinal gash. The tip is missing with an uneven transverse break. The mid-rib is perforated 28mm below this break with a further perforation in one wing, 65mm above the base. All these perforations occur on the same side. The blade edges are severely dented and notched, with evident metal loss, rolling of the metal and distortion, forming large burrs. The preservation condition is good, although the overall appearance is of a crushed object.

Dimensions: Maximum width 51mm; maximum length 254mm; weight 295g

Classification: This is a large hollow-blade narrow leaf-shaped spearhead with bevelled blades. The damage sustained by the blades prevents any assessment of the degree of sharpening, but there are no casting seams or flashes observed on the socket, which is indicative of finishing prior to use. Traces of the haft may be

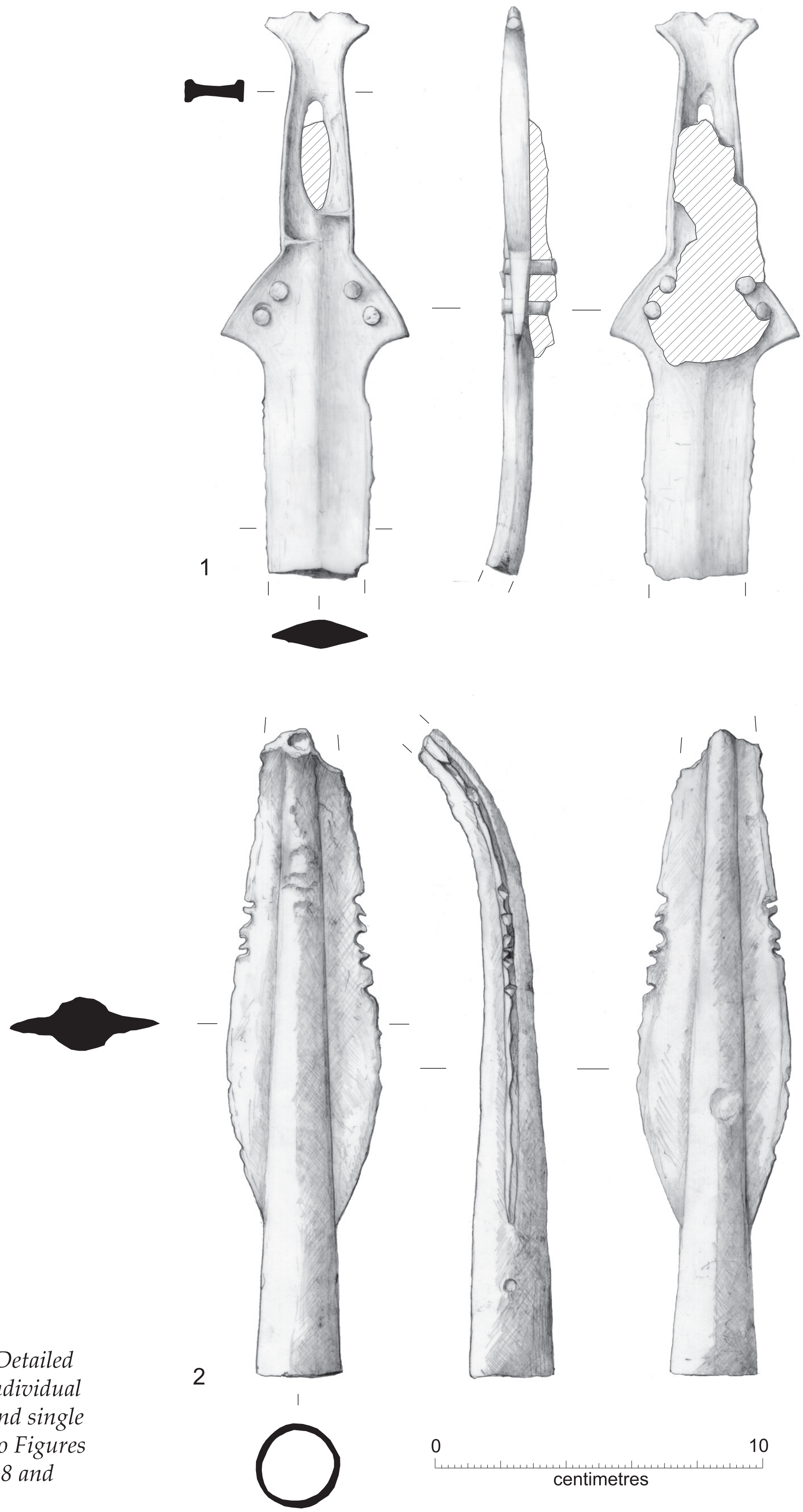


Figure 4.35. *Detailed drawings of individual hoard pieces and single spears (see also Figures 4.36, 4.37, 4.38 and 4.39).*

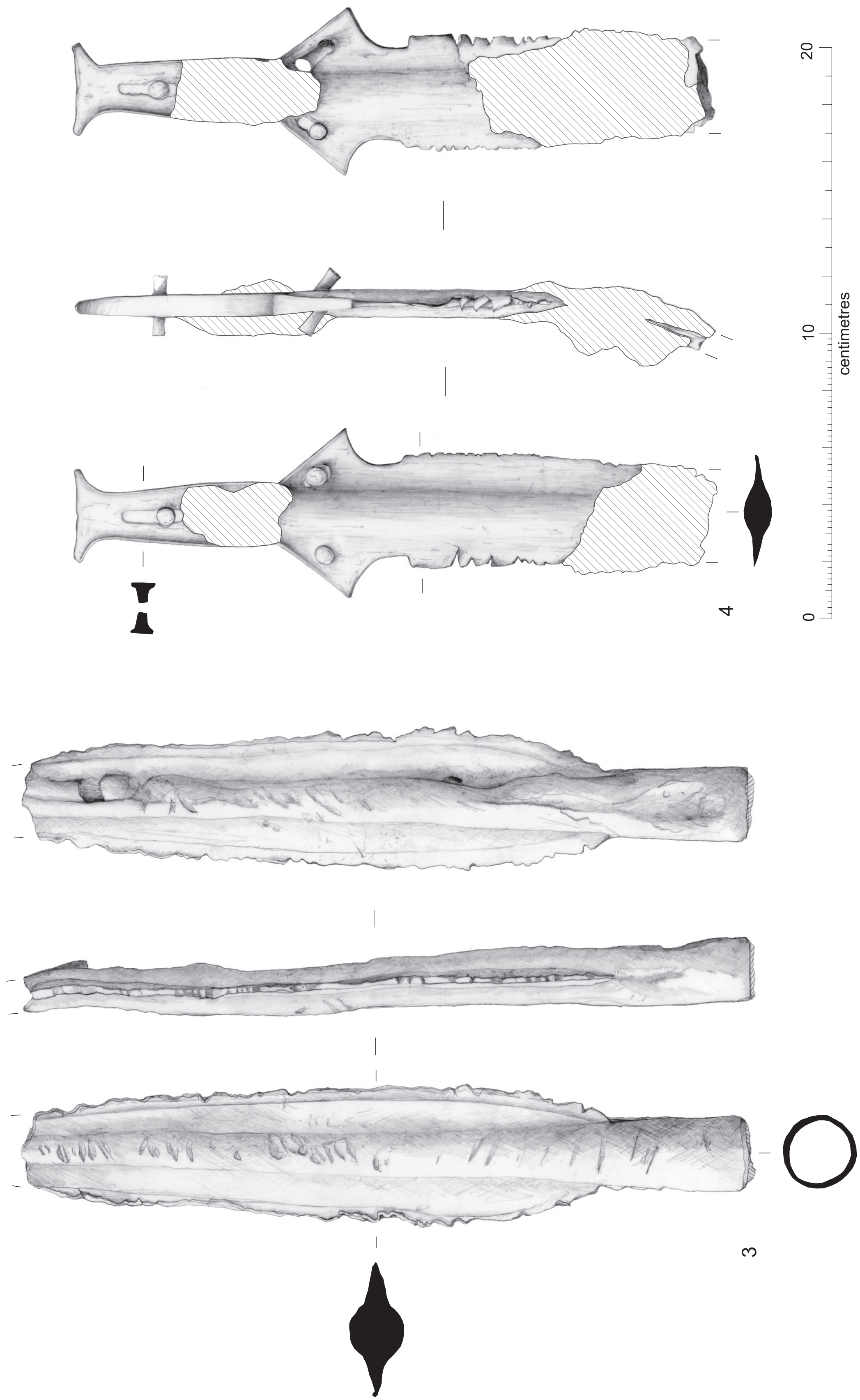


Figure 4.36. *Detailed drawings of individual hoard pieces and single spears (see also Figures 4.35, 4.37, 4.38 and 4.39).*

preserved in the socket, along with the possible survival of rivets. This form is characteristic of the Wilburton phase.

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.00	0.02	0.23	87.24	0.01	0.41	0.57	7.38	0.16
Bi	Pb	Au	Cd	S	Al	Si	Mn	
0.02	3.83	0.01	0.01	0.10	0.00	0.00	0.00	

HD 4 Sword fragment <1209> (Fig. 4.36, no. 4)
Description: The sword has an orange-brown patina with green and white patches. Both sides are heavily concreted with iron oxide clearly evident. Some copper mineralization has occurred, particularly on one side towards the ricasso. Both blade edges are severely notched with clear deformation of the metal away from the longitudinal axis of the blade, creating a 'gill' like appearance. A substantial portion of the blade is missing, with an irregular transverse break approximately 120mm below the ricasso. The blade is bowed towards the break. The hilt and shoulder appear undamaged with no traces of casting flashes or sprues. Three rivets remain *in situ*, two in the shoulder (one loose) and one in the hilt slot (loose); this rivet has enlarged the slot slightly. Additionally, the concretions present on either side of the hilt may preserve elements of an organic hilt. The preservation state of the fragment is reasonable.

Dimensions: Length 224mm; terminal 33mm; hilt maximum width 23mm; shoulder 58mm; ricasso 32mm; maximum blade width 39mm; weight 275g

Classification: Similar in appearance to HD 1, this sword differs notably in the number of rivets used for the attachment of an organic handle, the ricasso and angle of the shoulders. Metallurgical analysis suggests this sword falls into the Carp's Tongue complex, or similar period (see Northover, below).

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.01	0.00	0.00	91.73	0.00	0.01	0.00	7.76	0.02
Bi	Pb	Au	Cd	S	Al	Si	Mn	
0.00	0.01	0.03	0.00	0.40	0.00	0.01	0.01	

HD 5 & HD 17 Spearhead <1210> & <1222> (Fig. 4.37, no. 5 & no. 17)
Description: One side of the spearhead has a brown-green patina with some concretion and iron oxide deposits. The top fragment has a slight silvery shiny appearance on one wing. The other side has a brown to pale brown-green patina with green patches, iron oxide deposits and copper mineralization. The socket is broken, friable at the edges of the break and covered with concretions (peat remains and mud). Remains of a wooden haft were found *in situ*. Both blades are severely damaged and notched with numerous burrs, deformation and evident metal loss. The mid-rib is dented in several locations with a clearly defined deep circular depression on one side and transverse cut marks. The top section of the spearhead is missing. The break between these two portions is irregular and the precise mechanism of breakage is unclear. The preservation condition is good.

Dimensions: (from re-fitted fragments) Maximum width 59mm; maximum length 230mm; weight 264g

Classification: This is a hollow-blade leaf-shaped spearhead with a lozenge-shaped cross-section lacking a distinct mid-rib. There are slight channels towards the edge of the blades, creating a bevelled appearance. These are part of the original casting and not the result of finishing and sharpening. It is characteristic of the Wilburton phase. A similar example from the Wilburton Hoard has been dated to 1260–980 cal BC (OxA5036 2900±45) (Needham et al. 1997).

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.01	0.04	0.18	74.78	0.02	0.36	0.51	10.12	0.14
Bi	Pb	Au	Cd	S	Al	Si	Mn	
0.01	13.63	0.01	0.00	0.05	0.00	0.13	0.00	

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.00	0.02	0.19	76.75	0.03	0.35	0.46	9.61	0.18
Bi	Pb	Au	Cd	S	Al	Si	Mn	
0.02	12.15	0.02	0.00	0.20	0.00	0.01	0.00	

HD 6 Sword blade fragment <1211> (Fig. 4.37, no. 6)
Description: The blade fragment has a brown patina with green tinges in places. Iron oxide deposits exist on both sides of the fragment. Both blade edges are severely damaged and notched, with evident metal loss, distortion and 'curling' of the metal, forming burrs. Both transverse breaks exhibit sharp breaks, revealing in cross-section a lozenge-shaped profile. A possible chisel mark is preserved at the stepped transverse break. Along the central axis there is some distortion leading to a slightly bowed appearance. There is some minor pitting along the central rib of the fragment, minor corrosion and residual concretions. The preservation condition is good.

Dimensions: Maximum width 34mm; maximum length 66mm; maximum thickness 7.3mm; weight 59g

Classification: The blade fragment is narrow in width, with no obvious taper, and lozenge-shaped in cross-section. Some evidence for bevelling or sharpening of the blade edges survives. There are no casting flashes or sprues, suggesting that the sword was finished before deposition. Unclassified fragment.

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.00	0.05	0.30	75.03	0.00	0.57	0.85	8.84	0.21
Bi	Pb	Au	Cd	S	Al	Si	Mn	
0.01	13.78	0.04	0.00	0.29	0.00	0.02	0.00	

HD 7 Ferrule <1212> (Fig. 4.37, no. 7)
Description: The ferrule has a pale brown-green patina. Towards the top, there are three small transverse indentations, one with a sharp crescent-shape appearance. The top of the ferrule appears to be missing as the surface is uneven and pitted. There are concretions on the surface with some minor pitting observable. The overall preservation condition is good.

Dimensions: Maximum width 16mm; minimum width 12mm; maximum length 121mm; weight 50g

Classification: This is a slightly tapering incomplete tubular circular ferrule. Although the top is missing the base is intact. Ferrules of this variety span the Middle Bronze Age and Late Bronze Age and are interpreted as spear-shaft attachments (Savory 1980, 57).

HD 8 Spearhead <1213> (Fig. 4.37, no. 8)
Description: The spearhead has a brown-green patina with occasional concretions and some copper mineralization. The socket is complete

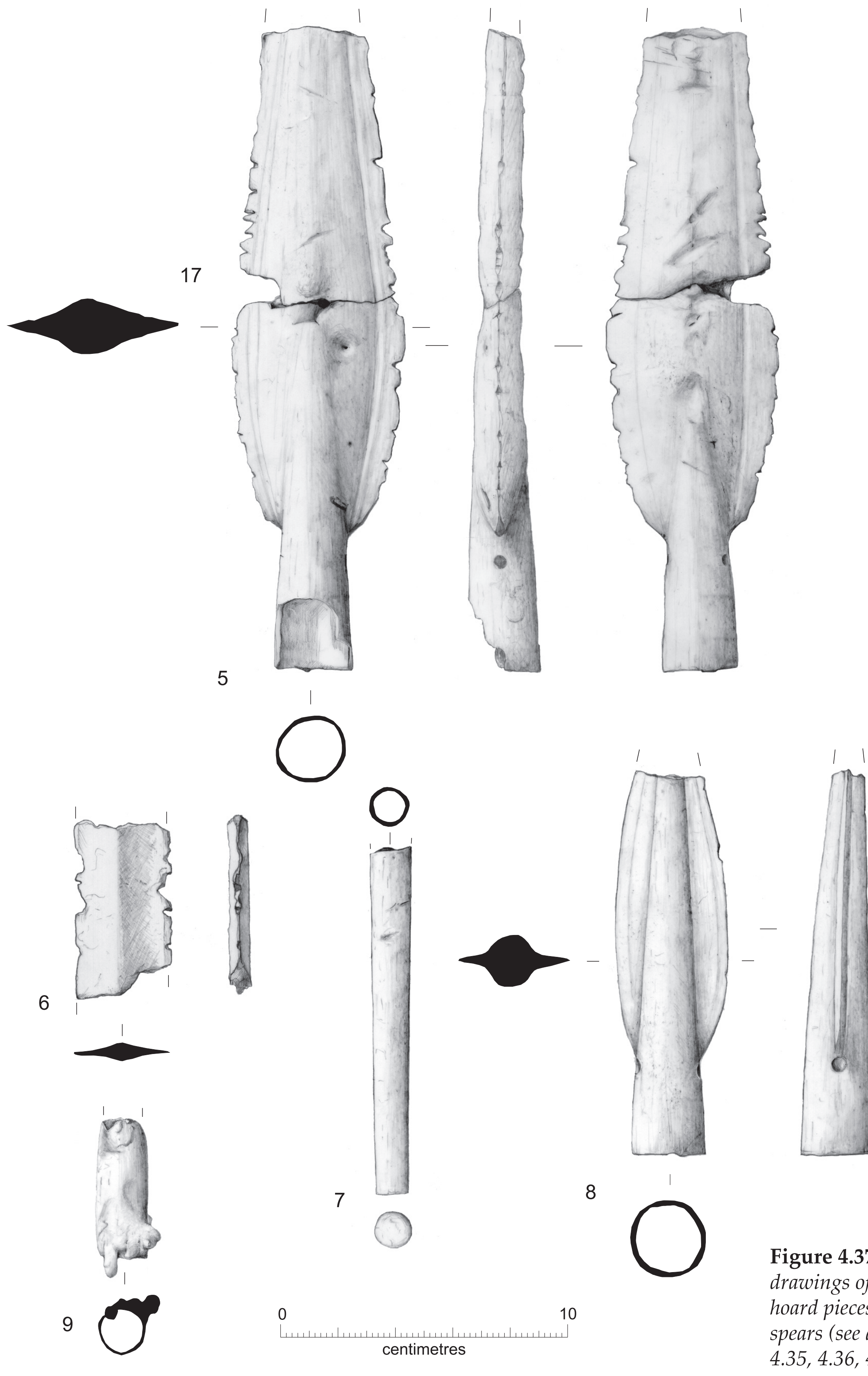


Figure 4.37. *Detailed drawings of individual hoard pieces and single spears (see also Figures 4.35, 4.36, 4.38 and 4.39).*

with two rivet holes and possible haft *in situ*. The blades are bevelled and sharp, with occasional small nicks. The wings are asymmetrical. The tip is missing with a slightly irregular transverse break revealing a distinct circular mid-rib in cross-section. The preservation condition is very good.

Dimensions: Maximum width 38mm; maximum length 132mm; weight 155g

Classification: A substantially complete leaf-shaped pegged-socketed spearhead similar to SF 55, SF 62, SF 64 and HD 10. The finishing is to a high standard, evidenced by the sharpness of the surviving parts of the blades and lack of casting seams on the socket. The asymmetry of the blades may indicate differential sharpening or a flaw in the original casting process. It is generic in form, thus possibly pre-dating the Wilburton phase.

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.01	0.01	0.11	75.04	0.00	0.24	0.45	12.89	0.13

Bi	Pb	Au	Cd	S	Al	Si	Mn
0.00	10.90	0.03	0.00	0.17	0.00	0.01	0.00

HD 9 Copper alloy tube <1214> (Fig. 4.37, no. 9)
Description: The tube has an orange-brown patina, cream coloured patches, concretions and iron oxide deposits. One end of the tube is crushed and distorted with the metal pushed outwards with an irregular break. There is some minor copper mineralization towards this end. At the undamaged end, solidified metal droplets are present. It is unclear whether these originated from the object, but clearly demonstrate the tube was exposed to, or was near to, a high temperature heat source. One of these droplets has a silver-tin appearance following the careful removal of residual mud. There is no evidence of casting seams or rivet holes. The interior of the tube is coated in a layer of iron oxide, presumably from residual peat. The overall preservation condition is good.

Dimensions: Maximum diameter 19mm; maximum length 47mm; weight 43g

Classification: This fragment was found in association with the hoard. It is heavy for its size and despite the damage to one end does not have an obvious taper. The function or purpose of this piece is unknown, although it may be a fragment of a ferrule or socketed gouge.

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.10	0.01	0.05	84.90	0.01	0.07	0.07	11.66	0.03

Bi	Pb	Au	Cd	S	Al	Si	Mn
0.02	3.03	0.01	0.00	0.04	0.00	0.02	0.00

HD 10 Spearhead <1215> (Fig. 4.38, no. 10)
Description: The spearhead has a brown-green patina with white sandy patches and concretions creating a rough surface. The socket is complete with casting seams and two rivet holes. The socket is circular in cross-section whilst the mid-rib is hexagonal. The spearhead is bent giving it a curved appearance in profile. The blades are bevelled and sharp, with occasional nicks and dents. A narrow vertical 'slice' is missing on one blade, extending about 12mm from the tip. The preservation condition is good.

Dimensions: Maximum width 34mm; maximum length 121mm; weight 97g

Classification: This is a complete leaf-shaped pegged-socketed spearhead similar in form and date to SF 55, SF 62, SF 64 and HD 8.

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.11	0.03	0.22	89.71	0.00	0.48	0.70	7.79	0.17

Bi	Pb	Au	Cd	S	Al	Si	Mn
0.02	0.71	0.02	0.01	0.01	0.00	0.01	0.01

HD 11, 12a & 12b Long-tongue chape fragments <1216> <1217> (Fig. 4.38, nos 11–12)
Description: The chape fragments have a brown patina, green patches, significant concretions and iron oxide deposits. Traces of peat and plant matter are present on the interior surfaces of the larger fragments. Several smaller fragments remain encased in this matrix. The surviving refitted pieces form a lozenge-shaped cross-section, with median ribs and flat edges. The breaks are irregular, but re-fitting the fragments enables the profile to be reconstructed. The preservation condition is good to poor.

Dimensions: (from re-fitted fragments) Maximum width 70mm; minimum width 30mm; maximum length 178mm; weight 83g

Classification: The re-fitted fragments reveal that the majority of the chape is present, although the lower portion is missing. Classified as a long-tongue chape, this type dates to the Wilburton phase of the Late Bronze Age.

HD 13 Spearhead fragment <1218> (Fig. 4.38, no. 13)
Description: The fragment has a brown patina with green patches and concretions on both sides with occasional iron oxide deposits. Both transverse breaks exhibit regular sharp breaks, revealing in cross-section a lozenge-shaped profile. There is a possible chisel mark towards the wider end of the fragment, whereas the break at the narrower end is clean. This break may represent a brittle-zone fracture, although there is a very slight deflection seen in the transverse plane. There are minor dents in the blade edges, but no other significant damage to the fragment. The preservation condition is good.

Dimensions: Maximum width 46mm; minimum width 29mm; maximum length 67mm; weight 74g

Classification: The fragment tapers with straight parallel sides from 46mm to 29mm. In cross-section, the fragment reveals the spearhead to be hollow-cast and lozenge-shaped lacking a distinct mid-rib. The blade edges are bevelled and sharp. Classified as a leaf-shaped hollow-blade spearhead similar to HD 5, it is contemporaneous with the Wilburton phase of the Late Bronze Age.

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.00	0.01	0.19	81.12	0.01	0.31	0.48	7.25	0.26

Bi	Pb	Au	Cd	S	Al	Si	Mn
0.01	10.08	0.03	0.00	0.24	0.00	0.01	0.00

HD 14 Spearhead fragment <1219> (Fig. 4.38, no. 14)
Description: The spearhead has a pale brown to green patina with white patches and some copper mineralization. The socket is broken, with an irregular break, crushed and slightly distorted to one side. Residual peat and soil is present in the socket, possibly preserving elements of a haft. A large solidified metal droplet is present on the exterior rim of the socket, indicating the spearhead was close to a high temperature heat source. The mid-rib is severely dented

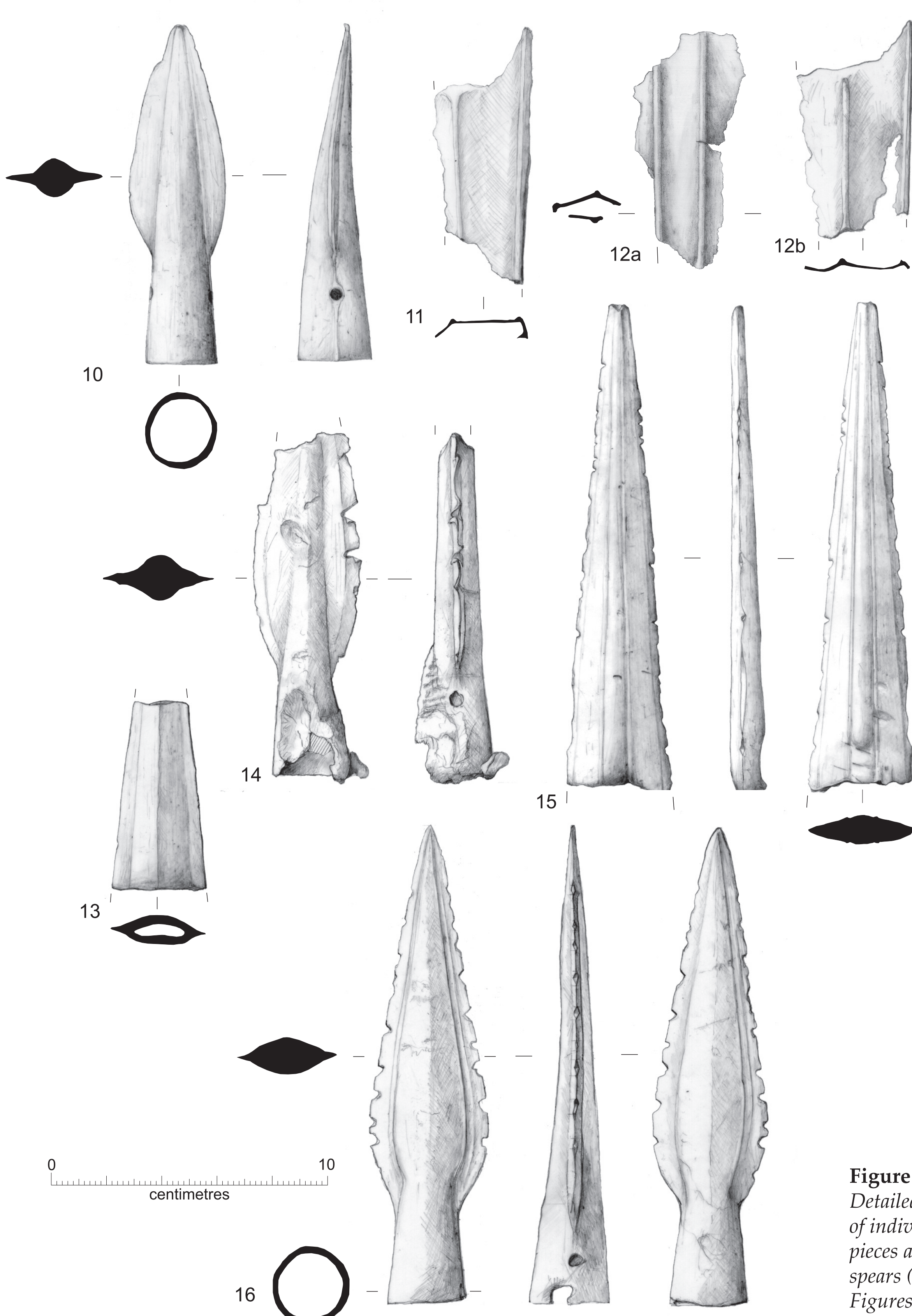


Figure 4.38. *Detailed drawings of individual hoard pieces and single spears (see also Figures 4.35, 4.36, 4.37 and 4.39).*

on one side, possibly caused by a chisel-like implement. There is a transverse cut mark on one side of the spearhead extending from the blade edge to the mid-rib. Both blades are severely damaged with two large notches and burrs on one edge. The opposing blade is dented and rolled with a vertical 'slice' missing towards the top of the spearhead. There is an irregular transverse break at the top of the fragment, revealing a hollow-cast lozenge-shaped cross-section with a distinct rounded mid-rib. Despite the obvious damage the preservation condition is good.

Dimensions: Maximum width 39mm; maximum length 130mm; weight 138g

Classification: This spearhead is similar in form and date to HD 5, but with a more distinct mid-rib. It has bevelled sharp edges and where there is little damage there are no observable casting seams or flashes, indicating the spearhead was originally finished to a high standard.

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.07	0.06	0.15	76.69	0.01	0.32	0.46	9.67	0.23
0.08	0.03	0.15	81.54	0.01	0.59	0.73	13.11	0.18

Bi	Pb	Au	Cd	S	Al	Si	Mn
0.00	11.90	0.03	0.00	0.31	0.00	0.10	0.00
0.02	3.39	0.01	0.00	0.15	0.00	0.01	0.01

HD 15 Spearhead fragment <1220> (Fig. 4.38, no. 15)
Description: The fragment has brown patina with minor concretions and some copper mineralization. The surface has some residual peat and mud present and occasional iron oxide deposits. This is an incomplete spearhead fragment missing the socket and extreme tip. The mid-rib and wing bodies are largely undamaged, with occasional dents. The mid-rib is emphasized by the presence of small ribs that extend along the entire length of the fragment. The blades are bevelled and sharp, but are severely nicked with curling, burrs and evident metal loss. The transverse break towards the base of the fragment is irregular and pushed in one direction with the adjacent mid-rib flattened. The transverse break at the tip is slightly distorted and irregular. The overall preservation condition is very good.

Dimensions: Maximum width 36mm; maximum length 179mm; weight 235g

Classification: This is a substantial fragment of a large channel hollow-blade spearhead with added ribs enhancing the mid-rib. There is no evidence of pointillé decoration, such as that seen on a similar example from the Blackmoor Hoard (Burgess & Colquhoun 1988). However, three similar examples form part of the Wilburton Hoard (ibid.). Using these examples as a guide, this specimen would measure between 220–300mm. It dates to the Wilburton phase, although the form may have originated in the Penard phase of the Middle Bronze Age.

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.00	0.01	0.11	83.11	0.01	0.18	0.30	9.93	0.08

Bi	Pb	Au	Cd	S	Al	Si	Mn
0.03	6.03	0.02	0.00	0.12	0.01	0.05	0.00

HD 16 Spearhead <1221> (Fig. 4.38, no. 16)
Description: The spearhead has a mid-brown patina with some concretions and copper mineralization. The surface has some residual peat and mud present and iron oxide deposits. The socket is undamaged with two rivet holes, although there is a casting flaw in the rim itself. Apart from the concretions, there is no observable damage on the main body of the spear. There is no distinct mid-rib, but the wings are stepped and the edges bevelled. The blades have regular deep notches and burrs with evident metal loss. The overall preservation condition is very good.

Dimensions: Maximum width 42mm; maximum length 173mm; weight 160g

Classification: Similar to SF 66, this complete example is smaller than the other hollow-blade spearheads found at Bradley Fen. Although the socket is circular in profile, the spearhead has an overall rounded lozenge-shaped cross-section. There are no traces of the casting process, indicative of a high standard of finishing. The form dates to the Wilburton phase (Burgess & Colquhoun 1988, 42; Needham et al. 1997, 91).

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.00	0.01	0.10	81.72	0.00	0.14	0.23	8.33	0.09

Bi	Pb	Au	Cd	S	Al	Si	Mn
0.01	9.16	0.03	0.01	0.17	0.00	0.01	0.00

HD 18 Sword blade fragment <1223> (Fig. 4.39, no. 18)
Description: The blade fragment has a mid-brown patina with concretions, largely on one side, residual mud and some copper mineralization. Both edges are nicked and dented with curling and formation of burrs. The fragment is severely distorted and bent where it tapers toward the tip. The extreme tip is missing with a regular transverse break, revealing a rounded lozenge-shaped cross-section. Evidence for bevelling and sharpening of the blade edges survive. The preservation condition is very good.

Dimensions: Maximum width 34mm; minimum width 14; maximum length 80mm; maximum thickness 6mm; weight 47g

Classification: The blade fragment tapers from a maximum width of 34mm to 14mm, with parallel straight edges. Similar to HD 6 and HD 20, the fragment is unclassified.

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.00	0.05	0.33	81.81	0.00	0.60	0.86	8.79	0.39

Bi	Pb	Au	Cd	S	Al	Si	Mn
0.02	6.74	0.03	0.00	0.36	0.00	0.01	0.00

HD 19 Sword fragment <1224> (Fig. 4.39, no. 19)
Description: The sword has a brown to dark brown patina with green and white patches. Both sides of the hilt and blade are heavily concreted, with residual peat and iron oxide deposits clearly evident. Some copper mineralization has occurred. There are four rivet holes in the shoulder with one retaining a rivet and one loose rivet in the hilt slot. The ricasso notch has a slight concavity. Although the blade edges are partially obscured, they are clearly bevelled, with occasional notches and dents and evident metal loss, but not to the same extent as HD 4. A substantial portion of the blade is missing, with an irregular transverse break approximately 100mm below the ricasso. The blade is severely distorted approximately 28mm above the break. The break is irregular and obscured by corrosion products, concretions and iron oxide deposits. The hilt is flanged, possesses a fish-tail terminal and appears undamaged. It shows no traces of casting flashes or sprues, although the rivet

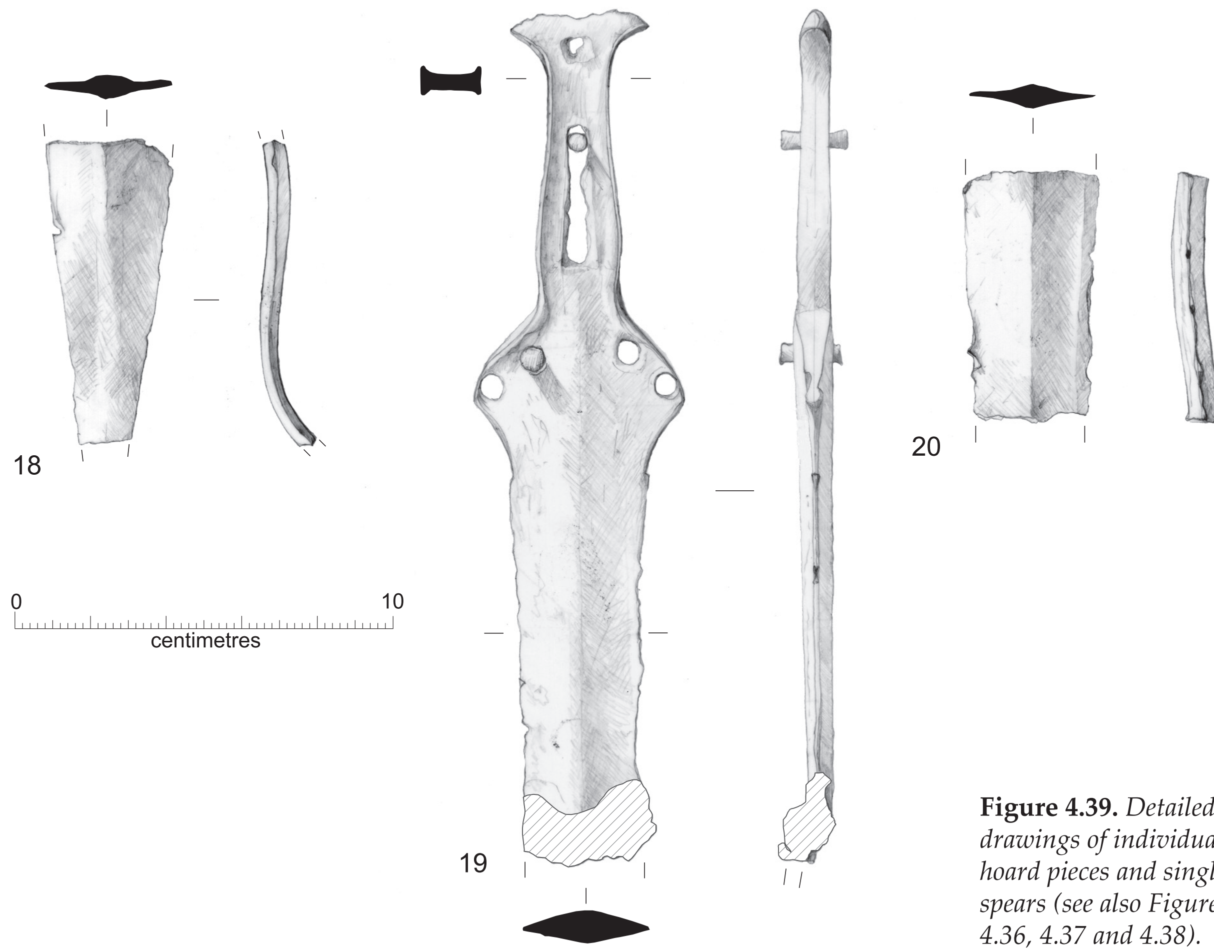


Figure 4.39. *Detailed drawings of individual hoard pieces and single spears (see also Figures 4.35, 4.36, 4.37 and 4.38).*

slot retains part of the casting sprue. Towards the terminal is a cast rectangular perforation. Flashing is present on the interior surface of this perforation. The preservation state, despite the concretions, is good.

Dimensions: Length 225mm; terminal 35mm; hilt maximum width 23mm; shoulder 55mm; ricasso 35mm; maximum blade width 32mm; weight 268g

Classification: Similar to HD 1 this sword differs in the number of rivets used for the attachment of an organic handle, the ricasso length and angle of the shoulders. The angle of the shoulders and ricasso are indicative of a Wilburton variant D type sword (Burgess & Colquhoun 1988, 48).

HD 20 Sword blade fragment <1225> (Fig. 4.39, no. 20)
Description: The blade fragment has a green-brown patina with iron oxide and concretion on one side. Both edges are nicked and dented with partial curling and formation of burrs. The fragment is slightly bowed along the blade's longitudinal axis. Evidence for bevelling and sharpening of the blade edges survives. The transverse breaks are irregular, revealing a lozenge-shaped cross-section similar to HD 6. Both breaks have a small stepped cut mark, possibly indicating the use of a chisel-like object to break up the sword. The preservation condition is good.

Dimensions: Maximum width 33.5mm; maximum length 65mm; maximum thickness 8.8mm; weight 84g

Classification: The blade fragment is narrow in width, with a slight taper and lozenge-shaped in cross-section, as with HD 6 and HD 18. Unclassified fragment.

Analysis:

Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag
0.01	0.03	0.20	76.04	0.01	0.34	0.51	9.44	0.13

Bi	Pb	Au	Cd	S	Al	Si	Mn
0.00	13.02	0.01	0.00	0.25	0.00	0.01	0.01

Analysis and metallography of Bronze Age metalwork (Peter Northover)

The metalwork recovered at Bradley Fen is primarily characteristic of the Wilburton period of the Late Bronze Age in Britain, although there are elements which are suggestive of the transition to the succeeding Ewart Phase. This dating is also supported by the radiocarbon dates. With this in mind, the characterization of the Bronze Age metalwork from Bradley Fen was undertaken:

a) to assist in the dating of the material within the Wilburton/Blackmoor sequence using the known

variations in time of Bronze compositions from the Wilburton into the Ewart Park period
b) to look for evidence of any special treatment of the metal associated with deposition
c) to determine whether there are any differences in composition or treatment between the objects in the hoard (20) and those deposited singly (6).

To do this required both compositional analysis and metallographic examination of the metalwork and this requirement dictated the type and location of the samples. Not all the 28 pieces of metal, which came from 25 objects, could be sampled owing to their condition. Those not sampled were the ferrule HD 7, the chape HD 11–12, the sword fragment HD 19 and the spearhead SF 64.

All but one of the samples were cut using a jeweller's piercing saw with a blade with 32 teeth/cm. Sampling locations were selected to maximize the information about the condition of the object, e.g. close to edge damage or burning, consistent with minimizing the impact of the sampling. Where a suitable sample could not be extracted without undue damage, it was drilled instead; the only sample so taken was that from the blob of fused metal attached to HD 14.

The samples were hot-mounted in a carbon-filled thermosetting resin, ground and polished to a 1μm finish. Analysis was by electron probe microanalysis using wavelength dispersive spectrometry. Operating conditions were an accelerating voltage of 20kV, a beam current of 30nA and an X-ray take-off angle of 40º. Counting times were 10s or 20s per element and pure element and mineral standards were used. Seventeen elements were analysed (Fe, Co, Ni, Cu, Zn, As, Sb, Sn, Ag, Bi, Pb, Au, Cd, S, Al, Si, Mn); detection limits were 100–200ppm for most elements, except 300ppm for gold.

From 5 to 14 areas, each 30 × 50μm, were analysed on each sample. Individual analyses and their means, normalized to 100%, are given in full in the site archive (Northover 2010, Appendix) and are summarized above by catalogue entry and in Table 4.17 by impurity pattern. All concentrations are in weight %. The writer is indebted to Mr C.J. Salter for his great assistance with the analyses.

After analysis, the cut samples were examined metallographically in both the as-polished and etched states. The etches used were an acidified aqueous solution of ferric chloride for the copper alloys and an ammoniacal solution of hydrogen peroxide for the silver mount.

The alloys

Of the 22 items sampled, 2 can be described definitively as unleaded bronze, lead being present only as a trace element. The two are a sword (HD 4) and a spearhead (SF 55). While there may well have been segregation of lead in casting both spearheads and swords it would not have been so extreme as to leave lead at trace levels only at the edge of the object. The sword fragment is rather unusual, having a combination of a broad, thick mid-rib, sharply angled ricasso and V-shaped shoulders, features which together seem prototypical of a Carp's Tongue sword and which raise the possibility that the sword might have been imported. In contrast, the spearhead is of a very typical Late Bronze Age pegged form. However, both sword and spearhead have impurity patterns which are unique for the site and the two weapons will be discussed further under that heading.

Three analysed samples had measured lead contents below that which would significantly modify the casting behaviour of the melt. It is, of course, possible for this to be the result of extreme segregation between the surface and the centre of a more heavily leaded casting (Hughes et al. 1982) and the effects of corrosion in removing what lead there was. In fact, the general pattern of segregation is not normally so severe (Northover & Bridgford 2002), so that it is most probable that the objects concerned were never heavily leaded, while corrosion only rarely removes so much of the lead. In other words, these samples genuinely had low lead contents. They are all small plain spearheads (SF 62, SF 69 and HD 10), with lead contents of 0.7%, 1.3% and 1.2% respectively and tin contents of 7.8%, 7.9% and 10.8%. Evidence from the analysis of the Waterden weapon assemblage in Norfolk (Northover & Bridgford 2002; Rogerson et al. forthcoming), which is closely contemporary with the metalwork from Bradley Fen, showed that the alloys of spearheads were nowhere near as tightly controlled as those for swords and that for small weapons like this any suitable scrap would have been used without further addition of tin or lead. To explore the question of segregation further, both portions of a hollow-bladed spearhead (HD 5 and HD 17) were analysed at widely separated locations and the two compositions were found to be very close indeed (9.6% and 10.1% tin; 12.2% and 13.6% lead).

The remaining objects can be described as having been cast in medium tin leaded bronze. The range of tin and lead contents is illustrated in Fig. 4.40. One variable which cannot be ignored is the state of corrosion with, in particular, a strong probability of lead being lost. To address this, every effort was made to analyse only uncorroded parts of the samples, which perhaps in itself biased the picture. Adding to this is the observation that the total number of samples is much smaller than the 146 analysed from Waterden, so any conclusion about alloy selection must be

Table 4.17. *Compositions of copper alloy metalwork (ordered by impurity pattern).*

No.	Object	Sample	Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag	Bi	Pb	Au	Cd	S	Al	Si	Mn
HD 4	Sword fragment, hilt section	Edge	0.01	0.00	0.00	91.73	0.00	0.01	0.00	7.76	0.02	0.00	0.01	0.03	0.00	0.40	0.00	0.01	0.01
SF 55	Spearhead, leaf-shaped, small	Socket	0.01	0.02	0.14	89.05	0.01	0.23	0.03	10.02	0.03	0.01	0.05	0.05	0.00	0.33	0.00	0.01	0.00
HD 9	Tubular fragment, heated	End	0.10	0.01	0.05	84.90	0.01	0.07	0.07	11.66	0.03	0.02	3.03	0.01	0.00	0.04	0.00	0.02	0.00
HD 16	Spearhead, hollow-bladed	Edge	0.00	0.01	0.10	81.72	0.00	0.14	0.23	8.33	0.09	0.01	9.16	0.03	0.01	0.17	0.00	0.01	0.00
SF 69	Spearhead, leaf-shaped, small	Socket	0.06	0.01	0.09	87.05	0.01	0.16	0.23	10.84	0.05	0.01	1.23	0.05	0.00	0.19	0.00	0.02	0.00
HD 15	Spearhead, fillet-defined mid-rib, blade	Edge	0.00	0.01	0.11	83.11	0.01	0.18	0.30	9.93	0.08	0.03	6.03	0.02	0.00	0.12	0.01	0.05	0.00
HD 8	Spearhead, leaf-shaped	Edge	0.01	0.01	0.11	75.04	0.00	0.24	0.45	12.89	0.13	0.00	10.90	0.03	0.00	0.17	0.00	0.01	0.00
HD 17	Spearhead, hollow-bladed, large	Edge	0.00	0.02	0.19	76.75	0.03	0.35	0.46	9.61	0.18	0.02	12.15	0.02	0.00	0.20	0.00	0.01	0.00
HD 14	Spearhead, plain, hollow-winged	Edge	0.07	0.06	0.15	76.69	0.01	0.32	0.46	9.67	0.23	0.00	11.90	0.03	0.00	0.31	0.00	0.10	0.00
HD 13	Spearhead, hollow-bladed, fragment	Fracture	0.00	0.01	0.19	81.12	0.01	0.31	0.48	7.25	0.26	0.01	10.08	0.03	0.00	0.24	0.00	0.01	0.00
HD 20	Sword blade fragment, lozenge section	Edge	0.01	0.03	0.20	76.04	0.01	0.34	0.51	9.44	0.13	0.00	13.02	0.01	0.00	0.25	0.00	0.01	0.01
HD 5	Spearhead, hollow-bladed, large	Edge	0.01	0.04	0.18	74.78	0.02	0.36	0.51	10.12	0.14	0.01	13.63	0.01	0.00	0.05	0.00	0.13	0.00
HD 3	Spearhead, long, narrow, distorted	Edge	0.00	0.02	0.23	87.24	0.01	0.41	0.57	7.38	0.16	0.02	3.83	0.01	0.01	0.10	0.00	0.00	0.00
HD 2	Spearhead, leaf-shaped, distorted	Edge	0.02	0.03	0.19	85.68	0.01	0.42	0.59	9.33	0.17	0.03	3.01	0.01	0.00	0.49	0.00	0.01	0.00
SF 62	Spearhead, leaf-shaped	Edge	0.01	0.04	0.28	89.09	0.00	0.50	0.61	7.90	0.14	0.01	1.34	0.01	0.01	0.05	0.00	0.00	0.01
HD 1	Sword fragment, hilt section	Fracture	0.00	0.04	0.27	80.13	0.00	0.44	0.68	7.19	0.23	0.02	10.74	0.01	0.00	0.23	0.00	0.01	0.00
HD 10	Spearhead, leaf-shaped	Edge	0.11	0.03	0.22	89.71	0.00	0.48	0.70	7.79	0.17	0.02	0.71	0.02	0.01	0.01	0.00	0.01	0.01
HD 14	Spearhead, plain, hollow-winged	Blob	0.08	0.03	0.15	81.54	0.01	0.59	0.73	13.11	0.18	0.02	3.39	0.01	0.00	0.15	0.00	0.01	0.01
HD 6	Sword blade fragment, lozenge section	Edge	0.00	0.05	0.30	75.03	0.00	0.57	0.85	8.84	0.21	0.01	13.78	0.04	0.00	0.29	0.00	0.02	0.00
HD 18	Sword tip fragment, lozenge section	Edge	0.00	0.05	0.33	81.81	0.00	0.60	0.86	8.79	0.39	0.02	6.74	0.03	0.00	0.36	0.00	0.01	0.00
SF 66	Spearhead, stepped blade	Fracture	0.01	0.04	0.33	85.79	0.00	0.63	0.95	9.29	0.35	0.01	2.50	0.05	0.00	0.03	0.00	0.01	0.01
SF 63	Spearhead, hollow-winged	Edge	0.04	0.02	0.32	76.37	0.02	0.87	1.94	13.86	0.38	0.01	5.81	0.00	0.00	0.19	0.01	0.16	0.00

very tentative. However, excepting the one unleaded bronze sword, the alloys used in the swords form a much tighter grouping than that for the spearheads, replicating the pattern from Waterden.

The lead contents could also be used to demonstrate a difference between the spearheads deposited singly, where 4 out of 5 have <5% lead, while only 6 out of 17 items analysed from the hoard have <5% lead.

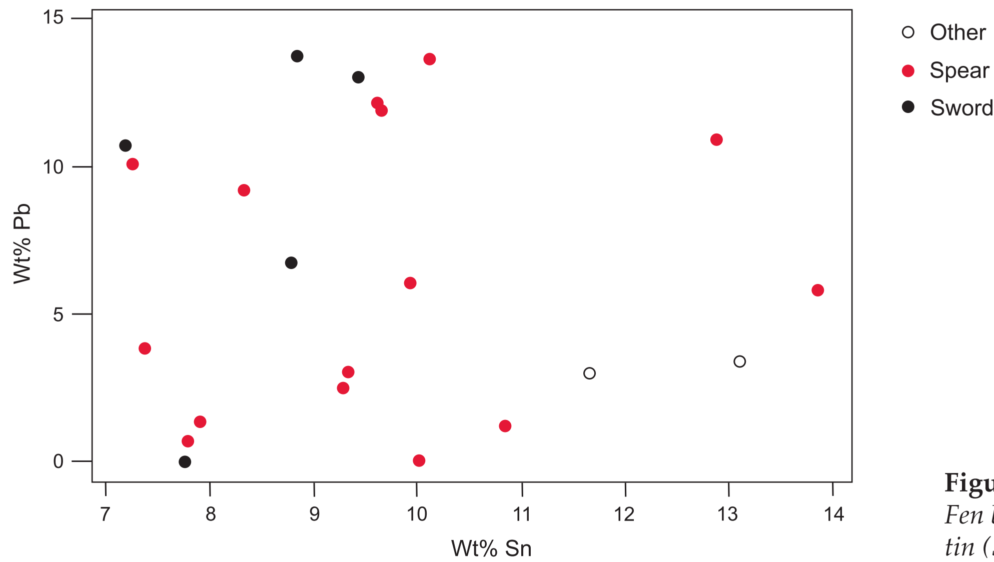


Figure 4.40. *Bradley Fen bronze content – tin (Sn) and lead (Pb).*

Given the small numbers of objects and the variability of spearhead compositions it is very difficult to regard this as significant.

Impurity patterns

The majority of the objects analysed have an impurity pattern defined by the presence of nickel, arsenic, antimony and silver. If pairs of these elements are plotted against each other (Fig. 4.41a–c), these elements are often strongly correlated with, overall, Sb>As and Ni>Ag. The correlation comes initially from the nature of the *fahlerz* ore, from which these impurities derive, and the way in which it was smelted. The range of concentrations of these impurities could then be extended to lower concentrations by mixing with metal with low impurity totals (Northover 1982; 1983).

For antimony contents of 0.5% and above, with Sb>As, the impurity pattern was labelled 'S' in a system of labels for impurity patterns devised for the Bronze Age in Wales (Northover 1980) but now used more widely for the British and Irish Bronze Age as a whole. An extensive programme of analysis of Wilburton period metalwork (Northover 1982) then showed that 'S' metal was by far the dominant group of compositions in that period. Further work showed that in the succeeding Ewart Park period the same impurities tended to persist, especially in eastern England, but usually at lower concentrations (impurity patterns TA, TB (Cowie et al. 1998)). It was suggested that one measure of change with time would be the proportion of compositions in an assemblage which fall into the 'S' group, starting with the Andover hoard, which has been regarded as relatively early in the century or so of the Wilburton period, and ending with the Isleham hoard, which contains items regarded as late in Wilburton and, with Blackmoor, transitional to Ewart Park. The comparison, set out in Table 4.18, also includes the weapon assemblage from Waterden, with its early Ewart park style swords and Wilburton radiocarbon dates, and two contemporary hoards from across the English Channel.

The decrease in the proportion of 'S' metal has a number of causes which worked together: changes in the concentrations of the diagnostic impurities in bronze imported with an Ni/As/Sb/Ag impurity pattern, loss of impurities on re-melting and mixing with other bronze with much lower impurity concentrations during recycling. One source of the latter class of metal is to be found in the plate scrap which is a feature of some Wilburton hoards such as Guilsfield, Isleham and Syon Reach. The bronze in the plate scrap may have originated in western, Atlantic Europe, especially in north-western and western France. This region

Table 4.18. *'S' metal content of Wilburton assemblages*

Hoard	% 'S' metal
Andover, Hampshire	100
Ivinghoe Beacon, Buckinghamshire	100
Nettleham, Lincolnshire	90
Guilsfield, Powys	75
Wilburton, Cambridgeshire	68
Waterden, Norfolk	68
Isleham, Cambridgeshire	56
Bradley Fen, Cambridgeshire	55
Blackmoor, Hampshire	23
Close de la Blanche Pierre, Jersey	86
St Brieuc-des-Iffs, Ille-et-Vilaine	68

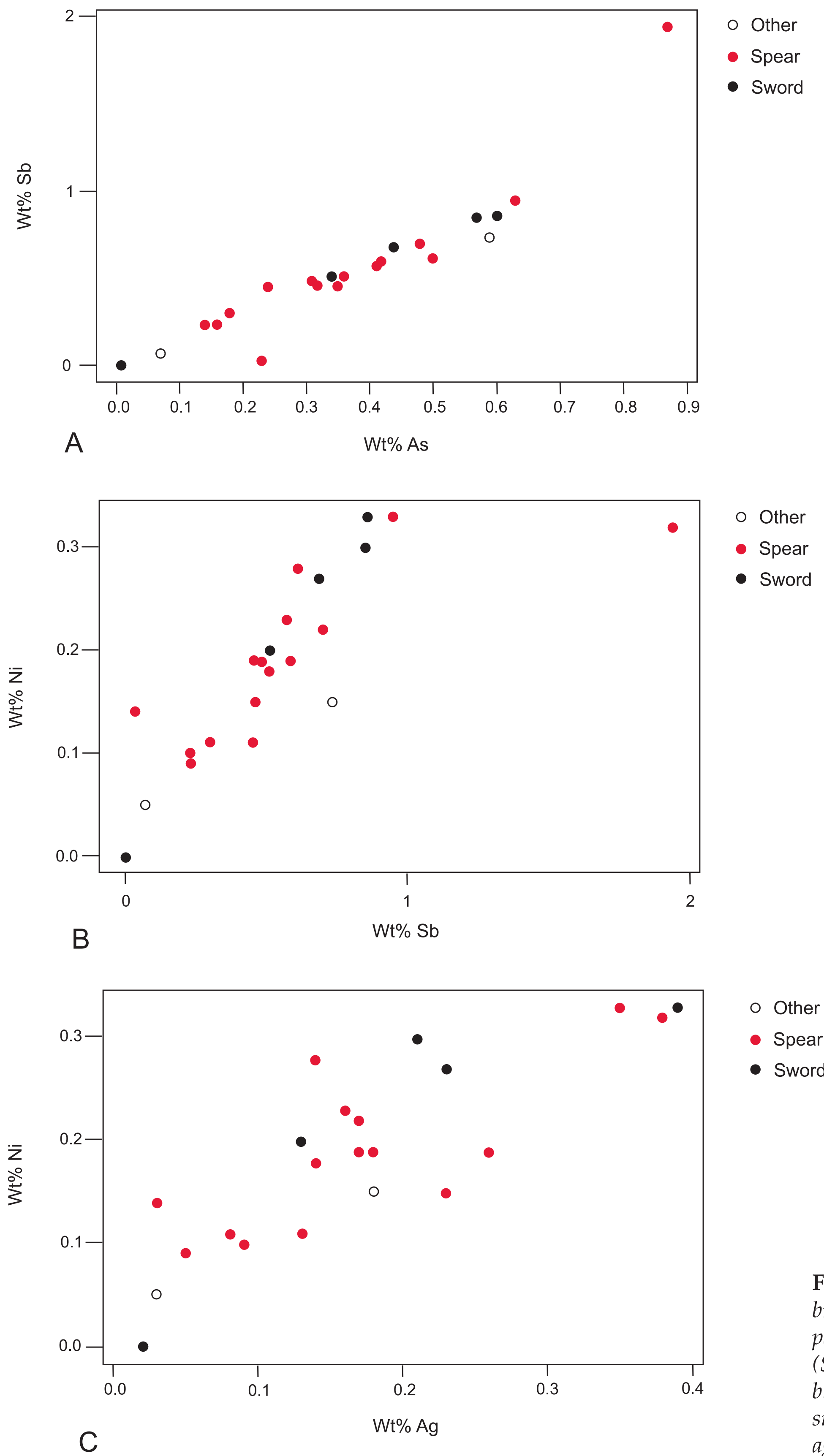


Figure 4.41. *Bradley Fen bronze content – impurity patterns. a. antimony (Sb) against arsenic (As); b. nickel (Ni) against silver (Ag); c. nickel (Ni) against antimony (Sb).*

Table 4.19. *Matches between fragments (all edge samples except for HD 1).*

No.	Object	Fe	Co	Ni	Cu	Zn	As	Sb	Sn	Ag	Bi	Pb	Au	Cd	S	Al	Si	Mn
HD 5	Spearhead, hollow-bladed	0.01	0.04	0.18	74.78	0.02	0.36	0.51	10.12	0.14	0.01	13.63	0.01	0.00	0.05	0.00	0.13	0.00
HD 17	Spearhead, hollow-bladed	0.00	0.02	0.19	76.75	0.03	0.35	0.46	9.61	0.18	0.02	12.15	0.02	0.00	0.20	0.00	0.01	0.00
HD 4	Sword fragment, hilt	0.01	0.00	0.00	91.73	0.00	0.01	0.00	7.76	0.02	0.00	0.01	0.03	0.00	0.40	0.00	0.01	0.01
HD 20	Sword blade fragment, lozenge	0.01	0.03	0.20	76.04	0.01	0.34	0.51	9.44	0.13	0.00	13.02	0.01	0.00	0.25	0.00	0.01	0.01
HD 1	Sword fragment, hilt	0.00	0.04	0.27	80.13	0.00	0.44	0.68	7.19	0.23	0.02	10.74	0.01	0.00	0.23	0.00	0.01	0.00
HD 6	Sword blade fragment, lozenge	0.00	0.05	0.30	75.03	0.00	0.57	0.85	8.84	0.21	0.01	13.78	0.04	0.00	0.29	0.00	0.02	0.00
HD 18	Sword tip fragment, lozenge	0.00	0.05	0.33	81.81	0.00	0.60	0.86	8.79	0.39	0.02	6.74	0.03	0.00	0.36	0.00	0.01	0.00

became increasingly important as a source of bronze and copper from the latter part of the Wilburton period through into Ewart Park and was especially associated with metal of the Carp's Tongue complex. The import of this metal initially had a greater impact in southern than in eastern England, hence the low proportion of 'S' metal in Blackmoor. Table 4.18 would suggest that the Bradley Fen metalwork might be quite close in date to both Isleham and Waterden, but it must be remembered that, while almost all of Waterden was analysed, only 2.5% of the fragments in the Isleham hoard have been analysed.

The non-'S' metal compositions at Bradley Fen fall into two groups. There are first those objects which maintain the proportions of arsenic, antimony, nickel and silver, but fall below 0.5% antimony. Excluding HD 17, with 0.46% antimony, which joins to HD 5, with 0.51% antimony, there are six objects which fit this pattern (impurity pattern 'TA', i.e. 0.50% > Sb > As). All are spearheads and include all the types at Bradley Fen: plain, hollow-bladed and fillet-defined mid-rib.

There then remain three objects within the assemblage which fall outside this pattern and have low impurity totals, the sort of metal that would dilute 'S' metal. These are the sword HD 4 and spearhead SF 55, already mentioned, and the heat-distorted ferrule HD 14. The very low level of impurities in sword HD 4 can be roughly paralleled at Blackmoor, although there the impurity traces are slightly higher and the lead contents are higher, but can still be well below 1%. The very low concentration of lead and other impurities can also offer a link to the beginnings of the Carp's Tongue sword. The recent publication of the swords of the Iberian Peninsula (Brandherm 2007) together with a metallurgical discussion (Rovira Llorens 2007) shows how. Some swords in the assemblage from Huelva, which Brandherm places in his Series 1 of Type Huelva, have lead below the detection limit of the analysis used, with iron as the only significant impurity. Brandherm sees these particular swords as contemporary with Wilburton; it is also very clear from the illustrations that some of the swords have been burned before being deposited in the Ría de Huelva.

Spearhead SF 55 has an As/Ni impurity pattern. This was the dominant type in the Middle Bronze Age but is very uncommon in Wilburton contexts; among the few examples are a spearhead from Weymouth and two in the Waterden assemblage. It becomes rather more common in the Ewart Park period and may be associated both with imported Carp's Tongue material and, possibly, with copper produced in Britain. Heat-distorted ferrule HD 14 has 0.07% arsenic and 0.07% antimony and can be paralleled in both Late Wilburton and Ewart Park bronzes.

The impurity patterns may also be used to determine whether fragments might be part of the same object. This is not a problem with the two spearhead fragments, HD 5 and HD 17, as is confirmed by Table 4.19, but with non-joining sword fragments the compositions do suggest a possible join. The compositions of HD 6 and HD 18 are sufficiently close to make it very likely they came from the same blade. It is not impossible that the hilt fragment HD 1 belongs to the same weapon: since antimony and nickel tend to segregate with the tin, the lower concentrations in the sample correlate with the lower tin content. We can also say that the remaining two sword fragments, HD 4 and HD 20, have no matches and are the only representatives of the weapons from which they come. Finally, the blob of metal attached to spearhead HD 14 does not match any of the analysed objects.

Metallography

The obvious exposure of some of the metalwork to high temperature and the very deliberate damaging of the edges of both swords and spearheads suggested that a metallographic study of the weapons analysed would increase our understanding of how they had been treated prior to deposition. The results are summarized and tabulated in Table 4.20 in a similar manner to that used for a number of other sites (e.g. Northover 1998). The quality of the data is restricted by the state of corrosion of many of the samples, with much of the lead attacked and altered and, in some cases, replaced by cuprite or redeposited copper. Also, the samples were usually oriented so that a cross-section at an angle to the edge of the blade was presented and, as a result, the full elongation of sulphide inclusions could not easily be gauged. (The elongation being a measure of the total working the cutting edge had received.)

Only one of the samples examined, from the socket of spearhead SF 69, had an as-cast structure, or rather an as-cast structure showing some modification by heat which presumably occurred during the working and annealing of the blade edges. A majority of the remainder had structures which were fully recrystallized; the five which were only partially recrystallized all came from the blade edges of spearheads and one sword fragment. The structures show that only the surface layers of the blades have been worked and it is only at the cutting-edge that the through thickness has been worked. The maximum grain size is approximately 40mm, meaning that these areas have not been exposed to more heat than that encountered in the annealing of the edges. Most of the five samples have some signs of mechanical deformation, either as slip traces or as deformation twins, and it is likely some of this deformation may have been incurred during the breaking-up of a weapon, for example with the sword HD 4 and the spearheads HD 8 and HD 15.

The swords and spearheads where the samples were fully recrystallized divide into three groups; those with grain sizes either side of 10mm, those with grain sizes in the range 30–60mm and those with grain sizes in the region of 100mm. Taking the last group first, this grain size is not the result of the normal working and annealing practices of the period but is the result of exposure to fire. Unfortunately, the state of corrosion meant that it was not possible to determine whether the metal had also become internally oxidized at the surface. There are four objects in this group, the spearheads HD 2 and HD 3, both visibly distorted, the sword fragment HD 4 and the tubular object, possibly part of a ferrule, HD 9. The tubular object and the sword fragment both display some deformation twins, possibly from the breaking-up of the objects after burning. Interestingly, the spearhead blade HD 14, which has fused metal adhering to its crushed socket, was not exposed to severe heat because the grain size is only 30–40mm and there is 15% final cold work.

The samples not modified by heat prior to deposition have a rather uniform character. Recrystallized grain sizes are typically around 30–40mm and, more often than not, have been annealed at a high enough temperature to homogenize the sample area. Final cold work is in the order of 10–15%; this might seem a very limited amount of working for the edge of a weapon, but the results from the extensive survey of the Waterden assemblage suggest that it was typical, with hardnesses in the range 160–180VPN. Putting the edge in this condition gives it sufficient hardness to cut into flesh while retaining the toughness to resist cracking and fracture and leaving sufficient ductility for moderate combat damage to be readily hammered out and the edge refurbished.

Conclusions

As discussed above, two radiocarbon dates are associated with the metalwork in the hoard: 1310–1040 cal BC for peat inside a spear and 1280–1010 cal BC for peat underlying the hoard. These fit well with the dates of 1260–1050 and 1160–1000 cal BC for the Wilburton, Cambridgeshire assemblage and 1050–920, 1110–910 and 990–850 cal BC for the later Blackmoor, Hampshire hoard (Needham 1996; Needham et al. 1997). To these must be added dates of 1380–1040 and 1260–800 cal BC for two spear shafts in the Waterden assemblage. These dates to a large extent validate the ordering of Wilburton and related metalwork in Table 4.18, based on the proportion of 'S' metal in a hoard, which placed the Bradley Fen assemblage towards the end of the Wilburton period. The types of swords and spearheads also fit comfortably into this period, especially sword HD 4 with its prototypical Carp's Tongue features and spearhead SF 63, a predecessor of the barbed spearheads.

The metallurgical analysis has also helped illuminate the practices associated with the deposition of the bronzes. It is at once evident from them that they have been considerably damaged in a deliberate fashion and some show evidence of exposure to fire, through distortion, partial melting and contact with

Table 4.20. *Metallography. Abbreviations: R = Recrystallized, CW = Cold worked, HA = Heat affected, AC = As cast, :m = micrometre, eut = "* eutectoid, def twins = deformation twins, id = interdendritic, ig = intergranular, tg = transgranular, rdc = redeposited copper.*

No.	Object	Sample site	Sb	Sn	Pb	Structure	Grain size	Coring	Second phases	Slip traces	Final cold work	Total reduction	Corrosion
HD 1	Sword fragment, hilt section	Fracture	0.68	7.19	10.74	RCW	5–10:m	Slight	Pb, eut, Cu2S	Yes	Slight	?	massive, pitting, ig/tg
HD 2	Spearhead, leaf-shaped, distorted	Edge	0.59	9.33	3.01	HA/R	100:	No	Pb, Cu2S	No	0%	?	massive, ig
HD 3	Spearhead, long, narrow, distorted	Edge	0.57	7.38	3.83	HA/R	100–150:m	No	Pb, Cu2S	No	0%	?	
HD 4	Sword fragment, hilt section	Edge	0.00	7.76	0.01	HA/ part R	100–200:m	No	Cu2S	Some def. twins	?	?	deep pitting, rdc
HD 5	Spearhead, hollow-bladed, large	Edge	0.51	10.12	13.63	R/part CW	30–40:m	No	Pb, eut, Cu2S	At surface	?	?	pitted, id, ig, tg, rdc
HD 6	Sword blade fragment, lozenge section	Edge	0.85	8.84	13.78	RCW	10–15:m	Slight	Pb, Cu2S	Yes	15%	40–50%	pitted, id, ig, tg
HD 8	Spearhead, leaf-shaped	Edge	0.45	12.89	10.90	HA/ part R	30:m	Yes	Pb, Cu2S	Yes	15%	40–50%	massive, id, ig, tg
HD 9	Tubular fragment, heated	End	0.07	11.66	3.03	HA	50–100:m	No	Pb, eut, Cu2S	Some def. twins	?	?	pitted, ig, tg
HD 10	Spearhead, leaf-shaped	Edge	0.70	7.79	0.71	HA/ part R	40–60:m	No	Pb, Cu2S	Yes	10%	?	massive, ig
HD 13	Spearhead, hollow-bladed, fragment	Fracture	0.48	7.25	10.08	HA/R	40–60:m	No	Pb, Cu2S	No	0%	?	pitted, id, ig, tg
HD 14	Spearhead, plain, hollow-winged	Edge	0.46	9.67	11.90	RCW	30–40:m	No	Pb, Cu2S	Yes	15%	?	pitted, ig, tg
HD 14	Spearhead, plain, hollow-winged	Blob	0.73	13.11	3.39	Drillings	-	-	-	-	-	-	-
HD 15	Spearhead, fillet-defined mid-rib, blade	Edge	0.30	9.93	6.03	Part R/ CW	?	Yes	Pb, eut, Cu2S	Yes + def. twins	10–15%	40–50%	pitted, id, tg, rdc
HD 16	Spearhead, hollow-bladed	Edge	0.23	8.33	9.16	HA/R	40–60:m	No	Pb, Cu2S	Some, def. twins	5%	?	massive, pitted, ig, tg
HD 17	Spearhead, hollow-bladed, large	Edge	0.46	9.61	12.15	RCW	5–10:m	Slight	Pb, eut, Cu2S	Yes	Slight	?	massive, ig, tg
HD 18	Sword tip fragment, lozenge section	Edge	0.86	8.79	6.74	Part R/ CW	7.5–10:m	Yes	Pb, eut, Cu2S	Yes	5–10%	?	pitted, id, ig, tg, rdc
HD 20	Sword blade fragment, lozenge section	Edge	0.51	9.44	13.02	RCW	30–40:m	No	Pb, eut, Cu2S, porosity	Yes	10%	?	massive/id, ig, tg
SF 66	Spearhead, stepped blade	Fracture	0.61	7.90	1.34	RCW	10:m	Yes	Pb, eut, Cu2S	Yes	10–15%	?	id/massive
SF 62	Spearhead, leaf-shaped	Edge	1.94	13.86	5.81	RCW	10–20:m	?	Pb (corr.), eut, Cu2S	?	?	?	massive, ig, tg
SF 63	Spearhead, hollow-winged	Edge	0.95	9.29	2.50	RCW	20–25:m	Yes	Pb, Cu2S	Yes	15–20%	40–50%	pitting
SF 69	Spearhead, leaf-shaped, small	Socket	0.23	10.84	1.23	HA or AC	?	Some	Pb, eut., Cu2S	No	10%	?	id/massive
SF 55	Spearhead, leaf-shaped, small	Socket	0.03	10.02	0.05	HA/R	40–60:m	No	Pb, Cu2S	Some, def. twins	5%	?	pitted, ig, tg

Table 4.21. *Metalwork damage assessment.*

No.	Object	Section	Description	Burned
HD 1	Sword	Hilt/upper blade	Deliberately broken, slight edge damage	-
HD 2	Spearhead, leaf-shaped	Tip missing	Tip deliberately broken, edge chopped	Burned
HD 3	Spearhead, leaf-shaped, long	Tip missing	Tip deliberately broken, edge chopped, distorted	Burned
HD 4	Sword	Hilt/upper blade	Deliberately broken, edge chopped	Burned
HD 5 HD 17	Spearhead, hollow blade	Tip missing, broken	Deliberately broken, edge chopped	-
HD 6	Sword	Blade fragment	Deliberately broken, some edge damage	-
HD 7	Tubular ferrule	Lower section	Deliberately broken?	-
HD 8	Spearhead, leaf-shaped	Tip missing	Deliberately broken?	-
HD 9	Tubular fragment	Ferrule section?	Deliberately broken?	Burned
HD 10	Spearhead, leaf-shaped	Intact	Bent, some edge damage at tip	-
HD 11 HD 12	Long tongue chape	Fragments	Deliberately broken, parts missing	-
HD 13	Spearhead, hollow blade	Fragments	Deliberately broken, flattened	-
HD 14	Spearhead, leaf-shaped	Tip missing, fused metal adheres	Deliberately broken, edge chopped, socket crushed	-
HD 15	Spearhead, fillet-defined mid-rib	Tip/blade section	Deliberately broken, edge chopped, flattened	-
HD 16	Spearhead, hollow blade	Intact	edges chopped	-
HD 18	Sword	Tip fragment	Deliberately broken, bent	-
HD 19	Sword	Hilt/upper blade	Deliberately broken, slight edge damage	-
HD 20	Sword	Blade fragment	Deliberately broken, edges chopped	-
SF 66	Spearhead, stepped blade	Tip missing	Deliberately broken?, some edge damage	-
SF 64	Spearhead, leaf-shaped	Socket broken	Uncertain	-
SF 62	Spearhead, leaf-shaped	Intact	No significant damage	-
SF 63	Spearhead, leaf-shaped	Intact	No significant damage	-
SF 69	Spearhead, leaf-shaped	Intact	Slight edge damage	-
SF 55	Spearhead, leaf-shaped	Intact	No significant damage	-

fused metal. The burning of bronze has been identified both visually and by metallography and this result adds Bradley Fen to a growing number of sites where weapons have been burned. All the instances which have so far been characterized fall into a narrow time period straddling the end of the Wilburton period and are located in Scotland (Duddingston Loch, Midlothian (Coles 1960) and Peelhill, Strathaven, Lanarkshire (Coles & Scott 1962–63)), in East Anglia (Wilburton, Cambridgeshire and Waterden, Norfolk (Northover & Bridgford 2002)), and in a collection of metalwork from the Seine at Paris in the Ashmolean Museum, Oxford (Northover 1982). The distinguishing features are that the weapons are either complete or in such large fragments that they would not fit in a contemporary crucible, they show frequent edge damage which may be the result of combat or, more often in the case of spearheads, deliberately inflicted and they frequently demonstrate signs of exposure to heat, either externally as distortion or partial melting or internally through secondary grain growth and internal oxidation. It is also often the case that the fragmented weapons are incomplete with only some sections deposited, the remainder presumably being taken for scrap, practicality combining with ceremony.

At Bradley Fen, we see many instances of deliberate damage but only four objects that have certainly been in the fire. The damage is summarized in Table 4.21 and this leads us to look at the differences between the hoard deposit and the single finds. All the major damage is confined to objects in the hoard which also includes the higher status weapons, the swords and the more elaborate spearheads such as those with hollow or long blades or fillet-defined mid-ribs. Within this group, swords and spearheads, as well as a possible ferrule have been burned. The objects deposited singly are the simpler spearheads, which are usually undamaged.

Discussion – fieldsystem, settlement and metalwork

The chronology of this discussion can be broken down into two separate 200-year periods: 1500–1300 and 1300–1100 cal BC. The first period covers the instigation of the fieldsystem and the second, the deposition of metalwork. The nature of contemporary settlement evidence across both periods is also reviewed, especially in relation to the absence of recognizable structures. The comparatively rapid changes in environmental conditions that occurred during these times are paramount to the discussion and, given the scale of inundation, it would be apposite to describe the successive 200-year periods as *wet* and *wetter*.

The time/space-transgressive dynamic of peat development brought about a loss of land that overlapped firstly with the building of lasting land divisions and secondly with the deposition of metalwork. However tempting it is to see these things as straightforward responses to the advancing wetness, it has to be remembered that, as features, Middle Bronze Age fieldsystems and later Bronze Age metalwork were by no means unique to this environment and occurred throughout southern England. If anything, it would appear these activities occurred irrespective of the increasing saturation, especially in relation to the construction of the fieldsystem, which at its deepest end appeared to represent an outwardly *terrestrial* response to what was swiftly becoming an increasingly *aquatic* situation – as fast as the boundaries were built they were subsumed. Conversely, the subsequent deposition of bronze weapons seems to have been a much more fitting response to the ensuing conditions and one that conformed to the established Bronze Age practice of leaving such objects in perpetually wet places. In this sense, the contrast between fieldsystems and metalwork was striking, so much so that a fracture beyond mere chronology is implied. In practice, the metalwork heralded a decisive switch in perspective, a conscious counteraction, which corresponded precisely with the premeditated movement of occupation out into the wet. The first ventures into the fen were accompanied by large numbers of weapons made of bronze.

The aim of the first part of the discussion is to correlate the construction of the fieldsystem with the established landscape and to substantiate the overall character and scale of contemporary settlement. The aim of the second part of the discussion is to relate the deposition of metalwork to the fieldsystem and its settlement and, at the same time, the rapidly changing landscape conditions. In both parts, it is essential that we address the apparent emptiness of the fields. All of these concerns have significant implications for the rest of the Flag Fen Basin and especially the opposing Fengate shoreline. As before, the ever changing landscape conditions can be employed to articulate fieldsystems, settlement and metalwork.

Building boundaries

The coaxial, non-aggregative layout of the fieldsystem strongly indicates that it was built or, at the very least, coordinated 'as one' and that its prevailing arrangement was married to a previously established landscape pattern or *operational grain*. In practice, the linear ditches and banks served to outline or enunciate something already present rather than mark out something entirely new. This was made especially evident by the interrelationship of the fieldsystem with the existing configurations of barrows and burnt mounds. The geometry of the fieldsystem was such that it was able to incorporate or accommodate the alignments of both sets of features whilst, at the same time, systematically segregate the intervening block of ground into a series of regular parallel strips (Fig. 4.42). In its organization the fieldsystem reconciled what had seemed at first sight to be spatially dislocated and functionally divergent constructions; its configuration assimilated contrasting topographies and in doing so conjoined the *elevated* (monuments) and the *marginal* (burnt mounds).

The marrying of boundaries to features already in the landscape was such that the spacing or intervals between ditches dovetailed with the spacing of the earlier builds. In effect, its lines articulated connections between spaces that were not otherwise obvious and at the same time made clear the position of individual plots of land. In its making, the operational grain of the landscape was, quite literally, being entrenched. Through *entrenchment* its form or fabric was brought to light (both to us the archaeologists, but also in a way to them, the Middle Bronze Age inhabitants). Everything about the implementation of the ditched fieldsystem suggests its making was a concerted act of grand maintenance. Like any act of maintenance this was an intrinsically backward-looking undertaking and not an act of radical innovation.

The original intention behind the newly constructed boundary-works might have been retrospective in its outlook but the imposition of endless horizontal and vertical barriers was to have an impact far beyond its primary intent. If previously tenure was something to be negotiated via pathways, burial grounds, access to water, individual cultivation plots and tracts of pasture, it was now something to be negotiated via a series of linear obstructions. At this time, solid architecture was being employed to delineate the prevailing tenurial claims and, whereas in the past the

Figure 4.42. *Interrelationship of the fieldsystem with the existing configurations of barrows and burnt mounds.*

limits of tenure could be somewhat equivocal, they were now incontrovertible.

It can be argued that the incontrovertibility of these newly constructed boundary-works rested first and foremost in the act or practice of 'inscription' rather than necessarily in the ability of these features to impede movement. The primary intention of a fieldsystem was to delineate rather than obstruct and, as such, the boundaries stood as palpable lines of guidance. Any role they had as physical barriers was in many ways supplementary. It was only much later on, once the immediate *tenurial jurisdiction* of these lines of guidance started to diminish that their role as physical barriers really came to the fore; as upstanding earthworks the boundaries endured as linear obstacles long after they ceased to enforce their original claims of tenure.

In addressing the Bronze Age coaxial fieldsystems of Dartmoor, Johnston suggested 'that land division was only possible because the forms of tenure and perceptions of landscape were already in place' (Johnston 2005, 1). Most importantly for him, the implementation of coaxial boundaries represented a deliberate formalization of land tenure that had previously been 'open to negotiation' (ibid., 16). As with the earthwork divisions at Bradley Fen, the building of reaves on Dartmoor were never part of a grand plan of landscape reorganization but part of a reflexive course of action; an architecture which projected backwards as much as forwards. The construction of tangible boundaries *gave* tenure a definitive structure or shape.

There is nothing new in recognizing relationships between the implementation of fieldsystems and pre-existing landscape features such as round barrows, ring-ditches or burnt mounds (Bradley et al. 1994, 141; Yates 1999; Evans & Knight 2001, 85; Bradley 2002, 81; Cooper & Edmonds 2007, 133). Generally, however, these particular relationships have been understood as straightforward expressions of past communities attempting to legitimize claims to specific stretches of land through lineage (either real or imagined). By consciously interconnecting the new architecture of land division with the old architecture of past inhabitants a *bona fide* entitlement to ownership is invoked. Yet this type of land claim validation still implies a fractured relationship or disjuncture between one form of landscape occupancy and another. Under these circumstances, the living (the builders of the fieldsystem) are able to utilize the dead (the builders of the monuments) wherever and whenever they choose and irrespective of the relationship between the two communities. As a consequence, the gap between the past (monuments) and the present (fieldsystems) allows authors to write about 'a new sense of order on the land' (Yates 2007, 134) in spite of some compelling evidence to the contrary.

In these understandings, monuments represented an antique way of asserting territorial claims, whereas fieldsystems represented something entirely fresh. In the same vein, novelty is equated with innovation and as a consequence the desired rift between the past (monuments) and present (fieldsystems) is magnified. Underlying everything is the conviction that fieldsystems represented a profound agricultural breakthrough which was about to radically increase levels of production and, in turn, generate unparalleled levels of wealth (ibid., 120). The new boundary features are afforded almost machine-like qualities. In these accounts, all the emphasis is placed on the management or organization of land in terms of agricultural production, rather than issues of tenure or the conditions under which land was held or occupied.

Then again, and in agreement with Johnson's perspective on prehistoric land division, there is little evidence to suggest that the world changed fundamentally for people who lived before and during the development of these earthen barriers, beyond the fact that movement became (perhaps inadvertently) a little more obstructed or regulated. Plainly, the visibly deep-seated interrelationship between this new form of land division and standing monuments suggests an act of traced-entrenchment (i.e. the lines already prevailed). In our opinion, the link made between the boundaries and barrows was reflective not nostalgic – we know this because this architectural relationship foreshadowed renewed activity at and around the monuments in the form of Deverel-Rimbury cremation cemeteries (Evans & Knight 2000, 99–100; Robinson 2007; Evans et al. 2013, 126–28).

We would suggest that the focus of Pryor's, and subsequently Evans's, interpretation of the Fengate fieldsystem was, fundamentally, the management or organization of land and that the subject of tenure was similarly sidestepped (Pryor 1996; Evans 2009c, 243–52). Pryor's main concern was always the mechanics or practicalities of land division and to some extent Evans revisited similar themes (Fig. 4.43). If sheep, communal stockyards, inter-communal droveways and drafting-races commanded Pryor's more recent understandings, Evans's presented a sort of inverted perspective as it swapped sheep for cattle, returned the stockyards to settlement and interpreted the majority of Fengate's various droveways and drafting-races as compelling evidence for the presence of embanked hedges. Regardless of their differences, between the two models we are presented with a boundary system that facilitated the improved management of livestock at a time when land was being lost beneath the fen (see

Figure 4.43. *'Livestock dynamics'. (1) Pryor 1980, cover; (2) Pryor 1996, fig. 3; (3) Yates 2007, 26, pl. 4.*

French 2003, 12). Both of these interpretations may well be right but there was more to land division than livestock management or hedge building.

The precise chronology of the implementation of the ditched boundaries remains, it seems, open to debate, with Pryor still favouring a slightly earlier origin than Evans, but with both erring towards the beginning of the Bronze Age. In light of Evans and Pollard's recalibration of the Storey's Bar Road system and its post-Neolithic attribution (Evans & Pollard 2001, 25–26), it is perhaps telling that both Pryor and Evans make special reference to the siting of principal boundaries in relation to Beaker-associated features. The uncertainty relating to the inception of the system is further complicated by large elements of the system being thought to be laid-out at different times. Crucially, both agree that the system expired sometime towards the very end of the Bronze Age. Depending on whom you choose to believe, formal land division at Fengate represented a relatively short-term 'five to ten century-long *experiment*' (Evans 2009c, 256; his emphasis) or alternatively, a significant project that extended well beyond one thousand years (Bayliss & Pryor 2001, 397).

Issues of tenure were almost touched upon by Evans in his vexed pursuit of a suitable cultural genesis for the Fengate fieldsystem. Seemingly unable to countenance a mid second millennium BC inception date, on the basis of an absence of suitable quantities of contemporary pottery and/or burials, he chose instead to locate the origins of the fieldsystem, via its proximity to the recently discovered Late Neolithic/Early Bronze Age barrow cemeteries situated deep within the Flag Fen Basin (Evans 2009c, 260). Right at the beginning of the Fengate investigations, Pryor expressed similar vexations over the origins of the ditched enclosures, especially in relation to the very obvious absence of contemporary occupation. Only for him it was an absence of sufficient later Neolithic settlement that required explanation (Pryor 1980, 178–80). It would seem that, whichever period is examined, there will always be a shortfall between the scale of undertaking involved in the making of the fieldsystem and the intensity of contemporary occupation. Evans makes this explicit in his quantifications of later prehistoric flint and pottery from Fengate (Evans 2009c, 240–41). If quantity of associated material is the principal criteria of attribution, it is very easy to understand how such irresolution might ensue and also why, ultimately, Pryor originally favoured a Grooved Ware genesis and Evans favoured Beaker.

What is made clear at Bradley Fen, however, is that large-scale formal land division was not borne out of a sudden intensification of occupation or even a change in material culture but its inception stemmed from something already in place. Its scale was equivalent to the scale of tenure and the fact that its extent stretched far beyond the limits of our investigations was entirely consistent with the *extensity* of occupancy (Fig. 4.44). Just as Johnston proposed for the coaxial systems of Dartmoor, the newly constructed linear boundaries did not constitute a 'wholesale reorganization' of the landscape (Johnston 2005, 16), instead they made manifest an ongoing negotiation of the circumstances under which the ground surface was held or occupied. Critically, and as will be demonstrated in the next chapter, at the very point when the scale or level of occupation altered from being *extensive* to *intensive*, the final vestiges of the first attempts at formal land division had all but disappeared.

Prior to the construction of ditch and bank-built boundaries at Bradley Fen, the operational grain of the landscape, its occupancy, appeared to play out a pattern of low-ground pasture and high-ground arable cultivation. Hoofprints, waterholes and metalled surfaces peppered the lower contours. The higher areas contained settlement and contemporary burial features which included an assortment of plant remains indicative of patterns of past clearance and ongoing arable cultivation occurring on free-draining, nutrient-rich soils. French's analysis of the old land surface located down in the low-ground showed large expanses of uncultivated former woodland soils, whilst Scaife's analysis of pollen samples taken from the same places suggested grassland succeeding woodland.

The increasing saturation along the low contours eventually led to full-on waterlogging and, inevitably, peat growth ensued. Before it was only the Bradley Fen Embayment that experienced such conditions, now the bottom of the Flag Fen Basin was subject to the same processes. All-importantly, the ongoing transformation of the environmental circumstances did not appear to have an immediate impact of the existing patterns of land-use as cattle hoofprints disturbed the first peat growth just as they had the earlier land surface. The erection of an ad hoc fence-line or dead-hedge coincided with the changes in ground conditions and its alignment helped segregate the sodden bottom of the Flag Fen Basin from the now flooded Bradley Fen Embayment enabling the continued use of the greater part of the lower contours for pasture (Fig. 4.44). The later substitution of the dead-hedge for a continuous bank and ditch consolidated the division and, in doing so, showed how the instigation of lasting boundaries represented ostensively reflexive measures.

The strands of interpretation presented here encompass the conditions under which land was occupied (landscape tenure) and used (landscape texture).

Figure 4.44. *Distribution of ditched fieldsystems in the Flag Fen Basin with total weights of Early and Middle Bronze Age pottery assemblages indicated (Collared Urn in black; Deverel-Rimbury in red).*

In trying to make sense of the former we endeavoured to realize the latter, tenure and texture being understood as integral. Due to issues of preservation or depth of cover, different parts of the investigations were better at elucidating details of these processes than others; in the case of the fieldsystem *tenure* was sometimes far more obvious than *texture*. The comparatively heavily truncated character of the elevated contours precluded the same heightened preservation of patterns of land-use observed on the lower contours. As a result, it is not currently possible to tell whether the instigation of coaxial boundaries across the higher, free-draining contours represented an equivalent maintenance of ongoing agricultural practices. It is, nevertheless, tempting to suggest that the elongated parallel strips marked-out by the newly emplaced boundaries represented a reiteration of the edges of established cultivation plots or winter grazing tracts.

The loss of the lower system, however, clearly initiated a displacement of land-use and with it an unavoidable transposition of agricultural practice. The increasing disappearance of low or marginal pasture led to higher ground being utilized for grazing more frequently; as things got wetter, pastoral supplanted arable. Features, such as waterholes and metalled surfaces, that had once typified the low ground now characterized the middle ground and, fittingly, the environmental detail accompanying this shift in location describes a transformation to scrubland.

In spite of its all-encompassing reach and outward rigidity, the fieldsystem represented a transitory course of action in the developing occupation of this unstable landscape. Its manifestation brought to light existing patterns of tenure and texture and, through its enhanced tangibility, established a new set of conditions by which people, animals and plants used and occupied land. Nevertheless, before long large sections of the system were subsumed beneath the peat and another sort of boundary began to take hold on the orientation and organization of this space. The currency of formalized land division was comparatively fleeting but not only as a result of shifting environmental circumstances. The occupation which preceded and succeeded its inscription shared identical characteristics to occupation found elsewhere, in far more stable conditions. The demise of the fieldsystem was not brought about by a change in environment, but its expiration was made all the more explicit by the sediments which accompanied the transformation.

Scale of occupation

The instigation of tangible land divisions around the edge of the embayment would appear to have occurred sometime around 1500 cal BC. The intervention, or temporal mediation, of the peat horizon between the establishment of the ditch and bank field-boundaries and the concerted deposition of items of metalwork demonstrates a definite chronological break separating the two events. All the dating evidence suggests a gap of at least 200 years, enough time for the lower field ditches to fill-up with silt, be re-dug (in places) and fill-up with silt again, before the first development of peat. From the deposit sequence, it would seem that the escalating wet conditions prompted the construction of the final form of the main terminal boundary and that its configuration helped delineate the edge of the embayment at, or about, 1300 cal BC. By the end of the second millennium BC, the practice of putting bronze weapons into the saturated margins of the embayment looks to have reached its zenith. If we were to draw a curve to describe the trajectory of the fieldsystem alongside a curve to describe the trajectory of metalwork deposition the two lines would certainly overlap, but they would also exhibit markedly different peaks; the former peaking some 300 years prior to the latter.

Absent from the above account is settlement and its relationship to the establishment of permanent boundaries and also to the widespread deposition of metalwork. In terms of the bigger Bronze Age picture, we can think of permanent boundaries and metalwork deposition as relatively late innovations but settlement as intrinsically pervasive; the boundaries did not build themselves and the metalwork did not throw itself away. We need to ask, how did the character of settlement differ from before the building of the fieldsystem and what was its connection to the disposal of bronzes? And if, as before, we were to draw a curve to describe the trajectory of settlement for the duration of the Bronze Age what shape would it take? By answering these questions we might start to understand the scale of things.

In the previous chapter, traces of settlement were comparatively easy to recognize. Small diameter postholes alongside small groups of pits complete with fragments of household debris provided clear structural evidence of habitation. These buildings occurred at extended but nevertheless approximately uniform intervals and appeared to show that the scale of investigation was proportionate to the scale of earlier Bronze Age occupation. An absence of equivalent earth-fast structures contemporary with the field boundaries could suggest a different pattern of settlement altogether.

At Bradley Fen and King's Dyke the evidence for occupation comprised a sporadic distribution of diminutive wells or shafts which produced a moderately-sized assemblage of Deverel-Rimbury pottery (Table 4.22) and some discrete dumps of butchered

Table 4.22. *Collared Urn and Deverel-Rimbury assemblages from Flag Fen Basin sites.*

Site	Collared Urn (wt g)	Deverel-Rimbury (wt g)
Bradley Fen	3633	2525
Briggs Farm	1685	4234
Edgerley Drain Road	3008	0
King's Dyke	9691	147
Pode Hole	571	3192
Tanholt Farm	6508	5265
Total	**22088**	**15363**

cattle bone. The combined chronology of these features was as long as the currency of the pottery (*c*. 1500–1100 cal BC) and, on balance, there appeared to be far too few features to 'populate' the fields. In practice, the fieldsystem seemed empty. The ditch fills made evident a similar lack of activity with the majority of the finds being residual.

Yet this pattern matches that found throughout the rest of the Flag Fen Basin. A trawl through the different sites produces a list of comparably empty fields. Fengate's six undated 'roundhouses' represent, at best, a motley selection of structures, of which the most persuasive, Newark Road Structure 1 (Evans & Beadsmoore 2009, 84), has an almost identical ground plan to two of the Early Iron Age houses at King's Dyke. Pickstone & Mortimer (2011, 30) identified a small group of postholes associated with a large assemblage of Deverel-Rimbury pottery at Briggs Farm but otherwise the fields of the lower Nene Valley and Flag Fen basin seem to have been 'untenanted'.

The absence of earth-fast settlement contemporary with the fields at Bradley Fen stands in stark contrast to the earlier and later periods. The site revealed unambiguous structural foundations belonging to the start (3) and end (1) of the Bronze Age but absolutely nothing for the middle. During the start the 'surface available for settlement' was much greater and as a result the Bradley Fen window had a commensurably better chance of locating individual dwellings. The increasingly dynamic relationship between the accretion of peat and the establishment of fields meant that the surface available for settlement during the Middle Bronze Age was always decreasing and with it our likelihood of finding contemporary dryland structures. On top of this, towards the second half of the Middle Bronze Age (*c*. 1300–1100 cal BC) the correlation between settlement and the ever-expanding wetland took a radically different turn, as construction relocated into the wet. Direct evidence for built architecture might have been 'missing' from terrestrial contexts at this time but they were quickly becoming obvious above the peat. Prodigious timber structures first extended across the Flag Fen Basin in the course of the first half of the thirteenth century BC (Neve 2001, 245; Pryor 2001, 398; Gibson et al. 2010, 24). The earliest constructions took the form of continuous rows of massive wooden piles driven deeply into the underlying deposits and, in sharp contrast to the surrounding land, there was nothing at all ambiguous about this architecture (Pryor et al. 1986; Pryor 2001; Gibson & Knight 2009; Gibson et al. 2010). Whilst we struggle to pinpoint mid-late second millennium dwellings within the terrestrial domain great edifices span the embayment and somewhat perversely, we seem to find it easier to countenance desolate fieldsystems as places of concerted occupation than raised architecture (*pace* Pryor 2001, 426). Could the same large-wood architecture which helped expedite the flow of later Bronze Age metalwork from land to fen also have provided a whole new context for settlement? As will be shown in the following chapter, there is compelling evidence that this is exactly what happened at the end of the Bronze Age.

Metalwork deposition

At the beginning of the chapter, it was suggested that the metalwork, or to be more precise, its deposition, signposted a marked turnaround in perspective or what we might call a conscious counteraction, namely, the first real colonization of the wet. The *submergence* of the low-lying plains of the Flag Fen Basin was accompanied by the *emergence* of a whole new set of environmental conditions and with it a very different kind of landscape. If previously the trajectory of occupation at Bradley Fen was about staying ahead of the deluge and keeping to the dry, it was now about finding novel ways of responding to the new surroundings and, in particular, coming up with the means to venture out onto this altered terrain. In simple terms, as the peat covered one way of being in the world, it established a fresh backdrop for another.

Most significantly, the deposition of metalwork at Bradley Fen coincided with the construction of a series of great timber causeways and platforms above and across the inundated Flag Fen Basin (Fig. 4.45). The relationship of elevated movement and inhabitation to the deposition of large quantities of metalwork was exemplified at the westernmost end of the Flag Fen timber alignment. The Power Station excavations recovered just under 300 metal objects from the peat, all close to the point where the causeway adjoined the Fengate shoreline and where it superimposed the edge of the Fengate fieldsystem (Pryor 2005, 138). Pins, rings and ornaments made up the bulk of the assemblage

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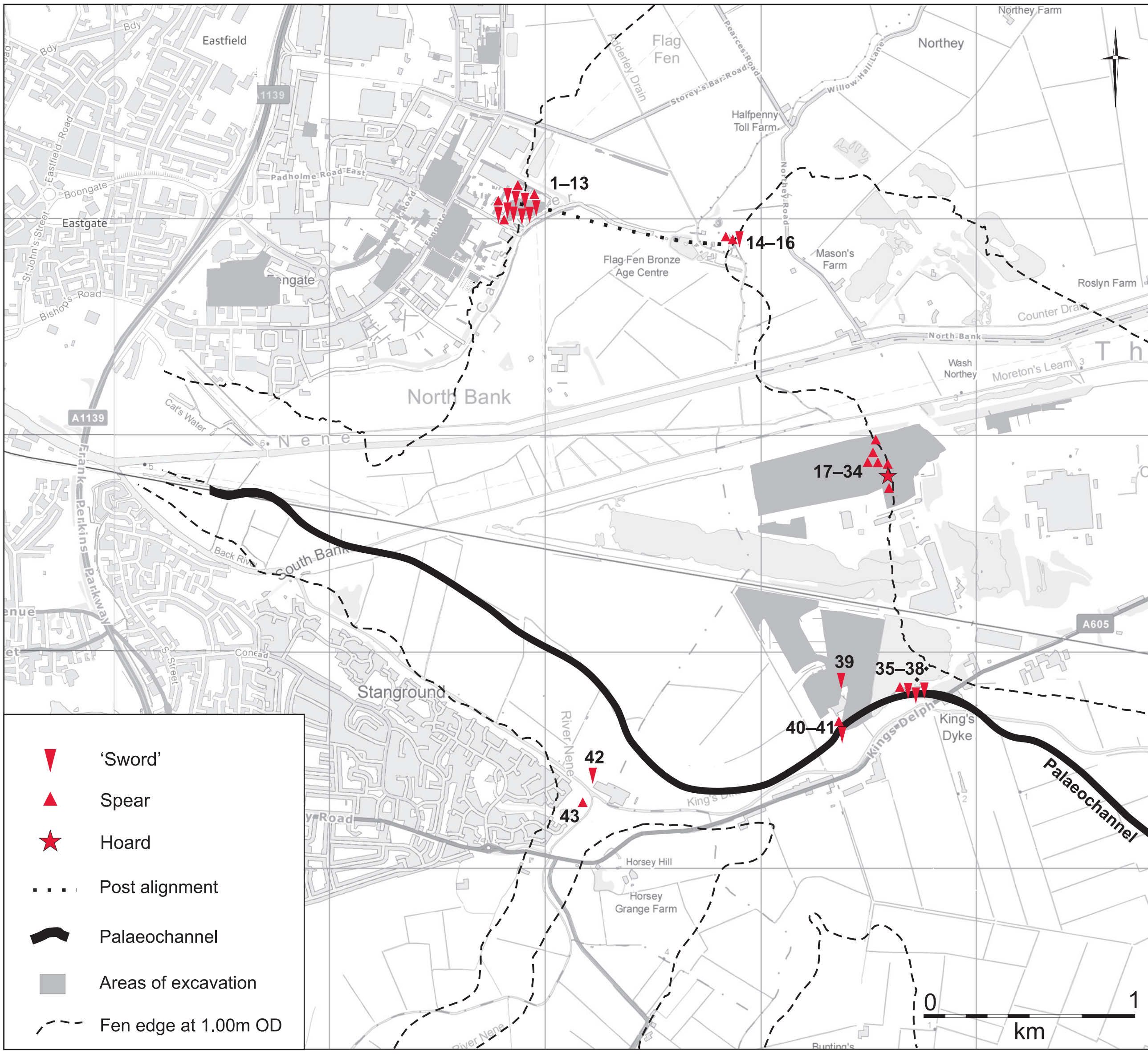

Figure 4.45. *Metalwork deposition and the Flag Fen Basin.*

and, even though a lot of the metalwork was Iron Age in date, the collection also contained a considerable number of later Bronze Age weapons which included rapiers, swords, spears, chapes and ferrules (ibid.). The distribution of these particular objects roughly emulated the linear distribution of timbers, although, intriguingly, most were located slightly to the south of the alignment and much closer to the arrangement of Fengate's partially submerged field boundaries. Just as at Bradley Fen, the peat interceded between the fields and the bronzes and the resemblance was striking, only here, the presence of the timber causeway appears to have represented an additional attraction when it came to the disposal of metalwork (both spatially and temporarily). The published patterns of metalwork distribution suggest that the prominence of the timber causeway increased over time as the adjacent field boundaries became more and more obscured by the build-up of peat. Eventually, and somewhat inevitably, the causeway became the principal focus of deposition (Coombs 2001, 295–99). The extended duration of metalwork deposition identified at the Power Station corresponded to the extended duration of the causeway (in all of its manifestations) and the absence of a similar 'late-focus' at Bradley Fen would help to explain its comparatively abridged metalwork chronology.

If nothing else, the raised quality of the Flag Fen timber causeway demonstrates elevated levels of waterlogging at the time of its construction and use. Its very preservation was determined by the fact that it was built within a progressively more saturated environment. As an edifice the Flag Fen causeway integrated function, circumstance and context, as its very construction served to reconcile a drowning landscape precisely at a time when consigning bronze objects to perpetually wet places was a commonplace.

In several aspects, the original context of the Flag Fen timber causeway was the same as the context of Bradley Fen metalwork. Likewise, a fair proportion of the types of metalwork found at the two sites were interchangeable. It could also be argued that, despite the fact that the two sites were situated on opposite sides of the Flag Fen Basin, the respective collections of metalwork were, in actual practice, being immersed in the same body of water. This becomes the key relationship in terms of context and, especially, in terms of intent. In the next section we explore the intentions behind the consignment of later Bronze Age weaponry to watery places and the possible differences between individual items and a hoard.

Deposition reversed

Spatially and temporarily, the hoard was buried at the very edge of the Flag Fen Basin. To be precise, it was placed on a slight rise on the wet side of the Bradley Fen fieldsystem's main terminal division, next to a marked kink in its alignment and directly opposite a major field junction (Fig. 4.33). Quite obviously there was nothing ambiguous about its burial location and everything to suggest that the hoard was deposited with an increased level of care. If so required, those involved in its deposition would have little problem in returning to its place in the landscape.

The individual spears were disposed of much further out and therefore much deeper into the basin, consistently at least 25m away from the main dry–wet divide (Fig. 4.29). The majority were deposited along the northern sides of partially submerged field boundaries and all shared the same saturated environment. One of the spears was found point-first in the peat as if it had been thrown rather than placed and it seems most likely that its shaft would have remained proud of the rising waters (Fig. 4.30). Another spear retained the butt of a deliberately snapped shaft although it was found lying on its side (Fig. 4.46). In contrast to the hoard, deposition was slightly more haphazard and as a consequence a little less specific it its location. Those involved in the disposal of the spears would no doubt have been capable of retracing their actions but they might have struggled to return to the exact point of deposition. Given the different heights it would also be safe to suggest that the spears were deposited in a wetter location than the hoard and that this contrast in conditions would only have increased over time. The differences were subtle but nevertheless significant in that they show that even though the hoard and the spears were deposited in ostensibly the same wetland context their specific circumstances were rather different.

In their study of later Bronze Age metalwork deposition in the Fens, Yates & Bradley suggested different types of deposition could be related to *different kinds of water* (2010, 405–13). Although preliminary, their research proposed a spectrum of wet places or 'waterscapes' into which bronze could ultimately be consigned. These ranged from deep water contexts such as active rivers through to recently flooded or once dry edge-lands. The study established a series of patterns including a strong connection between deep water and intact single items, as well as between dryland situations and individual fragments. The same research located hoards towards the dry-end of the waterscape continuum and, in particular, at a distance from Fenland's main water courses. Part of Yates & Bradley's concern was to establish an unambiguous relationship between metal and bodies of water as a way of demonstrating motive. For these authors, watery places made retrieval progressively more difficult and as a consequence confirmed such deposits as votive offerings; Fenland's peculiar but comparatively delicate environmental detail was utilized to exemplify this contextual detail.

Needham, in an earlier piece of research, focused on the circulation of metal and metalwork and, in particular, on the potential for retrieval once pieces had been deposited (2001). For him 'the *option* to retrieve could have become a strategic device' (ibid., 287; his emphasis). Ultimately, rather than define metalwork deposition on the basis of environment (*wet* versus *dry*) and/or purpose (*ritual* versus *utility*), he proposes that it might actually be more constructive to think in terms of *permanent* and *temporary* modes of deposition. Such a perspective, he suggests, introduces a flexibility or open-endedness to metalwork deposition and one that is entirely appropriate for a material capable of being brought back into circulation post-deposition. Most importantly, recoverability does not preclude deposition from being motivated by ideological/political goals.

By bringing Yates & Bradley's *waterscape continuum* together with Needham's *permanency of deposition,* we can begin to construct a context for the Bradley Fen metalwork which steers clear of clichéd explanations. For a start, later Bronze Age metalwork deposition was by no means unique to the Fens and, if anything, its

Figure 4.46. *Single spears and wooden hafts.*

presence serves to demonstrate a level of universality to Fenland's prehistory, in spite of its distinctive hydrological history. It is entirely possible that the sheer diversity of watery places available in the Fens at this particular time provided a magnified range of choices when it came to deposition. There appears to be a much greater sense of latitude, which in turn facilitated a flexibility of intention between deciding to make things either *more* or *less* recoverable. In the scale of things, we can think of the hoard as more recoverable than the individual spears, which in turn, were more recoverable than objects deposited in active rivers. When it came to bronzes, Fenland's waterscape continuum was a kind of enhanced scale for permanent and temporary acts of deposition and, as such, it represented a balance contingent on 'competing demands for metalwork' (Bradley 1998, 150).

One of Needham's principal concerns in advocating an 'option to retrieve' approach rested upon ideas about the flow of metalwork and, in particular, its peculiar ability to be recycled (2001). In this light, it is possible to think of the Bradley Fen hoard as a recoverable deposit which in itself included pieces retrieved or recycled from earlier or previous acts of deposition. Its burial represented another stage in the potential flow of metalwork. As well as being collected together, all of the pieces in the hoard had been deliberately damaged and/or broken and several items had also been burnt (Fig. 4.47). The level of destruction was particularly excessive and unlike anything seen on metalwork excavated elsewhere in the Flag Fen Basin. By comparison the Flag Fen causeway material was intact and much more like the single spears from Bradley Fen in its overall appearance and condition. Again following Needham's lead, perhaps the overt destruction of recovered/recycled items was part of a prescribed practice that 'circumscribed the kind of reuse' (ibid., 289).

Permanent deposition deferred

In the Fens, *permanent* places of deposition included the deep water of its active rivers and their tributaries.

The pronounced expansion of wetland conditions at this time, however, had a major impact on the relationship between navigable waterways and land. Whereas previously rivers and watercourses were fairly accessible they now had to be reached via ever-expanding bog. The development of wetland conditions increasingly dislocated settlement from rivers and, in doing so, later Bronze Age communities became ever more detached from these all-important networks of communication and exchange. At the exact time when the lower reaches of major rivers such as the Thames and the Trent were becoming the principal focus for large scale metalwork deposition and, accordingly, key avenues of control (Bradley 1990, 146; Thomas 1999, 121), the equivalent stretches of Fenland's main river channels were in the process of becoming increasingly cut-off from conventional land-fast settlement. In the context of the Fens, weapon deposition and active rivers and waterways had to be reconciled by other means. The great timber causeways of Flag Fen, Must Farm and Horsey Hill represented one approach, whilst an intricate system of major roddons (Fenland's natural causeways) represented another (Fig. 4.45). In the latter case, investigations of the Must Farm palaeochannel/roddon continue to uncover individual Middle and Late Bronze Age weapons (rapiers, swords, daggers and spears), including swords with pommels still attached, a spear complete with its shaft and circumstantial evidence of weapons being deposited still within their scabbards (Robinson et al. 2015). Here, it seems comparatively pristine metalwork was being consigned in the confident knowledge that this deep water context would remove it from circulation permanently.

The purposeful colonization of the wet incorporated many elaborate ways of maintaining access and control over the principal networks of communication and exchange. The rivers were not lost to the fens, if anything, the perseverance of these particular features is what perpetuated movement and occupation beyond the fields and deep into the expanding wetland. Contrary to Thomas (1999, 121), Fenland's changing environmental circumstances did not curtail later Bronze Age metalwork deposition, it merely deferred it.

Figure 4.47. *Damage to hoard spears.*

Spatial-temporal configuration 2 – fieldsystem, settlement & metalwork

With the introduction of lasting land divisions, a different *temporal-spatial configuration* transpired, although crucially, one which helped to (re)articulate an earlier pattern (Fig. 4.48). The pre-fieldsystem configuration described a space made up of contrasting 'ends', a place of elevated monuments and marginal burnt mounds, whilst single dwellings occurred sporadically across the middle ground, oscillating between the two. Now, for the first time, the middle ground was visibly outlined, its fields formally entrenched. Even the marginal was delineated. Simultaneously, and perhaps surprisingly, at the time of entrenchment all indications of tangible dwellings receded from view. Space that had previously contained discrete structures now seemed vacant beyond a series of small waterholes or shafts and occasional dumps of butchered cattle bone. At the very point when land was being made immutable settlement was being made obscure. Metalwork deposition happened only after the submergence of the lower fields and when key elements of the established landscape grain had either vanished (burnt mounds) or fallen out of custom (monuments). Metalwork was divorced from these particular spaces and, somewhat fittingly, in our latest configuration the hoard and spears are depicted floating above the fields. In this historical-geographical arrangement, a major switch in orientation was signalled by the deposition of bronze weapons. As land division disappeared below the peat, metalwork was set out above it. The exact same circumstances which made fields unviable made metalwork deposition possible.

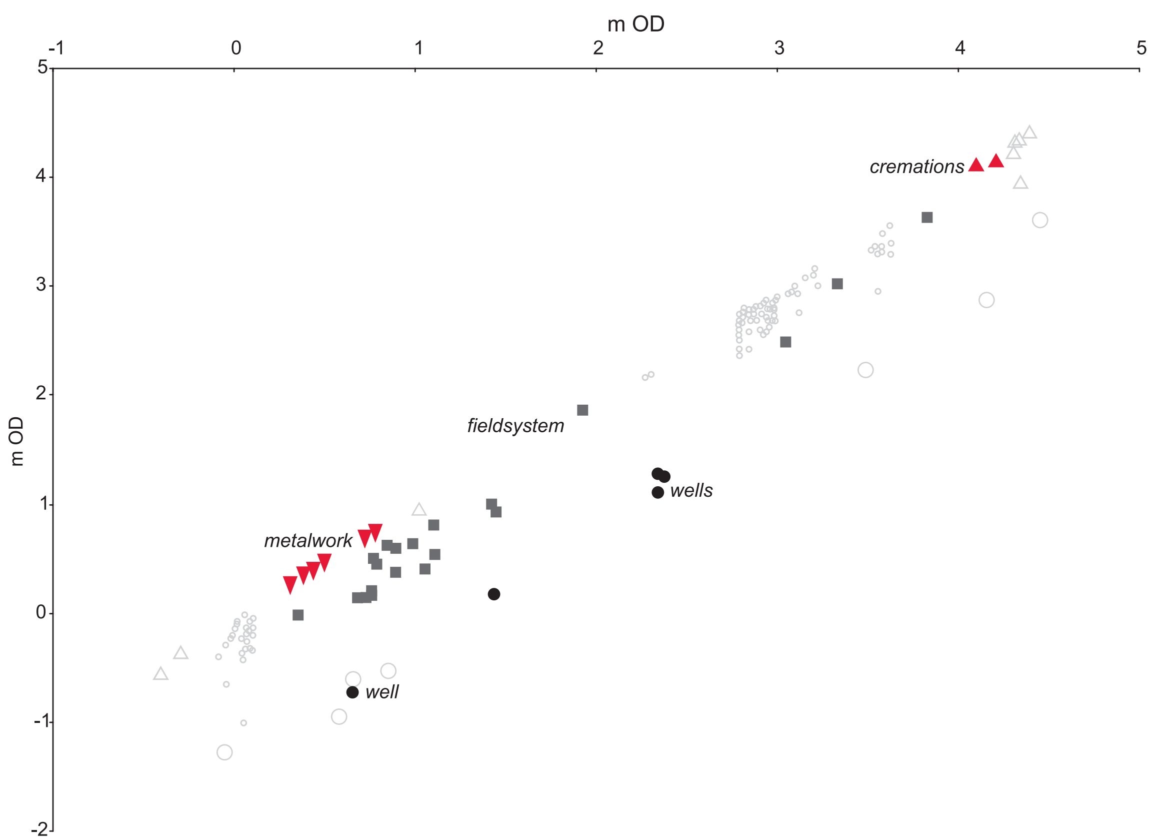

Figure 4.48. *Spatial-temporal configuration 2 – fieldsystem, settlement & metalwork.*

Conclusion

Chapter 4 described the divergent histories of Bronze Age land division and metalwork deposition. It suggested the former constituted a consciously reflexive measure, an act of grand maintenance, whilst in contrast, the latter signposted something forward-looking, namely the concerted colonization of a newly developing terrain. Peat growth, and its innate capability as sediment to intercede between things, helped articulate this particular relationship. At Bradley Fen, the *terrestrial* practice of parcelling-up large tracts of land was supplanted by the progressively *aquatic* activity of depositing metalwork. Throughout this process, settlement remained elusive, although it was suggested that its elusiveness was at least partially down to a general reluctance (amongst archaeologists) to relocate occupation away from dry land and out onto the wet. Structures sufficient to accommodate settlement exist although it seems their heightened preservation comes with a heightened expectation of what it is that qualifies as occupation.

In many ways, the first part of the next chapter describes an equivalent situation as it also presents a place where settlement was difficult to find and where fields continued to disappear beneath ever more saturated surroundings. At the beginning of the Bronze Age occupation was defined by its relationship to the river. The people who made the monuments and the burnt mounds were inhabitants of the Nene Valley, as were the people who built the banks and ditches around the fields. The relatively rapid onset of fen conditions across the flat plain at the bottom of the Flag Fen Basin interrupted this association. It dislocated the river from the land and simultaneously precipitated a 'no man's land' – a space which was neither terrestrial nor aquatic – too wet to traverse by foot and too dry to navigate by boat. A small fen-embayment, otherwise known as the Flag Fen Basin, was now a fully established historical-geographical feature whose boundaries were having an ever-increasing bearing on the situation and configuration of settlement.

Pattern and Process

The King's Dyke and Bradley Fen excavations occurred within the brick pits of the Fenland town of Whittlesey, Cambridgeshire. The investigations straddled the south-eastern contours of the Flag Fen Basin, a small peat-filled embayment located between the East-Midland city of Peterborough and the western limits of Whittlesey 'island'. Renowned principally for its Bronze Age discoveries at sites such as Fengate and Flag Fen, the Flag Fen Basin also marked the point where the prehistoric River Nene debouched into the greater Fenland Basin.

A henge, two round barrows, an early fieldsystem, metalwork deposition and patterns of sustained settlement along with metalworking evidence helped produce a plan similar in its configuration to that revealed at Fengate. In addition, unambiguous evidence of earlier second millennium BC settlement was identified together with large watering holes and the first burnt stone mounds to be found along Fenland's western edge.

Genuine settlement structures included three of Early Bronze Age date, one Late Bronze Age, ten Early Iron Age and three Middle Iron Age. Later Bronze Age metalwork, including single spears and a weapon hoard, was deposited in indirect association with the earlier land divisions and consistently within ground that was becoming increasingly wet.

The large-scale exposure of the base of the Flag Fen Basin at Bradley Fen revealed a sub-peat or pre-basin landscape related to the buried floodplain of an early River Nene. Above all, the revelation of sub-fen occupation helped position the Flag Fen Basin in time as well as space.

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